

MTH 05

WORKBOOK

If you have any suggestions or see any mistakes on this workbook,

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[CH 0.1-1] Adding Fractions

$$[1]1) \frac{2}{3} + \frac{1}{6}$$

$$2) \frac{5}{6} + \frac{1}{12}$$

$$3) \frac{2}{11} + \frac{2}{33}$$

$$4) \frac{11}{35} + \frac{2}{7}$$

$$5) \frac{7}{15} + \frac{5}{12}$$

$$6) \frac{2}{3} + \frac{1}{4}$$

$$7) \frac{2}{5} + \frac{2}{15}$$

$$8) \frac{5}{14} + \frac{10}{21}$$

$$9) \frac{6}{25} + \frac{7}{35}$$

$$10) \frac{2}{28} + \frac{2}{21}$$

$$[2]1) \frac{5}{9} + \frac{1}{3}$$

$$2) \frac{5}{8} + \frac{3}{20}$$

$$3) \frac{4}{5} + \frac{3}{40}$$

$$4) \frac{5}{6} + \frac{1}{12}$$

$$5) \frac{3}{14} + \frac{3}{7}$$

$$6) \frac{8}{25} + \frac{7}{35}$$

$$7) \frac{2}{28} + \frac{2}{21}$$

$$8) \frac{2}{33} + \frac{2}{21}$$

$$9) \frac{1}{3} + \frac{1}{9} + \frac{1}{27}$$

$$10) \frac{5}{7} + \frac{1}{8} + \frac{1}{2}$$

[CH0.1-2] Subtracting Fractions

$$[1]1) \frac{7}{8} - \frac{3}{16}$$

$$2) \frac{10}{13} - \frac{7}{10}$$

$$3) \frac{5}{12} - \frac{1}{9}$$

$$4) \frac{6}{25} - \frac{7}{35}$$

$$5) \frac{5}{13} - \frac{3}{26}$$

$$6) \frac{5}{11} - \frac{3}{9}$$

$$7) \frac{7}{12} - \frac{5}{18}$$

$$8) \frac{5}{6} - \frac{3}{7}$$

$$9) \frac{1}{100} - \frac{1}{1000}$$

$$10) \frac{21}{44} - \frac{11}{36}$$

$$[2]1) \frac{5}{6} - \frac{3}{8}$$

$$2) \frac{7}{18} - \frac{2}{9}$$

$$3) \frac{7}{15} - \frac{5}{12}$$

$$4) \frac{1}{50} - \frac{1}{500}$$

$$5) \frac{3}{4} - \frac{1}{7}$$

$$6) \frac{11}{35} - \frac{2}{7}$$

$$7) \frac{5}{8} - \frac{3}{20}$$

$$8) \frac{8}{9} - \frac{5}{12}$$

$$9) \frac{7}{18} - \frac{2}{45}$$

$$10) \frac{5}{12} - \frac{1}{8}$$

[CH 0.1-3] Adding and Subtracting Fraction

{1} 1) $\frac{9}{10} + \frac{2}{5}$

2) $\frac{1}{6} + \frac{3}{14}$

3) $\frac{7}{8} - \frac{1}{3}$

4) $\frac{6}{21} - \frac{1}{7}$

5) $\frac{9}{20} + \frac{2}{3}$

6) $\frac{16}{25} - \frac{1}{2}$

7) $\frac{4}{8} + \frac{5}{12}$

8) $\frac{5}{6} - \frac{5}{12}$

9) $\frac{7}{15} + \frac{7}{12}$

10) $\frac{5}{14} - \frac{5}{21}$

{2} 1) $\frac{5}{8} - \frac{3}{20}$

2) $\frac{8}{12} + \frac{5}{10}$

3) $\frac{8}{25} - \frac{7}{35}$

4) $\frac{2}{5} + \frac{3}{6} + \frac{3}{4}$

5) $\frac{2}{21} - \frac{2}{33}$

6) $\frac{5}{6} - \frac{5}{8}$

7) $\frac{5}{8} + \frac{4}{6}$

8) $\frac{5}{14} + \frac{3}{8}$

9) $\frac{5}{6} - \frac{2}{4} - \frac{2}{8}$

10) $\frac{5}{7} + \frac{1}{8} - \frac{1}{2}$

[CH 0.1-4] Addition of Mixed Numbers

$$[1] 1) 10\frac{3}{14} + 3\frac{4}{7}$$

$$2) 12\frac{5}{12} + 4\frac{1}{6}$$

$$3) 9\frac{1}{5} + 8\frac{2}{25}$$

$$4) 6\frac{2}{13} + 8\frac{7}{26}$$

$$5) 8\frac{2}{5} + 11\frac{2}{3}$$

$$6) 7\frac{3}{7} + 3\frac{3}{5}$$

$$7) 102\frac{5}{8} + 96\frac{21}{25}$$

$$8) 3\frac{5}{8} + 2\frac{1}{6}$$

$$9) 12\frac{7}{8} + 25\frac{5}{12}$$

$$[2] 1) 12\frac{5}{12} + 4\frac{1}{6}$$

$$2) 9\frac{1}{5} + 8\frac{2}{25}$$

$$3) 9\frac{3}{4} + 2\frac{1}{8}$$

$$4) 1\frac{5}{6} + 5\frac{3}{8}$$

$$5) 2\frac{5}{12} + 1\frac{5}{8}$$

$$6) 40\frac{9}{10} + 15\frac{8}{27}$$

$$7) 4\frac{1}{3} + 9\frac{2}{5}$$

$$8) 3\frac{1}{6} + 7\frac{3}{4}$$

$$9) 8\frac{5}{9} + 9\frac{9}{12}$$

[CH 0.1-5] Subtraction of Mixed Numbers

[1] 1) $10\frac{13}{14} - 3\frac{4}{7}$

2) $12\frac{5}{12} - 4\frac{1}{6}$

3) $5\frac{2}{3} - 3\frac{1}{5}$

4) $23\frac{3}{5} - 8\frac{8}{15}$

5) $5\frac{3}{8} - 2\frac{13}{20}$

6) $9\frac{1}{5} - 8\frac{6}{25}$

7) $15\frac{4}{7} - 9\frac{11}{14}$

8) $5\frac{3}{8} - 2\frac{13}{20}$

9) $5\frac{2}{13} - 4\frac{7}{26}$

[2]

1) $6\frac{1}{6} - 5\frac{11}{14}$

2) $23 - 17\frac{3}{4}$

3) $11\frac{3}{5} - 9\frac{11}{15}$

4) $9\frac{1}{10} - 7\frac{2}{5}$

5) $6 - 2\frac{4}{9}$

6) $63\frac{1}{6} - 47\frac{5}{12}$

7) $86\frac{2}{15} - 27\frac{3}{10}$

8) $47\frac{4}{18} - 23\frac{19}{24}$

9) $33\frac{11}{20} - 15\frac{19}{30}$

[CH 0.1-6] Multiplication and Division of Mixed Fractions

[1]

1) $(\frac{5}{12})(\frac{3}{4})$

2) $(\frac{3}{14})(\frac{7}{12})$

3) $(6\frac{4}{5}) \div (1\frac{7}{10})$

4) $12 \div (2\frac{2}{3})$

5) $(1\frac{2}{3})(2\frac{1}{2})$

6) $(1\frac{3}{7}) \div (1\frac{1}{4})$

7) $(2\frac{2}{3})(2\frac{1}{4})$

8) $(2\frac{3}{5}) \div (1\frac{4}{35})$

9) $(8)(3\frac{3}{4})$

10) $7 \div (4\frac{2}{3})$

11) $(2\frac{5}{8})(4)$

12) $(3\frac{1}{3}) \div 5$

13) $(3\frac{3}{10})(\frac{6}{11})(1\frac{2}{3})$

14) $(\frac{7}{8})(1\frac{3}{14})(64)$

15) $(2\frac{7}{16}) \div 8$

16) $(7\frac{1}{3})(3\frac{5}{11})$

[2]

1) $(\frac{3}{7})(\frac{2}{9})$

2) $(\frac{7}{9}) \div (\frac{2}{3})$

3) $(2\frac{4}{5})(2\frac{1}{7})$

4) $(3\frac{2}{3}) \div (1\frac{7}{15})$

5) $(4\frac{2}{3})(6)$

6) $(3\frac{4}{5}) \div 19$

7) $6(2\frac{5}{12})$

8) $11 \div (3\frac{1}{7})$

9) $(1\frac{1}{8})(\frac{4}{9})(1\frac{5}{6})$

10) $(\frac{7}{8})(1\frac{3}{14})(64)$

11) $1(\frac{1}{8}) \div 16$

12) $(11\frac{2}{3})(13\frac{3}{5})$

13) $24 \div (2\frac{2}{3})$

14) $56 \div 4\frac{2}{3}$

15) $(\frac{100}{3}) \div (\frac{3}{10}) \div (1\frac{4}{5})$ 16) $(1\frac{2}{3}) \div (1\frac{5}{10}) \div (1\frac{1}{9})$

[3]

1) $(3\frac{3}{4})(2\frac{2}{5})$

2) $(2\frac{1}{6}) \div (3\frac{1}{4})$

3) $(3\frac{3}{8})(2\frac{2}{15})$

4) $(3\frac{2}{5}) \div (2\frac{4}{15})$

5) $(5\frac{3}{4})(12)$

6) $22 \div (3\frac{2}{3})$

7) $12(3\frac{7}{12})$

8) $(3\frac{5}{6}) \div 46$

9) $(1\frac{2}{7})(2\frac{1}{3})(2\frac{1}{6})$

10) $(2\frac{2}{3})(2\frac{1}{4})(12)$

11) $1\frac{1}{4} \div 22$

12) $(8\frac{2}{5})(4\frac{2}{7})$

13) $85 \div 4\frac{1}{4}$

14) $10\frac{1}{2} \div 3$

15) $22 \div 2\frac{5}{8}$

16) $(4\frac{3}{4})(5\frac{2}{3})$

[4]

1) $(1\frac{1}{6})(2\frac{1}{7})$

2) $8\frac{1}{2} \div 2\frac{1}{8}$

3) $(1\frac{3}{5})(1\frac{9}{16})$

4) $(3\frac{3}{4}) \div (5\frac{1}{3})$

5) $16(4\frac{1}{8})$

6) $(3\frac{2}{3}) \div 22$

7) $(3\frac{7}{12})(12)$

8) $15 \div (2\frac{6}{7})$

9) $(3\frac{1}{3})(1\frac{1}{8})(\frac{4}{45})$

10) $(2\frac{2}{5})(1\frac{1}{6})(1\frac{3}{7})$

11) $(1\frac{1}{8}) \div 12$

12) $(12\frac{4}{5})(1\frac{9}{16})$

13) $42 \div 1\frac{1}{6}$

14) $42 \div 1\frac{1}{2}$

15) $8\frac{1}{2} \div \frac{5}{8}$

16) $(6\frac{1}{2}) \div (2\frac{1}{2})$

[CH 0.3-1] Adding Signed Numbers

[1]

1) $7 + 6$

2) $-5 + (-9)$

3) $12 + (-15)$

4) $35 + (-17)$

5) $-16 + (-28)$

6) $(-5) + (-98)$

7) $-89 + 575$

8) $-568 + 893$

9) $85 + (-62)$

10) $-42 + 700$

11) $-25 + (-863)$

12) $572 + (-871)$

13) $3 + [(-9) + 6]$

14) $[-2 + 8] + (-3)$

15) $-18 + [(-5) + (-23)]$

16) $[17 + (-32)] + (-16)$

[2]

1) $8 + 9$

2) $-10 + (-7)$

3) $34 + (-18)$

4) $46 + (-37)$

5) $-38 + (-47)$

6) $(-67) + (-82)$

7) $-572 + (-89)$

8) $-893 + (-568)$

9) $-62 + (-85)$

10) $-700 + (-42)$

11) $-863 + 25$

12) $-871 + (-572)$

13) $[3 + (-9)] + 6$

14) $-2 + [8 + (-3)]$

15) $[(-18) + (-5)] + (-23)$

16) $17 + [(-32) + (-16)]$

[3]

1) $-19 + (-18)$

2) $-18 + (-87)$

3) $-26 + 112$

4) $-357 + 82$

5) $-74 + (-59)$

6) $39 + (-47)$

7) $87 + (-356)$

8) $-563 + (-88)$

9) $98 + (-89)$

10) $(-58) + (97)$

11) $-362 + 259$

12) $-82 + 900$

13) $[2 + (-8)] + 5$

14) $-3 + [9 + (-5)]$

15) $-23 + [(-10) + (-41)]$

16) $[48 + (-47)] + (-22)$

[4]

1) $-44 + (-18)$

2) $-36 + (-37)$

3) $39 + (-47)$

4) $67 + (-82)$

5) $(-47) + 47$

6) $-47 + (-56)$

7) $-87 + (-356)$

8) $653 + (-88)$

9) $-98 + (-89)$

10) $(-58) + (-97)$

11) $-362 + (-259)$

12) $-82 + (-900)$

13) $[-2 + (-8)] + 5$

14) $-3 + [(-9) + (-5)]$

15) $[(-23) + (-10)] + (-41)$

16) $48 + [(-47) + (-22)]$

[CH 0.3-2] Subtracting Signed Numbers

[1] 1) $9 - 15$

2) $16 - (-7)$

3) $-20 - (-7)$

4) $-28 - 16$

5) $59 - 73$

6) $314 - (-88)$

7) $-592 - (-346)$

8) $670 - 830$

9) $-25 - (-7)$

10) $-146 - 146$

11) $-146 - (-146)$

12) $-8 - [12 - (-7)]$

13) $[35 - (-27)] - (-19)$

14) Subtract 86 from 78

15) Subtract 25 from -37

16) Subtract -16 from -18

17) Subtract -86 from 78

18) Subtract -5 from -3

[2]

1) $18 - 25$

2) $27 - (-13)$

3) $-10 - (-3)$

4) $24 - (-13)$

5) $47 - 62$

6) $82 - (-98)$

7) $-258 - 368$

8) $-468 - 562$

9) $25 - (-7)$

10) $146 - (-146)$

11) $[-8 - 12] - (-7)$

12) $0 - 57$

13) $35 - [-27 - (-19)]$

14) Subtract 78 from -86

15) Subtract 37 from -25

16) Subtract -5 from 3

17) Subtract -78 from -86

18) Subtract 5 from -3

[3]

1) $4 - 10$

2) $8 - (-2)$

3) $-10 - (-4)$

4) $-15 - 11$

5) $86 - 96$

6) $156 - (-97)$

7) $-354 - (-286)$

8) $780 - 840$

9) $9 - 17$

10) $-8 - (-15)$

11) $-356 - (-356)$

12) $-5 - [6 - (-2)]$

13) $[23 - (-14)] - (-17)$

14) Subtract 91 from 82

15) Subtract -91 from 82

16) Subtract -18 from -6

17) Subtract 16 from -8

18) Subtract -5 from -3

[4]

1) $5 - 12$

2) $10 - (-3)$

3) $-12 - (-5)$

4) $-24 - 13$

5) $72 - 89$

6) $284 - (-89)$

7) $-484 - (-375)$

8) $597 - 700$

9) $-15 - (-8)$

10) $17 - 9$

11) $-356 - 356$

12) a) $0 - 42$ b) $23 - [-14 - (-17)]$

13) $[-5 - 6] - (-2)$

14) Subtract 91 from -82

15) Subtract -91 from -82

16) Subtract 6 from -18

17) Subtract -6 from 8

18) Subtract -3 from -5

CH 0.4-1 | Multiplication of Signed Numbers

[1] 1) $8(-4)$

2) $(-7)(9)$

3) $(-10)(-10)$

4) $(-9)(-9)$

5) $0(-12)$

6) $8[(-7)(-1)]$

7) $-2(3)(-4)$

8) $-7(-2)(-5)$

9) $2(-3)(-3)(-2)$

10) $3(-4)(2)(-5)$

11) $(-15)(-35)$

12) $[9(-11)](-10)$

13) $(-7)[8+(-3)]$

14) $(-9)[(-6) + (-15)]$

15) Evaluate $6b$ if $b = -5$ 16) Evaluate $-6b$ if $b = -4$

17) Evaluate $6x$ if $x = -8$ 18) Evaluate $-6x$ if $x = -8$

[2]

1) $9(-5)$

2) $(-6)(9)$

3) $(-10)(-8)$

4) $(-9)(-7)$

5) $-(-12)$

6) $[8(-7)](-1)$

7) $3(-5)(6)$

8) $-2(15)(-5)$

9) $3(-2)(-2)(-5)$

10) $5(-4)(-3)(2)$

11) $-8[9 + (-7)]$

12) $-6[(-7) + (-12)]$

13) $(-7)(8) + (-7)(-3)$

14) $-9(-6) + (-9)(-15)$

15) Evaluate $8y$ if $y = -3$ 16) Evaluate $-8y$ if $y = -5$

17) Evaluate $-12w$ if $w = -7$ 18) Evaluate $12w$ if $w = -3$

[CH 0.4-2 | Division of Signed Number

[1] 1) $-40 \div 8$

2) $16 \div (-4)$

3) $-15 \div -5$

4) $\frac{12}{-4}$

5) $\frac{-18}{-2}$

6) $\frac{-150}{10}$

7) $-18 \div -3$

8) $-5 \div 35$

9) $84 \div -4$

10) $[48 \div (-6)] \div (-2)$

11) $[(-24) \div 6] \div (-2)$

12) Evaluate $\frac{x}{6}$ if $x = -12$

13) Evaluate $\frac{a}{-7}$ if $a = -21$

14) $\frac{10 - (-6)}{-2 - 4}$

15) $\frac{-10 + 4}{-1 - (-4)}$

16) $\frac{5 - 3(4)}{-2 - 5}$

[2] 1) $-60 \div (10)$

2) $25 \div (-5)$

3) $-27 \div -9$

4) $\frac{24}{-6}$

5) $\frac{-49}{-7}$

6) $\frac{-250}{100}$

7) $-3 \div -81$

8) $\frac{35}{-5}$

9) $-4 \div 84$

10) $48 \div [-6 \div -2]$

11) $-24 \div [6 \div -2]$

12) Evaluate $\frac{y}{12}$ if $y = -48$

13) Evaluate $\frac{b}{-15}$ if $b = -45$

14) $\frac{5 - (-4)}{-2 - 1}$

15) $\frac{-8 + 2}{-10 - 2}$

16) $\frac{7 - 3(5)}{-3 - (-7)}$

[CH 0.4-3 | Combined Operation

[1] 1) $1 - 9 - 18$

2) $1 - (9 - 18)$

3) $-72 \div (-9) \div 3$

4) $-72 \div [(-9) \div 3]$

5) $17 + 3(-8)$

6) $-15 \div 3(-5)$

7) $-15 \div 3 \times (-5)$

8) $-13 - 5(-1)$

9) $-3 \cdot 8^2$

10) $-(3 \cdot 8)^2$

11) $(-3 \cdot 8)^2$

12) $8(-3)^2$

13) $\frac{-9 + 3}{-1 - (-7)}$

14) $\frac{3 - 2 \cdot 4}{-1 - 4}$

15) Evaluate $4 - 2x^2$ if $x = 2$ 16) Evaluate $5 + a^2$ if $a = -9$

17) Evaluate $2x^2 - 3x + 4$ find $f(3)$

18) Evaluate $2x^2 - 3x + 4$ find $f(-3)$

[2]

1) $2 - 25 - 36$

2) $2 - (25 - 36)$

3) $-48 \div (-16) \div 2$

4) $-48 \div [(-16) \div 2]$

5) $19 + 4(-6)$

6) $-24 \div 6(-4)$

7) $38 - 8(7)$

8) $-21 - 6(-2)$

9) $-8 \cdot 2^2$

10) $-(8 \cdot 2)^2$

11) $-8 + 2^2$

12) $2(-4)^3$

13) $\frac{9 - (-7)}{-2 - 2}$

14) $\frac{8 - 3 \cdot 5}{-2 - 5}$

15) Evaluate $6 - 4b^2$ if $b = -3$ 16) Evaluate $8 + c^2$ if $c = -11$

17) Evaluate $5x^2 - 4x - 3$ find $f(4)$

18) Evaluate $5x^2 - 4x - 3$ find $f(-2)$

[3]

1) $3 - 7 - 26$

2) $3 - (7 - 26)$

3) $-56 \div -8 \div 2$

4) $-56 \div [-8 \div 2]$

5) $-81 \div (-27)(-3)$

6) $23 + 5(-7)$

7) $-35 \div 7(-5)$

8) $-17 - 6(-2)$

9) $-3 \cdot 5^2$

10) $(-3 \cdot 5)^2$

11) $-3 + 5^2$

12) $8(-2)^3$

13) $\frac{10 - (-5)}{-2 - 3}$

14) $\frac{8 - 3 \cdot 6}{-2 - 8}$

15) Evaluate $5 - 8x^2$ if $x = -5$ 16) Evaluate $6 + c^2$ if $c = -13$

17) Evaluate $2x^2 - 3x - 4$ find $f(5)$

18) Evaluate $2x^2 - 3x - 4$ find $f(-5)$

[4]

1) $5 - 14 - 29$

2) $5 - (14 - 29)$

3) $-88 \div 44 \div 2$

4) $-88 \div [44 \div 2]$

5) $-81 \div [-27(3)]$

6) $16 + 6(-9)$

7) $-36 \div 4(-9)$

8) $-31 - 5(-3)$

9) $-2 \cdot 6^2$

10) $(-2 \cdot 6)^2$

11) $-2 + 6^2$

12) $5(-3)^3$

13) $\frac{15 - (-6)}{-4 - 3}$

14) $\frac{8 - 4 \cdot 7}{-3 - 7}$

15) Evaluate $5 + 8x^2$ if $x = -5$ 16) Evaluate $4 + d^2$ if $d = -1$

17) Evaluate $-2x^2 - 3x - 4$ find $f(4)$

18) Evaluate $-2x^2 - 3x - 4$ find $f(-2)$

[CH0.5] Order of Operations

[1]

1) $15 + 3 \cdot 2$

2) $28 \div 7 \cdot 2 + 3$

3) $100 \div 10 \cdot 5 + 4$

4) $28 \div 4 - 3 \times 4$

5) $2 \times 5 + 2(7-2)$

6) $24 \div 4 \times 2 - 2(5-3)$

7) $12 + 3\sqrt{64} - 7$

[2]

1) $(3 + 5^2) \div 2 \cdot 3^2$

2) $(13 + 6^2) \div 7 \cdot 4^2$

3) $6^2 - (10 - 8) + 2^3 + 5^2$

4) $\frac{18 + 6}{2^4 - 2^2}$

5) $18 - 16 \div 8$

6) $18 \div 2 \times 6 + 3(7-5)$

7) $2\sqrt{100} - 2^2 \cdot 5$

[3]

1) $2^3 \cdot 4 - (10 \div 5)$

2) $[40 - (8 - 2)] - 2^5$

3) $6 \cdot \sqrt{9} + 3\sqrt{4}$

4) $7 \cdot \sqrt{36} - 0 \div \sqrt{64}$

5) $(2 + 3) \cdot 6 - 2(10 - 2^3)$

6) $24 \div (3 \cdot 2) - 2 \cdot (5 - 3)$

7) $81 \div 3^2 \cdot (3^3 \div 3^2)$

8) $2(3^3 \div 9) - 3(5^0 - 3^0)$

[4]

1) $2 \cdot 3^2 + (2 \cdot 3)^2$

2) $(2 + 3) \cdot (6 - 2)$

3) $24 \div (3 \cdot 2 + 2) \cdot 5$

4) $24 \div 3 \cdot 2 + 2 \cdot 5$

5) $2 + 3 \cdot 6 - 2$

6) $24 \div 3 \cdot 2 \div 2$

7) $(10^2 \div 5^2)^2 - \sqrt{121} + 5$

8) $2^0(5^0 - 3^0) - 3^0(2^0 - 1^0)$

[5]

1) $72 \div 2 \times 7$

2) $15 - 3^0$

3) $56 \div 4 \cdot 2(5)$

4) $3 \cdot 4^2 + 2 \cdot 3^2 + 14$

5) $9^0 + 12^0 + 12 + 10^3$

6) $5^2 + 8 \cdot 0 + 7 \cdot 9$

7) $4 \cdot 10^2 + 3^2 \cdot 100$

8) $10^2 \sqrt{81} \cdot 4$

9) $5 \cdot 3 + 6^2 - 5 \cdot 8$

10) $144 \div 3^2 \cdot 2 + 6 \cdot 70$

11) $5 + 2\sqrt{36} - 9$

12) $7(8 + 9)$

13) $8 \cdot 9 - 8 \cdot 7$

14) $27 - 18 + 3$

15) $\sqrt{13^2 - 12^2}$

16) $2[3(4 - 2) + 2(5)]$

[6]

1) $81 \div 9 \times 3$

2) $34 - 7^0$

3) $108 \div 2^2 \cdot 3 + 4 \cdot 25$

4) $8 \cdot 4 + 30 \div 6$

5) $10^3 \sqrt{121} \cdot 2$

6) $64 \div 4 \cdot 2(5)$

7) $12 + 3\sqrt{64} - 7$

8) $4 \cdot 3 + 5^2 - 3 \cdot 2$

9) $7^0 + 8^1 + 8^0 + 10^2$

10) $8 \cdot 10^2 + 6^2 \cdot 10^3$

11) $4^3 + 7 \cdot 0 + 8 \cdot 7$

12) $7 \cdot 8 + 7 \cdot 9$

13) $8(9 - 7)$

14) $11 - 3 + 2$

15) $\sqrt{6^2 + 8^2}$

16) $10 - \frac{10 - 7}{3} \cdot 2(5 - 2)$

[7]

1) $36 \div 6 \div 2$

2) $17 - 8^0$

3) $10 \div 2 \times 5$

4) $3 \cdot 2^4$

5) $10 \cdot 10^2 + 100$

6) $4 \cdot 3 + 15 \div 5$

7) $48 \div 4 \cdot 2(6)$

8) $2 \cdot 5^2 + 3 \cdot 2^2 + 4$

9) $6^0 + 10^0 + 10 + 10^4$

10) $9^3 + 9 \cdot 0 + 7 \cdot 8$

11) $5 \cdot 10^2 + 4^2 \cdot 100$

12) $10^2 \sqrt{16} \cdot 5$

13) $2 \cdot 3 + 3^2 - 4 \cdot 2$

14) $100 \div 5^2 \cdot 6 + 8 \cdot 75$

15) $4 + 3\sqrt{25} - 7$

16) $8(9 + 7)$

[8]

1) $64 \div 16 \times 2$

2) $23 - 5^0$

3) $16 \div 4 \times 4$

4) $2 \cdot 3^3$

5) $1 \times 10^3 + 1000$

6) $6 \cdot 4 + 20 \div 5$

7) $36 \div 6 \cdot 2(3)$

8) $2 \cdot 5^2 + 3 \cdot 2^2 + 4$

9) $5^0 + 5^1 + 7^0 + 10^3$

10) $2^3 + 0 \cdot 6 + 8 \cdot 6$

11) $10^3 \sqrt{25} \cdot 3$

12) $9 \cdot 10^3 + 5^2 \cdot 10^3$

13) $5 \cdot 2 + 7^2 - 2 \cdot 8$

14) $54 \div 3^2 \cdot 4 + 3 \cdot 15$

15) $10 + 5\sqrt{16} - 5$

16) $9(8 - 7)$

CH 1.1-1 Translation of Algebraic Expression

[1] 1) The sum of a and twice of b .

2) 8 less than twice of c .

3) The product of -2 and the quantity of a plus b .

4) Twice the sum of c and d .

5) The sum of twice r and s .

6) Twice the difference of m and n .

7) The quantity c plus d times the quantity c minus d .

8) The product of x and 4 less than x .

9) Six subtracted from four times P .

10) The difference of m and n , divided by 6.

11) The sum of b and 2, divided by the difference of b and 2.

12) 8 more than 2 times a number.

13) 5 subtracted from twice P .

14) The product of 3 more than a number and 3 less than that same number.

15) Three less than twice of X is subtracted from P less than three times Q .

16) 7 more than a number divided by 7 less than that same number.

17) Three times the product of a minus b and sum of twice a and three times d .

18) Twice the quotient of twice c , divided by d less than E .

[2] 1) Twice d less than three times c

2) a number that exceeds m by 4

3) 5 times x increased by 2

4) 36 divided by the sum of t and u

5) the product of x and y decreased by one-half the sum of x and y

6) Twice of X is subtracted from Y

7) Twice of the result from X subtracted from Y

8) 3 less than twice a number

9) one-third of the product of 5 and a number

10) the product of 5 more than a number, and 4

11) one half of, 10 more than a number

12) twice the sum of, one-half a number and 1

13) Saul is 25 years old. Represent his age x years ago.

14) Paul and Martha saved 100 dollars. If the amount saved by Paul is represented by x , represent the amount saved by Martha.

15) The cost of a fur coat is 5 times the cost of a cloth coat. If the cloth coat costs x dollars, represent the cost of the fur coat.

16) Sally weighs 2.5 times as much as Helen. If Helen weighs m pounds, represent Sally's weight.

17) The length of a rectangle is presented by L . If the width of the rectangle is one-half of its length, represent the width.

[CH 1.1-2 | Translating Sentences into Algebraic Equations

[1]

- 1) Seven more than three times x is 15.
- 2) An unknown number increased by 8 is 32.
- 3) When the sum of an unknown number and 6 is multiplied by 4, the result is 16.
- 4) A 37 inch piece of wire is to be cut into two pieces. One piece is twice as long as the other piece.
- 5) 20 is 6 less than twice of P .
- 6) Six more than four times an unknown number is 22.
- 7) When the sum of an unknown number and 6 is multiplied by 2, the result is 48.
- 8) Eight subtracted from three times the X is 3.
- 9) David bought 3 more pens than pencils. He bought 13 pen and pencils all together.
- 10) Susan bought 5 times as many tapes as CD's. She purchased 12 items altogether.

[2]

- 1) Eight more than three times unknown number is 53.
- 2) An unknown number increased by 11 is 25.
- 3) When the sum of an unknown number and 8 is multiplied by 3, the result is 63.
- 4) An 81 inch piece of tubing is to be cut into two pieces. One piece is to be twice as long as the other piece.
- 5) 5 less than three times of X is 10.
- 6) Kim bought 4 more cans of Pepsi than Coke. She bought 16 cans of soda altogether.
- 7) Mike bought 4 times as many tapes as CD's. He purchased 30 items altogether.
- 8) Four is Six subtracted from twice the P
- 9) The sum of an unknown number and a number that is 4 less than the unknown number is 24.
- 10) Three times the sum of two less than unknown number and 6 more than the unknown number is 36.

[CH1.2] Evaluate the Following Expressions

[1] If $a = 2$, $b = 3$, $c = 4$, and $d = 5$ then

1) $8ac$

2) $a + c$

3) $4a + 2c$

4) $3c^3$

5) $2a^2 + 4c^2$

6) $2(a + d)$

7) $2a + b$

8) $5(a + 2c)$

9) $5(4d - 3b)$

10) $c(3a + 4b)$

11) $2b^2 + c^2$

12) $2(b^2 + c^2)$

13) $(2a^2 + c)^2$

14) $\frac{10b}{d}$

15) $\frac{7a - c}{d}$

16) $\frac{a + 2c}{2c - b}$

17) $\frac{2a^3 - 2c}{d - b}$

18) $\frac{2a^2 + 6c}{2a + b}$

[2] If $a = 2$, $b = -3$, $c = 4$, and $d = -5$ then

1) $2bd$

2) $d - b$

3) $4d - 6a$

4) $4c^2$

5) $d^3 - 2b^3$

6) $6(d - b)$

7) $2(3b + d)$

8) $4(4a + b)$

9) $8(2a + 3c)$

10) $b(3c - 2a)$

11) $7(a^2 + c^2)$

12) $(5a^2 + b)^2$

13) $\frac{9c}{b}$

14) $\frac{8ab}{c}$

15) $\frac{8abd}{c^2}$

16) $\frac{5a + d}{b}$

17) $\frac{3b + d}{c - b}$

18) $\frac{2b^2 + 6c}{2a + b}$

[CH 1.3] Adding and Subtracting Algebraic Expression

[1] 1) $3x + 7x$

(Combine the Like Term)
2) $16y^2 - 4y^2$

3) $15m^2n - 5m^2n$

4) $6y^2 - 5y^2 + 3y^2$

5) $6b - 4b + 3c$

6) $10m^2 - 2m - 3m^2$

7) $3a - 4b + 2b$

8) $6a + 4b - 2a - 3b$

9) $\frac{1}{4}x + 2 + \frac{2}{4}x$

10) $\frac{4}{5}x - \frac{1}{5}y - \frac{2}{5}x$

11) $2(3y + 4) + 5$

12) $6(5y - 3) + 10y$

13) $3x + 3(x + 5) + 5$

14) $5(6p - 3) - 10p$

15) Subtract $3y$ from the sum of $7y$ and $4y$.

16) Subtract the sum of $7ab$ and $15ab$ from $5ab$

17) $(3a - 5b) - (-5a - 4b)$

18) $(2x^2 - 3x + 4) - (5x^2 + 6x - 7)$

19) $-(3x - 2y) - (-4x + 6y)$

20) $(5a^2 - 6a - 7) - (3a^2 - 4a - 3)$

[2]

1) $12a^2b - 6ab^2$

2) $3x^2 - x - x^2$

3) $2a - 5a$

4) $5b - 3b - 7b$

5) $8c - 4b - 5c + 5b$

6) $4F + 5G - 2F + 3G$

7) $\frac{5}{7}x + 4 - \frac{3}{7}x + 5$

8) $\frac{9}{7}a - \frac{4}{7}b + \frac{6}{7}b - \frac{4}{7}a$

9) $7.5x - 2.5y - 3.6x - 2.6y$

10) $3.7a + 2.5b - 5.9a + 1.5b$

11) The sum of 7 less than $5b$ and twice b

12) The sum of twice b and 7 less than $5b$

13) Subtract $3y + 2$ from the sum of $5y$ and 12.

14) Subtract the 7 plus $9x$ from 5 plus $4x$

15) $7(9a - 5) + 2(4a - 6)$

16) $6(3b - 7) + 4(8 - 4b)$

17) $-2(4x + 5) - 3(2x - 3)$

18) $3(7y - 2) - 2(4y - 3)$

19) $5(3p - 4q) + 2(4p - 2q)$

20) $-(5x^2 + 6x - 7) - (2x^2 - 3x + 4)$

21) $-5(3p - 4q) - 2(4p - 2q)$

22) $-(3x^2 - 4x - 3) - (5x^2 - 6x - 7)$

[CH 5] Multiplying and Dividing Expressions

[1]

1) $x^5 \cdot x^6$

2) $5^4 \cdot 5^9$

3) $a^6 \cdot a$

4) $ab^2 \cdot a^2b^3$

5) $a \cdot a^2 \cdot a^3$

6) $x^2y^3 \cdot xy \cdot x^2y^4$

7) $6a^4b^2 \cdot 2ab^4$

8) $4a^2b \cdot 8ab^4$

9) $3x^3 \cdot x^2 \cdot 4x^6$

10) $4x^2y \cdot 3xy^2 \cdot 2x^6y$

11) $4a^2 \cdot a^4 \cdot 3a \cdot 5a^3$

12) $2c^2d \cdot cd^3 \cdot 5c^2d \cdot 4cd$

13) $\frac{b^6}{b^4}$

14) $\frac{x^8}{x}$

15) $\frac{8w^4}{2w}$

16) $\frac{9x^4}{3x^2}$

17) $\frac{14x^4y}{7x^2}$

18) $\frac{24a^3b^6}{6ab}$

19) $\frac{240x^5y^7}{60y^5}$

20) $\frac{16a^2b^3c^4}{8ab^2c^2}$

[2]

1) $x^7 \cdot 2x^5 \cdot x$

2) $2^3 \cdot 2^5 \cdot 2^4 \cdot 2$

3) $a^5 \cdot a^4 \cdot a^3 \cdot a$

4) $x^2y^5 \cdot x^3y^2$

5) $a^2b \cdot a^3b^2 \cdot ab^6$

6) $6p \cdot 3p \cdot 2p^4$

7) $5a^2b^5 \cdot 4ab^3$

8) $3x^3 \cdot x^2 \cdot 4x^6 \cdot x$

9) $3y^4 \cdot 2y^5 \cdot 5y^2$

10) $7x^3y \cdot x^2y^2 \cdot 2xy^4$

11) $2p^4 \cdot 2p \cdot p^3 \cdot 3p^5$

12) $8x^2y \cdot xy \cdot 3xy^3 \cdot 4x^3y$

13) $\frac{y^6}{y}$

14) $\frac{a^7b^3}{a^4b^2}$

15) $\frac{6a^4}{2a}$

16) $\frac{15a^6}{3a^6}$

17) $\frac{40x^3y^4}{10y^3}$

18) $\frac{36w^5z^8}{6w^3z}$

19) $\frac{30x^6y^5z^4}{6x^5yz^3}$

20) $\frac{4x^2y^3 \cdot 3x^3y^6}{2x^5 \cdot 2y^9}$

[CH 1.4] Addition and Subtraction (Solve and Check)

[1] 1) $x + 2 = 7$

2) $x - 8 = 7$

3) $x - 6 = -10$

4) $x + 5 = -3$

5) $12 = x + 4$

6) $5 + x = 9$

7) $x - 6 = 0$

8) $3x = 2x + 6$

9) $7x = 6x - 10$

10) $7x + 2 = 6x$

11) $6x - 4 = 5x$

12) $2x + 4 = x + 6$

13) $5x - 8 = 4x - 3$

14) $8x - 4 = 7x + 6$

15) $3 + 6x = 5 + 5x$

16) $4 + 10x = 9x - 8$

17) $3 + 5x + 1 = x + 8 + 3x$

18) $6x + 6 + 2x = 6x + 12 + x$

19) $3(7x + 2) = 4(5x + 1) + 14$

20) $6(6x - 1) - 7(5x + 2) = 3$

[2]

1) $x - 4 = -3$

2) $x + 6 = 0$

3) $6x = 5x - 6$

4) $8x = 7x + 5$

5) $9x - 8 = 8x$

6) $3x - 4 = 2x + 1$

7) $7x + 5 = 6x - 2$

8) $10x - 4 = 9x - 5$

9) $2 + 5x = 1 + 4x$

10) $3 + 7x = 6x - 7$

11) $4x - 3 + x = 4 + 4x + 5$

12) $5x + 9 + 3x = 9x + 7x - 5$

$$13) 3(4x - 3) = 11x + 4$$

$$14) 3(8x + 6) = 5(5x - 2) + 8$$

$$15) 5(9x - 9) - 4(11x - 11) = 5$$

$$16) \frac{9}{6}x + 5 = \frac{3}{6}x - 7$$

$$17) \frac{7}{2}x - \frac{5}{4} = \frac{5}{2}x + \frac{3}{4}$$

$$18) \frac{10}{3}x + \frac{1}{6} = \frac{7}{3}x + \frac{7}{6}$$

19) 4 less than x is 12

20) 2 more than 5 times a number is 6 times that same number

[CH1.5] Multiplication/Division (Solve for x and Check)

[1]1) $4x = 12$

2) $9x = 72$

3) $-3x = 27$

4) $-9x = -81$

5) $-9x = 63$

6) $7x = -56$

7) $\frac{x}{2} = 6$

8) $\frac{2}{3}x = 8$

9) $\frac{3}{4}x = -12$

10) $-\frac{2}{5}x = 8$

11) $5x + 2x = 28$

12) $14x - 6x = 48$

13) $8x = 2x + 60$

14) $9x = 72 - 3x$

15) $7x - 4x + 5x = 32$

16) $9x + 3x = 6x - 36$

17) A number divided by 7 is equal to 5

18) Twice a number divided by 4 is 12

19) $3.2x = 9.6$

20) $-3.5x = 10.5$

$$[2]1) 72 = 9x$$

$$2) 4x = -16$$

$$3) -9x = -72$$

$$4) -10x = -70$$

$$5) \frac{x}{3} = 3$$

$$6) -\frac{x}{3} = -2$$

$$7) \frac{7}{8}x = -28$$

$$8) -\frac{5}{8}x = -15$$

$$9) 8x - 2x = 60$$

$$10) 9x + 3x = 72$$

$$11) 5x = 28 - 2x$$

$$12) 14x = 6x + 48$$

$$13) 9x + 3x - 6x = 36$$

$$14) 7x - 4x = 5x + 32$$

$$15) 3.7x + 5.4x = -18.2$$

$$16) 12.4x - 6.2x = -24.8$$

$$17) \text{Twice a number is } 34$$

$$18) \frac{2}{7} \text{ of a number is } 6$$

$$19) 3 \text{ times a number, divided by } 4 \text{ is } 33$$

$$20) \text{Twice a number divided by } 7 \text{ is } 10$$

[CH 1.6] Combined Operations (Solve for x and Check)

$$[1]1) 2x + 1 = 7$$

$$2) 2x + 9 = 3$$

$$3) 2 - 4x = 14$$

$$4) 6 - 7x = -15$$

$$5) 5x = 24 - x$$

$$6) 7x + 4 = 2x + 24$$

$$7) 7x - 3 = 9x + 7$$

$$8) 2x + 5 = 4x - 2$$

$$9) 3(2x+4) = 4x+6$$

$$10) 2(3x - 5) = 9x+5$$

$$11) 2(5x - 6) = 6x - 4$$

$$12) 2(4x + 6) = 10x - 6$$

$$13) 2x - 3 + 5x = 4 + 4x + 1$$

$$14) 6x + 6 - 4x = 12 + 7x - 21$$

$$15) 6(2x-1) - 5x = x+24$$

$$16) 2x+3(3x-4) = 6x-9$$

$$17) \frac{8}{3}x - 3 = \frac{2}{3}x + 5$$

$$18) 5.2x - 7 = 2.2x + 8$$

[2]

1) $6x + 20 = -4$

2) $7 - 3x = -8$

3) $\frac{3}{4}x - 4 = 2$

4) $\frac{4}{5}x - 1 = 11$

5) $3x = 12 - x$

6) $8x = 4x + 24$

7) $5x + 3 = 2x - 3$

8) $2x + 21 = 6x - 7$

9) $8x - 8 - 2x = 2 + 4x - 4$

10) $7x - 2 - 3x = 5 + 9x + 13$

11) $8(3x + 2) - 10x = 12x - 2$

12) $6x + 2(3x + 5) = 8x + 13$

13) $\frac{12}{5}x + 6 = 12 - \frac{3}{5}x$

14) $7.8x + 4 = 3.8x + 20$

15) 5 less than 3 times a number is 22

16) 10 more than twice a number is 46

17) 3 less than three-fourths of a number is 33.

18) 5 times a number is 12 less than that number

[CH 1.7] Solve Literal Equations and Applications(Formula)

[1] 1) $V = Bh$ (for h)

2) $E = IR$ (for I)

3) $V = \pi r^2 h$ (for h)

4) $A + B + C = 180$ (for A)

5) $ax + b = 0$ (for a)

6) $X = 2a + 5b$ (for a)

7) $2x + y = 6$ (for x)

8) $P = 2L + 2W$ (for W)

9) $Y = 2X - 3Z$ (for X)

10) $X = \frac{a+b}{2}$ (for a)

11) $C = \frac{5}{9}(F - 32)$ for F

12) $A = \frac{1}{2}(B + b)$ for B

13) $A = P + Prt$ (for t)

14) $C = \frac{A-B}{C}$ (for A)

[2]

1) $P = 4S$ (for S)

2) $I = Prt$ (for t)

3) $V = LWH$ (for W)

4) $V - E + F = 2$ (for V)

5) $Y = mx + b$ (for x)

6) $a = 3b - 4c$ (for b)

7) $3x + 4y = 12$ (for y)

8) $ax + by = c$ (for x)

9) $V = \frac{KT}{P}$ (for K)

10) $D = \frac{C - S}{n}$ (for C)

11) $A = P + Prt$ (for r)

12) $S = 2\pi r^2 - 2\pi rh$ (for h)

13) $A = \frac{1}{2}h(B + b)$ (for b)

14) $C = \frac{A - B}{C}$ (for B)

CH 1.6.4.1 Consecutive Integer Problems

- 1) Find the four consecutive odd integers whose sum is 112.
- 2) Find three consecutive integers such that the sum of the first and the third is 40.
- 3) Find the 4 consecutive integers such that the sum of the second and fourth is 132.
- 4) Find the three consecutive integers such that the sum of the first 2 integers is 24 more than the third integers.
- 5) Find the 3 consecutive odd integers such that the sum of the first and second is 27 less than 3 times the third.
- 6) Find the 3 consecutive even integers such that the sum of the smallest and twice the second is 20 more than the third?
- 7) Find the three consecutive even integers such that the sum of the first two integers minus the third integer is 4.
- 8) Find two consecutive integers such that twice the first integer minus the second integer is 8.
- 9) Find the three consecutive integers such that the sum of the first two integers is equal to 4 times the third.
- 10) Find the 3 consecutive even integers such that the sum of the first two integers is equal to three times the third.

[CH 1.6.4.2] World Problems (Relation and Total)

[1]

1) The larger of two numbers is twice the smaller. If the sum of the two numbers is 96, find the numbers.

2) One number is 5 times another. If their difference is 96, find the numbers.

3) A number is one-half of another number. Find the numbers if their difference is 28.

4) A number is $\frac{2}{3}$ of another number. The sum of the two numbers is 50. Find the numbers.

5) Herbert is 5 times as old as Mike. If the sum of their ages is 18 years, find the age of each boy.

6) Bob and Dan earned a total of \$24 shoveling snow. If Bob earned 3 times as much as Dan, how much did each boy earn?

7) Lily spent 3 times as much as her sister Sue. If the girls spent \$24, how much did each girl spend?

8) Carl and Richard earned \$10.50 delivering packages. If they agreed that Carl should get 1.5 times as much as Richard gets, how much did each boy receive?

9) A house and a lot are worth \$30,000. If the house is worth 5 times as much as the lot, find how much each is worth.

10) The larger of two numbers is 5 more than the smaller. The smaller number plus twice the larger equals 100. Find the numbers.

11) One number is 2 smaller than another. If 4 times the larger is subtracted from 5 times the smaller, the result is 10. Find the numbers.

12) A coat costs \$15 more than a dress. Two coats and 4 dresses cost \$150. Find the cost of each.

13) Sam is 4 years older than Catherine. If 4 times Catherine's age is 32 years. Find the age of each.

14) Mr. Powers travels 12 miles less each day in going to and from his job than Mr. Clay does. The difference between the distance Mr. Clay travels in 6 days and the distance that Mr. Powers travels in 5 days is 96 miles. How far does each one travel each day?

[CH 1.6.4.3] Simple Percent Problems

[1]1) What is 20% of 70?

2) 5 is what percent of 20?

3) 30% of what number is 12?

4) 15 is 30% of what number?

5) 100 is what percent of 250?

6) What number is 25% of 40?

7) 40% of what number is 20?

8) What percent of 20 is 5?

9) What is the percent increase from 20 to 60?

10) How much did the percent decrease from 200 to 100?

[2]

1) 20 is what percent of 50?

2) What number is 200% of 12?

3) 16 is 20% of what number?

4) 90 is what percent of 180?

5) What number is 40% of 200?

6) 30% of what number is 60?

7) What percent of 60 is 20?

8) 15% of 500 is what number?

9) How much did the percent increase from 100 to 200?

10) What is the percent decrease from 200 to 100?

[CH 1.6.4.4] Simple Percent Word Problems

[1]

- 1) A team won 80% of its games. If it won 68 games, how many games did it play?

- 2) A team won 80% of its games. If it lost 10 games, how many games did it play?

- 3) On a math test, Paul answered 18 problems correctly and scored 60%. How many problems were on the test?

- 4) On a math test, Paul answered 12 problems incorrectly and scored 60%. How many problems were on the test?

- 5) In a class of 40 students, 10 students received a grade of B. What percent of the class received a grade of B?

- 6) In a class of 50 students, 10 students received a grade of A. What percent of the class received other than a grade of A?

- 7) Peter's weekly gross pay for his job is \$200, but 20% of his check is withheld. How much is withheld?

- 8) 54 out of 216 applicants passed their exams. What percent of the applicants passed? What percent did not pass?

- 9) Bryan, salesman, made a 9% commission on all items he sells. One week he made \$720. What were his gross sales for the week?

- 10) Audrey will receive a 10% raise in her salary. Her present salary is \$60,000. What will her new salary be?

- 11) The Paul's monthly salary increased from \$2000 to \$3000. What was the percent increase of his salary?

- 12) The daily sale of Victor's Store decreased from \$4,000 to \$3,000 yesterday. What was the percent decrease?

[CH 1.7.2] Geometry Word Problems

[1]

- 1) The length of a rectangle is 12. What is the width if the perimeter is 36?

- 2) The length of a rectangle is three more than the width. If the perimeter is 50, what are the length and width?

- 3) The perimeter of a square is 64. What is the length of a side of the square?

- 4) The length of a rectangle is 3 less than the width. If the perimeter is 50, what are the length and the width?

- 5) The width of a rectangle is six less than the length. What are the length and the width if the perimeter is 40?

- 6) The area of a triangle is 24 square inches and the base is 8 inches. What is the height of the triangle?

- 7) The second side of a triangle is 8 inches less than the first side. The third side is 14 inches more than the first side. The perimeter is 63 inches. Find the three sides.

- 8) The lengths of the sides of a triangle are represented by 3 consecutive even integers. If the perimeter is 96 feet, find the length of its sides.

- 9) The perimeter of a triangle is 40". The second side is 1 more than twice the first side, and the third side is 2" less than the 2nd side. Find the length of each side.

[CH 1.7.3] Motion Problems

- 1) A truck is traveling 60 mph and a van traveling 40 mph left the same gas station at the same time and drove in opposite directions. In how many hours were the vehicles 600 miles apart?

- 2) Two boats departed from the harbor at the same time. One sailed east at the rate of 50 mph; the other sailed west at the rate of 90 mph. In how many hours were they 1260 miles apart?

- 3) Two planes are 1,100 miles apart. At 7 A.M. they start traveling toward each other at average rates of 140 and 135 mph. At what time will they pass each other?

- 4) Orangetown and Appletown are 512 miles apart. A car traveled from Appletown towards Orangetown at the rate of 56 mph. Another car from Orangetown towards Appletown at the rate of 72 mph. How many miles did each travel before they meet?

- 5) A businessman made a trip of 490 miles by car and train. He traveled 5 hours by car and 2 hours by train. If the train averaged 35 mph more than the car, find the rate of each.

- 6) A motorcyclist made a trip of 380 miles in 5 hours. Before noon he averaged 82 mph, and in the afternoon he averaged 52 mph. At what time did he begin his trip and when did he end it?

- 7) Two Super-fast-cars started at the same time from two rest stops which are 1550 miles apart and drove toward each other. One car drove at 330 mph, and the other at 370 mph. In how many hours are the cars still 150 miles apart?

- 8) At 2 P.M. two planes started flying towards each other from airports which were 1,701 miles apart at average rates of 245 and 312 mph. At what time were the planes still 30 miles apart?

- 9) A taxicab traveling 59 mph and a bus traveling 44 mph leave the same station at the same time and drive in the same direction. In how many hours will they be 135 miles apart?

- 10) At 8:00 A.M. two battleships started from the same naval base and traveled north. One ship averaged 34 mph, and the other ship averaged 21 mph. At what time were the battleships 104 miles apart?

- 11) Mr. Jim left his workplace and drove west at the rate of 20 mph. One hour later, Mr. Kim left the same building at the rate of 25 mph, also traveling east. In how many hours did Mr. Kim overtake Mr. Jim?

- 12) Susan left her home at 7 A.M., driving her car at the rate of 30 mph. At 9 A.M. her sister Marion drove after her along the same highway, traveling at the rate of 45 mph. In how many hours did Marion pass Susan?

- 13) Mr. Lee spent 6 hours on a trip out into the country and back. He walked out at the rate of 4 mph and walked back at the rate of 2 mph. How far out into the country did he go?

- 14) Ronald drove away from home in a car at the rate of 28 mph. He walked back at the rate of 4 mph. The round trip required 4 hours. How far did Ronald ride?

- 15) A round trip in a helicopter lasted 3 hours. If the helicopter flew away from the airport at 100 mph and returned at the rate of 50 mph, what was its greatest distance from the airport?

[CH 1.7.4] Dry Mixture Problems

1) A dealer wishes to mix coffee worth 65 cents per pound with coffee worth 90 cents per pound in order to produce 40 pounds of coffee which can be sold at 75 cents per pound. How many pounds of each type should he use?

2) How many pounds of candy worth 70 cents per pound must be mixed with 30 pounds of candy worth 90 cents per pound to produce a mixture which can be sold for 85 cents per pound?

3) A grocer mixed nuts worth 80 cents per pound with nuts worth 50 cents per pound. How many pounds of each did he use to make a mixture of 30 pounds to sell at 75 cents per pound?

4) If almonds sell at \$1.20 per pound and walnuts sell for \$.75 per pound, how many pounds of each must be used to make 45 pounds of a mixture to sell at \$1.00 per pound?

5) A seedman has seeds worth \$.70 per pound and seeds worth \$.90 per pound. How many pounds of each must he use to make 300 pounds worth \$.75 per pound?

6) A dealer wishes to produce 300 gallons of oil worth 40 cents a quart by mixing oil worth 36 cents a quart with oil worth 52 cents a quart. How many quarts of each kind of oil should he use?

7) A baker has cookies worth \$.95 per pound and cookies worth \$1.70 per pound. How many pounds of each kind must he use to produce a 45 pound mixture to sell for \$1.25 per pound?

8) A florist sold roses at \$3.50 per dozen and carnations at \$2.50 per dozen. In all he sold 14 dozen, and his total receipts were \$43. How many dozen of each kind of flower did he sell?

9) One evening 478 tickets were sold at the local movie. The charges for admission were \$.85 for adults and \$.50 for children. The total receipts for the performance were \$375.50. How many adults and how many children attended?

10) How many pounds of 65-cent coffee must be mixed with 10 pounds of 90-cent coffee to make a mixture worth 70 cents a pound?

11) How many pounds of tea worth \$1.80 a pound must be mixed with 15 pounds of tea worth \$1.10 a pound to produce a mixture worth \$1.50 a pound?

[CH1.8] Solve the Inequalities and Graph

[1] Solve the inequalities and graph the solution on the number line

1) $x - 5 < 2$

2) $-3x < 12$

3) $6x + 2 \geq x - 8$

4) $5x + 7 > 13 + 11x$

5) $2x - 9 > 3(x - 2)$

6) $4(6 - 2x) \leq 5x - 2$

7) $2x - 3(x + 4) \leq -7$

8) $6(3 - 4x) + 12 \geq 10x - 2(5 - 3x)$

9) $5(3 - 2x) + 25 > 4x - 6(10 - 3x)$

[2]

1) $x + 3 \geq -4$

2) $-2x \geq -6$

3) $7x - 3 < 18$

4) $4x + 28 > 7 + x$

5) $6x + 7 \geq 3 + 8x$

6) $3x - 11 > 5(x - 1)$

7) $3x - 6 \leq 3(2 - x)$

8) $4x - 2(3 - x) \leq 12$

9) $6(2x - 5) + 29 > 3x - 7(11 - 4x)$

10) $7(2 - 5x) + 27 > 18x - 3(8 - 4x)$

[CH 3.1] The Graph of a Linear Equation

Graph the Following

1) $2x + 3y = 6$

2) $2x - 3y = 6$

3) $y = \frac{3}{4}x + 2$

4) $y = -4$

5) $x = -3$

6) $y = -\frac{3}{4}x + 2$

7) $-2x + 3y = 6$

8) $-2x - 3y = 6$

9) The horizontal line passing through the point $(2, -3)$.

10) $y = 4$

11) $x = 3$

12) The vertical line passing through the point $(5, -2)$.

[CH 3.2] The Slope of a Line

[A] Find the slope of the line that passes through each given pair of points.

1) $(-5, -8)$ and $(-9, 4)$

2) $(9, 15)$ and $(-6, 3)$

3) $(-2, -11)$ and $(-7, -11)$

4) $(14, 19)$ and $(14, -21)$

5) $(-3, 2)$ and $(4, -3)$

6) $(8, 1)$ and $(8, 6)$

7) $(0, 5)$ and $(3, -5)$

8) $(4, -2)$ and $(-2, 4)$

9) $(-3, -5)$ and $(3, 0)$

10) $(-5, -5)$ and $(1, -7)$

[B] Find the slope and y-intercept from the standard equation.

1) $2x + 3y = 6$

2) $2x - 3y = 6$

3) $-2x - 3y = 6$

4) $3x - 6y = 18$

5) $3x + 6y = 18$

6) $-3x + 2y = 18$

7) $-3x - 2y = 18$

8) $-2x + 3y = 6$

9) $-4x + 2y = 8$

10) $10x + 5y = 15$

[CH 3.3] Forms (Type) of Linear Equations
[A] Find an Equation when slope and y - intercept is given. ($y = mx + b$)

1) $m = \frac{5}{7}$ and y intercept = -3

2) $m = -\frac{1}{4}$, and y - intercept is -2

3) $m = -\frac{4}{3}$, and y - intercept = $-\frac{1}{2}$

4) $m = 2$, and y - intercept = 3

5) $m = 0$, and y - intercept = 5

6) $m = 0$, y - intercept = -7

7) $m = \frac{5}{6}$, y - intercept = -4

8) $m = -\frac{2}{9}$ and y - intercept = $\frac{1}{3}$

9) $m = \frac{2}{3}$, and y - intercept = 0

10) $m = 3$, and y - intercept = 0

[B] Find an equation when a point and a slope is given.
(Use point-slope form)

1) Point A (-1, 3) and $m = 3$

2) Point A (2, -4) and $m = 5$

3) Point B (0, 4) and $m = -\frac{2}{5}$

4) Point C (1, -3) and $m = -\frac{5}{3}$

5) Point A (5, 0), and $m = -3$

6) Point B (-2, 4) and $m = \frac{3}{5}$

7) Point C (0, 0) and $m = 0$

8) Point D (3, -1) and $m = -\frac{1}{4}$

9) Point A (3, 4) and $m = \frac{2}{3}$

10) Point (4, 0) and $m = 1$

[C] When 2 points are given. Write an Expression of the line that passes through the given points.

1) $(8, -1)$ and $(6, 4)$

2) $(7, -2)$ and $(5, 1)$

3) $(10, 0)$ and $(7, 4)$

4) $(-4, 0)$ and $(-6, -5)$

5) $(-9, 3)$ and $(-3, -1)$

6) $(-11, 4)$ and $(-3, -2)$

7) $(12, -7)$ and $(8, -9)$

8) $(4, 7)$ and $(7, 4)$

9) $(-3, 5)$ and $(-3, 2)$

10) $(0, 4)$ and $(-3, 5)$

[D] When a point and parallel to the line is given. Write an equation of the line that passes through.

1) $(7, -13)$ and is parallel to $6x - 8y = 15$

2) $(-7, -13)$ and is parallel to $6y - 4x = 5$

3) $(-4, 7)$ and is parallel to $3x - 5y = 6$

4) $(8, -5)$ and is parallel to $7x + 4y + 3 = 0$

5) $(3, 8)$ and is parallel to $y = 4x - 2$

6) $(2, -5)$ and is parallel to $y = -2x - 6$

7) $(-2, -3)$ and is parallel to $3x + 2y = 5$

8) $(6, -2)$ and is parallel to $2x + 4y = 9$

9) $(6, 1)$ and is parallel to $8x - y = 9$

10) $(8, -3)$ and is parallel to $6x + 2y = 5$

[E] When a point and perpendicular to the line is given. Write an equation of the line that passes through.

- 1) (6, 2) and is perpendicular to $2x + 4y = 3$
- 2) (5, -1) and is perpendicular to $3x - 6y = 2$
- 3) (0, 0) and is perpendicular to $2x + 5y = 10$
- 4) (0, 3) and is perpendicular to $2y + 5x = 1$
- 5) Through (2, -5); perpendicular to $y = -2x - 6$
- 6) Through (-4, 8); perpendicular to $y = -4x - 1$
- 7) Through (-2, 6); perpendicular to $y = 7$
- 8) Through (-2, -3); perpendicular to $3x + 2y = 5$
- 9) Through (3, 5); perpendicular to $2x - y = 8$
- 10) Through (-1, -5); perpendicular to $x = 3$

[CH 3.5] Graphing Linear Inequalities

[1] Graph the solution set of each of the following inequalities

- 1) $3x - 4y > 12$
- 2) $7x - 2y < 14$
- 3) $8x + 12y < -24$
- 4) $x - 5y \geq 0$
- 5) $5x + 8y < 0$
- 6) $4y + 2x > 4$
- 7) $4x < 12$
- 8) $-3y \geq 15$
- 9) $5x - 3y < 15; x \geq 0; y \leq 0$
- 10) $4x + 3y \leq 12; x \geq 0; y \geq 0$

[Ch 4.3] Systems of Equations
[1] The Addition Method

$$\begin{aligned} 1) \quad & 2x - y = -4 \\ & x + y = -2 \end{aligned}$$

$$\begin{aligned} 2) \quad & 2x + y = 6 \\ & x - y = 0 \end{aligned}$$

$$\begin{aligned} 3) \quad & 2x + 5y = 2 \\ & 3x - 5y = 3 \end{aligned}$$

$$\begin{aligned} 4) \quad & x - 2y = 10 \\ & 3x - 5y = 4 \end{aligned}$$

$$\begin{aligned} 5) \quad & x + y = 2 \\ & 3x - 2y = -9 \end{aligned}$$

$$\begin{aligned} 6) \quad & x + 2y = -4 \\ & 2x - y = -3 \end{aligned}$$

$$\begin{aligned} 7) \quad & 4x + 3y = 2 \\ & 3x + 5y = -4 \end{aligned}$$

$$\begin{aligned} 8) \quad & 5x + 7y = 1 \\ & 3x + 4y = 1 \end{aligned}$$

$$\begin{aligned} 9) \quad & 6x - 10y = 6 \\ & 9x - 15y = -4 \end{aligned}$$

$$\begin{aligned} 10) \quad & 3y + 2x = 4 \\ & 5x + 6y = 11 \end{aligned}$$

[2] The Substitution Method

$$\begin{aligned} 1) \quad & 2x - 3y = 1 \\ & x = y + 2 \end{aligned}$$

$$\begin{aligned} 2) \quad & 3x + 4y = 2 \\ & y = x - 3 \end{aligned}$$

$$\begin{aligned} 3) \quad & 4x - y = 3 \\ & 8x - 2y = 6 \end{aligned}$$

$$\begin{aligned} 4) \quad & x = 3y - 4 \\ & 5y - 2x = 2 \end{aligned}$$

$$\begin{aligned} 5) \quad & 2k + 5y = -5 \\ & 3y + x = -2 \end{aligned}$$

$$\begin{aligned} 6) \quad & 5x + y = 0 \\ & 3x + 2y = 7 \end{aligned}$$

$$\begin{aligned} 7) \quad & 6x + 3y = -1 \\ & 4x + 9y = 4 \end{aligned}$$

$$\begin{aligned} 8) \quad & 2x + y = 5 \\ & 3x - 2y = 18 \end{aligned}$$

$$\begin{aligned} 9) \quad & 3y + 2x = 4 \\ & 5x + 6y = 11 \end{aligned}$$

$$\begin{aligned} 10) \quad & 3x + 4y = 6 \\ & 2x + 3y = 5 \end{aligned}$$

[CH 5.1] Positive Integer Exponents

[1] Evaluate

1) $a^2 \cdot a^5 \cdot a^4$

2) $x^6 \cdot x^4 \cdot x$

3) $3^3 \cdot 3^2 \cdot 3$

4) $(-2)^3 \cdot (-2)^2$

5) $\frac{x^8}{x^5}$

6) $\frac{a^{10}}{a^3}$

7) $\frac{7^7}{7^4}$

8) $\frac{6^{10}}{6^8}$

9) $(x^3)^2$

10) $(3^5)^2$

11) $(-2x^2)^2$

12) $(-2x^2)^3$

13) $(2x^4y^2)^3$

14) $(-5a^3b^3)^2$

15) $(3x^2)^3(2x^3)^2$

16) $(a^3)^4(3a^2)^3$

17) $\frac{(a^4)^3}{a^6a^2}$

18) $\frac{(x^2)^3(x^3)^2}{(x^4)^2}$

19) $\frac{a^8b^9}{(a^3b^2)^2}$

20) $\frac{(x^2y^3)^3}{x^3y^5}$

21) $\frac{x^4y^8}{x^2(y^2)^3}$

22) $\frac{c^5(d^3)^4}{c^3d^2}$

23) $(3x^2y^2)(-4x^3y^3)$

24) $(-x^2)^2 \cdot (-x^2)^3$

25) $(2x^3)^4 \cdot (3x^2)^3$

26) $(-3a^2b^3)^2(-2a^3b^2)^3$

27) $\frac{(d^5)^2}{d^3d^4}$

28) $\frac{c^4c^5}{(c^2)^3}$

29) $\frac{(b^3)^4}{b^2b^3}$

30) $\frac{(-b^3)^4}{-b^2b^3}$

31) $(-x)^4(-x^4)$

32) $-(x^3)^2 \cdot (-x^3)^2$

[CH 5.2] Zero and Negative Exponents

[1] Evaluate

1) 7^0

2) $-4^0 + (-4)^0$

3) $(-6)^0$

4) $6x^0 + (6x)^0$

5) $(a^2b^4)^0 + (-a^3b^2)^0$

6) $(-5x)^0 - 5x^0$

7) a^{-10}

8) 2^{-4}

9) $5x^{-2}$

10) $(5x)^{-2}$

11) $(2x)^{-3}$

12) $2x^{-3}$

13) $(-3x)^{-4}$

14) $-3x^{-4}$

15) $a^0 + b^0 + c^0 + (a + b + c)^0$

16) $x^5 \cdot x^{-3}$

17) $\frac{x^4}{x^{10}}$

18) $\frac{x^{-4}}{x^{10}}$

19) $\frac{a^3}{a^{-7}}$

20) $\frac{a^{-3}}{a^{-4}}$

21) $\frac{10^{-3} \cdot 10}{10^{-4}}$

22) $\frac{a^5b^{-2}}{a^{-4}b^5}$

23) $\frac{x^{-2}y^{-3}}{x^{-3}y^4}$

24) $(z^3p^{-2})^4$

25) $(a^{-3}b^2)^{-2}$

26) $\frac{(a^3)^2}{a^4b^{-2}}$

27) $\frac{(x^2)^{-4}}{(x^{-6})^2}$

28) $\frac{(b^3)^{-3}}{(b^{-2})^4}$

29) $\frac{(m^{-2})^3(m^4)}{(m^{-2})^{-2}}$

30) $\frac{(x^{-2})^{-3}(x^{-3})}{(x^2)^{-4}}$

31) $\frac{5^0 - (-5)^0}{5^0 + (-5)^0}$

32) $\frac{2^0 + (-2)^0}{2^0 - (-2)^0}$

33) $\frac{(c^3)^4}{c^5c^{-2}}$

34) $\frac{c^2c^3}{(c^4)^{-3}}$

[CH 5.2-2] Scientific Notation

[A] Write each number in scientific notation

- | | |
|---------------------------|-----------------------------|
| 1) 28.56 | 2) 78,000 |
| 3) 375.4 | 4) 1400 |
| 5) 0.06184 | 6) 0.008012 |
| 7) 0.0006 | 8) 0.000032 |
| 9) 0.456×10^{-3} | 10) 0.0145×10^{-4} |
| 11) 256×10^5 | 12) 39.9×10^4 |
| 13) 4,200,000 | 14) 0.0000000012 |
| 15) $12,345 \times 10^5$ | 16) $12,345 \times 10^{-5}$ |

[B] Change scientific notation to regular number

- | | |
|--|---|
| 1) 2.3×10^0 | 2) 1.25×10^1 |
| 3) 1.256×10^2 | 4) 1.256×10^3 |
| 5) 1.256×10^4 | 6) 1.256×10^5 |
| 7) 1.256×10^{-1} | 8) 1.256×10^{-2} |
| 9) 1.256×10^{-3} | 10) 1.256×10^{-4} |
| 11) 1.256×10^{-5} | 12) $\frac{4.0 \times 10^{-4}}{2.0 \times 10^2}$ |
| 13) $\frac{6.0 \times 10^4}{2.0 \times 10^{-3}}$ | 14) $\frac{2.4 \times 10^{-4}}{1.2 \times 10^{-3}}$ |
| 15) $(2.0 \times 10^3)(3.0 \times 10^2)$ | 16) $(3.0 \times 10^{-3})(2.0 \times 10^3)$ |

[C] Do the indicated operation; Answer in scientific notations

$$1) \frac{8 \times 10^5}{2 \times 10^2}$$

$$2) \frac{4 \times 10^{-2}}{2 \times 10^7}$$

$$3) \frac{6 \times 10^{-5}}{2 \times 10^{-2}}$$

$$4) \frac{8 \times 10^5}{5 \times 10^{-5}}$$

$$5) (5 \times 10^5)(3 \times 10^3)$$

$$6) (6 \times 10^{-2})(4 \times 10^{-4})$$

$$7) (4 \times 10^{-5})(5 \times 10^7)$$

$$8) (7 \times 10^4)(8 \times 10^{-2})$$

$$9) \frac{5 \times 10^{-1}}{2 \times 10^6}$$

$$10) \frac{36 \times 10^{-3}}{6 \times 10^{-5}}$$

$$11) \frac{0.8 \times 10^3}{0.4 \times 10^5}$$

$$12) \frac{14 \times 10^{-3}}{5 \times 10^4}$$

$$13) (1.3 \times 10^4)(2 \times 10^2)$$

$$14) (1.2 \times 10^{-2})(3 \times 10^3)$$

$$15) (2 \times 10^{-2})(7 \times 10^{-5})$$

$$16) (0.2 \times 10^{-3})(0.3 \times 10^{-5})$$

$$17) 2 \times 10^3 + 3 \times 10^2$$

$$18) 2 \times 10^{-3} + 3 \times 10^{-2}$$

$$19) 5.7 \times 10^7 - 3.4 \times 10^5$$

$$29) 5.7 \times 10^{-7} - 3.4 \times 10^{-5}$$

[D] Change to scientific notations and evaluate expressions

$$1) \frac{0.000025}{5000}$$

$$2) \frac{12,000,000}{0.0006}$$

$$3) \frac{0.000000025}{0.000000005}$$

$$4) \frac{8,000,000,000}{2,000,000}$$

$$5) (2,000,000)(300,000)$$

$$6) (5,000,000,000)(3,000,000)$$

$$7) (4,000,000,000)(2,000)$$

$$8) (2,000,000)(30,000,000)(40,000)$$

$$9) \frac{(0.00002)(40,000,000)}{(5,000,000)(0.0007)}$$

$$10) \frac{500,000,000 \cdot 0.00005}{0.00003 \cdot 3000}$$

$$11) \frac{0.00002 \cdot 5,000,000}{300,000 \cdot 0.00003}$$

$$12) \frac{200}{0.00002 \cdot 0.0005 \cdot 0.001}$$

$$13) \frac{20,000 \cdot 40,000}{0.004 \cdot 0.0002}$$

$$14) \frac{0.00002 \cdot 0.00004}{2,000 \cdot 4,000}$$

$$15) \frac{0.0001 \cdot 0.0002 \cdot 0.0003}{0.001 \cdot 0.002 \cdot 0.003}$$

$$16) \frac{10,000 \cdot 20,000 \cdot 30,000}{100 \cdot 200 \cdot 300}$$

[CH 5.4] Adding and Subtracting Polynomials

[1] 1) $7x - 2 + 2x + 9$

2) $(8x^2 - 10x) + (4x^2 - 6x)$

3) $(2d^2 - 3d) + (-d^2 + 3d)$

4) $(a^2 - 2a^3) + (3a^3 + 4a^2)$

5) $6x - (3y - 2x)$

6) $-8a - (3b - 2a)$

7) Subtract $2x - 3$ from $5x - 2$

8) Subtract $y - 3$ from $2y + 7$

9) Subtract $-6x^2 - 2x$ from $8x^2 - 8$

10) Subtract $7a^2 - 3a + 2$ from $-8a^2 - 7a + 5$

11) $(3x - 7) + (5 - x) - (4x - 2)$

12) $(7a + 2) - (3a - 8) + (a - 7)$

13) $(y^2 - 3y) - (4y - 6) - (2 - y^2)$

14) $(x^3 - 4x^2) - (5x^2 - x) - (7x - 9)$

15) $(3x^2 - 5x + 3) - (x^2 + 2x - 2)$

16) $(4x^2 + 6x - 5) - (-2x^2 - 3x + 2)$

[2]

1) $(3x - 5) + (2x + 7)$

2) $(3x - 5) - (2x + 7)$

3) $(4x^3 - 4x^2) + (x^3 - 6x^2)$

4) $(4a^2 - a) - (-2a^2 + 5a)$

5) $(2A^2 - A + 4) + (3A^2 + A - 5)$

6) $(3x^2 + 4x - 10) - (5x^2 - 3x + 7)$

7) Subtract $-5b^2 + 4b + 8$ from $8b^2 + 2b - 14$

8) Subtract $c^2 - 9c + 6$ from $11c^2 - 4c + 7$

9) $(2b^2 + 7b - 5) + (4b^2 - 2b + 8)$

10) $(4a^2 + 6 - 3a) - (5a - 3a^2 - 4)$

11) $(7x^2 - 2x - 5) - (-2x^2 + 4x - 7)$

12) $(9x^2 - 3x - 6) - (7x^2 - 5x + 4)$

13) $(x^2 + 4) - [(x^2 - 5) - (3x^2 + 1)]$

14) $(2a + 5) - [(3a + 2) + (5a - 3)]$

15) Subtract $2a - 3$ from the sum of $(2a - 5)$ and $(-5a - 4)$

16) Subtract $-5x + 7$ from the sum of $(10x + 7)$ and $(-4x - 10)$

[CH 5.5] Multiplication and Division of Polynomials

[1]

1) $(3a^2)(5a^4)$

2) $(-4x^3)(-3x^5)$

3) $5a(2a - 4)$

4) $-6b^2(3b^3 + 5b)$

5) $4a^2b(2a^2b - 3ab^2 + 5ab)$

6) $-7p^2q(2pq^2 - 4p^2q + pq)$

7) $(a + 4)(a + 2)$

8) $(x - 3)(x - 6)$

9) $(3x - 4)(2x + 3)$

10) $(5x + 2y)(2x - 3y)$

11) $(3a + 2)^2$

12) $(x + 4)(x - 4)$

13) $x(x + 2)(x - 3)$

14) $-2p(3p^2 - 4p + 5)$

15) $(3c - 4)(2c^2 - c - 6)$

16) $(2a - 3)(2a^2 + 2a - 3)$

[2]

1) $6xy^2(3xy - 3x + 4y)$

2) $-5x(3x^3 - 2x^2 + 3)$

3) $(5c + 4d)(5c - 4d)$

4) $a(a + 1)(a - 1)$

5) $(2y - 3)(3y^2 - 4y + 5)$

6) $(3d - 4)(5d^2 + 2d - 4)$

7) $\frac{45x^6y^5}{5x^2y^3}$

8) $\frac{25p^4q^3}{5p^2q}$

9) $\frac{15x^3 - 9x^2}{3x}$

10) $\frac{27m^4 - 18m^3}{9m^2}$

11) $\frac{18x^5 - 27x^4 + 36x^3}{9x^3}$

12) $\frac{40p^7 - 36p^5 - 32p^3}{4p^2}$

13) $\frac{36x^5y^4 + 30x^4y^3 - 24x^3y^4}{6x^3y^2}$

14) $\frac{-16x^4y^3 + 12x^3y^4}{4x^2y}$

[CH 6.1] Introducing Factoring
[1] Factor by Common Factor

- | | |
|--------------------------------------|---------------------------|
| 1) $5x + 10$ | 2) $15a - 5$ |
| 3) $-15b - 10$ | 4) $-6a - 15$ |
| 5) $8x^2 - 4x$ | 6) $10a^3 - 25a^2$ |
| 7) $15xy + 20y$ | 8) $27a^2 - 18a^4$ |
| 9) $2a^2b + 4ab^2$ | 10) $12c^3d^2 - 18c^2d^3$ |
| 11) $4x^3 - 12x^2 - 24x$ | 12) $24a^4 + 8a^2 - 40$ |
| 13) $14x^8y^9 + 42x^5y^4 - 28x^2y^3$ | |
| 14) $18a^3b^4 - 12a^2b^3 - 48a^4b^3$ | |
| 15) $x(a+b) - y(a+b)$ | 16) $3a(a-2b) - 2(a-2b)$ |

[2] Factor by grouping

- | | |
|-----------------------------|-----------------------------|
| 1) $ax + bx + ay + by$ | 2) $mx - nx - my + ny$ |
| 3) $pq + p - q - 1$ | 4) $cd - d + c - 1$ |
| 5) $3a^3 - 6ab + 2a^2 - 4b$ | 6) $2x^2 - 6xy + 5x - 15y$ |
| 7) $6a^2 - 2ab - 9a + 3b$ | 8) $8x^2 - 4xy - 6x - 3y$ |
| 9) $ax + ay + 2bx + 2by$ | 10) $ef - gf - eh + gh$ |
| 11) $ac + c - a - 1$ | 12) $2x^2 - 6xy + 5y - 15x$ |
| 13) $10ab - 15b + 8a - 12$ | 14) $35 - 42c - 18cd + 15d$ |
| 15) $a^3 + 3a^2 - 2a - 6$ | 16) $2p^3 - 8p^2 + 3p - 12$ |

[CH 6.2] Factoring the Difference of Two Squares

1) $x^2 - 16$

2) $a^2 - 1$

3) $1 - p^2$

4) $25a^2 - 9b^2$

5) $81x^2 - 100y^2$

6) $64a^2 - 49b^2$

7) $2p^2 - 8$

8) $3x^2 - 3$

9) $5ab^2 - 5ac^2$

10) $6x^2y^2 - 6x^2p^2$

11) $3x^3 - 75x$

12) $a^2 - b^6$

13) $81a^6 - 100b^4$

14) $a^2b^2 - c^2d^2$

15) $27x^4 - 3x^2$

16) $16p^4q - 25p^2q^3$

[2] Mixed-Factor Completely if Possible

1) $8x - 4$

2) $2x^3 - 18x$

3) $9a^2 - 144$

4) $8 - 2a^2$

5) $ab + 2b - a - 2$

6) $xy - 4x + 3y - 12$

7) $p^2(3x+4y) - q^2(3x+4y)$

8) $4x(3x-2y) - 8(3x-2y)$

9) $a^4 - b^4$

10) $a^8 - 1$

11) $15a^2 + 15ab - 30b^2$

12) $6x^3y^2 - 9xy^3 - 12xy$

13) $x^2 - 4x + 5x - 20$

14) $8a^2 + 6a - 20a - 15$

15) $6p^3 + 9p^2 - 4p^2 - 6p$

16) $3x^4 + 6x^3 + 5x^3 + 10x^2$

[CH 6.3-1] Factoring Trinomial ($ax^2 + bx + c$), when $a=1$
[1]

1) $x^2 + 5x + 6$

2) $x^2 + 9x + 8$

3) $a^2 + 7a + 10$

4) $x^2 + 9x + 20$

5) $x^2 - 5x + 6$

6) $x^2 - 7x + 10$

7) $a^2 - 9a + 8$

8) $p^2 - 12p + 20$

9) $x^2 + x - 6$

10) $a^2 + 2a - 8$

11) $x^2 + 3x - 10$

12) $t^2 + 11t - 30$

13) $x^2 - x - 6$

14) $p^2 - 13p - 30$

15) $v^2 - 6v - 16$

16) $p^2 - 5p - 14$

[2]

1) $x^2 + 12x + 20$

2) $a^2 - 9a + 14$

3) $p^2 + p - 20$

4) $q^2 - 3q - 10$

5) $b^2 + 9b + 14$

6) $c^2 - 11c + 18$

7) $d^2 + 3d - 18$

8) $e^2 - 3e - 18$

9) $g^2 + 17g + 30$

10) $f^2 - 15f + 30$

11) $x^2 + 11x - 60$

12) $h^2 - 4h - 60$

13) $b^2 + 19bd + 60d^2$

14) $a^2 - 16ab + 60b^2$

15) $J^2 + 10J - 24$

16) $k^2 - 23k - 24$

[CH 6.3-2] Factoring Trinomial, (ax^2+bx+c) , when $a \neq 1$

[1]

1) $2x^2 + 7x + 5$

2) $6a^2 - 19a + 15$

3) $12a^2 + 7a - 10$

4) $3c^2 - 2c - 8$

5) $3x^2 + 5x + 2$

6) $5y^2 - 16y + 3$

7) $3p^2 + 14p - 5$

8) $5q^2 - 34q - 7$

9) $5x^2 + 11x + 2$

10) $35d^2 - 12d + 1$

11) $5x^2 + 21x + 4$

12) $6a^2 - 7a - 20$

13) $2x^2 + 10x + 5$

14) $5a^2 - 16a + 12$

15) $7e^2 + 2e - 5$

16) $8v^2 - 14v - 15$

[2]

1) $3a^2 + 7a + 2$

2) $5a^2 - 16a + 3$

3) $18b^2 + 39b - 15$

4) $8x^2 - 2x - 15$

5) $3a^2 + 5a + 2$

6) $5m^2 - 8m + 3$

7) $12x^2 + 14x - 10$

8) $8x^2 - 14x - 15$

9) $5x^2 + 20x + 4$

10) $25p^2 - 20p + 4$

11) $18c^2 + 39c + 15$

12) $10d^2 - 29d - 21$

13) $6p^2 + 13p + 6$

14) $6q^2 - 19q + 10$

15) $9x^2 + 24x - 20$

16) $6c^2 - 5c - 21$

[CH 6.5] Strategies in Factoring (Factoring Completely)

[1]

1) $2x^2 - 8y^2$

2) $5a^4 - 20b^2$

3) $a^4 - 16$

4) $4x^2 + 14x - 8$

5) $8p^2 - 12p - 8$

6) $ab^2 - 2ab + a$

7) $3a^2 - 75b^2$

8) $3x^3 - 12xy^2$

9) $12x^2y - 27y^3$

10) $a^5b^2 - 4a^3b^4$

11) $x^3 - 4x^2 - 4x + 16$

12) $6ab - 4cd + 15ad - 5dc$

13) $6ab - 6ay + 3xb - 3xy$

14) $20dw - 4dp + 30cw - 6cp$

15) $a^4 - 2a^2 + 1$

16) $8x^3y^2 + 4x^2y^3 - 12xy^4$

[2]

1) $3x^2 - 27y^2$

2) $6m^2 - 54n^2$

3) $x^4 - y^4$

4) $6p^2 - 27p - 15$

5) $12x^2 + 10x - 8$

6) $ax^2 - 2ax + a$

7) $4b^4 - 36c^2$

8) $2y^3 - 18x^2y$

9) $18xy^2 - 8x^3$

10) $x^2y^4 - 100x^4y^2$

11) $z^3 - 5z^2 - 9z + 45$

12) $10ab + 5cd - 6ab - dc$

13) $12cy - 12cz + 8dy - 8dz$

14) $12ac - 6ad + 18bc - 9bd$

15) $y^4 - 8y^2 + 16$

16) $3a^4b^2 - 9a^3b^3 - 12a^2b^4$

[CH 6.6] Solving Quadratic Equation by Factoring
[A]

1) $(x-2)(x+3)=0$

2) $3x(x-2)=0$

3) $(2x+3)(x-4)=0$

4) $x^2=81$

5) $x^2=16$

6) $4x^2=100$

7) $x^2+5x+6=0$

8) $x^2-x-6=0$

9) $x^2+6x-16=0$

10) $x^2-6x-16=0$

11) $4x^2-24x=0$

12) $6a^2-10a=0$

13) $5a^2-11a+4=0$

14) $3a^2-22a+7=0$

15) $3a^2+3a-18=0$

16) $3b^2-2b-5=0$

[B] More Factoring trinomials and Solving

1) $2x^2-50=0$

2) $3x^2=12$

3) $x^2+7x=30$

4) $x^2-x=6$

5) $x^2+5x=-6$

6) $x^2-7x=-12$

7. $3t^2-17t-6=0$

8. $3x^2-7x-6=0$

9. $4a^2+4a+1=0$

10. $9b^2+6b+1=0$

11. $7h^2-11h+4=0$

12. $7h^2-16h+4=0$

13. $4x^2+14x-8=0$

14. $5u^2+17u-12=0$

15. $6e^2-7ep-20p^2=0$

16. $10f^4-29f^2-21=0$

[CH 6.7] Word Problems Solve by Factoring

[A]

- 1) One number is 8 less than 6 times the other. If the product of the two numbers is 8, what are the 2 integers?

- 2) The difference of two numbers is 3. Their product is 10. What are the 2 numbers?

- 3) Find two consecutive integers whose product is 11 more than their sum.

- 4) Find the two consecutive odd integers whose product is 63.

- 5) One number is 3 times another. The sum of their squares is 40. Find the numbers.

- 6) The length of a rectangle is 5 feet more than its width. Its area is 84 square feet. Find the length and the width.

- 7) The width of a rectangle is 3 inches less than its length. Its area is 28 square inches. Find the length and width.

- 8) The base of a triangle is 3 inches more than its altitude. Its area is 20 square inches. Find the base and the altitude.

[B]

1. The difference of two numbers is 6. Their product is 27. Find two numbers.

2. The sum of two numbers is -4 . Their product is -12 . Find the numbers.

3. Find two consecutive even integers whose product is 48.

4. Find three consecutive numbers such that the product of the first two is 23 more than the third integer.

5. One number is three more than another number. The sum of their squares is 89. Find the numbers.

6. The base of a triangle is 5" more than its altitude. If the area is 33in^2 , find the altitude and the base of the triangle.

7. The width of a rectangle is 5cm less than its length. Its area is 10cm^2 more than its perimeter. What are the dimensions of the rectangle?

8. The area of a square is twice its perimeter. What is the length of its side?

[CH 7.1] Radicals and Exponents

[1] Simplify

1) a) $\sqrt{81} =$

2) a) $\sqrt{1} =$

b) $-\sqrt{81} =$

b) $\sqrt{0} =$

3) a) $\sqrt{(-5)^2} =$

4) a) $\sqrt{25} =$

b) $(\sqrt{-5})^2 =$

b) $\sqrt{-25} =$

5) a) $\sqrt{x^2} =$

6) a) $\sqrt{121} + \sqrt{144}$

b) $\sqrt{x^4}$

b) $\sqrt{81} - \sqrt{36}$

7) a) $\sqrt[3]{2^3}$

8) a) $-\sqrt[3]{8}$

b) $\sqrt[3]{5^3}$

b) $\sqrt[3]{-8}$

9) a) $\sqrt[3]{x^3}$

10) a) $\sqrt[3]{-27}$

b) $\sqrt[3]{x^9}$

b) $\sqrt[4]{-16}$

11) a) $\sqrt[4]{16}$

12) a) $\sqrt{x^6}$

b) $\sqrt[4]{81x^4}$

b) $\sqrt[3]{x^6}$

13) a) $\sqrt{9x^2}$

14) a) $\sqrt[3]{8a^3}$

b) $\sqrt{16a^4}$

b) $\sqrt[3]{27x^6}$

15) Find the distance between 2 points A(6, 4), B(-2, 0)

16) Find the distance between 2 points A (6,9), B(-4, -1)

[CH 7.2] Simplifying Radical Expressions

1) a) $\sqrt{24}$

2) a) $\sqrt{12}$

b) $\sqrt{75}$

b) $\sqrt{18}$

3) a) $\sqrt{20}$

4) a) $\sqrt{54}$

b) $\sqrt{32}$

b) $\sqrt{125}$

5) a) $\sqrt{x^{10}}$

6) a) $\sqrt{x^5}$

b) $\sqrt{a^{18}}$

b) $\sqrt{x^{19}}$

7) a) $\sqrt{75a^2b^4}$

8) a) $\sqrt{24a^3b^5}$

b) $\sqrt{18x^4y^6}$

b) $\sqrt{20x^5y^7}$

9) a) $\sqrt{32a^6b^7}$

10) a) $\sqrt{27a^5b^4}$

b) $\sqrt{54x^8y^9}$

b) $\sqrt{8x^7y^4}$

11) a) $\sqrt[3]{16a^6b^9}$

12) a) $\sqrt[3]{27x^2y^7}$

b) $\sqrt[3]{8x^8y^9}$

b) $\sqrt[3]{8x^8y^9}$

13) a) $\sqrt{\frac{6}{4}}$

14) a) $\sqrt{\frac{14x}{25y^2}}$

b) $\sqrt{\frac{10}{9}}$

b) $\sqrt{\frac{2x^2}{36y^4}}$

15) a) $\sqrt{\frac{5}{2}}$

16) a) $\sqrt{\frac{7}{c}}$

b) $\sqrt{\frac{4}{7}}$

b) $\sqrt{\frac{6}{ab}}$

[CH 7.3] Operations of Radical Expressions
 [A] Addition and Subtraction of Radical Expressions

1) $6\sqrt{3} + 8\sqrt{3}$

2) $3\sqrt{5} - \sqrt{5}$

3) $5\sqrt{x} + 2\sqrt{x} - \sqrt{x}$

4) $8\sqrt{b} - \sqrt{b} + 2\sqrt{b}$

5) $\sqrt{18} + \sqrt{50}$

6) $\sqrt{63} + \sqrt{28}$

7) $\sqrt{75} - \sqrt{27}$

8) $\sqrt{50} - \sqrt{8}$

9) $5\sqrt{12} + 2\sqrt{75}$

10) $2\sqrt{48} - 4\sqrt{27}$

11) $2\sqrt{48} - 3\sqrt{12}$

12) $3\sqrt{54} + 2\sqrt{24}$

13) $3\sqrt{45} - 3\sqrt{12} + 2\sqrt{20}$

14) $\sqrt{64} + 2\sqrt{50} - 2\sqrt{72}$

15) $5\sqrt{5} - \sqrt{\frac{4}{5}}$

16) $\frac{\sqrt{18}}{3} - \frac{\sqrt{8}}{5}$

[B] Multiplication of Radical Expressions

[1] Find the product and simplify

1. $\sqrt{5}\sqrt{20}$

2. $\sqrt{25x}\sqrt{x}$

3. $\sqrt{3a^2}\sqrt{12a^4}$

4. $\sqrt{8}\sqrt{3}$

5. $\sqrt{4x}\sqrt{3x}$

6. $\sqrt{40a}\sqrt{10a^2}$

7. $3\sqrt{7} \cdot 5\sqrt{7}$

8. $3\sqrt{12} \cdot 5\sqrt{2}$

9. $\sqrt{2}(3\sqrt{12} + \sqrt{27})$

10. $\sqrt{6}(2\sqrt{3} + \sqrt{12})$

11. $\sqrt{3}(3\sqrt{8} - 2\sqrt{6})$

12. $\sqrt{8}(3\sqrt{6} - 2\sqrt{3})$

13. $(\sqrt{7} + 2)(\sqrt{7} + 3)$

14. $(3 - 2\sqrt{5})(4 - \sqrt{5})$

15. $(\sqrt{5} + \sqrt{3})(\sqrt{5} - \sqrt{3})$

16. $(\sqrt{5} - \sqrt{3})^2$

[2] Find the product and simplify

1. $\sqrt{3}\sqrt{27}$

2. $\sqrt{4c^3}\sqrt{16c^5}$

3. $\sqrt{9p}\sqrt{4p^5}$

4. $\sqrt[3]{4x^2} \cdot \sqrt[3]{16x^4}$

5. $\sqrt{2x^2} \cdot \sqrt{12x^5}$

6. $4\sqrt{12} \cdot 3\sqrt{18}$

7. $2\sqrt{5}(3\sqrt{5} - 4\sqrt{5})$

8. $\sqrt{2x}(\sqrt{8x^3} + \sqrt{3x})$

9. $\sqrt{3}(\sqrt{12} + \sqrt{6})$

10. $2\sqrt{2x}(\sqrt{4x} - 3)$

11. $(\sqrt{3} + \sqrt{4})(\sqrt{5} + \sqrt{6})$

12. $(\sqrt{3} - \sqrt{4})(\sqrt{5} - \sqrt{6})$

13. $(\sqrt{3} + \sqrt{4})(\sqrt{3} - \sqrt{4})$

14. $(\sqrt{3} + \sqrt{4})^2$

15. $\sqrt{2}(\sqrt{3} + \sqrt{4}) + \sqrt{3}(\sqrt{3} + \sqrt{4})$

16. $\sqrt{5}(\sqrt{5} + \sqrt{6}) - \sqrt{6}(\sqrt{5} + \sqrt{6})$

[C] Division with Radical Expressions*[1] Simplify*

1. $\frac{3}{\sqrt{5}}$

2. $\frac{\sqrt{3}}{\sqrt{5}}$

3. $\sqrt{\frac{2}{3}}$

4. $\frac{\sqrt{32}}{\sqrt{2}}$

5. $\frac{\sqrt{6}}{\sqrt{54}}$

6. $\frac{\sqrt{5}}{\sqrt{20}}$

7. $\frac{\sqrt{10}\sqrt{6}}{\sqrt{5}}$

8. $\frac{\sqrt{27}}{\sqrt{3}}$

9. $\frac{\sqrt{18x^5}}{\sqrt{2x}}$

10. $\frac{\sqrt{72a^3}}{\sqrt{8a}}$

11. $\frac{\sqrt{54}}{\sqrt{2}\sqrt{3}}$

12. $\frac{\sqrt{3}\sqrt{50}}{\sqrt{6}}$

13. $\frac{\sqrt{3}\sqrt{6}}{\sqrt{2}}$

14. $\frac{\sqrt{24}\sqrt{4}}{\sqrt{6}}$

15. $\frac{\sqrt{8}\sqrt{50}}{\sqrt{16}\sqrt{5}}$

16. $\frac{\sqrt{6}\sqrt{14}}{\sqrt{4}\sqrt{7}}$

[D] Mixed Operations*Simplify*

1. $x^{-3a} \cdot x^{4a}$

2. $\frac{a^{-3}}{a^{-4}} + \sqrt{9a^2}$

3. $\frac{x^3}{x^{-2}} - \sqrt{x^{10}}$

4. $\left(\frac{p^{-2}}{p^3}\right)^{-2} \cdot p$

5. $\frac{x^0}{x^{-2}} + 2\sqrt{x^4} - x^2$

6. $(m^{-2})^{-3} \cdot (m^{-2})^3$

7. $(q^0)^{-2} - (p^7)^0$

8. $\frac{-4^2}{(-4)^2} + \frac{2^{-2} \cdot 2^2}{2^{-4}}$

9. $(2 \times 10^{-35}) \cdot (3 \times 10^{-34})$

10. $\frac{6 \times 10^{12}}{2 \times 10^{10}}$

11. $(1.2 \times 10^{-8}) \cdot (2 \times 10^5)$

12. $\frac{(5 \times 10^7)(1.2 \times 10^5)}{3 \times 10^4}$

13. $\sqrt{40} + \sqrt{90} - \sqrt{160}$

14. $2\sqrt{75} + 4\sqrt{27} - 8\sqrt{12}$

15. $-3\sqrt{3}(2\sqrt{3} - 5)$

16. $(3\sqrt{2} + 5)(2\sqrt{2} + 1)$

17. $(6.2 \times 10^7) \cdot (2 \times 10^{-5})$

18. $\frac{(5 \times 10^9)(12 \times 10^{-5})}{3 \times 10^{-4}}$

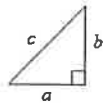
[7.5] The Pythagorean Theorem.

[A] The Pythagorean Theorem in a Right Triangle

[1] $c^2 = a^2 + b^2$; $c = \sqrt{a^2 + b^2}$

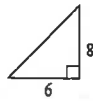
[2] $a^2 = c^2 - b^2$; $a = \sqrt{c^2 - b^2}$

[3] $b^2 = c^2 - a^2$; $b = \sqrt{c^2 - a^2}$



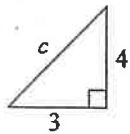
[Example 1] Find the missing side.

$1. c = \sqrt{6^2 + 8^2} = \sqrt{36 + 64} = \sqrt{100} = 10$

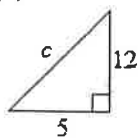


[Ex-A] Find the missing sides of the following triangles.

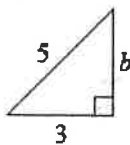
(1)



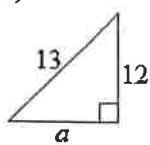
(2)



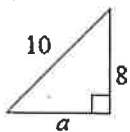
(3)



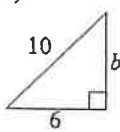
(4)



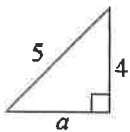
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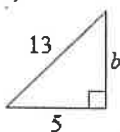
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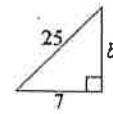
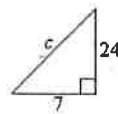


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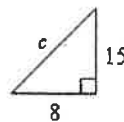
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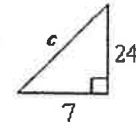


[Ex-B] Find the missing sides of the following triangles.

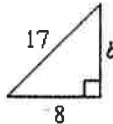
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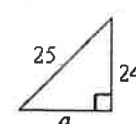
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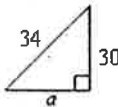
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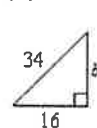
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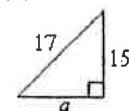
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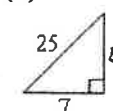
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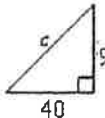
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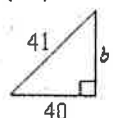
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(10)



[CH. 8.1] Solving Quadratic Equations by Factoring or Square Root Method.

[1]

1. $x^2 + 5x + 6 = 0$

2. $x^2 - 3 = 0$

3. $x^2 - 2x - 15 = 0$

4. $x^2 = 5 - 4x$

5. $x^2 = 7$

6. $2a^2 - 12 = 0$

7. $3x^2 = 27$

8. $10x^2 - 160 = 0$

9. $12x^2 - 3x = 0$

10. $x^2 - 16x = 0$

11. $x^2 - 4x = 0$

12. $\frac{x^2}{2} = x - \frac{3}{8}$

13. $x(x - 4) = 18 - x$

14. $x(x + 4) = 12$

15. $(x + 2)(x + 3) = x + 3$

16. $(x - 2)(x + 1) = 6x - 12$

17) $x^2 - 2x + 15 = 0$

[CH 8.2] Solving Quadratic Equations Using Quadratic Formula

1. $x^2 - 4x + 1 = 0$

2. $x^2 - 4x + 2 = 0$

3. $3x^2 - x - 2 = 0$

4. $2x^2 + 3x - 2 = 0$

5. $2x^2 - 3x - 2 = 0$

6. $4x^2 = 12x - 7$

7. $2x^2 = 8x - 5$

8. $3x^2 = 6x - 2$

9. $3x^2 + 2x + 1 = 0$

10. $4x^2 + 3x + 2 = 0$

11. $x(x - 2) = 3$

12. $(x + 1)(x + 2) = 12$

13. $x^2 = \frac{3 - 5x}{2}$

14. $\frac{x^2}{2} = x + 1$

15. The area of a square is 48in^2 . Find a side.

16. The square of a number is equal to twice the number plus four. Find the number.

[CH 9] Ratio and Proportions

1. A baseball team won 20 out of 30 games played. There were no tie games. Find the ratio of (a) wins to played (b) wins to losses and (c) losses to wins.

2. In an English class, 12 out of 25 students are women. Find the ratio of (a) women to total students (b) women to men and (c) men to total.

3. Paula has 12 pens, 8 pencils, and 4 erasers. What is the ratio of (a) pens to pencils (b) pencils to erasers and (c) pens to total?

4. Solve $\frac{x}{25} = \frac{6}{5}$

5. Solve $\frac{10}{x} = \frac{15}{4}$

6. 5 quarts of ice cream was used to make 100 milkshakes. How many quarts are needed to make 500 milk shakes?

7. If a 6-foot man casts a 4-foot shadow, how tall is a tree that casts a 30-foot shadow?

8. A painter uses about 5 gallons of paint painting 2 rooms. How many gallons would she need to paint 20 rooms?

9. A man drove 800 miles in 2 days. How long would it take him to drive 3,200 miles?

10. 5 builders finish 20 houses in a month. How many houses could 25 builders finish in the same time?

11. An investment of \$5,000 earned \$300 for one year. How much would have to be invested to earn \$750 at the same time?

12. A store sells 3 jars of grape jelly for \$2. How many jars can someone buy with \$8?

13. The property tax on a \$200,000 home is \$4,000. What would be the tax on a \$600,000 home?

14. A market is selling 3 cans of corn for 90¢. How much will 18 cans cost at the same store?

15. On a map $\frac{1}{2}$ an inch represents 15 miles. How many miles with $4\frac{1}{2}$ inches represent?

16. The ratio of weight on earth to the weight on the moon is 6 to 1. How much would 150 pound woman weigh on the moon?

[CH 10] Functional Notation

1. Given $f(x) = 2x - 3$, find the following

(a) $f(2)$

(b) $f(0)$

(c) $f(-5)$

(d) $f(x+2)$

2. Given $g(x) = 4x + 3$, find the following

(b) $g(-3)$

(c) $g(a)$

(d) $g(a-2)$

3. Given $p(x) = x^2 + 2x + 1$

(a) $4p(2)$

(b) $-3p(-2)$

(c) $2p(c)$

(d) $p(q+1)$

4. Given $H(x) = 2x + 6$ and $K(x) = 3x^2 - 2x - 4$

(a) $2H(3)$

(b) $3K(5)$

(c) $3H(2) + 2K(-5)$

(d) $2H(5) - 3K(-2)$

5. If $A(a) = a^2 - 3$ and $B(c) = 3 - c$, then find

(a) $A(2) + B(5)$

(b) $2A(3) - 3B(2)$

(c) $A(x) - B(x)$

(d) $2A(x) + 3B(x)$

(e) $\frac{A(4) - B(1)}{5}$

6. Given $G(x) = 3x^2 - 3x - 5$

(a) $G(4)$

(b) $G(-2)$

(c) $2G(2)$

(d) $-3G(5)$

8. Given $G(x) = 2x^2 - 4x + 3$

(a) $G(4)$

(b) $G(-2)$

(c) $2G(2)$

(d) $-3G(5)$

CH 1 – Review –A

[1] Write the equation of

(a) 14 is 3 less than 3 times x

(b) 39 subtracted from 4 times a number is 15.

[2] Solve for x

(a) $20 - 5x = 12 - 9x$

(b) $-3(2x - 4) = -5x + 2$

[3] Solve for x

(a) $k = 7x - b$

(b) $a = \frac{x-c}{d}$

[4] Solve and graph

(a) $4x - 10 \geq 6x + 2$

(b) $3 - 5x > -9 - 2x$

[5] Evaluate (a) $F(x) = 2x^2 - 5x + 2$. Find $F(2)$

(b) $G(x) = -2x^2 + 5x - 2$. Find $G(-3)$

[6] (a) 90 is what percent of 180?

(b) 16 is 20% of what number?

[7] (a) What is the percent increase from 2,000 to 6,000?

(b) What is the percent decrease from 4,000 to 1,000?

[8] (a) Audrey wanted to buy a ring with 25% discount, which was originally priced as \$80. How much did she have to pay after the discount?

(b) Bryan wanted to buy a ring with 10% tax that was originally \$80. How much did he have to pay in total?

CH 2 & CH 3 – Review –A

[1] Find the slope and the y- intercept and graph the equation

(a) $3x - 4y = 12$

(b) $3x + 2y = 6$

(c) $10x = 15 - 5y$

[2] Find the equation and graph with the following information

(a) the line passes A (2, - 3) and B (4, - 5)

(b) the line passes A (- 9, 3) and B (- 3, - 1)

(c) the line passes A (- 3, 5) and B (0, 4)

[3] Find the equation and graph with the following information

(a) The vertical line passes the point (- 2, - 5)

(b) The horizontal line passes the point (- 2, - 5)

(c) The vertical line passes the point (0, 0)

[4] (a) Find and graph the equation of the line passing through (6, -2) and parallel to the line $2x+4y=9$.

(b) Find and graph the equation of the line passing through (- 2, +3) and parallel to the line $3x + 2y = 5$.

(c) Find and graph the equation of the line passing through (3, -1) and perpendicular to the line

$3x+6y=2$.

CH 4 & CH 5 – Review–A

[1] Solve the following systems

(a) $x + 2y = 4$

$2x - y = 3$

(b) $4x + 3y = 2$

$3x + 5y = -4$

[2] Simplify

(a) $\frac{a^3 \cdot a^8}{(a^5)^2}$

(b) $\frac{b^5 c^4}{b^3 c^{-2}}$

[3] Simplify

(a) $(2 \times 10^5)(5 \times 10^{-3})$

(b) $\frac{2 \times 10^5}{5 \times 10^{-3}}$

[4] Simplify

(a) Subtract $2x - 3$ from $5x - 4$

(b) Subtract $2x^2 - 3x + 4$ from $5x^2 - 6x - 7$

[5] Simplify

(a) $(2x + 8) - (3x - 4)$

(b) $(7x^2 - 2x - 5) - (2x^2 - 4x + 7)$

[6] Simplify

(a) $(3x - 4)(5x - 6)$

(b) $(2x - 3)(2x^2 + 2x - 3)$

[7] Simplify

(a) $\frac{20x^2 - 5x - 10}{5}$

(b) $\frac{18x^5 - 15x^4 + 21x^3}{-3x^2}$

CH 6 – Review–A

[1] Factor completely

(a) $5x^2 - 20y^2$

(b) $16x^3 - 36xy^2$

(c) $75ab^3 - 12a^3b$

[2] Factor

(a) $x^2 + 3x - 18$

(b) $x^2 - 3x - 18$

(c) $5x^2 - 10x + 5$

[3] Factor

(a) $3x^2 + 4x - 4$

(b) $7x^2 - 3x - 4$

(c) $12x^2 + 10x - 8$

[4] Factor

(a) $4x^3 - 3x^2 + 16x - 12$

(b) $ax + ay - bx - by$

(c) $x^3 + x^2 - 9x - 9$

[5] Factor and Solve

(a) $2x^2 = 18$

(b) $x^2 - 4x = 0$

(c) $2x^2 - 16x - 40 = 0$

(d) $x^2 - 5x + 6 = 0$

CH 7 – Review–A

[1] Simplify

(a) $\sqrt{12} + \sqrt{27} - \sqrt{5}$

(b) $2\sqrt{50} + 3\sqrt{8} - \sqrt{18}$

(c) $3\sqrt{32} - 2\sqrt{18} + \sqrt{27}$

[2] Simplify

(1) $\sqrt{2}(\sqrt{5} + \sqrt{6})$

(2) $2\sqrt{3}(3\sqrt{5} - 4\sqrt{6})$

(3) $-\sqrt{3}(2\sqrt{3} - 3\sqrt{4})$

[3] Simplify

(1) $(\sqrt{2} - 3)(\sqrt{2} + 4)$

(2) $(\sqrt{3} + \sqrt{5})(\sqrt{3} - \sqrt{5})$

(3) $(3\sqrt{3} + 2\sqrt{2})(3\sqrt{3} - 2\sqrt{2})$

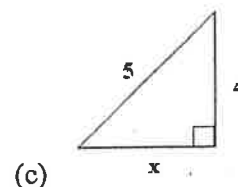
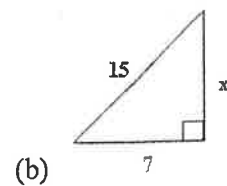
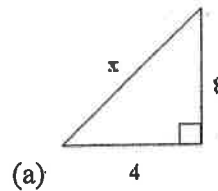
[4] Simplify

(1) $\frac{\sqrt{3}\sqrt{6}}{\sqrt{2}}$

(2) $\frac{\sqrt{15}\sqrt{20}}{\sqrt{25}}$

(3) $\frac{\sqrt{10}\sqrt{4}}{\sqrt{6}\sqrt{5}}$

[5] Find the missing value



CH 8 - Review-A

[1] Solve

(a) $x^2 = 81$

(b) $3x^2 - 27 = 0$

(c) $5x^2 = 45$

[2] Solve

(a) $x^2 - 6x = 0$

(b) $2x^2 = 6x$

(c) $3x^2 - 21x = 0$

[3] Solve

(a) $x^2 = 5$

(b) $x^2 - 7 = 3$

(c) $4x^2 - 32 = 0$

[4] Solve by quadratic formula

(a) $x^2 + 4x - 7 = 0$

(b) $3x^2 - 2x + 4 = 0$

(c) $2x^2 = 8x - 5$

[5] Solve

(a) $x^2 - 2x - 8 = 0$

(b) $x^2 - x - 6 = 0$

(c) $3x^2 + 3x - 18 = 0$

MISC. Review-A

CH 9 - Ratio and proportion ; CH 10 - Functions

[1] Find x

(a) $\frac{10}{x} = \frac{30}{27}$

(b) $\frac{x}{25} = \frac{7}{5}$

(c) $\frac{10}{2x} = \frac{15}{12}$

[2] (a) If a 6 feet object casts a 4 feet shadow at a certain time of the day, how tall is the tree that casts a 30 feet shadow that that time?

(b) A painter can paint 2 rooms with 5 gallons of paint. How many gallons would he need to paint 30 rooms?

(c) A man can drive 800 miles in 2 days. How long would it take him to drive 3,200 miles?

[3] (a) A store is selling 5 jars of jelly beans for \$8. How many jars can one buy with \$40?

(b) A car can go 60 miles on 5 gallons of gas. How many gallons of gas is needed to travel 480 miles?

(c) On a map, $\frac{1}{2}$ inch represents 15 miles. How many miles would $4\frac{1}{2}$ inches represent?

[4] (a) Find $f(3)$ if $f(x) = 3x^2 - 2x - 4$

(b) Find $5f(3)$ if $f(x) = -3x + 2x + 4$

(c) Find $-3f(-2)$ if $f(x) = 3x^2 - 2x - 4$

CH 1 – Review–B

[1] Write the equation of

(a) P is twice the Q less than 5 times R

(b) 3 times of A subtracted from four times of P is Q

[2] Solve for x

(a) $40 - 4x = 2(25 - x)$

(b) $6x - 12 = -2(5x - 10)$

[3] Solve for x

(a) $b = c - 2x$

(b) $\frac{q+x}{r} = \frac{p}{c}$

[4] Solve and graph

(a) $6x - 12 \leq 8x + 8$

(b) $5 - 4x < -13 - 2x$

[5] Evaluate

(a) $F(x) = 4x^2 - 3x + 6$. Find $F(3)$

(b) $G(x) = -4x^2 - 7x + 12$. Find $G(-5)$

[6](a) What number is 40% of 300?

(b) 50 is what percent of 200?

[7] (a) What is the percent increase from 400 to 500?

(b) What is the percent decrease from 500 to 400?

[8] (a) Audrey would receive 10% raise in her salary. If her present salary is \$50,000 annually, how much would be her new salary?

(b) Bryan's weekly allowance is to decrease by 5%. If his current allowance is \$50 a week, how much will be his new weekly allowance?

CH 2 & CH 3 – Review –B

[1] Find the slope and the y- intercept and graph the equation

(a) $3x + 2y = 8$

(b) $4x - 8y = 24$

(c) $12x = 8 - 4y$

[2] Find the equation and graph with the following information

(a) the line passes A (4, 1) and B (4, 3)

(b) the line passes A (0, 2) and B (3, - 2)

(c) the line passes A (4, - 2) and B (- 2, 4)

[3] Find the equation and graph with the following information

(a) The vertical line passes the point (- 2, 3)

(b) The horizontal line passes the point (- 1, - 4)

(c) The vertical line passes the point (3, 0)

[4] (a) Find and Graph the equation of the line passing through (- 5, 2) and parallel to the line $3x - 5y = 6$.

(b) Find and Graph the equation of the line passing through (2, 5) and parallel to the line $2x + 4y = - 3$.

(c) Find and Graph the equation of the line passing through (0, 3) and perpendicular to the line $2y - 5x = 1$.

CH 4 & CH 5 – Review–B

[1] Solve the following systems

(a) $x - y = -3$

(b) $3y + 2x = 4$

$3x + 4y = -2$

$5x + 6y = 11$

[2] Simplify

(a) $\frac{(c^3)^4}{c^2 \cdot c^6}$

(b) $\frac{c^5 d^{-2}}{c^{-3} d^3}$

[3] Simplify

(a) $(4 \times 10^5)(6 \times 10^{-2})$

(b) $\frac{4 \cdot 10^{-5}}{8 \cdot 10^{-3}}$

[4] Simplify

(a) Subtract $6x - 2$ from $8x - 5$

(b) Subtract $5x^2 - x + 2$ from $7x^2 - 4x - 8$

[5] Simplify

(a) $(4x + 6) - (2x - 3)$

(b) $(9x^2 - 3x - 6) - (7x^2 - 5x + 2)$

[6] Simplify

(a) $(4x - 2)(4x - 7)$

(b) $(3x - 2)(2x^2 + 3x - 4)$

[7] Simplify

(a) $\frac{12x^2 - 6x - 3}{3}$

(b) $\frac{16x^5 - 12x^4 + 8x^3}{-4x^2}$

CH 6 – Review–B

[1] Factor completely

(a) $7x^2 - 28y^2$

(b) $25x^3 - 49xy^2$

(c) $72ab^3 - 32a^3b$

[2] Factor

(a) $x^2 - 12x + 20$

(b) $x^2 + 7x - 30$

(c) $5x^2 - 8x - 4$

(d) $x^2 + 11x - 30$

[3] Factor

(a) $3x^2 - 22x + 7$

(b) $3x^2 + 3x - 18$

(c) $5x^2 - 5x - 30$

[4] Factor

(a) $x^3 - 5x^2 + 9x - 45$

(b) $ax - ay - bx + by$

(c) $2x^3 - 2x^2 + 18x - 18$

[5] Factor and Solve

(a) $3x^2 = 27$

(b) $x^2 + 5x = 0$

(c) $3x^2 - 3x - 60 = 0$

(d) $2x^2 - 10x + 12 = 0$

CH 7 – Review–B

[1] Simplify

(a) $\sqrt{18} + \sqrt{50} - \sqrt{8}$

(a) $3\sqrt{50} + 2\sqrt{8} - 2\sqrt{18}$

(b) $2\sqrt{32} - 3\sqrt{18} + 2\sqrt{27}$

[2] Simplify

(1) $\sqrt{3}(\sqrt{2} + \sqrt{5})$

(2) $3\sqrt{2}(5\sqrt{3} - 4\sqrt{2})$

(3) $-3\sqrt{3}(2\sqrt{3} - 4\sqrt{6})$

[3] Simplify

(1) $(\sqrt{3} - 2)(\sqrt{2} - 3)$

(2) $(\sqrt{5} + \sqrt{3})(\sqrt{5} - \sqrt{3})$

(3) $(2\sqrt{3} + 3\sqrt{2})(2\sqrt{3} - 3\sqrt{2})$

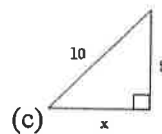
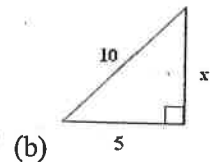
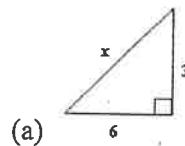
[4] Simplify

(1) $\frac{\sqrt{32}}{\sqrt{3}\sqrt{6}}$

(2) $\frac{\sqrt{150}}{\sqrt{15}\sqrt{5}}$

(3) $\frac{\sqrt{5}\sqrt{4}}{\sqrt{6}\sqrt{5}}$

[5] Find the missing value



CH 8 - Review-B

[1] Solve

(a) $x^2 = 49$

(b) $6x^2 - 54 = 0$

(c) $4x^2 - 48 = 0$

(c) $3x^2 = 75$

[2] Solve

(a) $x^2 - 8x = 0$

(b) $4x^2 = 16x$

(c) $3x^2 = 6x - 2$

(c) $8x^2 - 24x = 0$

[4] Solve

(a) $x^2 - 10x + 24 = 0$

(b) $x^2 - x - 20 = 0$

[3] Solve

(a) $x^2 = 14$

(b) $x^2 - 11 = 9$

(c) $6x^2 - 14x + 4 = 0$

MISC. Review-B

CH 9 – Ratio and proportion

CH 10 – Functions

[1] Find x

(a) $\frac{5}{x} = \frac{20}{32}$

(b) $\frac{x}{24} = \frac{6}{8}$

(c) $\frac{40}{6x} = \frac{20}{24}$

[2] (a) If an 8 feet object casts a 12 feet shadow at a certain time of the day, how tall is the lamp post that casts a 60 feet shadow that that time?

(b) A car factory can produce 3 cars in 4 hours. How many hours will it take to produce 60 cars?

(c) A choo-choo train can travel 600 miles in 3 days. How long would it to travel 4,800 miles?

[3] (a) A store is selling 4 jars of mayonnaise for \$12. How many jars can one buy with \$72?

(b) A motorbike can go 140 miles on 5 gallons of gas. How many gallons of gas is needed to travel 196 miles?

(c) On a map, $\frac{2}{5}$ inch represents 20 miles. How many miles would 5 inches represent?

[4]

(a) Find $f(4)$ if $f(x) = 2x^2 - 8x - 12$

(b) Find $2f(3)$ if $f(x) = -4x^2 + 3x + 6$

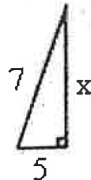
(c) Find $-6f(-3)$ if $f(x) = 5x^2 - x - 3$

1. Which of the following is a factor of the polynomial? $2x^2 + 9x - 56$
 A) $-2x + 7$ B) $x - 8$ C) $2x - 7$ D) $x - 7$

2. Simplify. $7\sqrt{50} - 5\sqrt{18}$
 A) $14\sqrt{5} - 2\sqrt{3}$ B) $2\sqrt{2}$ C) $20\sqrt{2}$ D) $12\sqrt{2}$

3. What is the value of x in the right triangle?

A) $2\sqrt{6}$ B) $4\sqrt{6}$ C) 12 D) $\sqrt{74}$



4. Find all solutions to the equation. $4b^2 + 12b = 0$
 A) Only $b = -3$ B) $b = 0$ or $b = -3$
 C) Only $b = 3$ D) $b = 0$ or $b = 3$

5. Solve for a . $x = 3a + 2b$

A) $a = \frac{x-2b}{3}$ B) $a = \frac{x}{3} - 2b$
 C) $x = \frac{x}{5} - y$ D) $x = 5(z - y)$

6. Factor completely. $8x^2y - 18y^3$
 A) $2(4x^2y - 3y^3)$ B) $2y(4x - 3y)^2$
 C) $2y(2x - 3y)(2x + 3y)$ D) $2y(4x^2 + 9y^2)$

7. Multiply. Give the answer in scientific notation.
 $(8 \times 10^5)(3 \times 10^{-2})$

A) 24×10^3 B) 2.4×10^4 C) 2.4×10^3 D) 2.4×10^7

8. Simplify.

A) x^4 B) x^{12} C) x^{20} D) x^{59}

$$\frac{x^7 \cdot x^9}{(x^2)^2}$$

9. Find the equation of the vertical line passing through the point $(4, -3)$.

A) $y = x - 7$ B) $y = -3$ C) $x = 4$ D) $y = 4$

10. Find all solutions to the equation. $7x^2 = 112$

A) $x = 7$ or $x = 49$ B) $x = 0$ or $x = 4$
 C) $x = 4$ or $x = -4$ D) Only $x = 4$

11. What is the value of the y -coordinate of the solution to the system of equations?

$$\begin{aligned} 3x + 2y &= 24 \\ -2x + 4y &= 16 \end{aligned}$$

A) $y = 4$ B) $y = -4$ C) $y = -6$ D) $y = 6$

12. Simplify completely.

$$(6x^2 - 2x + 3) - (-4x^2 - 5x + 3)$$

A) $10x^2 - 3x$ B) $10x^2 + 3x + 6$
 C) $10x^2 + 3x - 6$ D) $10x^2 + 3x$

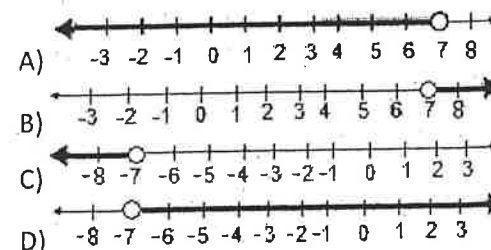
13. Find the slope and y -intercept for the graph of the equation. $5x + 2y = 4$

A) Slope = $-\frac{5}{2}$ and y -intercept $(0, 2)$
 B) Slope = $\frac{5}{2}$ and y -intercept $(0, -2)$
 C) Slope = $\frac{2}{5}$ and y -intercept = $(0, 2)$
 D) Slope = $-\frac{2}{5}$ and y -intercept = $(0, -2)$

14. Find the equation of the line passing through the points $(2, 6)$ and $(4, 10)$. Write the equation in slope-intercept form.

A) $y = -2x + 2$ B) $y = 2x + 2$
 C) $y = -2x - 2$ D) $y = 2x - 2$

15. Find the graph of the solution to the inequality.
 $6x + 2 > 7x - 5$



16. If 8 gallons of gas cost \$32, how much does 12 gallons of gas cost?

- A) \$36 B) \$48 C) \$28 D) \$42

17. Which of the following is a factor of the polynomial? $12ab - 12ay + 3xb - 3xy$

- A) $3b - 3x$ B) $4a - x$ C) $4a + x$ D) $3b + 3y$

18. During the course of a year, the price of a house increased from \$250,000 to \$350,000. What was the percent increase in price?

- A) 10% B) 40% C) 71% D) 140%

19. If n represents a number, which equation is a correct translation of the sentence?

14 is 13 less than 3 times a number.

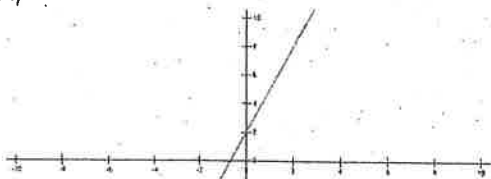
- A) $14 = 3n - 13$ B) $14 = 13 - 3n$
 C) $14 = 3(n - 13)$ D) $14 = 3(n + 13)$

20. Solve for n . $2(n + 6) = 5n - 9$

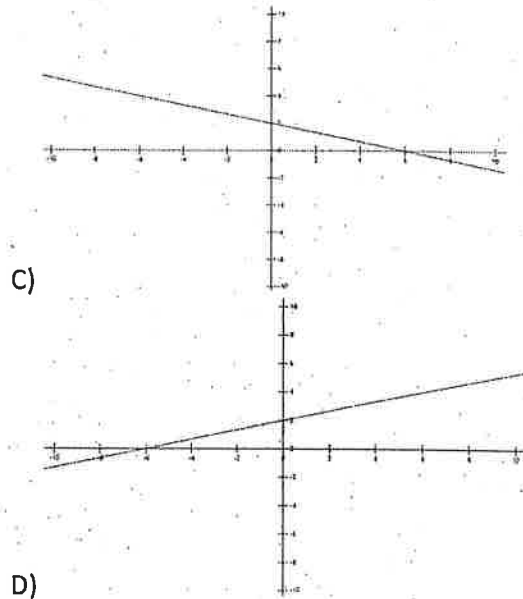
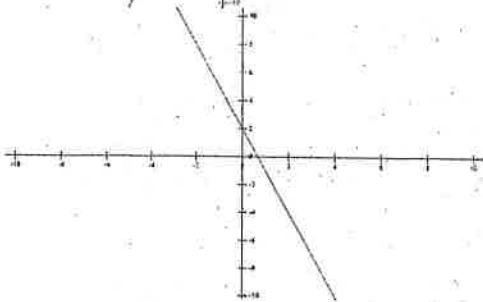
- A) $n = 1$ B) $n = -1$ C) $n = 7$ D) $n = -7$

21. Which of the following is the graph of the equation? $-2x + 6y = 12$

A)



B)



C)

D)

22. Evaluate $g(5)$ for the function $g(x)$.

$g(x) = 3x^2 - 3x + 9$ A) 99 B) 60 C) 69 D) 13

23. Simplify completely. $\frac{49x^2 - 28x + 7}{-7x}$

- A) $7x^2 + 4x - 1$ B) $-7x^2 - 4x - 1$
 C) $-7x^2 + 4x - 1$ D) $7x^2 - 4x + 1$

24. Multiply. $(4x - 7)(x^2 + 3x - 5)$

- A) $4x^3 + 5x^2 - 41x + 35$ B) $4x^3 + 5x^2 - x + 35$
 C) $4x^3 + 19x^2 - x + 35$ D) $4x^3 + 19x^2 - 41x + 35$

25. Simplify completely. $\sqrt{8(\sqrt{2} + \sqrt{3})}$

- A) $\sqrt{16} + \sqrt{24}$ B) 40 C) $2\sqrt{6} + 4$ D) 50

1. Factor *completely*. $2x^3 - 18xy^2$
 A) $2x(x^2 + 9y^2)$ B) $2x(x+3y)(x-3y)$
 C) $2x(x+3y)(x+3y)$ D) $x(x^2 - 9y^2)$

2. Multiply. $(2x-3)(2x^2-4x+6)$
 A) $4x^3 - 14x^2 + 24x - 18$ B) $4x^3 - 2x^2 + 12x - 18$
 C) $4x^3 - 8x^2 - 24x - 18$ D) $4x^3 - 2x^2 + 12x - 18$

3. Simplify completely. $(2x^2 + 4x + 5) - (4x^2 - 5x + 4)$
 A) $2x^2 - 9x + 1$ B) $-2x^2 + 9x + 1$
 C) $-2x^2 + 9x + 2$ D) $2x^2 + 9x - 1$

4. Simplify completely. $\frac{\sqrt{5}\sqrt{15}}{\sqrt{3}}$
 A) $6\sqrt{2}$ B) $\sqrt{10}$ C) 5 D) $\sqrt{17}$

5. Divide. Give the answer in scientific notation.

$$\frac{15 \times 10^3}{6 \times 10^5}$$

- A) 2.5×10^{-2} B) 25×10^2
 C) 0.25×10^{-2} D) 2.5×10^2

6. Simplify. $\sqrt{12} + \sqrt{56}$
 A) $\sqrt{68}$ B) $4\sqrt{17}$ C) $4\sqrt{3} + 4\sqrt{14}$ D) $2\sqrt{3} + 2\sqrt{14}$

7. Simplify. $\frac{w^8x^3}{w^7x^{-2}}$
 A) x^5 B) wx C) wx^5 D) wx^{-5}

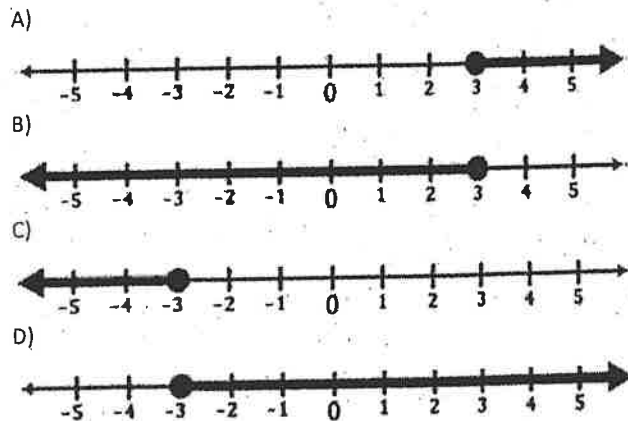
8. Find *all* solutions to the equation. $x^2 - 2x = 24$
 A) $x = 4$ or $x = -6$ B) $x = -4$ or $x = -6$
 C) $x = -4$ or $x = 6$ D) $x = -4$ or $x = -6$

9. Evaluate $f(2)$ for the function $f(x) = 6x^2 - 4x + 7$
 A) 11 B) 16 C) 14 D) 23

10. Find the equation of the horizontal line passing through the point $(3, -2)$.
 A) $x = -2$ B) $y = -2$ C) $y = 2$ D) $y = x - 2$

11. Find the graph of the solution to the inequality.

$$4x - 2 \leq 2x + 4$$



12. Solve for x. $y = 3x + 9z$
 A) $x = \frac{y+9z}{3}$ B) $x = \frac{y}{3} - 3z$
 C) $x = \frac{-y-9z}{3}$ D) $x = \frac{y}{3} + 3z$

13. In 2008, there were 90 fish in a pond. One year later, the number of fish decreased by 30%. How many fish were in the pond in 2009?

- A) 27 fish B) 60 fish C) 63 fish D) 117 fish

14. If y represents a number, which equation is a correct translation of the sentence?

39 subtracted from 4 times a number is 15.

- A) $39 - 4y = 15$ B) $4(y + 39) = 15$
 C) $4(y - 39) = 15$ D) $4y - 39 = 15$

15. Simplify completely. $\frac{32x^6 - 16x^7 + 4x^3}{-4x^3}$

- A) $-8x^2 - 4x^4 + x$ B) $-8x^3 - 4x^4 + 1$
 C) $-8x^3 + 4x^4 - 1$ D) $-8x^3 + 4x^4 - x$

16. Which of the following is a factor of the polynomial? $8x^2 - 22x - 21$

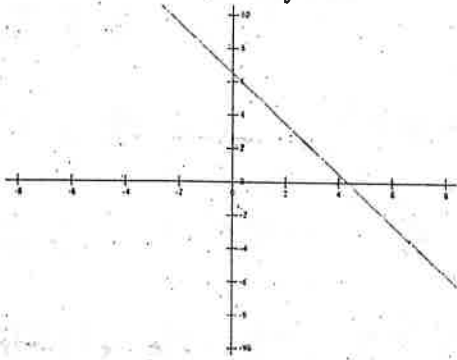
- A) $2x - 7$ B) $2x + 7$ C) $4x - 3$ D) $4x + 3$

17. Find the equation of the line passing through the points $(-1, 7)$ and $(2, -8)$. Write the equation in slope-intercept form.

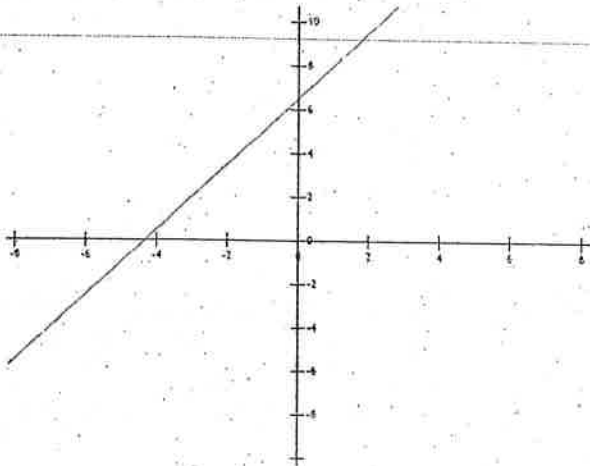
- A) $y = 5x - 2$ B) $y = 5x + 2$
 C) $y = -5x - 2$ D) $y = -5x + 2$

18. Which of the following is the graph of the equation?

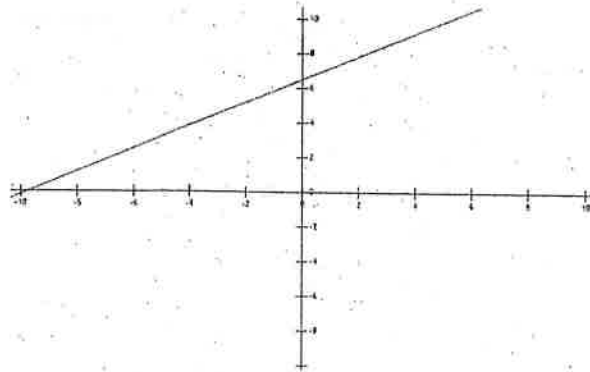
$$4x + 6y = 26$$



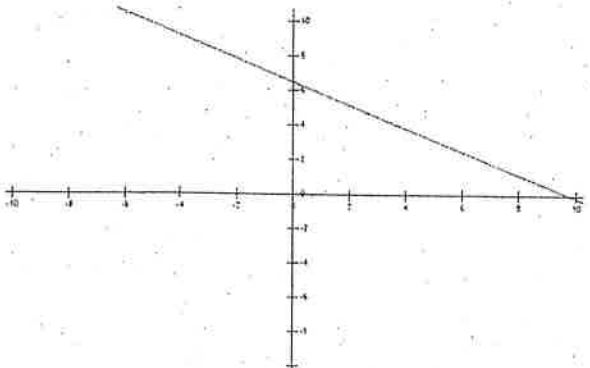
A)



B)



C)



D)

19. Which of the following is a factor of the polynomial? $18dw - 6dz + 63cw - 21cz$

- A) $2d - 7c$ B) $2c + 7d$ C) $3w + z$ D) $3w - z$

20. Solve for x. $21 - 6x = 24 - 7x$

- A) $x = 3$ B) $x = -3$ C) $x = -4$ D) $x = -4$

21. Find the slope and y-intercept for the graph of the equation. $7x - 14y = 35$

- A) Slope $-\frac{1}{2}$ and y-intercept $= (0, \frac{5}{2})$
 B) Slope $\frac{1}{2}$ and y-intercept $= (0, -\frac{5}{2})$
 C) Slope $\frac{1}{2}$ and y-intercept $= (0, \frac{5}{2})$
 D) Slope $-\frac{1}{2}$ and y-intercept $= (0, \frac{5}{2})$

22. What is the value of the x-coordinate of the solution to the system of equations?

$$\begin{aligned} 3x - y &= 8 \\ -6x + 3y &= -9 \end{aligned}$$

- A) $x = 3$ B) $x = 7$ C) $x = -5$ D) $x = 5$

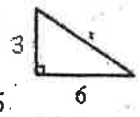
23. If 8 beads weigh 32 grams, how many beads weigh 52 grams?

- A) 4 beads B) 9 beads C) 13 beads D) 38 beads

24. Find *all* solutions to the equation. $4x^2 = 196$

- A) Only $x = 7$ B) Only $x = -7$
 C) $x = 7$ or $x = -7$ D) $x = 7$ or $x = 49$

25. What is the value of x in the right triangle?



- A) $\sqrt{18}$ B) $9\sqrt{5}$ C) 3 D) $3\sqrt{5}$

MTH 05

WORKBOOK

Solutions

If you have any suggestions or see any mistakes on this workbook,

Please e-mail me at jasonkimbcc@gmail.com

Step 1: Find LCD
 Step 2: Find equal denominator fraction

[CH 0.1-1] Adding Fractions

1) $\frac{2}{3} + \frac{1}{6}$ LCD(3,6)=6
 $\frac{4}{6} + \frac{1}{6} = \frac{4+1}{6} = \frac{5}{6}$

2) $\frac{5}{6} + \frac{1}{12}$ LCD(6,12)=12
 $\frac{10}{12} + \frac{1}{12} = \frac{10+1}{12} = \frac{11}{12}$

3) $\frac{2}{11} + \frac{2}{33}$ LCD(11,33)=33
 $\frac{6}{33} + \frac{2}{33} = \frac{6+2}{33} = \frac{8}{33}$

4) $\frac{11}{35} + \frac{2}{7}$ LCD(35,7)=35
 $\frac{11}{35} + \frac{10}{35} = \frac{11+10}{35} = \frac{21}{35} = \frac{3}{5}$

5) $\frac{7}{15} + \frac{5}{12}$ LCD(15,12)=60
 $\frac{28}{60} + \frac{25}{60} = \frac{28+25}{60} = \frac{53}{60}$

6) $\frac{2}{3} + \frac{1}{4}$ LCD(3,4)=12
 $\frac{8}{12} + \frac{3}{12} = \frac{8+3}{12} = \frac{11}{12}$

7) $\frac{2}{5} + \frac{2}{15}$ LCD(5,15)=15
 $\frac{6}{15} + \frac{2}{15} = \frac{8}{15}$

8) $\frac{5}{14} + \frac{10}{21}$ LCD(14,21)=42
 $\frac{15}{42} + \frac{20}{42} = \frac{35}{42} = \frac{5}{6}$

9) $\frac{6}{25} + \frac{7}{35}$ LCD(25,35)=175
 $\frac{42}{175} + \frac{35}{175} = \frac{77}{175} = \frac{11}{25}$

10) $\frac{2}{28} + \frac{2}{21}$ LCD(28,21)=84
 $\frac{6}{84} + \frac{8}{84} = \frac{14}{84} = \frac{1}{6}$

1) $\frac{5}{9} + \frac{1}{3}$ LCD(9,3)=9
 $\frac{5}{9} + \frac{3}{9} = \frac{8}{9}$

2) $\frac{5}{8} + \frac{3}{20}$ LCD(8,20)=40
 $\frac{25}{40} + \frac{6}{40} = \frac{31}{40}$

3) $\frac{4}{5} + \frac{3}{40}$ LCD(5,40)=40
 $\frac{32}{40} + \frac{3}{40} = \frac{35}{40} = \frac{7}{8}$

4) $\frac{5}{6} + \frac{1}{12}$ LCD(6,12)=12
 $\frac{10}{12} + \frac{1}{12} = \frac{10+1}{12} = \frac{11}{12}$

5) $\frac{3}{14} + \frac{3}{7}$ LCD(14,7)=14
 $\frac{3}{14} + \frac{6}{14} = \frac{3+6}{14} = \frac{9}{14}$

6) $\frac{8}{25} + \frac{7}{35}$ LCD(25,35)=175
 $\frac{56}{175} + \frac{35}{175} = \frac{56+35}{175} = \frac{91}{175}$

7) $\frac{2}{28} + \frac{2}{21}$ LCD(28,21)=84
 $\frac{6}{84} + \frac{8}{84} = \frac{6+8}{84} = \frac{14}{84} = \frac{1}{6}$

8) $\frac{2}{33} + \frac{2}{21}$ LCD(33,21)=231
 $\frac{14}{231} + \frac{22}{231} = \frac{36}{231} = \frac{12}{77}$

9) $\frac{1}{3} + \frac{1}{9} + \frac{1}{27}$ LCD(3,9,27)=27
 $\frac{9}{27} + \frac{3}{27} + \frac{1}{27} = \frac{9+3+1}{27} = \frac{13}{27}$

10) $\frac{5}{7} + \frac{1}{8} + \frac{1}{2}$ LCD(7,8,2)=56
 $\frac{40}{56} + \frac{7}{56} + \frac{28}{56} = \frac{40+7+28}{56} = \frac{75}{56}$

step ① Find LCD
step ② Find Equal denominator Fraction

[CH0.1-2] Subtracting Fractions

1) $\frac{7}{8} - \frac{3}{16}$
 $= \frac{14}{16} - \frac{3}{16} = \frac{14-3}{16} = \frac{11}{16}$
 ① LCD(8,16)=16
 ② $\frac{7}{8} \times \frac{2}{2} = \frac{14}{16}$
 $\frac{3}{16} = \frac{3}{16}$

2) $\frac{10}{13} - \frac{7}{10}$
 $= \frac{100}{130} - \frac{91}{130} = \frac{100-91}{130} = \frac{9}{130}$
 ① LCD(13,10)=130
 ② $\frac{10}{13} \times \frac{10}{10} = \frac{100}{130}$
 $\frac{7}{10} \times \frac{13}{13} = \frac{91}{130}$

3) $\frac{5}{12} - \frac{1}{9}$
 $= \frac{15}{36} - \frac{4}{36} = \frac{15-4}{36} = \frac{11}{36}$
 ① LCD(12,9)=36
 ② $\frac{5}{12} \times \frac{3}{3} = \frac{15}{36}$
 $\frac{1}{9} \times \frac{4}{4} = \frac{4}{36}$

4) $\frac{6}{25} - \frac{7}{35}$
 $= \frac{42}{175} - \frac{35}{175} = \frac{42-35}{175} = \frac{7}{175} = \frac{1}{25}$
 ① LCD(25,35)=175
 ② $\frac{6}{25} \times \frac{7}{7} = \frac{42}{175}$
 $\frac{7}{35} \times \frac{5}{5} = \frac{35}{175}$

5) $\frac{5}{13} - \frac{3}{26}$
 $= \frac{10}{26} - \frac{3}{26} = \frac{10-3}{26} = \frac{7}{26}$
 ① LCD(13,26)=26
 ② $\frac{5}{13} \times \frac{2}{2} = \frac{10}{26}$
 $\frac{3}{26} = \frac{3}{26}$

6) $\frac{5}{11} - \frac{3}{9}$
 $= \frac{45}{99} - \frac{33}{99} = \frac{45-33}{99} = \frac{12}{99} = \frac{4}{33}$
 ① LCD(11,9)=99
 ② $\frac{5}{11} \times \frac{9}{9} = \frac{45}{99}$
 $\frac{3}{9} \times \frac{11}{11} = \frac{33}{99}$

7) $\frac{7}{12} - \frac{5}{18}$
 $= \frac{21}{36} - \frac{10}{36} = \frac{21-10}{36} = \frac{11}{36}$
 ① LCD(12,18)=36
 ② $\frac{7}{12} \times \frac{3}{3} = \frac{21}{36}$
 $\frac{5}{18} \times \frac{2}{2} = \frac{10}{36}$

8) $\frac{5}{6} - \frac{3}{7}$
 $= \frac{35}{42} - \frac{18}{42} = \frac{35-18}{42} = \frac{17}{42}$
 ① LCD(6,7)=42
 ② $\frac{5}{6} \times \frac{7}{7} = \frac{35}{42}$
 $\frac{3}{7} \times \frac{6}{6} = \frac{18}{42}$

9) $\frac{1}{100} - \frac{1}{1000}$
 $= \frac{10}{1000} - \frac{1}{1000} = \frac{10-1}{1000} = \frac{9}{1000}$
 ① LCD(100,1000)=1000
 ② $\frac{1}{100} \times \frac{10}{10} = \frac{10}{1000}$
 $\frac{1}{1000} = \frac{1}{1000}$

10) $\frac{21}{44} - \frac{11}{36}$
 $= \frac{189}{396} - \frac{121}{396} = \frac{189-121}{396} = \frac{68}{396} = \frac{17}{99}$
 ① LCD(44,36)=396
 ② $\frac{21}{44} \times \frac{9}{9} = \frac{189}{396}$
 $\frac{11}{36} \times \frac{11}{11} = \frac{121}{396}$

2) $\frac{5}{6} - \frac{3}{8}$
 $= \frac{20}{24} - \frac{9}{24} = \frac{20-9}{24} = \frac{11}{24}$
 ① LCD(6,8)=24
 ② $\frac{5}{6} \times \frac{4}{4} = \frac{20}{24}$
 $\frac{3}{8} \times \frac{3}{3} = \frac{9}{24}$

2) $\frac{7}{18} - \frac{2}{9}$
 $= \frac{7}{18} - \frac{4}{18} = \frac{7-4}{18} = \frac{3}{18} = \frac{1}{6}$
 ① LCD(18,9)=18
 ② $\frac{7}{18} = \frac{7}{18}$
 $\frac{2}{9} \times \frac{2}{2} = \frac{4}{18}$

3) $\frac{7}{15} - \frac{5}{12}$
 $= \frac{28}{60} - \frac{25}{60} = \frac{28-25}{60} = \frac{3}{60} = \frac{1}{20}$
 ① LCD(15,12)=60
 ② $\frac{7}{15} \times \frac{4}{4} = \frac{28}{60}$
 $\frac{5}{12} \times \frac{5}{5} = \frac{25}{60}$

4) $\frac{1}{50} - \frac{1}{500}$
 $= \frac{10}{500} - \frac{1}{500} = \frac{10-1}{500} = \frac{9}{500}$
 ① LCD(50,500)=500
 ② $\frac{1}{50} \times \frac{10}{10} = \frac{10}{500}$
 $\frac{1}{500} = \frac{1}{500}$

5) $\frac{3}{4} - \frac{1}{7}$
 $= \frac{21}{28} - \frac{4}{28} = \frac{21-4}{28} = \frac{17}{28}$
 ① LCD(4,7)=28
 ② $\frac{3}{4} \times \frac{7}{7} = \frac{21}{28}$
 $\frac{1}{7} \times \frac{4}{4} = \frac{4}{28}$

6) $\frac{11}{35} - \frac{2}{7}$
 $= \frac{11}{35} - \frac{10}{35} = \frac{11-10}{35} = \frac{1}{35}$
 ① LCD(35,7)=35
 ② $\frac{11}{35} = \frac{11}{35}$
 $\frac{2}{7} \times \frac{5}{5} = \frac{10}{35}$

7) $\frac{5}{8} - \frac{3}{20}$
 $= \frac{25}{40} - \frac{6}{40} = \frac{25-6}{40} = \frac{19}{40}$
 ① LCD(8,20)=40
 ② $\frac{5}{8} \times \frac{5}{5} = \frac{25}{40}$
 $\frac{3}{20} \times \frac{2}{2} = \frac{6}{40}$

8) $\frac{8}{9} - \frac{5}{12}$
 $= \frac{32}{36} - \frac{15}{36} = \frac{32-15}{36} = \frac{17}{36}$
 ① LCD(9,12)=36
 ② $\frac{8}{9} \times \frac{4}{4} = \frac{32}{36}$
 $\frac{5}{12} \times \frac{3}{3} = \frac{15}{36}$

9) $\frac{7}{18} - \frac{2}{45}$
 $= \frac{35}{90} - \frac{4}{90} = \frac{35-4}{90} = \frac{31}{90}$
 ① LCD(18,45)=90
 ② $\frac{7}{18} \times \frac{5}{5} = \frac{35}{90}$
 $\frac{2}{45} \times \frac{2}{2} = \frac{4}{90}$

10) $\frac{5}{12} - \frac{1}{8}$
 $= \frac{10}{24} - \frac{3}{24} = \frac{10-3}{24} = \frac{7}{24}$
 ① LCD(12,8)=24
 ② $\frac{5}{12} \times \frac{2}{2} = \frac{10}{24}$
 $\frac{1}{8} \times \frac{3}{3} = \frac{3}{24}$

ICH 0.1-3] Adding and Subtracting Fraction

(1)

1) $\frac{9}{10} + \frac{2}{5}$ $\text{LCD}(10,5)=10$ (2a) $\frac{9}{10} = \frac{9}{10}$
 $\frac{9}{10} + \frac{4}{10} = \frac{13}{10} = \frac{13}{10}$ (2b) $\frac{2}{5} = \frac{4}{10}$

2) $\frac{1}{6} + \frac{3}{14}$ $\text{LCD}(6,14)=42$ (2a) $\frac{1}{6} = \frac{7}{42}$
 $\frac{7}{42} + \frac{9}{42} = \frac{16}{42} = \frac{8}{21}$ (2b) $\frac{3}{14} = \frac{9}{42}$

3) $\frac{7}{8} - \frac{1}{3}$ $\text{LCD}(8,3)=24$ (2a) $\frac{7}{8} = \frac{21}{24}$
 $\frac{21}{24} - \frac{8}{24} = \frac{13}{24}$ (2b) $\frac{1}{3} = \frac{8}{24}$

4) $\frac{6}{21} - \frac{1}{7}$ $\text{LCD}(21,7)=21$ (2a) $\frac{6}{21} = \frac{6}{21}$
 $\frac{6}{21} - \frac{3}{21} = \frac{3}{21} = \frac{1}{7}$ (2b) $\frac{1}{7} = \frac{3}{21}$

5) $\frac{9}{20} + \frac{2}{3}$ $\text{LCD}(20,3)=60$ (2a) $\frac{9}{20} = \frac{27}{60}$
 $\frac{27}{60} + \frac{40}{60} = \frac{67}{60} = \frac{11}{60}$ (2b) $\frac{2}{3} = \frac{40}{60}$

6) $\frac{16}{25} - \frac{1}{2}$ $\text{LCD}(25,2)=50$ (2a) $\frac{16}{25} = \frac{32}{50}$
 $\frac{32}{50} - \frac{25}{50} = \frac{7}{50}$ (2b) $\frac{1}{2} = \frac{25}{50}$

7) $\frac{4}{8} + \frac{5}{12}$ $\text{LCD}(8,12)=24$ (2a) $\frac{4}{8} = \frac{12}{24}$
 $\frac{12}{24} + \frac{10}{24} = \frac{22}{24} = \frac{11}{12}$ (2b) $\frac{5}{12} = \frac{10}{24}$

8) $\frac{5}{6} - \frac{5}{12}$ $\text{LCD}(6,12)=12$ (2a) $\frac{5}{6} = \frac{10}{12}$
 $\frac{10}{12} - \frac{5}{12} = \frac{5}{12}$ (2b) $\frac{5}{12} = \frac{5}{12}$

9) $\frac{7}{15} + \frac{7}{12}$ $\text{LCD}(15,12)=60$ (2a) $\frac{7}{15} = \frac{28}{60}$
 $\frac{28}{60} + \frac{35}{60} = \frac{63}{60} = \frac{21}{20}$ (2b) $\frac{7}{12} = \frac{35}{60}$

10) $\frac{5}{14} - \frac{5}{21}$ $\text{LCD}(14,21)=42$ (2a) $\frac{5}{14} = \frac{15}{42}$
 $\frac{15}{42} - \frac{10}{42} = \frac{5}{42}$ (2b) $\frac{5}{21} = \frac{10}{42}$

[2]
 1) $\frac{5}{8} - \frac{3}{20}$ $\text{LCD}(8,20)=40$ (2a) $\frac{5}{8} = \frac{25}{40}$
 $\frac{25}{40} - \frac{6}{40} = \frac{19}{40}$ (2b) $\frac{3}{20} = \frac{6}{40}$

2) $\frac{8}{12} + \frac{5}{10}$ $\text{LCD}(12,10)=60$ (2a) $\frac{8}{12} = \frac{40}{60}$
 $\frac{40}{60} + \frac{30}{60} = \frac{70}{60} = \frac{7}{6}$ (2b) $\frac{5}{10} = \frac{30}{60}$

3) $\frac{8}{25} - \frac{7}{35}$ $\text{LCD}(25,35)=175$ (2a) $\frac{8}{25} = \frac{56}{175}$
 $\frac{56}{175} - \frac{35}{175} = \frac{21}{175} = \frac{3}{25}$ (2b) $\frac{7}{35} = \frac{35}{175}$

4) $\frac{2}{5} + \frac{3}{6} + \frac{3}{4}$ $\text{LCD}(5,6,4)=60$ (2a) $\frac{2}{5} = \frac{24}{60}$
 $\frac{24}{60} + \frac{30}{60} + \frac{45}{60} = \frac{99}{60} = \frac{33}{20}$ (2b) $\frac{3}{6} = \frac{30}{60}$
 $\frac{3}{4} = \frac{45}{60}$

5) $\frac{2}{21} - \frac{2}{33}$ $\text{LCD}(33,21)=231$ (2a) $\frac{2}{33} = \frac{14}{231}$
 $\frac{22}{231} - \frac{14}{231} = \frac{8}{231}$ (2b) $\frac{2}{21} = \frac{22}{231}$

6) $\frac{5}{6} - \frac{5}{8}$ $\text{LCD}(6,8)=24$ (2a) $\frac{5}{6} = \frac{20}{24}$
 $\frac{20}{24} - \frac{15}{24} = \frac{5}{24}$ (2b) $\frac{5}{8} = \frac{15}{24}$

7) $\frac{5}{8} + \frac{4}{6}$ $\text{LCD}(8,6)=24$ (2a) $\frac{5}{8} = \frac{15}{24}$
 $\frac{16}{24} + \frac{15}{24} = \frac{31}{24} = \frac{17}{24}$ (2b) $\frac{4}{6} = \frac{16}{24}$

8) $\frac{5}{14} + \frac{3}{8}$ $\text{LCD}(14,8)=56$ (2a) $\frac{5}{14} = \frac{20}{56}$
 $\frac{20}{56} + \frac{21}{56} = \frac{41}{56}$ (2b) $\frac{3}{8} = \frac{21}{56}$

9) $\frac{5}{6} - \frac{2}{4} - \frac{2}{8}$ $\text{LCD}(6,4,8)=12$ (2a) $\frac{5}{6} = \frac{10}{12}$
 $\frac{10}{12} - \frac{6}{12} - \frac{2}{12} = \frac{2}{12} = \frac{1}{6}$ (2b) $\frac{2}{4} = \frac{6}{12}$
 $\frac{2}{8} = \frac{2}{12}$

10) $\frac{5}{7} + \frac{1}{8} - \frac{1}{2}$ $\text{LCD}(7,8,2)=56$ (2a) $\frac{5}{7} = \frac{40}{56}$
 $\frac{40}{56} + \frac{7}{56} - \frac{28}{56} = \frac{19}{56}$ (2b) $\frac{1}{8} = \frac{7}{56}$
 $\frac{1}{2} = \frac{28}{56}$

[CH 0.1-4] Addition of Mixed Numbers

[1]

1) $10\frac{3}{14} + 3\frac{4}{7}$

$10\frac{3}{14} = \frac{3}{14}$
 $3\frac{4}{7} = \frac{8}{7} = \frac{16}{14}$
 $10\frac{3}{14} + 3\frac{16}{14} = 13\frac{19}{14}$

① LCD(14, 7) = 14

2a) $\frac{3}{14} = \frac{3}{14}$
 2b) $\frac{4}{7} = \frac{8}{7} = \frac{16}{14}$

2) $12\frac{5}{12} + 4\frac{1}{6}$

$12\frac{5}{12} = \frac{5}{12}$
 $4\frac{1}{6} = \frac{2}{6} = \frac{4}{12}$
 $12\frac{5}{12} + 4\frac{4}{12} = 16\frac{9}{12} = 16\frac{3}{4}$

① LCD(12, 6) = 12

2a) $\frac{5}{12} = \frac{5}{12}$
 2b) $\frac{1}{6} = \frac{2}{6} = \frac{4}{12}$

3) $9\frac{1}{5} + 8\frac{2}{25}$

$9\frac{1}{5} = \frac{2}{5} = \frac{4}{10}$
 $8\frac{2}{25} = \frac{2}{25} = \frac{4}{50} = \frac{2}{25}$
 $9\frac{4}{10} + 8\frac{2}{25} = 17\frac{10}{25} = 17\frac{2}{5}$

① LCD(5, 25) = 25

2a) $\frac{1}{5} = \frac{5}{25}$
 2b) $\frac{2}{25} = \frac{2}{25}$

4) $6\frac{2}{13} + 8\frac{7}{26}$

$6\frac{2}{13} = \frac{4}{26}$
 $8\frac{7}{26} = \frac{7}{26}$
 $6\frac{4}{26} + 8\frac{7}{26} = 14\frac{11}{26}$

① LCD(13, 26) = 26

2a) $\frac{2}{13} = \frac{4}{26}$
 2b) $\frac{7}{26} = \frac{7}{26}$

5) $8\frac{2}{5} + 11\frac{2}{3}$

$8\frac{2}{5} = \frac{6}{15}$
 $11\frac{2}{3} = \frac{10}{15}$
 $8\frac{6}{15} + 11\frac{10}{15} = 19\frac{16}{15} = 20\frac{1}{3}$

① LCD(5, 3) = 15

2a) $\frac{2}{5} = \frac{6}{15}$
 2b) $\frac{2}{3} = \frac{10}{15}$

6) $7\frac{3}{7} + 3\frac{3}{5}$

$7\frac{3}{7} = \frac{15}{35}$
 $3\frac{3}{5} = \frac{21}{35}$
 $7\frac{15}{35} + 3\frac{21}{35} = 10\frac{36}{35} = 11\frac{1}{5}$

① LCD(7, 5) = 35

2a) $\frac{3}{7} = \frac{15}{35}$
 2b) $\frac{3}{5} = \frac{21}{35}$

7) $102\frac{5}{8} + 96\frac{21}{25}$

$102\frac{5}{8} = \frac{125}{200}$
 $96\frac{21}{25} = \frac{168}{200}$
 $102\frac{125}{200} + 96\frac{168}{200} = 198\frac{293}{200} = 199\frac{93}{200}$

① LCD(8, 25) = 200

2a) $\frac{5}{8} = \frac{125}{200}$
 2b) $\frac{21}{25} = \frac{168}{200}$

8) $3\frac{5}{8} + 2\frac{1}{6}$

$3\frac{5}{8} = \frac{15}{24}$
 $2\frac{1}{6} = \frac{4}{24}$
 $3\frac{15}{24} + 2\frac{4}{24} = 5\frac{19}{24}$

① LCD(8, 6) = 24

2a) $\frac{5}{8} = \frac{15}{24}$
 2b) $\frac{1}{6} = \frac{4}{24}$

9) $12\frac{7}{8} + 25\frac{5}{12}$

$12\frac{7}{8} = \frac{21}{24}$
 $25\frac{5}{12} = \frac{10}{24}$
 $12\frac{21}{24} + 25\frac{10}{24} = 37\frac{31}{24} = 38\frac{7}{24}$

① LCD(8, 12) = 24

2a) $\frac{7}{8} = \frac{21}{24}$
 2b) $\frac{5}{12} = \frac{10}{24}$

[2]

1) $12\frac{5}{12} + 4\frac{1}{6}$

$12\frac{5}{12} = \frac{5}{12}$
 $4\frac{1}{6} = \frac{2}{6} = \frac{4}{12}$
 $12\frac{5}{12} + 4\frac{4}{12} = 16\frac{9}{12} = 16\frac{3}{4}$

① LCD(12, 6) = 12

2a) $\frac{5}{12} = \frac{5}{12}$
 2b) $\frac{1}{6} = \frac{2}{6} = \frac{4}{12}$

2) $9\frac{1}{5} + 8\frac{2}{25}$

$9\frac{1}{5} = \frac{2}{5} = \frac{4}{10}$
 $8\frac{2}{25} = \frac{2}{25} = \frac{4}{50} = \frac{2}{25}$
 $9\frac{4}{10} + 8\frac{2}{25} = 17\frac{10}{25} = 17\frac{2}{5}$

① LCD(5, 25) = 25

2a) $\frac{1}{5} = \frac{5}{25}$
 2b) $\frac{2}{25} = \frac{2}{25}$

3) $9\frac{3}{4} + 2\frac{1}{8}$

$9\frac{3}{4} = \frac{6}{8}$
 $2\frac{1}{8} = \frac{1}{8}$
 $9\frac{6}{8} + 2\frac{1}{8} = 11\frac{7}{8}$

① LCD(4, 8) = 8

2a) $\frac{3}{4} = \frac{6}{8}$
 2b) $\frac{1}{8} = \frac{1}{8}$

4) $1\frac{5}{6} + 5\frac{3}{8}$

$1\frac{5}{6} = \frac{20}{24}$
 $5\frac{3}{8} = \frac{9}{24}$
 $1\frac{20}{24} + 5\frac{9}{24} = 6\frac{29}{24} = 7\frac{5}{24}$

① LCD(6, 8) = 24

2a) $\frac{5}{6} = \frac{20}{24}$
 2b) $\frac{3}{8} = \frac{9}{24}$

5) $2\frac{5}{12} + 1\frac{5}{8}$

$2\frac{5}{12} = \frac{10}{24}$
 $1\frac{5}{8} = \frac{15}{24}$
 $2\frac{10}{24} + 1\frac{15}{24} = 3\frac{25}{24} = 4\frac{1}{24}$

① LCD(12, 8) = 24

2a) $\frac{5}{12} = \frac{10}{24}$
 2b) $\frac{5}{8} = \frac{15}{24}$

6) $40\frac{9}{10} + 15\frac{8}{27}$

$40\frac{9}{10} = \frac{243}{270}$
 $15\frac{8}{27} = \frac{80}{270}$
 $40\frac{243}{270} + 15\frac{80}{270} = 55\frac{323}{270} = 56\frac{53}{270}$

① LCD(10, 27) = 270

2a) $\frac{9}{10} = \frac{243}{270}$
 2b) $\frac{8}{27} = \frac{80}{270}$

7) $4\frac{1}{3} + 9\frac{2}{5}$

$4\frac{1}{3} = \frac{5}{15}$
 $9\frac{2}{5} = \frac{6}{15}$
 $4\frac{5}{15} + 9\frac{6}{15} = 13\frac{11}{15}$

① LCD(3, 5) = 15

2a) $\frac{1}{3} = \frac{5}{15}$
 2b) $\frac{2}{5} = \frac{6}{15}$

8) $3\frac{1}{6} + 7\frac{3}{4}$

$3\frac{1}{6} = \frac{2}{12}$
 $7\frac{3}{4} = \frac{9}{12}$
 $3\frac{2}{12} + 7\frac{9}{12} = 10\frac{11}{12}$

① LCD(6, 4) = 12

2a) $\frac{1}{6} = \frac{2}{12}$
 2b) $\frac{3}{4} = \frac{9}{12}$

9) $8\frac{5}{9} + 9\frac{9}{12}$

$8\frac{5}{9} = \frac{20}{36}$
 $9\frac{9}{12} = \frac{27}{36}$
 $8\frac{20}{36} + 9\frac{27}{36} = 17\frac{47}{36} = 18\frac{11}{36}$

① LCD(9, 12) = 36

2a) $\frac{5}{9} = \frac{20}{36}$
 2b) $\frac{9}{12} = \frac{27}{36}$

[CH 0.1-5] Subtraction of Mixed Numbers

[1]

1) $10\frac{13}{14} - 3\frac{4}{7}$

ⓁLCD (14, 7) = 14

ⓐ $10\frac{13}{14} = 10\frac{13}{14}$; ⓑ $3\frac{4}{7} = 3\frac{8}{14}$

$$\begin{array}{r} 10\frac{13}{14} = 10\frac{13}{14} \\ - 3\frac{8}{14} = 3\frac{8}{14} \\ \hline 7\frac{5}{14} \end{array}$$

2) $12\frac{5}{12} - 4\frac{1}{6}$

ⓁLCD (12, 6) = 12

ⓐ $12\frac{5}{12} = 12\frac{5}{12}$; ⓑ $4\frac{1}{6} = 4\frac{2}{12}$

$$\begin{array}{r} 12\frac{5}{12} = 12\frac{5}{12} \\ - 4\frac{2}{12} = 4\frac{2}{12} \\ \hline 8\frac{3}{12} = 8\frac{1}{4} \end{array}$$

3) $5\frac{2}{3} - 3\frac{1}{5}$

ⓁLCD (3, 5) = 15

ⓐ $5\frac{2}{3} = 5\frac{10}{15}$; ⓑ $3\frac{1}{5} = 3\frac{3}{15}$

$$\begin{array}{r} 5\frac{10}{15} = 5\frac{10}{15} \\ - 3\frac{3}{15} = 3\frac{3}{15} \\ \hline 2\frac{7}{15} \end{array}$$

4) $23\frac{3}{5} - 8\frac{8}{15}$

ⓁLCD (5, 15) = 15

ⓐ $23\frac{3}{5} = 23\frac{9}{15}$; ⓑ $8\frac{8}{15} = 8\frac{8}{15}$

$$\begin{array}{r} 23\frac{9}{15} = 23\frac{9}{15} \\ - 8\frac{8}{15} = 8\frac{8}{15} \\ \hline 15\frac{1}{15} \end{array}$$

5) $5\frac{3}{8} - 2\frac{13}{20}$

ⓁLCD (8, 20) = 40

ⓐ $5\frac{3}{8} = 5\frac{15}{40}$; ⓑ $2\frac{13}{20} = 2\frac{26}{40}$

$$\begin{array}{r} 5\frac{15}{40} = 5\frac{15}{40} \\ - 2\frac{26}{40} = 2\frac{26}{40} \\ \hline 2\frac{29}{40} \end{array}$$

6) $9\frac{1}{5} - 8\frac{6}{25}$

ⓁLCD (5, 25) = 25

ⓐ $9\frac{1}{5} = 9\frac{5}{25}$; ⓑ $8\frac{6}{25} = 8\frac{6}{25}$

$$\begin{array}{r} 9\frac{5}{25} = 9\frac{5}{25} \\ - 8\frac{6}{25} = 8\frac{6}{25} \\ \hline 0\frac{24}{25} = \frac{24}{25} \end{array}$$

7) $15\frac{4}{7} - 9\frac{11}{14}$

ⓁLCD (7, 14) = 14

ⓐ $15\frac{4}{7} = 15\frac{8}{14}$; ⓑ $9\frac{11}{14} = 9\frac{11}{14}$

$$\begin{array}{r} 15\frac{8}{14} = 15\frac{8}{14} \\ - 9\frac{11}{14} = 9\frac{11}{14} \\ \hline 5\frac{11}{14} \end{array}$$

8) $5\frac{3}{8} - 2\frac{13}{20}$

ⓁLCD (8, 20) = 40

ⓐ $5\frac{3}{8} = 5\frac{15}{40}$; ⓑ $2\frac{13}{20} = 2\frac{26}{40}$

$$\begin{array}{r} 5\frac{15}{40} = 5\frac{15}{40} \\ - 2\frac{26}{40} = 2\frac{26}{40} \\ \hline 2\frac{29}{40} \end{array}$$

9) $5\frac{2}{13} - 4\frac{1}{26}$

ⓁLCD (13, 26) = 26

ⓐ $5\frac{2}{13} = 5\frac{4}{26}$; ⓑ $4\frac{1}{26} = 4\frac{1}{26}$

$$\begin{array}{r} 5\frac{4}{26} = 5\frac{4}{26} \\ - 4\frac{1}{26} = 4\frac{1}{26} \\ \hline 1\frac{3}{26} \end{array}$$

[2]

1) $6\frac{1}{6} - 5\frac{11}{14}$

ⓁLCD (6, 14) = 42

ⓐ $6\frac{1}{6} = 6\frac{7}{42}$; ⓑ $5\frac{11}{14} = 5\frac{33}{42}$

$$\begin{array}{r} 6\frac{7}{42} = 6\frac{7}{42} \\ - 5\frac{33}{42} = 5\frac{33}{42} \\ \hline 1\frac{4}{42} = \frac{2}{21} \end{array}$$

2) $23 - 17\frac{3}{4}$

$$\begin{array}{r} 23 = 22\frac{4}{4} \\ - 17\frac{3}{4} = 17\frac{3}{4} \\ \hline 5\frac{1}{4} \end{array}$$

3) $11\frac{3}{5} - 9\frac{11}{15}$

ⓁLCD (5, 15) = 15

ⓐ $11\frac{3}{5} = 11\frac{9}{15}$; ⓑ $9\frac{11}{15} = 9\frac{11}{15}$

$$\begin{array}{r} 11\frac{9}{15} = 11\frac{9}{15} \\ - 9\frac{11}{15} = 9\frac{11}{15} \\ \hline 2\frac{4}{15} \end{array}$$

4) $9\frac{1}{10} - 7\frac{2}{5}$

ⓁLCD (10, 5) = 10

ⓐ $9\frac{1}{10} = 9\frac{1}{10}$; ⓑ $7\frac{2}{5} = 7\frac{4}{10}$

$$\begin{array}{r} 9\frac{1}{10} = 9\frac{1}{10} \\ - 7\frac{4}{10} = 7\frac{4}{10} \\ \hline 1\frac{7}{10} \end{array}$$

5) $6 - 2\frac{4}{9}$

$$\begin{array}{r} 6 = 5\frac{9}{9} \\ - 2\frac{4}{9} = 2\frac{4}{9} \\ \hline 3\frac{5}{9} \end{array}$$

6) $63\frac{1}{6} - 47\frac{5}{12}$

ⓁLCD (6, 12) = 12

ⓐ $63\frac{1}{6} = 63\frac{2}{12}$; ⓑ $47\frac{5}{12} = 47\frac{5}{12}$

$$\begin{array}{r} 63\frac{2}{12} = 63\frac{2}{12} \\ - 47\frac{5}{12} = 47\frac{5}{12} \\ \hline 15\frac{7}{12} \end{array}$$

7) $86\frac{2}{15} - 27\frac{3}{10}$

ⓁLCD (15, 10) = 30

ⓐ $86\frac{2}{15} = 86\frac{4}{30}$; ⓑ $27\frac{3}{10} = 27\frac{9}{30}$

$$\begin{array}{r} 86\frac{4}{30} = 86\frac{4}{30} \\ - 27\frac{9}{30} = 27\frac{9}{30} \\ \hline 58\frac{5}{30} = 58\frac{1}{6} \end{array}$$

8) $47\frac{4}{18} - 23\frac{19}{24}$

ⓁLCD (18, 24) = 72

ⓐ $47\frac{4}{18} = 47\frac{16}{72}$; ⓑ $23\frac{19}{24} = 23\frac{57}{72}$

$$\begin{array}{r} 47\frac{16}{72} = 47\frac{16}{72} \\ - 23\frac{57}{72} = 23\frac{57}{72} \\ \hline 23\frac{31}{72} \end{array}$$

9) $33\frac{11}{20} - 15\frac{19}{30}$

ⓁLCD (20, 30) = 60

ⓐ $33\frac{11}{20} = 33\frac{33}{60}$; ⓑ $15\frac{19}{30} = 15\frac{38}{60}$

$$\begin{array}{r} 33\frac{33}{60} = 33\frac{33}{60} \\ - 15\frac{38}{60} = 15\frac{38}{60} \\ \hline 17\frac{11}{60} \end{array}$$

[CH 0.1-6] Multiplication and Division of Mixed Fractions

[1]

$$1) \left(\frac{5}{12}\right)\left(\frac{3}{4}\right) = \frac{5 \cdot 3}{12 \cdot 4}$$

$$= \frac{\cancel{3} \cdot 5 \cdot \cancel{4}}{\cancel{3} \cdot 4 \cdot \cancel{4}} = \frac{5 \cdot 1}{4 \cdot 1} = \frac{5}{4} = \boxed{1\frac{1}{4}}$$

$$2) \left(\frac{3}{14}\right)\left(\frac{7}{12}\right) = \frac{3 \cdot 7}{14 \cdot 12}$$

$$= \frac{\cancel{7} \cdot 3 \cdot \cancel{4}}{\cancel{7} \cdot 4 \cdot \cancel{4} \cdot 3} = \frac{1 \cdot 1}{2 \cdot 1} = \frac{1}{2} = \boxed{\frac{1}{2}}$$

$$3) \left(6\frac{4}{5}\right) \div \left(1\frac{7}{10}\right) = \left(\frac{34}{5}\right) \div \left(\frac{17}{10}\right)$$

$$= \frac{34}{5} \times \frac{10}{17} = \frac{2 \cdot 2}{1 \cdot 1} = 4 = \boxed{4}$$

$$4) 12 \div \left(2\frac{2}{3}\right) = \left(\frac{12}{1}\right) \div \left(\frac{8}{3}\right)$$

$$= \frac{12}{1} \times \frac{3}{8} = \frac{2 \cdot 3}{1 \cdot 1} = \frac{6}{1} = \boxed{6}$$

$$5) \left(1\frac{2}{3}\right)\left(2\frac{1}{2}\right) = \left(\frac{5}{3}\right)\left(\frac{5}{2}\right)$$

$$= \frac{5 \cdot 5}{3 \cdot 2} = \frac{25}{6} = \boxed{4\frac{1}{6}}$$

$$6) \left(1\frac{3}{7}\right) \div \left(1\frac{1}{4}\right) = \left(\frac{10}{7}\right) \div \left(\frac{5}{4}\right)$$

$$= \frac{10}{7} \times \frac{4}{5} = \frac{2 \cdot 2}{1 \cdot 1} = \frac{4}{1} = \boxed{4}$$

$$7) \left(2\frac{2}{3}\right)\left(2\frac{1}{4}\right) = \left(\frac{8}{3}\right)\left(\frac{9}{4}\right)$$

$$= \frac{8}{3} \times \frac{9}{4} = \frac{2 \cdot 3}{1 \cdot 1} = 6 = \boxed{6}$$

$$8) \left(2\frac{3}{5}\right) + \left(1\frac{4}{35}\right) = \left(\frac{13}{5}\right) + \left(\frac{39}{35}\right)$$

$$= \frac{13 \cdot 7}{5 \cdot 7} + \frac{39}{35} = \frac{91}{35} + \frac{39}{35} = \frac{130}{35} = \frac{26}{7} = \boxed{3\frac{5}{7}}$$

$$9) (8)\left(3\frac{3}{4}\right) = \left(\frac{8}{1}\right)\left(\frac{15}{4}\right)$$

$$= \frac{8}{1} \times \frac{15}{4} = \frac{2 \cdot 3}{1 \cdot 1} = 6 = \boxed{6}$$

$$10) 7 \div \left(4\frac{2}{3}\right) = \left(\frac{7}{1}\right) \div \left(\frac{14}{3}\right)$$

$$= \frac{7}{1} \times \frac{3}{14} = \frac{3}{2} = \boxed{1\frac{1}{2}}$$

$$9) \left(1\frac{1}{8}\right)\left(\frac{4}{9}\right)\left(1\frac{5}{6}\right) = \left(\frac{9}{8}\right)\left(\frac{4}{9}\right)\left(\frac{11}{6}\right)$$

$$= \frac{9}{8} \times \frac{4}{9} \times \frac{11}{6} = \frac{11}{2 \cdot 2} = \frac{11}{4} = \boxed{2\frac{3}{4}}$$

$$10) \left(\frac{7}{8}\right)\left(1\frac{3}{14}\right)(64) = \left(\frac{7}{8}\right)\left(\frac{17}{14}\right)\left(\frac{64}{1}\right)$$

$$= \frac{7}{8} \times \frac{17}{14} \times 64 = \frac{17 \cdot 8}{1 \cdot 1} = 136 = \boxed{136}$$

$$11) \left(2\frac{5}{8}\right)(4) = \left(\frac{21}{8}\right)\left(\frac{4}{1}\right)$$

$$= \frac{21}{8} \times 4 = \frac{21 \cdot 4}{8} = \frac{21 \cdot 1}{2} = 10\frac{1}{2} = \boxed{10\frac{1}{2}}$$

$$12) \left(3\frac{1}{3}\right) \div 5 = \left(\frac{10}{3}\right) \div \left(\frac{5}{1}\right)$$

$$= \frac{10}{3} \times \frac{1}{5} = \frac{2 \cdot 1}{3 \cdot 1} = \frac{2}{3} = \boxed{\frac{2}{3}}$$

$$11) 1\left(\frac{1}{8}\right) \div 16 = \left(\frac{1}{8}\right) \div \left(\frac{16}{1}\right)$$

$$= \frac{1}{8} \times \frac{1}{16} = \frac{1}{128} = \boxed{\frac{1}{128}}$$

$$12) \left(11\frac{2}{3}\right)\left(13\frac{3}{5}\right) = \left(\frac{35}{3}\right)\left(\frac{68}{5}\right)$$

$$= \frac{35}{3} \times \frac{68}{5} = \frac{7 \cdot 68}{3 \cdot 1} = \frac{476}{3} = \boxed{158\frac{2}{3}}$$

$$13) \left(3\frac{3}{10}\right)\left(\frac{6}{11}\right)\left(1\frac{2}{3}\right) = \left(\frac{33}{10}\right)\left(\frac{6}{11}\right)\left(\frac{5}{3}\right)$$

$$= \frac{33}{10} \times \frac{6}{11} \times \frac{5}{3} = \frac{3 \cdot 2 \cdot 1}{1 \cdot 1} = 3 = \boxed{3}$$

$$4) \left(\frac{7}{8}\right)\left(1\frac{3}{14}\right)(64) = \left(\frac{7}{8}\right)\left(\frac{17}{14}\right)\left(\frac{64}{1}\right)$$

$$= \frac{7}{8} \times \frac{17}{14} \times 64 = \frac{17 \cdot 4}{1 \cdot 1} = 68 = \boxed{68}$$

$$13) 24 \div \left(2\frac{2}{3}\right) = \left(\frac{24}{1}\right) \div \left(\frac{8}{3}\right)$$

$$= \frac{24}{1} \times \frac{3}{8} = \frac{3 \cdot 3}{1 \cdot 1} = 9 = \boxed{9}$$

$$14) 56 \div 4\frac{2}{3} = \left(\frac{56}{1}\right) \div \left(\frac{14}{3}\right)$$

$$= \frac{56}{1} \times \frac{3}{14} = \frac{4 \cdot 3}{1 \cdot 1} = 12 = \boxed{12}$$

$$15) \left(2\frac{7}{16}\right) \div 8 = \left(\frac{39}{16}\right) \div \left(\frac{8}{1}\right)$$

$$= \frac{39}{16} \times \frac{1}{8} = \frac{39}{128} = \boxed{\frac{39}{128}}$$

$$16) \left(7\frac{1}{3}\right)\left(3\frac{5}{11}\right) = \left(\frac{22}{3}\right)\left(\frac{38}{11}\right)$$

$$= \frac{22}{3} \times \frac{38}{11} = \frac{2 \cdot 38}{3 \cdot 1} = \frac{76}{3} = \boxed{25\frac{1}{3}}$$

$$15) \left(\frac{100}{3}\right) \div \left(\frac{3}{10}\right) \div \left(1\frac{4}{5}\right)$$

$$= \frac{100}{3} \div \frac{3}{10} \div \frac{9}{5}$$

$$= \frac{100}{3} \times \frac{10}{3} \times \frac{5}{9} = \frac{5000}{81} = \boxed{61\frac{59}{81}}$$

$$16) \left(1\frac{2}{3}\right) \div \left(1\frac{5}{10}\right) + \left(1\frac{1}{9}\right)$$

$$= \left(\frac{5}{3}\right) \div \frac{15}{10} + \frac{10}{9}$$

$$= \frac{5}{3} \times \frac{10}{15} + \frac{10}{9} = \frac{10}{9} + \frac{10}{9} = \frac{20}{9} = \boxed{2\frac{2}{9}}$$

[2]

$$1) \left(\frac{3}{7}\right)\left(\frac{2}{9}\right) = \frac{3 \cdot 2}{7 \cdot 9}$$

$$= \frac{\cancel{3} \cdot 2}{7 \cdot \cancel{3}} = \frac{2}{7} = \boxed{\frac{2}{7}}$$

$$2) \left(\frac{7}{9}\right) \div \left(\frac{2}{3}\right) = \frac{7}{9} \times \frac{3}{2}$$

$$= \frac{7 \cdot \cancel{3}}{9 \cdot 2} = \frac{7 \cdot 1}{3 \cdot 2} = \frac{7}{6} = \boxed{1\frac{1}{6}}$$

$$3) \left(2\frac{4}{5}\right)\left(2\frac{1}{7}\right) = \left(\frac{14}{5}\right)\left(\frac{15}{7}\right)$$

$$= \frac{14}{5} \times \frac{15}{7} = \frac{2 \cdot 3}{1 \cdot 1} = 6 = \boxed{6}$$

$$4) \left(3\frac{2}{3}\right) \div \left(1\frac{7}{15}\right) = \frac{11}{3} \div \frac{22}{15}$$

$$= \frac{11}{3} \times \frac{15}{22} = \frac{5 \cdot 3}{1 \cdot 2} = \frac{15}{2} = \boxed{7\frac{1}{2}}$$

$$5) \left(4\frac{2}{3}\right)(6) = \left(\frac{14}{3}\right)\left(\frac{6}{1}\right)$$

$$= \frac{14}{3} \times 6 = (14)(2) = 28 = \boxed{28}$$

$$6) \left(3\frac{4}{5}\right) \div 19 = \left(\frac{19}{5}\right) \div \left(\frac{19}{1}\right)$$

$$= \frac{19}{5} \times \frac{1}{19} = \frac{1}{5} = \boxed{\frac{1}{5}}$$

$$7) 6\left(2\frac{5}{12}\right) = \left(\frac{6}{1}\right)\left(\frac{29}{12}\right)$$

$$= \frac{6}{1} \times \frac{29}{12} = \frac{29}{2} = \boxed{14\frac{1}{2}}$$

$$8) 11 \div \left(3\frac{1}{7}\right) = \left(\frac{11}{1}\right) \div \left(\frac{22}{7}\right)$$

$$= \frac{11}{1} \times \frac{7}{22} = \frac{7}{2} = \boxed{3\frac{1}{2}}$$

[3]

$$1) (3\frac{3}{4})(2\frac{2}{5}) = \frac{15}{4} \cdot \frac{12}{5}$$

$$\frac{15 \cdot 12}{4 \cdot 5} = \frac{3 \cdot 3 \cdot 2 \cdot 2}{1 \cdot 1} = 9 \cdot 2 = 18$$

$$2) (2\frac{1}{6}) \div (3\frac{1}{4})$$

$$\frac{13}{6} \div \frac{13}{4} = \frac{13}{6} \cdot \frac{4}{13}$$

$$= \frac{4}{6} = \frac{2 \cdot 2}{2 \cdot 3} = \frac{2}{3}$$

$$3) (3\frac{3}{8})(2\frac{2}{15}) = \frac{27}{8} \cdot \frac{34}{15}$$

$$\frac{27 \cdot 34}{8 \cdot 15} = \frac{9 \cdot 4}{1 \cdot 5} = \frac{36}{5} = 7\frac{1}{5}$$

$$4) (3\frac{2}{5})(2\frac{4}{15})$$

$$\frac{17}{5} \div \frac{34}{15} = \frac{17 \cdot 15}{5 \cdot 34}$$

$$= \frac{3}{2} = 1\frac{1}{2}$$

$$5) (5\frac{3}{4})(12) = (\frac{23}{4})(\frac{12}{1})$$

$$\frac{23 \cdot 12}{4 \cdot 1} = 69 = 69$$

$$6) 22 \div (3\frac{2}{3}) = 22 \div \frac{11}{3}$$

$$\frac{22}{1} \times \frac{3}{11} = \frac{2 \cdot 3}{1 \cdot 1}$$

$$= 6 = 6$$

$$7) 12(3\frac{7}{12}) = (\frac{43}{1})(\frac{43}{12})$$

$$\frac{43}{1} = 43$$

$$8) (3\frac{5}{6}) \div 46 = \frac{23}{6} \div 46$$

$$\frac{23}{6} \times \frac{1}{46} = \frac{1}{12}$$

$$9) (1\frac{2}{7})(2\frac{1}{3})(2\frac{1}{6}) = (\frac{9}{7})(\frac{7}{3})(\frac{13}{6})$$

$$\frac{9 \cdot 7 \cdot 13}{7 \cdot 3 \cdot 6} = \frac{13}{2} = 6\frac{1}{2}$$

$$10) (2\frac{2}{3})(2\frac{1}{4})(12) = (\frac{8}{3})(\frac{9}{4})(12)$$

$$\frac{8 \cdot 9 \cdot 12}{3 \cdot 4 \cdot 1} = \frac{8 \cdot 9}{1 \cdot 1} = 72$$

$$11) 1\frac{1}{4} \div 22 = (\frac{5}{4})(\frac{1}{22})$$

$$\frac{5}{4} \times \frac{1}{22} = \frac{5}{88}$$

$$12) (8\frac{2}{5})(4\frac{2}{7}) = (\frac{42}{5})(\frac{30}{7})$$

$$\frac{42 \cdot 30}{5 \cdot 7} = \frac{6 \cdot 6}{1 \cdot 1} = 36$$

$$13) 85 \div 4\frac{1}{4} = (\frac{85}{1}) \div (\frac{17}{4})$$

$$\frac{85}{1} \times \frac{4}{17} = \frac{5 \cdot 4}{1 \cdot 1} = 20 = 20$$

$$14) 10\frac{1}{2} \div 3 = \frac{21}{2} \div 3$$

$$\frac{21}{2} \div 3 = \frac{7}{2} = 3\frac{1}{2}$$

$$15) 22 \div 2\frac{5}{8} = \frac{22}{1} \div \frac{21}{8}$$

$$\frac{22 \cdot 8}{1 \cdot 21} = \frac{176}{21} = 8\frac{8}{21}$$

$$16) (4\frac{3}{4})(5\frac{2}{3}) = (\frac{19}{4})(\frac{17}{3})$$

$$= \frac{323}{12} = 26\frac{11}{12}$$

[4]

$$1) (1\frac{1}{6})(2\frac{1}{7}) = (\frac{7}{6})(\frac{15}{7})$$

$$\frac{7 \cdot 15}{6 \cdot 7} = \frac{15}{6} = \frac{5}{2} = 2\frac{1}{2}$$

$$2) 8\frac{1}{2} \div 2\frac{1}{8} = \frac{17}{2} \div \frac{17}{8}$$

$$\frac{17}{2} \cdot \frac{8}{17} = \frac{8}{2} = 4$$

$$3) (1\frac{3}{5})(1\frac{9}{16}) = (\frac{8}{5})(\frac{25}{16})$$

$$\frac{8 \cdot 25}{5 \cdot 16} = \frac{10 \cdot 5}{1 \cdot 2} = \frac{5}{2} = 2\frac{1}{2}$$

$$4) (3\frac{3}{4}) \div (5\frac{1}{3}) = (\frac{15}{4}) \div (\frac{16}{3})$$

$$= \frac{15 \cdot 3}{4 \cdot 16} = \frac{45}{64}$$

$$5) 16(4\frac{1}{8}) = (\frac{16}{1})(\frac{33}{8})$$

$$\frac{16 \cdot 33}{1 \cdot 8} = 2 \cdot 33 = 66$$

$$6) (3\frac{2}{3}) \div 22 = (\frac{11}{3}) \div (\frac{22}{1})$$

$$= \frac{11}{3} \cdot \frac{1}{22} = \frac{1}{3 \cdot 2} = \frac{1}{6}$$

$$7) (3\frac{7}{12})(12) = (\frac{43}{12})(\frac{12}{1})$$

$$\frac{43 \cdot 12}{12 \cdot 1} = 43$$

$$8) 15 \div (2\frac{6}{7}) = (\frac{15}{1}) \div (\frac{20}{7})$$

$$\frac{15}{1} \cdot \frac{7}{20} = \frac{3 \cdot 7}{1 \cdot 4} = \frac{21}{4} = 5\frac{1}{4}$$

$$9) (3\frac{1}{3})(1\frac{1}{8})(\frac{4}{45}) = (\frac{10}{3})(\frac{9}{8})(\frac{4}{45})$$

$$\frac{10 \cdot 9 \cdot 4}{3 \cdot 8 \cdot 45} = \frac{10 \cdot 3}{2 \cdot 45} = \frac{30}{90} = \frac{1}{3}$$

$$10) (2\frac{2}{5})(1\frac{1}{6})(1\frac{3}{7}) = (\frac{12}{5})(\frac{7}{6})(\frac{10}{7})$$

$$\frac{12 \cdot 7 \cdot 10}{5 \cdot 6 \cdot 7} = \frac{22}{1} = 22$$

$$11) (1\frac{1}{8}) \div 12 = (\frac{9}{8}) \div (\frac{12}{1})$$

$$= \frac{9}{8} \cdot \frac{1}{12} = \frac{3 \cdot 1}{8 \cdot 4} = \frac{3}{32}$$

$$12) (12\frac{4}{5})(1\frac{9}{16}) = (\frac{64}{5})(\frac{25}{16})$$

$$\frac{64 \cdot 25}{5 \cdot 16} = \frac{4 \cdot 5}{1 \cdot 1} = 20$$

$$13) 42 \div 1\frac{1}{6} = (\frac{42}{1}) \div (\frac{7}{6})$$

$$\frac{42 \cdot 6}{1 \cdot 7} = \frac{6 \cdot 6}{1 \cdot 1} = 36$$

$$14) 42 \div 1\frac{1}{2} = (\frac{42}{1}) \div (\frac{3}{2})$$

$$\frac{42 \cdot 2}{1 \cdot 3} = \frac{14 \cdot 2}{1 \cdot 1} = 28 = 28$$

$$15) 8\frac{1}{2} \div \frac{5}{8} = (\frac{17}{2}) \div (\frac{5}{8})$$

$$\frac{17}{2} \times \frac{8}{5} = \frac{68}{5} = 13\frac{3}{5}$$

$$16) (6\frac{1}{2}) \div (2\frac{1}{2}) = (\frac{13}{2}) \div (\frac{5}{2})$$

$$\frac{13}{2} \cdot \frac{2}{5} = \frac{13}{5} = 2\frac{3}{5}$$

CH 0.3-1] Adding Signed Numbers

[1]

$$1) 7 + 6 = (+7) + (+6) \\ = \boxed{13}$$

$$2) -5 + (-9) \\ = -(5+9) = \boxed{-14}$$

[2]

$$1) 8 + 9 = (+8) + (+9) \\ = \boxed{17}$$

$$2) -10 + (-7) = (-10) + (-7) \\ = -(10+7) = \boxed{-17}$$

$$3) 12 + (-15) = (+12) + (-15) \\ = -(15-12) = \boxed{-3}$$

$$4) 35 + (-17) = (+35) + (-17) \\ = +(35-17) = \boxed{18}$$

$$3) 34 + (-18) = (+34) + (-18) \\ = +(34-18) = \boxed{16}$$

$$4) 46 + (-37) = (+46) + (-37) \\ = +(46-37) = \boxed{9}$$

$$5) -16 + (-28) = (-16) + (-28) \\ = -(16+28) = \boxed{-44}$$

$$6) (-5) + (-98) \\ = -(5+98) \\ = \boxed{-103}$$

$$5) -38 + (-47) \\ = -(38+47) \\ = \boxed{-85}$$

$$6) (-67) + (-82) \\ = -(67+82) \\ = \boxed{-149}$$

$$7) -89 + 575 = (-89) + (+575) \\ = +(575-89) \\ = \boxed{486}$$

$$8) -568 + 893 \\ = (-568) + (+893) \\ = +(893-568) \\ = +(325) = \boxed{325}$$

$$7) -572 + (-89) \\ = -(572+89) \\ = \boxed{-661}$$

$$8) -893 + (-568) \\ = -(893+568) \\ = \boxed{-1461}$$

$$9) 85 + (-62) = (+85) + (-62) \\ = +(85-62) \\ = \boxed{23}$$

$$10) -42 + 700 = (-42) + (+700) \\ = +(700-42) \\ = \boxed{658}$$

$$9) -62 + (-85) \\ = -(62+85) \\ = \boxed{-147}$$

$$10) -700 + (-42) \\ = -(700+42) \\ = \boxed{-742}$$

$$11) -25 + (-863) \\ = -(25+863) \\ = \boxed{-888}$$

$$12) 572 + (-871) \\ = -(871-572) \\ = \boxed{-299}$$

$$11) -863 + 25 \\ = -(863-25) \\ = \boxed{-838}$$

$$12) -871 + (-572) \\ = -(871+572) \\ = \boxed{-1443}$$

$$13) 3 + [(-9) + 6] \\ = +3 + [-(9-6)] \\ = +3 + [-3] \\ = \boxed{0}$$

$$14) [-2 + 8] + (-3) \\ = [8-2] + (-3) \\ = +(6) + (-3) \\ = +(6-3) = \boxed{3}$$

$$13) [3 + (-9)] + 6 \\ = [-(9-3)] + 6 \\ = -6 + 6 = \boxed{0}$$

$$14) -2 + [8 + (-3)] \\ = -2 + [5] \\ = -2 + 5 = \boxed{3}$$

$$15) -18 + [(-5) + (-23)] \\ = -18 + [-(5+23)] \\ = -18 + [-28] \\ = -(18+28) \\ = \boxed{-46}$$

$$16) [17 + (-32)] + (-16) \\ = -(32-17) + (-16) \\ = -15 + (-16) \\ = -(15+16) \\ = \boxed{-31}$$

$$15) [(-18) + (-5)] + (-23) \\ = -(18+5) + (-23) \\ = -23 + (-23) \\ = \boxed{-46}$$

$$16) 17 + [(-32) + (-16)] \\ = 17 + [-(32+16)] \\ = 17 + [-48] \\ = -(48-17) \\ = \boxed{-31}$$

[3]

1) $-19 + (-18)$

$-(19+18)$

$\boxed{-37}$

2) $-18 + (-87)$

$-(18+87)$

$-(105) = \boxed{-105}$

[4]

1) $-44 + (-18)$

$-(44+18)$

$\boxed{-62}$

2) $-36 + (-37)$

$-(36+37)$

$\boxed{-73}$

3) $-26 + 112 = (-26) + (+112)$

$+ (112 - 26)$

$+ (86) = \boxed{+86}$

4) $-357 + 82 = (-357) + (+82)$

$-(357-82)$

$\boxed{-275}$

3) $39 + (-47) = (+39) + (-47)$

$-(47-39)$

$\boxed{-8}$

4) $67 + (-82) = (+67) + (-82)$

$-(82-67)$

$\boxed{-15}$

5) $-74 + (-59)$

$-(74+59)$

$\boxed{-133}$

6) $39 + (-47) = (+39) + (-47)$

$-(47-39)$

$\boxed{-8}$

5) $(-47) + 47 = (-47) + (+47)$

$-(47-47)$

$\boxed{0}$

6) $-47 + (-56)$

$-(56+47)$

$\boxed{-103}$

7) $87 + (-356) = (+87) + (-356)$

$-(356-87)$

$\boxed{-269}$

8) $-563 + (-88)$

$-(563+88)$

$\boxed{-651}$

7) $-87 + (-356)$

$-(356+87)$

$\boxed{-443}$

8) $653 + (-88) = (+653) + (-88)$

$+ (653-88)$

$\boxed{+565}$

9) $98 + (-89) = (+98) + (-89)$

$+ (98-89) = \boxed{9}$

10) $(-58) + (97) = (-58) + (+97)$

$+ (97-58) = \boxed{39}$

9) $-98 + (-89)$

$-(98+89)$

$\boxed{-187}$

10) $(-58) + (-97)$

$-(58+97)$

$\boxed{-155}$

11) $-362 + 259 = (-362) + (+259)$

$-(362-259)$

$\boxed{-103}$

12) $-82 + 900 = (-82) + (+900)$

$+ (900-82)$

$\boxed{818}$

11) $-362 + (-259)$

$-(362+259)$

$\boxed{-621}$

12) $-82 + (-900)$

$-(900+82)$

$\boxed{-982}$

13) $[2 + (-8)] + 5$

$[-6] + 5$

$-(6-5) = \boxed{-1}$

14) $-3 + [9 + (-5)]$

$-3 + [4]$

$4-3 = \boxed{1}$

13) $[-2 + (-8)] + 5$

$[-(8+2)] + 5$

$[-10] + 5$

$-(10-5) = \boxed{-5}$

14) $-3 + [(-9) + (-5)]$

$-3 + [-(9+5)]$

$-3 + [-14]$

$-(3+14) = \boxed{-17}$

15) $-23 + [(-10) + (-41)]$

$-23 + [-51]$

$-(23+51)$

$\boxed{-74}$

16) $[48 + (-47)] + (-22)$

$[1] + (-22)$

$-(22-1)$

$\boxed{-21}$

15) $[(-23) + (-10)] + (-41)$

$-(23+10) + (-41)$

$-33 + (-41)$

$-(33+41) = \boxed{-74}$

16) $48 + [(-47) + (-22)]$

$48 + [-(47+22)]$

$48 + (-69)$

$-(69-48) = \boxed{-21}$

CH 0.3-2] Subtracting Signed Numbers

1) $9 - 15$
 $+9 + (-15)$
 $-(15-9) = \boxed{-6}$

2) $16 - (-7)$
 $(+16) + (+7)$
 $= \boxed{23}$

3) $-20 - (-7)$
 $-20 + (+7)$
 $-(20-7) = \boxed{-13}$

4) $-28 - 16$
 $-28 + (-16)$
 $-(28+16) = \boxed{-44}$

5) $59 - 73$
 $59 + (-73)$
 $-(73-59) = \boxed{-14}$

6) $314 - (-88)$
 $314 + (+88)$
 $= \boxed{402}$

7) $-592 - (-346)$
 $-592 + 346$
 $-(592-346) = \boxed{-246}$

8) $670 - 830$
 $670 + (-830)$
 $-(830-670) = \boxed{-160}$

9) $-25 - (-7)$
 $-25 + (+7)$
 $-(25-7) = \boxed{-18}$

10) $-146 - 146$
 $-146 + (-146)$
 $-(146+146) = \boxed{-292}$

11) $-146 - (-146)$
 $-146 + 146$
 $(146-146) = \boxed{0}$

12) $-8 - [12 - (-7)]$
 $-8 - [12 + 7]$
 $-8 - 19$
 $-8 + (-19) = \boxed{-27}$

13) $[35 - (-27)] - (-19)$
 $[35 + 27] + (+19)$
 $(62) + (19) = \boxed{81}$

14) Subtract 86 from 78
 $78 - 86$
 $= 78 + (-86)$
 $= -(86-78) = \boxed{-8}$

15) Subtract 25 from -37
 $(-37) - (+25)$
 $-37 + (-25) = \boxed{-62}$

16) Subtract -16 from -18
 $(-18) - (-16)$
 $(-18) + (+16) = \boxed{-2}$

17) Subtract -86 from 78
 $(+78) - (-86)$
 $(+78) + (+86)$
 $+ (78+86)$
 $\boxed{+164}$

18) Subtract -5 from -3
 $(-3) - (-5)$
 $(-3) + (+5)$
 $= + (5-3) = \boxed{+2}$

[2]

1) $18 - 25$
 $18 + (-25)$
 $-(25-18)$
 $-(7) = \boxed{-7}$

2) $27 - (-13)$
 $27 + (+13)$
 $= \boxed{40}$

3) $-10 - (-3)$
 $-10 + (+3)$
 $-(10-3) = \boxed{-7}$

4) $24 - (-13)$
 $24 + (+13)$
 $24 + 13$
 $\boxed{37}$

5) $47 - 62$
 $47 + (-62)$
 $-(62-47)$
 $\boxed{-15}$

6) $82 - (-98)$
 $82 + (+98)$
 $\boxed{180}$

7) $-258 - 368$
 $-258 + (-368)$
 $-(258+368)$
 $-(626) = \boxed{-626}$

8) $-468 - 562$
 $-468 + (-562)$
 $-(468+562)$
 $-(1030) = \boxed{-1030}$

9) $25 - (-7)$
 $25 + (+7)$
 $=(25+7) = \boxed{32}$

10) $146 - (-146)$
 $+146 + (+146)$
 $(146+146)$
 $(292) = \boxed{292}$

11) $[-8 - 12] - (-7)$
 $[-8 + 12] + (+7)$
 $[-20] + (+7)$
 $-(20-7) = \boxed{-13}$

12) $0 - 57$
 $0 + (-57)$
 $\boxed{-57}$

13) $35 - [-27 - (-19)]$
 $35 - [-27 + 19]$
 $35 - [-8]$
 $35 + (+8) = \boxed{43}$

14) Subtract 78 from -86
 $-86 - 78$
 $-86 + (-78)$
 $-(86+78) = \boxed{-164}$

15) Subtract 37 from -25
 $-25 - 37$
 $-25 + (-37)$
 $-(25+37) = \boxed{-62}$

16) Subtract -5 from 3
 $3 - (-5)$
 $(+3) + (+5) = +(3+5) = \boxed{+8}$

17) Subtract -78 from -86
 $-86 - (-78)$
 $-86 + (+78)$
 $-(86-78) = \boxed{-8}$

18) Subtract 5 from -3
 $(-3) - (+5)$
 $(-3) + (-5)$
 $= -(3+5) = \boxed{-8}$

Rules of Adding Signed Numbers



- ① Take sign of bigger absolute value
 ② Same sign → Add them
 Different sign → subtract them

[3] 1) $4 - 10$
 $= +4 + (-10)$
 $= -(10 - 4) = \boxed{-6}$

2) $8 - (-2)$
 $= +8 + (+2)$
 $= +(8 + 2) = \boxed{+10}$

1) $5 - 12$
 $= +5 + (-12)$
 $= -(12 - 5) = \boxed{-7}$

2) $10 - (-3)$
 $= +10 + (+3)$
 $= (10 + 3) = \boxed{13}$

3) $-10 - (-4)$
 $-10 + (+4)$
 $= -(10 - 4) = \boxed{-6}$

4) $-15 - 11$
 $-15 + (-11)$
 $= -(15 + 11) = \boxed{-26}$

3) $-12 - (-5)$
 $-12 + (+5)$
 $= -(12 - 5) = \boxed{-7}$

4) $-24 - 13$
 $-24 + (-13)$
 $= -(24 + 13) = \boxed{-37}$

5) $86 - 96$
 $+86 + (-96)$
 $= -(96 - 86) = -(10)$
 $= \boxed{-10}$

6) $156 - (-97)$
 $+156 + (+97)$
 $= +(156 + 97)$
 $= \boxed{+253}$

5) $72 - 89$
 $+72 + (-89)$
 $= -(89 - 72) = -(17)$
 $= \boxed{-17}$

6) $284 - (-89)$
 $+284 + (+89)$
 $= (284 + 89)$
 $= \boxed{373}$

7) $-354 - (-286)$
 $-354 + (+286)$
 $= -(354 - 286) = \boxed{-68}$

8) $780 - 840$
 $+780 + (-840)$
 $= -(840 - 780) = \boxed{-60}$

7) $-484 - (-375)$
 $-484 + (+375)$
 $= -(484 - 375)$
 $= \boxed{-109}$

8) $597 - 700$
 $+597 + (-700)$
 $= -(700 - 597)$
 $= \boxed{-103}$

9) $9 - 17$
 $+9 + (-17) = -(17 - 9)$
 $= \boxed{-8}$

10) $-8 - (-15)$
 $-8 + (+15)$
 $= +(15 - 8) = \boxed{7}$

9) $-15 - (-8)$
 $-15 + (+8)$
 $= -(15 - 8) = \boxed{-7}$

10) $17 - 9$
 $17 - 9 = \boxed{8}$

11) $-356 - (-356)$
 $-356 + (+356)$
 $= (356 - 356) = \boxed{0}$

12) $-5 - [6 - (-2)]$
 $-5 - [6 + (+2)]$
 $= -5 - [8] = -5 + -8$
 $= -(5 + 8) = \boxed{-13}$

11) $-356 - 356$
 $-356 + (-356)$
 $= -(356 + 356)$
 $= \boxed{-712}$

12) a. $0 - 42$ b. $23 - [-14 - (-17)]$
 a. $0 - 42 = 0 + (-42)$
 $= -(42 - 0) = \boxed{-42}$
 b. $23 - [-14 + (+17)]$
 $= 23 - [(17 - 14)]$
 $= 23 - [3] = \boxed{20}$

13) $[23 - (-14)] - (-17)$
 $[23 + (+14)] + (+17)$
 $= +[37] + (+17)$
 $= +(37 + 17) = \boxed{54}$

14) Subtract 91 from 82
 $(+82) - (+91)$
 $= -(91 - 82) = \boxed{-9}$

13) $[-5 - 6] - (-2)$
 $[-5 + (-6)] + (+2)$
 $=[-(6 + 5)] + (+2)$
 $[-11] + 2 = -(11 - 2)$
 $= \boxed{-9}$

14) Subtract 91 from -82
 $(-82) - (+91)$
 $= -82 + (-91)$
 $= -(82 + 91)$
 $= \boxed{-173}$

15) Subtract -91 from 82
 $+82 - (-91)$
 $= +82 + (+91) = \boxed{173}$

16) Subtract -18 from -6
 $-6 - (-18)$
 $= -6 + (+18) = +(18 - 6)$
 $= \boxed{12}$

15) Subtract -91 from -82
 $-82 - (-91)$
 $= -82 + (+91)$
 $= +(91 - 82)$
 $= \boxed{+9}$

16) Subtract 6 from -18
 $-18 - (+6)$
 $= -18 + (-6)$
 $= -(18 + 6)$
 $= \boxed{-24}$

17) Subtract 16 from -8
 $-8 - 16 = -8 + (-16)$
 $= -(8 + 16) = \boxed{-24}$

18) Subtract -5 from -3
 $-3 - (-5)$
 $-3 + (+5)$
 $= +(5 - 3) = \boxed{+2}$

17) Subtract -6 from 8
 $+8 - (-6)$
 $= 8 + (+6) = +(8 + 6)$
 $= \boxed{+14}$

18) Subtract -3 from -5
 $-5 - (-3)$
 $= -5 + (+3)$
 $= -(5 - 3) = \boxed{-2}$

CH 0.4-1 | Multiplication of Signed Numbers

[1] 1) $8(-4)$
 $= -(8 \cdot 4) = \boxed{-32}$

2) $(-7)(9)$
 $= -(7 \cdot 9) = \boxed{-63}$

3) $(-10)(-10)$
 $--(10 \cdot 10)$
 $= \boxed{+100}$

4) $(-9)(-9)$
 $--(9 \cdot 9) = \boxed{+81}$

5) $0(-12)$
 $-(0 \cdot 12) = -0$
 $= \boxed{0}$

6) $8[(-7)(-1)]$
 $--(8 \cdot 7 \cdot 1) = \boxed{+56}$

7) $-2(3)(-4)$
 $--(2 \cdot 3 \cdot 4)$
 $\boxed{+24}$

8) $-7(-2)(-5)$
 $---(7 \cdot 2 \cdot 5)$
 $\boxed{-70}$

9) $2(-3)(-3)(-2)$
 $---(2 \cdot 3 \cdot 3 \cdot 2)$
 $\boxed{-36}$

10) $3(-4)(2)(-5)$
 $---(3 \cdot 4 \cdot 2 \cdot 5)$
 $\boxed{+120}$

11) $(-15)(-35)$
 $--(15 \cdot 35)$
 $\boxed{+525}$

12) $9(-11)(-10)$
 $--(9 \cdot 11 \cdot 10)$
 $\boxed{+990}$

13) $(-7)[8+(-3)]$
 $-7[5]$
 $\boxed{-35}$

14) $(-9)[(-6)+(-15)]$
 $-9[-(6+15)]$
 $-9[-21]$
 $--189 = \boxed{+189}$

15) Evaluate $6b$ if $b = -5$
 $6(-5) = \boxed{-30}$

16) Evaluate $-6b$ if $b = -4$
 $-6(-4) = --(6 \cdot 4)$
 $= \boxed{+24}$

17) Evaluate $6x$ if $x = -8$
 $6(-8) = \boxed{-48}$

18) Evaluate $-6x$ if $x = -8$
 $-6(-8) = --(6 \cdot 8)$
 $= \boxed{+48}$

[2]

1) $9(-5)$
 $= -(9 \cdot 5) = \boxed{-45}$

2) $(-6)(9)$
 $= -(6 \cdot 9) = \boxed{-54}$

3) $(-10)(-8)$
 $--(10 \cdot 8)$
 $= \boxed{+80}$

4) $(-9)(-7)$
 $--(9 \cdot 7) = \boxed{+63}$

5) (-12)
 $-(1 \cdot 12)$
 $= \boxed{-12}$

6) $8(-7)(-1)$
 $--(8 \cdot 7 \cdot 1) = \boxed{+56}$

7) $3(-5)(6)$
 $-(3 \cdot 5 \cdot 6)$
 $= \boxed{-90}$

8) $-2(15)(-5)$
 $--(2 \cdot 15 \cdot 5)$
 $= \boxed{+150}$

9) $3(-2)(-2)(-5)$
 $---(3 \cdot 2 \cdot 2 \cdot 5)$
 $\boxed{-60}$

10) $5(-4)(-3)(2)$
 $---(5 \cdot 4 \cdot 3 \cdot 2)$
 $\boxed{+120}$

11) $-8[9+(-7)]$
 $-8[2]$
 $\boxed{-16}$

12) $-6[(-7)+(-12)]$
 $-6[-(7+12)]$
 $-6[-(19)]$
 $--114 = \boxed{+114}$

13) $(-7)(8)+(-7)(-3)$
 $-(7 \cdot 8) + --(7 \cdot 3)$
 $-56 + 21$
 $= -(56-21) = \boxed{-35}$

14) $-9(-6)+(-9)(-15)$
 $--(54) + --(135)$
 $54 + 135$
 $= \boxed{+189}$

15) Evaluate $8y$ if $y = -3$
 $8(-3) = \boxed{-24}$

16) Evaluate $-8y$ if $y = -5$
 $-8(-5)$
 $= --(8 \cdot 5)$
 $= \boxed{+40}$

17) Evaluate $-12w$ if $w = -7$ 18) Evaluate $12w$ if $w = -3$
 $-12(-7) = --(12 \cdot 7)$ $12(-3) = \boxed{-36}$
 $= \boxed{+84}$

ICH 0.4-2 | Division of Signed Number

[1] 1) $-40 \div 8$

$$-\frac{40}{8} = \boxed{-5}$$

2) $16 \div (-4)$

$$\frac{16}{-4} = \boxed{-4}$$

3) $-15 \div -5$

$$\frac{-15}{-5} = \boxed{3}$$

4) $\frac{12}{-4} = \boxed{-3}$

5) $\frac{-18}{-2} = \boxed{9}$

6) $\frac{-150}{10} = \boxed{-15}$

7) $-18 \div -3 = \boxed{6}$

8) $-5 \div 35 = \boxed{-\frac{1}{7}}$
 $\frac{-5}{35} = \boxed{-\frac{1}{7}}$

9) $84 \div -4 = \boxed{-21}$

10) $[48 \div (-6)] \div (-2)$
 $[-8] \div -2$
 $\frac{-8}{-2} = \boxed{4}$

11) $[(-24) \div 6] \div (-2)$

$$[-4] \div -2$$

$$\frac{-4}{-2} = \boxed{2}$$

12) Evaluate $\frac{x}{6}$ if $x = -12$

$$\frac{-12}{6} = \boxed{-2}$$

13) Evaluate $\frac{a}{-7}$ if $a = -21$

$$\frac{-21}{-7} = \boxed{3}$$

14) $\frac{10 - (-6)}{-2 - 4} = \frac{10 + 6}{-2 + (-4)}$

$$= \frac{16}{-6} = \frac{2 \cdot 8}{-2 \cdot 3} = \boxed{-\frac{8}{3}}$$

or $\boxed{-2\frac{2}{3}}$

15) $\frac{-10 + 4}{-1 - (-4)}$

$$= \frac{-10 + 4}{-1 + (+4)} = \frac{-(10-4)}{+(4-1)} = \frac{-6}{3} = \boxed{-2}$$

16) $\frac{5 - 3(4)}{-2 - 5} = \frac{5 - 12}{-(2+5)}$

$$= \frac{-(12-5)}{-(5+2)} = \frac{-7}{-7} = \boxed{1}$$

[2] 1) $-60 \div (10)$

$$\frac{-60}{10} = \boxed{-6}$$

2) $25 \div (-5)$

$$\frac{25}{-5} = \boxed{-5}$$

3) $-27 \div -9$

$$\frac{-27}{-9} = \boxed{3}$$

4) $\frac{24}{-6} = \boxed{-4}$

5) $\frac{-49}{-7} = \boxed{7}$

6) $\frac{-250}{100} = -\frac{25}{10}$
 $= \frac{-5 \cdot 5}{5 \cdot 2} = \boxed{-\frac{5}{2}} = \boxed{-2\frac{1}{2}}$

7) $-3 \div -81$

$$\frac{-3}{-81} = \frac{3 \cdot 1}{3 \cdot 27} = \boxed{\frac{1}{27}}$$

8) $\frac{35}{-5} = \boxed{-7}$

9) $-4 \div 84$

$$\frac{-4}{84} = \frac{-4 \cdot 1}{4 \cdot 21} = \boxed{-\frac{1}{21}}$$

10) $48 \div [-6 \div -2]$

$$48 \div [3] = \boxed{16}$$

11) $-24 \div [6 \div -2]$

$$-24 \div [-3]$$

$$\frac{-24}{-3} = \boxed{8}$$

12) Evaluate $\frac{y}{12}$ if $y = -48$

$$\frac{-48}{12} = \frac{-12 \cdot 4}{12 \cdot 1} = \boxed{-4}$$

13) Evaluate $\frac{b}{-15}$ if $b = -45$

$$\frac{-45}{-15} = \frac{15 \cdot 3}{15 \cdot 1} = \frac{3}{1} = \boxed{3}$$

14) $\frac{5 - (-4)}{-2 - 1}$

$$\frac{5 + (+4)}{-(2+1)} = \frac{9}{-3} = \boxed{-3}$$

15) $\frac{-8 + 2}{-10 - 2} = \frac{-(8-2)}{-(10+2)}$

$$= \frac{-6}{-12} = \boxed{\frac{1}{2}}$$

16) $\frac{7 - 3(5)}{-3 - (-7)} = \frac{7 - 15}{-3 + 7}$

$$= \frac{-8}{+(7-3)} = \frac{-8}{4} = \boxed{-2}$$

[CH 0.4-3] Combined Operation

[1] 1) $1 - 9 - 18$

$-8 - 18 = \boxed{-26}$

2) $1 - (9 - 18)$

$1 - (-9)$
 $1 + 9 = \boxed{10}$

3) $-72 \div (-9) \div 3$

$\frac{-72}{-9} \div 3$
 $8 \div 3 = \boxed{\frac{8}{3}}$ or $\boxed{\frac{2\frac{2}{3}}$

4) $-72 \div [(-9) \div 3]$

$-72 \div [-3]$
 $\frac{-72}{-3} = \boxed{24}$

5) $17 + 3(-8)$

$17 + -24 = \boxed{-7}$

6) $-15 \div 3(-5)$

$(\frac{-15}{3})(-5)$
 $(-5)(-5) = \boxed{25}$

7) $-15 \div 3 \times (-5)$

$-5 \times (-5) = \boxed{25}$

8) $-13 - 5(-1)$

$-13 - (-5)$
 $-13 + 5 = \boxed{-8}$

9) $-3 \cdot 8^2$

$-3(64) = \boxed{-192}$

10) $(-3 \cdot 8)^2$

$-(24)^2$
 $\boxed{-576}$ $\frac{24}{\times 24}$
 576

11) $(-3 \cdot 8)^2$

$(-24)^2 = \boxed{576}$

12) $8(-3)^2$

$8(9) = \boxed{72}$

13) $\frac{-9+3}{-1-(-7)} = \frac{-6}{-1+7}$

$= \frac{-6}{6} = \boxed{-1}$

14) $\frac{3-2 \cdot 4}{-1-4} = \frac{3-8}{-5}$

$\frac{-5}{-5} = \boxed{1}$

15) Evaluate $4 - 2x^2$ if $x = 2$ · 16) Evaluate $5 + a^2$ if $a = -9$

$4 - 2(2)^2$
 $4 - 2(4)$
 $4 - 8 = \boxed{-4}$

$5 + (-9)^2$
 $5 + 81 = \boxed{86}$

17) Evaluate $2x^2 - 3x + 4$ find $f(3)$

$2(3)^2 - 3(3) + 4 = 2 \cdot 9 - 9 + 4 = 18 - 9 + 4$
 $= 9 + 4 = \boxed{13}$

18) Evaluate $2x^2 - 3x + 4$ find $f(-3)$

$2(-3)^2 - 3(-3) + 4 = 2 \cdot 9 - (-9) + 4 = 18 + 9 + 4$
 $= 27 + 4 = \boxed{31}$ 14

[2]

1) $2 - 25 - 36$

$-23 - 36$

$\boxed{-59}$

2) $2 - (25 - 36)$

$2 - (-11)$

$2 + 11 = \boxed{13}$

3) $-48 \div (-16) \div 2$

$(\frac{-48}{-16}) \div 2$

$3 \div 2 = \boxed{\frac{3}{2}}$ or $\boxed{1\frac{1}{2}}$

4) $-48 \div [(-16) \div 2]$

$-48 \div [-8]$

$= \frac{-48}{-8} = \boxed{6}$

5) $19 + 4(-6)$

$19 + (-24)$

$\boxed{-5}$

6) $-24 \div 6(-4)$

$(\frac{-24}{6})(-4)$

$(-4)(-4) = \boxed{16}$

7) $38 - 8(7)$

$38 - 56$

$38 + (-56) = \boxed{-18}$

8) $-21 - 6(-2)$

$-21 - (-12)$

$-21 + 12 = \boxed{-9}$

9) $-8 \cdot 2^2$

$-8 \cdot 4 = \boxed{-32}$

10) $(-8 \cdot 2)^2$

$-(16)^2 = \boxed{-256}$

11) $-8 + 2^2$

$-8 + 4 = \boxed{-4}$

12) $2(-4)^3$

$2(-64) = \boxed{-128}$

13) $\frac{9-(-7)}{-2-2} = \frac{9+7}{-4}$

$= \frac{16}{-4} = \boxed{-4}$

14) $\frac{8-3 \cdot 5}{-2-5} = \frac{8-15}{-7}$

$= \frac{-7}{-7} = \boxed{1}$

15) Evaluate $6 - 4b^2$ if $b = -3$ 16) Evaluate $8 + c^2$ if $c = -11$

$6 - 4(-3)^2 = 6 - 4(9)$
 $= 6 - 36 = \boxed{-30}$

$8 + (-11)^2 = 8 + 121$
 $= \boxed{129}$

17) Evaluate $5x^2 - 4x - 3$ find $f(4)$

$5(4)^2 - 4(4) - 3 = 5 \cdot 16 - 16 - 3 = 80 - 16 - 3$
 $= \boxed{61}$

18) Evaluate $5x^2 - 4x - 3$ find $f(-2)$

$5(-2)^2 - 4(-2) - 3 = 5 \cdot 4 - (-8) - 3$
 $= 20 + 8 - 3 = \boxed{25}$

[3]
1) $3 - 7 - 26$
 $\checkmark -4 - 26 = \boxed{-30}$

2) $3 - (7 - 26)$
 $3 - (-19)$
 $3 + 19 = \boxed{22}$

[4]
1) $5 - 14 - 29$
 $-9 - 29 = \boxed{-38}$

2) $5 - (14 - 29)$
 $5 - (-15)$
 $5 + 15 = \boxed{20}$

3) $-56 \div -8 \div 2$
 $\checkmark 7 \div 2 = \frac{7}{2}$ or $3\frac{1}{2}$

4) $-56 \div [-8 \div 2]$
 $-56 \div [-4]$
 $\boxed{14}$

3) $-88 \div 44 \div 2$
 $\checkmark -2 \div 2 = \boxed{-1}$

4) $-88 \div [44 \div 2]$
 $-88 \div 22 = \boxed{-4}$

5) $-81 \div (-27)(-3)$
 $\left(\frac{-81}{-27}\right)(-3)$
 $(3)(-3) = \boxed{-9}$

6) $23 + 5(-7)$
 $23 + (-35)$
 $\boxed{-12}$

5) $-81 \div [-27(3)]$
 $-81 \div [-81]$
 $\frac{-81}{-81} = \boxed{1}$

6) $16 + 6(-9)$
 $16 + (-54) = \boxed{-38}$

7) $-35 \div 7(-5)$
 $-35 \div 7 \cdot (-5)$
 $\checkmark -5 \cdot (-5) = \boxed{25}$

8) $-17 - 6(-2)$
 $-17 - (-12)$
 $-17 + 12 = \boxed{-5}$

7) $-36 \div 4(-9)$
 $-36 \div 4 \cdot (-9)$
 $-9 \cdot (-9) = \boxed{81}$

8) $-31 - 5(-3)$
 $-31 - (-15)$
 $-31 + 15 = \boxed{-16}$

9) $-3 \cdot 5^2$
 $-3 \cdot 25 = \boxed{-75}$

10) $(-3 \cdot 5)^2$
 $(-15)^2 = \boxed{225}$

9) $-2 \cdot 6^2$
 $-2 \cdot 36 = \boxed{-72}$

10) $(-2 \cdot 6)^2$
 $(-12)^2 = \boxed{144}$

11) $-3 + 5^2$
 $-3 + 25 = \boxed{22}$

12) $8(-2)^3$
 $8 \cdot (-8) = \boxed{-64}$

11) $-2 + 6^2$
 $-2 + 36 = \boxed{34}$

12) $5(-3)^3$
 $5(-27) = \boxed{-135}$

13) $\frac{10 - (-5)}{-2 - 3} = \frac{10 + 5}{-5}$
 $= \frac{15}{-5} = \boxed{-3}$

14) $\frac{8 - 3 \cdot 6}{-2 - 8} = \frac{8 - 18}{-10}$
 $= \frac{-10}{-10} = \boxed{1}$

13) $\frac{15 - (-6)}{-4 - 3} = \frac{15 + 6}{-7}$
 $= \frac{21}{-7} = \boxed{-3}$

14) $\frac{8 - 4 \cdot 7}{-3 - 7} = \frac{8 - 28}{-10}$
 $= \frac{-20}{-10} = \boxed{2}$

15) Evaluate $5 - 8x^2$ if $x = -5$
 $5 - 8(-5)^2$
 $5 - 8(25)$
 $5 - 200 = \boxed{-195}$

16) Evaluate $6 + c^2$ if $c = -13$
 $6 + (-13)^2$
 $6 + 169 = \boxed{175}$

15) Evaluate $5 + 8x^2$ if $x = -5$ 16) Evaluate $4 + d^2$ if $d = -1$

$5 + 8(-5)^2$
 $5 + 8(25)$
 $5 + 200 = \boxed{205}$

$4 + (-1)^2$
 $4 + 1$
 $\boxed{5}$

17) Evaluate $2x^2 - 3x - 4$ find $f(5)$
 $2(5)^2 - 3(5) - 4$
 $2(25) - 15 - 4$
 $50 - 15 - 4 = \boxed{31}$

17) Evaluate $-2x^2 - 3x - 4$ find $f(4)$
 $-2(4)^2 - 3(4) - 4$
 $-2(16) - 12 - 4$
 $-32 - 12 - 4 = -44 - 4 = \boxed{-48}$

18) Evaluate $2x^2 - 3x - 4$ find $f(-5)$
 $2(-5)^2 - 3(-5) - 4$
 $2(25) - (-15) - 4$
 $\rightarrow 50 + 15 - 4$
 $65 - 4 = \boxed{61}$

18) Evaluate $-2x^2 - 3x - 4$ find $f(-2)$
 $-2(-2)^2 - 3(-2) - 4$
 $-2(4) - (-6) - 4$
 $\rightarrow -8 + 6 - 4$
 $-2 - 4 = \boxed{-6}$

[CH0.5] Order of Operations

[1]

1) $15 + 3 \cdot 2$

$15 + 6 = \boxed{21}$

[2]

1) $(3 + 5^2) \div 2 \cdot 3^2$

$(3 + 25) \div 2 \cdot 9$

$(28) \div 2 \cdot 9$

$14 \cdot 9 = \boxed{126}$

2) $28 \div 7 \cdot 2 + 3$

$4 \cdot 2 + 3$

$8 + 3 = \boxed{11}$

2) $(13 + 6^2) \div 7 \cdot 4^2$

$(13 + 36) \div 7 \cdot 16$

$(49) \div 7 \cdot 16$

$7 \cdot 16 = \boxed{112}$

3) $100 \div 10 \cdot 5 + 4$

$10 \cdot 5 + 4$

$50 + 4 = \boxed{54}$

3) $6^2 - (10 - 8) + 2^3 + 5^2$

$6^2 - (2) + 2^3 + 5^2$

$36 - (2) + 8 + 25$

$34 + 8 + 25 = \boxed{67}$

4) $28 \div 4 - 3 \times 4$

$7 - 12$

$7 + (-12) = -(12 - 7) = \boxed{-5}$

4) $\frac{18 + 6}{2^4 - 2^2}$

$\frac{18 + 6}{16 - 4} = \frac{24}{12} = \boxed{2}$

5) $2 \times 5 + 2(7 - 2)$

$10 + 2(5)$

$10 + 10 = \boxed{20}$

5) $18 - 16 \div 8$

$18 - 2 = \boxed{16}$

6) $24 \div 4 \times 2 - 2(5 - 3)$

$6 \times 2 - 2(2)$

$12 - 4 = \boxed{8}$

6) $18 \div 2 \times 6 + 3(7 - 5)$

$18 \div 2 \times 6 + 3(2)$

$9 \times 6 + 6$

$54 + 6 = \boxed{60}$

7) $12 + 3\sqrt{64} - 7$

$12 + 3(8) - 7$

$12 + 24 - 7$

$36 - 7 = \boxed{29}$

7) $2\sqrt{100} - 2^2 \cdot 5$

$2(10) - 4 \cdot 5$

$20 - 20 = \boxed{0}$

[3]
 1) $2^3 \cdot 4 - (10 \div 5)$
 $8 \cdot 4 - 2$
 $= 32 - 2 = \boxed{30}$

2) $[40 - (8 - 2)] - 2^5$
 $[40 - 6] - 32$
 $= 34 - 32 = \boxed{2}$

3) $6 \cdot \sqrt{9} + 3\sqrt{4}$
 $6 \cdot 3 + 3 \cdot 2$
 $= 18 + 6 = \boxed{24}$

4) $7 \cdot \sqrt{36} - 0 \div \sqrt{64}$
 $7 \cdot 6 - 0 \div 8$
 $= 42 - 0 = \boxed{42}$

5) $(2+3) \cdot 6 - 2(10-2^3)$
 $5 \cdot 6 - 2(10-8)$
 $= 30 - 2(2)$
 $= 30 - 4 = \boxed{26}$

6) $24 \div (3 \cdot 2) - 2 \cdot (5-3)$
 $24 \div 6 - 2(2)$
 $= 4 - 4 = \boxed{0}$

7) $81 \div 3^2 \cdot (3^3 \div 3^3)$
 $81 \div 9 \cdot (27 \div 27)$
 $= 9 \cdot (1) = \boxed{9}$

8) $2(3^3 \div 9) - 3(5^0 - 3^0)$
 $2(27 \div 9) - 3(1 - 1)$
 $2(3) - 3(0)$
 $6 - 0 = \boxed{6}$

[4]
 1) $2 \cdot 3^2 + (2 \cdot 3)^2$
 $2 \cdot 9 + (6)^2$
 $= 18 + 36 = \boxed{54}$

2) $(2+3) \cdot (6-2)$
 $(5) \cdot (4) = \boxed{20}$

3) $24 \div (3 \cdot 2 + 2) \cdot 5$
 $24 \div (6+2) \cdot 5$
 $24 \div (8) \cdot 5$
 $3 \cdot 5 = \boxed{15}$

4) $24 \div 3 \cdot 2 + 2 \cdot 5$
 $8 \cdot 2 + 10$
 $16 + 10 = \boxed{26}$

5) $2 + 3 \cdot 6 - 2$
 $2 + 18 - 2 = \boxed{18}$

6) $24 \div 3 \cdot 2 \div 2$
 $8 \cdot 2 \div 2$
 $16 \div 2 = \boxed{8}$

7) $(10^2 \div 5^3)^2 - \sqrt{121} + 5$
 $(100 \div 125)^2 - 11 + 5$
 $(4)^2 - 11 + 5$
 $16 - 11 + 5 = \boxed{10}$

8) $2^0(5^0 - 3^0) - 3^0(2^0 - 1^0)$
 $1(1-1) - 1(1-1)$
 $1(0) - 1(0)$
 $0 - 0 = \boxed{0}$

[5]

1) $72 \div 2 \times 7$

$$\checkmark$$
$$36 \times 7 = \boxed{252}$$

2) $15 - 3^0$

$$15 - 1 = \boxed{14}$$

[6]

1) $81 \div 9 \times 3$

$$\checkmark$$
$$9 \times 3 = \boxed{27}$$

2) $34 - 7^0$

$$34 - 1 = \boxed{33}$$

3) $56 \div 4 \cdot 2(5)$

$$\checkmark$$
$$14 \cdot 2 \cdot 5$$
$$\checkmark$$
$$28 \cdot 5 = \boxed{140}$$

4) $3 \cdot 4^2 + 2 \cdot 3^2 + 14$

$$3 \cdot 16 + 2 \cdot 9 + 14$$
$$48 + 18 + 14$$
$$\boxed{80}$$

3) $108 \div 2^2 \cdot 3 + 4 \cdot 25$

$$108 \div 4 \cdot 3 + 100$$
$$27 \cdot 3 + 100$$
$$81 + 100 = \boxed{181}$$

4) $8 \cdot 4 + 30 \div 6$

$$32 + 5$$
$$\boxed{37}$$

5) $9^0 + 12^0 + 12 + 10^3$

$$1 + 1 + 12 + 1000$$
$$\boxed{1014}$$

6) $5^2 + 8 \cdot 0 + 7 \cdot 9$

$$25 + 0 + 63$$
$$\boxed{88}$$

5) $10^3 \sqrt{121} \cdot 2$

$$(1000)(11) \cdot 2$$
$$\boxed{22000}$$

6) $64 \div 4 \cdot 2(5)$

$$\checkmark$$
$$16 \cdot 2 \cdot 5$$
$$16 \cdot 10$$
$$\boxed{160}$$

7) $4 \cdot 10^2 + 3^2 \cdot 100$

$$4 \cdot 100 + 9 \cdot 100$$
$$400 + 900$$
$$\boxed{1300}$$

8) $10^2 \sqrt{81} \cdot 4$

$$100 \cdot 9 \cdot 4$$
$$900 \cdot 4$$
$$\boxed{3600}$$

7) $12 + 3\sqrt{64} - 7$

$$12 + 3 \cdot 8 - 7$$
$$12 + 24 - 7 = \boxed{29}$$

8) $4 \cdot 3 + 5^2 - 3 \cdot 2$

$$12 + 25 - 6$$
$$\boxed{31}$$

9) $5 \cdot 3 + 6^2 - 5 \cdot 8$

$$15 + 36 - 40$$
$$\checkmark$$
$$51 - 40$$
$$\boxed{11}$$

10) $144 \div 3^2 \cdot 2 + 6 \cdot 70$

$$144 \div 9 \cdot 2 + 420$$
$$\checkmark$$
$$16 \cdot 2 + 420$$
$$32 + 420$$
$$\boxed{452}$$

9) $7^0 + 8^1 + 8^0 + 10^2$

$$1 + 8 + 1 + 100$$
$$\boxed{110}$$

10) $8 \cdot 10^2 + 6^2 \cdot 10^3$

$$8 \cdot 100 + 36 \cdot 1000$$
$$800 + 36,000$$
$$\boxed{36800}$$

11) $5 + 2\sqrt{36} - 9$

$$5 + 2 \cdot 6 - 9$$
$$5 + 12 - 9$$
$$17 - 9$$
$$\boxed{8}$$

12) $7(8+9)$

$$7(17) = \boxed{119}$$

11) $4^3 + 7 \cdot 0 + 8 \cdot 7$

$$64 + 0 + 56$$
$$\boxed{120}$$

12) $7 \cdot 8 + 7 \cdot 9$

$$56 + 63$$
$$\boxed{119}$$

13) $8 \cdot 9 - 8 \cdot 7$

$$72 - 56$$
$$= \boxed{16}$$

14) $27 - 18 + 3$

$$\checkmark$$
$$9 + 3 = \boxed{12}$$

13) $8(9-7)$

$$8(2)$$
$$\boxed{16}$$

14) $11 - 3 + 2$

$$\checkmark$$
$$8 + 2$$
$$\boxed{10}$$

15) $\sqrt{13^2 - 12^2}$

$$\sqrt{169 - 144}$$
$$\sqrt{25} = \boxed{5}$$

16) $2[3(4-2) + 2(5)]$

$$2[3(2) + 10]$$
$$2[6 + 10]$$
$$2[16] = \boxed{32}$$

15) $\sqrt{6^2 + 8^2}$

$$\sqrt{36 + 64}$$
$$\sqrt{100} = \boxed{10}$$

16) $10 - \frac{10-7}{3} \cdot 2(5-2)$

$$10 - \frac{3}{3} \cdot 2(3)$$
$$10 - 1 \cdot 2 \cdot 3$$
$$10 - 6 = \boxed{4}$$

[7]

1) $36 \div 6 \div 2$

$$6 \div 2 = \boxed{3}$$

2) $17 - 8^0$

$$17 - 1 = \boxed{16}$$

[8]

1) $64 \div 16 \times 2$

$$4 \cdot 2 = \boxed{8}$$

2) $23 - 5^0$

$$23 - 1 = \boxed{22}$$

3) $10 \div 2 \times 5$

$$5 \times 5 = \boxed{25}$$

4) $3 \cdot 2^4$

$$3 \cdot (16) = \boxed{48}$$

3) $16 \div 4 \times 4$

$$4 \cdot 4 = \boxed{16}$$

4) $2 \cdot 3^3$

$$2 \cdot 27 = \boxed{54}$$

5) $10 \cdot 10^2 + 100$

$$10 \cdot 100 + 100$$

$$1000 + 100 = \boxed{1,100}$$

6) $4 \cdot 3 + 15 \div 5$

$$12 + 3 = \boxed{15}$$

5) $1 \times 10^3 + 1000$

$$1 \times 1000 + 1000$$

$$1000 + 1000$$

$$\boxed{2000}$$

6) $6 \cdot 4 + 20 \div 5$

$$24 + 4$$

$$\boxed{28}$$

7) $48 \div 4 \cdot 2(6)$

$$12 \cdot 2 \cdot 6$$

$$24 \cdot 6 = \boxed{144}$$

8) $2 \cdot 5^2 + 3 \cdot 2^2 + 4$

$$2 \cdot 25 + 3 \cdot 4 + 4$$

$$50 + 12 + 4$$

$$= \boxed{66}$$

7) $36 \div 6 \cdot 2(3)$

$$6 \cdot 2 \cdot 3 = \boxed{36}$$

8) $2 \cdot 5^2 + 3 \cdot 2^2 + 4$

$$2 \cdot 25 + 3 \cdot 4 + 4$$

$$50 + 12 + 4$$

$$\boxed{66}$$

9) $6^0 + 10^0 + 10 + 10^4$

$$1 + 1 + 10 + 10,000$$

$$= \boxed{10,012}$$

10) $9^3 + 9 \cdot 0 + 7 \cdot 8$

$$729 + 0 + 56$$

$$= \boxed{785}$$

9) $5^0 + 5^1 + 7^0 + 10^3$

$$1 + 5 + 1 + 1000$$

$$\boxed{1007}$$

10) $2^3 + 0 \cdot 6 + 8 \cdot 6$

$$8 + 0 + 48$$

$$\boxed{56}$$

11) $5 \cdot 10^2 + 4^2 \cdot 100$

$$5 \cdot 100 + 16 \cdot 100$$

$$500 + 1600$$

$$= \boxed{2100}$$

12) $10^2 \cdot \sqrt{16} \cdot 5$

$$100 \cdot 4 \cdot 5$$

$$400 \cdot 5$$

$$= \boxed{2000}$$

11) $10^3 \cdot \sqrt{25} \cdot 3$

$$1000 \cdot 5 \cdot 3$$

$$\boxed{15000}$$

12) $9 \cdot 10^3 + 5^2 \cdot 10^3$

$$9 \cdot 1000 + 25 \cdot 1000$$

$$9000 + 25000$$

$$\boxed{34000}$$

13) $2 \cdot 3 + 3^2 - 4 \cdot 2$

$$6 + 9 - 8$$

$$15 - 8 = \boxed{7}$$

14) $100 \div 5^2 \cdot 6 + 8 \cdot 75$

$$100 \div 25 \cdot 6 + 600$$

$$4 \cdot 6 + 600$$

$$24 + 600$$

$$\boxed{624}$$

13) $5 \cdot 2 + 7^2 - 2 \cdot 8$

$$10 + 49 - 16$$

$$\boxed{43}$$

14) $54 \div 3^2 \cdot 4 + 3 \cdot 15$

$$54 \div 9 \cdot 4 + 45$$

$$6 \cdot 4 + 45$$

$$24 + 45$$

$$\boxed{69}$$

15) $4 + 3\sqrt{25} - 7$

$$4 + 3 \cdot 5 - 7$$

$$4 + 15 - 7$$

$$19 - 7 = \boxed{12}$$

16) $8(9 + 7)$

$$8(16) = \boxed{128}$$

15) $10 + 5\sqrt{16} - 5$

$$10 + 5 \cdot 4 - 5$$

$$10 + 20 - 5$$

$$30 - 5$$

$$\boxed{25}$$

16) $9(8 - 7)$

$$9(1) = \boxed{9}$$

[CH 1.1-1] Translation of Algebraic Expression

[1] 1) The sum of a and twice of b .

$$a + 2b$$

2) 8 less than twice of c .

$$2c - 8$$

3) The product of -2 and the quantity of a plus b .

$$-2(a+b)$$

4) Twice the sum of c and d .

$$2(c+d)$$

5) The sum of twice r and s .

$$2r + s$$

6) Twice the difference of m and n .

$$2(m-n)$$

7) The quantity c plus d times the quantity c minus d .

$$(c+d)(c-d)$$

8) The product of x and 4 less than x .

$$x(x-4)$$

9) Six subtracted from four times P .

$$4P - 6$$

10) The difference of m and n , divided by 6.

$$\frac{m-n}{6}$$

11) The sum of b and 2, divided by the difference of b and 2.

$$\frac{b+2}{b-2}$$

12) 8 more than 2 times a number.

$$2x + 8$$

13) 5 subtracted from twice P .

$$2P - 5$$

14) The product of 3 more than a number and 3 less than that same number.

$$(x+3)(x-3)$$

15) Three less than twice of X is subtracted from P less than three times Q .

$$(3Q - P) - (2X - 3)$$

16) 7 more than a number divided by 7 less than that same number.

$$\frac{x+7}{x-7}$$

17) Three times the product of a minus b and sum of twice a and three times d .

$$3[(a-b)(2a+3d)]$$

or $3(a-b)(2a+3d)$

18) Twice the quotient of twice c , divided by d less than E .

$$2\left(\frac{2c}{E-d}\right)$$

[2] 1) Twice d less than three times c

$$3c - 2d$$

2) a number that exceeds m by 4

$$m+4$$

3) 5 times x increased by 2

$$5x+2$$

4) 36 divided by the sum of t and u

$$\frac{36}{t+u}$$

5) the product of x and y decreased by one-half the sum of x and y

$$xy - \frac{1}{2}(x+y)$$

6) Twice of X is subtracted from Y

$$Y - 2X$$

7) Twice of the result from X subtracted from Y

$$2(Y-X)$$

8) 3 less than twice a number

$$2X - 3$$

9) one-third of the product of 5 and a number

$$\frac{1}{3}(5x)$$

10) the product of 5 more than a number, and 4

$$(x+5) \cdot 4$$

11) one half of, 10 more than a number

$$\frac{1}{2}(x+10)$$

12) twice the sum of, one-half a number and 1

$$2\left(\frac{1}{2}x + 1\right)$$

13) Saul is 25 years old. Represent his age x years ago.

$$25 - x$$

14) Paul and Martha saved 100 dollars. If the amount saved by Paul is represented by x , represent the amount saved by Martha.

$$100 < x \text{ (Paul)}$$

$$100 - x \text{ (Martha)}$$

$$100 - x$$

15) The cost of a fur coat is 5 times the cost of a cloth coat. If the cloth coat costs x dollars, represent the cost of the fur coat.

$$5x$$

16) Sally weighs 2.5 times as much as Helen. If Helen weighs m pounds, represent Sally's weight.

$$2.5m$$

17) The length of a rectangle is presented by L . If the width of the rectangle is one-half of its length, represent the width.

$$\frac{1}{2}L$$

[CH 1.1-2] Translating Sentences into Algebraic Equations

[1]

1) Seven more than three times x is 15.

$$3x + 7 = 15$$

2) An unknown number increased by 8 is 32.

$$x + 8 = 32$$

3) When the sum of an unknown number and 6 is multiplied by 4, the result is 16.

$$(x + 6) \cdot 4 = 16$$

4) A 37 inch piece of wire is to be cut into two pieces. One piece is twice as long as the other piece.

Total $\rightarrow x + 2x = 37$

Base

other piece	x
one piece	2x
Total	37

5) 20 is 6 less than twice of P.

$$20 = 2p - 6$$

6) Six more than four times an unknown number is 22.

Unknown	x
	4x + 6
	22

$$4x + 6 = 22$$

7) When the sum of an unknown number and 6 is multiplied by 2, the result is 48.

$$(x + 6) \cdot 2 = 48$$

Unknown	x
	(x + 6) \cdot 2
Result	48

8) Eight subtracted from three times the X is 3.

$$3x - 8 = 3$$

9) David bought 3 more pens than pencils. He bought 13 pen and pencils all together.

Base

Total $\rightarrow x + (x + 3) = 13$

pencils	x
pen	x + 3
total	13

10) Susan bought 5 times as many tapes as CD's. She purchased 12 items altogether.

Base

Total $\rightarrow c + 5c = 12$

CD	c
Tape	5c
total	12

[2]

1) Eight more than three times x is 53.

$$3x + 8 = 53$$

2) An unknown number increased by 11 is 25.

$$x + 11 = 25$$

3) When the sum of an unknown number and 8 is multiplied by 3, the result is 63.

$$(x + 8) \cdot 3 = 63$$

Unknown	x
	(x + 8) \cdot 3
Result	63

4) An 81 inch piece of tubing is to be cut into two pieces.

One piece is to be twice as long as the other piece.

Total $\rightarrow x + 2x = 81$

other piece	x
one piece	2x
total	81

5) 5 less than three times of X is 10.

$$3x - 5 = 10$$

6) Kim bought 4 more cans of Pepsi than Coke. She bought 16 cans of soda altogether.

Base

Total $\rightarrow c + (c + 4) = 16$

Coke	c
Pepsi	c + 4
total	16

7) Mike bought 4 times as many tapes as CD's. He purchased 30 items altogether.

Base

$$x + 4x = 30$$

CD	x
TAPE	4x
total	30

8) Four is six subtracted from twice the P

$$4 = 2p - 6$$

9) The sum of an unknown number and a number that is 4 less than the unknown number is 24.

Base

Total $\rightarrow x + (x - 4) = 24$

Unknown	x
Number	x - 4
total	24

10) Three times the sum of two less than unknown number and 6 more than the unknown number is 36.

$$3[(x - 2) + (x + 6)] = 36$$

Unknown	x
	3[(x - 2) + (x + 6)]
	36

[CH1.2] Evaluate the Following Expressions

[1] If $a = 2$, $b = 3$, $c = 4$, and $d = 5$ then

1) $8ac$

$$8(2)(4) = \boxed{64}$$

2) $a + c$

$$2 + 4 = \boxed{6}$$

3) $4a + 2c$

$$4(2) + 2(4) \\ 8 + 8 = \boxed{16}$$

4) $3c^3$

$$3(4)^3 = 3 \cdot 64 = \boxed{192}$$

5) $2a^2 + 4c^2$

$$2(2)^2 + 4(4)^2 \\ 2(4) + 4(16) \\ 8 + 64 = \boxed{72}$$

6) $2(a + d)$

$$2(2 + 5) = 2(7) = \boxed{14}$$

7) $2a + b$

$$2(2) + (3) \\ 4 + 3 = \boxed{7}$$

8) $5(a + 2c)$

$$5(2 + 2(4)) \\ 5(2 + 8) \\ 5(10) = \boxed{50}$$

9) $5(4d - 3b)$

$$5(4(5) - 3(3)) \\ 5(20 - 9) \\ 5(11) = \boxed{55}$$

10) $c(3a + 4b)$

$$4(3(2) + 4(3)) \\ 4(6 + 12) \\ 4(18) = \boxed{72}$$

11) $2b^2 + c^2$

$$2(3)^2 + (4)^2 \\ 2(9) + 16 \\ 18 + 16 = \boxed{34}$$

12) $2(b^2 + c^2)$

$$2(3^2 + 4^2) \\ 2(9 + 16) \\ 2(25) = \boxed{50}$$

13) $(2a^2 + c)^2$

$$(2(2)^2 + (4))^2 \\ (2(4) + 4)^2 \\ (8 + 4)^2 = (12)^2 = \boxed{144}$$

14) $\frac{10b}{d}$

$$\frac{10(3)}{(5)} = \frac{30}{5} \\ = \boxed{6}$$

15) $\frac{7a - c}{d}$

$$\frac{7(2) - (4)}{(5)} = \frac{14 - 4}{5} = \frac{10}{5} \\ = \boxed{2}$$

16) $\frac{a + 2c}{2c - b}$

$$\frac{(2) + 2(4)}{2(4) - (3)} = \frac{2 + 8}{8 - 3} \\ = \frac{10}{5} = \boxed{2}$$

17) $\frac{2a^3 - 2c}{d - b}$

$$\frac{2(2)^3 - 2(4)}{(5) - (3)} = \frac{2(8) - 8}{2} \\ = \frac{16 - 8}{2} = \frac{8}{2} = \boxed{4}$$

18) $\frac{2a^2 + 6c}{2a + b}$

$$\frac{2(2)^2 + 6(4)}{2(2) + (3)} \\ = \frac{2(4) + 24}{4 + 3} \\ = \frac{8 + 24}{7} = \frac{32}{7} = \boxed{4\frac{4}{7}}$$

[2] If $a = 2$, $b = -3$, $c = 4$, and $d = -5$ then

1) $2bd$

$$2(-3)(-5) \\ 2(15) = \boxed{30}$$

2) $d - b$

$$(-5) - (-3) \\ -5 + 3 = -(5 - 3) \\ = \boxed{-2}$$

3) $4d - 6a$

$$4(-5) - 6(2) \\ -20 - 12 = -(20 + 12) \\ = \boxed{-32}$$

4) $4c^2$

$$4(4)^2 = 4(16) \\ = \boxed{64}$$

5) $d^3 - 2b^3$

$$(-5)^3 - 2(-3)^3 \\ -125 - 2(-27) \\ -125 + 54 = -(125 - 54) = \boxed{-71}$$

6) $6(d - b)$

$$6(-5 - (-3)) \\ 6(-5 + 3) = 6(-2) = \boxed{-12}$$

7) $2(3b + d)$

$$2(3(-3) + (-5)) = 2(-9 - 5) \\ = 2(-14) = \boxed{-28}$$

8) $4(4a) + b$

$$4(4(2)) + (-3) \\ 4(8) + (-3) \\ 32 - 3 = \boxed{29}$$

9) $8(2a + 3c)$

$$8(2(2) + 3(4)) \\ 8(4 + 12) = 8(16) \\ = \boxed{128}$$

10) $b(3c - 2a)$

$$(-3)(3(4) - 2(2)) \\ (-3)(12 - 4) = -3(8) \\ = \boxed{-24}$$

11) $7(a^2 + c^2)$

$$7(2^2 + 4^2) = 7(4 + 16) \\ 7(20) = \boxed{140}$$

12) $(5a^2 + b)^2$

$$(5(2^2) + (-3))^2 \\ (5(4) + (-3))^2 \\ (20 - 3)^2 = (17)^2 \\ = \boxed{289}$$

13) $\frac{9c}{b}$

$$\frac{9(4)}{-3} = \frac{36}{-3} = \boxed{-12}$$

14) $\frac{8ab}{c}$

$$\frac{8(2)(-3)}{(4)} = \frac{-48}{4} \\ = \boxed{-12}$$

15) $\frac{8abd}{c^2}$

$$\frac{8(2)(-3)(-5)}{(4)^2} = \frac{240}{16} \\ = \boxed{15}$$

16) $\frac{5a + d}{b}$

$$\frac{5(2) + (-5)}{(-3)} \\ = \frac{10 - 5}{-3} = \frac{5}{-3} = \boxed{-\frac{5}{3}}$$

17) $\frac{3b + d}{c - b}$

$$\frac{3(-3) + (-5)}{4 - (-3)} = \frac{-9 - 5}{4 + 3} \\ = \frac{-14}{7} = \boxed{-2}$$

18) $\frac{2b^2 + 6c}{2a + b}$

$$\frac{2(-3)^2 + 6(4)}{2(2) + (-3)} \\ = \frac{2(9) + 24}{4 - 3} = \frac{42}{1} = \boxed{42}$$

[CH 1.3] Adding and Subtracting Algebraic Expression

(Combine the Like Term)

[1] 1) $3x + 7x$

$(3+7)x = 10x$

2) $16y^2 - 4y^2$

$(16-4)y^2 = 12y^2$

3) $15m^2n - 5m^2n$

$(15-5)m^2n = 10m^2n$

4) $6y^2 - 5y^2 + 3y^2$

$(6-5+3)y^2 = 4y^2$

5) $6b - 4b + 3c$

$(6-4)b + 3c = 2b + 3c$

6) $10m^2 - 2m - 3m^2$

$(10-3)m^2 - 2m = 7m^2 - 2m$

7) $3a - 4b + 2b$

$3a + (-4+2)b = 3a - 2b$

8) $6a + 4b - 2a - 3b$

$6a - 2a + 4b - 3b = 4a + b$

9) $\frac{1}{4}x + 2 + \frac{2}{4}x$

$(\frac{1}{4} + \frac{2}{4})x + 2 = \frac{3}{4}x + 2$

10) $\frac{4}{5}x - \frac{1}{5}y - \frac{2}{5}x$

$(\frac{4}{5}x - \frac{2}{5}x) - \frac{1}{5}y = \frac{2}{5}x - \frac{1}{5}y$

11) $2(3y + 4) + 5$

$(2)(3y) + (2)(4) + 5 = 6y + 8 + 5 = 6y + 13$

12) $6(5y - 3) + 10y$

$(6)(5y) - (6)(3) + 10y = 30y - 18 + 10y = (30y + 10y) - 18 = 40y - 18$

13) $3x + 3(x + 5) + 5$

$3x + 3(x) + 3(5) + 5 = 3x + 3x + 15 + 5 = 6x + 20$

14) $5(6p - 3) - 10p$

$5(6p) - 5(3) - 10p = 30p - 15 - 10p = (30p - 10p) - 15 = 20p - 15$

15) Subtract $3y$ from the sum of $7y$ and $4y$.

$(7y + 4y) - 3y = 11y - 3y = 8y$

16) Subtract the sum of $7ab$ and $15ab$ from $5ab$

$5ab - (7ab + 15ab) = 5ab - 22ab = -17ab$

17) $(3a - 5b) - (-5a - 4b)$

$3a - 5b + (+5a + 4b) = (3a + 5a) + (-5b + 4b) = 8a - b = 8a - b$

18) $(2x^2 - 3x + 4) - (5x^2 + 6x - 7)$

$2x^2 - 3x + 4 + (-5x^2 - 6x + 7) = (2x^2 - 5x^2) + (-3x - 6x) + (4 + 7) = -3x^2 - 9x + 11 = -3x^2 - 9x + 11$

19) $(-3x - 2y) - (-4x + 6y)$

$(-3x + 4x) + (-2y - 6y) = 1x - 4y = x - 4y$

20) $(5a^2 - 6a - 7) - (3a^2 - 4a - 3)$

$5a^2 - 6a - 7 + (-3a^2 + 4a + 3) = (5a^2 - 3a^2) + (-6a + 4a) + (-7 + 3) = 2a^2 - 2a - 4 = 2a^2 - 2a - 4$

[2]

1) $12a^2b - 6ab^2$

Not like term

2) $3x^2 - x - x^2$

$(3-1)x^2 - x = 2x^2 - x$

3) $2a - 5a$

$(2-5)a = -3a$

4) $5b - 3b - 7b$

$(5-3-7)b = (2-7)b = -5b$

5) $8c - 4b - 5c + 5b$

$(8-5)c + (-4+5)b = 3c + 1b = 3c + b$

6) $4F + 5G - 2F + 3G$

$4F - 2F + 5G + 3G = 2F + 8G$

7) $\frac{5}{7}x + 4 - \frac{3}{7}x + 5$

$(\frac{5}{7} - \frac{3}{7})x + (4+5) = \frac{2}{7}x + 9$

8) $\frac{9}{7}a - \frac{4}{7}b + \frac{6}{7}b - \frac{4}{7}a$

$(\frac{9}{7} - \frac{4}{7})a + (-\frac{4}{7} + \frac{6}{7})b = \frac{5}{7}a + \frac{2}{7}b$

9) $7.5x - 2.5y - 3.6x - 2.6y$

$(7.5 - 3.6)x + (-2.5 - 2.6)y = 3.9x - 5.1y = 3.9x - 5.1y$

10) $3.7a + 2.5b - 5.9a + 1.5b$

$(3.7 - 5.9)a + (2.5 + 1.5)b = -2.2a + 4b = -2.2a + 4b$

11) The sum of 7 less than $5b$ and twice b

$(2b + 5b - 7) = 7b - 7$

12) The sum of twice b and 7 less than $5b$

$2b + (5b - 7) = 2b + 5b - 7 = 7b - 7$

13) Subtract $3y + 2$ from the sum of $5y$ and 12.

$(5y + 12) - (3y + 2) = 5y + 12 + (-3y - 2) = (5y - 3y) + (12 - 2) = 2y + 10$

14) Subtract the 7 plus $9x$ from 5 plus $4x$

$(5 + 4x) - (7 + 9x) = 5 + 4x - 7 - 9x = (5 - 7) + (4x - 9x) = -2 - 5x = -5x - 2$

15) $7(9a - 5) + 2(4a - 6)$

$63a - 35 + 8a - 12 = (63a + 8a) + (-35 - 12) = 71a - 47 = 71a - 47$

16) $6(3b - 7) + 4(8 - 4b)$

$18b - 42 + 32 - 16b = (18b - 16b) + (-42 + 32) = 2b - 10 = 2b - 10$

17) $-2(4x + 5) - 3(2x - 3)$

$-8x - 10 - 6x + 9 = (-8x - 6x) + (-10 + 9) = -14x - 1 = -14x - 1$

18) $3(7y - 2) - 2(4y - 3)$

$21y - 6 - 8y + 6 = (21y - 8y) + (-6 + 6) = 13y + 0 = 13y$

19) $5(3p - 4q) + 2(4p - 2q)$

$15p - 20q + 8p - 4q = (15p + 8p) + (-20q - 4q) = 23p - 24q = 23p - 24q$

20) $(-5x^2 + 6x - 7) - (2x^2 - 3x + 4)$

$-5x^2 - 6x + 7 - 2x^2 + 3x - 4 = (-5x^2 - 2x^2) + (-6x + 3x) + (7 - 4) = -7x^2 - 3x + 3 = -7x^2 - 3x + 3$

21) $-5(3p - 4q) - 2(4p - 2q)$

$-15p + 20q - 8p + 4q = (-15p - 8p) + (20q + 4q) = -23p + 24q = -23p + 24q$

22) $(-3x^2 - 4x - 3) - (5x^2 - 6x - 7)$

$-3x^2 + 4x + 3 - 5x^2 + 6x + 7 = (-3x^2 - 5x^2) + (4x + 6x) + (3 + 7) = -8x^2 + 10x + 10 = -8x^2 + 10x + 10$

Rules ① $a^x \cdot a^y = a^{x+y}$ ② $\frac{a^x}{a^y} = a^{x-y}$

[CH1.3-2] Multiplying and Dividing Expressions

[1] 1) $x^5 \cdot x^6 = x^{5+6} = \boxed{x^{11}}$

2) $5^4 \cdot 5^9 = 5^{4+9} = \boxed{5^{13}}$

[2] 1) $x^7 \cdot 2x^5 \cdot x = (2)(x^7 x^5 x) = 2(x^{7+5+1}) = \boxed{2x^{13}}$

2) $2^3 \cdot 2^5 \cdot 2^4 \cdot 2 = 2^{3+5+4+1} = \boxed{2^{13}}$

3) $a^6 \cdot a = a^{6+1} = \boxed{a^7}$

4) $ab^2 \cdot a^2 b^3 = a^{1+2} b^{2+3} = \boxed{a^3 b^5}$

3) $a^5 \cdot a^4 \cdot a^3 \cdot a = a^{5+4+3+1} = \boxed{a^{13}}$

* 4) $x^2 y^3 \cdot x^3 y^2 = (x^2 x^3)(y^3 y^2) = \boxed{x^5 y^5}$

5) $a \cdot a^2 \cdot a^3 = a^{1+2+3} = \boxed{a^6}$

6) $x^2 y^3 \cdot xy \cdot x^2 y^4 = (x^2 x x^2)(y^3 y y^4) = x^{2+1+2} y^{3+1+4} = \boxed{x^5 y^8}$

5) $a^2 b \cdot a^3 b^2 \cdot ab^6 = (a^2 a^3 a)(b b^2 b^6) = a^{2+3+1} b^{1+2+6} = \boxed{a^6 b^9}$

6) $6p \cdot 3p \cdot 2p^4 = (6 \cdot 3 \cdot 2)(p p p^4) = (36)(p^{1+1+4}) = \boxed{36p^6}$

7) $6a^2 b^3 \cdot 2ab^4 = (6 \cdot 2)(a^2 a)(b^3 b^4) = 12 a^{2+1} b^{3+4} = \boxed{12a^3 b^7}$

8) $4a^2 b \cdot 8ab^4 = (4 \cdot 8)(a^2 a)(b b^4) = 32 a^{2+1} b^{1+4} = \boxed{32a^3 b^5}$

7) $5a^2 b^5 \cdot 4ab^3 = (5 \cdot 4)(a^2 a)(b^5 b^3) = 20 a^{2+1} b^{5+3} = \boxed{20a^3 b^8}$

8) $3x^3 \cdot x^2 \cdot 4x^6 \cdot x = (8 \cdot 4)(x^3 x^2 x^6 x) = 12 x^{3+2+6+1} = \boxed{12x^{12}}$

9) $3x^3 \cdot x^2 \cdot 4x^6 = (3 \cdot 1 \cdot 4)(x^3 \cdot x^2 \cdot x^6) = 12(x^{3+2+6}) = \boxed{12x^{11}}$

10) $4x^2 y \cdot 3xy^2 \cdot 2x^6 y = (4 \cdot 3 \cdot 2)(x^2 x x^6)(y y^2 y) = 24 x^{2+1+6} y^{1+2+1} = \boxed{24x^9 y^4}$

9) $3y^4 \cdot 2y^5 \cdot 5y^2 = (3 \cdot 2 \cdot 5)(y^{4+5+2}) = \boxed{30y^{11}}$

10) $7x^3 y \cdot x^2 y^2 \cdot 2xy^4 = (7 \cdot 1 \cdot 2)(x^3 x^2 x)(y y^2 y^4) = 14 x^{3+2+1} y^{1+2+4} = \boxed{14x^6 y^7}$

11) $4a^2 \cdot a^4 \cdot 3a \cdot 5a^3 = (4 \cdot 1 \cdot 3 \cdot 5)(a^2 a^4 a a^3) = 60 a^{2+4+1+3} = \boxed{60a^{10}}$

12) $2c^2 d \cdot cd^3 \cdot 5c^2 d \cdot 4cd = (2 \cdot 1 \cdot 5 \cdot 4)(c^2 c c^2 c)(d d^3 d d) = 40 c^{2+1+2+1} d^{1+3+1+1} = \boxed{40c^6 d^6}$

11) $2p^4 \cdot 2p \cdot p^3 \cdot 3p^5 = (2 \cdot 2 \cdot 1 \cdot 3) p^{4+1+3+5} = \boxed{12p^{13}}$

12) $8x^2 y \cdot xy \cdot 3xy^3 \cdot 4x^3 y = (8 \cdot 1 \cdot 3 \cdot 4)(x^2 x x x^3)(y y y^3 y) = 96 x^{2+1+1+3} y^{1+1+3+1} = \boxed{96x^7 y^6}$

13) $\frac{b^6}{b^4} = b^{6-4} = \boxed{b^2}$

14) $\frac{x^8}{x} = x^{8-1} = \boxed{x^7}$

13) $\frac{y^6}{y} = y^{6-1} = \boxed{y^5}$

14) $\frac{a^7 b^3}{a^4 b^2} = (a^{7-4})(b^{3-2}) = a^3 b^1 = \boxed{a^3 b}$

15) $\frac{8w^4}{2w} = \left(\frac{8}{2}\right)\left(\frac{w^4}{w}\right) = \left(\frac{4}{1}\right)(w^{4-1}) = \boxed{4w^3}$

16) $\frac{9x^4}{3x^2} = \left(\frac{9}{3}\right)\left(\frac{x^4}{x^2}\right) = \left(\frac{3}{1}\right)(x^{4-2}) = \boxed{3x^2}$

15) $\frac{6a^4}{2a} = \left(\frac{6}{2}\right)\left(\frac{a^4}{a}\right) = \left(\frac{3}{1}\right)(a^{4-1}) = \boxed{3a^3}$

16) $\frac{15a^6}{3a^6} = \left(\frac{15}{3}\right)\left(\frac{a^6}{a^6}\right) = \left(\frac{5}{1}\right)(a^{6-6}) = 5a^0 = 5 \cdot 1 = \boxed{5}$

17) $\frac{14x^4 y}{7x^2} = \left(\frac{14}{7}\right)\left(\frac{x^4}{x^2}\right)(y) = 2x^{4-2} y = \boxed{2x^2 y}$

18) $\frac{24a^3 b^6}{6ab} = \left(\frac{24}{6}\right)\left(\frac{a^3}{a}\right)\left(\frac{b^6}{b}\right) = \left(\frac{4}{1}\right)(a^{3-1})(b^{6-1}) = \boxed{4a^2 b^5}$

17) $\frac{40x^3 y^4}{10y^3} = \left(\frac{40}{10}\right)(x^3)\left(\frac{y^4}{y^3}\right) = \left(\frac{4}{1}\right)(x^3)(y^{4-3}) = 4x^3 y^1 = \boxed{4x^3 y}$

18) $\frac{36w^5 z^8}{6w^3 z} = \left(\frac{36}{6}\right)\left(\frac{w^5}{w^3}\right)\left(\frac{z^8}{z}\right) = \left(\frac{6}{1}\right)(w^{5-3})(z^{8-1}) = \boxed{6w^2 z^7}$

19) $\frac{240x^5 y^7}{60y^5} = \left(\frac{240}{60}\right)(x^5)\left(\frac{y^7}{y^5}\right) = \left(\frac{4}{1}\right)(x^5)(y^{7-5}) = \boxed{4x^5 y^2}$

20) $\frac{16a^2 b^3 c^4}{8ab^2 c^2} = \left(\frac{16}{8}\right)\left(\frac{a^2}{a}\right)\left(\frac{b^3}{b^2}\right)\left(\frac{c^4}{c^2}\right) = \left(\frac{2}{1}\right)(a^{2-1})(b^{3-2})(c^{4-2}) = \boxed{2abc^2}$

19) $\frac{30x^6 y^5 z^4}{6x^5 yz^3} = \left(\frac{30}{6}\right)\left(\frac{x^6}{x^5}\right)\left(\frac{y^5}{y}\right)\left(\frac{z^4}{z^3}\right) = \left(\frac{5}{1}\right)(x^{6-5})(y^{5-1})(z^{4-3}) = 5x^1 y^4 z^1 = \boxed{5xy^4 z}$

20) $\frac{4x^2 y^3 \cdot 3x^3 y^6}{2x^5 \cdot 2y^9} = \left(\frac{4 \cdot 3}{2 \cdot 2}\right)\left(\frac{x^2 x^3}{x^5}\right)\left(\frac{y^3 y^6}{y^9}\right) = \left(\frac{3}{1}\right)(x^{2+3-5})(y^{3+6-9}) = 3x^0 y^0 = 3(1)(1) = \boxed{3}$

[CH 1.4] Addition and Subtraction (Solve and Check)

[1] 1) $x+2=7$
 $\begin{array}{r} -2 \quad -2 \\ x = \boxed{5} \end{array}$
 $5+2=7 \checkmark$

2) $x-8=7$
 $\begin{array}{r} +8 \quad +8 \\ x = \boxed{15} \end{array}$
 $15-8=7 \checkmark$

3) $x-6=-10$
 $\begin{array}{r} +6 \quad +6 \\ x = \boxed{-4} \end{array}$
 $-4-6=-10 \checkmark$

4) $x+5=-3$
 $\begin{array}{r} -5 \quad -5 \\ x = \boxed{-8} \end{array}$
 $-8+5=-3 \checkmark$

5) $12=x+4$
 $\begin{array}{r} -4 \quad -4 \\ \boxed{8} = x \end{array}$
 $12=8+4 \checkmark$

6) $5+x=9$
 $\begin{array}{r} -5 \quad -5 \\ x = \boxed{4} \end{array}$
 $5+4=9 \checkmark$

7) $x-6=0$
 $\begin{array}{r} +6 \quad +6 \\ x = \boxed{6} \end{array}$
 $6-6=0 \checkmark$

8) $3x=2x+6$
 $\begin{array}{r} -2x \quad -2x \\ x = \boxed{6} \end{array}$
 $3(6)=2(6)+6$
 $18=12+6 \checkmark$

9) $7x=6x-10$
 $\begin{array}{r} -6x \quad -6x \\ x = \boxed{-10} \end{array}$
 $7(-10)=6(-10)-10$
 $-70=-60-10 \checkmark$

10) $7x+2=6x$
 $\begin{array}{r} -6x \quad -6x \\ x+2=0 \\ -2 \quad -2 \\ x = \boxed{-2} \end{array}$

11) $6x-4=5x$
 $\begin{array}{r} -5x \quad -5x \\ x-4=0 \\ +4 \quad +4 \\ x = \boxed{4} \end{array}$

12) $2x+4=x+6$
 $\begin{array}{r} -x \quad -x \\ x+4=6 \\ -4 \quad -4 \\ x = \boxed{2} \end{array}$

13) $5x-8=4x-3$
 $\begin{array}{r} -4x \quad -4x \\ x-8=-3 \\ +8 \quad +8 \\ x = \boxed{5} \checkmark \end{array}$

14) $8x-4=7x+6$
 $\begin{array}{r} -7x \quad -7x \\ x-4=6 \\ +4 \quad +4 \\ x = \boxed{10} \end{array}$

15) $3+6x=5+5x$
 $\begin{array}{r} -5x \quad -5x \\ 3+x=5 \\ -3 \quad -3 \\ x = \boxed{2} \end{array}$

16) $4+10x=9x-8$
 $\begin{array}{r} -9x \quad -9x \\ 4+x=-8 \\ -4 \quad -4 \\ x = \boxed{-12} \end{array}$

17) $3+5x+1=x+8+3x$
 $\begin{array}{r} 5x+4 = 4x+8 \\ -4x \quad -4x \\ x+4 = 8 \end{array}$

$\begin{array}{r} x+4 = 8 \\ -4 \quad -4 \\ x = \boxed{4} \end{array}$

18) $6x+6+2x=6x+12+x$
 $\begin{array}{r} 8x+6 = 7x+12 \\ -7x \quad -7x \\ x+6 = 12 \end{array}$

$\begin{array}{r} x+6 = 12 \\ -6 \quad -6 \\ x = \boxed{6} \end{array}$

19) $3(7x+2)=4(5x+1)+14$
 $\begin{array}{r} 21x+6 = 20x+4+14 \\ -20x \quad -20x \\ x+6 = 18 \end{array}$

$\begin{array}{r} x+6 = 18 \\ -6 \quad -6 \\ x = \boxed{12} \end{array}$

20) $6(6x-1)-7(5x+2)=3$
 $36x-6-35x-14=3$
 $x-20=3$
 $+20 \quad +20$
 $x = \boxed{23}$

[2]

1) $x-4=-3$
 $\begin{array}{r} +4 \quad +4 \\ x = \boxed{1} \end{array}$

2) $x+6=0$
 $\begin{array}{r} -6 \quad -6 \\ x = \boxed{-6} \end{array}$

3) $6x=5x-6$
 $\begin{array}{r} -5x \quad -5x \\ x = \boxed{-6} \end{array}$

4) $8x=7x+5$
 $\begin{array}{r} -7x \quad -7x \\ x = \boxed{5} \end{array}$

5) $9x-8=8x$
 $\begin{array}{r} -8x \quad -8x \\ x-8=0 \\ +8 \quad +8 \\ x = \boxed{8} \end{array}$

6) $3x-4=2x+1$
 $\begin{array}{r} -2x \quad -2x \\ x-4=1 \\ +4 \quad +4 \\ x = \boxed{5} \end{array}$

7) $7x+5=6x-2$
 $\begin{array}{r} -6x \quad -6x \\ x+5=-2 \\ -5 \quad -5 \\ x = \boxed{-7} \end{array}$

8) $10x-4=9x-5$
 $\begin{array}{r} -9x \quad -9x \\ x-4=-5 \\ +4 \quad +4 \\ x = \boxed{-1} \end{array}$

9) $2+5x=1+4x$
 $\begin{array}{r} -4x \quad -4x \\ 2+x=1 \\ -2 \quad -2 \\ x = \boxed{-1} \end{array}$

10) $3+7x=6x-7$
 $\begin{array}{r} -6x \quad -6x \\ 3+x=-7 \\ -3 \quad -3 \\ x = \boxed{-10} \end{array}$

11) $4x-3+x=4+4x+5$
 $\begin{array}{r} 5x-3 = 4x+9 \\ -4x \quad -4x \\ x-3=9 \\ +3 \quad +3 \\ x = \boxed{12} \end{array}$

12) $5x+9+3x=9x+7x-5$
 $8x+9=16x-5$
 $-8x \quad -8x$
 $9=8x-5$

$8x-5=9$
 $+5 \quad +5$
 $8x=14$
 $\frac{8x}{8} = \frac{14}{8}$
 $x = \frac{14}{8} = \frac{2 \cdot 7}{2 \cdot 4} = \frac{7}{4} = \boxed{\frac{7}{4}}$

$$13) 3(4x-3) = 11x+4$$

$$\begin{array}{r} 12x - 9 = 11x + 4 \\ -11x \quad -11x \\ \hline x - 9 = 4 \\ +9 \quad +9 \\ \hline x = 13 \end{array}$$

$$14) 3(8x+6) = 5(5x-2) + 8$$

$$24x + 18 = 25x - 10 + 8$$

$$24x + 18 = 25x - 2$$

$$\begin{array}{r} -24x \quad -24x \\ \hline 18 = x - 2 \end{array}$$

$$18 = x - 2$$

$$\begin{array}{r} x - 2 = 18 \\ +2 \quad +2 \\ \hline x = 20 \end{array}$$

$$x = 20$$

$$15) 5(9x-9) - 4(11x-11) = 5$$

$$45x - 45 - 44x + 44 = 5$$

$$45x - 44x - 45 + 44 = 5$$

$$1x - 1 = 5$$

$$\begin{array}{r} x - 1 = 5 \\ +1 \quad +1 \\ \hline x = 6 \end{array}$$

$$x = 6$$

$$\text{LCD}(6) = 6$$

$$16) \frac{9}{6}x + 5 = \frac{3}{6}x - 7$$

$$6\left(\frac{9}{6}x\right) + 6(5) = 6\left(\frac{3}{6}x\right) - 6(7)$$

$$6\left(\frac{9}{6}x\right) + 30 = 6\left(\frac{3}{6}x\right) - 42$$

$$\begin{array}{r} 9x + 30 = 3x - 42 \\ -3x \quad -3x \\ \hline 6x + 30 = -42 \\ -36 \quad -36 \\ \hline 6x = -72 \\ x = -72/6 = -12 \end{array}$$

$$6x + 30 = -42$$

$$6x = -72$$

$$x = -72/6 = -12$$

$$17) \frac{7}{2}x - \frac{5}{4} = \frac{5}{2}x + \frac{3}{4}$$

$$4\left(\frac{7}{2}x\right) - 4\left(\frac{5}{4}\right) = 4\left(\frac{5}{2}x\right) + 4\left(\frac{3}{4}\right)$$

$$2\cancel{4}\left(\frac{7}{\cancel{2}}x\right) - \cancel{4}\left(\frac{5}{\cancel{4}}\right) = \cancel{4}\left(\frac{5}{\cancel{2}}x\right) + \cancel{4}\left(\frac{3}{\cancel{4}}\right)$$

$$2(7x) - 5 = 2(5x) + 3$$

$$\text{LCD}(2, 4) = 4$$

$$\begin{array}{r} 14x - 5 = 10x + 3 \\ -10x \quad -10x \\ \hline 4x - 5 = 3 \\ +5 \quad +5 \\ \hline 4x = 8 \\ x = 8/4 = 2 \end{array}$$

$$4x - 5 = 3$$

$$4x = 8$$

$$x = 8/4 = 2$$

$$18) \frac{10}{3}x + \frac{1}{6} = \frac{7}{3}x + \frac{7}{6}$$

$$6\left(\frac{10}{3}x\right) + 6\left(\frac{1}{6}\right) = 6\left(\frac{7}{3}x\right) + 6\left(\frac{7}{6}\right)$$

$$2\cancel{6}\left(\frac{10}{\cancel{3}}x\right) + \cancel{6}\left(\frac{1}{\cancel{6}}\right) = 2\cancel{6}\left(\frac{7}{\cancel{3}}x\right) + \cancel{6}\left(\frac{7}{\cancel{6}}\right)$$

$$2(10x) + 1 = 2(7x) + 7$$

$$\text{LCD}(3, 6) = 6$$

$$\begin{array}{r} 20x + 1 = 14x + 7 \\ -14x \quad -14x \\ \hline 6x + 1 = 7 \\ -1 \quad -1 \\ \hline 6x = 6 \\ x = 6/6 = 1 \end{array}$$

$$6x + 1 = 7$$

$$6x = 6$$

$$x = 6/6 = 1$$

$$19) 4 \text{ less than } x \text{ is } 12$$

$$\begin{array}{r} x - 4 = 12 \\ +4 \quad +4 \\ \hline x = 16 \end{array}$$

$$x = 16$$

$$20) 2 \text{ more than } 5 \text{ times a number is } 6 \text{ times that same number}$$

$$5x + 2 = 6x$$

$$\begin{array}{r} -5x \quad -5x \\ \hline 2 = x \end{array}$$

$$2 = x$$

$$x = 2$$

[CH1.5] Multiplication/Division (Solve for x and Check)

$$1) 4x = 12$$

$$\begin{array}{r} \frac{4}{4} \frac{4}{4} \\ \hline x = 3 \end{array}$$

$$x = 3$$

$$2) 9x = 72$$

$$\begin{array}{r} \frac{9}{9} \frac{9}{9} \\ \hline x = 8 \end{array}$$

$$x = 8$$

$$3) -3x = 27$$

$$\begin{array}{r} \frac{-3}{-3} \frac{-3}{-3} \\ \hline x = -9 \end{array}$$

$$x = -9$$

$$4) -9x = -81$$

$$\begin{array}{r} \frac{-9}{-9} \frac{-9}{-9} \\ \hline x = 9 \end{array}$$

$$x = 9$$

$$5) -9x = 63$$

$$\begin{array}{r} \frac{-9}{-9} \frac{-9}{-9} \\ \hline x = -7 \end{array}$$

$$x = -7$$

$$6) 7x = -56$$

$$\begin{array}{r} \frac{7}{7} \frac{7}{7} \\ \hline x = -8 \end{array}$$

$$x = -8$$

$$7) \frac{x}{2} = 6$$

$$\frac{2}{2}\left(\frac{x}{2}\right) = \frac{2}{2}(6)$$

$$x = 2 \cdot 6 = 12$$

$$8) \frac{2}{3}x = 8$$

$$\frac{3}{3}\left(\frac{2}{3}x\right) = \frac{3}{3}(8)$$

$$x = \frac{3 \cdot 8}{2} = 12$$

$$9) \frac{3}{4}x = -12$$

$$\frac{4}{3}\left(\frac{3}{4}x\right) = \frac{4}{3}(-12)$$

$$x = 4 \cdot \frac{-12}{3} = -16$$

$$10) -\frac{2}{5}x = 8$$

$$-\frac{5}{2}\left(-\frac{2}{5}x\right) = -\frac{5}{2}(8)$$

$$x = \frac{-5 \cdot 8}{2} = -20$$

$$11) 5x + 2x = 28$$

$$\begin{array}{r} 7x = 28 \\ \frac{7}{7} \frac{7}{7} \\ \hline x = 4 \end{array}$$

$$x = 4$$

$$12) 14x - 6x = 48$$

$$\begin{array}{r} 8x = 48 \\ \frac{8}{8} \frac{8}{8} \\ \hline x = 6 \end{array}$$

$$x = 6$$

$$13) 8x = 2x + 60$$

$$\begin{array}{r} -2x \quad -2x \\ \hline 6x = 60 \end{array}$$

$$\frac{6x}{6} = \frac{60}{6}$$

$$x = 10$$

$$14) 9x = 72 - 3x$$

$$\begin{array}{r} +3x \quad +3x \\ \hline 12x = 72 \end{array}$$

$$\frac{12x}{12} = \frac{72}{12}; x = 6$$

$$15) 7x - 4x + 5x = 32$$

$$(7-4+5)x = 32$$

$$8x = 32$$

$$16) 9x + 3x = 6x - 36$$

$$12x = 6x - 36$$

$$-6x = -36$$

$$6x = 36$$

$$x = 6$$

$$17) \text{A number divided by 7 is equal to 5}$$

$$\frac{x}{7} = 5; 7\left(\frac{x}{7}\right) = 7(5)$$

$$x = 35$$

$$\frac{6x}{6} = \frac{36}{6}$$

$$x = 6$$

$$18) \text{Twice a number divided by 4 is 12}$$

$$\frac{2x}{4} = 12; \frac{1}{2}x = 12; 2\left(\frac{1}{2}x\right) = 2(12)$$

$$x = 24$$

$$19) 3.2x = 9.6$$

$$\frac{3.2x}{3.2} = \frac{9.6}{3.2} \Rightarrow x = 3$$

$$20) -3.5x = 10.5$$

$$\begin{array}{r} -3.5x = 10.5 \\ \frac{-3.5x}{-3.5} = \frac{10.5}{-3.5}; x = -3 \end{array}$$

2] 1) $72 = 9x$

$$\frac{9x}{9} = \frac{72}{9}; x = \boxed{8}$$

2) $4x = -16$

$$\frac{4x}{4} = \frac{-16}{4}; x = \boxed{-4}$$

3) $-9x = -72$

$$\frac{-9x}{-9} = \frac{-72}{-9}; x = \boxed{8}$$

4) $-10x = -70$

$$\frac{-10x}{-10} = \frac{-70}{-10}; x = \boxed{7}$$

5) $\frac{x}{3} = 3$

$$3\left(\frac{x}{3}\right) = 3(3); x = \boxed{9}$$

6) $-\frac{x}{3} = -2$

$$-3\left(-\frac{x}{3}\right) = -3(-2); x = \boxed{6}$$

7) $\frac{7}{8}x = -28$

$$\frac{8}{7}\left(\frac{7}{8}x\right) = \frac{8}{7}(-28); x = \frac{224}{7} = \boxed{-32}$$

8) $-\frac{5}{8}x = -15$

$$-\frac{8}{5}\left(-\frac{5}{8}x\right) = -\frac{8}{5}(-15); x = \boxed{24}$$

9) $8x - 2x = 60$

$$\frac{6x}{6} = \frac{60}{6}; x = \boxed{10}$$

10) $9x + 3x = 72$

$$\frac{12x}{12} = \frac{72}{12}; x = \boxed{6}$$

11) $5x = 28 - 2x$

$$\frac{7x}{7} = \frac{28}{7}; x = \boxed{4}$$

12) $14x = 6x + 48$

$$\frac{8x}{8} = \frac{48}{8}; x = \boxed{6}$$

13) $9x + 3x - 6x = 36$

$$(9+3-6)x = 36; 6x = 36; x = \frac{36}{6} = \boxed{6}$$

14) $7x - 4x = 5x + 32$

$$3x = 5x + 32; -3x -3x; 0 = 2x + 32; 2x = -32; x = \boxed{-16}$$

15) $3.7x + 5.4x = -18.2$

$$(3.7+5.4)x = -18.2; 9.1x = -18.2; x = \frac{-18.2}{9.1} = \boxed{-2}$$

16) $12.4x - 6.2x = -24.8$

$$6.2x = -24.8; x = \frac{-24.8}{6.2} = \boxed{-4}$$

17) Twice a number is 34

$$\frac{2x}{2} = \frac{34}{2}; x = \boxed{17}$$

18) $\frac{2}{7}$ of a number is 6

$$\frac{2}{7} \cdot x = 6; \frac{7}{2}\left(\frac{2}{7}x\right) = \frac{7}{2}(6); x = \boxed{21}$$

19) 3 times a number, divided by 4 is 33

$$\frac{3x}{4} = 33; x = (33)\left(\frac{4}{3}\right) = (11)(4) = \boxed{44}$$

20) Twice a number divided by 7 is 10

$$\frac{2x}{7} = 10; 2x = 70; x = \frac{70}{2} = \boxed{35}$$

[CH 1.6] Combined Operations (Solve for x and Check)

[1] 1) $2x + 1 = 7$

$$\frac{-1 -1}{2x} = \frac{6}{2}; x = \frac{6}{2} = \boxed{3}$$

2) $2x + 9 = 3$

$$\frac{-9 -9}{2x} = \frac{-6}{2}; x = \frac{-6}{2} = \boxed{-3}$$

3) $2 - 4x = 14$

$$\frac{-2 -2}{-4x} = \frac{12}{-4}; x = \frac{12}{-4} = \boxed{-3}$$

4) $6 - 7x = -15$

$$\frac{-6 -6}{-7x} = \frac{-21}{-7}; x = \frac{-21}{-7} = \boxed{3}$$

5) $5x = 24 - x$

$$\frac{6x}{6} = \frac{24}{6}; x = \boxed{4}$$

6) $7x + 4 = 2x + 24$

$$\frac{5x+4}{-4 -4} = \frac{24}{-4}; 5x+4 = 24; 5x = 20; x = \boxed{4}$$

7) $7x - 3 = 9x + 7$

$$\frac{-7x -7x}{-3 -3} = \frac{2x+10}{-10 -10}; 2x+10 = 0; 2x = -10; x = \boxed{-5}$$

8) $2x + 5 = 4x - 2$

$$\frac{-2x -2x}{5 = 2x -2} = \frac{2x-2=5}{+2 +2}; 2x-2=5; 2x = 7; x = \boxed{\frac{7}{2}}$$

9) $3(2x+4) = 4x+6$

$$\frac{6x+12}{-4x} = \frac{4x+6}{-4x}; 6x+12 = 4x+6; 2x+12 = 6; 2x = -6; x = \frac{-6}{2} = \boxed{-3}$$

10) $2(3x-5) = 9x+5$

$$\frac{6x-10}{-6x} = \frac{9x+5}{-6x}; 6x-10 = 9x+5; -10 = 3x+5; -5 = 3x+5; -5-5 = 3x+5-5; -10 = 3x; x = \frac{-10}{3} = \boxed{-\frac{10}{3}}$$

11) $2(5x-6) = 6x-4$

$$\frac{10x-12}{6x} = \frac{6x-4}{6x}; 10x-12 = 6x-4; 4x-12 = -4; 4x = 8; x = \boxed{2}$$

12) $2(4x+6) = 10x-6$

$$\frac{8x+12}{-8x} = \frac{10x-6}{-8x}; 8x+12 = 10x-6; 12 = 2x-6; +6 +6; 18 = 2x; x = \boxed{9}$$

13) $2x - 3 + 5x = 4 + 4x + 1$

$$\frac{7x-3}{-4x} = \frac{4x+5}{-4x}; 7x-3 = 4x+5; -4x -4x; 3x-3 = 5; +3 +3; 3x = 8; x = \frac{8}{3} = \boxed{\frac{8}{3}}$$

14) $6x + 6 - 4x = 12 + 7x - 21$

$$\frac{2x+6}{-2x} = \frac{7x-9}{-2x}; 2x+6 = 7x-9; -2x -2x; 6 = 5x-9; +9 +9; 5x = 15; x = \frac{15}{5} = \boxed{3}$$

15) $6(2x-1) - 5x = x+24$

$$\frac{12x-6-5x}{-x} = \frac{x+24}{-x}; 7x-6 = x+24; -x -x; 6x-6 = 24; +6 +6; 6x = 30; x = \frac{30}{6} = \boxed{5}$$

16) $2x+3(3x-4) = 6x-9$

$$\frac{2x+9x-12}{-6x} = \frac{6x-9}{-6x}; 11x-12 = 6x-9; -6x -6x; 5x-12 = -9; +12 +12; 5x = 3; x = \frac{3}{5} = \boxed{\frac{3}{5}}$$

17) $\frac{8}{3}x - 3 = \frac{2}{3}x + 5$

$$\frac{-\frac{2}{3}x}{\frac{6}{3}x-3} = \frac{-\frac{2}{3}x}{\frac{6}{3}x-3}; \frac{6}{3}x-3 = 5; +3 +3; \frac{6}{3}x = 8; x = \frac{8 \cdot 3}{6} = \frac{24}{6} = \boxed{4}$$

18) $5.2x - 7 = 2.2x + 8$

$$\frac{-2.2x}{3x-7} = \frac{8}{3x-7}; 3x-7 = 8; +7 +7; 3x = 15; x = \frac{15}{3} = \boxed{5}$$

[2]

1) $6x + 20 = -4$
 $\frac{-20 \quad -20}{6x} = -24 ; x = \frac{-24}{6} = -4$

2) $7 - 3x = -8$
 $\frac{-7 \quad -7}{-3x} = -15 ; x = \frac{-15}{-3} = 5$

3) $\frac{3}{4}x - 4 = 2$
 $\frac{+4 \quad +4}{\frac{3}{4}x} = 6 ; x = \frac{6}{\frac{3}{4}} = 8$

4) $\frac{4}{5}x - 1 = 11$
 $\frac{+1 \quad +1}{\frac{4}{5}x} = 12 ; x = \frac{12}{\frac{4}{5}} = 15$

5) $3x = 12 - x$
 $\frac{+x \quad +x}{4x} = 12 ; x = \frac{12}{4} = 3$

6) $8x = 4x + 24$
 $\frac{-4x \quad -4x}{4x} = 24 ; x = \frac{24}{4} = 6$

7) $5x + 3 = 2x - 3$
 $\frac{-2x \quad -2x}{3x+3} = -3 ; x = \frac{-6}{3} = -2$

8) $2x + 21 = 6x - 7$
 $\frac{-2x \quad -2x}{21} = 4x - 7 ; x = \frac{28}{4} = 7$

9) $8x - 8 - 2x = 2 + 4x - 4$
 $\frac{6x-8}{-4x} = \frac{4x-2}{-4x} ; x = \frac{6}{2} = 3$

10) $7x - 2 - 3x = 5 + 9x + 13$
 $\frac{4x-2}{-4x} = \frac{9x+18}{-4x} ; x = \frac{-20}{5} = -4$

11) $8(3x+2) - 10x = 12x - 2$
 $24x+16-10x = 12x-2 ; x = \frac{-18}{2} = -9$

12) $6x + 2(3x+5) = 8x + 13$
 $6x+6x+10 = 8x+13 ; x = \frac{3}{2}$

13) $\frac{12}{5}x + 6 = 12 - \frac{3}{5}x$
 $\frac{+ \frac{3}{5}x \quad + \frac{3}{5}x}{\frac{15}{5}x+6} = 6 ; x = \frac{6}{\frac{15}{5}} = 2$

14) $7.8x + 4 = 3.8x + 20$
 $\frac{-3.8x \quad -3.8x}{4x+4} = 16 ; x = 4$

15) 5 less than 3 times a number is 22
 $3x-5=22 ; x = \frac{27}{3} = 9$

16) 10 more than twice a number is 46
 $2x+10=46 ; x = \frac{36}{2} = 18$

17) 3 less than three-fourths of a number is 33
 $\frac{3}{4}x-3=33 ; x = \frac{36}{\frac{3}{4}} = 48$

18) 5 times a number is 12 less than that number
 $5x = x - 12 ; x = \frac{-12}{4} = -3$

[CH 1.7] Solve Literal Equations and Applications (Formula)

[1] 1) $V = Bh$ (for h)

2) $E = IR$ (for I)

$Bh = V ; h = \frac{V}{B}$

$IR = E ; I = \frac{E}{R}$

3) $V = \pi r^2 h$ (for h)

4) $A + B + C = 180$ (for A)

$\pi r^2 h = V ; h = \frac{V}{\pi r^2}$

$A + B + C = 180 ; A = 180 - B - C$

5) $ax + b = 0$ (for a)

6) $X = 2a + 5b$ (for a)

$ax + b = 0 ; a = \frac{-b}{x}$

$2a + 5b = X ; a = \frac{X - 5b}{2}$

7) $2x + y = 6$ (for x)

8) $P = 2L + 2W$ (for W)

$2x + y = 6 ; x = \frac{6-y}{2}$

$P = 2L + 2W ; W = \frac{P-2L}{2}$

9) $Y = 2X - 3Z$ (for X)

10) $X = \frac{a+b}{2}$ (for a)

$Y = 2X - 3Z ; X = \frac{Y+3Z}{2}$

$X = \frac{a+b}{2} ; a = 2X - b$

11) $C = \frac{5}{9}(F - 32)$ for F

12) $A = \frac{1}{2}(B + b)$ for B

$\frac{5}{9}(F - 32) = C ; F = \frac{9}{5}(C + 160) = \frac{9}{5}C + 160$

$A = \frac{1}{2}(B + b) ; B = 2A - b$

13) $A = P + Prt$ (for t)

14) $C = A - B$

$A = P + Prt ; t = \frac{A-P}{Pr}$

$C = A - B ; A = C^2 + B$

[2]

1) $P = 4S$ (for S)

$$4S = P$$

$$S = \frac{P}{4}$$

2) $I = Prt$ (for t)

$$Prt = I$$

$$\frac{Prt}{Pr} = \frac{I}{Pr}$$

$$t = \frac{I}{Pr}$$

3) $V = LWH$ (for W)

$$\frac{LWH}{LH} = \frac{V}{LH}$$

$$W = \frac{V}{LH}$$

4) $V - E + F = 2$ (for V)

$$+E - F + E - F$$

$$V = 2 + E - F$$

5) $Y = mx + b$ (for x)

$$mx + b = Y$$

$$-b \quad -b$$

$$mx = Y - b$$

$$x = \frac{Y - b}{m}$$

6) $a = 3b - 4c$ (for b)

$$3b - 4c = a$$

$$+4c \quad +4c$$

$$3b = a + 4c$$

$$b = \frac{a + 4c}{3}$$

7) $3x + 4y = 12$ (for y)

$$-3x \quad -3x$$

$$4y = -3x + 12$$

$$\frac{4y}{4} = \frac{-3x + 12}{4}$$

$$y = -\frac{3}{4}x + 3$$

8) $ax + by = c$ (for x)

$$-by \quad -by$$

$$ax = c - by$$

$$\frac{ax}{a} = \frac{c - by}{a}$$

$$x = \frac{c - by}{a}$$

9) $V = \frac{KT}{P}$ (for K)

$$\frac{KT}{P} = V$$

$$P\left(\frac{KT}{P}\right) = P(V)$$

$$\frac{KT}{\cancel{P}} = PV$$

$$K = \frac{PV}{T}$$

10) $D = \frac{C - S}{n}$ (for C)

$$\frac{C - S}{n} = D$$

$$n\left(\frac{C - S}{n}\right) = n(D)$$

$$C - S = nD$$

$$+S \quad +S$$

$$C = nD + S$$

11) $A = P + Prt$ (for r)

$$P + Prt = A$$

$$-P \quad -P$$

$$Prt = A - P$$

$$\frac{Prt}{PE} = \frac{A - P}{PE}$$

$$r = \frac{A - P}{Pt}$$

12) $S = 2\pi r^2 - 2\pi rh$ (for h)

$$2\pi r^2 - 2\pi rh = S$$

$$-2\pi r^2 \quad -2\pi r^2$$

$$-2\pi rh = S - 2\pi r^2$$

$$\frac{-2\pi rh}{-2\pi r} = \frac{S - 2\pi r^2}{-2\pi r}$$

$$h = \frac{S - 2\pi r^2}{-2\pi r}$$

13) $A = \frac{1}{2}h(B + b)$ (for b)

$$\frac{1}{2}h(B + b) = A$$

$$2\left(\frac{1}{2}h(B + b)\right) = 2A$$

$$h(B + b) = 2A$$

$$\frac{h(B + b)}{h} = \frac{2A}{h}$$

$$B + b = \frac{2A}{h}$$

$$-B \quad -B$$

$$b = \frac{2A}{h} - B$$

ICH 1.6.4.1 Consecutive Integer Problems

1) Find the four consecutive odd integers whose sum is

112.

1st #	X
2nd #	X+2
3rd #	X+4
4th #	X+6
total	112

$$(X) + (X+2) + (X+4) + (X+6) = 112$$

$$4X + 12 = 112$$

$$4X = 100$$

$$X = \frac{100}{4} = 25$$

$\boxed{25, 27, 29, 31}$

2) Find three consecutive integers such that the sum of the first and the third is 40.

First #	X
Second #	X+1
Third #	X+2

$$(X) + (X+2) = 40$$

$$2X + 2 = 40$$

$$-2 \quad -2$$

$$2X = 38$$

$$X = \frac{38}{2} = 19$$

$\boxed{19, 20, 21}$

3) Find the 4 consecutive integers such that the sum of the second and fourth is 132.

1st #	X
2nd #	X+1
3rd #	X+2
4th #	X+3

$$(X+1) + (X+3) = 132$$

$$2X + 4 = 132$$

$$2X = 128$$

$$X = 64$$

$\boxed{64, 65, 66, 67}$

4) Find the three consecutive integers such that the sum of the first 2 integers is 24 more than the third integers.

1st #	X
2nd #	X+1
3rd #	X+2

$$(X) + (X+1) = (X+2) + 24$$

$$2X + 1 = X + 26$$

$$X + 1 = 26$$

$$X = 25$$

$\boxed{25, 26, 27}$

5) Find the 3 consecutive odd integers such that the sum of the first and second is 27 less than 3 times the third.

1st #	X
2nd #	X+2
3rd #	X+4

$$X + (X+2) = 3(X+4) - 27$$

$$2X + 2 = 3X + 12 - 27$$

$$2X + 2 = 3X - 15$$

$$-X \quad -X$$

$$-13 = X$$

$\boxed{19, 19, 21}$

6) Find the 3 consecutive even integers such that the sum of the smallest and twice the second is 20 more than the third?

1st #	X
2nd #	X+2
3rd #	X+4

$$X + 2(X+2) = (X+4) + 20$$

$$X + 2X + 4 = X + 24$$

$$3X + 4 = X + 24$$

$$-X \quad -X$$

$$2X + 4 = 20$$

$$2X = 16$$

$$X = 8$$

$\boxed{10, 12, 14}$

7) Find the three consecutive even integers such that the sum of the first two integers minus the third integer is 4.

First #	X
2nd #	X+2
3rd #	X+4

$$X + (X+2) - (X+4) = 4$$

$$2X + 2 - X - 4 = 4$$

$$X - 2 = 4$$

$$X = 6$$

$\boxed{6, 8, 10}$

8) Find two consecutive integers such that twice the first integer minus the second integer is 8.

1st #	X
2nd #	X+1

$$2(X) - (X+1) = 8$$

$$2X - X - 1 = 8$$

$$X - 1 = 8$$

$$X = 9$$

$\boxed{9, 10}$

9) Find the three consecutive integers such that the sum of the first two integers is equal to 4 times the third.

1st #	X
2nd #	X+1
3rd #	X+2

$$(X) + (X+1) = 4(X+2)$$

$$2X + 1 = 4X + 8$$

$$-2X \quad -2X$$

$$-7 = 2X$$

$$X = -\frac{7}{2}$$

$\boxed{-\frac{7}{2}}$

10) Find the 3 consecutive even integers such that the sum of the first two integers is equal to three times the third.

1st	X
2nd	X+2
3rd	X+4

$$(X) + (X+2) = 3(X+4)$$

$$2X + 2 = 3X + 12$$

$$-X \quad -X$$

$$-10 = X$$

$\boxed{-10, -8, -6}$

[CH 1.6.4.2] World Problems (Relation and Total)

[1]

1) The larger of two numbers is twice the smaller. If the sum of the two numbers is 96, find the numbers.

smaller	X
Larger	2X
sum	96

$$\begin{aligned} (x) + (2x) &= 96 \\ 3x &= 96 \\ x &= \frac{96}{3} = \boxed{32}; 2x = \boxed{64} \end{aligned}$$

2) One number is 5 times another. If their difference is 96, find the numbers.

another	X
one Number	5X
difference	96

$$\begin{aligned} 5x - x &= 96 \\ 4x &= 96 \\ x &= \frac{96}{4} = \boxed{24} \\ 5x &= \boxed{120} \end{aligned}$$

3) A number is one-half of another number. Find the numbers if their difference is 28.

another	X
A Number	$\frac{1}{2}X$
difference	28

$$\begin{aligned} x - \frac{1}{2}x &= 28 \\ \frac{1}{2}x &= 28 \\ 2(\frac{1}{2}x) &= 2(28) \\ x &= \boxed{56}; \frac{1}{2}x = \boxed{28} \end{aligned}$$

4) A number is $\frac{2}{3}$ of another number. The sum of the two numbers is 50. Find the numbers.

another	X
A Number	$\frac{2}{3}X$
sum	50

$$\begin{aligned} x + \frac{2}{3}x &= 50 \\ \frac{3}{3}x + \frac{2}{3}x &= 50 \\ \frac{5}{3}x &= 50 \\ x &= \frac{3 \cdot 50}{5} = \frac{150}{5} = \boxed{30} \\ \frac{2}{3}x &= \frac{2}{3}(30) = \boxed{20} \end{aligned}$$

5) Herbert is 5 times as old as Mike. If the sum of their ages is 18 years, find the age of each boy.

Mike	M
Herbert	5M
sum	18

$$\begin{aligned} M + 5M &= 18 \\ 6M &= 18 \\ M &= \frac{18}{6} = \boxed{3}; 5M = \boxed{15} \end{aligned}$$

6) Bob and Dan earned a total of \$24 shoveling snow. If Bob earned 3 times as much as Dan, how much did each boy earn?

Dan	D
Bob	3D
Total	24

$$\begin{aligned} D + 3D &= 24 \\ 4D &= 24 \\ D &= \frac{24}{4} = \boxed{6}; 3D = \boxed{18} \end{aligned}$$

7) Lily spent 3 times as much as her sister Sue. If the girls spent \$24, how much did each girl spend?

Lily	3X
Sue	X
Total	24

$$\begin{aligned} x + 3x &= 24 \\ 4x &= 24 \\ x &= \frac{24}{4} = \boxed{6}; 3x = 3(6) = \boxed{18} \end{aligned}$$

8) Carl and Richard earned \$10.50 delivering packages. If they agreed that Carl should get 1.5 times as much as Richard gets, how much did each boy receive?

Richard	R
Carl	1.5R
Total	10.50

$$\begin{aligned} R + 1.5R &= 10.50 \\ 2.5R &= 10.50 \\ R &= \frac{10.5}{2.5} = \frac{105}{25} = \boxed{4.2} \\ C &= (1.5)(4.2) = \boxed{6.3} \end{aligned}$$

9) A house and a lot are worth \$30,000. If the house is worth 5 times as much as the lot find how much each is worth.

LOT	L
HOUSE	5L
Total	30,000

$$\begin{aligned} L + 5L &= 30,000 \\ 6L &= 30,000 \\ L &= \frac{30,000}{6} = \boxed{5000}; 5L = \boxed{25,000} \end{aligned}$$

10) The larger of two numbers is 5 more than the smaller. The smaller number plus twice the larger equals 100. Find the numbers.

Smaller	X
Larger	X+5
2(Larger) + smaller	100

$$\begin{aligned} x + 2(x+5) &= 100 \\ 3x + 10 &= 100 \\ -10 & \quad -10 \\ 3x &= 90 \\ x &= \frac{90}{3} = \boxed{30} \\ x+5 &= \boxed{35} \end{aligned}$$

11) One number is 2 smaller than another. If 4 times the larger is subtracted from 5 times the smaller, the result is 10. Find the numbers.

another	X
one Number	X-2
5(smaller) - 4(larger)	10

$$\begin{aligned} 5(\text{smaller}) - 4(\text{larger}) &= 10 \\ 5(x-2) - 4(x) &= 10 \\ 5x - 10 - 4x &= 10 \\ x - 10 &= 10 \\ x &= \frac{10+10}{1} = \boxed{20}; x-2 = 20-2 = \boxed{18} \end{aligned}$$

12) A coat costs \$15 more than a dress. Two coats and 4 dresses cost \$150. Find the cost of each.

dress	d
coat	d+15
2 coats + 4 dress	150

$$\begin{aligned} 2(\text{coats}) + 4(\text{dresses}) &= 150 \\ 2(d+15) + 4(d) &= 150 \\ 2d + 30 + 4d &= 150 \\ 6d + 30 &= 150 \\ 6d &= 120 \\ d &= \frac{120}{6} = \boxed{20} \\ c &= 20 + 15 = \boxed{35} \end{aligned}$$

13) Sam is 4 years older than Catherine. If 4 times Catherine's age is 32 years. Find the age of each.

Catherine	C
Sam	C+4
4(Catherine)	32

$$\begin{aligned} 4(C) &= 32 \\ C &= \frac{32}{4} = \boxed{8} \\ \text{Sam} &= 8 + 4 = \boxed{12} \end{aligned}$$

14) Mr. Powers travels 12 miles less each day in going to and from his job than Mr. Clay does. The difference between the distance Mr. Clay travels in 6 days and the distance that Mr. Powers travels in 5 days is 96 miles. How far does each one travel each day?

clay	C
Powers	C-12
6(clay) - 5(powers)	96

$$\begin{aligned} 6(\text{clay}) - 5(\text{powers}) &= 96 \\ 6(C) - 5(C-12) &= 96 \\ 6C + (-5)(C) + (-5)(-12) &= 96 \\ 6C - 5C + 60 &= 96 \\ C + 60 &= 96 \\ -60 & \quad -60 \\ C &= \boxed{36} \\ P &= 36 - 12 = \boxed{24} \end{aligned}$$

$$\frac{\%}{100} = \frac{\text{is}}{\text{of}}$$

[CH 1.6.4.3] Simple Percent Problems

(1) 1) What is 20% of 70?

$$\frac{20}{100} = \frac{X}{70}; 100X = (20)(70)$$

$$X = \frac{20 \cdot 70}{100} = \boxed{14}$$

2) 5 is what percent of 20?

$$\frac{X}{100} = \frac{5}{20}; 20X = (5)(100)$$

$$X = \frac{5 \cdot 100}{20} = 5 \cdot 5 = \boxed{25}\%$$

3) 30% of what number is 12?

$$\frac{30}{100} = \frac{12}{X}; 30X = 100 \cdot 12$$

$$X = \frac{100 \cdot 12}{30} = \frac{1200}{3} = \boxed{40}$$

4) 15 is 30% of what number?

$$\frac{30}{100} = \frac{15}{X}; 30X = 15 \cdot 100$$

$$X = \frac{15 \cdot 100}{30} = \frac{1500}{3} = \boxed{50}$$

5) 100 is what percent of 250?

$$\frac{X}{100} = \frac{100}{250}; 250X = 100 \cdot 100$$

$$X = \frac{100 \cdot 100}{250} = \frac{10000}{25} = \boxed{40}\%$$

6) What number is 25% of 40?

$$\frac{25}{100} = \frac{X}{40}; 100X = (40)(25)$$

$$X = \frac{40 \cdot 25}{100} = \frac{1000}{100} = \boxed{10}$$

7) 40% of what number is 20?

$$\frac{40}{100} = \frac{20}{X}; 40X = (20)(100)$$

$$X = \frac{20 \cdot 100}{40} = \frac{2000}{4} = \boxed{50}$$

8) What percent of 20 is 5?

$$\frac{X}{100} = \frac{5}{20}; 20X = (100)(5)$$

$$X = \frac{100 \cdot 5}{20} = \frac{500}{2} = \boxed{25}\%$$

9) What is the percent increase from 20 to 60?

Percent increase = $\frac{\text{Second \#} - \text{First \#}}{\text{First \#}} \times 100$

$$= \frac{60 - 20}{20} \times 100 = \frac{40}{20} \times 100 = 2 \times 100 = \boxed{200}\%$$

10) How much did the percent decrease from 200 to 100?

Percent decrease = $\frac{\text{Second \#} - \text{First \#}}{\text{First \#}} \times 100$

$$= \frac{100 - 200}{200} \times 100 = \frac{-100}{200} \times 100 = -\frac{1}{2} \times 100 = \boxed{-50}\%$$

50% decrease

$$\text{Percent change} = \frac{\text{Second \#} - \text{First \#}}{\text{First \#}} \times 100$$

[2]

1) 20 is what percent of 50?

$$\frac{X}{100} = \frac{20}{50}; 50X = 20 \cdot 100$$

$$X = \frac{20 \cdot 100}{50} = \frac{2000}{5} = \boxed{40}\%$$

2) What number is 200% of 12?

$$\frac{200}{100} = \frac{X}{12}; 100X = 200 \cdot 12$$

$$X = \frac{200 \cdot 12}{100} = 2 \cdot 12 = \boxed{24}$$

3) 16 is 20% of what number?

$$\frac{20}{100} = \frac{16}{X}; 20X = 16 \cdot 100$$

$$X = \frac{16 \cdot 100}{20} = \frac{1600}{2} = \boxed{80}$$

4) 90 is what percent of 180?

$$\frac{X}{100} = \frac{90}{180}; 180X = 90 \cdot 100$$

$$X = \frac{90 \cdot 100}{180} = \frac{9000}{18} = \boxed{50}$$

5) What number is 40% of 200?

$$\frac{40}{100} = \frac{X}{200}; 100X = (40)(200)$$

$$X = \frac{40 \cdot 200}{100} = \boxed{80}$$

6) 30% of what number is 60?

$$\frac{30}{100} = \frac{60}{X}; 30X = (60)(100)$$

$$X = \frac{60 \cdot 100}{30} = \frac{6000}{3} = \boxed{200}$$

7) What percent of 60 is 20?

$$\frac{X}{100} = \frac{20}{60}; 60X = (20)(100)$$

$$X = \frac{20 \cdot 100}{60} = \frac{2000}{6} = \frac{1000}{3} = \boxed{33\frac{1}{3}}\%$$

8) 15% of 500 is what number?

$$\frac{15}{100} = \frac{X}{500}; 100X = 15 \cdot 500; X = \frac{15 \cdot 500}{100} = \boxed{75}$$

9) How much did the percent increase from 100 to 200?

Percent increase = $\frac{\text{2nd \#} - \text{1st \#}}{\text{1st \#}} \times 100$

$$= \frac{200 - 100}{100} \times 100 = \frac{100}{100} \times 100 = \boxed{100}\%$$

10) What is the percent decrease from 200 to 100?

Percent decrease = $\frac{\text{2nd \#} - \text{1st \#}}{\text{1st \#}} \times 100$

$$= \frac{100 - 200}{200} \times 100 = \frac{-100}{200} \times 100 = -\frac{1}{2} \times 100 = \boxed{-50}\%$$

50% decreased

$$\frac{\%}{100} = \frac{\text{Part or Value}}{\text{Whole Value}}$$

[CH 1.6.4.4] Simple Percent Word Problems

[1]

1) A team won 80% of its games. If it won 68 games, how many games did it play?

$$\frac{80}{100} = \frac{68}{X}; 80X = 68 \cdot 100; 80X = 6800; X = \frac{6800}{80} = 85$$

2) A team won 80% of its games. If it lost 10 games, how many games did it play?

$$\frac{20}{100} = \frac{10}{X}; 20X = (100)(10); 20X = 1000; X = \frac{1000}{20} = 50$$

3) On a math test, Paul answered 18 problems correctly and scored 60%. How many problems were on the test?

$$\frac{60}{100} = \frac{18}{X}; 60X = (100)(18); 60X = 1800; X = \frac{1800}{60} = 30$$

4) On a math test, Paul answered 12 problems incorrectly and scored 60%. How many problems were on the test?

100% < 60% correct
40% incorrect

$$\frac{40}{100} = \frac{12}{X}; 40X = 1200; X = 30$$

5) In a class of 40 students, 10 students received a grade of B. What percent of the class received a grade of B?

$$\frac{X}{100} = \frac{10}{40}; 40X = (100)(10); 40X = 1000; X = \frac{1000}{40} = 25\%$$

6) In a class of 50 students, 10 students received a grade of A. What percent of the class received other than a grade of A?

50 < 10 A
40 Not A

$$\frac{X}{100} = \frac{40}{50}; 50X = (100)(40); 50X = 4000; X = \frac{4000}{50} = 80\%$$

7) Peter's weekly gross pay for his job is \$200, but 20% of his check is withheld. How much is withheld?

$$\frac{20}{100} = \frac{X}{200}; 100X = (200)(20); 100X = 4000; X = \frac{4000}{100} = 40$$

8) 54 out of 216 applicants passed their exams. What percent of the applicants passed? What percent did not pass?

pass: $\frac{54}{216} = \frac{X}{100}; 216X = 5400; X = 25\%$
didn't pass: $100\% - 25\% = 75\%$

9) Bryan, salesman, made a 9% commission on all items he sells. One week he made \$720. What were his gross sales for the week?

$$\frac{720}{X} = \frac{9}{100}; 9X = 72,000; X = 8,000$$

10) Audrey will receive a 10% raise in her salary. Her present salary is \$60,000. What will her new salary be?

raise 100% + 10% = 110%

$$\frac{60,000}{X} = \frac{100}{110}; 110X = 6,600,000; X = 66,000$$

11) The Paul's monthly salary increased from \$2000 to \$3000. What was the percent increase of his salary?

2nd # \$3000
1st # \$2000

$$\frac{\text{Percent Increase}}{\text{Decrease}} = \frac{\text{2nd \#} - \text{1st \#}}{\text{1st \#}} \times 100 = \frac{3000 - 2000}{2000} \times 100 = \frac{1000}{2000} \times 100 = 50$$

12) The daily sale of Victor's Store decreased from \$4,000 to \$3,000 yesterday. What was the percent decrease?

2nd # \$3000
1st # \$4000

$$\frac{\text{Percent Decrease}}{\text{Increase}} = \frac{\text{2nd \#} - \text{1st \#}}{\text{1st \#}} \times 100 = \frac{3000 - 4000}{4000} \times 100 = \frac{-1000}{4000} \times 100 = -25\%$$

25% decreased

[CH 1.7-2] Geometry Word Problems

[1]

1) The length of a rectangle is 12. What is the width if the perimeter is 36?

$$P = 2L + 2W$$

$$36 = 2(12) + 2W$$

$$36 = 24 + 2W$$

$$2W = 12$$

$$W = 6$$

2) The length of a rectangle is three more than the width. If the perimeter is 50, what are the length and width?

$$L = W + 3$$

$$P = 2L + 2W$$

$$50 = 2(W + 3) + 2W$$

$$44 = 4W; W = 11$$

$$L = W + 3 = 11 + 3 = 14$$

3) The perimeter of a square is 64. What is the length of a side of the square?

$$P = 4s$$

$$64 = 4s; s = 16$$

4) The length of a rectangle is 3 less than the width. If the perimeter is 50, what are the length and the width?

$$L = W - 3$$

$$P = 2L + 2W$$

$$50 = 2(W - 3) + 2W$$

$$56 = 4W; \frac{4W}{4} = \frac{56}{4}$$

$$W = 14$$

5) The width of a rectangle is six less than the length. What are the length and the width if the perimeter is 40?

$$W = L - 6$$

$$P = 2L + 2W$$

$$40 = 2L + 2(L - 6)$$

$$52 = 4L; \frac{52}{4} = \frac{52}{4}$$

$$L = 13$$

$$W = L - 6 = 13 - 6 = 7$$

6) The area of a triangle is 24 square inches and the base is 8 inches. What is the height of the triangle?

$$A = \frac{1}{2}bh$$

$$24 = \frac{1}{2}(8)(h)$$

$$24 = 4h; \frac{4h}{4} = \frac{24}{4}$$

$$h = 6$$

7) The second side of a triangle is 8 inches less than the first side. The third side is 14 inches more than the first side. The perimeter is 63 inches. Find the three sides.

side 1	X
side 2	X - 8
side 3	X + 14

$$X + (X - 8) + (X + 14) = 63$$

$$3X + 6 = 63; 3X = 57; X = 19$$

① X - 8 = 11; X + 14 = 33

8) The lengths of the sides of a triangle are represented by 3 consecutive even integers. If the perimeter is 96 feet, find the length of its sides.

side 1	X
side 2	X + 2
side 3	X + 4

$$X + (X + 2) + (X + 4) = 96$$

$$3X + 6 = 96; 3X = 90; X = 30$$

① X + 2 = 32
② X + 4 = 34

9) The perimeter of a triangle is 40". The second side is 1 more than twice the first side, and the third side is 2" less than the 2nd side. Find the length of each side.

side 1	X
side 2	2X + 1
side 3	(2X + 1) - 2

$$X + (2X + 1) + [(2X + 1) - 2] = 40$$

$$3X + 1 + [2X - 1] = 40$$

$$\Rightarrow 5X = 40; X = 8$$

① 2X + 1 = 17; ② 17 - 1 = 16

Rate · Time = Distance

CH 1.7-3] Motion Problems

1) A truck is traveling 60 mph and a van traveling 40 mph left the same gas station at the same time and drove in opposite directions. In how many hours were the vehicles 600 miles apart?

$R \cdot T = D$

60	X	
40	X	
		600

→

60	X	60X
40	X	40X
		600

d_1 d_2 $d_1 + d_2 = d_T$

$60X + 40X = 600$
 $100X = 600$
 $X = \frac{600}{100} = 6$ hrs

2) Two boats departed from the harbor at the same time. One sailed east at the rate of 50 mph; the other sailed west at the rate of 90 mph. In how many hours were they 1260 miles apart?

$R \cdot T = D$

50	X	
90	X	
		1260

→

50	X	50X
90	X	90X
		1260

d_1 d_2 $d_1 + d_2 = d_T$

$50X + 90X = 1260$
 $140X = 1260$
 $X = \frac{1260}{140} = 9$ hrs

3) Two planes are 1,100 miles apart. At 7 A.M. they start traveling toward each other at average rates of 140 and 135 mph. At what time will they pass each other?

$R \cdot T = D$

140	X	140X
135	X	135X
		1100

d_1 d_2 $d_1 + d_2 = d_T$

$140X + 135X = 1100$
 $275X = 1100$
 $X = \frac{1100}{275} = 4$ hrs

7 AM + 4 hrs = 11 AM

4) Orangetown and Appletown are 512 miles apart. A car traveled from Appletown towards Orangetown at the rate of 56 mph. Another car from Orangetown towards Appletown at the rate of 72 mph. How many miles did each travel before they meet?

$R \cdot T = D$

56	X	56X
72	X	72X
		512

d_1 d_2 $d_1 + d_2 = d_T$

$56X + 72X = 512$
 $128X = 512$
 $X = \frac{512}{128} = 4$ hrs

Distance
 A → O = $56(4) = 224$
 O → A = $72(4) = 288$

5) A businessman made a trip of 490 miles by car and train. He traveled 5 hours by car and 2 hours by train. If the train averaged 35 mph more than the car, find the rate of each.

$R \cdot T = D$

X	5	5X
X+35	2	2(X+35)
		490

d_1 d_2 $d_1 + d_2 = d_T$

$5X + 2(X+35) = 490$
 $5X + 2X + 70 = 490$
 $7X + 70 = 490$
 $7X = 490 - 70 = 420$
 $X = \frac{420}{7} = 60$ (car)

Train = $60 + 35 = 95$ (Train)

6) A motorcyclist made a trip of 380 miles in 5 hours. Before noon he averaged 82 mph, and in the afternoon he averaged 52 mph. At what time did he begin his trip and when did he end it?

$R \cdot T = D$

82	X	82X
52	5-X	52(5-X)
		380

d_1 d_2 $d_1 + d_2 = d_T$

$82X + 52(5-X) = 380$
 $82X + 260 - 52X = 380$
 $30X + 260 = 380$
 $30X = 380 - 260 = 120$
 $X = \frac{120}{30} = 4$ hrs

before noon = 12 - 4 = 8 AM
 after noon = 12 + 4 = 4 PM

7) Two cars started at the same time from two rest stops which are 1550 miles apart and drove toward each other. One car drove at 330 mph, and the other at 370 mph. In how many hours are the cars still 150 miles apart?

$R \cdot T = D$

330	X	330X
370	X	370X
		150

d_1 d_2 d_3 $d_1 + d_2 + d_3 = d_T$

$330X + 370X + 150 = 1550$
 $700X + 150 = 1550$
 $700X = 1550 - 150 = 1400$
 $700X = 1400$
 $X = \frac{1400}{700} = 2$ hrs

8) At 2 P.M. two planes started flying towards each other from airports which were 1,701 miles apart at average rates of 245 and 312 mph. At what time were the planes still 30 miles apart?

$R \cdot T = D$

245	X	245X
312	X	312X
		30

d_1 d_2 d_3 $d_1 + d_2 + d_3 = d_T$

$245X + 312X + 30 = 1701$
 $557X + 30 = 1701$
 $557X = 1701 - 30 = 1671$
 $X = \frac{1671}{557} = 3$ hrs

2 PM + 3 hrs = 5 PM

9) A taxicab traveling 59 mph and a bus traveling 44 mph leave the same station at the same time and drive in the same direction. In how many hours will they be 135 miles apart?

$R \cdot T = D$

59	X	59X
44	X	44X
		135

d_1 d_2 $d_1 - d_2 = d_T$

$59X - 44X = 135$
 $15X = 135$
 $X = \frac{135}{15} = 9$ hrs

10) At 8:00 A.M. two battleships started from the same naval base and traveled north. One ship averaged 34 mph, and the other ship averaged 21 mph. At what time were the battleships 104 miles apart?

$R \cdot T = D$

34	X	34X
21	X	21X
		104

d_1 d_2 $d_1 - d_2 = d_T$

$34X - 21X = 104$
 $13X = 104$
 $X = \frac{104}{13} = 8$ hrs

8 AM + 8 hrs = 4 PM

11) Mr. Jim left his workplace and drove west at the rate of 20 mph. One hour later, Mr. Kim left the same building at the rate of 25 mph, also traveling east. In how many hours did Mr. Kim overtake Mr. Jim?

$R \cdot T = D$

20	X+1	20(X+1)
25	X	25X

d_1 d_2 $d_1 = d_2$

$20(X+1) = 25X$
 $20X + 20 = 25X$
 $-20X = -20X$
 $20 = 5X$
 $X = \frac{20}{5} = 4$ hrs

12) Susan left her home at 7 A.M., driving her car at the rate of 30 mph. At 9 A.M. her sister Marion drove after her along the same highway, traveling at the rate of 45 mph. In how many hours did Marion pass Susan?

$R \cdot T = D$

30	X+2	30(X+2)
45	X	45X

d_1 d_2 $d_1 = d_2$

$30(X+2) = 45X$
 $30X + 60 = 45X$
 $-30X = -30X$
 $60 = 15X$
 $X = \frac{60}{15} = 4$ hrs

13) Mr. Lee spent 6 hours on a trip out into the country and back. He walked out at the rate of 4 mph and walked back at the rate of 2 mph. How far out into the country did he go?

$R \cdot T = D$

4	X	4X
2	6-X	2(6-X)

d_1 d_2 $d_1 = d_2$

$4X = 2(6-X)$
 $4X = 12 - 2X$
 $6X = 12$
 $X = \frac{12}{6} = 2$ hrs

Distance = $4X = 4(2) = 8$ miles

14) Ronald drove away from home in a car at the rate of 28 mph. He walked back at the rate of 4 mph. The round trip required 4 hours. How far did Ronald ride?

$R \cdot T = D$

28	X	28X
4	4-X	4(4-X)

d_1 d_2 $d_1 = d_2$

$28X = 4(4-X)$
 $28X = 16 - 4X$
 $32X = 16$
 $X = \frac{16}{32} = 0.5$ hrs

Distance = $28X = 28(0.5) = 14$ miles

15) A round trip in a helicopter lasted 3 hours. If the helicopter flew away from the airport at 100 mph and returned at the rate of 50 mph, what was its greatest distance from the airport?

$R \cdot T = D$

100	X	100X
50	3-X	50(3-X)

d_1 d_2 $d_1 = d_2$

$100X = 50(3-X)$
 $100X = 150 - 50X$
 $+50X = +50X$
 $150X = 150$
 $X = \frac{150}{150} = 1$ hr

Distance = $100X = 100(1) = 100$ miles

[CH 1.7-4] Dry Mixture Problems

$Rate \cdot \# = Total\ Value$

1) A dealer wishes to mix coffee worth 65 cents per pound with coffee worth 90 cents per pound in order to produce 40 pounds of coffee which can be sold at 75 cents per pound. How many pounds of each type should he use?

	Rate	#	Total Value
65¢	X		65X
90¢	40-X		90(40-X)
Mixture (75¢)	75	40	(75)(40)

$$65X + 90(40-X) = 75(40)$$

$$65X + 3600 - 90X = 3000$$

$$-25X + 3600 = 3000$$

$$-25X = -600$$

$$X = 600/25 = 24$$

7) A baker has cookies worth \$.95 per pound and cookies worth \$1.70 per pound. How many pounds of each kind must he use to produce a 45 pound mixture to sell for \$1.25 per pound?

95¢	X	95X
170¢	(45-X)	170(45-X)
Mixture (125¢)	45	125(45)

$$95X + 170(45-X) = 125(45)$$

$$95X + 7650 - 170X = 5625$$

$$-75X = -2025$$

$$X = \frac{-2025}{-75} = 27$$

2) How many pounds of candy worth 70 cents per pound must be mixed with 30 pounds of candy worth 90 cents per pound to produce a mixture which can be sold for 85 cents per pound?

70¢	X	70X
90¢	30	90(30)
Mixture (85¢)	30+X	85(30+X)

$$70X + 90(30) = 85(30+X)$$

$$70X + 2700 = 2550 + 85X$$

$$85X - 70X = 2700 - 2550$$

$$15X = 150$$

$$X = 150/15 = 10$$

3) A grocer mixed nuts worth 80 cents per pound with nuts worth 50 cents per pound. How many pounds of each did he use to make a mixture of 30 pounds to sell at 75 cents per pound?

80¢	X	80X
50¢	30-X	50(30-X)
Mixture (75¢)	30	(75)(30)

$$80X + 50(30-X) = 75(30)$$

$$80X + 1500 - 50X = 2250$$

$$80X - 50X = 2250 - 1500$$

$$30X = 750$$

$$X = 750/30 = 25$$

4) If almonds sell at \$1.20 per pound and walnuts sell for \$.75 per pound, how many pounds of each must be used to make 45 pounds of a mixture to sell at \$1.00 per pound?

1.20	X	120X
.75	45-X	75(45-X)
Mixture (\$1.00)	45	(100)(45)

$$120X + 75(45-X) = 100(45)$$

$$120X + 3375 - 75X = 4500$$

$$120X - 75X = 4500 - 3375$$

$$45X = 1125$$

$$X = 1125/45 = 25$$

5) A seedman has seeds worth \$.70 per pound and seeds worth \$.90 per pound. How many pounds of each must he use to make 300 pounds worth \$.75 per pound?

70¢	X	70X
90¢	300-X	90(300-X)
Mixture (75¢)	300	75(300)

$$70X + 90(300-X) = 75(300)$$

$$70X + 27000 - 90X = 22500$$

$$70X - 90X = 22500 - 27000$$

$$-20X = -4500$$

$$X = -4500/-20 = 225$$

6) A dealer wishes to produce 300 gallons of oil worth 40 cents a quart by mixing oil worth 36 cents a quart with oil worth 52 cents a quart. How many quarts of each kind of oil should he use?

36	X	36X
52	300-X	52(300-X)
Mixture (40)	300	(40)(300)

$$36X + 52(300-X) = 40(300)$$

$$36X + 15600 - 52X = 12000$$

$$36X - 52X = 12000 - 15600$$

$$-16X = -3600$$

$$X = \frac{-3600}{-16} = 225$$

8) A florist sold roses at \$3.50 per dozen and carnations at \$2.50 per dozen. In all he sold 14 dozen, and his total receipts were \$43. How many dozen of each kind of flower did he sell?

Rose	350	X	350X
Carnation	250	14-X	250(14-X)
Total		14	4300

$$350X + 250(14-X) = 4300$$

$$350X + 3500 - 250X = 4300$$

$$350X - 250X = 4300 - 3500$$

$$100X = 800$$

$$X = \frac{800}{100} = 8$$

9) One evening 478 tickets were sold at the local movie. The charges for admission were \$.85 for adults and \$.50 for children. The total receipts for the performance were \$375.50. How many adults and how many children attended?

Adult	.85	X	.85X
Children	.50	478-X	.50(478-X)
Total		478	375.50

$$.85X + .50(478-X) = 375.50$$

$$.85X + 239.00 - .50X = 375.50$$

$$.85X - .50X = 375.50 - 239.00$$

$$.35X = 136.50$$

$$X = \frac{136.50}{.35} = 390$$

10) How many pounds of 65-cent coffee must be mixed with 10 pounds of 90-cent coffee to make a mixture worth 70 cents a pound?

65¢	X	65X
90¢	10	90(10)
Mixture	10	70(10)

$$65X + 90(10-X) = 70(10)$$

$$65X + 900 - 90X = 700$$

$$65X - 90X = 700 - 900$$

$$-25X = -200$$

$$X = \frac{-200}{-25} = 8$$

11) How many pounds of tear worth \$1.80 a pound must be mixed with 15 pounds of tear worth \$1.10 a pound to produce a mixture worth \$1.50 a pound?

180	X	180X
110	15	110(15)
Mixture	X+15	150(X+15)

$$180X + 110(15) = 150(X+15)$$

$$180X + 1650 = 150X + 2250$$

$$180X - 150X = 2250 - 1650$$

$$30X = 600$$

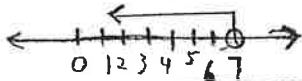
$$X = \frac{600}{30} = 20$$

[CH1.8] Solve the Inequalities and Graph

[1] Solve the inequalities and graph the solution on the number line

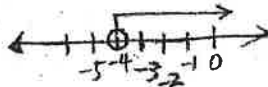
1) $x - 5 < 2$
 $+5 \quad +5$

$x < 7$



2) $-3x < 12$
 $\frac{-3}{-3} \quad \frac{12}{-3}$

$x > -4$



3) $6x + 2 \geq x - 8$
 $-x \quad -x$

$5x + 2 \geq -8$
 $-2 \quad -2$

$5x \geq -10$
 $\frac{5x}{5} \geq \frac{-10}{5}; x \geq -2$



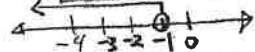
4) $5x + 7 > 13 + 11x$
 $-5x \quad -5x$

$7 > 13 + 6x$

$-13 \quad -13$

$-6 > 6x$

$-1 > x$ or $x < -1$

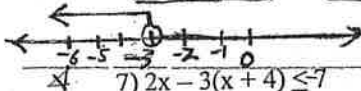


5) $2x - 9 > 3(x - 2)$

$2x - 9 > 3x - 6$
 $-2x \quad -2x$

$-9 > x - 6$
 $+6 \quad +6$

$-3 > x$ or $x < -3$



6) $4(6 - 2x) \leq 5x - 2$

$24 - 8x \leq 5x - 2$

$+8x \quad +8x$

$24 \leq 13x - 2$

$+2 \quad +2$

$26 \leq 13x$

$2 \leq x$ or $x \geq 2$



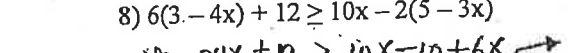
7) $2x - 3(x + 4) \leq -7$

$2x - 3x - 12 \leq -7$

$-x - 12 \leq -7$
 $+12 \quad +12$

$-x \leq 5$

$x \geq -5$



8) $6(3 - 4x) + 12 \geq 10x - 2(5 - 3x)$

$18 - 24x + 12 \geq 10x - 10 + 6x$

$30 - 24x \geq 16x - 10$
 $+24x \quad +24x$

$30 \geq 40x - 10$
 $+10 \quad +10$

$40 \geq 40x$

$\frac{40}{40} \geq \frac{40x}{40}$

$1 \geq x$ or $x \leq 1$



9) $5(3 - 2x) + 25 > 4x - 6(10 - 3x)$

$15 - 10x + 25 > 4x - 60 + 18x$

$40 - 10x > 22x - 60$
 $+10x \quad +10x$

$40 > 32x - 60$
 $+60 \quad +60$

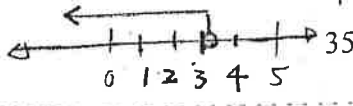
$100 > 32x$

$\frac{32x}{32} < \frac{100}{32}$

$x < \frac{100 \cdot 4.25}{32 \cdot 4.25}$

$x < \frac{25}{8}$

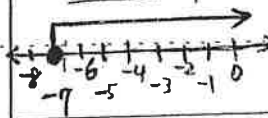
$x < 3.125$



[2]

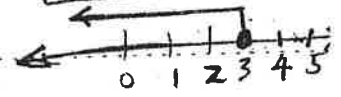
1) $x + 3 \geq -4$

$\frac{-3}{-1} \quad \frac{-7}{-1}$
 $x \geq -7$



2) $-2x \geq -6$

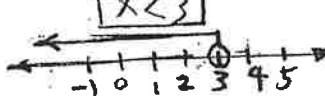
$\frac{-2}{-2} \quad \frac{-6}{-2}$
 $x \leq 3$



3) $7x - 3 < 18$

$+3 \quad +3$
 $7x < 21$

$\frac{7}{7} \quad \frac{21}{7}$
 $x < 3$



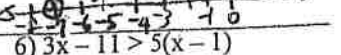
4) $4x + 28 > 7 + x$
 $-x \quad -x$

$3x + 28 > 7$

$-28 \quad -28$

$3x > -21$

$\frac{3}{3} \quad \frac{-21}{3}$
 $x > -7$



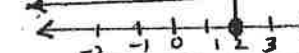
5) $6x + 7 \geq 3 + 8x$

$-6x \quad -6x$
 $7 \geq 3 + 2x$

$-3 \quad -3$

$4 \geq 2x$

$\frac{4}{2} \geq \frac{2x}{2}$
 $2 \geq x$ or $x \leq 2$



6) $3x - 11 > 5(x - 1)$

$3x - 11 > 5x - 5$

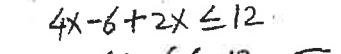
$-3x \quad -3x$

$-11 > 2x - 5$

$+5 \quad +5$

$-6 > 2x$

$\frac{-6}{2} > \frac{2x}{2}$
 $-3 > x$ or $x < -3$



7) $3x - 6 \leq 3(2 - x)$

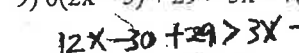
$3x - 6 \leq 6 - 3x$

$+3x \quad +3x$

$6x - 6 \leq 6$

$+6 \quad +6$

$6x \leq 12$
 $\frac{6x}{6} \leq \frac{12}{6}; x \leq 2$



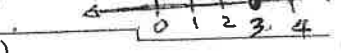
8) $4x - 2(3 - x) \leq 12$

$4x - 6 + 2x \leq 12$

$6x - 6 \leq 12$

$+6 \quad +6$

$6x \leq 18$
 $\frac{6x}{6} \leq \frac{18}{6}; x \leq 3$



9) $6(2x - 5) + 29 > 3x - 7(11 - 4x)$

$12x - 30 + 29 > 3x - 77 + 28x$

$12x - 1 > 31x - 77$

$-12x \quad -12x$

$-1 > 19x - 77$
 $+77 \quad +77$

$76 > 19x$

$\frac{76}{19} > \frac{19x}{19}$

$4 > x$ or $x < 4$



10) $7(2 - 5x) + 27 > 18x - 3(8 - 4x)$

$14 - 35x + 27 > 18x - 24 + 12x$

$41 - 35x > 30x - 24$

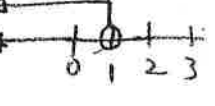
$+35x \quad +35x$

$41 > 65x - 24$

$+24 \quad +24$

$65 > 65x$

$\frac{65}{65} > \frac{65x}{65}$
 $1 > x$ or $x < 1$



$$y = mx + b; y = \frac{\text{RISE}}{\text{RUN}}x + \text{Y-Intercept}$$

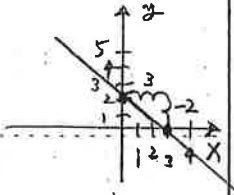
[CH 3.1] The Graph of a Linear Equation

Graph the Following

1) $2x + 3y = 6$

$$\begin{array}{r} -2x \quad -2x \\ 3y = -2x + 6 \\ \frac{3y}{3} = \frac{-2x + 6}{3} \\ y = -\frac{2}{3}x + 2 \end{array}$$

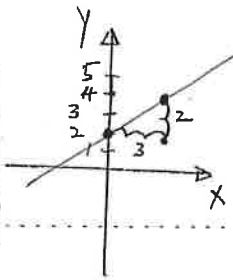
Start from
 $y = 2$
Run 3
Rise -2



7) $-2x + 3y = 6$

$$\begin{array}{r} +2x \quad +2x \\ 3y = 2x + 6 \\ \frac{3y}{3} = \frac{2x + 6}{3} \\ y = \frac{2}{3}x + 2 \end{array}$$

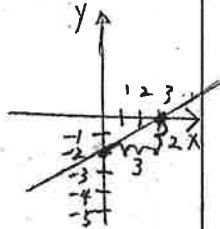
Start from
 $y = 2$
Run 3 Rise 2



2) $2x - 3y = 6$

$$\begin{array}{r} -2x \quad -2x \\ -3y = -2x + 6 \\ \frac{-3y}{-3} = \frac{-2x + 6}{-3} \\ y = \frac{2}{3}x - 2 \end{array}$$

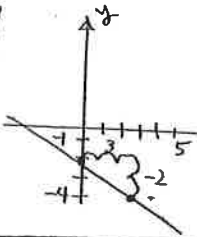
Start from
 $y = -2$
Run 3
Rise +2



8) $-2x - 3y = 6$

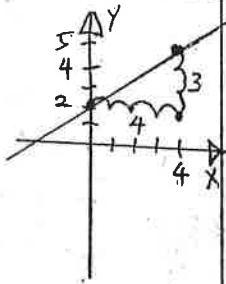
$$\begin{array}{r} +2x \quad +2x \\ -3y = 2x + 6 \\ \frac{-3y}{-3} = \frac{2x + 6}{-3} \\ y = -\frac{2}{3}x - 2 \end{array}$$

Start from
 $y = -2$
Run 3 Rise -2

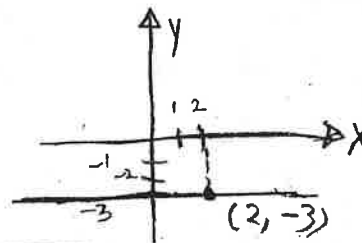


3) $y = \frac{3}{4}x + 2$

Start from
 $y = 2$
Run 4 Rise 3

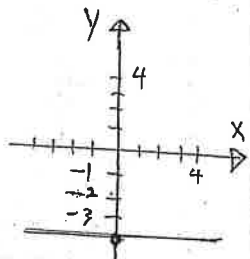


9) The horizontal line passing through the point (2, -3).



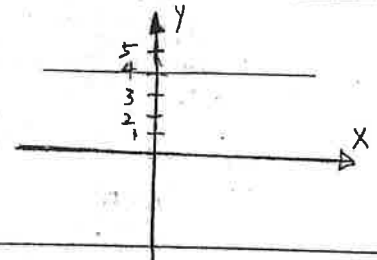
4) $y = -4$

Start from
 $y = -4$
stay constant
 $y = -4$



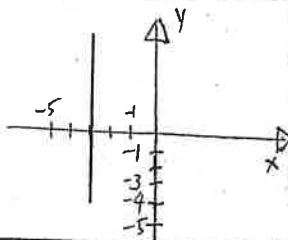
10) $y = 4$

Start from
 $y = 4$
stay constant
 $y = 4$



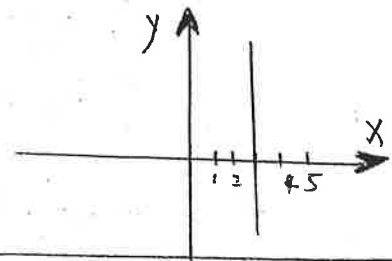
5) $x = -3$

Start from
 $x = -3$
stay constant
 $x = -3$



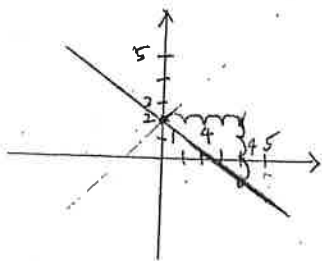
11) $x = 3$

Start from
 $x = 3$
stay constant
 $x = 3$

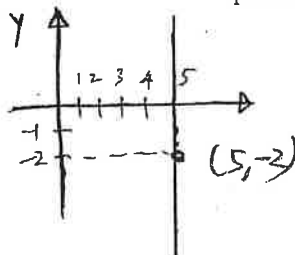


6) $y = \frac{3}{4}x + 2$

Start from
 $y = 2$
Run 4 Rise -3



12) The vertical line passing through the point (5, -2).



[CH 3.2] The Slope of a Line

[A] Find the slope of the line that passes through each given pair of points.

slope, $m = \frac{y_2 - y_1}{x_2 - x_1}$

1) x_1, y_1 and x_2, y_2
 $(-5, -8)$ and $(-9, 4)$
 $m = \frac{4 - (-8)}{-9 - (-5)} = \frac{4 + 8}{-9 + (-5)} = \frac{12}{-14} = -\frac{3}{4}$

2) x_1, y_1 and x_2, y_2
 $(9, 15)$ and $(-6, 3)$
 $m = \frac{3 - 15}{-6 - 9} = \frac{-12}{-15} = \frac{12}{15} = \frac{4}{5}$

3) x_1, y_1 and x_2, y_2
 $(-2, -11)$ and $(-7, -11)$
 $m = \frac{-11 - (-11)}{-7 - (-2)} = \frac{-11 + 11}{-7 + 2} = \frac{0}{-5} = 0$
 zero slope

4) x_1, y_1 and x_2, y_2
 $(14, 19)$ and $(14, -21)$
 $m = \frac{-21 - 19}{14 - 14} = \frac{-40}{0} = \text{Undefined}$
 NO SLOPE

5) x_1, y_1 and x_2, y_2
 $(-3, 2)$ and $(4, -3)$
 $m = \frac{-3 - 2}{4 - (-3)} = \frac{-5}{4 + 3} = -\frac{5}{7}$

6) x_1, y_1 and x_2, y_2
 $(8, 1)$ and $(8, 6)$
 $m = \frac{6 - 1}{8 - 8} = \frac{5}{0} = \text{Undefined}$ NO SLOPE

7) x_1, y_1 and x_2, y_2
 $(0, 5)$ and $(3, -5)$
 $m = \frac{-5 - 5}{3 - 0} = -\frac{10}{3}$

8) x_1, y_1 and x_2, y_2
 $(4, -2)$ and $(-2, 4)$
 $m = \frac{4 - (-2)}{-2 - 4} = \frac{4 + 2}{-6} = -\frac{6}{6} = -1$

9) x_1, y_1 and x_2, y_2
 $(-3, -5)$ and $(3, 0)$
 $m = \frac{0 - (-5)}{3 - (-3)} = \frac{5}{6}$

10) x_1, y_1 and x_2, y_2
 $(-5, -5)$ and $(1, -7)$
 $m = \frac{-7 - (-5)}{1 - (-5)} = \frac{-7 + 5}{1 + 5} = \frac{-2}{6} = -\frac{1}{3}$

$y = mx + b$ $m = \text{slope}$
 $b = y\text{-intercept}$

[B] Find the slope and y-intercept from the standard equation.

1) $2x + 3y = 6$
 $-2x$ $-2x$
 $3y = -2x + 6$
 $\frac{3y}{3} = \frac{-2x}{3} + \frac{6}{3}$
 $y = -\frac{2}{3}x + 2$
 slope = $-\frac{2}{3}$
 y-intercept = 2

2) $2x - 3y = 6$
 $-2x$ $-2x$
 $-3y = -2x + 6$
 $\frac{-3y}{-3} = \frac{-2x}{-3} + \frac{6}{-3}$
 $y = \frac{2}{3}x - 2$
 slope = $\frac{2}{3}$
 y-intercept = -2

3) $-2x - 3y = 6$
 $+2x$ $+2x$
 $-3y = 2x + 6$
 $\frac{-3y}{-3} = \frac{2x}{-3} + \frac{6}{-3}$
 $y = -\frac{2}{3}x - 2$
 slope = $-\frac{2}{3}$
 y-intercept = -2

4) $3x - 6y = 18$
 $-3x$ $-3x$
 $-6y = -3x + 18$
 $\frac{-6y}{-6} = \frac{-3x}{-6} + \frac{18}{-6}$
 $y = \frac{1}{2}x - 3$
 slope = $\frac{1}{2}$
 y-intercept = -3

5) $3x + 6y = 18$
 $-3x$ $-3x$
 $6y = -3x + 18$
 $\frac{6y}{6} = \frac{-3x}{6} + \frac{18}{6}$
 $y = -\frac{1}{2}x + 3$
 slope = $-\frac{1}{2}$
 y-intercept = 3

6) $-3x + 2y = 18$
 $+3x$ $+3x$
 $2y = 3x + 18$
 $\frac{2y}{2} = \frac{3x}{2} + \frac{18}{2}$
 $y = \frac{3}{2}x + 9$
 slope = $\frac{3}{2}$
 y-intercept = 9

7) $-3x - 2y = 18$
 $+3x$ $+3x$
 $-2y = 3x + 18$
 $\frac{-2y}{-2} = \frac{3x}{-2} + \frac{18}{-2}$
 $y = -\frac{3}{2}x - 9$
 slope = $-\frac{3}{2}$
 y-intercept = -9

8) $-2x + 3y = 6$
 $+2x$ $+2x$
 $3y = 2x + 6$
 $\frac{3y}{3} = \frac{2x}{3} + \frac{6}{3}$
 $y = \frac{2}{3}x + 2$
 slope = $\frac{2}{3}$
 y-intercept = 2

9) $-4x + 2y = 8$
 $+4x$ $+4x$
 $2y = 4x + 8$
 $\frac{2y}{2} = \frac{4x}{2} + \frac{8}{2}$
 $y = 2x + 4$
 slope = 2
 y-intercept = 4

10) $10x + 5y = 15$
 $-10x$ $-10x$
 $5y = -10x + 15$
 $\frac{5y}{5} = \frac{-10x}{5} + \frac{15}{5}$
 $y = -2x + 3$
 slope = -2
 y-intercept = 3

[CH 3.3] Forms (Type) of Linear Equations

[A] Find an Equation when slope and y - intercept is given. ($y = mx + b$)

1) $m = \frac{5}{7}$ and y intercept = -3

$$y = \frac{5}{7}x - 3$$

2) $m = -\frac{1}{4}$, and y - intercept is -2

$$y = -\frac{1}{4}x - 2$$

3) $m = -\frac{4}{3}$, and y - intercept = $-\frac{1}{2}$

$$y = -\frac{4}{3}x - \frac{1}{2}$$

4) $m = 2$, and y - intercept = 3

$$y = 2x + 3$$

5) $m = 0$, and y - intercept = 5

$$y = 0x + 5$$

$$y = 5$$

6) $m = 0$, y - intercept = -7

$$y = 0x - 7$$

$$y = -7$$

7) $m = \frac{5}{6}$, y - intercept = -4

$$y = \frac{5}{6}x - 4$$

8) $m = -\frac{2}{9}$ and y - intercept = $\frac{1}{3}$

$$y = -\frac{2}{9}x + \frac{1}{3}$$

9) $m = \frac{2}{3}$, and y - intercept = 0

$$y = \frac{2}{3}x + 0$$

$$y = \frac{2}{3}x$$

10) $m = 3$, and y - intercept = 0

$$y = 3x + 0$$

$$y = 3x$$

$$y - y_1 = m(x - x_1)$$

[B] Find an equation when a point and a slope is given. (Use point-slope form)

1) Point A (-1, 3) and $m = 3$

$$y - 3 = 3(x - (-1))$$

$$y - 3 = 3(x + 1)$$

$$y - 3 = 3x + 3$$

$$y = 3x + 6$$

2) Point A (2, -4) and $m = 5$

$$y - (-4) = 5(x - 2)$$

$$y + 4 = 5x - 10$$

$$y = 5x - 14$$

3) Point B (0, 4) and $m = -\frac{2}{5}$

$$y - 4 = -\frac{2}{5}(x - 0)$$

$$y - 4 = -\frac{2}{5}x$$

$$y = -\frac{2}{5}x + 4$$

4) Point C (1, -3) and $m = -\frac{5}{3}$

$$y - (-3) = -\frac{5}{3}(x - 1)$$

$$y + 3 = -\frac{5}{3}x + \frac{5}{3}$$

$$y = -\frac{5}{3}x - \frac{4}{3}$$

5) Point A (5, 0), and $m = -3$

$$y - 0 = -3(x - 5)$$

$$y = -3x + 15$$

6) Point B (-2, 4) and $m = \frac{3}{5}$

$$y - 4 = \frac{3}{5}(x - (-2))$$

$$y - 4 = \frac{3}{5}(x + 2)$$

$$y - 4 = \frac{3}{5}x + \frac{6}{5}$$

$$y = \frac{3}{5}x + 5\frac{4}{5}$$

7) Point C (0, 0) and $m = 0$

$$y - 0 = 0(x - 0)$$

$$y = 0$$

8) Point D (3, -1) and $m = -\frac{1}{4}$

$$y - (-1) = -\frac{1}{4}(x - 3)$$

$$y + 1 = -\frac{1}{4}x + \frac{3}{4}$$

$$y = -\frac{1}{4}x - \frac{1}{4}$$

9) Point A (3, 4) and $m = \frac{2}{3}$

$$y - 4 = \frac{2}{3}(x - 3)$$

$$y - 4 = \frac{2}{3}x - 2$$

$$y = \frac{2}{3}x + 2$$

10) Point (4, 0) and $m = 1$

$$y - 0 = 1(x - 4)$$

$$y = x - 4$$

Step 1 Find a slope

Step 2 USE point and slope Rule

$$y - y_1 = m(x - x_1)$$

Step 1 Find the slope (m_2) from the slope of the parallel line ($m_2 =$

Step 2 Use $y - y_1 = m_2(x - x_1)$

[C] When 2 points are given. Write an Expression of the line that passes through the given points.

1) $(8, -1)$ and $(6, 4)$

Step 1 $m = \frac{4 - (-1)}{6 - 8} = \frac{4 + 1}{-2} = \left(\frac{5}{-2}\right)$

Step 2 $y - (-1) = -\frac{5}{2}(x - 8)$

$$y + 1 = -\frac{5}{2}(x - 8)$$
$$y + 1 = -\frac{5}{2}x + 20$$
$$y = -\frac{5}{2}x + 19$$

2) $(7, -2)$ and $(5, 1)$

Step 1 $m = \frac{1 - (-2)}{5 - 7} = \frac{1 + 2}{-2} = \left(\frac{3}{-2}\right)$

Step 2 $y - (-2) = -\frac{3}{2}(x - 7)$

$$y + 2 = -\frac{3}{2}(x - 7)$$
$$y + 2 = -\frac{3}{2}x + \frac{21}{2}$$
$$y = -\frac{3}{2}x + \frac{17}{2}$$
$$y = -\frac{3}{2}x + 8\frac{1}{2}$$

3) $(10, 0)$ and $(7, 4)$

Step 1 $m = \frac{4 - 0}{7 - 10} = \left(\frac{4}{-3}\right)$

Step 2 $y - 0 = \frac{4}{-3}(x - 10)$
 $y - 0 = -\frac{4}{3}x + \frac{40}{3}$

$$y = -\frac{4}{3}x + \frac{40}{3}$$
$$y = -\frac{4}{3}x + 13\frac{1}{3}$$

4) $(-4, 0)$ and $(-6, -5)$

Step 1 $m = \frac{-5 - 0}{-6 - (-4)} = \frac{-5}{-2} = \left(\frac{5}{2}\right)$

Step 2 $y - 0 = \frac{5}{2}(x - (-4))$

$$y = \frac{5}{2}(x + 4)$$
$$y = \frac{5}{2}x + 10$$

5) $(-9, 3)$ and $(-3, -1)$

Step 1 $m = \frac{-1 - 3}{-3 - (-9)} = \frac{-4}{6} = \left(\frac{-2}{3}\right)$

Step 2 $y - 3 = -\frac{2}{3}(x - (-9))$

$$y - 3 = -\frac{2}{3}(x + 9)$$
$$y - 3 = -\frac{2}{3}x - 6$$
$$y = -\frac{2}{3}x - 3$$

6) $(-11, 4)$ and $(-3, -2)$

Step 1 $m = \frac{-2 - 4}{-3 - (-11)} = \frac{-6}{8} = \left(\frac{-3}{4}\right)$

Step 2 $y - 4 = -\frac{3}{4}(x - (-11))$

$$y - 4 = -\frac{3}{4}(x + 11)$$
$$y - 4 = -\frac{3}{4}x + \frac{33}{4}$$
$$y = -\frac{3}{4}x + 9\frac{3}{4}$$

7) $(12, -7)$ and $(8, -9)$

Step 1 $m = \frac{-9 - (-7)}{8 - 12} = \frac{-2}{-4} = \left(\frac{1}{2}\right)$

Step 2 $y - (-7) = \frac{1}{2}(x - 12)$
 $y + 7 = \frac{1}{2}x - 6$

$$y + 7 = \frac{1}{2}x - 6$$
$$y = \frac{1}{2}x - 13$$

8) $(4, 7)$ and $(7, 4)$

Step 1 $m = \frac{4 - 7}{7 - 4} = \frac{-3}{3} = -1$

Step 2 $y - 7 = -1(x - 4)$

$$y - 7 = -x + 4$$
$$y + 7 = -x + 11$$
$$y = -x + 11$$

9) $(-3, 5)$ and $(-3, 2)$

Step 1 $m = \frac{2 - 5}{-3 - (-3)} = \frac{-3}{0}$

Undefined
No slope

10) $(0, 4)$ and $(-3, 5)$

Step 1 $m = \frac{5 - 4}{-3 - 0} = \frac{1}{-3} = \left(\frac{-1}{3}\right)$

Step 2 $y - 4 = -\frac{1}{3}(x - 0)$

$$y - 4 = -\frac{1}{3}x$$
$$y + 4 = -\frac{1}{3}x + 4$$
$$y = -\frac{1}{3}x + 4$$

[D] When a point and parallel to the line is given. Write an equation of the line that passes through.

1) $(7, -13)$ and is parallel to $6x - 8y = 15$

Step 1 $6x - 8y = 15$
 $-8y = -6x + 15$

$$-8y = -6x + 15 \Rightarrow y = \frac{6}{8}x - \frac{15}{8}$$
$$y = \frac{3}{4}x - \frac{15}{8}$$

Step 2

$$y - (-13) = \frac{3}{4}(x - 7)$$
$$y + 13 = \frac{3}{4}x - \frac{21}{4}$$
$$y = \frac{3}{4}x - 18\frac{1}{4}$$

2) $(-7, -13)$ and is parallel to $6y - 4x = 5$

Step 1 $6y - 4x = 5$
 $6y = 4x + 5$

$$\frac{6y}{6} = \frac{4x + 5}{6}$$
$$y = \frac{2}{3}x + \frac{5}{6}$$

Step 2

$$y - (-13) = \frac{2}{3}(x - (-7))$$
$$y + 13 = \frac{2}{3}(x + 7)$$
$$y + 13 = \frac{2}{3}x + \frac{14}{3}$$
$$y = \frac{2}{3}x - 8\frac{1}{3}$$

3) $(-4, 7)$ and is parallel to $3x - 5y = 6$

Step 1 $3x - 5y = 6$
 $-5y = -3x + 6$

$$-5y = -3x + 6 \Rightarrow y = \frac{3}{5}x - \frac{6}{5}$$

Step 2

$$y - 7 = \frac{3}{5}(x - (-4))$$
$$y - 7 = \frac{3}{5}(x + 4)$$
$$y - 7 = \frac{3}{5}x + \frac{12}{5}$$
$$y = \frac{3}{5}x + 9\frac{2}{5}$$

4) $(8, -5)$ and is parallel to $7x + 4y + 3 = 0$

Step 1 $7x + 4y + 3 = 0$
 $4y = -7x - 3$

$$4y = -7x - 3 \Rightarrow y = -\frac{7}{4}x - \frac{3}{4}$$

Step 2

$$y - (-5) = -\frac{7}{4}(x - 8)$$
$$y + 5 = -\frac{7}{4}x + 14$$
$$y = -\frac{7}{4}x + 9$$

5) $(3, 8)$ and is parallel to $y = 4x - 2$

Step 1 $y = 4x - 2$

$$m_1 = 4 \rightarrow m_2$$

Step 2

$$y - 8 = 4(x - 3)$$
$$y - 8 = 4x - 12$$
$$y = 4x - 4$$

6) $(2, -5)$ and is parallel to $y = -2x - 6$

Step 1 $y = -2x - 6$

$$m_1 = -2 \rightarrow m_2$$

Step 2

$$y - (-5) = -2(x - 2)$$
$$y + 5 = -2x + 4$$
$$y = -2x - 1$$

7) $(-2, -3)$ and is parallel to $3x + 2y = 5$

Step 1 $3x + 2y = 5$
 $2y = -3x + 5$

$$y = -\frac{3}{2}x + \frac{5}{2}$$

Step 2

$$y - (-3) = -\frac{3}{2}(x - (-2))$$
$$y - 3 = -\frac{3}{2}(x + 2)$$
$$y + 3 = -\frac{3}{2}x - 3$$
$$y = -\frac{3}{2}x - 6$$

8) $(6, -2)$ and is parallel to $2x + 4y = 9$

Step 1 $2x + 4y = 9$
 $4y = -2x + 9$

$$4y = -2x + 9 \Rightarrow y = -\frac{2}{4}x + \frac{9}{4}$$
$$y = -\frac{1}{2}x + \frac{9}{4}$$

Step 2

$$y - (-2) = -\frac{1}{2}(x - 6)$$
$$y + 2 = -\frac{1}{2}x + 3$$
$$y = -\frac{1}{2}x + 1$$

9) $(6, 1)$ and is parallel to $8x - y = 9$

Step 1 $8x - y = 9$
 $-y = -8x + 9$

$$y = 8x - 9$$

Step 2

$$y - 1 = 8(x - 6)$$
$$y - 1 = 8x - 48$$
$$y = 8x - 47$$

10) $(8, -3)$ and is parallel to $6x + 2y = 5$

Step 1 $6x + 2y = 5$
 $2y = -6x + 5$

$$y = -\frac{6}{2}x + \frac{5}{2}$$
$$y = -3x + \frac{5}{2}$$

Step 2

$$y - (-3) = -3(x - 8)$$
$$y + 3 = -3x + 24$$
$$y = -3x + 21$$

Step 1 Find slope (m_2) from the slope (m_1) of perpendicular line ($m_2 = -\frac{1}{m_1}$)

Step 2 Use $Y - Y_1 = m_2(X - X_1)$

[E] When a point and perpendicular to the line is given. Write an equation of the line that passes through.

1) (6, 2) and is perpendicular to $2x + 4y = 3$

Step 1 $2x + 4y = 3$
 $4y = -2x + 3$
 $y = -\frac{2}{4}x + \frac{3}{4}$
 $m_1 = -\frac{2}{4} = -\frac{1}{2}$
 $m_2 = -\frac{1}{-\frac{1}{2}} = 2$

Step 2 $Y - 2 = 2(X - 6)$
 $Y - 2 = 2X - 12$
 $Y = 2X - 10$

2) (5, -1) and is perpendicular to $3x - 6y = 2$

Step 1 $3x - 6y = 2$
 $-6y = -3x + 2$
 $y = \frac{3}{6}x - \frac{2}{6}$
 $m_1 = \frac{3}{6} = \frac{1}{2}$
 $m_2 = -\frac{1}{\frac{1}{2}} = -2$

Step 2 $Y - (-1) = -2(X - 5)$
 $Y + 1 = -2X + 10$
 $Y = -2X + 9$

3) (0, 0) and is perpendicular to $2x + 5y = 10$

Step 1 $2x + 5y = 10$
 $5y = -2x + 10$
 $y = -\frac{2}{5}x + \frac{10}{5}$
 $m_1 = -\frac{2}{5}$
 $m_2 = -\frac{1}{-\frac{2}{5}} = \frac{5}{2}$

Step 2 $Y - 0 = \frac{5}{2}(X - 0)$
 $Y = \frac{5}{2}X - 0$
 $Y = \frac{5}{2}X$

4) (0, 3) and is perpendicular to $2y + 5x = 1$

Step 1 $2y + 5x = 1$
 $2y = -5x + 1$
 $y = -\frac{5}{2}x + \frac{1}{2}$
 $m_1 = -\frac{5}{2}$
 $m_2 = -\frac{1}{-\frac{5}{2}} = \frac{2}{5}$

Step 2 $Y - 3 = \frac{2}{5}(X - 0)$
 $Y - 3 = \frac{2}{5}X$
 $Y = \frac{2}{5}X + 3$

5) Through (2, -5); perpendicular to $y = -2x - 6$

Step 1 $y = -2x - 6$
 $m_1 = -2$
 $m_2 = -\frac{1}{-2} = \frac{1}{2}$

Step 2 $Y - (-5) = \frac{1}{2}(X - 2)$
 $Y + 5 = \frac{1}{2}X - 1$
 $Y = \frac{1}{2}X - 6$

6) Through (-4, 8); perpendicular to $y = -4x - 1$

Step 1 $y = -4x - 1$
 $m_1 = -4$
 $m_2 = -\frac{1}{-4} = \frac{1}{4}$

Step 2 $Y - 8 = \frac{1}{4}(X - (-4))$
 $Y - 8 = \frac{1}{4}(X + 4)$
 $Y - 8 = \frac{1}{4}X + 1$
 $Y = \frac{1}{4}X + 9$

7) Through (-2, 6); perpendicular to $y = 7$

Step 1 $y = 7 \Rightarrow y = 0x + 7$
 $m_1 = 0$
 $m_2 = -\frac{1}{0} = \text{undefined (No slope)}$

Step 2 $X - (-2) = 0(X - (-2))$
 $X + 2 = 0$
 $X = -2$

8) Through (-2, -3); perpendicular to $3x + 2y = 5$

Step 1 $3x + 2y = 5$
 $2y = -3x + 5$
 $y = -\frac{3}{2}x + \frac{5}{2}$
 $m_1 = -\frac{3}{2}$
 $m_2 = -\frac{1}{-\frac{3}{2}} = \frac{2}{3}$

Step 2 $Y - (-3) = \frac{2}{3}(X - (-2))$
 $Y + 3 = \frac{2}{3}(X + 2)$
 $Y + 3 = \frac{2}{3}X + \frac{4}{3}$
 $Y = \frac{2}{3}X - \frac{5}{3}$

9) Through (3, 5); perpendicular to $2x - y = 8$

Step 1 $2x - y = 8$
 $-y = -2x + 8$
 $y = 2x - 8$
 $m_1 = 2$
 $m_2 = -\frac{1}{2}$

Step 2 $Y - 5 = -\frac{1}{2}(X - 3)$
 $Y - 5 = -\frac{1}{2}X + \frac{3}{2}$
 $Y = -\frac{1}{2}X + 6\frac{1}{2}$

10) Through (-1, -5); perpendicular to $x = 3$

Step 1 $x = 3$
 $m_1 = \text{No slope}$
 $m_2 = \text{Zero slope}$

Step 2 $Y - (-5) = 0(X - (-1))$
 $Y + 5 = 0$
 $Y = -5$

Step 1 Graph the Inequality

Step 2 Test the good point (like (0,0))

Step 3 highlight the region

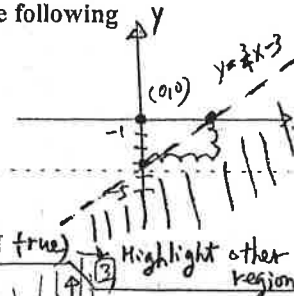
[CH 3.5] Graphing Linear Inequalities

[1] Graph the solution set of each of the following inequalities

1) $3x - 4y > 12$

$3x - 4y = 12$
 $-4y = -3x + 12$
 $y = \frac{3}{4}x - 3$

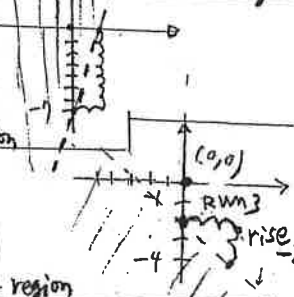
Test (0,0)
 $3(0) - 4(0) > 12$
 $0 > 12$ (Not true)



2) $7x - 2y < 14$

$7x - 2y = 14$
 $-2y = -7x + 14$
 $y = \frac{7}{2}x - 7$

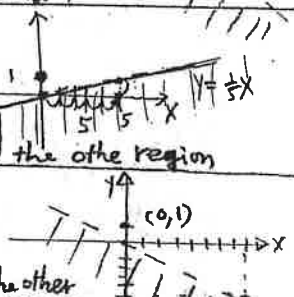
Test (0,0)
 $7(0) - 2(0) < 14$
 $0 < 14$ (True)



3) $8x + 12y < -24$

$12y = -8x - 24$
 $y = -\frac{8}{12}x - \frac{24}{12}$
 $y = -\frac{2}{3}x - 2$

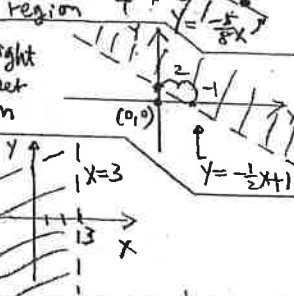
Test (0,0)
 $8(0) + 12(0) < -24$
 $0 < -24$ (Not true)



4) $x - 5y \geq 0$

$x - 5y = 0$
 $-5y = -x$
 $y = \frac{1}{5}x$

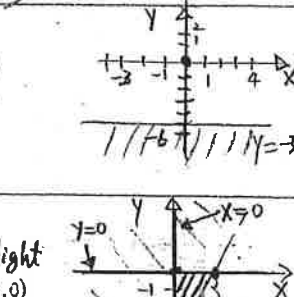
Test (0,1)
 $0 - 5(1) \geq 0$
 $-5 \geq 0$ (Not true)



5) $5x + 8y < 0$

$5x + 8y = 0$
 $8y = -5x$
 $y = -\frac{5}{8}x$

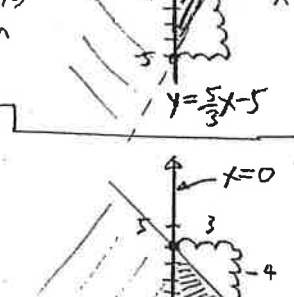
Test (0,1)
 $5(0) + 8(1) < 0$
 $8 < 0$ (Not true)



6) $4y + 2x > 4$

$4y = -2x + 4$
 $y = -\frac{2}{4}x + \frac{4}{4}$
 $y = -\frac{1}{2}x + 1$

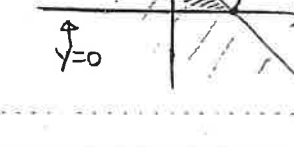
Test (0,0)
 $4(0) + 2(0) > 4$
 $0 > 4$ (Not true)



7) $4x < 12$

$4x = 12$
 $x = \frac{12}{4}$
 $x = 3$

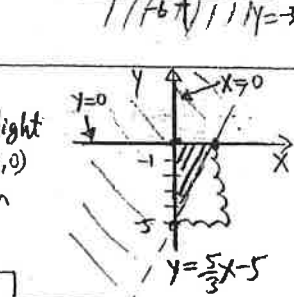
Test (0,0)
 $4(0) < 12$
 $0 < 12$ (True)



8) $-3y \geq 15$

$-3y = 15$
 $\frac{-3y}{-3} = \frac{15}{-3}$
 $y = -5$

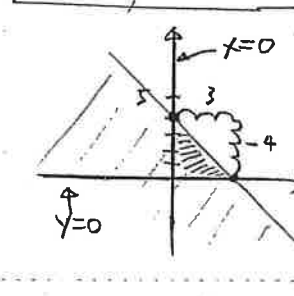
Test (0,0)
 $-3(0) \geq 15$
 $0 \geq 15$ (Not true)



9) $5x - 3y < 15; x \geq 0; y \leq 0$

$5x - 3y = 15$
 $-3y = -5x + 15$
 $y = \frac{5}{3}x - 5$

Test (0,0)
 $5(0) - 3(0) < 15$
 $0 < 15$ (True)



10) $4x + 3y \leq 12; x \geq 0; y \geq 0$

$4x + 3y = 12$
 $3y = -4x + 12$
 $y = -\frac{4}{3}x + 4$

Test (0,0)
 $4(0) + 3(0) \leq 12$
 $0 \leq 12$ (True)



[Ch 4.3] Systems of Equations

[1] The Addition Method

$$\begin{array}{r} 1) \quad 2x + y = -4 \\ \quad +) \quad x + y = -2 \\ \hline \quad 3x = -6 \\ \quad x = -2 \end{array}$$

$$\begin{array}{r} 2(-2) - y = -4 \\ -4 - y = -4 \\ +4 \quad +4 \\ \hline -y = 0 \\ y = 0 \end{array}$$

x, y
 $(-2, 0)$

$$\begin{array}{r} 2) \quad 2x + y = 6 \\ \quad +) \quad x - y = 0 \\ \hline \quad 3x = 6 \\ \quad x = \frac{6}{3} = 2 \end{array}$$

$$\begin{array}{r} 2(2) + y = 6 \\ 4 + y = 6 \\ -4 \quad -4 \\ \hline y = 2 \end{array}$$

x, y
 $(2, 2)$

$$\begin{array}{r} 3) \quad 2x + 5y = 2 \\ \quad +) \quad 3x - 5y = 3 \\ \hline \quad 5x = 5 \\ \quad x = \frac{5}{5} = 1 \end{array}$$

$$\begin{array}{r} 2(1) + 5y = 2 \\ 2 + 5y = 2 \\ -2 \quad -2 \\ \hline 5y = 0 \\ y = 0 \end{array}$$

x, y
 $(1, 0)$

$$\begin{array}{r} 4) \quad x - 2y = 10 \\ \quad 3x - 5y = 4 \end{array}$$

$$\begin{array}{r} -3x + 6y = -30 \\ +) \quad 3x - 5y = 4 \\ \hline \quad y = -26 \end{array}$$

$$\begin{array}{r} x - 2(-26) = 10 \\ x + 52 = 10 \\ x = -42 \end{array}$$

$(-42, -26)$

$$\begin{array}{r} 5) \quad x + y = 2 \\ \quad 3x - 2y = -9 \end{array}$$

$$\begin{array}{r} 2x + 2y = 4 \\ +) \quad 3x - 2y = -9 \\ \hline \quad 5x = 5 \\ \quad x = \frac{5}{5} = 1 \end{array}$$

$$\begin{array}{r} -1 + y = 2 \\ +1 \quad +1 \\ \hline y = 3 \end{array}$$

$(1, 3)$

$$\begin{array}{r} 6) \quad x + 2y = -4 \\ \quad 2x - y = -3 \end{array}$$

$$\begin{array}{r} x + 2y = -4 \\ 4x - 2y = -6 (+) \\ \hline \quad 5x = -10 \\ \quad x = \frac{-10}{5} = -2 \end{array}$$

$$\begin{array}{r} (-2) + 2y = -4 \\ +2 \quad +2 \\ \hline 2y = -2 \\ y = \frac{-2}{2} = -1 \end{array}$$

$(-2, -1)$

$$\begin{array}{r} 7) \quad 4x + 3y = 2 \\ \quad 3x + 5y = -4 \end{array}$$

$$\begin{array}{r} 12x + 9y = 6 \\ -12x - 20y = 16 (+) \\ \hline \quad -11y = 22 \\ \quad y = \frac{22}{-11} = -2 \end{array}$$

$$\begin{array}{r} 4x + 3(-2) = 2 \\ 4x - 6 = 2 \\ 4x = 8 \\ x = \frac{8}{4} = 2 \end{array}$$

$(2, -2)$

$$\begin{array}{r} 8) \quad 5x + 7y = 1 \\ \quad 3x + 4y = 1 \end{array}$$

$$\begin{array}{r} -15x - 21y = -3 \\ +) \quad 15x + 20y = 5 (+) \\ \hline \quad -1y = 2 \\ \quad y = -2 \end{array}$$

$$\begin{array}{r} 5x + 7(-2) = 1 \\ 5x - 14 = 1 \\ 5x = 15; x = 3 \end{array}$$

$(3, -2)$

$$\begin{array}{r} 9) \quad 6x - 10y = 6 \\ \quad 9x - 15y = -4 \end{array}$$

$$\begin{array}{r} 18x - 30y = 18 \\ -18x + 30y = 18 (+) \\ \hline \quad 0 = 36 \text{ (Not true)} \end{array}$$

$$\begin{array}{r} 10) \quad 3y + 2x = 4 \\ \quad 5x + 6y = 11 \end{array}$$

$$\begin{array}{r} 2x + 3y = 4 \\ -2x + 6y = 11 \\ \hline \quad 9y = 15 \\ \quad y = \frac{15}{9} = \frac{5}{3} \end{array}$$

$$\begin{array}{r} 3(\frac{5}{3}) + 2x = 4 \\ 5 + 2x = 4 \\ 2x = -1 \\ x = -\frac{1}{2} \end{array}$$

$(-\frac{1}{2}, \frac{5}{3})$

[2] The Substitution Method

$$\begin{array}{r} 1) \quad 2x - 3y = 1 \\ \quad x = y + 2 \end{array}$$

$$\begin{array}{r} 2(y+2) - 3y = 1 \\ 2y + 4 - 3y = 1 \\ -y + 4 = 1 \\ -y = -3 \\ y = 3 \end{array}$$

$$\begin{array}{r} x = (3) + 2 = 5 \\ \quad y = 3 \end{array}$$

$(5, 3)$

$$\begin{array}{r} 2) \quad 3x + 4y = 2 \\ \quad y = x - 3 \end{array}$$

$$\begin{array}{r} 3x + 4(x-3) = 2 \\ 3x + 4x - 12 = 2 \\ 7x - 12 = 2 \\ +12 \quad +12 \\ \hline 7x = 14 \\ x = 2 \end{array}$$

$$\begin{array}{r} y = x - 3 \\ y = (2) - 3 \\ y = -1 \end{array}$$

$(2, -1)$

$$\begin{array}{r} 3) \quad 4x - y = 3 \\ \quad 8x - 2y = 6 \end{array}$$

$$\begin{array}{r} 8x - 2(4x-3) = 6 \\ 8x - 8x + 6 = 6 \\ 6 = 6 \text{ (True)} \end{array}$$

$$\begin{array}{r} -y = -4x + 3 \\ y = 4x - 3 \end{array}$$

$$\begin{array}{r} 4) \quad x = 3y - 4 \\ \quad 5y - 2x = 2 \end{array}$$

$$\begin{array}{r} 5y - 2(3y-4) = 2 \\ 5y - 6y + 8 = 2 \\ -y + 8 = 2 \\ -y = -6 \\ y = 6 \end{array}$$

$$\begin{array}{r} x = 3y - 4 \\ x = 3(6) - 4 \\ x = 18 - 4 = 14 \end{array}$$

$(14, 6)$

$$\begin{array}{r} 5) \quad 2x + 5y = -5 \\ \quad 3y + x = -2 \end{array}$$

$$\begin{array}{r} -6y - 4 + 5y = -5 \\ -y - 4 = -5 \\ +4 \quad +4 \\ \hline -y = -1 \\ y = 1 \end{array}$$

$$\begin{array}{r} 2x + 5(1) = -5 \\ 2x + 5 = -5 \\ 2x = -10 \\ x = -5 \end{array}$$

$(-5, 1)$

$$\begin{array}{r} 6) \quad 5x + y = 0 \\ \quad 3x + 2y = 7 \end{array}$$

$$\begin{array}{r} 3x - 10x = 7 \\ -7x = 7 \\ x = \frac{7}{-7} = -1 \end{array}$$

$$\begin{array}{r} 5x + y = 0 \\ 5(-1) + y = 0 \\ -5 + y = 0 \\ y = 5 \end{array}$$

$(-1, 5)$

$$\begin{array}{r} 7) \quad 6x + 3y = -1 \\ \quad 4x + 9y = 4 \end{array}$$

$$\begin{array}{r} 4x + 9(-\frac{2x-1}{3}) = 4 \\ 4x - 18x - \frac{9}{3} = 4 \\ -14x - 3 = 4 \\ -14x = 7 \\ x = \frac{7}{-14} = -\frac{1}{2} \end{array}$$

$$\begin{array}{r} 6x + 3y = -1 \\ 6(-\frac{1}{2}) + 3y = -1 \\ -3 + 3y = -1 \\ +3 \quad +3 \\ \hline 3y = 2 \\ y = \frac{2}{3} \end{array}$$

$(-\frac{1}{2}, \frac{2}{3})$

$$\begin{array}{r} 8) \quad 2x + y = 5 \\ \quad 3x - 2y = 18 \end{array}$$

$$\begin{array}{r} 2x - 10 = 18 \\ +10 \quad +10 \\ \hline 2x = 28 \\ x = \frac{28}{2} = 14 \end{array}$$

$$\begin{array}{r} 2x + y = 5 \\ 2(14) + y = 5 \\ 28 + y = 5 \\ y = -23 \end{array}$$

$(14, -23)$

$$\begin{array}{r} 9) \quad 3y + 2x = 4 \\ \quad 5x + 6y = 11 \end{array}$$

$$\begin{array}{r} 5x + 6(\frac{4-2x}{3}) = 11 \\ 5x + \frac{24-12x}{3} = 11 \\ 5x - 4x + 8 = 11 \\ x + 8 = 11 \\ x = 3 \end{array}$$

$$\begin{array}{r} 3y + 2(3) = 4 \\ 3y + 6 = 4 \\ 3y = -2 \\ y = -\frac{2}{3} \end{array}$$

$(3, -\frac{2}{3})$

$$\begin{array}{r} 10) \quad 3x + 4y = 6 \\ \quad 2x + 3y = 5 \end{array}$$

$$\begin{array}{r} 2x + 3y = 5 \\ 2(-\frac{4y+6}{3}) + 3y = 5 \\ -\frac{8y}{3} + 4 + 3y = 5 \\ -\frac{8y}{3} + 3y + 4 = 5 \\ -\frac{8y}{3} + \frac{9y}{3} + 4 = 5 \\ \frac{1}{3}y + 4 = 5 \\ \frac{1}{3}y = 1 \\ y = 3 \end{array}$$

$$\begin{array}{r} 3x + 4(3) = 6 \\ 3x + 12 = 6 \\ 3x = -6 \\ x = -2 \end{array}$$

$(-2, 3)$

[CH 5.1] Positive Integer Exponents

[1] Evaluate

1) $a^2 \cdot a^5 \cdot a^4$

$$a^{2+5+4} = \boxed{a^{11}}$$

2) $x^6 \cdot x^4 \cdot x$

$$x^{6+4+1} = \boxed{x^{11}}$$

3) $3^3 \cdot 3^2 \cdot 3$

$$3^{3+2+1} = \boxed{3^6}$$

4) $(-2)^3 \cdot (-2)^2$

$$(-2)^{3+2} = \boxed{(-2)^5}$$

$$5) \frac{x^8}{x^5} = x^{8-5} = \boxed{x^3}$$

$$6) \frac{a^{10}}{a^3} = a^{10-3} = \boxed{a^7}$$

$$7) \frac{7^7}{7^4} = 7^{7-4} = \boxed{7^3}$$

$$8) \frac{6^{10}}{6^8} = 6^{10-8} = \boxed{6^2}$$

$$9) (x^3)^2 = x^{3 \cdot 2} = \boxed{x^6}$$

$$10) (3^5)^2 = 3^{5 \cdot 2} = \boxed{3^{10}}$$

$$11) (-2x^2)^2 = (-2)^2 (x^2)^2 = \boxed{4x^4}$$

$$12) (-2x^3)^3 = (-2)^3 (x^3)^3 = \boxed{-8x^9}$$

$$13) (2x^4y^3)^3 = 2^3 x^{4 \cdot 3} y^{3 \cdot 3} = \boxed{8x^{12}y^9}$$

$$14) (-5a^3b^2)^2 = (-5)^2 (a^3)^2 (b^2)^2 = \boxed{25a^6b^4}$$

$$15) (3x^2)^3 (2x^3)^2 = 3^3 x^{2 \cdot 3} 2^2 x^{3 \cdot 2} = 3^3 \cdot 2^2 \cdot x^6 \cdot x^6 = 3^3 \cdot 2^2 \cdot x^{12} = (27)(4)x^{12} = \boxed{108x^{12}}$$

$$16) (a^3)^4 (3a^2)^3 = a^{12} (3^3 a^{2 \cdot 3}) = (a^{12})(27)(a^6) = 27a^{12+6} = \boxed{27a^{18}}$$

$$17) \frac{(a^4)^3}{a^6 a^2} = \frac{a^{12}}{a^{6+2}} = \frac{a^{12}}{a^8} = a^{12-8} = \boxed{a^4}$$

$$18) \frac{(x^2)^3 (x^3)^2}{(x^4)^2} = \frac{x^6 x^6}{x^8} = \frac{x^{12}}{x^8} = x^{12-8} = \boxed{x^4}$$

$$19) \frac{a^8 b^9}{(a^3 b^2)^2} = \frac{a^8 b^9}{a^{3 \cdot 2} b^{2 \cdot 2}} = \frac{a^8 b^9}{a^6 b^4} = \left(\frac{a^8}{a^6}\right) \left(\frac{b^9}{b^4}\right) = a^{8-6} b^{9-4} = \boxed{a^2 b^5}$$

$$20) \frac{(x^2 y^3)^3}{x^3 y^5} = \frac{x^{2 \cdot 3} y^{3 \cdot 3}}{x^3 y^5} = \frac{x^6 y^9}{x^3 y^5} = \left(\frac{x^6}{x^3}\right) \left(\frac{y^9}{y^5}\right) = \boxed{x^3 y^4}$$

$$21) \frac{x^4 y^8}{x^2 (y^2)^3} = \frac{x^4 y^8}{x^2 y^{2 \cdot 3}} = \frac{x^4 y^8}{x^2 y^6} = \left(\frac{x^4}{x^2}\right) \left(\frac{y^8}{y^6}\right) = \boxed{x^2 y^2}$$

$$22) \frac{c^5 (d^3)^4}{c^3 d^2} = \frac{c^5 d^{12}}{c^3 d^2} = \left(\frac{c^5}{c^3}\right) \left(\frac{d^{12}}{d^2}\right) = \boxed{c^2 d^{10}}$$

$$23) (3x^2y^3)(-4x^3y^3) = (3)(-4)(x^2 x^3)(y^3 y^3) = -12x^{2+3}y^{3+3} = \boxed{-12x^5y^6}$$

$$24) (-x^2)^2 \cdot (-x^3)^3 = (-1)^2 x^{2 \cdot 2} \cdot (-1)^3 x^{3 \cdot 3} = (1)x^4 \cdot (-1)x^9 = (-1)(x^4 x^9) = \boxed{-x^{13}}$$

$$25) (2x^3)^4 \cdot (3x^2)^3 = 2^4 x^{3 \cdot 4} \cdot 3^3 x^{2 \cdot 3} = (2^4 \cdot 3^3)(x^{12} \cdot x^6) = (16 \cdot 27)(x^{12+6}) = \boxed{432x^{18}}$$

$$26) (-3a^2b^3)^2 (-2a^3b^2)^3 = (-3)^2 a^{2 \cdot 2} b^{3 \cdot 2} \cdot (-2)^3 a^{3 \cdot 3} b^{2 \cdot 3} = (9)(-8)(a^4 a^9 \cdot b^6 b^6) = \boxed{-72(a^{13} b^{12})}$$

$$27) \frac{(d^5)^2}{d^3 d^4} = \frac{d^{5 \cdot 2}}{d^{3+4}} = \frac{d^{10}}{d^7} = d^{10-7} = \boxed{d^3}$$

$$28) \frac{c^4 c^5}{(c^2)^3} = \frac{c^{4+5}}{c^{2 \cdot 3}} = \frac{c^9}{c^6} = c^{9-6} = \boxed{c^3}$$

$$29) \frac{(b^3)^4}{b^2 b^3} = \frac{b^{3 \cdot 4}}{b^{2+3}} = \frac{b^{12}}{b^5} = b^{12-5} = \boxed{b^7}$$

$$30) \frac{(-b^3)^4}{-b^2 b^3} = \frac{b^{3 \cdot 4}}{-b^{2+3}} = \frac{b^{12}}{-b^5} = -b^{12-5} = \boxed{-b^7}$$

$$31) (-x)^4 (-x^4) = x^4 \cdot -x^4 = -x^4 x^4 = -x^{4+4} = \boxed{-x^8}$$

$$32) (-x^3)^2 \cdot (-x^3)^2 = (-1)^2 x^{3 \cdot 2} \cdot (-1)^2 x^{3 \cdot 2} = (1)x^6 \cdot (1)x^6 = x^6 x^6 = \boxed{x^{12}}$$

[CH 5.2] Zero and Negative Exponents

[1] Evaluate

1) $7^0 = \boxed{1}$

2) $-4^0 + (-4)^0 = -1 + 1 = \boxed{0}$

3) $(-6)^0 = \boxed{1}$

4) $6x^0 + (6x)^0 = 6(1) + (1) = 6 + 1 = \boxed{7}$

5) $(a^2b^4)^0 + (-a^3b^2)^0 = 1 + 1 = \boxed{2}$

6) $(-5x)^0 - 5x^0 = 1 - 5(1) = 1 - 5 = \boxed{-4}$

7) $a^{-10} = \frac{1}{a^{10}}$

8) $2^{-4} = \frac{1}{2^4}$ or $\frac{1}{16}$

9) $5x^{-2} = \frac{5}{x^2}$

10) $(5x)^{-2} = \frac{1}{(5x)^2} = \frac{1}{25x^2}$

11) $(2x)^{-3} = \frac{1}{(2x)^3} = \frac{1}{8x^3}$

12) $2x^{-3} = \frac{2}{x^3}$

13) $(-3x)^{-4} = \frac{1}{(-3x)^4} = \frac{1}{81x^4}$

14) $-3x^{-4} = \frac{-3}{x^4}$

15) $a^0 + b^0 + c^0 + (a+b+c)^0 = 1 + 1 + 1 + 1 = \boxed{4}$

16) $x^5 \cdot x^{-3} = x^{5+(-3)} = \boxed{x^2}$

17) $\frac{x^4}{x^{10}} = x^{4-10} = x^{-6} = \frac{1}{x^6}$

18) $\frac{x^{-4}}{x^{10}} = x^{-4-10} = x^{-14} = \frac{1}{x^{14}}$

19) $\frac{a^3}{a^{-7}} = a^{3-(-7)} = a^{3+7} = \boxed{a^{10}}$

20) $\frac{a^{-3}}{a^{-4}} = a^{-3-(-4)} = a^{-3+4} = \boxed{a^1}$

21) $\frac{10^{-3} \cdot 10}{10^{-4}} = \frac{10^{-3+1}}{10^{-4}} = \frac{10^{-2}}{10^{-4}} = 10^{-2-(-4)} = 10^{-2+4} = 10^2 = \boxed{10^2}$

22) $\frac{a^5b^{-2}}{a^{-4}b^5} = \left(\frac{a^5}{a^{-4}}\right)\left(\frac{b^{-2}}{b^5}\right) = a^{5-(-4)}b^{-2-5} = a^{5+4}b^{-7} = a^9b^{-7} = \frac{a^9}{b^7}$

23) $\frac{x^{-2}y^{-3}}{x^{-3}y^4} = \left(\frac{x^{-2}}{x^{-3}}\right)\left(\frac{y^{-3}}{y^4}\right) = (x^{-2-(-3)})(y^{-3-4}) = (x^{-2+3})(y^{-7}) = (x^1)(y^{-7}) = \frac{x}{y^7}$

24) $(z^2)^4 = \left(\frac{z}{p^2}\right)^4 = \frac{z^4}{p^8}$

25) $(a^{-3}b^2)^{-2} = \left(\frac{b^2}{a^3}\right)^{-2} = \left(\frac{a^3}{b^2}\right)^2 = \frac{a^6}{b^4}$

26) $\frac{(a^{-3})^2}{a^{-4}} = \frac{a^{-6}}{a^{-4}} = a^{-6-(-4)} = a^{-6+4} = a^{-2} = \frac{1}{a^2}$

27) $\frac{(x^2)^{-4}}{(x^{-6})^2} = \frac{x^{-8}}{x^{-12}} = x^{-8-(-12)} = x^{-8+12} = x^4 = \boxed{x^4}$

28) $\frac{(b^3)^{-3}}{(b^{-2})^4} = \frac{b^{-9}}{b^{-8}} = b^{-9-(-8)} = b^{-9+8} = b^{-1} = \frac{1}{b}$

29) $\frac{(m^{-2})^3(m^4)}{(m^{-2})^{-2}} = \frac{m^{-6}m^4}{m^{+4}} = \frac{m^{-6+4}}{m^4} = \frac{m^{-2}}{m^4} = m^{-2-4} = m^{-6} = \frac{1}{m^6}$

30) $\frac{(x^{-2})^{-3}(x^{-3})}{(x^2)^{-4}} = \frac{x^{+6}x^{-3}}{x^{-8}} = \frac{x^{6-3}}{x^{-8}} = \frac{x^3}{x^{-8}} = x^{3-(-8)} = x^{3+8} = x^{11}$

31) $\frac{5^0 - (-5)^0}{5^0 + (-5)^0} = \frac{1-1}{1+1} = \frac{0}{2} = \boxed{0}$

32) $\frac{2^0 + (-2)^0}{2^0 - (-2)^0} = \frac{1+1}{1-1} = \frac{2}{0} = \text{undefined}$

33) $\frac{(c^3)^4}{c^5c^{-2}} = \frac{c^{12}}{c^{5+(-2)}} = \frac{c^{12}}{c^3} = c^{12-3} = c^9 = \boxed{c^9}$

34) $\frac{c^2c^3}{(c^4)^{-3}} = \frac{c^{2+3}}{c^{4 \cdot (-3)}} = \frac{c^5}{c^{-12}} = c^{5-(-12)} = c^{5+12} = c^{17} = \boxed{c^{17}}$

[CH 5.2-2] Scientific Notation

[A] Write each number in scientific notation

1) 28.56

$= 2.856 \times 10^1$

2) 78,000

Move decimal place left 4 times
 7.8×10^4

3) 375.4

moved left 2 times
 3.754×10^2

4) 1400

moved left 3 times
 1.4×10^3

5) 0.06184

moved right 2 times
 6.184×10^{-2}

6) 0.008012

moved right 3 times
 8.012×10^{-3}

7) 0.0006

moved right 4 times
 6.0×10^{-4}

8) 0.000032

moved right 5 times
 3.2×10^{-5}

9) 0.456×10^{-3}

moved right 1 time
 $4.56 \times 10^{-3-1}$
 4.56×10^{-4}

10) 0.0145×10^{-4}

moved right 2 times
 $1.45 \times 10^{-4-2}$
 1.45×10^{-6}

11) 256×10^5

moved left 2 times
 $2.56 \times 10^{5+2}$
 2.56×10^7

12) 39.9×10^4

moved left 1 time
 $3.99 \times 10^{4+1}$
 3.99×10^5

13) 4,200,000

Moved left 6 times
 4.2×10^6

14) 0.0000000012

Moved right 9 times
 1.2×10^{-9}

15) $12,345 \times 10^5$

Moved left 4 times
 $1.2345 \times 10^{5+4}$
 1.2345×10^9

16) $12,345 \times 10^{-5}$

Moved left 4 times
 $1.2345 \times 10^{-5+4}$
 1.2345×10^{-1}

[B] Change scientific notation to regular number

1) 2.3×10^0

$= 2.3 \times 1$
 $= 2.3$

2) 1.25×10^1

$= 1.25 \times 10$
 $= 12.5$

3) 1.256×10^2

$1.256 \times 100 = 125.6$
 Move decimal place twice (2 zeros) right
 125.6

4) $1.256 \times 10^3 \Rightarrow 1000$

MOVE 3 times right
 1256

5) 1.256×10^{-4}

MOVE decimal place right 4 times
 1.2560
 12560

6) 1.256×10^5

MOVE Right 5 times
 1.2560000
 125600

7) 1.256×10^{-1}

MOVE decimal place left 1 time
 1.256
 0.1256

8) 1.256×10^{-2}

MOVE left 2 times
 1.256
 0.01256

9) 1.256×10^{-3}

MOVE left 3 times
 1.256
 0.001256

10) 1.256×10^{-4}

MOVE left 4 times
 1.256
 0.0001256

11) 1.256×10^{-5}

MOVE left 5 times
 1.256
 0.00001256

12) $\frac{4.0 \times 10^{-4}}{2.0 \times 10^2}$

$= \left(\frac{4.0}{2.0}\right) \times \left(\frac{10^{-4}}{10^2}\right)$
 $= (2.0) \times (10^{-4-2})$
 $= 2.0 \times 10^{-6}$

13) $\frac{6.0 \times 10^4}{2.0 \times 10^{-3}}$

$= \left(\frac{6.0}{2.0}\right) \times (10^{4-(-3)})$
 $= (3.0) \times (10^{4+3})$
 $= 3.0 \times 10^7$

14) $\frac{2.4 \times 10^{-4}}{1.2 \times 10^{-3}}$

$= \left(\frac{2.4}{1.2}\right) \times (10^{-4-(-3)})$
 $= (2.0) \times (10^{-4+3})$
 $= 2.0 \times 10^{-1}$

15) $(2.0 \times 10^3)(3.0 \times 10^3)$

$= (2.0)(3.0)(10^3 \cdot 10^3)$
 $= (6.0)(10^{3+3})$
 $= 6.0 \times 10^5$

16) $(3.0 \times 10^{-3})(2.0 \times 10^3)$

$= (3.0)(2.0) \times (10^{-3+3})$
 $= 6.0 \times 10^{-1}$

[C] Perform the indicated operation

1) $\frac{8 \times 10^5}{2 \times 10^2} = \left(\frac{8}{2}\right) \left(\frac{10^5}{10^2}\right) = 4 \times 10^{5-2} = 4 \times 10^3$

2) $\frac{4 \times 10^{-2}}{2 \times 10^7} = \left(\frac{4}{2}\right) \left(\frac{10^{-2}}{10^7}\right) = 2 \times 10^{-2-7} = 2 \times 10^{-9}$

3) $\frac{6 \times 10^{-5}}{2 \times 10^{-2}} = \left(\frac{6}{2}\right) (10^{-5-(-2)}) = 3 (10^{-5+2}) = 3 \times 10^{-3}$

4) $\frac{8 \times 10^5}{5 \times 10^{-5}} = \left(\frac{8}{5}\right) \times 10^{5-(-5)} = 1.6 \times 10^{5+5} = 1.6 \times 10^{10}$

5) $(5 \times 10^5)(3 \times 10^3) = (5 \cdot 3)(10^5 \cdot 10^3) = (15)(10^{5+3}) = 15 \times 10^8 = 1.5 \times 10^9$

6) $(6 \times 10^{-2})(4 \times 10^{-4}) = (6 \cdot 4)(10^{-2} \cdot 10^{-4}) = (24)(10^{-2+(-4)}) = 24 \times 10^{-6} = 2.4 \times 10^{-5}$

7) $(4 \times 10^{-3})(5 \times 10^1) = (4 \cdot 5)(10^{-3} \cdot 10^1) = (20)(10^{-3+1}) = 20 \times 10^{-2} = 2.0 \times 10^{-3}$

8) $(7 \times 10^4)(8 \times 10^{-2}) = (7 \cdot 8)(10^4 \cdot 10^{-2}) = (56)(10^{4+(-2)}) = 56 \times 10^2 = 5.6 \times 10^3$

9) $\frac{5 \times 10^{-1}}{2 \times 10^6} = \left(\frac{5}{2}\right) \times 10^{-1-6} = 2.5 \times 10^{-7}$

10) $\frac{36 \times 10^{-3}}{6 \times 10^{-5}} = \left(\frac{36}{6}\right) \cdot 10^{-3-(-5)} = 6 \times 10^{-3+5} = 6 \times 10^2$

11) $\frac{0.8 \times 10^3}{0.4 \times 10^5} = \left(\frac{0.8}{0.4}\right) (10^{3-5}) = 2 \times 10^{-2}$

12) $\frac{14 \times 10^{-3}}{5 \times 10^4} = \left(\frac{14}{5}\right) \times 10^{-3-4} = 2.8 \times 10^{-7}$

13) $(1.3 \times 10^4)(2 \times 10^2) = (1.3)(2)(10^4 \cdot 10^2) = 2.6 \times 10^6$

14) $(1.2 \times 10^{-2})(3 \times 10^3) = (1.2)(3)(10^{-2} \cdot 10^3) = 3.6 \times 10^1$

15) $(2 \times 10^{-2})(7 \times 10^{-5}) = (2 \cdot 7)(10^{-2} \cdot 10^{-5}) = 14 \times 10^{-2+(-5)} = 14 \times 10^{-7} = 1.4 \times 10^{-6}$

16) $(0.2 \times 10^{-3})(0.3 \times 10^{-5}) = (0.2 \cdot 0.3)(10^{-3} \cdot 10^{-5}) = 0.06(10^{-3+(-5)}) = 0.06(10^{-8}) = 0.6 \times 10^{-9} = 6.0 \times 10^{-10}$

17) $2 \times 10^3 + 3 \times 10^2 = 20 \times 10^2 + 3 \times 10^2 = (20+3) \times 10^2 = 23 \times 10^2 = 2.3 \times 10^3$

18) $2 \times 10^{-3} + 3 \times 10^{-2} = 2 \times 10^{-3} + 30 \times 10^{-3} = (2+30) \times 10^{-3} = 32 \times 10^{-3} = 3.2 \times 10^{-2}$

19) $5.7 \times 10^7 - 3.4 \times 10^5 = 570 \times 10^5 - 3.4 \times 10^5 = (570-3.4) \times 10^5 = 566.6 \times 10^5 = 5.666 \times 10^7$

20) $5.7 \times 10^7 - 3.4 \times 10^5 = 5.7 \times 10^7 - 340 \times 10^4 = (5.7-340) \times 10^7 = -334.3 \times 10^7 = -3.343 \times 10^5$

[D] Change to scientific notations and evaluate expressions

1) $\frac{0.000025}{5000} = \frac{2.5 \times 10^{-5}}{5 \times 10^3} = \left(\frac{2.5}{5}\right) (10^{-5-3}) = \frac{1}{2} \times 10^{-8} = 0.5 \times 10^{-8} = 5.0 \times 10^{-9}$

2) $\frac{12,000,000}{0.0006} = \frac{1.2 \times 10^7}{6 \times 10^{-4}} = \left(\frac{1.2}{6}\right) (10^{7-(-4)}) = 0.2 \times 10^{11} = 2.0 \times 10^{10}$

3) $\frac{0.0000000025}{0.0000000005} = \frac{2.5 \times 10^{-8}}{5.0 \times 10^{-10}} = \left(\frac{2.5}{5}\right) (10^{-8-(-10)}) = 0.5 \times 10^{-8+10} = 0.5 \times 10^2 = 5.0 \times 10^1$

4) $\frac{8,000,000,000}{2,000,000} = \frac{8 \times 10^9}{2 \times 10^6} = \left(\frac{8}{2}\right) \left(\frac{10^9}{10^6}\right) = 4 \times 10^{9-6} = 4 \times 10^3$

5) $(2,000,000)(300,000) = (2 \times 10^6)(3 \times 10^5) = (2 \cdot 3)(10^6 \cdot 10^5) = 6 \times 10^{11}$

6) $(5,000,000,000)(3,000,000) = (5 \times 10^9)(3 \times 10^6) = (5 \cdot 3)(10^9 \cdot 10^6) = 15 \times 10^{15} = 1.5 \times 10^{16}$

7) $(4,000,000,000)(2,000) = (4 \times 10^9)(2 \times 10^3) = (4 \cdot 2)(10^9 \cdot 10^3) = 8 \times 10^{12} = 8.0 \times 10^{12}$

8) $(2,000,000)(30,000,000)(40,000) = (2 \times 10^6)(3 \times 10^7)(4 \times 10^4) = (2 \cdot 3 \cdot 4)(10^6 \cdot 10^7 \cdot 10^4) = 24 \times 10^{17} = 2.4 \times 10^{18}$

9) $\frac{(0.00002)(40,000,000)}{(5,000,000)(0.0007)} = \frac{(2 \times 10^{-5})(4 \times 10^7)}{(5 \times 10^6)(7 \times 10^{-4})} = \frac{8 \times 10^2}{35 \times 10^2} = 0.229 \times 10^0 = 2.29 \times 10^1$

10) $\frac{500,000,000 \times 0.00005}{0.00003 \times 3000} = \frac{(5 \times 10^8)(5 \times 10^{-5})}{(3 \times 10^{-5})(3 \times 10^3)} = \frac{25 \times 10^3}{9 \times 10^{-2}} = \left(\frac{25}{9}\right) (10^{3-(-2)}) = 2.78 \times 10^5$

11) $\frac{0.00002 \times 5,000,000}{300,000 \times 0.00003} = \frac{(2 \times 10^{-5})(5 \times 10^6)}{(3 \times 10^5)(3 \times 10^{-5})} = \frac{10 \times 10^1}{9 \times 10^0} = \left(\frac{10}{9}\right) \times 10^{1-0} = 1.11 \times 10^1$

12) $\frac{200}{0.00002 \times 0.0005 \times 0.001} = \frac{2 \times 10^2}{2 \times 10^{-5} \times 5 \times 10^{-4} \times 1 \times 10^{-3}} = \frac{2 \times 10^2}{10 \times 10^{-12}} = 0.2 \times 10^{12-(-12)} = 2 \times 10^{24}$

13) $\frac{20,000 \times 40,000}{0.004 \times 0.0002} = \frac{(2 \times 10^4)(4 \times 10^4)}{(4 \times 10^{-3})(2 \times 10^{-4})} = \frac{8 \times 10^8}{8 \times 10^{-7}} = \left(\frac{8}{8}\right) \times 10^{8-(-7)} = 1 \times 10^{15}$

14) $\frac{0.00002 \times 0.00004}{2,000 \times 4,000} = \frac{(2 \times 10^{-5})(4 \times 10^{-5})}{(2 \times 10^3)(4 \times 10^3)} = \frac{8 \times 10^{-10}}{8 \times 10^6} = \left(\frac{8}{8}\right) \times 10^{-10-6} = 1 \times 10^{-16}$

15) $\frac{0.0001 \times 0.0002 \times 0.0003}{0.001 \times 0.002 \times 0.003} = \frac{(1 \times 10^{-4})(2 \times 10^{-4})(3 \times 10^{-4})}{(1 \times 10^{-3})(2 \times 10^{-3})(3 \times 10^{-3})} = \frac{6 \times 10^{-12}}{6 \times 10^{-9}} = \left(\frac{6}{6}\right) \times 10^{-12-(-9)} = 1 \times 10^{-3}$

16) $\frac{10,000 \times 20,000 \times 30,000}{100 \times 200 \times 300} = \frac{(1 \times 10^4)(2 \times 10^4)(3 \times 10^4)}{(1 \times 10^2)(2 \times 10^2)(3 \times 10^2)} = \frac{6 \times 10^{12}}{6 \times 10^6} = \left(\frac{6}{6}\right) \times 10^{12-6} = 1 \times 10^6$

[CH 5.4] Adding and Subtracting Polynomials

[1]

$$1) 7x - 2 + 2x + 9 = (7x + 2x) + (-2 + 9) = \boxed{9x + 7}$$

$$2) (8x^2 - 10x) + (4x^2 - 6x) = (8x^2 + 4x^2) + (-10x - 6x) \\ = 12x^2 - 16x = \boxed{12x^2 - 16x}$$

$$3) (2d^2 - 3d) + (-d^2 + 3d) = (2d^2 - d^2) + (-3d + 3d) \\ = d^2 + 0 = \boxed{d^2}$$

$$4) (a^2 - 2a^3) + (3a^3 + 4a^2) = (-2a^3 + 3a^3) + (a^2 + 4a^2) \\ = \boxed{a^3 + 5a^2}$$

$$5) 6x - (3y - 2x) = 6x - 3y + 2x = \boxed{8x - 3y}$$

$$6) -8a - (3b - 2a) = -8a - 3b + 2a = \boxed{-6a - 3b}$$

$$7) \text{ Subtract } 2x - 3 \text{ from } 5x - 2 \\ (5x - 2) - (2x - 3) = 5x - 2 - 2x + 3 = (5x - 2x) + (-2 + 3) \\ = \boxed{3x + 1}$$

$$8) \text{ Subtract } y - 3 \text{ from } 2y + 7 \\ (2y + 7) - (y - 3) = 2y + 7 - y + 3 = (2y - y) + (7 + 3) = \boxed{y + 10}$$

$$9) \text{ Subtract } -6x^2 - 2x \text{ from } 8x^2 - 8 \\ (8x^2 - 8) - (-6x^2 - 2x) = 8x^2 - 8 + 6x^2 + 2x = 14x^2 + 2x - 8 \\ = \boxed{14x^2 + 2x - 8}$$

$$10) \text{ Subtract } 7a^2 - 3a + 2 \text{ from } -8a^2 - 7a + 5 \\ (-8a^2 - 7a + 5) - (7a^2 - 3a + 2) = -8a^2 - 7a + 5 - 7a^2 + 3a - 2 \\ = -15a^2 - 4a + 3 = \boxed{-15a^2 - 4a + 3}$$

$$11) (3x - 7) + (5 - x) - (4x - 2) \\ 3x - 7 + 5 - x - 4x + 2 = -2x - 0 \\ = \boxed{-2x}$$

$$12) (7a + 2) - (3a - 8) + (a - 7) \\ 7a + 2 - 3a + 8 + a - 7 = (7a - 3a + a) + (2 + 8 - 7) = \boxed{5a + 3}$$

$$13) (y^2 - 3y) - (4y - 6) - (2 - y^2) \\ y^2 - 3y - 4y + 6 - 2 + y^2 \\ = (y^2 + y^2) + (-3y - 4y) + (6 - 2) = \boxed{2y^2 - 7y + 4}$$

$$14) (x^3 - 4x^2) - (5x^2 - x) - (7x - 9) \\ x^3 - 4x^2 - 5x^2 + x - 7x + 9 \\ = x^3 - 9x^2 - 6x + 9 = \boxed{x^3 - 9x^2 - 6x + 9}$$

$$15) (3x^2 - 5x + 3) - (x^2 + 2x - 2) \\ 3x^2 - 5x + 3 - x^2 - 2x + 2 = (3x^2 - x^2) + (-5x - 2x) + (3 + 2) \\ = 2x^2 - 7x + 5 = \boxed{2x^2 - 7x + 5}$$

$$16) (4x^2 + 6x - 5) - (-2x^2 - 3x + 2) \\ 4x^2 + 6x - 5 + 2x^2 + 3x - 2 = (4x^2 + 2x^2) + (6x + 3x) + (-5 - 2) \\ = 6x^2 + 9x - 7 = \boxed{6x^2 + 9x - 7}$$

[2]

$$1) (3x - 5) + (2x + 7) = 3x - 5 + 2x + 7 = (3x + 2x) + (-5 + 7) = \boxed{5x + 2}$$

$$2) (3x - 5) - (2x + 7) = 3x - 5 - 2x - 7 = (3x - 2x) + (-5 - 7) = \boxed{x - 12}$$

$$3) (4x^3 - 4x^2) + (x^2 - 6x^2) = 4x^3 - 4x^2 + x^2 - 6x^2 = (4x^3 + x^2) + (-4x^2 - 6x^2) = \boxed{5x^3 - 10x^2}$$

$$4) (4a^2 - a) - (-2a^2 + 5a) = 4a^2 - a + 2a^2 - 5a = 4a^2 + 2a^2 - a - 5a = \boxed{6a^2 - 6a}$$

$$5) (2A^2 - A + 4) + (3A^2 + A - 5) = 2A^2 - A + 4 + 3A^2 + A - 5 \\ = (2A^2 + 3A^2) + (-A + A) + (4 - 5) = 5A^2 + 0A - 1 = \boxed{5A^2 - 1}$$

$$6) (3x^2 + 4x - 10) - (5x^2 - 3x + 7) = 3x^2 + 4x - 10 - 5x^2 + 3x - 7 \\ = (3x^2 - 5x^2) + (4x + 3x) + (-10 - 7) = \boxed{-2x^2 + 7x - 17}$$

$$7) \text{ Subtract } -5b^2 + 4b + 8 \text{ from } 8b^2 + 2b - 14 \\ (8b^2 + 2b - 14) - (-5b^2 + 4b + 8) = (8b^2 + 5b^2) + (2b - 4b) + (-14 - 8) \\ = 13b^2 - 2b - 22 = \boxed{13b^2 - 2b - 22}$$

$$8) \text{ Subtract } c^2 - 9c + 6 \text{ from } 11c^2 - 4c + 7 \\ (11c^2 - 4c + 7) - (c^2 - 9c + 6) = (11c^2 - c^2) + (-4c + 9c) + (7 - 6) \\ = 10c^2 + 5c + 1 = \boxed{10c^2 + 5c + 1}$$

$$9) (2b^2 + 7b - 5) + (4b^2 - 2b + 8) \\ = (2b^2 + 4b^2) + (7b - 2b) + (-5 + 8) = \boxed{6b^2 + 5b + 3}$$

$$10) (4a^2 + 6 - 3a) - (5a + 3a^2 - 4) = 4a^2 + 6 - 3a - 5a - 3a^2 + 4 \\ = (4a^2 - 3a^2) + (-3a - 5a) + (6 + 4) = a^2 - 8a + 10 = \boxed{a^2 - 8a + 10}$$

$$11) (7x^2 - 2x - 5) - (-2x^2 + 4x - 7) = 7x^2 - 2x - 5 + 2x^2 - 4x + 7 \\ = (7x^2 + 2x^2) + (-2x - 4x) + (-5 + 7) = 9x^2 - 6x + 2 = \boxed{9x^2 - 6x + 2}$$

$$12) (8y + 1) + [(2y - 3) + (y + 7)] = 8y + 1 + 2y - 3 + y + 7 \\ = (8y + 2y + y) + (1 - 3 + 7) = 11y + 5 = \boxed{11y + 5}$$

$$13) (x^2 + 4) - [(x^2 - 5) - (3x^2 + 1)] = x^2 + 4 - [x^2 - 5 - 3x^2 - 1] \\ = x^2 + 4 - [-2x^2 - 6] = (x^2 + 2x^2) + (4 + 6) = \boxed{3x^2 + 10}$$

$$14) (2a + 5) - [(3a + 2) + (5a - 3)] = 2a + 5 - [3a + 2 + 5a - 3] \\ = 2a + 5 - [8a - 1] = 2a + 5 - 8a + 1 = (2a - 8a) + (5 + 1) = \boxed{-6a + 6}$$

$$15) \text{ Subtract } 2a - 3 \text{ from the sum of } (2a - 5) \text{ and } (-5a - 4) \\ [(2a - 5) + (-5a - 4)] - (2a - 3) = (-3a - 9 - 2a + 3) - (2a - 3) \\ = (-3a - 2a) + (-9 + 3) - 2a + 3 = -5a - 6 - 2a + 3 = \boxed{-7a - 3}$$

$$16) \text{ Subtract } -5x + 7 \text{ from the sum of } (10x + 7) \text{ and } (-4x - 10) \\ [(10x + 7) + (-4x - 10)] - (-5x + 7) = (6x - 3 - 5x + 7) - (-5x + 7) \\ = (6x - 5x) + (-3 + 7) - (-5x + 7) = x + 4 - (-5x + 7) \\ = x + 4 + 5x - 7 = 6x - 3 = \boxed{6x - 3}$$

[CH 5.5] Multiplication and Division of Polynomials

[1]

1) $(3a^2)(5a^4)$
 $(3 \cdot 5)(a^2 \cdot a^4)$
 $15(a^{2+4}) = 15a^6$

2) $(-4x^3)(-3x^5)$
 $(-4)(-3)(x^3 \cdot x^5)$
 $12x^8$

3) $5a(2a-4)$
 $5a(2a) - 5a(4)$
 $10a^2 - 20a$

4) $(-6b^2)(3b^3 + 5b)$
 $(-6b^2)(3b^3) + (-6b^2)(5b)$
 $-18b^5 + -30b^3$

5) $4a^2b(2a^2b - 3ab^2 + 5ab)$
 $(4a^2b)(2a^2b) - (4a^2b)(3ab^2) + (4a^2b)(5ab)$
 $= (4 \cdot 2)a^4b^3 - (4 \cdot 3)a^3ab^3 + (4 \cdot 5)a^3abb$
 $= 8a^4b^3 - 12a^3b^3 + 20a^3b^2$

6) $-7p^2q(2p^2q - 4p^2q + pq)$
 $(-7p^2q)(2p^2q) - (-7p^2q)(4p^2q) + (-7p^2q)(pq)$
 $= -14p^4q^2 + 28p^4q^2 - 7p^3q^2$

7) $(a+4)(a+2)$
 $(a)(a) + (a)(2) + (4)(a) + (4)(2)$
 $a^2 + 2a + 4a + 8$
 $a^2 + 6a + 8$

8) $(x-3)(x-6)$
 $(x)(x) + (x)(-6) + (-3)(x) + (-3)(-6)$
 $x^2 - 6x - 3x + 18$
 $x^2 - 9x + 18$

9) $(3x-4)(2x+3)$
 $(3x)(2x) + (3x)(3) + (-4)(2x) + (-4)(3)$
 $6x^2 + 9x - 8x - 12$
 $6x^2 + x - 12$

10) $(5x+2y)(2x-3y)$
 $(5x)(2x) + (5x)(-3y) + (2y)(2x) + (2y)(-3y)$
 $10x^2 - 15xy + 4xy - 6y^2$
 $10x^2 - 11xy - 6y^2$

11) $(3a+2)^2$
 $(3a+2)(3a+2)$
 $(3a)(3a) + (3a)(2) + (2)(3a) + (2)(2)$
 $9a^2 + 6a + 6a + 4$
 $9a^2 + 12a + 4$

12) $(x+4)(x-4)$
 $(x)(x) + (x)(-4) + (4)(x) + (4)(-4)$
 $x^2 - 4x + 4x - 16$
 $x^2 - 16$

13) $x(x+2)(x-3)$
 $(x)(x) + (x)(2) + (x)(-3)$
 $(x^2 + 2x)(x-3)$
 $(x^2)(x) + (x^2)(-3) + (2x)(x) + (2x)(-3)$
 $x^3 + -3x^2 + 2x^2 + -6x$
 $x^3 + (-x^2) - 6x$

14) $-2p(3p^2 - 4p + 5)$
 $(-2p)(3p^2) + (-2p)(-4p) + (-2p)(5)$
 $= -6p^3 + 8p^2 - 10p$

15) $(3c-4)(2c^2 - c - 6)$
 $(3c)(2c^2) + (3c)(-c) + (3c)(-6) + (-4)(2c^2) + (-4)(-c) + (-4)(-6)$
 $= 6c^3 + -3c^2 + -18c + -8c^2 + 4c + 24$
 $6c^3 + -11c^2 + -14c + 24$
 $6c^3 - 11c^2 - 14c + 24$

16) $(2a-3)(2a^2 + 2a - 3)$
 $(2a)(2a^2) + (2a)(2a) + (2a)(-3) + (-3)(2a^2) + (-3)(2a) + (-3)(-3)$
 $= 4a^3 + 4a^2 - 6a - 6a^2 - 6a + 9$
 $= 4a^3 - 2a^2 - 12a + 9$

[2]

1) $6xy^2(3xy - 3x + 4y)$

2) $-5x(3x^3 - 2x^2 + 3)$

$6xy^2(3xy) + 6xy^2(-3x) + 6xy^2(4y)$
 $18x^2y^3 - 18x^2y^2 + 24xy^3$

$(-5x)(3x^3) + (-5x)(-2x^2) + (-5x)(3)$
 $-15x^4 + 10x^3 - 15x$

3) $(5c+4d)(5c-4d)$
 $(5c)(5c) + (5c)(-4d) + (4d)(5c) + (4d)(-4d)$
 $25c^2 - 20cd + 20cd - 16d^2$
 $25c^2 - 16d^2$

4) $a(a+1)(a-1)$
 $(a^2 + a)(a-1)$
 $(a^2)(a) + (a^2)(-1) + (a)(a) + (a)(-1)$
 $a^3 - a^2 + a^2 - a$
 $a^3 - a$

5) $(2y-3)(3y^2 - 4y + 5)$
 $(2y)(3y^2) + (2y)(-4y) + (2y)(5) + (-3)(3y^2) + (-3)(-4y) + (-3)(5)$
 $= 6y^3 + -8y^2 + 10y + -9y^2 + 12y - 15$
 $6y^3 + -17y^2 + 22y - 15$

6) $(3d-4)(5d^2 + 2d - 4)$
 $(3d)(5d^2) + (3d)(2d) + (3d)(-4) + (-4)(5d^2) + (-4)(2d) + (-4)(-4)$
 $15d^3 + 6d^3 + -12d + -20d^2 + -8d + 16$
 $15d^3 + -14d^2 + -20d + 16$
 $15d^3 - 14d^2 - 20d + 16$

7) $\frac{45x^6y^5}{5x^2y^3}$
 $(\frac{45}{5})(\frac{x^6}{x^2})(\frac{y^5}{y^3})$
 $9x^4y^2$

8) $\frac{25p^4q^3}{5p^2q}$
 $(\frac{25}{5})(\frac{p^4}{p^2})(\frac{q^3}{q})$
 $5p^2q^2$

9) $\frac{15x^3 - 9x^2}{3x} - \frac{9x^2}{3x}$
 $5x^2 - 3x$

10) $\frac{27m^4 - 18m^3}{9m^2} - \frac{18m^3}{9m^2}$
 $3m^2 - 2m$

11) $\frac{18x^5 - 27x^4 + 36x^3}{9x^3}$

12) $\frac{40p^7 - 36p^5 - 32p^3}{4p^2}$

$\frac{18x^5}{9x^3} - \frac{27x^4}{9x^3} + \frac{36x^3}{9x^3}$
 $2x^2 - 3x + 4$

$\frac{40p^7}{4p^2} - \frac{36p^5}{4p^2} - \frac{32p^3}{4p^2}$
 $10p^5 - 9p^3 - 8p$

13) $\frac{36x^5y^4 + 30x^4y^3 - 24x^3y^4}{6x^3y^2}$

14) $\frac{-16x^4y^3 + 12x^3y^4}{4x^2y}$

$\frac{36x^5y^4}{6x^3y^2} + \frac{30x^4y^3}{6x^3y^2} - \frac{24x^3y^4}{6x^3y^2}$
 $6x^2y^2 + 5xy - 4y^2$

$\frac{-16x^4y^3}{4x^2y} + \frac{12x^3y^4}{4x^2y}$
 $-4x^2y^2 + 3xy^3$

[CH 6.1] Introducing Factoring

[1] Factor by Common Factor

1) $5x + 10$ $GCF=5$
 $= 5(\frac{5x}{5} + \frac{10}{5})$
 $= 5(x+2)$

2) $15a - 5$ $GCF=5$
 $= 5(\frac{15a}{5} + \frac{-5}{5})$
 $= 5(3a-1)$

3) $-15b - 10$ $GCF=-5$
 $= -5(\frac{-15b}{-5} + \frac{-10}{-5})$
 $= -5(3b+2)$

4) $-6a - 15$ $GCF=-3$
 $= -3(\frac{-6a}{-3} + \frac{-15}{-3})$
 $= -3(2a+5)$

5) $8x^2 - 4x$ $GCF=4x$
 $= 4x(\frac{8x^2}{4x} - \frac{4x}{4})$
 $= 4x(2x-1)$

6) $10a^3 - 25a^2$ $GCF=5a^2$
 $5a^2(\frac{10a^3}{5a^2} - \frac{25a^2}{5a^2})$
 $5a^2(2a-5)$

7) $15xy + 20y$ $GCF=5y$
 $= 5y(\frac{15xy}{5y} + \frac{20y}{5y})$
 $= 5y(3x+4)$

8) $27a^2 - 18a^4$ $GCF=9a^2$
 $= 9a^2(\frac{27a^2}{9a^2} - \frac{18a^4}{9a^2})$
 $= 9a^2(3-2a^2)$

9) $2a^2b + 4ab^2$ $GCF=2ab$
 $2ab(\frac{2a^2b}{2ab} + \frac{4ab^2}{2ab})$
 $= 2ab(a+2b)$

10) $12c^3d^2 - 18c^2d^3$ $GCF=6c^2d^2$
 $= 6c^2d^2(\frac{12c^3d^2}{6c^2d^2} - \frac{18c^2d^3}{6c^2d^2})$
 $= 6c^2d^2(2c-3d)$

11) $4x^3 - 12x^2 - 24x$ $GCF=4x$
 $4x(\frac{4x^3}{4x} - \frac{12x^2}{4x} - \frac{24x}{4x})$
 $4x(x^2-3x-6)$

12) $24a^4 + 8a^2 - 40$ $GCF=8$
 $8(\frac{24a^4}{8} + \frac{8a^2}{8} - \frac{40}{8})$
 $= 8(3a^4 + a^2 - 5)$

13) $14x^3y^3 + 42x^2y^4 - 28x^2y^3$ $GCF=14x^2y^3$
 $14x^2y^3(\frac{14x^3y^3}{14x^2y^3} + \frac{42x^2y^4}{14x^2y^3} - \frac{28x^2y^3}{14x^2y^3})$
 $14x^2y^3(x+3y-2)$

14) $18a^3b^4 - 12a^2b^3 - 48a^4b^3$ $GCF=6a^2b^3$
 $6a^2b^3(\frac{18a^3b^4}{6a^2b^3} - \frac{12a^2b^3}{6a^2b^3} - \frac{48a^4b^3}{6a^2b^3})$
 $6a^2b^3(3ab-2-8a^2)$

15) $x(a+b) - y(a+b)$ $GCF=(a+b)$
 $(a+b)(\frac{x(a+b)}{a+b} - \frac{y(a+b)}{a+b})$
 $(a+b)(x-y)$

16) $3a(a-2b) - 2(a-2b)$ $GCF=(a-2b)$
 $(a-2b)(\frac{3a(a-2b)}{a-2b} - \frac{2(a-2b)}{a-2b})$
 $(a-2b)(3a-2)$

[2] Factor by grouping

1) $ax + bx + ay + by$ $GCF1=2x$ $GCF2=2y$
 $x(\frac{ax}{x} + \frac{bx}{x}) + y(\frac{ay}{y} + \frac{by}{y})$
 $x(a+b) + y(a+b)$
 $(a+b)(\frac{x(a+b)}{a+b} + \frac{y(a+b)}{a+b}) = (a+b)(x+y)$

2) $mx - nx - my + ny$ $GCF1=2x$ $GCF2=2y$
 $x(\frac{mx}{x} - \frac{nx}{x}) - y(\frac{my}{y} + \frac{ny}{y})$
 $x(m-n) - y(m-n)$
 $(m-n)(x-y) = (m-n)(x-y)$

3) $pq + p - q - 1$ $GCF2=-1$
 $(p+1)(q-1) + (q-1)$
 $(q-1)(\frac{(p+1)(q-1)}{q-1} + \frac{(q-1)}{q-1})$
 $(q-1)(p+1+1) = (q-1)(p+2)$

4) $cd - d + c - 1$ $GCF1=d$ $GCF2=c-1$
 $d(\frac{cd}{d} - \frac{d}{d}) + (c-1)$
 $d(c-1) + (c-1)$
 $(c-1)(\frac{d(c-1)}{c-1} + \frac{(c-1)}{c-1}) = (c-1)(d+1)$

5) $3a^2 - 6ab + 2a^2 - 4b$ $GCF1=3a$ $GCF2=2$
 $3a(\frac{3a^2}{3a} - \frac{6ab}{3a}) + 2(\frac{2a^2}{2} - \frac{4b}{2})$
 $3a(a-2b) + 2(a^2-2b)$
 $(a^2-2b)(3a+2)$

6) $2x^2 - 6xy + 5x - 15y$ $GCF1=2x$ $GCF2=5$
 $2x(\frac{2x^2}{2x} - \frac{6xy}{2x}) + 5(\frac{5x}{5} - \frac{15y}{5})$
 $2x(x-3y) + 5(x-3y)$
 $(x-3y)(2x+5)$

7) $6a^2 - 2ab - 9a + 3b$ $GCF1=3a$ $GCF2=3b$
 $(6a^2-2ab) + (9a+3b)$
 $2a(\frac{6a^2}{2a} - \frac{2ab}{2a}) - 3(\frac{9a}{3} + \frac{3b}{3})$
 $= 2a(3a-b) - 3(3a+b)$
 $= (3a-b)(2a-3)$

8) $8x^2 - 4xy - 6x - 3y$ $GCF1=4x$ $GCF2=3$
 $(8x^2-4xy) + (6x+3y)$
 $4x(\frac{8x^2}{4x} - \frac{4xy}{4x}) + 3(\frac{6x}{3} + \frac{3y}{3})$
 $= 4x(2x-y) + 3(2x+y)$
 $\text{Can not factor any further}$

9) $ax + ay + 2bx + 2by$ $GCF1=a$ $GCF2=2b$
 $a(x+y) + 2b(x+y)$
 $(x+y)(a+2b)$

10) $ef - gf - eh + gh$ $GCF1=f$ $GCF2=h$
 $(ef-gf) + (-eh+gh)$
 $f(\frac{ef}{f} - \frac{gf}{f}) + h(\frac{-eh}{-h} + \frac{gh}{h})$
 $= f(e-g) + h(g-e)$
 $= (e-g)(f-h)$

11) $ac + c - a - 1$ $GCF1=c$ $GCF2=1$
 $(ac+c) - (a+1)$
 $c(\frac{ac}{c} + \frac{c}{c}) - (a+1)$
 $c(a+1) - (a+1)$
 $(a+1)(c-1)$

12) $2x^2 - 6xy + 5y - 15x$ $GCF1=2x$ $GCF2=5$
 $(2x^2-6xy) + (5y-15x)$
 $2x(x-3y) + 5(y-3x)$
 $\text{Can not be factored}$

13) $10ab - 15b + 8a - 12$ $GCF1=5b$ $GCF2=4$
 $5b(\frac{10ab}{5b} - \frac{15b}{5b}) + 4(\frac{8a}{4} - \frac{12}{4})$
 $= 5b(2a-3) + 4(2a-3)$
 $= (2a-3)(5b+4)$

14) $35 - 42c - 18cd + 15d$ $GCF1=7$ $GCF2=3$
 $(35-42c) + (-18cd+15d)$
 $7(\frac{35}{7} - \frac{42c}{7}) + 3d(\frac{-18cd}{-3d} + \frac{15d}{-3d})$
 $7(5-6c) + 3d(6c-5)$
 $7(5-6c) + 3d(5-6c)$
 $7(5-6c) + 3d(5-6c) = (5-6c)(7+3d)$

15) $a^3 + 3a^2 - 2a - 6$ $GCF1=a^2$ $GCF2=-2$
 $(a^3+3a^2) + (-2a-6)$
 $a^2(\frac{a^3}{a^2} + \frac{3a^2}{a^2}) - 2(\frac{2a}{-2} + \frac{-6}{-2})$
 $a^2(a+3) - 2(a+3)$
 $(a+3)(a^2-2)$

16) $2p^3 - 8p^2 + 3p - 12$ $GCF1=2p^2$ $GCF2=3$
 $(2p^3-8p^2) + (3p-12)$
 $2p^2(\frac{2p^3}{2p^2} - \frac{8p^2}{2p^2}) + 3(\frac{3p}{3} - \frac{12}{3})$
 $2p^2(p-4) + 3(p-4)$
 $(p-4)(2p^2+3)$

$$(a^2 - b^2) = (a+b)(a-b); \quad x^2 - y^2 = (x+y)(x-y)$$

[CH 6.2] Factoring the Difference of Two Squares

1) $x^2 - 16$

$$(x^2 - 4^2) = (x+4)(x-4)$$

2) $a^2 - 1$

$$a^2 - 1^2 = (a+1)(a-1)$$

3) $1 - p^2$

$$1^2 - p^2 = (1+p)(1-p)$$

4) $25a^2 - 9b^2$

$$(5a)^2 - (3b)^2 = (5a+3b)(5a-3b)$$

5) $81x^2 - 100y^2$

$$(9x)^2 - (10y)^2 = (9x+10y)(9x-10y)$$

6) $64a^2 - 49b^2$

$$(8a)^2 - (7b)^2 = (8a+7b)(8a-7b)$$

7) $2p^2 - 8$

$$2(p^2 - 4) = 2(p+2)(p-2)$$

8) $3x^2 - 3$

$$3(x^2 - 1) = 3(x+1)(x-1)$$

9) $5ab^2 - 5ac^2$

$$5a(\frac{ab^2}{a} - \frac{5ac^2}{a}) = 5a(b^2 - c^2) = 5a(b+c)(b-c)$$

10) $6x^2y^2 - 6x^2p^2$

$$6x^2(\frac{6x^2y^2}{6x^2} - \frac{6x^2p^2}{6x^2}) = 6x^2(y^2 - p^2) = 6x^2(y+p)(y-p)$$

11) $3x^3 - 75x$

$$3x(\frac{3x^3}{3x} - \frac{75x}{3x}) = 3x(x^2 - 25) = 3x(x+5)(x-5)$$

12) $a^2 - b^6$

$$(a^2 - (b^3)^2) = (a+b^3)(a-b^3)$$

13) $81a^6 - 100b^4$

$$(9a^3)^2 - (10b^2)^2 = (9a^3+10b^2)(9a^3-10b^2)$$

14) $a^2b^2 - c^2d^2$

$$(ab)^2 - (cd)^2 = (ab+cd)(ab-cd)$$

15) $27x^4 - 3x^2$

$$3x^2(\frac{27x^4}{3x^2} - \frac{3x^2}{3x^2}) = 3x^2(9x^2 - 1) = 3x^2(3x+1)(3x-1)$$

16) $16p^4q - 25p^2q^3$

$$p^2q(\frac{16p^4q}{p^2q} - \frac{25p^2q^3}{p^2q}) = p^2q(16p^2 - 25q^2) = p^2q((4p)^2 - (5q)^2) = p^2q(2p+5q)(2p-5q)$$

[2] Mixed-Factor Completely if Possible

1) $8x - 4$

$$4(2x-1)$$

2) $2x^3 - 18x$

$$2x(x^2 - 9) = 2x(x+3)(x-3)$$

3) $9a^2 - 144$

$$(3a)^2 - (12)^2 = (3a+12)(3a-12)$$

4) $8 - 2a^2$

$$2(4 - a^2) = 2(2+a)(2-a)$$

GCF1 = 6, GCF2 = -1

5) $ab + 2b - a - 2$
 $b(\frac{ab}{b} + \frac{2b}{b}) + -1(\frac{-a}{-1} + \frac{-2}{-1}) = b(a+2) + -1(a+2) = (a+2)(b-1)$

GCF1 = X, GCF2 = 3

6) $xy - 4x + 3y - 12$
 $x(y-4) + 3(y-4) = (y-4)(x+3)$

7) $p^2(3x+4y) - q^2(3x+4y)$

$$(3x+4y)(p^2 - q^2) = (3x+4y)(p+q)(p-q)$$

8) $4x(3x-2y) - 8(3x-2y)$

$$(3x-2y)(4x-8) = (3x-2y)[4(x-2)] = 4(3x-2y)(x-2)$$

9) $a^4 - b^4$

$$(a^2)^2 - (b^2)^2 = (a^2+b^2)(a^2-b^2) = (a^2+b^2)(a+b)(a-b)$$

10) $a^8 - 1$

$$(a^4)^2 - (1)^2 = (a^4+1)(a^4-1) = (a^4+1)(a^2+1)(a^2-1) = (a^4+1)(a^2+1)(a+1)(a-1)$$

11) $15a^2 + 15ab - 30b^2$

$$15(a^2 + ab + 2b^2) = 15(a+2b)(a-b)$$

12) $6x^2y^2 - 9xy^3 - 12xy$

$$3xy(\frac{6x^2y^2}{3xy} - \frac{9xy^3}{3xy} - \frac{12xy}{3xy}) = 3xy(2x^2y - 3y^2 - 4)$$

GCF1 = X, GCF2 = 5

13) $x^2 - 4x + 5x - 20$
 $x(x-4) + 5(x-4) = (x-4)(x+5)$

GCF1 = 2a, GCF2 = -5

14) $8a^2 + 6a - 20a - 15$
 $(8a^2 + 6a) + (-20a - 15) = 2a(4a+3) + -5(4a+3) = (4a+3)(2a-5)$

15) $6p^3 + 9p^2 - 4p^2 - 6p$

$$p(6p^2 + 9p - 4p - 6) = p[6p^2 + 9p + (-4p - 6)] = p[3p(2p+3) - 2(2p+3)] = p[3p(2p+3) - 2(2p+3)] = p(2p+3)(3p-2)$$

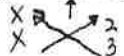
16) $3x^4 + 6x^3 + 5x^2 + 10x^2$

$$x^2[3x^2 + 6x + 5x + 10] = x^2[(3x^2 + 6x) + (5x + 10)] = x^2[3x(x+2) + 5(x+2)] = x^2(x+2)(3x+5)$$

[CH 6.3-1] Factoring Trinomial ($ax^2 + bx + c$), when $a = 1$

[1]

1) $x^2 + 5x + 6$



$3x+2x=5x$

$(x+2)(x+3)$

2) $x^2 + 9x + 8$



$8x+1x=9x$

$(x+8)(x+1)$

3) $a^2 + 7a + 10$



$5a+2a=7a$

$(a+2)(a+5)$

4) $x^2 + 9x + 20$



$5x+4x=9x$

$(x+4)(x+5)$

5) $x^2 - 5x + 6$



$-3x-2x=-5x$

$(x-2)(x-3)$

6) $x^2 - 7x + 10$



$-5x-2x=-7x$

$(x-2)(x-5)$

7) $a^2 - 9a + 8$



$-8a-1a=-9a$

$(a-1)(a-8)$

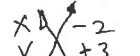
8) $p^2 - 12p + 20$



$-2p-10p=-12p$

$(p-10)(p-2)$

9) $x^2 + x - 6$



$+3x+(-2x)=+x$

$(x+3)(x-2)$

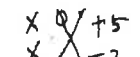
10) $a^2 + 2a - 8$



$+4a+(-2a)=2a$

$(a+4)(a-2)$

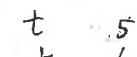
11) $x^2 + 3x - 10$



$-2x+5x=3x$

$(x+5)(x-2)$

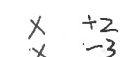
12) $t^2 + 11t - 30$



$Can not be factored$

$Can not be factored$

13) $x^2 - x - 6$



$-3x+2x=-x$

$(x+2)(x-3)$

14) $p^2 - 13p - 30$



$-15p+2p=-13p$

$(p+2)(p-15)$

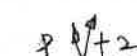
15) $v^2 - 6v - 16$



$-8v+2v=-6v$

$(v+2)(v-8)$

16) $p^2 - 5p - 14$



$-7p+2p=-5p$

$(p+2)(p-7)$

[2]

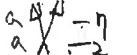
1) $x^2 + 12x + 20$



$2x+10x=12x$

$(x+10)(x+2)$

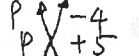
2) $a^2 - 9a + 14$



$-2a+(-7a)=-9a$

$(a-7)(a-2)$

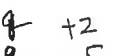
3) $p^2 + p - 20$



$5p-4p=p$

$(p+5)(p-4)$

4) $q^2 - 3q - 10$



$-5q+2q=-3q$

$(q+2)(q-5)$

5) $b^2 + 9b + 14$



$2b+7b=9b$

$(b+2)(b+7)$

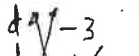
6) $c^2 - 11c + 18$



$-9c+(-2c)=-11c$

$(c-2)(c-9)$

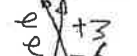
7) $d^2 + 3d - 18$



$6d+(-3d)=3d$

$(d+6)(d-3)$

8) $e^2 - 3e - 18$



$-6e+3e=-3e$

$(e+3)(e-6)$

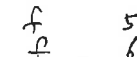
9) $g^2 + 17g + 30$



$15g+2g=17g$

$(g+2)(g+15)$

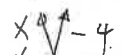
10) $f^2 - 15f + 30$



$Can not be factored$

$Can not be factored$

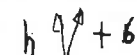
11) $x^2 + 11x - 60$



$15x-4x=11x$

$(x+15)(x-4)$

12) $h^2 - 4h - 60$



$-10h+6h=-4h$

$(h+6)(h-10)$

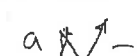
13) $b^2 + 19bd + 60d^2$



$4bd+15bd=19bd$

$(b+15d)(b+4d)$

14) $a^2 - 16ab + 60b^2$



$-6ab+(-10ab)=-16ab$

$(a-6b)(a-10b)$

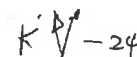
15) $J^2 + 10J - 24$



$12J+(-2J)=10J$

$(J+12)(J-2)$

16) $K^2 - 23K - 24$



$K-24K=-23K$

$(K+1)(K-24)$

[CH 6.3-2] Factoring Trinomial, (ax^2+bx+c) , when $a \neq 1$

[1]

1) $2x^2 + 7x + 5$

$$\begin{array}{r} 2x \nearrow 5 \\ x \searrow 1 \end{array} \quad \begin{array}{l} 2x+5x \\ = 7x \end{array}$$

$(2x+5)(x+1)$

2) $6a^2 - 19a + 15$

$$\begin{array}{r} 2a \nearrow -3 \\ 3a \searrow -5 \end{array} \quad \begin{array}{l} -10a - 9a \\ = -19a \end{array}$$

$(2a-3)(3a-5)$

3) $12a^2 + 7a - 10$

$$\begin{array}{r} 3a \nearrow -2 \\ 4a \searrow +5 \end{array} \quad \begin{array}{l} 15a - 8a \\ = 7a \end{array}$$

$(4a+5)(3a-2)$

4) $3c^2 - 2c - 8$

$$\begin{array}{r} 3c \nearrow +4 \\ 1c \searrow -2 \end{array} \quad \begin{array}{l} -6c + 4c \\ = -2c \end{array}$$

$(3c+4)(c-2)$

5) $3x^2 + 5x + 2$

$$\begin{array}{r} 3x \nearrow 2 \\ 1x \searrow 1 \end{array} \quad \begin{array}{l} 3x+2x \\ = 5x \end{array}$$

$(3x+2)(x+1)$

6) $5y^2 - 16y + 3$

$$\begin{array}{r} 5y \nearrow -1 \\ y \searrow -3 \end{array} \quad \begin{array}{l} -15y - y \\ = -16y \end{array}$$

$(5y-1)(y-3)$

7) $3p^2 + 14p - 5$

$$\begin{array}{r} 3p \nearrow -1 \\ p \searrow +5 \end{array} \quad \begin{array}{l} 15p - p \\ = 14p \end{array}$$

$(p+5)(3p-1)$

8) $5q^2 - 34q - 7$

$$\begin{array}{r} 5q \nearrow +1 \\ q \searrow -7 \end{array} \quad \begin{array}{l} -35q + q \\ = -34q \end{array}$$

$(5q+1)(q-7)$

9) $5x^2 + 11x + 2$

$$\begin{array}{r} 5x \nearrow 2 \\ x \searrow 1 \end{array} \quad \begin{array}{l} 10x + x \\ = 11x \end{array}$$

$(5x+1)(x+2)$

10) $35d^2 - 12d + 1$

$$\begin{array}{r} 5d \quad - \\ 7d \quad - \end{array} \quad \begin{array}{l} -5d + 7d \\ = -12d \end{array}$$

$(5d-1)(7d-1)$

11) $5x^2 + 21x + 4$

$$\begin{array}{r} 5x \nearrow 4 \\ x \searrow 1 \end{array} \quad \begin{array}{l} 20x + x \\ = 21x \end{array}$$

$(5x+1)(x+4)$

12) $6a^2 - 7a - 20$

$$\begin{array}{r} 2a \nearrow -5 \\ 3a \searrow +4 \end{array} \quad \begin{array}{l} 8a - 15a \\ = -7a \end{array}$$

$(3a+4)(2a-5)$

13) $2x^2 + 10x + 5$

Can not be factored

14) $5a^2 - 16a + 12$

$$\begin{array}{r} 5a \nearrow -6 \\ 1a \searrow -2 \end{array} \quad \begin{array}{l} -10a - 6a \\ = -16a \end{array}$$

$(5a-6)(a-2)$

15) $7e^2 + 2e - 5$

$$\begin{array}{r} 7e \nearrow -5 \\ 1e \searrow +1 \end{array} \quad \begin{array}{l} 7e - 5e \\ = 2e \end{array}$$

$(7e-5)(e+1)$

16) $8v^2 - 14v - 15$

$$\begin{array}{r} 2v \nearrow -5 \\ 4v \searrow +3 \end{array} \quad \begin{array}{l} -20v + 6v \\ = -14v \end{array}$$

$(4v+3)(2v-5)$

[2]

1) $3a^2 + 7a + 2$

$$\begin{array}{r} 3a \nearrow 1 \\ a \searrow 2 \end{array} \quad \begin{array}{l} 6a + a \\ = 7a \end{array}$$

$(3a+1)(a+2)$

2) $5a^2 - 16a + 3$

$$\begin{array}{r} 5a \nearrow -1 \\ a \searrow -3 \end{array} \quad \begin{array}{l} -15a - a \\ = -16a \end{array}$$

$(5a-1)(a-3)$

3) $18b^2 + 39b - 15$

GCF = 3

$$3(6b^2 + 13b - 5)$$

$$\begin{array}{r} 2b \nearrow +5 \\ 3b \searrow -1 \end{array} \quad \begin{array}{l} -2b + 5b \\ = 3b \end{array}$$

$3(2b+5)(3b-1)$

4) $8x^2 - 2x - 15$

$$\begin{array}{r} 2x \nearrow -3 \\ 4x \searrow +5 \end{array} \quad \begin{array}{l} 10x - 12x \\ = -2x \end{array}$$

$(4x+5)(2x-3)$

5) $3a^2 + 5a + 2$

$$\begin{array}{r} 3a \nearrow +2 \\ a \searrow +1 \end{array}$$

$(3a+2)(a+1)$

6) $5m^2 - 8m + 3$

$$\begin{array}{r} 5m \nearrow -3 \\ m \searrow -1 \end{array} \quad \begin{array}{l} -5m + 3m \\ = -8m \end{array}$$

$(5m-3)(m-1)$

7) $12x^2 + 14x - 10$

GCF = 2

$$2(6x^2 + 7x - 5)$$

$$\begin{array}{r} 2x \nearrow -5 \\ 3x \searrow +1 \end{array} \quad \begin{array}{l} 6x - 20x \\ = -14x \end{array}$$

$2(3x+5)(2x-1)$

8) $8x^2 - 14x - 15$

$$\begin{array}{r} 2x \nearrow -5 \\ 4x \searrow +3 \end{array} \quad \begin{array}{l} 6x - 20x \\ = -14x \end{array}$$

$(4x+3)(2x-5)$

9) $5x^2 + 20x + 4$

Can not be factored

10) $25p^2 - 20p + 4$

$$\begin{array}{r} 5p \nearrow -2 \\ 5p \searrow -2 \end{array} \quad \begin{array}{l} -10p - 10p \\ = -20p \end{array}$$

$(5p-2)(5p-2)$

11) $18c^2 + 39c + 15$

GCF = 3

$$3(6c^2 + 13c + 5)$$

$$\begin{array}{r} 2c \nearrow 1 \\ 3c \searrow 5 \end{array} \quad \begin{array}{l} 10c + 3c \\ = 13c \end{array}$$

$3(2c+1)(3c+5)$

12) $10d^2 - 29d - 21$

$$\begin{array}{r} 2d \nearrow -7 \\ 5d \searrow +3 \end{array} \quad \begin{array}{l} 6d - 35d \\ = -29d \end{array}$$

$(5d+3)(2d-7)$

13) $6p^2 + 13p + 6$

$$\begin{array}{r} 2p \nearrow 3 \\ 3p \searrow 2 \end{array} \quad \begin{array}{l} 4p + 9p \\ = 13p \end{array}$$

$(2p+3)(3p+2)$

14) $6q^2 - 19q + 10$

$$\begin{array}{r} 2q \nearrow -5 \\ 3q \searrow -2 \end{array} \quad \begin{array}{l} -10q - 15q \\ = -25q \end{array}$$

$(2q-5)(3q-2)$

15) $9x^2 + 24x - 20$

$$\begin{array}{r} 3x \nearrow -2 \\ 3x \searrow 10 \end{array} \quad \begin{array}{l} 30x - 6x \\ = 24x \end{array}$$

$(3x+10)(3x-2)$

16) $6c^2 - 5c - 21$

$$\begin{array}{r} 2c \nearrow +3 \\ 3c \searrow -7 \end{array} \quad \begin{array}{l} -14c + 9c \\ = -5c \end{array}$$

$(2c+3)(3c-7)$

[CH 6.5] Strategies in Factoring (Factoring Completely)

[1]

$$1) 2x^2 - 8y^2$$

$$= 2(x^2 - 4y^2)$$

$$= 2(x^2 - (2y)^2)$$

$$= 2(x+2y)(x-2y)$$

$$2) 5a^4 - 20b^2$$

$$= 5(a^4 - 4b^2)$$

$$= 5(a^2 - 2b)^2$$

$$= 5(a^2 + 2b)(a^2 - 2b)$$

$$2) 6m^2 - 54n^2$$

$$6(m^2 - 9n^2)$$

$$6(m^2 - (3n)^2)$$

$$6(m+3n)(m-3n)$$

$$3) a^4 - 16$$

$$= (a^2)^2 - (4)^2$$

$$= (a^2 + 4)(a^2 - 4)$$

$$= (a^2 + 4)(a^2 - 2^2)$$

$$= (a^2 + 4)(a+2)(a-2)$$

$$4) 4x^2 + 14x - 8$$

$$2(2x^2 + 7x - 4)$$

$$2 \left(\begin{matrix} 2x & -1 \\ 1x & 4 \end{matrix} \right)$$

$$2(x+4)(2x-1)$$

$$3) x^4 - y^4$$

$$(x^2)^2 - (y^2)^2$$

$$(x^2 + y^2)(x^2 - y^2)$$

$$(x^2 + y^2)(x+y)(x-y)$$

$$4) 6p^2 - 27p - 15$$

$$3(2p^2 - 9p - 5)$$

$$\begin{matrix} 1p & -10p \\ 2p & -5 \end{matrix}$$

$$(p-5)(2p+1)$$

$$5) 8p^2 - 12p - 8$$

$$4 \left(\frac{8p^2}{4} - \frac{12p}{4} - \frac{8}{4} \right)$$

$$= 4(2p^2 - 3p - 2)$$

$$= 4(2p+1)(p-2)$$

$$6) ab^2 - 2ab + a$$

$$a \left(\frac{ab^2}{a} - \frac{2ab}{a} + \frac{a}{a} \right)$$

$$a(b^2 - 2b + 1)$$

$$a(b-1)^2$$

$$5) 12x^2 + 10x - 8$$

$$2(6x^2 + 5x - 4)$$

$$\begin{matrix} 3x & +4 \\ 2x & -1 \end{matrix}$$

$$2(3x+4)(2x-1)$$

$$6) ax^2 - 2ax + a$$

$$a(x^2 - 2x + 1)$$

$$\begin{matrix} 1x & -1 \\ 1x & -1 \end{matrix}$$

$$a(x-1)(x-1)$$

$$7) 3a^2 - 75b^2$$

$$3(a^2 - 25b^2)$$

$$3(a^2 - (5b)^2)$$

$$3(a+5b)(a-5b)$$

$$8) 3x^3 - 12xy^2$$

$$3x(x^2 - 4y^2)$$

$$= 3x(x^2 - (2y)^2)$$

$$= 3x(x+2y)(x-2y)$$

$$7) 4b^4 - 36c^2$$

$$4(b^4 - 9c^2)$$

$$4((b^2)^2 - (3c)^2)$$

$$4(b^2 + 3c)(b^2 - 3c)$$

$$8) 2y^3 - 18x^2y$$

$$2y(y^2 - 9x^2)$$

$$= 2y(y^2 - (3x)^2)$$

$$= 2y(y+3x)(y-3x)$$

$$9) 12x^2y - 27y^3$$

$$3y(4x^2 - 9y^2)$$

$$3y((2x)^2 - (3y)^2)$$

$$3y(2x+3y)(2x-3y)$$

$$10) a^3b^2 - 4a^3b^4$$

$$a^3b^2(a^2 - 4b^2)$$

$$= a^3b^2(a^2 - (2b)^2)$$

$$= a^3b^2(a+2b)(a-2b)$$

$$9) 18xy^2 - 8x^3$$

$$2x(9y^2 - 4x^2)$$

$$2x((3y)^2 - (2x)^2)$$

$$2x(3y+2x)(3y-2x)$$

$$10) x^2y^4 - 100x^4y^2$$

$$x^2y^2(y^2 - 100x^2)$$

$$x^2y^2(y^2 - (10x)^2)$$

$$x^2y^2(y+10x)(y-10x)$$

$$11) x^3 - 4x^2 - 4x + 16$$

$$x^2(x-4) + 4(x-4)$$

$$(x-4)(x^2-4)$$

$$(x-4)(x^2-2^2)$$

$$(x-4)(x+2)(x-2)$$

$$12) 6ab - 4cd + 15ad - 5dc$$

$$6ab + 15ad - 4cd - 5cd$$

$$6ab + 15ad - 9cd$$

$$3(2ab + 5ad - 3cd)$$

$$11) z^3 - 5z^2 - 9z + 45$$

$$z^2(z-5) + 9(z-5)$$

$$(z-5)(z^2+9)$$

$$(z-5)(z^2-3^2)$$

$$(z-5)(z+3)(z-3)$$

$$12) 10ab + 5cd - 6ab - dc$$

$$10ab + 5cd + 5cd - dc$$

$$4ab + 4cd$$

$$4(ab+cd)$$

$$13) 6ab - 6ay + 3xb - 3xy$$

$$3[2ab - 2ay + xb - xy]$$

$$3[2a(b-y) + x(b-y)]$$

$$3[(b-y)(2a+x)]$$

$$14) 20dw - 4dp + 30cw - 6cp$$

$$2[10dw - 2dp + 15cw - 3cp]$$

$$2[2d(5w-p) + 3c(5w-p)]$$

$$2[(5w-p)(2d+3c)]$$

$$13) 12cy - 12cz + 8dy - 8dz$$

$$4[3cy - 3cz + 2dy - 2dz]$$

$$4[3c(y-z) + 2d(y-z)]$$

$$4[(y-z)(3c+2d)]$$

$$14) 12ac - 6ad + 18bc - 9bd$$

$$3[4ac - 2ad + 6bc - 3bd]$$

$$3[2a(2c-d) + 3b(2c-d)]$$

$$3[(2c-d)(2a+3b)]$$

$$15) a^4 - 2a^2 + 1$$

$$(a^2)^2 - 2a^2 + 1$$

$$= \begin{matrix} a^2 & -1 \\ a^2 & -1 \end{matrix}$$

$$(a^2-1)(a^2-1)$$

$$(a+1)(a-1)(a+1)(a-1)$$

$$(a+1)^2(a-1)^2$$

$$16) 8x^3y^2 + 4x^2y^3 - 12xy^4$$

$$4xy^2(2x^2 + xy - 3y^2)$$

$$4xy^2 \left(\begin{matrix} 2x & -1 \\ 1x & -3y \end{matrix} \right)$$

$$4xy^2(2x+3y)(x-y)$$

$$15) y^4 - 8y^2 + 16$$

$$(y^2)^2 - 8y^2 + 16$$

$$\begin{matrix} (y^2)^2 & -4 \\ (y^2)^2 & -4 \end{matrix}$$

$$(y^2-4)(y^2-4)$$

$$(y+2)(y-2)(y+2)(y-2)$$

$$(y+2)^2(y-2)^2$$

$$16) 3a^4b^2 - 9a^3b^3 - 12a^2b^4$$

$$3a^2b^2(a^2 - 3ab - 4b^2)$$

$$3a^2b^2 \left(\begin{matrix} a & -4b \\ a & -b \end{matrix} \right)$$

$$3a^2b^2(a-4b)(a+b)$$

[CH 6.6] Solving Quadratic Equation by Factoring

1) $(x-2)(x+3)=0$
 $x-2=0 \Rightarrow x=2$
 $x+3=0 \Rightarrow x=-3$

2) $3x(x-2)=0$
 $x=0$
 $x-2=0 \Rightarrow x=2$

3) $(2x+3)(x-4)=0$
 $2x+3=0 \Rightarrow x=-\frac{3}{2}$
 $x-4=0 \Rightarrow x=4$

4) $x^2=81$
 $x^2-81=0$
 $(x-9)(x+9)=0$
 $x=9, -9$

5) $x^2=16$
 $x^2-16=0$
 $(x-4)(x+4)=0$
 $x=4, -4$

6) $4x^2=100$
 $4x^2-100=0$
 $4(x^2-25)=0$
 $4(x-5)(x+5)=0$
 $x=5, -5$

7) $x^2+5x+6=0$
 $(x+2)(x+3)=0$
 $x+2=0 \Rightarrow x=-2$
 $x+3=0 \Rightarrow x=-3$

8) $x^2-x-6=0$
 $(x+2)(x-3)=0$
 $x+2=0 \Rightarrow x=-2$
 $x-3=0 \Rightarrow x=3$

9) $x^2+6x-16=0$
 $(x+8)(x-2)=0$
 $x+8=0 \Rightarrow x=-8$
 $x-2=0 \Rightarrow x=2$

10) $x^2-6x-16=0$
 $(x-8)(x+2)=0$
 $x-8=0 \Rightarrow x=8$
 $x+2=0 \Rightarrow x=-2$

11) $4x^2-24x=0$
GCF = 4x
 $4x(x-6)=0$
 $x=0, x=6$

12) $6a^2-10a=0$
GCF = 2a
 $2a(3a-5)=0$
 $a=0$
 $3a-5=0 \Rightarrow a=\frac{5}{3}$

13) $5a^2-11a+4=0$

14) $3a^2-22a+7=0$

Can not be solved by factoring

$3a^2-11a-7=0$
 $(3a-7)(a+1)=0$
 $3a-7=0 \Rightarrow a=\frac{7}{3}$
 $a+1=0 \Rightarrow a=-1$

15) $3a^2+3a-18=0$
GCF = 3
 $3(a^2+a-6)=0$
 $3(a-2)(a+3)=0$
 $a-2=0 \Rightarrow a=2$
 $a+3=0 \Rightarrow a=-3$

16) $3b^2-2b-5=0$
 $(3b-5)(b+1)=0$
 $3b-5=0 \Rightarrow b=\frac{5}{3}$
 $b+1=0 \Rightarrow b=-1$

[B] More Factoring trinomials and Solving

1) $2x^2-50=0$
 $2(x^2-25)=0$
 $2(x-5)(x+5)=0$
 $x=5, -5$

2) $3x^2=12$
 $3x^2-12=0$
 $3(x^2-4)=0$
 $3(x-2)(x+2)=0$
 $x=2, -2$

3) $x^2+7x=30$
 $x^2+7x-30=0$
 $(x+10)(x-3)=0$
 $x=-10, 3$

4) $x^2-x=6$
 $x^2-x-6=0$
 $(x-3)(x+2)=0$
 $x=3, -2$

5) $x^2+5x=-6$
 $x^2+5x+6=0$
 $(x+2)(x+3)=0$
 $x=-2, -3$

6) $x^2-7x=-12$
 $x^2-7x+12=0$
 $(x-3)(x-4)=0$
 $x=3, 4$

7) $3t^2-17t-6=0$
 $(3t+1)(t-6)=0$
 $3t+1=0 \Rightarrow t=-\frac{1}{3}$
 $t-6=0 \Rightarrow t=6$

8) $3x^2-7x-6=0$
 $(3x+2)(x-3)=0$
 $3x+2=0 \Rightarrow x=-\frac{2}{3}$
 $x-3=0 \Rightarrow x=3$

9) $4a^2+4a+1=0$
 $(2a+1)(2a+1)=0$
 $2a+1=0 \Rightarrow a=-\frac{1}{2}$

10) $9b^2+6b+1=0$
 $(3b+1)(3b+1)=0$
 $3b+1=0 \Rightarrow b=-\frac{1}{3}$

11) $7h^2-11h+4=0$
 $(7h-4)(h-1)=0$
 $7h-4=0 \Rightarrow h=\frac{4}{7}$
 $h-1=0 \Rightarrow h=1$

12) $7h^2-16h+4=0$
 $(7h-2)(h-2)=0$
 $7h-2=0 \Rightarrow h=\frac{2}{7}$
 $h-2=0 \Rightarrow h=2$

13) $4x^2+14x-8=0$
GCF = 2
 $2(2x^2+7x-4)=0$
 $2(2x-1)(x+4)=0$
 $2x-1=0 \Rightarrow x=\frac{1}{2}$
 $x+4=0 \Rightarrow x=-4$

14) $5u^2+17u-12=0$
 $(5u-3)(u+4)=0$
 $5u-3=0 \Rightarrow u=\frac{3}{5}$
 $u+4=0 \Rightarrow u=-4$

15) $6e^2-7ep-20p^2=0$
 $(2e-5p)(3e+4p)=0$
 $2e-5p=0 \Rightarrow e=\frac{5p}{2}$
 $3e+4p=0 \Rightarrow e=-\frac{4p}{3}$

$6e^2-7e-20=0$
 $(2e-5)(3e+4)=0$
 $2e-5=0 \Rightarrow e=\frac{5}{2}$
 $3e+4=0 \Rightarrow e=-\frac{4}{3}$

16) $10f^2-29f-21$
 $(5f+3)(2f-7)=0$
 $5f+3=0 \Rightarrow f=-\frac{3}{5}$
 $2f-7=0 \Rightarrow f=\frac{7}{2}$

[CH 6.7] Word Problems Solve by Factoring

1) One number is 8 less than 6 times the other. If the product of the two numbers is 8, what are the 2 integers?

other = x
 one number = 6x - 8
 product = (x)(6x - 8) = 8

$$6x^2 - 8x - 8 = 0$$

$$2(3x^2 - 4x - 4) = 0$$

$$3x^2 - 4x - 4 = 0$$

$$(3x+2)(x-2) = 0$$

$$3x+2=0 \Rightarrow x = -\frac{2}{3}$$

$$x-2=0 \Rightarrow x = 2$$

2) The difference of two numbers is 3. Their product is 10. What are the 2 numbers?

Let numbers be x and x+3

$$x(x+3) = 10$$

$$x^2 + 3x - 10 = 0$$

$$(x-2)(x+5) = 0$$

$$x-2=0 \Rightarrow x = 2$$

$$x+5=0 \Rightarrow x = -5$$

3) Find two consecutive integers whose product is 11 more than their sum.

Let numbers be x and x+1

$$x(x+1) = x + (x+1) + 11$$

$$x^2 + x = 2x + 12$$

$$x^2 + x - 2x - 12 = 0$$

$$x^2 - x - 12 = 0$$

$$(x-4)(x+3) = 0$$

$$x-4=0 \Rightarrow x = 4$$

$$x+3=0 \Rightarrow x = -3$$

4) Find the two consecutive odd integers whose product is 63.

Let numbers be x and x+2

$$x(x+2) = 63$$

$$x^2 + 2x - 63 = 0$$

$$(x+9)(x-7) = 0$$

$$x+9=0 \Rightarrow x = -9$$

$$x-7=0 \Rightarrow x = 7$$

5) One number is 3 times another. The sum of their squares is 40. Find the numbers.

one number = 3x
 another = x

$$x^2 + (3x)^2 = 40$$

$$x^2 + 9x^2 = 40$$

$$10x^2 = 40$$

$$x^2 = \frac{40}{10} = 4$$

$$x = \pm\sqrt{4} = \pm 2$$

6) The length of a rectangle is 5 feet more than its width. Its area is 84 square feet. Find the length and the width.

Length = L
 Width = W
 Area = (Length)(Width) = 84

$$L = W + 5$$

$$W(W+5) = 84$$

$$W^2 + 5W - 84 = 0$$

$$(W-7)(W+12) = 0$$

$$W-7=0 \Rightarrow W = 7$$

$$W+12=0 \Rightarrow W = -12$$

$$L = 7 + 5 = 12$$

7) The width of a rectangle is 3 inches less than its length. Its area is 28 square inches. Find the length and width.

Length = L
 Width = L - 3
 Area = (Length)(Width) = 28

$$L(L-3) = 28$$

$$L^2 - 3L - 28 = 0$$

$$(L-7)(L+4) = 0$$

$$L-7=0 \Rightarrow L = 7$$

$$L+4=0 \Rightarrow L = -4$$

$$W = 7 - 3 = 4$$

8) The base of a triangle is 3 inches more than its altitude. Its area is 20 square inches. Find the base and the altitude.

Altitude = x
 Base = x + 3
 Area = $\frac{1}{2}(\text{Base})(\text{Altitude}) = 20$

$$\frac{1}{2}(x+3)(x) = 20$$

$$(x+3)(x) = 40$$

$$x^2 + 3x - 40 = 0$$

$$(x+8)(x-5) = 0$$

$$x+8=0 \Rightarrow x = -8$$

$$x-5=0 \Rightarrow x = 5$$

$$\text{Base} = 5 + 3 = 8$$

[B]

1. The difference of two numbers is 6. Their product is 27. Find two numbers.

First #	x
Second #	x+6

$$x(x+6) = 27$$

$$x^2 + 6x - 27 = 0$$

$$(x-3)(x+9) = 0$$

$$x-3=0 \Rightarrow x = 3$$

$$x+9=0 \Rightarrow x = -9$$

2. The sum of two numbers is -4. Their product is -12. Find the numbers.

Sum	-4
One Number	x
Other Number	-4-x

$$x(-4-x) = -12$$

$$-4x - x^2 = -12$$

$$x^2 + 4x - 12 = 0$$

$$(x+6)(x-2) = 0$$

$$x+6=0 \Rightarrow x = -6$$

$$x-2=0 \Rightarrow x = 2$$

3. Find two consecutive even integers whose product is 48.

First #	x
Second #	x+2

$$x(x+2) = 48$$

$$x^2 + 2x - 48 = 0$$

$$(x+8)(x-6) = 0$$

$$x+8=0 \Rightarrow x = -8$$

$$x-6=0 \Rightarrow x = 6$$

4. Find three consecutive numbers such that the product of the first two is 23 more than the third integer.

5. One number is three more than another number. The sum of their square is 89. Find the numbers.

First #	x
Second #	x+1
Third #	x+2

$$x(x+1) = (x+2) + 23$$

$$x^2 + x = x + 25$$

$$x^2 = 25 \Rightarrow x = \pm 5$$

6. The base of a triangle is 5" more than its altitude. If the area is 33in², find the altitude and the base of the triangle.

Altitude = x
 Base = x + 5

$$\frac{1}{2}(x+5)(x) = 33$$

$$(x+5)(x) = 66$$

$$x^2 + 5x - 66 = 0$$

$$(x+11)(x-6) = 0$$

$$x+11=0 \Rightarrow x = -11$$

$$x-6=0 \Rightarrow x = 6$$

$$\text{Base} = 6 + 5 = 11$$

7. The width of a rectangle is 5cm less than its length. Its area is 10cm² more than its perimeter. What are the dimensions of the rectangle?

Length	x
Width	x-5

$$x(x-5) = 10 + 2(x) + 2(x-5)$$

$$x^2 - 5x = 10 + 2x + 2x - 10$$

$$x^2 - 9x = 0$$

$$x(x-9) = 0$$

$$x-9=0 \Rightarrow x = 9$$

$$\text{Width} = 9 - 5 = 4$$

8. The area of a square is twice its perimeter. What is the length of its side?

Side = x

$$x^2 = 2(4x)$$

$$x^2 = 8x$$

$$x^2 - 8x = 0$$

$$x(x-8) = 0$$

$$x-8=0 \Rightarrow x = 8$$

*) $\sqrt{x^2} = |x| \begin{cases} = x & \text{when } x \geq 0 \\ = -x & \text{when } x < 0 \end{cases}$ $\sqrt[n]{x^n} \begin{cases} = |x| & \text{when } n \text{ is even} \\ = x & \text{when } n \text{ is odd} \end{cases}$

[CH 7.1] Radicals and Exponents
[1] Simplify

1) a) $\sqrt{81} = 9$ 2) a) $\sqrt{1} = 1$
 b) $-\sqrt{81} = -9$ b) $\sqrt{0} = 0$

3) a) $\sqrt{(-5)^2} = 5$ 4) a) $\sqrt{25} = 5$
 b) $(\sqrt{-5})^2 = \text{Undefined}$ b) $\sqrt{-25} = \text{Undefined}$

5) a) $\sqrt{x^2} = |x|$ (*) 6) a) $\sqrt{\frac{121}{11} + \frac{144}{12}} = 5$
 b) $\sqrt{x^4} = x^2$ b) $\sqrt{\frac{81}{9} - \frac{36}{6}} = 3$

7) a) $\sqrt[3]{2^3} = 2$ 8) a) $-\sqrt[3]{8} = -2$
 b) $\sqrt[3]{5^3} = 5$ b) $\sqrt[3]{-8} = -2$

9) a) $\sqrt[3]{x^3} = x$ 10) a) $\sqrt[3]{-27} = -3$
 b) $\sqrt[3]{x^9} = x^3$ b) $\sqrt[3]{-16} = \text{Undefined}$

11) a) $\sqrt[4]{16} = 2$ 12) a) $\sqrt{x^6} = |x^3|$
 b) $\sqrt[4]{81x^4} = 3|x|$ (*) b) $\sqrt[3]{x^6} = x^2$

13) a) $\sqrt{9x^2} = 3|x|$ (*) 14) a) $\sqrt[3]{8a^3} = 2a$
 b) $\sqrt{16a^4} = 4a^2$ b) $\sqrt[3]{27x^6} = 3x^2$

15) Find the distance between 2 points A(6, 4), B(-2, 0)
 $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(-8)^2 + (-4)^2} = \sqrt{64 + 16} = \sqrt{80}$

16) Find the distance between 2 points A(6, 9), B(-4, -1)
 $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(-10)^2 + (-10)^2} = \sqrt{100 + 100} = \sqrt{200}$

[CH 7.2] Simplifying Radical Expressions

1) a) $\sqrt{24} = \sqrt{4 \cdot 6} = 2\sqrt{6}$ 2) a) $\sqrt{12} = \sqrt{4 \cdot 3} = 2\sqrt{3}$
 b) $\sqrt{75} = \sqrt{25 \cdot 3} = 5\sqrt{3}$ b) $\sqrt{18} = \sqrt{9 \cdot 2} = 3\sqrt{2}$

3) a) $\sqrt{20} = \sqrt{4 \cdot 5} = 2\sqrt{5}$ 4) a) $\sqrt{54} = \sqrt{9 \cdot 6} = 3\sqrt{6}$
 b) $\sqrt{32} = \sqrt{16 \cdot 2} = 4\sqrt{2}$ b) $\sqrt{125} = \sqrt{25 \cdot 5} = 5\sqrt{5}$

5) a) $\sqrt{x^{10}} = x^{\frac{10}{2}} = x^5$ 6) a) $\sqrt{x^5} = \sqrt{x^4 \cdot x} = x^2\sqrt{x}$
 b) $\sqrt{a^{18}} = a^{\frac{18}{2}} = a^9$ b) $\sqrt{x^{19}} = \sqrt{x^{18} \cdot x} = x^9\sqrt{x}$

7) a) $\sqrt{75a^2b^4} = \sqrt{25 \cdot 3 \cdot a^2 \cdot b^4} = 5ab^2\sqrt{3}$ 8) a) $\sqrt{24a^3b^5} = \sqrt{4 \cdot 6 \cdot a^2 \cdot a \cdot b^4 \cdot b} = 2ab^2\sqrt{6a}$
 b) $\sqrt{18x^4y^6} = \sqrt{9 \cdot 2 \cdot x^4 \cdot y^6} = 3x^2y^3\sqrt{2}$ b) $\sqrt{20x^5y^7} = \sqrt{4 \cdot 5 \cdot x^4 \cdot x \cdot y^6 \cdot y} = 2x^2y^3\sqrt{5xy}$

9) a) $\sqrt{32a^6b^7} = \sqrt{16 \cdot 2 \cdot a^6 \cdot b^6 \cdot b} = 4a^3b^3\sqrt{2b}$ 10) a) $\sqrt{27a^5b^4} = \sqrt{9 \cdot 3 \cdot a^4 \cdot a \cdot b^4} = 3a^2b^2\sqrt{3a}$
 b) $\sqrt{54x^8y^9} = \sqrt{9 \cdot 6 \cdot x^8 \cdot y^8 \cdot y} = 3x^4y^4\sqrt{6y}$ b) $\sqrt{8x^7y^4} = \sqrt{4 \cdot 2 \cdot x^6 \cdot x \cdot y^4} = 2x^3y^2\sqrt{2x}$

11) a) $\sqrt[3]{16a^6b^9} = \sqrt[3]{8 \cdot 2 \cdot a^6 \cdot b^9} = 2a^2b^3\sqrt[3]{2}$ 12) a) $\sqrt[3]{27x^2y^7} = \sqrt[3]{27 \cdot x^2 \cdot y^6 \cdot y} = 3\sqrt[3]{x^2y}$
 b) $\sqrt[3]{8x^8y^9} = \sqrt[3]{8 \cdot x^6 \cdot x^2 \cdot y^9} = 2x^2y^3\sqrt[3]{x^2}$ b) $\sqrt[3]{8x^8y^9} = \sqrt[3]{8 \cdot x^6 \cdot x^2 \cdot y^9} = 2x^2y^3\sqrt[3]{x^2}$

13) a) $\sqrt{\frac{6}{4}} = \sqrt{\frac{3}{2}} = \frac{\sqrt{3}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{6}}{2}$ 14) a) $\sqrt{\frac{14x}{25y^2}} = \frac{\sqrt{14x}}{\sqrt{25y^2}} = \frac{\sqrt{14x}}{5y}$
 b) $\sqrt{\frac{10}{9}} = \frac{\sqrt{10}}{\sqrt{9}} = \frac{\sqrt{10}}{3}$ b) $\sqrt{\frac{2x^2}{36y^4}} = \frac{\sqrt{2x^2}}{\sqrt{36y^4}} = \frac{\sqrt{2}x}{6y^2}$

15) a) $\sqrt{\frac{5}{2}} = \frac{\sqrt{5}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{10}}{2}$ 16) a) $\sqrt{\frac{7}{c}} = \frac{\sqrt{7}}{\sqrt{c}} \cdot \frac{\sqrt{c}}{\sqrt{c}} = \frac{\sqrt{7c}}{c}$
 b) $\sqrt{\frac{4}{7}} = \frac{\sqrt{4}}{\sqrt{7}} = \frac{2\sqrt{7}}{\sqrt{7}\sqrt{7}} = \frac{2\sqrt{7}}{7}$ b) $\sqrt{\frac{6}{ab}} = \frac{\sqrt{6}}{\sqrt{ab}} \cdot \frac{\sqrt{ab}}{\sqrt{ab}} = \frac{\sqrt{6ab}}{ab}$

[CH 7.3] Operations of Radical Expressions
 [A] Addition and Subtraction of Radical Expressions

1) $6\sqrt{3} + 8\sqrt{3}$
 $= (6+8)\sqrt{3} = \boxed{14\sqrt{3}}$

2) $3\sqrt{5} - \sqrt{5}$
 $(3-1)\sqrt{5} = \boxed{2\sqrt{5}}$

3) $5\sqrt{x} + 2\sqrt{x} - \sqrt{x}$
 $(5+2-1)\sqrt{x} = \boxed{6\sqrt{x}}$

4) $8\sqrt{b} - \sqrt{b} + 2\sqrt{b}$
 $(8-1+2)\sqrt{b} = \boxed{9\sqrt{b}}$

5) $\sqrt{18} + \sqrt{50}$
 $\sqrt{9 \cdot 2} + \sqrt{25 \cdot 2}$
 $3\sqrt{2} + 5\sqrt{2} = \boxed{8\sqrt{2}}$

6) $\sqrt{63} + \sqrt{28}$
 $\sqrt{9 \cdot 7} + \sqrt{4 \cdot 7}$
 $= \boxed{3\sqrt{7} + 2\sqrt{7}} = \boxed{5\sqrt{7}}$

7) $\sqrt{75} - \sqrt{27}$
 $= \sqrt{25 \cdot 3} - \sqrt{9 \cdot 3}$
 $= \boxed{5\sqrt{3} - 3\sqrt{3}} = \boxed{2\sqrt{3}}$

8) $\sqrt{50} - \sqrt{8}$
 $\sqrt{25 \cdot 2} - \sqrt{4 \cdot 2}$
 $= \boxed{5\sqrt{2} - 2\sqrt{2}} = \boxed{3\sqrt{2}}$

9) $5\sqrt{12} + 2\sqrt{75}$
 $5\sqrt{4 \cdot 3} + 2\sqrt{25 \cdot 3}$
 $5(2)\sqrt{3} + 2(5)\sqrt{3}$
 $10\sqrt{3} + 10\sqrt{3} = \boxed{20\sqrt{3}}$

10) $2\sqrt{48} - 4\sqrt{27}$
 $2\sqrt{16 \cdot 3} - 4\sqrt{9 \cdot 3}$
 $= 2 \cdot 4\sqrt{3} - 4 \cdot 3\sqrt{3}$
 $= \boxed{8\sqrt{3} - 12\sqrt{3}} = \boxed{-4\sqrt{3}}$

11) $2\sqrt{48} - 3\sqrt{12}$
 $2\sqrt{16 \cdot 3} - 3\sqrt{4 \cdot 3}$
 $2(4)\sqrt{3} - 3(2)\sqrt{3}$
 $8\sqrt{3} - 6\sqrt{3} = \boxed{2\sqrt{3}}$

12) $3\sqrt{54} + 2\sqrt{24}$
 $3\sqrt{9 \cdot 6} + 2\sqrt{4 \cdot 6}$
 $3(3)\sqrt{6} + 2(2)\sqrt{6}$
 $9\sqrt{6} + 4\sqrt{6} = \boxed{13\sqrt{6}}$

13) $3\sqrt{45} - 3\sqrt{12} + 2\sqrt{20}$
 $3\sqrt{9 \cdot 5} - 3\sqrt{4 \cdot 3} + 2\sqrt{4 \cdot 5}$
 $3(3)\sqrt{5} - 3(2)\sqrt{3} + 2(2)\sqrt{5}$
 $9\sqrt{5} - 6\sqrt{3} + 4\sqrt{5}$
 $\boxed{13\sqrt{5} - 6\sqrt{3}}$

14) $\sqrt{64} + 2\sqrt{50} - 2\sqrt{72}$
 $\sqrt{8 \cdot 8} + 2\sqrt{25 \cdot 2} - 2\sqrt{36 \cdot 2}$
 $8 + 2(5)\sqrt{2} - 2(6)\sqrt{2}$
 $8 + 10\sqrt{2} - 12\sqrt{2}$
 $\boxed{8 - 2\sqrt{2}}$

15) $5\sqrt{5} - \sqrt{\frac{4}{5}}$
 $5\sqrt{5} - \frac{\sqrt{4} \cdot \sqrt{5}}{\sqrt{5} \cdot \sqrt{5}}$
 $5\sqrt{5} - \frac{\sqrt{4}\sqrt{5}}{5}$
 $5\sqrt{5} - \frac{2\sqrt{5}}{5} = (5 - \frac{2}{5})\sqrt{5}$
 $= \boxed{(4\frac{3}{5})\sqrt{5}}$

16) $\frac{\sqrt{18}}{3} - \frac{\sqrt{8}}{5}$
 $\frac{\sqrt{9 \cdot 2}}{3} - \frac{\sqrt{4 \cdot 2}}{5}$
 $\frac{3\sqrt{2}}{3} - \frac{2\sqrt{2}}{5}$
 $\sqrt{2} - \frac{2}{5}\sqrt{2} = (1 - \frac{2}{5})\sqrt{2}$
 $= \boxed{\frac{3}{5}\sqrt{2}}$

[B] Multiplication of Radical Expressions

$\sqrt{x} \cdot \sqrt{x} = x$

[1] Find the product and simplify

1. $\sqrt{5}\sqrt{20} = \sqrt{5 \cdot 20}$
 $= \sqrt{100} = \boxed{10}$

2. $\sqrt{25x}\sqrt{x} = \sqrt{25 \cdot x \cdot x}$
 $= \boxed{5x}$

3. $\sqrt{3a^2}\sqrt{12a^4}$
 $\sqrt{3 \cdot 12 \cdot a^2 a^4} = \sqrt{36 \cdot a^6}$
 $= 6a^{6/2} = \boxed{6a^3}$

4. $\sqrt{8}\sqrt{3} = \sqrt{24}$
 $= \sqrt{4 \cdot 6} = \boxed{2\sqrt{6}}$

5. $\sqrt{4x}\sqrt{3x}$
 $= \sqrt{4 \cdot 3 \cdot x \cdot x}$
 $= 2\sqrt{3} \cdot x = \boxed{2x\sqrt{3}}$

6. $\sqrt{40a}\sqrt{10a^2}$
 $= \sqrt{4 \cdot 10 \cdot a \cdot 10 \cdot a^2}$
 $= 2 \cdot 10 \sqrt{a \cdot a}$
 $= \boxed{20a\sqrt{a}}$

7. $3\sqrt{7} \cdot 5\sqrt{7}$
 $= 3 \cdot 5 \cdot 7 = \boxed{105}$

8. $3\sqrt{12} \cdot 5\sqrt{2}$
 $3\sqrt{4 \cdot 3} \cdot 5\sqrt{2}$
 $3 \cdot 2\sqrt{3} \cdot 5\sqrt{2}$
 $6 \cdot 5 \sqrt{3 \cdot 2} = \boxed{30\sqrt{6}}$

9. $\sqrt{2}(3\sqrt{12} + \sqrt{27})$
 $\sqrt{2}(3\sqrt{12}) + \sqrt{2}(\sqrt{27})$
 $3\sqrt{2 \cdot 12} + \sqrt{2 \cdot 27}$
 $3\sqrt{24} + \sqrt{54}$
 $3\sqrt{4 \cdot 6} + \sqrt{9 \cdot 6}$
 $3(2)\sqrt{6} + (3)\sqrt{6}$
 $6\sqrt{6} + 3\sqrt{6} = \boxed{9\sqrt{6}}$

10. $\sqrt{6}(2\sqrt{3} + \sqrt{12})$
 $\sqrt{6}(2\sqrt{3}) + \sqrt{6}(\sqrt{12})$
 $2\sqrt{6 \cdot 3} + \sqrt{6 \cdot 12}$
 $2\sqrt{18} + \sqrt{72}$
 $2\sqrt{9 \cdot 2} + \sqrt{36 \cdot 2}$
 $2(3)\sqrt{2} + (6)\sqrt{2}$
 $(\sqrt{2} + 6\sqrt{2}) = \boxed{7\sqrt{2}}$

11. $\sqrt{3}(3\sqrt{8} - 2\sqrt{6})$
 $\sqrt{3}(3\sqrt{8}) - \sqrt{3}(2\sqrt{6})$
 $3\sqrt{24} - 2\sqrt{18}$
 $3\sqrt{4 \cdot 6} - 2\sqrt{9 \cdot 2}$
 $3(2)\sqrt{6} - 2(3)\sqrt{2}$
 $\boxed{6\sqrt{6} - 6\sqrt{2}}$

12. $\sqrt{8}(3\sqrt{6} - 2\sqrt{3})$
 $\sqrt{8}(3\sqrt{6}) - \sqrt{8}(2\sqrt{3})$
 $3\sqrt{48} - 2\sqrt{24}$
 $3\sqrt{16 \cdot 3} - 2\sqrt{4 \cdot 6}$
 $3(4)\sqrt{3} - 2(2)\sqrt{6}$
 $\boxed{12\sqrt{3} - 4\sqrt{6}}$

13. $(\sqrt{7} + 2)(\sqrt{7} + 3)$
 $\sqrt{7}\sqrt{7} + \sqrt{7}(3) + (2)\sqrt{7} + 2 \cdot 3$
 $= 7 + 3\sqrt{7} + 2\sqrt{7} + 6$
 $= (7+6) + 5\sqrt{7} = \boxed{13 + 5\sqrt{7}}$

14. $(3 - 2\sqrt{5})(4 - \sqrt{5})$
 $3 \cdot 4 + 3(-\sqrt{5}) + (-2\sqrt{5})(4) + (-2\sqrt{5})(-\sqrt{5})$
 $12 - 3\sqrt{5} - 8\sqrt{5} + 2 \cdot 5$
 $12 - 11\sqrt{5} + 10$
 $12 + 10 - 11\sqrt{5} = \boxed{22 - 11\sqrt{5}}$

15. $(\sqrt{5} + \sqrt{3})(\sqrt{5} - \sqrt{3})$
 $\sqrt{5}\sqrt{5} + \sqrt{5}(-\sqrt{3}) + \sqrt{3}\sqrt{5} + \sqrt{3}(-\sqrt{5})$
 $= 5 + -\sqrt{15} + \sqrt{15} + -\sqrt{15}$
 $= 5 + 0 + -3$
 $= 5 - 3 = \boxed{2}$

16. $(\sqrt{5} - \sqrt{3})^2$
 $(\sqrt{5} - \sqrt{3})(\sqrt{5} - \sqrt{3})$
 $\sqrt{5}\sqrt{5} + \sqrt{5}(-\sqrt{3}) + (-\sqrt{3})\sqrt{5} + (-\sqrt{3})(-\sqrt{3})$
 $= 5 + -\sqrt{15} + -\sqrt{15} + 3$
 $= 8 - 2\sqrt{15} = \boxed{8 - 2\sqrt{15}}$

$$\sqrt{18} = \sqrt{9 \cdot 2} = 3\sqrt{2}$$

[2] Find the product and simplify

$$\begin{aligned} 1. \sqrt{3}\sqrt{27} &= \sqrt{3}\sqrt{9\sqrt{3}} \\ &= \sqrt{9\sqrt{3}\sqrt{3}} \\ &= 3 \cdot 3 = \boxed{9} \end{aligned}$$

$$\begin{aligned} 2. \sqrt{4c^3}\sqrt{16c^5} \\ &= \sqrt{4\sqrt{16}c^3 \cdot c^5} \\ &= 2 \cdot 4\sqrt{c^8} \\ &= 8c^{8/2} = \boxed{8c^4} \end{aligned}$$

$$\begin{aligned} 3. \sqrt{9p}\sqrt{4p^5} \\ &= \sqrt{9 \cdot 4} \sqrt{p^6} \\ &= \sqrt{36} p^{6/2} \\ &= \boxed{6p^3} \end{aligned}$$

$$\begin{aligned} 4. \sqrt[3]{4x^2} \cdot \sqrt[3]{16x^4} \\ &= \sqrt[3]{4 \cdot 16} \sqrt[3]{x^2 \cdot x^4} \\ &= \sqrt[3]{4 \cdot 4 \cdot 4} \sqrt[3]{x^6} \\ &= 4x^{6/3} = \boxed{4x^2} \end{aligned}$$

$$\begin{aligned} 5. \sqrt{2x^2} \cdot \sqrt{12x^5} \\ &= \sqrt{2 \cdot 12 x^2 x^5} \\ &= \sqrt{24 x^7} \\ &= \sqrt{4} \sqrt{6} \sqrt{x^6} \sqrt{x} \\ &= 2\sqrt{6} x^3 \sqrt{x} = \boxed{2x^3\sqrt{6x}} \end{aligned}$$

$$\begin{aligned} 6. 4\sqrt{12} \cdot 3\sqrt{18} \\ (4\sqrt{4\sqrt{3}})(3\sqrt{9\sqrt{2}}) \\ 4 \cdot 2\sqrt{3} \cdot 3 \cdot 3\sqrt{2} \\ 8\sqrt{3} \cdot 9\sqrt{2} = \boxed{72\sqrt{6}} \end{aligned}$$

$$\begin{aligned} 7. 2\sqrt{5}(3\sqrt{5}-4\sqrt{5}) \\ (2\sqrt{5})(3\sqrt{5}) - (2\sqrt{5})(4\sqrt{5}) \\ 6 \cdot 5 - 8 \cdot 5 \\ 30 - 40 = \boxed{-10} \end{aligned}$$

$$\begin{aligned} 8. \sqrt{2x}(\sqrt{8x^3}-\sqrt{3x}) \\ \sqrt{2x}\sqrt{8x^3} - \sqrt{2x}\sqrt{3x} \\ = \sqrt{16x^4} - \sqrt{6x^2} \\ = \boxed{4x^2 - x\sqrt{6}} \end{aligned}$$

$$\begin{aligned} 9. \sqrt{3}(\sqrt{12}+\sqrt{6}) \\ \sqrt{3}\sqrt{12} + \sqrt{3}\sqrt{6} \\ \sqrt{36} + \sqrt{18} \\ 6 + \sqrt{9\sqrt{2}} \\ \boxed{6 + 3\sqrt{2}} \end{aligned}$$

$$\begin{aligned} 10. 2\sqrt{2x}(\sqrt{4x}-3) \\ 2\sqrt{2x}\sqrt{4x} - 2\sqrt{2x} \cdot 3 \\ 2\sqrt{8x^2} - 6\sqrt{2x} \\ 2\sqrt{4\sqrt{2}\sqrt{x^2}} - 6\sqrt{2x} \\ 2 \cdot 2x\sqrt{2} - 6\sqrt{2x} \\ \boxed{4x\sqrt{2} - 6\sqrt{2x}} \end{aligned}$$

$$\begin{aligned} 11. (\sqrt{3}+\sqrt{4})(\sqrt{5}+\sqrt{6}) \\ \sqrt{3}\sqrt{5} + \sqrt{3}\sqrt{6} + \sqrt{4}\sqrt{5} + \sqrt{4}\sqrt{6} \\ = \sqrt{15} + \sqrt{18} + 2\sqrt{5} + 2\sqrt{6} \\ = \sqrt{15} + \sqrt{9\sqrt{2}} + 2\sqrt{5} + 2\sqrt{6} \\ = \boxed{\sqrt{15} + 3\sqrt{2} + 2\sqrt{5} + 2\sqrt{6}} \end{aligned}$$

$$\begin{aligned} 12. (\sqrt{3}-\sqrt{4})(\sqrt{5}-\sqrt{6}) \\ = \sqrt{3}\sqrt{5} + \sqrt{3}(-\sqrt{6}) + (-\sqrt{4})\sqrt{5} + (-\sqrt{4})(-\sqrt{6}) \\ = \sqrt{15} + \underbrace{-\sqrt{18}} + -2\sqrt{5} + +2\sqrt{6} \\ = \boxed{\sqrt{15} - 3\sqrt{2} - 2\sqrt{5} + 2\sqrt{6}} \end{aligned}$$

$$\begin{aligned} 13. (\sqrt{3}+\sqrt{4})(\sqrt{3}-\sqrt{4}) \\ \sqrt{3}\sqrt{3} + \sqrt{3}(-\sqrt{4}) + \sqrt{4}\sqrt{3} + \sqrt{4}(-\sqrt{4}) \\ 3 + \underbrace{-2\sqrt{3}} + 2\sqrt{3} - 4 \\ 3 + 0 - 4 \\ = 3 - 4 = \boxed{-1} \end{aligned}$$

$$\begin{aligned} 14. (\sqrt{3}+\sqrt{4})^2 \\ (\sqrt{3}+\sqrt{4})(\sqrt{3}+\sqrt{4}) \\ \sqrt{3}\sqrt{3} + \sqrt{3}\sqrt{4} + \sqrt{4}\sqrt{3} + \sqrt{4}\sqrt{4} \\ = 3 + 2\sqrt{3} + 2\sqrt{3} + 4 \\ = 3 + 4\sqrt{3} + 4 = \boxed{7 + 4\sqrt{3}} \end{aligned}$$

$$\begin{aligned} 15. \sqrt{2}(\sqrt{3}+\sqrt{4}) + \sqrt{3}(\sqrt{3}+\sqrt{4}) \\ \sqrt{2}\sqrt{3} + \sqrt{2}\sqrt{4} + \sqrt{3}\sqrt{3} + \sqrt{3}\sqrt{4} \\ = \boxed{\sqrt{6} + 2\sqrt{2} + 3 + 2\sqrt{3}} \end{aligned}$$

$$\begin{aligned} 16. \sqrt{5}(\sqrt{5}+\sqrt{6}) - \sqrt{6}(\sqrt{5}+\sqrt{6}) \\ \sqrt{5}\sqrt{5} + \sqrt{5}\sqrt{6} - \sqrt{6}\sqrt{5} - \sqrt{6}\sqrt{6} \\ 5 + \sqrt{30} - \sqrt{30} - 6 \\ 5 + 0 - 6 = \boxed{-1} \end{aligned}$$

[C] Division with Radical Expressions
[1] Simplify

$$1. \frac{3}{\sqrt{5}} \frac{\sqrt{5}}{\sqrt{5}} = \frac{3\sqrt{5}}{5}$$

$$2. \frac{\sqrt{3}}{\sqrt{5}} \frac{\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{15}}{5}$$

$$3. \frac{\sqrt{2}}{3} = \frac{\sqrt{2}}{\sqrt{3}} \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{6}}{3}$$

$$4. \frac{\sqrt{32}}{\sqrt{2}} \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{64}}{2} = \frac{8}{2} = 4$$

$$5. \frac{\sqrt{6}}{\sqrt{54}} = \frac{\sqrt{6}}{\sqrt{9 \cdot 6}} = \frac{\sqrt{6}}{3\sqrt{6}} = \frac{1}{3}$$

$$6. \frac{\sqrt{5}}{\sqrt{20}} = \frac{\sqrt{5}}{\sqrt{4 \cdot 5}} = \frac{\sqrt{5}}{2\sqrt{5}} = \frac{1}{2}$$

$$7. \frac{\sqrt{10}\sqrt{6}}{\sqrt{5}} = \frac{\sqrt{10 \cdot 6}}{\sqrt{5}} = \frac{\sqrt{60}}{\sqrt{5}} = \sqrt{12} = \sqrt{4 \cdot 3} = 2\sqrt{3}$$

$$8. \frac{\sqrt{27}}{\sqrt{3}} = \sqrt{\frac{27}{3}} = \sqrt{9} = 3$$

$$9. \frac{\sqrt{18x^5}}{\sqrt{2x}} = \frac{\sqrt{9 \cdot 2 \cdot x^4 \cdot x}}{\sqrt{2x}} = \frac{3 \cdot 2x^2 \cdot \sqrt{x}}{2x} = 3x\sqrt{x} = 3x^{\frac{3}{2}}$$

$$10. \frac{\sqrt{72a^3}}{\sqrt{8a}} = \frac{\sqrt{8 \cdot 9 \cdot 2 \cdot a^2 \cdot a}}{\sqrt{8a}} = \frac{2 \cdot 3 \cdot a \cdot \sqrt{2a}}{2 \cdot \sqrt{2a}} = 3a$$

$$11. \frac{\sqrt{54}}{\sqrt{2} \cdot \sqrt{3}} = \frac{\sqrt{54}}{\sqrt{6}} = \sqrt{\frac{54}{6}} = \sqrt{9} = 3$$

$$12. \frac{\sqrt{3}\sqrt{50}}{\sqrt{6}} = \frac{\sqrt{150}}{\sqrt{6}} = \sqrt{\frac{150}{6}} = \sqrt{25} = 5$$

$$13. \frac{\sqrt{3}\sqrt{6}}{\sqrt{2}} = \frac{\sqrt{3 \cdot 6}}{\sqrt{2}} = \frac{\sqrt{18}}{\sqrt{2}} = \sqrt{9} = 3$$

$$14. \frac{\sqrt{24}\sqrt{4}}{\sqrt{6}} = \frac{\sqrt{96}}{\sqrt{6}} = \sqrt{\frac{96}{6}} = \sqrt{16} = 4$$

$$15. \frac{\sqrt{8}\sqrt{50}}{\sqrt{16}\sqrt{5}} = \frac{\sqrt{8 \cdot 50}}{\sqrt{16 \cdot 5}} = \frac{\sqrt{400}}{\sqrt{80}} = \frac{20}{\sqrt{80}} = \frac{20}{4\sqrt{5}} = \frac{5}{\sqrt{5}} = \sqrt{5}$$

$$16. \frac{\sqrt{6}\sqrt{14}}{\sqrt{4}\sqrt{7}} = \frac{\sqrt{6 \cdot 14}}{\sqrt{4 \cdot 7}} = \frac{\sqrt{84}}{\sqrt{28}} = \frac{\sqrt{3 \cdot 28}}{\sqrt{28}} = \sqrt{3} = 3$$

[D] Mixed Operations
Simplify

$$1. x^{-3a} \cdot x^{4a} = x^{-3a+4a} = x^a$$

$$2. \frac{a^{-3}}{a^{-4}} + \sqrt{9a^2} = a^{-3-(-4)} + 3a = a^{1+3a} = 4a$$

$$3. \frac{x^3}{x^{-2}} - \sqrt{x^{10}} = x^{3-(-2)} - x^{10/2} = x^5 - x^5 = 0$$

$$4. \left(\frac{p^{-2}}{p^3}\right)^{-2} \cdot p = (p^{-2-3})^{-2} \cdot p = p^{10} \cdot p = p^{11}$$

$$5. \frac{x^0}{x^{-2}} + 2\sqrt{x^4} - x^2 = x^{0-(-2)} + 2(x^2) - x^2 = 2x^2$$

$$6. (m^{-2})^{-3} \cdot (m^{-2})^3 = m^6 \cdot m^{-6} = m^{6+(-6)} = m^0 = 1$$

$$7. (q^0)^{-2} - (p^7)^0 = q^{0 \cdot (-2)} - p^{7 \cdot 0} = q^0 - p^0 = 1 - 1 = 0$$

$$8. \frac{-4^2}{(-4)^2} + \frac{2^{-2} \cdot 2^2}{2^{-4}} = \frac{-16}{16} + \frac{2^{-2+2}}{2^{-4}} = -1 + \frac{2^0}{2^{-4}} = -1 + 2^4 = -1 + 16 = 15$$

$$9. (2 \times 10^{-35}) \cdot (3 \times 10^{-34}) = (2 \cdot 3) \times (10^{-35} \cdot 10^{-34}) = 6 \times 10^{-35-34} = 6 \times 10^{-69}$$

$$10. \frac{6 \times 10^{12}}{2 \times 10^{10}} = \left(\frac{6}{2}\right) \times \left(\frac{10^{12}}{10^{10}}\right) = 3 \times 10^{12-10} = 3 \times 10^2$$

$$11. (1.2 \times 10^{-8}) \cdot (2 \times 10^5) = (1.2 \cdot 2) \times (10^{-8} \cdot 10^5) = 2.4 \times 10^{-8+5} = 2.4 \times 10^{-3}$$

$$12. (5 \times 10^7)(1.2 \times 10^5) = \frac{(5 \times 1.2) \times (10^7 \cdot 10^5)}{3 \times 10^4} = \frac{6 \times 10^{12}}{3 \times 10^4} = \left(\frac{6}{3}\right) \times (10^{12-4}) = 2 \times 10^8$$

$$13. \sqrt{40} + \sqrt{90} - \sqrt{160} = \sqrt{4}\sqrt{10} + \sqrt{9}\sqrt{10} - \sqrt{16}\sqrt{10} = 2\sqrt{10} + 3\sqrt{10} - 4\sqrt{10} = (2+3-4)\sqrt{10} = \sqrt{10}$$

$$14. 2\sqrt{75} + 4\sqrt{27} - 8\sqrt{12} = 2\sqrt{25 \cdot 3} + 4\sqrt{9 \cdot 3} - 8\sqrt{4 \cdot 3} = 2 \cdot 5\sqrt{3} + 4 \cdot 3\sqrt{3} - 8 \cdot 2\sqrt{3} = 10\sqrt{3} + 12\sqrt{3} - 16\sqrt{3} = (10+12-16)\sqrt{3} = 6\sqrt{3}$$

$$15. -3\sqrt{3}(2\sqrt{3}-5) = (-3\sqrt{3})(2\sqrt{3}) - (-3\sqrt{3})(5) = (-6\sqrt{3}\sqrt{3}) - (-15\sqrt{3}) = (-6 \cdot 3) + (15\sqrt{3}) = -18 + 15\sqrt{3}$$

$$16. (3\sqrt{2}+5)(2\sqrt{2}+1) = (3\sqrt{2})(2\sqrt{2}) + (3\sqrt{2})(1) + 5(2\sqrt{2}) + 5(1) = 6 \cdot 2 + 3\sqrt{2} + 10\sqrt{2} + 5 = (12+5) + (3+10)\sqrt{2} = 17 + 13\sqrt{2}$$

$$17. (6.2 \times 10^7) \cdot (2 \times 10^{-5}) = (6.2 \cdot 2) \times (10^7 \cdot 10^{-5}) = 12.4 \times 10^2 = 1.24 \times 10^3$$

$$18. \frac{(5 \times 10^9)(12 \times 10^{-3})}{3 \times 10^{-4}} = \left(\frac{5 \cdot 12}{3}\right) \times \left(\frac{10^9 \cdot 10^{-3}}{10^{-4}}\right) = 20 \times 10^8 = 2.0 \times 10^9$$

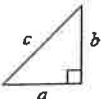
[11] The Pythagorean Theorem.

[A] The Pythagorean Theorem in a Right Triangle

[1] $c^2 = a^2 + b^2$; $c = \sqrt{a^2 + b^2}$

[2] $a^2 = c^2 - b^2$; $a = \sqrt{c^2 - b^2}$

[3] $b^2 = c^2 - a^2$; $b = \sqrt{c^2 - a^2}$



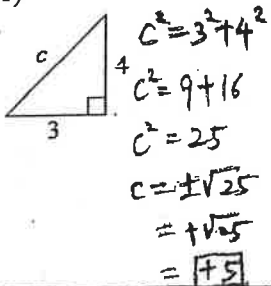
[Example 1] Find the missing side.

1. $c = \sqrt{6^2 + 8^2} = \sqrt{36 + 64} = \sqrt{100} = 10$

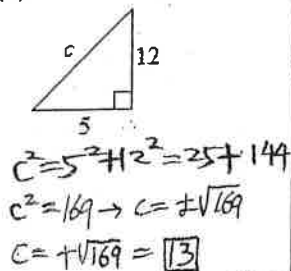


[Ex-A] Find the missing sides of the following triangles.

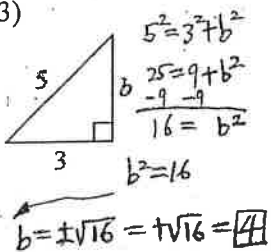
(1)



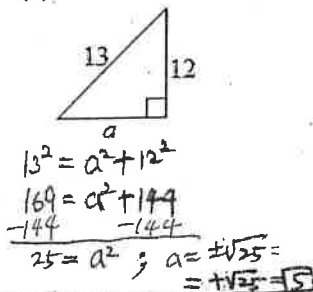
(2)



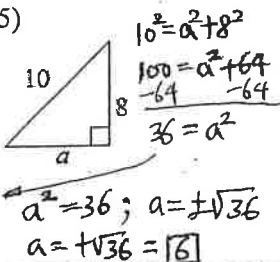
(3)



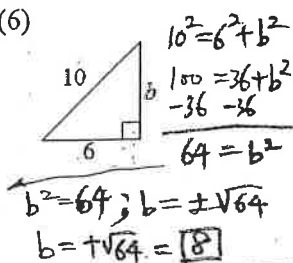
(4)



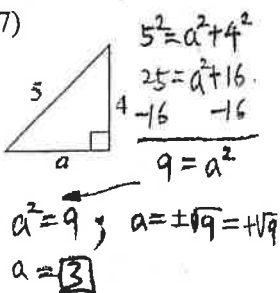
(5)



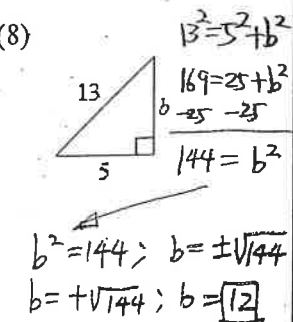
(6)



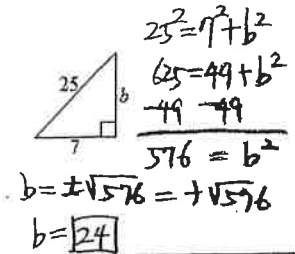
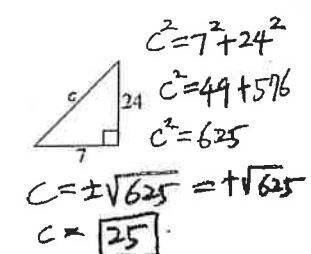
(7)



(8)

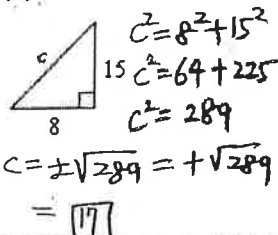


(9)

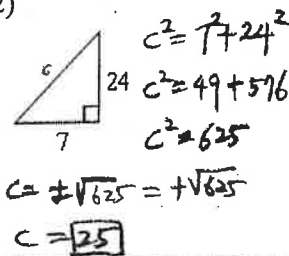


[Ex-B] Find the missing sides of the following triangles.

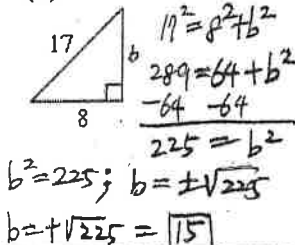
(1)



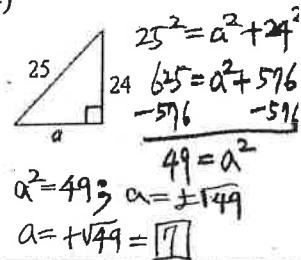
(2)



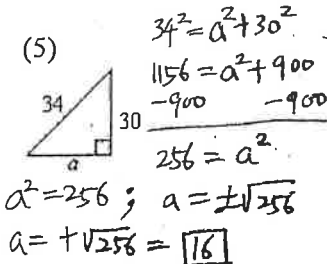
(3)



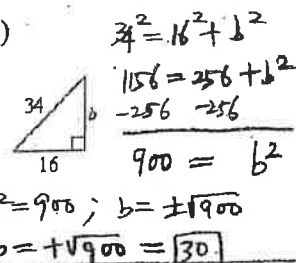
(4)



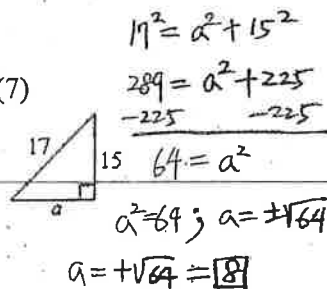
(5)



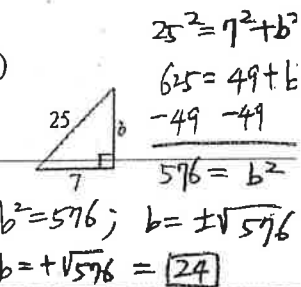
(6)



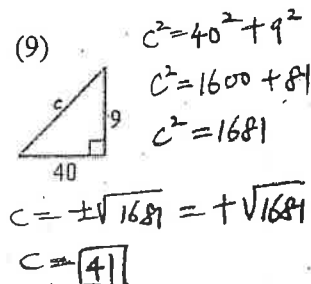
(7)



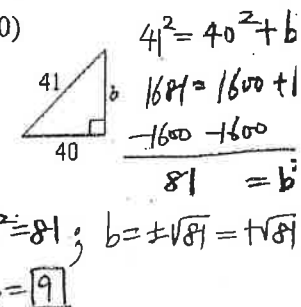
(8)



(9)



(10)



[CH. 8.1] Solving Quadratic Equations by Factoring

[1]

1. $x^2 + 5x + 6 = 0$

$(x+2)(x+3) = 0$
 $x+2=0 \Rightarrow x = -2$
 $x+3=0 \Rightarrow x = -3$

2. $x^2 - 3 = 0$ $x^2 = 3 \Rightarrow x = \pm\sqrt{3}$
 $x = +\sqrt{3}$
 $x = -\sqrt{3}$

3. $x^2 - 2x - 15 = 0$

$(x-5)(x+3) = 0$
 $x = 5$ $x = -3$

4. $x^2 = 5 - 4x$

$x^2 + 4x - 5 = 0$
 $(x+5)(x-1) = 0$
 $x = -5$ $x = 1$

5. $x^2 = 7 \Rightarrow x = \pm\sqrt{7}$
 $x = +\sqrt{7}$
 $x = -\sqrt{7}$

6. $2a^2 - 12 = 0$

$2(a^2 - 6) = 0 \Rightarrow a^2 - 6 = 0$
 $a^2 = 6 \Rightarrow a = \pm\sqrt{6}$
 $a = +\sqrt{6}$
 $a = -\sqrt{6}$

7. $3x^2 = 27$

$\frac{3x^2}{3} = \frac{27}{3} \Rightarrow x^2 = 9$
 $x = \pm\sqrt{9} = \pm 3$
 $x = +3$ or -3

8. $10x^2 - 160 = 0$

$10x^2 - 160 = 0$
 $+160 \quad +160$
 $10x^2 = 160$
 $\frac{10x^2}{10} = \frac{160}{10}$
 $x^2 = 16$
 $x = \pm\sqrt{16}$
 $x = \pm 4$
 $x = 4$ or -4

9. $12x^2 - 3x = 0$

$3x(4x-1) = 0$
 $3x = 0 \Rightarrow x = 0$
 $4x-1 = 0 \Rightarrow 4x = 1 \Rightarrow x = \frac{1}{4}$

10. $x^2 - 16x = 0$ $x(x-16) = 0$
 $x = 0$ $x = 16$

11. $x^2 - 4x = 0$ $x(x-4) = 0$
 $x = 0$ $x = 4$

12. $\frac{x^2}{2} = x - \frac{3}{8}$ LCB = 8

$8(\frac{x^2}{2}) = 8(x) - 8(\frac{3}{8})$
 $4x^2 = 8x - 3$
 $4x^2 - 8x + 3 = 0$
 $(2x-1)(2x-3) = 0$
 $2x-1 = 0 \Rightarrow 2x = 1 \Rightarrow x = \frac{1}{2}$
 $2x-3 = 0 \Rightarrow 2x = 3 \Rightarrow x = \frac{3}{2}$

13. $x(x-4) = 18 - x$

$x^2 - 4x = 18 - x$
 $x^2 - 3x - 18 = 0$
 $(x-6)(x+3) = 0$
 $x = 6$ $x = -3$

14. $x(x+4) = 12$

$x^2 + 4x = 12$
 $x^2 + 4x - 12 = 0$
 $(x+6)(x-2) = 0$
 $x = -6$ $x = 2$

15. $(x+2)(x+3) = x+3$

$x^2 + 3x + 2x + 6 = x + 3$
 $x^2 + 5x + 6 = x + 3$
 $x^2 + 4x + 3 = 0$
 $(x+3)(x+1) = 0$
 $x = -3$ $x = -1$

16. $(x-2)(x+1) = 6x - 12$

$x^2 + x - 2x - 2 = 6x - 12$
 $x^2 - x - 2 = 6x - 12$
 $x^2 - 7x + 10 = 0$
 $(x-5)(x-2) = 0$
 $x = 5$ $x = 2$

17. $x^2 - 2x + 15 = 0$

Can not factored

$$ax^2+bx+c=0; x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

[CH 8.2] Solving Quadratic Equations Using Quadratic Formula

1. $x^2-4x+1=0$ $a=1, b=-4, c=1$

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(1)}}{2(1)} = \frac{4 \pm \sqrt{16-4}}{2}$$

$$= \frac{4 \pm \sqrt{12}}{2} = \frac{4 \pm 2\sqrt{3}}{2} = \frac{2(2 \pm \sqrt{3})}{2} = \boxed{2 \pm \sqrt{3}}$$

2. $x^2-4x+2=0$ $a=1, b=-4, c=2$

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(2)}}{2(1)} = \frac{4 \pm \sqrt{16-8}}{2}$$

$$= \frac{4 \pm \sqrt{8}}{2} = \frac{4 \pm 2\sqrt{2}}{2} = \frac{2(2 \pm \sqrt{2})}{2} = \boxed{2 \pm \sqrt{2}}$$

3. $3x^2-x-2=0$ $a=3, b=-1, c=-2$

$$x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(3)(-2)}}{2(3)} = \frac{1 \pm \sqrt{1+24}}{6}$$

$$= \frac{1 \pm \sqrt{25}}{6} = \frac{1 \pm 5}{6}$$

$\frac{1+5}{6} = \frac{6}{6} = 1$
 $\frac{1-5}{6} = \frac{-4}{6} = -\frac{2}{3}$

4. $2x^2+3x-2=0$ $a=2, b=3, c=-2$

$$x = \frac{-3 \pm \sqrt{3^2 - 4(2)(-2)}}{2(2)} = \frac{-3 \pm \sqrt{9+16}}{4} = \frac{-3 \pm \sqrt{25}}{4}$$

$$= \frac{-3 \pm 5}{4}$$

$\frac{-3+5}{4} = \frac{2}{4} = \frac{1}{2}$
 $\frac{-3-5}{4} = \frac{-8}{4} = -2$

5. $2x^2-3x-2=0$ $a=2, b=-3, c=-2$

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(2)(-2)}}{2(2)} = \frac{3 \pm \sqrt{9+16}}{4} = \frac{3 \pm \sqrt{25}}{4}$$

$$= \frac{3 \pm 5}{4}$$

$\frac{3+5}{4} = \frac{8}{4} = 2$
 $\frac{3-5}{4} = \frac{-2}{4} = -\frac{1}{2}$

6. $4x^2=12x-7$ $4x^2-12x+7=0$ $a=4, b=-12, c=7$

$$x = \frac{-(-12) \pm \sqrt{(-12)^2 - 4(4)(7)}}{2(4)} = \frac{12 \pm \sqrt{144-112}}{8}$$

$$= \frac{12 \pm \sqrt{32}}{8} = \frac{12 \pm 4\sqrt{2}}{8} = \frac{4(3 \pm \sqrt{2})}{8} = \boxed{\frac{3 \pm \sqrt{2}}{2}}$$

7. $2x^2=8x-5$ $2x^2-8x+5=0$ $a=2, b=-8, c=5$

$$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(2)(5)}}{2(2)} = \frac{8 \pm \sqrt{64-40}}{4} = \frac{8 \pm \sqrt{24}}{4}$$

$$= \frac{8 \pm 2\sqrt{6}}{4} = \frac{2(4 \pm \sqrt{6})}{4} = \boxed{\frac{4 \pm \sqrt{6}}{2}}$$

8. $3x^2=6x-2$ $3x^2-6x+2=0$ $a=3, b=-6, c=2$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(3)(2)}}{2(3)} = \frac{6 \pm \sqrt{36-24}}{6}$$

$$= \frac{6 \pm \sqrt{12}}{6} = \frac{6 \pm 2\sqrt{3}}{6} = \frac{2(3 \pm \sqrt{3})}{6} = \boxed{\frac{3 \pm \sqrt{3}}{3}}$$

9. $3x^2+2x+1=0$ $a=3, b=2, c=1$

$$x = \frac{-2 \pm \sqrt{2^2 - 4(3)(1)}}{2(3)} = \frac{-2 \pm \sqrt{4-12}}{6}$$

$$= \frac{-2 \pm \sqrt{-8}}{6} \Rightarrow \text{undefined for now}$$

10. $4x^2+3x+2=0$ $a=4, b=3, c=2$

$$x = \frac{-3 \pm \sqrt{3^2 - 4(4)(2)}}{2(4)} = \frac{-3 \pm \sqrt{9-32}}{8} = \frac{-3 \pm \sqrt{-23}}{8}$$

undefined for now

11. $x(x-2)=3$

$$x^2-2x=3 \rightarrow x^2-2x-3=0$$
 $a=1, b=-2, c=-3$

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-3)}}{2(1)} = \frac{2 \pm \sqrt{4+12}}{2} = \frac{2 \pm \sqrt{16}}{2}$$

$$= \frac{2 \pm 4}{2}$$

$\frac{2+4}{2} = \frac{6}{2} = 3$
 $\frac{2-4}{2} = \frac{-2}{2} = -1$

12. $(x+1)(x+2)=12$

$$x^2+3x+2=12; x^2+3x-10=0$$
 $a=1, b=3, c=-10$

$$x = \frac{-3 \pm \sqrt{3^2 - 4(1)(-10)}}{2(1)} = \frac{-3 \pm \sqrt{9+40}}{2} = \frac{-3 \pm \sqrt{49}}{2}$$

$$= \frac{-3 \pm 7}{2}$$

$\frac{-3+7}{2} = \frac{4}{2} = 2$
 $\frac{-3-7}{2} = \frac{-10}{2} = -5$

13. $x^2 = \frac{3-5x}{2}$ $LCD=2$ $2(x^2) = 2(\frac{3-5x}{2})$

$$2x^2 = 3-5x \Rightarrow 2x^2+5x-3=0$$
 $a=2, b=5, c=-3$

$$x = \frac{-5 \pm \sqrt{5^2 - 4(2)(-3)}}{2(2)} = \frac{-5 \pm \sqrt{25+24}}{4}$$

$$= \frac{-5 \pm \sqrt{49}}{4} = \frac{-5 \pm 7}{4}$$

$\frac{-5+7}{4} = \frac{2}{4} = \frac{1}{2}$
 $\frac{-5-7}{4} = \frac{-12}{4} = -3$

14. $\frac{x^2}{2} = x+1$ $LCD=2$

$$2(\frac{x^2}{2}) = 2(x+1) \rightarrow x^2 = 2x+2 \rightarrow x^2-2x-2=0$$

$$a=1, b=-2, c=-2$$
 $x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-2)}}{2(1)}$

$$= \frac{2 \pm \sqrt{4+8}}{2} = \frac{2 \pm \sqrt{12}}{2} = \frac{2 \pm 2\sqrt{3}}{2} = \frac{2(1 \pm \sqrt{3})}{2} = \boxed{1 \pm \sqrt{3}}$$

15. The area of a square is 48 in^2 . Find a side.

$$\square x \quad x^2 = 48 \rightarrow x = \pm \sqrt{48} = \pm \sqrt{16 \cdot 3} = \pm 4\sqrt{3}$$

$(4\sqrt{3})$ only

16. The square of a number is equal to twice the number plus four. Find the number.

$$x^2 = 2x+4; x^2-2x-4=0$$
 $a=1, b=-2, c=-4$

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-4)}}{2(1)} = \frac{2 \pm \sqrt{4+16}}{2} = \frac{2 \pm \sqrt{20}}{2}$$

$$= \frac{2 \pm 2\sqrt{5}}{2} = \frac{2(1 \pm \sqrt{5})}{2} = \boxed{1 \pm \sqrt{5}}$$

[CH 9] Ratio and Proportions

1. A baseball team won 20 out of 30 games played. There were no tie games. Find the ratio of (a) wins to played (b) wins to losses and (c) losses to wins.

30 games played $\left\{ \begin{array}{l} 20 \text{ won} \\ 10 \text{ lost} \end{array} \right.$ (a) $\frac{20}{30} = \frac{2}{3}$ (b) $\frac{20}{10} = \frac{2}{1}$
 (c) $\frac{10}{30} = \frac{1}{3}$

2. In an English class, 12 out of 25 students are women. Find the ratio of (a) women to total students (b) women to men and (c) men to total.

25 students total $\left\{ \begin{array}{l} 12 \text{ women} \\ 13 \text{ men} \end{array} \right.$ (a) $\frac{12}{25}$ (b) $\frac{12}{13}$ (c) $\frac{13}{25}$

3. Paula has 12 pens, 8 pencils, and 4 erasers. What is the ratio of (a) pens to pencils (b) pencils to erasers and (c) pens to total?

(a) $\frac{12}{8} = \frac{3 \cdot 4}{2 \cdot 4} = \frac{3}{2}$ (b) $\frac{8}{4} = \frac{2}{1}$ (c) $\frac{12}{24} = \frac{12 \cdot 1}{12 \cdot 2} = \frac{1}{2}$
 Total = 12 + 8 + 4 = 24

4. Solve $\frac{x \cdot 16}{25 \cdot 5} \rightarrow 5x = 25 \cdot 6 ; x = \frac{25 \cdot 6}{5} = 5 \cdot 6 = 30$

5. Solve $\frac{10}{x} = \frac{15}{4} \rightarrow 15x = 4 \cdot 10$
 $x = \frac{4 \cdot 10}{15} = \frac{4 \cdot 2}{3} = \frac{8}{3}$

6. 5 quarts of ice cream was used to make 100 milkshakes. How many quarts are needed to make 500 milk shakes?

$\frac{5 \text{ qt}}{100 \text{ #ms}} = \frac{x \text{ qt}}{500 \text{ #ms}} \rightarrow 100x = (5)(500)$
 $x = \frac{5 \cdot 500}{100} = 5 \cdot 5 = 25 \text{ qt.}$

7. If a 6-foot man casts a 4-foot shadow, how tall is a tree that casts a 30-foot shadow?

$\frac{6'}{4'} = \frac{x}{30} \rightarrow 4x = 6 \cdot 30 \rightarrow x = \frac{6 \cdot 30}{4} = \frac{180}{4} = 45'$

8. A painter uses about 5 gallons of paint painting 2 rooms. How many gallons would she need to paint 20 rooms?

$\frac{5 \text{ gal}}{2 \text{ #R}} = \frac{x \text{ gal}}{20 \text{ #R}} \rightarrow 2x = (20)(5)$
 $x = \frac{20 \cdot 5}{2} = 10 \cdot 5 = 50 \text{ gal}$

9. A man drove 800 miles in 2 days. How long would it take him to drive 3,200 miles?

$\frac{800 \text{ mi}}{2 \text{ days}} = \frac{3200 \text{ mi}}{x \text{ days}} \rightarrow 800x = (3200)(2)$
 $x = \frac{(3200)(2)}{800} = (4)(2) = 8 \text{ days}$

10. 5 builders finish 20 houses in a month. How many houses could 25 builders finish in the same time?

$\frac{5^B}{20 \text{ h}} = \frac{25^B}{x \text{ h}} \Rightarrow 5x = (20)(25)$
 $x = \frac{20 \cdot 25}{5} = 20 \cdot 5 = 100 \text{ houses}$

11. An investment of \$5,000 earned \$300 for one year. How much would have to be invested to earn \$750 at the same time?

$\frac{\$5000}{\$300} = \frac{\$x}{\$750} \Rightarrow 300x = (5000)(750)$
 $x = \frac{5000 \cdot 750}{300} = \frac{50 \cdot 750}{3} = 12500$

12. A store sells 3 jars of grape jelly for \$2. How many jars can someone buy with \$8?

$\frac{3}{\$2} = \frac{x}{\$8} \rightarrow 2x = 8 \cdot 3 \rightarrow x = \frac{8 \cdot 3}{2} = \frac{24}{2} = 12 \text{ jars}$

13. The property tax on a \$200,000 home is \$4,000. What would be the tax on a \$600,000 home?

$\frac{\$200,000}{4,000} = \frac{\$600,000}{x} \Rightarrow 200,000x = (4000)(600,000)$
 $x = \frac{(4000)(600,000)}{200,000} = 12,000$

14. A market is selling 3 cans of corn for 90¢. How much will 18 cans cost at the same store?

$\frac{3^c}{90^c} = \frac{18^c}{x^c} \Rightarrow 3x = 18 \cdot 90$
 $x = \frac{18 \cdot 90}{3} = 540^c$

15. On a map 1/2 an inch represents 15 miles. How many miles with 4 1/2 inches represent?

$\frac{1/2''}{15^m} = \frac{4 1/2''}{x^m} \rightarrow \frac{1}{2}x = (15)(4 1/2) \rightarrow \frac{1}{2}x = (15)(\frac{9}{2})$
 $x = \frac{15 \cdot 9}{1/2} = 135 \text{ miles}$

16. The ratio of weight on earth to the weight on the moon is 6 to 1. How much would 150 pound woman weigh on the moon?

$\frac{6}{1} = \frac{150}{x} ; 6x = 150 ; x = \frac{150}{6} = 25 \text{ LB}$

[10] Functional Notation

1. Given $f(x) = 2x - 3$, find the following

(a) $f(2) = 2(2) - 3 = 4 - 3 = \textcircled{1}$

(b) $f(0) = 2(0) - 3 = 0 - 3 = \textcircled{-3}$

(c) $f(-5) = 2(-5) - 3 = -10 - 3 = \textcircled{-13}$

(d) $f(x+2) = 2(x+2) - 3 = 2x + 4 - 3 = \textcircled{2x+1}$

2. Given $g(x) = 4x + 3$, find the following

(a) $g(3) = 4(3) + 3 = 12 + 3 = \textcircled{15}$

(b) $g(-3) = 4(-3) + 3 = -12 + 3 = \textcircled{-9}$

(c) $g(a) = 4(a) + 3 = \textcircled{4a+3}$

(d) $g(a-2) = 4(a-2) + 3 = 4a - 8 + 3 = \textcircled{4a-5}$

3. Given $p(x) = x^2 + 2x + 1$

(a) $4p(2) = 4[(2)^2 + 2(2) + 1] = 4[4 + 4 + 1] = 4[9] = \textcircled{36}$

(b) $-3p(-2) = -3[(-2)^2 + 2(-2) + 1] = -3[4 - 4 + 1] = -3[1] = \textcircled{-3}$

(c) $2p(c) = 2[c^2 + 2c + 1] = 2[c^2 + 2c + 1] = \textcircled{2c^2 + 4c + 2}$

(d) $p(q+1) = (q+1)^2 + 2(q+1) + 1 = (q^2 + 2q + 1) + 2q + 2 + 1 = \textcircled{q^2 + 4q + 4}$

4. Given $H(x) = 2x + 6$ and $K(x) = 3x^2 - 2x - 4$

(a) $2H(3) = 2[2(3) + 6] = 2[6 + 6] = 2[12] = \textcircled{24}$

(b) $3K(5) = 3[3(5)^2 - 2(5) - 4] = 3[3(25) - 10 - 4] = 3[75 - 10 - 4] = 3[61] = \textcircled{183}$

(c) $3H(2) + 2K(-5) = 3[2(2) + 6] + 2[3(-5)^2 - 2(-5) - 4] = 3[4 + 6] + 2[3(25) + 10 - 4] = 3[10] + 2[75 + 10 - 4] = 3[10] + 2[81] = 30 + 162 = \textcircled{192}$

(d) $2H(5) - 3K(-2) = 2[2(5) + 6] - 3[3(-2)^2 - 2(-2) - 4] = 2[10 + 6] - 3[3(4) + 4 - 4] = 2[16] - 3[12 + 4 - 4] = 32 - 3[12] = 32 - 36 = \textcircled{-4}$

5. If $A(a) = a^2 - 3$ and $B(c) = 3 - c$, then find

(a) $A(2) + B(5)$

$(2^2 - 3) + (3 - 5) = 4 - 3 + 3 - 5 = \textcircled{-1}$

(b) $2A(3) - 3B(2) = 2[(3)^2 - 3] - 3[3 - (2)] = 2[9 - 3] - 3[1] = 2[6] - 3 = 12 - 3 = \textcircled{9}$

(c) $A(x) - B(x) = (x^2 - 3) - (3 - x) = x^2 - 3 - 3 + x = \textcircled{x^2 + x - 6}$

(d) $2A(x) + 3B(x) = 2[x^2 - 3] + 3[3 - x] = 2x^2 - 6 + 9 - 3x = \textcircled{2x^2 - 3x + 3}$

(e) $\frac{A(4) - B(1)}{5} = \frac{(4)^2 - 3 - (3 - 1)}{5} = \frac{16 - 3 - 2}{5} = \frac{11}{5}$

6. Given $G(x) = 3x^2 - 3x - 5$

(a) $G(4) = 3(4)^2 - 3(4) - 5 = 3(16) - 12 - 5 = 48 - 12 - 5 = \textcircled{31}$

(b) $G(-2) = 3(-2)^2 - 3(-2) - 5 = 3(4) - (-6) - 5 = 12 + 6 - 5 = \textcircled{13}$

(c) $2G(2) = 2[3(2)^2 - 3(2) - 5] = 2[3(4) - 6 - 5] = 2[12 - 6 - 5] = 2[1] = \textcircled{2}$

(d) $-3G(5) = -3[3(5)^2 - 3(5) - 5] = -3[3(25) - 15 - 5] = -3[75 - 15 - 5] = -3[55] = \textcircled{-165}$

8. Given $G(x) = 2x^2 - 4x + 3$

(a) $G(4) = 2(4)^2 - 4(4) + 3 = 2(16) - 16 + 3 = 32 - 16 + 3 = \textcircled{19}$

(b) $G(-2) = 2(-2)^2 - 4(-2) + 3 = 2(4) - (-8) + 3 = 8 + 8 + 3 = \textcircled{19}$

(c) $2G(2) = 2[2(2)^2 - 4(2) + 3] = 2[2(4) - 8 + 3] = 2[8 - 8 + 3] = 2[3] = \textcircled{6}$

(d) $-3G(5) = -3[2(5)^2 - 4(5) + 3] = -3[2(25) - 20 + 3] = -3[50 - 20 + 3] = -3[33] = \textcircled{-99}$

CH 1 - Review - A

[1] Write the equation of

(a) 14 is 3 less than 3 times x

$$14 = 3x - 3 \quad \boxed{14 = 3x - 3}$$

(b) 39 subtracted from 4 times a number is 15.

$$4x - 39 = 15 \quad \boxed{4x - 39 = 15}$$

[2] Solve for x

(a) $20 - 5x = 12 - 9x$

$$\begin{array}{r} 20 - 5x = 12 - 9x \\ +9x \quad +9x \\ \hline 20 + 4x = 12 \\ -20 \quad -20 \\ \hline 4x = -8 \end{array} \quad \begin{array}{r} 4x = -8 \\ \frac{4x}{4} = \frac{-8}{4} \\ \hline \boxed{x = -2} \end{array}$$

(b) $-3(2x - 4) = -5x + 2$

$$\begin{array}{r} -3(2x - 4) = -5x + 2 \\ -3(2x) + (-3)(-4) = -5x + 2 \\ -6x + 12 = -5x + 2 \\ +6x \quad +6x \\ \hline 12 = x + 2 \end{array} \quad \begin{array}{r} x + 2 = 12 \\ -2 \quad -2 \\ \hline \boxed{x = 10} \end{array}$$

[3] Solve for x

(a) $k = 7x - b$

$$\begin{array}{r} k = 7x - b \\ +b \quad +b \\ \hline k + b = 7x \\ \frac{k+b}{7} = \frac{7x}{7} \\ \hline \boxed{x = \frac{k+b}{7}} \end{array}$$

(b) $a \frac{x-c}{d}$

$$\begin{array}{r} ad = \cancel{d}(x-c) \\ ad = x - c \\ +c \quad +c \\ \hline \boxed{x = ad + c} \end{array}$$

[4] Solve and graph

(a) $4x - 10 \geq 6x + 2$

$$\begin{array}{r} 4x - 10 \geq 6x + 2 \\ -4x \quad -4x \\ \hline -10 \geq 2x + 2 \\ -2 \quad -2 \\ \hline -12 \geq 2x \\ 2x \leq -12 \end{array} \quad \begin{array}{r} \frac{2x}{2} \leq \frac{-12}{2} \\ \hline \boxed{x \leq -6} \end{array}$$

(b) $3 - 5x > -9 - 2x$

$$\begin{array}{r} 3 - 5x > -9 - 2x \\ +5x \quad +5x \\ \hline 3 > -9 + 3x \\ +9 \quad +9 \\ \hline 12 > 3x \end{array} \quad \begin{array}{r} 3x < 12 \\ \frac{3x}{3} < \frac{12}{3} \\ \hline \boxed{x < 4} \end{array}$$

[5] Evaluate (a) $F(x) = 2x^2 - 5x + 2$. Find $F(2)$

$$\begin{array}{r} F(2) = 2(2)^2 - 5(2) + 2 \\ = 2(4) - 10 + 2 \\ = 8 - 10 + 2 \end{array} \quad \begin{array}{r} = -2 + 2 \\ = \boxed{0} \end{array}$$

(b) $G(x) = -2x^2 + 5x - 2$. Find $G(-3)$

$$\begin{array}{r} G(-3) = -2(-3)^2 + 5(-3) - 2 \\ = -2(9) + (-15) - 2 \\ = -18 + (-15) - 2 \end{array} \quad \begin{array}{r} = -33 - 2 \\ = \boxed{-35} \end{array}$$

[6] (a) 90 is what percent of 180?

$$\frac{x}{100} = \frac{90}{180} \Rightarrow 180x = (90)(100) \Rightarrow x = \frac{9000}{180} = \boxed{50}$$

(b) 16 is 20% of what number?

$$\frac{16}{100} = \frac{20}{x} \Rightarrow 20x = (16)(100) \Rightarrow x = \frac{1600}{20} = \boxed{80}$$

[7] (a) What is the percent increase from 2,000 to 6,000?

$$\begin{array}{l} \text{Percent Change} = \frac{\text{2nd \#} - \text{1st \#}}{\text{1st \#}} \times 100 \\ = \frac{6000 - 2000}{2000} \times 100 \\ = \frac{4000}{2000} \times 100 \\ = \frac{4000}{2000} = \boxed{200\%} \end{array}$$

(b) What is the percent decrease from 4,000 to 1,000?

$$\begin{array}{l} \frac{1000 - 4000}{4000} \times 100 \\ = \frac{-3000}{4000} \times 100 \\ = -\frac{3000}{4000} = \boxed{-75\%} \end{array}$$

[8] (a) Audrey wanted to buy a ring with 25% discount, which was originally priced as \$80. How much did she have to pay after the discount?

$$\begin{array}{l} \text{discount amount} \Rightarrow \frac{25}{100} \times 80 \Rightarrow 100x = (80)(25) \\ 100x = 2000 \\ x = \frac{2000}{100} = 20 \\ \$80 - \$20 = \boxed{\$60} \end{array}$$

(b) Bryan wanted to buy a ring with 10% tax that was originally \$80. How much did he have to pay in total?

$$\begin{array}{l} \text{TAX Amount} \Rightarrow \frac{10}{100} \times 80 \Rightarrow 100x = (80)(10) \\ 100x = 800 \\ x = \frac{800}{100} = 8 \\ \$80 + 8 = \boxed{\$88} \end{array}$$

CH 2 & CH 3 - Review - A

$$Y = mX + b$$

↑ ↑
slope y-intercept

[1] Find the slope and the y-intercept and graph the equation

(a) $3x - 4y = 12$

$$\begin{array}{r} 3x - 4y = 12 \\ -3x \qquad -3x \\ \hline -4y = -3x + 12 \\ \frac{-4y}{-4} = \frac{-3x}{-4} + \frac{12}{-4} \end{array}$$

$$y = \left(\frac{3}{4}\right)x + (-3)$$

↑ ↑
slope y-intercept

$$m = \frac{3}{4}$$

Y-intercept (0, -3)

(b) $3x + 2y = 6$

$$\begin{array}{r} 3x + 2y = 6 \\ -3x \qquad -3x \\ \hline 2y = -3x + 6 \\ \frac{2y}{2} = \frac{-3x}{2} + \frac{6}{2} \end{array}$$

$$y = \left(-\frac{3}{2}\right)x + 3$$

↑ ↑
slope y-intercept

$$m = -\frac{3}{2}$$

Y-intercept (0, 3)

(c) $10x = 15 - 5y$

$$\begin{array}{r} 15 - 5y = 10x \\ -15 \qquad -15 \\ \hline -5y = 10x - 15 \\ \frac{-5y}{-5} = \frac{10x}{-5} + \frac{-15}{-5} \end{array}$$

$$y = -2x + 3$$

↑ ↑
slope y-intercept

$$m = -2$$

Y-intercept (0, 3)

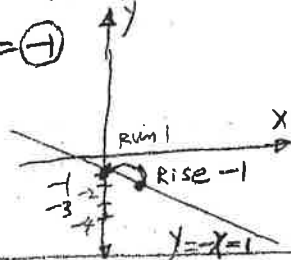
[2] Find the equation and graph with the following information

① $m = \frac{y_2 - y_1}{x_2 - x_1}$ ② $y - y_1 = m(x - x_1)$

(a) the line passes A (2, -3) and B (4, -5)

① $m = \frac{-5 - (-3)}{4 - 2} = \frac{-5 + 3}{2} = \frac{-2}{2} = -1$

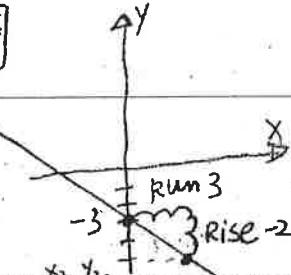
② $y - (-3) = -1(x - 2)$
 $y + 3 = -x + 2$
 $-3 \qquad -3$
 $y = -x - 1$



(b) the line passes A (-9, 3) and B (-3, -1)

① $m = \frac{-1 - 3}{-3 - (-9)} = \frac{-4}{6} = -\frac{2}{3}$

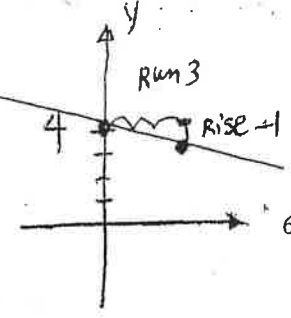
② $y - 3 = -\frac{2}{3}(x - (-9))$
 $y - 3 = -\frac{2}{3}x - 6$
 $+3 \qquad +3$
 $y = -\frac{2}{3}x - 3$



(c) the line passes A (-3, 5) and B (0, 4)

① $m = \frac{4 - 5}{0 - (-3)} = \frac{-1}{3}$

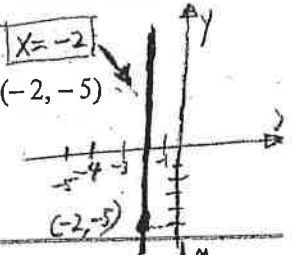
② $y - 5 = -\frac{1}{3}(x - (-3))$
 $y - 5 = -\frac{1}{3}(x + 3)$
 $y - 5 = -\frac{1}{3}x - 1$
 $+5 \qquad +5$
 $y = -\frac{1}{3}x + 4$



[3] Find the equation and graph with the following information

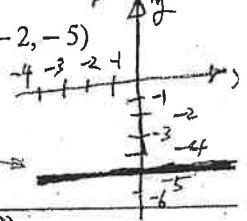
(a) The vertical line passes the point (-2, -5)

$$x = -2$$



(b) The horizontal line passes the point (-2, -5)

$$y = -5$$



(c) The vertical line passes the point (0, 0)

$$x = 0$$

[4] (a) Find and graph the equation of the line passing through (6, -2) and parallel to the line

$$\begin{array}{r} 2x + 4y = 9 \\ -2x \qquad -2x \\ \hline 4y = -2x + 9 \end{array}$$

② $y - (-2) = -\frac{1}{2}(x - 6)$

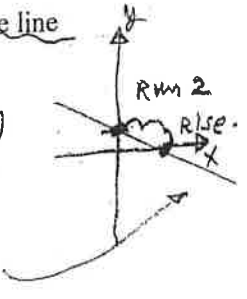
$$y + 2 = -\frac{1}{2}x + 3$$

$$y = -\frac{1}{2}x + 1$$

$$\frac{4y}{4} = \frac{-2x}{4} + \frac{9}{4}$$

$$y = -\frac{2}{4}x + \frac{9}{4}$$

$-\frac{2}{4} = -\frac{1}{2} \rightarrow m_1 = m_2$ ①



(b) Find and graph the equation of the line passing through (-2, +3) and parallel to the line $3x + 2y = 5$.

$$\begin{array}{r} 3x + 2y = 5 \\ -3x \qquad -3x \\ \hline 2y = -3x + 5 \end{array}$$

② $y - y_1 = m_2(x - x_1)$

$\Rightarrow y - (+3) = -\frac{3}{2}(x - (-2))$

$= y - 3 = -\frac{3}{2}(x + 2)$

$= y - 3 = -\frac{3}{2}x + \frac{3}{2}(2)$

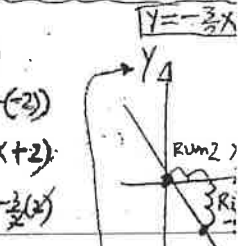
$= y - 3 = -\frac{3}{2}x + 3$

$+3 \qquad +3$
 $y = -\frac{3}{2}x + 6$

$$\frac{2y}{2} = \frac{-3x}{2} + \frac{5}{2}$$

$$y = -\frac{3}{2}x + \frac{5}{2}$$

① $m_1 = m_2$



(c) Find and graph the equation of the line passing through (3, 1) and perpendicular to the line $3x + 6y = 2$.

$$\begin{array}{r} 3x + 6y = 2 \\ -3x \qquad -3x \\ \hline 6y = -3x + 2 \end{array}$$

② $y - y_1 = m_2(x - x_1)$

$y - (+1) = 2(x - (3))$

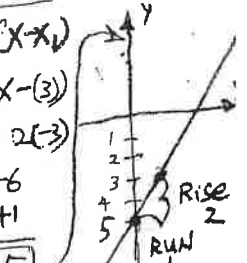
$y - 1 = 2x - 6$

$+1 \qquad +1$
 $y = 2x - 5$

$$\frac{6y}{6} = \frac{-3x}{6} + \frac{2}{6}$$

$$y = -\frac{3}{6}x + \frac{2}{6}$$

① $m_1 = -\frac{1}{2} = -\frac{1}{m_2} \Rightarrow m_2 = +2$



CH 4 & CH 5 - Review - A

[1] Solve the following systems

(a) $x + 2y = 4$ (1)

$2x - y = 3$

$$\begin{cases} x + 2y = 4 \\ 2x - y = 3 \end{cases} \xrightarrow{\times 2} \begin{cases} x + 2y = 4 \\ 4x - 2y = 6 \end{cases}$$

$$\xrightarrow{+} 5x = 10$$

$x = \frac{10}{5}; x = 2$

10. $(2) + 2y = 4$
 $2y = 2; y = 1$
 $\{2, 1\}$

[2] Simplify

(a) $\frac{a^3 \cdot a^8}{(a^5)^2}$

$$= \frac{a^{3+8}}{a^{5 \cdot 2}} = \frac{a^{11}}{a^{10}} = a^{11-10} = a^1 = \boxed{a}$$

[3] Simplify

(a) $(2 \times 10^5)(5 \times 10^{-3})$

$$= (2 \cdot 5)(10^5 \cdot 10^{-3})$$

$$= 10 \times 10^{5-3}$$

$$= 10 \times 10^2 = \boxed{1.0 \times 10^3}$$

[4] Simplify

(a) Subtract $2x - 3$ from $5x - 4$

$$(5x - 4) - (2x - 3)$$

$$= 5x - 4 + (-2x + 3)$$

$$= 5x - 4 - 2x + 3$$

$$= 3x - 1$$

(b) Subtract $2x^2 - 3x + 4$ from $5x^2 - 6x - 7$

$$(5x^2 - 6x - 7) - (2x^2 - 3x + 4)$$

$$= 5x^2 - 6x - 7 + (-2x^2 + 3x - 4)$$

$$= 5x^2 - 6x - 7 - 2x^2 + 3x - 4$$

$$(5x^2 - 2x^2) + (-6x + 3x) + (-7 - 4) = \boxed{3x^2 - 3x - 11}$$

[5] Simplify

(a) $(2x + 8) - (3x - 4)$

$$2x + 8 + (-3x + 4)$$

$$(2x - 3x) + (8 + 4)$$

$$= \boxed{-x + 12}$$

(b) $(7x^2 - 2x - 5) - (2x^2 - 4x + 7)$

$$(7x^2 - 2x - 5) + (-2x^2 + 4x - 7)$$

$$(7x^2 - 2x^2) + (-2x + 4x) + (-5 - 7)$$

$$= \boxed{5x^2 + 2x - 12}$$

[6] Simplify

(a) $(3x - 4)(5x - 6)$

$$(3x)(5x) + (3x)(-6) + (-4)(5x) + (-4)(-6)$$

$$= 15x^2 + -18x + -20x + 24$$

$$= \boxed{15x^2 - 38x + 24}$$

(b) $(2x - 3)(2x^2 + 2x - 3)$

$$(2x)(2x^2) + (2x)(2x) + (2x)(-3) + (-3)(2x^2) + (-3)(2x) + (-3)(-3)$$

$$= 4x^3 + 4x^2 - 6x - 6x^2 - 6x + 9$$

$$= 4x^3 + (4x^2 - 6x^2) + (-6x - 6x) + 9$$

$$= 4x^3 - 2x^2 - 12x + 9$$

$$= \boxed{4x^3 - 2x^2 - 12x + 9}$$

[7] Simplify

(a) $\frac{20x^2 - 5x - 10}{5}$

$$= \frac{20x^2}{5} + \frac{-5x}{5} + \frac{-10}{5}$$

$$= 4x^2 - x - 2$$

$$= \boxed{4x^2 - x - 2}$$

(b) $\frac{18x^5 - 15x^4 + 21x^3}{-3x^2}$

$$= \frac{18x^5}{-3x^2} + \frac{-15x^4}{-3x^2} + \frac{21x^3}{-3x^2}$$

$$= \boxed{-6x^3 + 5x^2 - 7x}$$

CH 6 - Review - A

[1] Factor completely

(a) $5x^2 - 20y^2$ GCF=5

$$5(x^2 - 4y^2)$$

$$= 5(x^2 - (2y)^2)$$

$$= \boxed{5(x+2y)(x-2y)}$$

(b) $16x^3 - 36xy^2$

GCF=4x

$$= 4x(4x^2 - 9y^2)$$

$$= 4x((2x)^2 - (3y)^2)$$

$$= \boxed{4x(2x+3y)(2x-3y)}$$

(c) $75ab^3 - 12a^3b$

GCF=3ab

$$3ab(25b^2 - 4a^2)$$

$$= 3ab((5b)^2 - (2a)^2)$$

$$= \boxed{3ab(5b+2a)(5b-2a)}$$

[2] Factor

(a) $x^2 + 3x - 18$

$$\begin{array}{r} x \quad +3 \\ x \quad -6 \\ \hline +6x + -3x = +3x \checkmark \end{array}$$

$$\boxed{(x-3)(x+6)}$$

(b) $x^2 - 3x - 18$

$$\begin{array}{r} x \quad +3 \\ x \quad -6 \\ \hline -6x + 3x = -3x \checkmark \end{array}$$

$$\boxed{(x+3)(x-6)}$$

(c) $5x^2 - 10x + 5$

GCF=5

$$5(x^2 - 2x + 1)$$

$$5 \begin{array}{r} x \quad -1 \\ x \quad -1 \\ \hline -x + -x = -2x \checkmark \end{array}$$

$$\boxed{5(x-1)(x-1)}$$

[3] Factor

(a) $3x^2 + 4x - 4$

$$\begin{array}{r} 3x \quad -2 \\ 1x \quad +2 \\ \hline 6x - 2x = +4x \checkmark \end{array}$$

$$\boxed{(3x-2)(x+2)}$$

(b) $7x^2 - 3x - 4$

$$\begin{array}{r} 7x \quad +4 \\ 1x \quad -1 \\ \hline -7x + 4x = -3x \checkmark \end{array}$$

$$\boxed{(7x+4)(x-1)}$$

(c) $12x^2 + 10x - 8$ GCF=2

$$2(6x^2 + 5x - 4)$$

$$\begin{array}{r} 2x \quad -1 \\ 3x \quad +4 \\ \hline 6x + -3x = +3x \checkmark \end{array}$$

$$\boxed{2(2x-1)(3x+4)}$$

[4] Factor

(a) $4x^3 - 3x^2 + 16x - 12$

GCF=x^2

$$= x^2(4x - 3) + 4(4x - 3)$$

$$= \boxed{(4x-3)(x^2+4)}$$

(b) $ax + ay - bx - by$

GCF=a GCF=-b

$$= a(x+y) - b(x+y)$$

$$= \boxed{(x+y)(a-b)}$$

(c) $x^3 + x^2 - 9x - 9$

GCF=x^2 GCF=-9

$$= x^2(x+1) - 9(x+1)$$

$$= (x+1)(x^2-9)$$

$$= (x+1)(x^2-3^2) = \boxed{(x+1)(x+3)(x-3)}$$

[5] Factor and Solve

(a) $2x^2 = 18$

$$2x^2 - 18 = 0$$

$$2(x^2 - 9) = 0$$

$$2(x+3)(x-3) = 0$$

$$x+3=0 \quad x-3=0$$

$$x = -3 \quad x = 3$$

$$\boxed{x = \{-3, 3\}}$$

(b) $x^2 - 4x = 0$ GCF=x

$$x(x-4) = 0$$

$$x = 0 \quad x-4 = 0$$

$$x = 4$$

$$\boxed{x = \{0, 4\}}$$

(c) $2x^2 - 16x - 40 = 0$

GCF=2

$$2(x^2 - 8x - 20) = 0$$

$$\begin{array}{r} x \quad +2 \\ x \quad -10 \\ \hline -10x + 2x = -8x \checkmark \end{array}$$

$$-10x + 2x = -8x \checkmark$$

$$2(x+2)(x-10) = 0$$

$$x+2=0 \quad x-10=0$$

$$x = -2 \quad x = 10$$

$$\boxed{x = \{-2, 10\}}$$

(d) $x^2 - 5x + 6 = 0$

$$\begin{array}{r} x \quad -2 \\ x \quad -3 \\ \hline -3x + -2x = -5x \checkmark \end{array}$$

$$-3x + -2x = -5x \checkmark$$

$$(x-2)(x-3) = 0$$

$$x-2=0 \quad x-3=0$$

$$x=2 \quad x=3$$

$$\boxed{x = \{2, 3\}}$$

CH 7 - Review - A

[1] Simplify

$$\begin{aligned} (a) & \sqrt{12} + \sqrt{27} - \sqrt{5} \\ &= \sqrt{4 \cdot 3} + \sqrt{9 \cdot 3} - \sqrt{5} \\ &= \sqrt{4} \sqrt{3} + \sqrt{9} \sqrt{3} - \sqrt{5} \\ &= 2\sqrt{3} + 3\sqrt{3} - \sqrt{5} \end{aligned} \rightarrow \boxed{5\sqrt{3} - \sqrt{5}}$$

$$\begin{aligned} (b) & 2\sqrt{50} + 3\sqrt{8} - \sqrt{18} \\ &= 2\sqrt{25 \cdot 2} + 3\sqrt{4 \cdot 2} - \sqrt{9 \cdot 2} \\ &= 2 \cdot 5\sqrt{2} + 3 \cdot 2\sqrt{2} - 3\sqrt{2} \\ &= 10\sqrt{2} + 6\sqrt{2} - 3\sqrt{2} = (10+6-3)\sqrt{2} \\ &= 13\sqrt{2} \end{aligned}$$

$$\begin{aligned} (c) & 3\sqrt{32} - 2\sqrt{18} + \sqrt{27} \\ &= 3\sqrt{16 \cdot 2} - 2\sqrt{9 \cdot 2} + \sqrt{9 \cdot 3} \\ &= 3 \cdot 4\sqrt{2} - 2 \cdot 3\sqrt{2} + 3\sqrt{3} \\ &= 12\sqrt{2} - 6\sqrt{2} + 3\sqrt{3} = \boxed{6\sqrt{2} + 3\sqrt{3}} \end{aligned}$$

[2] Simplify

$$\begin{aligned} (1) & \sqrt{2}(\sqrt{5} + \sqrt{6}) \\ &= \sqrt{2}\sqrt{5} + \sqrt{2}\sqrt{6} \\ &= \sqrt{10} + \sqrt{12} \\ &= \sqrt{10} + \sqrt{4 \cdot 3} = \boxed{\sqrt{10} + 2\sqrt{3}} \end{aligned}$$

$$\begin{aligned} (2) & 2\sqrt{3}(3\sqrt{5} - 4\sqrt{6}) \\ &= (2\sqrt{3})(3\sqrt{5}) - (2\sqrt{3})(4\sqrt{6}) \\ &= 6\sqrt{15} - 8\sqrt{18} \\ &= 6\sqrt{15} - 8 \cdot 3\sqrt{2} \\ &= \boxed{6\sqrt{15} - 24\sqrt{2}} \end{aligned}$$

$$\begin{aligned} (3) & -\sqrt{3}(2\sqrt{3} - 3\sqrt{4}) \\ &= (-\sqrt{3})(2\sqrt{3}) + (-\sqrt{3})(-3\sqrt{4}) \\ &= -2 \cdot \sqrt{9} + 3\sqrt{12} \\ &= -2 \cdot 3 + 3\sqrt{4 \cdot 3} \\ &= -6 + 3 \cdot 2\sqrt{3} = \boxed{-6 + 6\sqrt{3}} \end{aligned}$$

[3] Simplify

$$\begin{aligned} (1) & (\sqrt{2} - 3)(\sqrt{2} + 4) \\ &= (\sqrt{2})(\sqrt{2}) + (\sqrt{2})(4) + (-3)(\sqrt{2}) + (-3)(4) \\ &= \sqrt{4} + 4\sqrt{2} - 3\sqrt{2} - 12 \\ &= 2 + 4\sqrt{2} - 3\sqrt{2} - 12 \\ &= 2 + \sqrt{2} - 12 = \frac{64-5}{-10 + \sqrt{2}} \end{aligned}$$

$$\begin{aligned} (2) & (\sqrt{3} + \sqrt{5})(\sqrt{3} - \sqrt{5}) = (\sqrt{3})(\sqrt{3}) + (\sqrt{3})(-\sqrt{5}) + (\sqrt{5})(\sqrt{3}) + (\sqrt{5})(-\sqrt{5}) \\ &= \sqrt{9} + -\sqrt{15} + +\sqrt{15} + -\sqrt{25} = 3 + \underbrace{-\sqrt{15} + \sqrt{15}}_0 - 5 \\ &= 3 - 5 = \boxed{-2} \end{aligned}$$

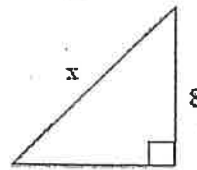
$$\begin{aligned} (3) & (3\sqrt{3} + 2\sqrt{2})(3\sqrt{3} - 2\sqrt{2}) \\ &= (3\sqrt{3})(3\sqrt{3}) + (3\sqrt{3})(-2\sqrt{2}) + (2\sqrt{2})(3\sqrt{3}) + (2\sqrt{2})(-2\sqrt{2}) \\ &= 9\sqrt{9} + -6\sqrt{6} + 6\sqrt{6} + -4\sqrt{4} \\ &= 9(3) + -6\sqrt{6} + 6\sqrt{6} + -4(2) \\ &= 27 + 0 - 8 = 27 - 8 = \boxed{19} \end{aligned}$$

[4] Simplify

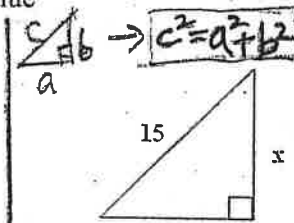
$$\begin{aligned} (1) & \frac{\sqrt{3}\sqrt{6}}{\sqrt{2}} = \sqrt{\frac{3 \cdot 6}{2}} = \sqrt{3 \cdot 3} = \boxed{3} \\ (2) & \frac{\sqrt{15}\sqrt{20}}{\sqrt{25}} = \sqrt{\frac{15 \cdot 20}{25}} = \sqrt{\frac{300}{25}} = \sqrt{12} = \sqrt{4 \cdot 3} = \sqrt{4} \sqrt{3} = \boxed{2\sqrt{3}} \end{aligned}$$

$$\begin{aligned} (3) & \frac{\sqrt{10}\sqrt{4}}{\sqrt{6}\sqrt{3}} \\ &= \sqrt{\frac{10 \cdot 4}{6 \cdot 3}} = \sqrt{\frac{2 \cdot 2}{3 \cdot 1}} = \sqrt{\frac{4}{3}} = \frac{\sqrt{4}}{\sqrt{3}} = \frac{2\sqrt{3}}{\sqrt{3}\sqrt{3}} = \boxed{\frac{2\sqrt{3}}{3}} \end{aligned}$$

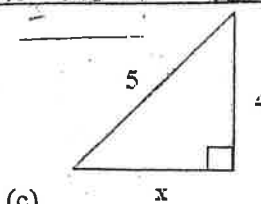
[5] Find the missing value



$$\begin{aligned} (a) & 4 \\ x^2 &= 4^2 + 8^2 \\ x^2 &= 16 + 64 = 80 \\ x &= \pm\sqrt{80} = +\sqrt{80} \\ x &= \sqrt{16 \cdot 5} = \boxed{4\sqrt{5}} \end{aligned}$$



$$\begin{aligned} (b) & 7 \\ 15^2 &= 7^2 + x^2 \\ 225 &= 49 + x^2 \\ -49 & -49 \end{aligned}$$



$$\begin{aligned} (c) & x \\ 5^2 &= x^2 + 4^2 \\ 25 &= x^2 + 16 \\ -16 & -16 \\ 9 &= x^2 \end{aligned}$$

$$\begin{aligned} 176 &= x^2; x^2 = 176 \\ x &= \pm\sqrt{176}; x = \boxed{+\sqrt{176}} \\ x &= \pm\sqrt{16 \cdot 11} = \boxed{4\sqrt{11}} \end{aligned}$$

$$\begin{aligned} x^2 &= 9 \\ x &= \pm\sqrt{9} = \pm 3 \rightarrow \boxed{+3} \end{aligned}$$

CH 8 - Review - A

[1] Solve

(a) $x^2 = 81$

$x = \pm\sqrt{81}$

$x = \boxed{\pm 9}$

(b) $3x^2 - 27 = 0$

$$\begin{array}{r} +27 \quad +27 \\ \hline 3x^2 = 27 \end{array}$$

$$\frac{3x^2}{3} = \frac{27}{3}$$

$x^2 = 9; x = \pm\sqrt{9}$

$x = \boxed{\pm 3}$

(c) $5x^2 = 45$

$$\frac{5x^2}{5} = \frac{45}{5}$$

$x^2 = 9$

$x = \pm\sqrt{9} = \boxed{\pm 3}$

[2] Solve

(a) $x^2 - 6x = 0$

GCF = X

$$x(x^2 - 6x) = 0$$

$$x(x-6) = 0$$

$$x=0 \quad | \quad x-6=0$$

$$x=0 \quad | \quad +6 \quad +6$$

$$x = \boxed{6}$$

(b) $2x^2 = 6x$

$$\begin{array}{r} 2x^2 = 6x \\ -6x \quad -6x \\ \hline 2x^2 - 6x = 0 \end{array}$$

GCF = 2x

$$2x(x^2 - 3x) = 0$$

$$2x(x-3) = 0$$

$$2x=0 \quad | \quad x-3=0$$

$$x=0 \quad | \quad +3 \quad +3$$

$$x = \boxed{3}$$

(c) $3x^2 - 21x = 0$

GCF = 3x

$$3x(x^2 - 7x) = 0$$

$$3x(x-7) = 0$$

$$3x=0 \quad | \quad x-7=0$$

$$x=0 \quad | \quad +7 \quad +7$$

$$x = \boxed{7}$$

[3] Solve

(a) $x^2 = 5$

$x = \boxed{\pm\sqrt{5}}$

(b) $x^2 - 7 = 3$

$$\begin{array}{r} +7 \quad +7 \\ \hline x^2 = 10 \end{array}$$

$x = \boxed{\pm\sqrt{10}}$

(c) $4x^2 - 32 = 0$

$$\begin{array}{r} +32 \quad +32 \\ \hline 4x^2 = 32 \end{array}$$

$$\frac{4x^2}{4} = \frac{32}{4}$$

$x^2 = 8$

$x = \pm\sqrt{8}$

$x = \pm\sqrt{4 \cdot 2}$

$x = \boxed{\pm 2\sqrt{2}}$

[4] Solve by quadratic formula

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

(a) $x^2 + 4x - 7 = 0$

$a=1, b=4, c=-7$

$$x = \frac{-4 \pm \sqrt{(4)^2 - 4(1)(-7)}}{2(1)}$$

$$= \frac{-4 \pm \sqrt{16 - (-28)}}{2}$$

$$= \frac{-4 \pm \sqrt{44}}{2}$$

$$= \frac{-4 \pm \sqrt{4 \cdot 11}}{2} = \frac{-4 \pm 2\sqrt{11}}{2}$$

$$= \frac{-4 \pm 2\sqrt{11}}{2} = 2(-2 \pm \sqrt{11}) = \boxed{-2 \pm \sqrt{11}}$$

(b) $3x^2 - 2x + 4 = 0$

$a=3, b=-2, c=4$

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(3)(4)}}{2(3)}$$

$$= \frac{2 \pm \sqrt{4 - 48}}{6}$$

$$= \frac{2 \pm \sqrt{-44}}{6} = \frac{2 \pm \sqrt{-4 \cdot 11}}{6}$$

$$= \frac{2 \pm i 2\sqrt{11}}{6} = \frac{2(1 \pm i\sqrt{11})}{6}$$

$$= \frac{1 \pm i\sqrt{11}}{3}$$

(c) $2x^2 = 8x - 5$

$2x^2 - 8x + 5 = 0$

$a=2, b=-8, c=5$

$$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(2)(5)}}{2(2)}$$

$$= \frac{8 \pm \sqrt{64 - 40}}{4}$$

$$= \frac{8 \pm \sqrt{24}}{4}$$

$$= \frac{8 \pm \sqrt{4 \cdot 6}}{4}$$

$$= \frac{8 \pm 2\sqrt{6}}{4}$$

$$= \frac{2(4 \pm \sqrt{6})}{4}$$

$$= \frac{4 \pm \sqrt{6}}{2}$$

[5] Solve

(a) $x^2 - 2x - 8 = 0$

$$\begin{array}{r} x \quad +2 \\ x \quad -4 \\ \hline -4x + 2x = (-2x) \checkmark \end{array}$$

$(x+2)(x-4) = 0$

$$\begin{array}{r} x+2=0 \\ -2 \quad -2 \\ \hline x = -2 \end{array} \quad \begin{array}{r} x-4=0 \\ +4 \quad +4 \\ \hline x = 4 \end{array}$$

(b) $x^2 - x - 6 = 0$

$$\begin{array}{r} x \quad -3 \\ x \quad +2 \\ \hline 2x + -3x = (-x) \checkmark \end{array}$$

$(x-3)(x+2) = 0$

$$\begin{array}{r} x-3=0 \\ +3 \quad +3 \\ \hline x = 3 \end{array} \quad \begin{array}{r} x+2=0 \\ -2 \quad -2 \\ \hline x = -2 \end{array}$$

(c) $3x^2 + 3x - 18 = 0$

GCF = 3

$$3\left(\frac{3x^2}{3} + \frac{3x}{3} - \frac{18}{3}\right) = 0$$

$3(x^2 + x - 6) = 0$

$$\begin{array}{r} x \quad +3 \\ x \quad -2 \\ \hline -2x + 3x = (+x) \checkmark \end{array}$$

$$\begin{array}{r} 3(x+3)(x-2) = 0 \\ \begin{array}{r} x+3=0 \\ -3 \quad -3 \\ \hline x = -3 \end{array} \quad \begin{array}{r} x-2=0 \\ +2 \quad +2 \\ \hline x = 2 \end{array} \end{array}$$

MISC. Review-A

CH 9 - Ratio and proportion ; CH 10 - Functions

[1] Find x

(a) $\frac{10}{x} = \frac{30}{27}$
 $30x = (27)(10)$
 $x = \frac{27 \cdot 10}{30}$
 $x = 9$

(b) $\frac{x}{25} = \frac{7}{5}$
 $5x = 25 \cdot 7$
 $x = \frac{25 \cdot 7}{5}$
 $x = 5 \cdot 7 = 35$

(c) $\frac{10}{2x} = \frac{15}{12}$
 $2x \cdot 15 = 10 \cdot 12$
 $30x = 10 \cdot 12$
 $x = \frac{10 \cdot 12}{30} = 4$

[2] (a) If a 6 feet object casts a 4 feet shadow at a certain time of the day, how tall is the tree that casts a 30 feet shadow that that time?

$\frac{6}{4} = \frac{x}{30} \Rightarrow 4x = 6 \cdot 30$
 $x = \frac{6 \cdot 30}{4}$
 $x = 3 \cdot 15 = 45$ feet

(b) A painter can paint 2 rooms with 5 gallons of paint. How many gallons would he need to paint 30 rooms?

$\frac{2R}{5} = \frac{30R}{X} \Rightarrow 2X = 5 \cdot 30$
 $x = \frac{5 \cdot 30}{2}$
 $x = 5 \cdot 15 = 75$ gal

(c) A man can drive 800 miles in 2 days. How long would it take him to drive 3,200 miles?

$\frac{800 \text{ mi}}{2 \text{ d}} = \frac{3200 \text{ mi}}{X \text{ d}} \Rightarrow 800x = (2)(3200)$
 $x = \frac{2 \cdot 3200}{800}$
 $x = 2 \cdot 4 = 8$ days

[3] (a) A store is selling 5 jars of jelly beans for \$8. How many jars can one buy with \$40?

$\frac{5 \text{ jars}}{8} = \frac{x}{40} \Rightarrow 8x = 5 \cdot 40$
 $x = \frac{5 \cdot 40}{8} = 5 \cdot 5$
 $x = 25$ jars

(b) A car can go 60 miles on 5 gallons of gas. How many gallons of gas is needed to travel 480 miles?

$\frac{60 \text{ mi}}{5 \text{ gal}} = \frac{480 \text{ mi}}{x \text{ gal}} \Rightarrow 60x = (5)(480)$
 $x = \frac{5 \cdot 480}{60}$
 $x = 5 \cdot 8 = 40$ gal

(c) On a map, $\frac{1}{2}$ inch represents 15 miles. How many miles would $4\frac{1}{2}$ inches represent?

$\frac{\frac{1}{2} \text{ inch}}{15 \text{ mi}} = \frac{4\frac{1}{2} \text{ inch}}{x \text{ mi}} \Rightarrow \frac{1}{2}x = 4\frac{1}{2} \cdot 15$
 $\frac{1}{2}x = \frac{9}{2} \cdot 15$
 $x = \frac{9}{2} \cdot 15 = 9 \cdot 15$
 $x = 135$ mi

[4] (a) Find $f(3)$ if $f(x) = 3x^2 - 2x - 4$

$f(3) = 3(3)^2 - 2(3) - 4$
 $= 3 \cdot 9 - 6 - 4$
 $= 27 - 6 - 4$
 $= 21 - 4 = 17$

(b) Find $5f(3)$ if $f(x) = -3x + 2x + 4$

$5(f(3)) = 5(-3(3) + 2(3) + 4)$
 $= 5(-9 + 6 + 4)$
 $= 5(-3 + 4)$
 $= 5(1) = 5$

(c) Find $-3f(-2)$ if $f(x) = 3x^2 - 2x - 4$

$-3(f(-2)) = -3(3(-2)^2 - 2(-2) - 4)$
 $= -3(3(4) - (-4) - 4)$
 $= -3(12 + 4 - 4)$
 $= -3(12) = -36$

CH 1 - Review-B

[1] Write the equation of

(a) P is twice the Q less than 5 times R

$$P = 5R - 2Q$$

(b) 3 times of A less than four times of P is Q

$$4P - 3A = Q$$

[2] Solve for x

(a) $4x - 10 = 2(25 - x)$

$$\begin{array}{r} 4x - 10 = 50 - 2x \\ +2x \quad +2x \\ \hline 6x - 10 = 50 \end{array}$$

$$\begin{array}{r} 6x - 10 = 50 \\ +10 \quad +10 \\ \hline 6x = 60 \end{array}$$

$$\frac{6x}{6} = \frac{60}{6}$$

$$x = 10$$

(b) $6x - 12 = -2(5x - 10)$

$$\begin{array}{r} 6x - 12 = -10x + 20 \\ +10x \quad +10x \\ \hline 16x - 12 = 20 \end{array}$$

$$\begin{array}{r} 16x - 12 = 20 \\ +12 \quad +12 \\ \hline 16x = 32 \\ x = \frac{32}{16} = 2 \end{array}$$

[3] Solve for x

(a) $b = c - 2x$

$$\begin{array}{r} b - 2x = c \\ -2x = c - b \\ \hline -2x = \frac{c-b}{-2} \\ \hline 2x = \frac{b-c}{-2} \end{array}$$

$$x = \frac{bc}{-2}$$

$$x = \frac{cb}{2}$$

(b) $\frac{q+x}{r} = \frac{p}{c}$

$$c(q+x) = rp$$

$$cq + cx = rp$$

$$-cq \quad -cq$$

$$cx = rp - cq$$

$$x = \frac{rp - cq}{c}$$

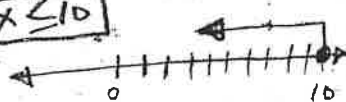
[4] Solve and graph

(a) $6x - 12 \leq 4x + 8$

$$\begin{array}{r} 6x - 12 \leq 4x + 8 \\ -4x \quad -4x \\ \hline 2x - 12 \leq 8 \\ +12 \quad +12 \\ \hline 2x \leq 20 \end{array}$$

$$\frac{2x}{2} \leq \frac{20}{2}$$

$$x \leq 10$$



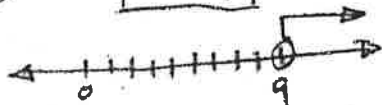
(b) $5 - 4x < -13 - 2x$

$$\begin{array}{r} 5 - 4x < -13 - 2x \\ +4x \quad +4x \\ \hline 5 < -13 + 2x \\ +13 \quad +13 \\ \hline 18 < 2x \end{array}$$

$$2x > 18$$

$$\frac{2x}{2} > \frac{18}{2}$$

$$x > 9$$



[5] Evaluate

[6] Evaluate

(a) $F(x) = 4x^2 - 3x + 6$. Find $F(3)$

$$\begin{aligned} F(3) &= 4(3)^2 - 3(3) + 6 \\ &= 4(9) - 9 + 6 \\ &= 36 - 9 + 6 \\ &= 47 + 6 \\ &= 53 \end{aligned}$$

(b) $G(x) = -4x^2 - 7x + 12$. Find $G(-5)$

$$\begin{aligned} G(-5) &= -4(-5)^2 - 7(-5) + 12 \\ &= -4(25) - (-35) + 12 \\ &= -100 + 35 + 12 \\ &= -65 + 12 \\ &= -53 \end{aligned}$$

[6] (a) Audrey would receive (10%) raise in her salary. If her present salary is \$50,000 annually, how much would be her new salary?

Raise $\frac{10}{100} = \frac{x}{50000}$; $100x = (10)(50,000)$

$$x = \frac{(10)(50,000)}{100} = 5000$$

$$\text{NEW Salary} = 50,000 + 5,000 = 55,000$$

(b) Bryan's weekly allowance is to decrease by (5%). If his current allowance is \$50 a week, how much will be his new weekly allowance?

decrease Amount $\Rightarrow \frac{5}{100} = \frac{x}{50}$; $100x = (5)(50)$

$$x = \frac{5 \cdot 50}{100} = \frac{25}{10} = 2.5$$

$$\text{NEW allowance} \Rightarrow \$50 - \$2.50 = \$47.50$$

[7] (a) What number is (40%) of 300?

$$\frac{40}{100} = \frac{x}{300} \Rightarrow 100x = (40)(300)$$

$$x = \frac{(40)(300)}{100} = (40)(3) = 120$$

(b) 50 is what percent of 200?

$$\frac{x}{100} = \frac{50}{200}$$

$$200x = (100)(50)$$

$$x = \frac{(100)(50)}{200} = \frac{50}{2} = 25\%$$

[8] (a) What is the percent increase from 400 to 500?

1st # 2nd #

$$\text{percent change} = \frac{500 - 400}{400} \times 100$$

$$= \frac{100}{400} \times 100 = \frac{100}{4} = 25\%$$

(b) What is the percent decrease from 500 to 400?

1st # 2nd #

$$\frac{400 - 500}{500} \times 100 = \frac{-100}{500} \times 100 = -\frac{100}{5} = -20\%$$

CH 2 & CH 3 - Review - B

[1] Find the slope and the y-intercept and graph the equation

(a) $3x + 2y = 8$
 $\frac{-3x}{-3x} \quad \frac{-2y}{-3x} \quad \frac{8}{-3x}$
 $2y = -3x + 8$

$\frac{2y}{2} = \frac{-3x}{2} + \frac{8}{2}$
 $y = -\frac{3}{2}x + 4$
 Slope \uparrow y-intercept

(b) $4x - 8y = 24$
 $\frac{-4x}{-4x} \quad \frac{-8y}{-4x} \quad \frac{24}{-4x}$
 $-8y = -4x + 24$
 $\frac{-8y}{-8} = \frac{-4x}{-8} + \frac{24}{-8}$
 $y = \frac{1}{2}x - 3$
 Slope \uparrow y-intercept

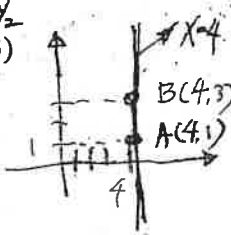
(c) $12x = 8 - 4y$

$8 - 4y = 12x$
 $-4y = 12x - 8$
 $\frac{-4y}{-4} = \frac{12x}{-4} + \frac{-8}{-4}$
 $y = -3x + 2$
 Slope \uparrow y-intercept

[2] Find the equation and graph with the following information

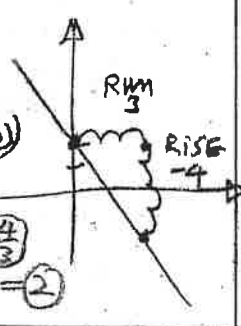
(a) the line passes A (4, 1) and B (4, 3)

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 1}{4 - 4} = \frac{2}{0}$
 undefined **NO SLOPE**
 $X = 4$



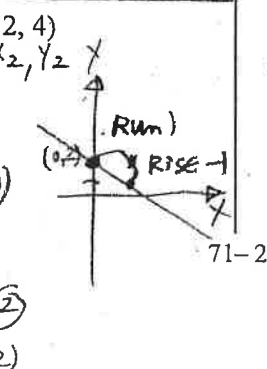
(b) the line passes A (0, 2) and B (3, -2)

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2 - 2}{3 - 0} = -\frac{4}{3}$
 $y - y_1 = m(x - x_1)$
 $y - 2 = -\frac{4}{3}(x - 0)$
 $y - 2 = -\frac{4}{3}x$
 $+2 \quad +2$
 $y = -\frac{4}{3}x + 2$
 Slope $= -\frac{4}{3}$
 y-intercept $= 2$
 (0, 2)



(c) the line passes A (4, -2) and B (-2, 4)

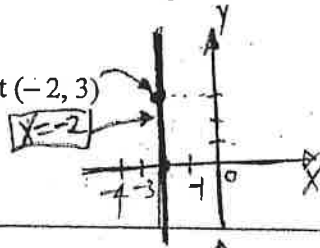
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - (-2)}{-2 - 4} = \frac{6}{-6} = -1$
 $y - y_1 = m(x - x_1)$
 $y - (-2) = -1(x - 4)$
 $y + 2 = -1(x - 4)$
 $y + 2 = -x + 4$
 $-2 \quad -2$
 $y = -x + 2$
 Slope $= -1$
 y-intercept $= 2$
 (0, 2)



[3] Find the equation and graph with the following information

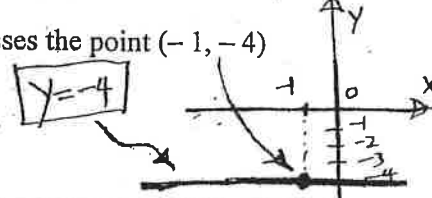
(a) The vertical line passes the point (-2, 3)

$X = -2$



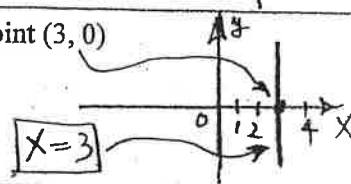
(b) The horizontal line passes the point (-1, -4)

$Y = -4$



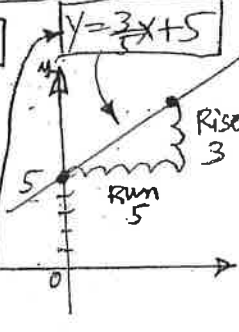
(c) The vertical line passes the point (3, 0)

$X = 3$



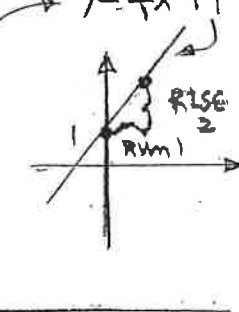
[4] (a) Find and Graph the equation of the line passing through (-5, 2) and parallel to the line $3x - 5y = 6$.

$3x - 5y = 6$
 $\frac{-5y}{-5} = \frac{-3x + 6}{-5}$
 $y = \frac{3}{5}x - \frac{6}{5}$
 $m_1 = m_2 = \frac{3}{5}$
 $y - y_1 = m_2(x - x_1)$
 $y - 2 = \frac{3}{5}(x - (-5))$
 $y - 2 = \frac{3}{5}(x + 5)$
 $y - 2 = \frac{3}{5}x + \frac{3(5)}{5}$
 $y - 2 = \frac{3}{5}x + 3$
 $+2 \quad +2$
 $y = \frac{3}{5}x + 5$



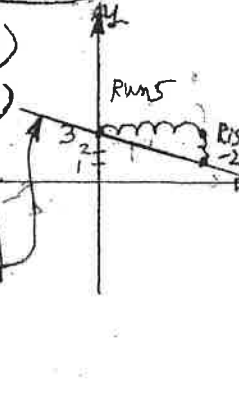
(b) Find and Graph the equation of the line passing through (2, 5) and parallel to the line $2x + 4y = -3$.

$2x + 4y = -3$
 $\frac{4y}{4} = \frac{-2x - 3}{4}$
 $y = -\frac{1}{2}x - \frac{3}{4}$
 $m_1 = -\frac{1}{2}$
 $m_2 = -\frac{1}{m_1} = -(-\frac{1}{2}) = \frac{1}{2}$
 $y - y_1 = m_2(x - x_1)$
 $y - 5 = \frac{1}{2}(x - 2)$
 $y - 5 = \frac{1}{2}x - 1$
 $+5 \quad +5$
 $y = \frac{1}{2}x + 4$



(c) Find and Graph the equation of the line passing through (0, 3) and perpendicular to the line $2y - 5x = 1$.

$2y - 5x = 1$
 $\frac{2y}{2} = \frac{1 + 5x}{2}$
 $y = \frac{1}{2}x + \frac{1}{2}$
 $m_1 = \frac{1}{2}$
 $m_2 = -\frac{2}{m_1} = -\frac{2}{1/2} = -4$
 $y - y_1 = m_2(x - x_1)$
 $y - 3 = -4(x - 0)$
 $y - 3 = -4x$
 $+3 \quad +3$
 $y = -4x + 3$



CH 4 & CH 5 - Review-B

[1] Solve the following systems

(a) $x - y = -3$ → Multiply ④
 $3x + 4y = -2$

$$\begin{array}{r} 4x - 4y = -12 \\ +) 3x + 4y = -2 \\ \hline 7x = -14 \\ x = \frac{-14}{7} = -2 \end{array}$$

plug into Eq ①
 $(-2) - y = -3 \Rightarrow -y = -1 \Rightarrow y = 1$

② Simplify

(b) $3y + 2x = 4$ → Multiply ②
 $5x + 6y = 11$

$$\begin{array}{r} -4x - 6y = -8 \\ +) 5x + 6y = 11 \\ \hline x = 3 \end{array}$$

plug into Eq ①
 $2(3) + 3y = 4 \Rightarrow 6 + 3y = 4 \Rightarrow 3y = -2 \Rightarrow y = -\frac{2}{3}$

③ Simplify

[5] Simplify

(a) $(4x + 6) - (2x - 3)$
 $= 4x + 6 - 2x + 3$
 $= (4x - 2x) + (6 + 3)$
 $= 2x + 9$

(b) $(9x^2 - 3x - 6) - (7x^2 - 5x + 2)$
 $= 9x^2 - 3x - 6 - 7x^2 + 5x - 2$
 $= (9x^2 - 7x^2) + (-3x + 5x) + (-6 - 2)$
 $= 2x^2 + 2x - 8$

(a) $\frac{c^3 d^4}{c^2 d^6}$
 $= \frac{c^{3-2} d^{4-6}}{1} = \frac{c^1 d^{-2}}{1} = \frac{c}{d^2}$

(b) $\frac{c^5 d^{-2}}{c^{-3} d^3} = \frac{c^{5-(-3)} d^{-2-3}}{1} = \frac{c^8 d^{-5}}{1} = \frac{c^8}{d^5}$

[6] Simplify

(a) $(4x - 2)(4x - 7)$
 $= (4x)(4x) + (4x)(-7) + (-2)(4x) + (-2)(-7)$
 $= 16x^2 - 28x - 8x + 14$
 $= 16x^2 - 36x + 14$

[3] Simplify

(a) $(4 \times 10^5)(6 \times 10^{-2})$
 $= (4 \cdot 6)(10^5 \cdot 10^{-2})$
 $= 24 \times 10^{5+(-2)}$
 $= 24 \times 10^3$
 $= 2.4 \times 10^4$

(b) $\frac{4 \cdot 10^{-5}}{8 \cdot 10^{-3}}$
 $= \left(\frac{4}{8}\right)(10^{-5-(-3)})$
 $= (0.5) \times 10^{-5+3}$
 $= 0.5 \times 10^{-2}$
 $= 5 \times 10^{-3}$

[6] Simplify

(b) $(3x - 2)(2x^2 + 3x - 4)$
 $= (3x)(2x^2) + (3x)(3x) + (3x)(-4) + (-2)(2x^2) + (-2)(3x) + (-2)(-4)$
 $= 6x^3 + 9x^2 - 12x - 4x^2 - 6x + 8$
 $= 6x^3 + (9x^2 - 4x^2) + (-12x - 6x) + 8$
 $= 6x^3 + 5x^2 - 18x + 8$

[4] Simplify

(a) Subtract $6x - 2$ from $8x - 5$ (first term)
 $(8x - 5) - (6x - 2)$
 $= 8x - 5 - 6x + 2 = (8x - 6x) + (-5 + 2)$
 $= 2x - 3$

(b) Subtract $5x^2 - x + 2$ from $7x^2 - 4x - 8$
 $(7x^2 - 4x - 8) - (5x^2 - x + 2)$
 $= 7x^2 - 4x - 8 - 5x^2 + x - 2$
 $= (7x^2 - 5x^2) + (-4x + x) + (-8 - 2)$
 $= 2x^2 - 3x - 10$

[7] Simplify

(a) $\frac{12x^2 - 6x - 3}{3}$
 $= \frac{12x^2}{3} - \frac{6x}{3} - \frac{3}{3}$
 $= 4x^2 - 2x - 1$

(b) $\frac{16x^5 - 12x^4 + 8x^3}{-4x^2}$
 $= \frac{16x^5}{-4x^2} + \frac{-12x^4}{-4x^2} + \frac{8x^3}{-4x^2}$
 $= -4x^3 + 3x^2 - 2x$

CH 6 - Review-B

[1] Factor completely

(a) $7x^2 - 28y^2$ GCF = 7

$$7 \left(\frac{7x^2}{7} - \frac{28y^2}{7} \right)$$

$$= 7(x^2 - 4y^2)$$

$$= 7(x^2 - (2y)^2)$$

$$= 7(x+2y)(x-2y)$$

(b) $25x^3 - 49xy^2$ GCF = x

$$x \left(\frac{25x^3}{x} - \frac{49xy^2}{x} \right)$$

$$= x(25x^2 - 49y^2)$$

$$= x((5x)^2 - (7y)^2)$$

$$= x(5x+7y)(5x-7y)$$

(c) $5x^2 - 5x - 30$ GCF = 5

$$5(x^2 - x - 6)$$

$$5 \left(\begin{array}{r} x \quad +2 \\ x \quad -3 \end{array} \right)$$

$$-3x + 2x = -x$$

$$5(x+2)(x-3)$$

(c) $72ab^3 - 32a^3b$ GCF = 8ab

$$8ab \left(\frac{72ab^3}{8ab} - \frac{32a^3b}{8ab} \right)$$

$$= 8ab(9b^2 - 4a^2)$$

$$= 8ab(3b^2 - (2a)^2)$$

$$8ab(3b+2a)(3b-2a)$$

[4] Factor

(a) $x^3 - 5x^2 + 9x - 45$

GCF1 = x^2 GCF2 = 9

$$x^2 \left(\frac{x^3}{x^2} - \frac{5x^2}{x^2} \right) + 9 \left(\frac{9x}{9} - \frac{45}{9} \right)$$

$$= x^2(x-5) + 9(x-5)$$

$$= (x-5)(x^2+9)$$

(b) $ax - ay - bx + by$ GCF2 = -1

$$a \left(\frac{ax}{a} - \frac{ay}{a} \right) + b \left(\frac{-bx}{-b} + \frac{by}{-b} \right)$$

$$= a(x-y) + b(x-y)$$

$$= (x-y)(a+b)$$

[2] Factor

(a) $x^2 - 12x + 20$

$$\begin{array}{r} x \quad -2 \\ x \quad -10 \end{array}$$

$$-10x + 2x = -8x$$

$$(x-2)(x-10)$$

(b) $x^2 + 7x - 30$

$$\begin{array}{r} x \quad +10 \\ x \quad -3 \end{array}$$

$$-3x + 10x = 7x$$

$$(x+10)(x-3)$$

(c) $2x^3 - 2x^2 + 18x - 18$

GCF1 = 2x^2 GCF2 = 18

$$2x^2 \left(\frac{2x^3}{2x^2} - \frac{2x^2}{2x^2} \right) + 18 \left(\frac{18x}{18} - \frac{18}{18} \right)$$

$$= 2x^2(x-1) + 18(x-1)$$

$$= (x-1)(2x^2+18)$$

(c) $5x^2 - 8x - 4$

$$\begin{array}{r} 5x \quad +2 \\ 1x \quad -2 \end{array}$$

$$-10x + 2x = -8x$$

$$(5x+2)(x-2)$$

(d) $x^2 + 11x - 30$

Can not be factored

[5] Factor and Solve

(a) $3x^2 = 27$

GCF = 3

$$3x^2 - 27 = 0$$

$$3(x^2 - 9) = 0$$

$$3(x^2 - (3)^2) = 0$$

$$3(x+3)(x-3) = 0$$

$$x = -3, 3$$

(b) $x^2 + 5x = 0$ GCF = x

$$x \left(\frac{x^2}{x} + \frac{5x}{x} \right) = 0$$

$$x(x+5) = 0$$

$$x = \{0, -5\}$$

[3] Factor

(a) $3x^2 - 22x + 7$

$$\begin{array}{r} 3x \quad -1 \\ 1x \quad -7 \end{array}$$

$$-21x + 1x = -20x$$

$$(3x-1)(x-7)$$

(b) $3x^2 + 3x - 18$ GCF = 3

$$3(x^2 + x - 6)$$

$$\begin{array}{r} x \quad -2 \\ x \quad +3 \end{array}$$

$$3x + 2x = 5x$$

$$3(x-2)(x+3)$$

(c) $3x^2 - 3x - 60 = 0$

GCF = 3

$$3 \left(\frac{3x^2}{3} - \frac{3x}{3} - \frac{60}{3} \right) = 0$$

$$= 3(x^2 - x - 20) = 0$$

$$3 \begin{array}{r} x \quad +4 \\ x \quad +5 \end{array}$$

$$-5x + 4x = -x$$

$$3(x+4)(x-5) = 0$$

$$x = \{-4, 5\}$$

(d) $2x^2 - 10x + 12 = 0$

$$2 \left(\frac{2x^2}{2} - \frac{10x}{2} + \frac{12}{2} \right) = 0$$

$$2(x^2 - 5x + 6) = 0$$

$$\begin{array}{r} x \quad -2 \\ x \quad -3 \end{array}$$

$$-3x + 2x = -x$$

$$2(x-2)(x-3) = 0$$

$$x = \{2, 3\}$$

[1] Simplify

$$\begin{aligned} \text{(a)} \quad & \sqrt{18} + \sqrt{50} - \sqrt{8} \\ & \sqrt{9} \sqrt{2} + \sqrt{25} \sqrt{2} - \sqrt{4} \sqrt{2} \\ & = 3\sqrt{2} + 5\sqrt{2} - 2\sqrt{2} \\ & = (3+5-2)\sqrt{2} = \boxed{6\sqrt{2}} \end{aligned}$$

$$\begin{aligned} \text{(a)} \quad & 3\sqrt{50} + 2\sqrt{8} - 2\sqrt{18} \\ & = 3\sqrt{25}\sqrt{2} + 2\sqrt{4}\sqrt{2} - 2\sqrt{9}\sqrt{2} \\ & = 3 \cdot 5\sqrt{2} + 2 \cdot 2\sqrt{2} - 2 \cdot 3\sqrt{2} \\ & = 15\sqrt{2} + 4\sqrt{2} - 6\sqrt{2} \\ & = (15+4-6)\sqrt{2} = \boxed{13\sqrt{2}} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad & 2\sqrt{32} - 3\sqrt{18} + 2\sqrt{27} \\ & = \sqrt{16}\sqrt{2} - 3\sqrt{9}\sqrt{2} + 2\sqrt{9}\sqrt{3} \\ & = 2 \cdot 4\sqrt{2} - 3 \cdot 3\sqrt{2} + 2 \cdot 3\sqrt{3} \\ & = 8\sqrt{2} - 9\sqrt{2} + 6\sqrt{3} \\ & = (8-9)\sqrt{2} + 6\sqrt{3} = \boxed{-\sqrt{2} + 6\sqrt{3}} \end{aligned}$$

[2] Simplify

$$\begin{aligned} \text{(1)} \quad & \sqrt{3}(\sqrt{2} + \sqrt{5}) \\ & (\sqrt{3})(\sqrt{2}) + (\sqrt{3})(\sqrt{5}) \\ & = \boxed{\sqrt{6} + \sqrt{15}} \end{aligned}$$

$$\begin{aligned} \text{(2)} \quad & 3\sqrt{2}(5\sqrt{3} - 4\sqrt{2}) \\ & 3\sqrt{2}(5\sqrt{3}) + 3\sqrt{2}(-4\sqrt{2}) \\ & 3 \cdot 5\sqrt{6} + 3(-4)\sqrt{4} \\ & = 15\sqrt{6} + -12(2) \\ & = 15\sqrt{6} + -24 \\ & = \boxed{15\sqrt{6} - 24} \end{aligned}$$

$$\begin{aligned} \text{(3)} \quad & -3\sqrt{3}(2\sqrt{3} + 4\sqrt{6}) \\ & (-3\sqrt{3})(2\sqrt{3}) + (-3\sqrt{3})(4\sqrt{6}) \\ & (-3)(2)\sqrt{9} + (-3)(4)\sqrt{18} \\ & -6(3) + 12\sqrt{9}\sqrt{2} \\ & -18 + 12(3)\sqrt{2} = \boxed{-18 + 36\sqrt{2}} \end{aligned}$$

[3] Simplify

$$\begin{aligned} \text{(1)} \quad & (\sqrt{3} - 2)(\sqrt{2} - 3) \\ & (\sqrt{3})(\sqrt{2}) + (\sqrt{3})(-3) + (-2)(\sqrt{2}) + (-2)(-3) \\ & = \sqrt{6} + -3\sqrt{3} + -2\sqrt{2} + 6 \\ & = \boxed{\sqrt{6} - 3\sqrt{3} - 2\sqrt{2} + 6} \end{aligned}$$

$$\begin{aligned} \text{(2)} \quad & (\sqrt{5} + \sqrt{3})(\sqrt{5} - \sqrt{3}) \\ & (\sqrt{5})(\sqrt{5}) + \sqrt{5}(-\sqrt{3}) + (\sqrt{3})(\sqrt{5}) + (\sqrt{3})(-\sqrt{3}) \\ & = 5 + -\sqrt{15} + \sqrt{15} + -3 \\ & = 5 - 3 = \boxed{2} \end{aligned}$$

$$\begin{aligned} \text{(3)} \quad & (2\sqrt{3} + 3\sqrt{2})(2\sqrt{3} - 3\sqrt{2}) \\ & (2\sqrt{3})(2\sqrt{3}) + (2\sqrt{3})(-3\sqrt{2}) + (3\sqrt{2})(2\sqrt{3}) + (3\sqrt{2})(-3) \\ & = (4 \cdot 3) + -6\sqrt{6} + 6\sqrt{6} + (-9 \cdot 2) \\ & = 12 + -18 = \boxed{-6} \end{aligned}$$

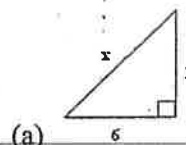
[4] Simplify

$$\begin{aligned} \text{(1)} \quad & \frac{\sqrt{32}}{\sqrt{3}\sqrt{6}} = \frac{\sqrt{16}\sqrt{2}}{\sqrt{18}} \\ & = \frac{4\sqrt{2}}{\sqrt{9}\sqrt{2}} = \frac{4\sqrt{2}}{3\sqrt{2}} \\ & = \boxed{\frac{4}{3}} \text{ or } \boxed{1\frac{1}{3}} \end{aligned}$$

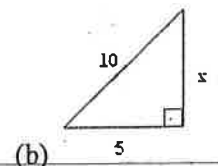
$$\begin{aligned} \text{(2)} \quad & \frac{\sqrt{150}}{\sqrt{15}\sqrt{5}} = \frac{\sqrt{25}\sqrt{6}}{\sqrt{75}} \\ & = \boxed{\sqrt{2}} \end{aligned}$$

$$\begin{aligned} \text{(3)} \quad & \frac{\sqrt{5}\sqrt{4}}{\sqrt{6}\sqrt{5}} = \frac{\sqrt{5}\sqrt{4}}{\sqrt{6}\sqrt{5}} = \frac{\sqrt{4}}{\sqrt{6}} = \sqrt{\frac{4}{6}} = \sqrt{\frac{2}{3}} \\ & = \boxed{\sqrt{\frac{2}{3}}} = \frac{\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{\frac{\sqrt{6}}{3}} \end{aligned}$$

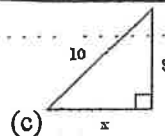
[5] Find the missing value



$$\begin{aligned} \text{(a)} \quad & x^2 = 6^2 + 3^2 \\ & x^2 = 36 + 9 = 45 \\ & x = \pm\sqrt{45} = \pm\sqrt{9 \cdot 5} \\ & = \boxed{3\sqrt{5}} \end{aligned}$$



$$\begin{aligned} \text{(b)} \quad & 10^2 = 5^2 + x^2 \\ & 100 = 25 + x^2 \\ & 75 = x^2; x = \pm\sqrt{75} \\ & x = \sqrt{25 \cdot 3} = \boxed{5\sqrt{3}} \end{aligned}$$



$$\begin{aligned} \text{(c)} \quad & 10^2 = x^2 + 8^2 \\ & 100 = x^2 + 64 \\ & x^2 = 36 \\ & x = \pm\sqrt{36} = \boxed{\pm 6} \end{aligned}$$

[1] Solve

(a) $x^2 = 49$

$$x^2 = 49$$

$$x = \pm\sqrt{49}$$

$$= \boxed{\pm 7}$$

(b) $6x^2 - 54 = 0$

$$\frac{6x^2}{6} = \frac{54}{6}$$

$$x^2 = \frac{54}{6} = 9$$

$$x = \pm\sqrt{9} = \boxed{\pm 3}$$

(c) $4x^2 - 48 = 0$

$$4x^2 = 48$$

$$\frac{4x^2}{4} = \frac{48}{4}$$

$$x^2 = 12$$

$$x = \pm\sqrt{12}$$

$$= \pm\sqrt{4 \cdot 3}$$

$$= \boxed{\pm 2\sqrt{3}}$$

(c) $3x^2 = 75$

$$\frac{3x^2}{3} = \frac{75}{3}$$

$$x^2 = 25$$

$$x = \pm\sqrt{25} = \boxed{\pm 5}$$

[2] Solve

(a) $x^2 - 8x = 0$ GCF = x

$$x \left(\frac{x^2}{x} - \frac{8x}{x} \right) = 0$$

$$x(x-8) = 0$$

$x = 0$	$x - 8 = 0$
$x = 0$	$x = 8$

(c) $8x^2 - 24x = 0$ GCF = 8x

$$8x \left(\frac{8x^2}{8x} - \frac{24x}{8x} \right) = 0$$

$$8x(x-3) = 0$$

$x = 0$	$x - 3 = 0$
$x = 0$	$x = 3$

(b) $4x^2 = 16x$

$$\frac{4x^2}{4} = \frac{16x}{4}$$

$$x^2 = 4x$$

$$x^2 - 4x = 0$$

$$x(x-4) = 0$$

$x = 0$	$x = 4$
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[5] Solve by quadratic formula

(a) $x^2 - 2x = 3$

$$x^2 - 2x - 3 = 0$$

$a=1, b=-2, c=-3$

$$\frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-3)}}{2(1)}$$

$$= \frac{2 \pm \sqrt{4 - (-12)}}{2}$$

$$= \frac{2 \pm \sqrt{16}}{2}$$

$$= \frac{2 \pm 4}{2}$$

$$\rightarrow \frac{2+4}{2} = \frac{6}{2} = 3$$

$$\rightarrow \frac{2-4}{2} = \frac{-2}{2} = -1$$

(b) $2x^2 - 8x + 5 = 0$

$a=2, b=-8, c=5$

$$\frac{-(-8) \pm \sqrt{(-8)^2 - 4(2)(5)}}{2(2)}$$

$$= \frac{8 \pm \sqrt{64 - 40}}{4}$$

$$= \frac{8 \pm \sqrt{24}}{4} = \frac{8 \pm \sqrt{4 \cdot 6}}{4}$$

$$= \frac{8 \pm 2\sqrt{6}}{4} = \frac{8}{4} \pm \frac{2\sqrt{6}}{4}$$

$$= \boxed{2 \pm \frac{\sqrt{6}}{2}}$$

(c) $3x^2 = 6x - 2$

$$3x^2 - 6x + 2 = 0$$

$a=3, b=-6, c=2$

$$\frac{-(-6) \pm \sqrt{(-6)^2 - 4(3)(2)}}{2(3)}$$

$$= \frac{6 \pm \sqrt{36 - 24}}{6} = \frac{6 \pm \sqrt{12}}{6}$$

$$= \frac{6 \pm \sqrt{4 \cdot 3}}{6} = \frac{6 \pm 2\sqrt{3}}{6} = \frac{6}{6} \pm \frac{2\sqrt{3}}{6}$$

[4] Solve

(a) $x^2 - 10x + 24 = 0$

x	x	-4
x	x	-6

$$-6x + -4x = -10x$$

$$(x-4)(x-6) = 0$$

$x-4=0$	$x-6=0$
$x=4$	$x=6$

(b) $x^2 - x - 20 = 0$ $\pm \sqrt{41}$

x	x	-5
x	x	$+4$

$$-5x + 4x = -x$$

$$(x-5)(x+4) = 0$$

$x-5=0$	$x+4=0$
$x=5$	$x=-4$

[3] Solve

(a) $x^2 = 14$

$$x = \boxed{\pm\sqrt{14}}$$

(b) $x^2 - 11 = 9$

$$+11 +11$$

$$x^2 = 20$$

$$x = \pm\sqrt{20}$$

$$x = \pm\sqrt{4 \cdot 5}$$

$$= \boxed{\pm 2\sqrt{5}}$$

(c) $6x^2 - 14x + 4 = 0$ GCF = 2

$$2(3x^2 - 7x + 2) = 0$$

$3x$	x	-1
$1x$	x	-2

$$-6x + -1x = -7x$$

$$2(3x-1)(x-2) = 0$$

$3x-1=0$	$x-2=0$
$3x=1$	$+2 +2$
$x = \frac{1}{3}$	$x = 2$

MISC. Review-B

CH 9 - Ratio and proportion

CH 10 - Functions

[1] Find x

(a) $\frac{5}{x} = \frac{20}{32}$

$$20x = (32)(5)$$

$$x = \frac{32 \cdot 5}{20} = \frac{160}{20}$$

$$= \boxed{8}$$

(b) $\frac{x}{24} = \frac{6}{8}$

$$8x = (24)(6)$$

$$x = \frac{24 \cdot 6}{8}$$

$$= \frac{3 \cdot 6}{1} = \frac{18}{1} = \boxed{18}$$

(c) $\frac{40}{6x} = \frac{20}{24}$

$$6x \cdot 20 = 24 \cdot 40$$

$$6x = \frac{24 \cdot 40}{20}$$

$$6x = 24 \cdot 2$$

$$x = \frac{24 \cdot 2}{6} = \frac{48}{6} = \boxed{8}$$

[2] (a) If an 8 feet object casts a 12 feet shadow at a certain time of the day, how tall is the lamp post that casts a 60 feet shadow that that time?

$$\frac{8 \text{ object}}{12 \text{ shadow}} = \frac{x \text{ object}}{60 \text{ shadow}}$$

$$\frac{8}{12} = \frac{x}{60} \rightarrow 12x = 60 \cdot 8$$

$$x = \frac{60 \cdot 8}{12} = \boxed{40} \text{ ft}$$

(b) A car factory can produce 3 cars in 4 hours. How many hours will it take to produce 60 cars?

$$\frac{3 \text{ cars}}{4 \text{ hrs}} = \frac{60 \text{ cars}}{x \text{ hrs}}$$

$$3x = 4 \cdot 60 ; x = \frac{4 \cdot 60}{3} = \boxed{80} \text{ hrs.}$$

(c) A choo-choo train can travel 600 miles in 3 days. How long would it take to travel 4,800 miles?

$$\frac{600 \text{ mi}}{3 \text{ days}} = \frac{4800 \text{ mi}}{x \text{ days}}$$

$$600x = (3)(4800)$$

$$x = \frac{3 \cdot 4800}{600} = \boxed{24} \text{ days}$$

[3] (a) A store is selling 4 jars of mayonnaise for \$12. How many jars can one buy with \$72?

$$\frac{4 \text{ jars}}{\$12} = \frac{x \text{ jars}}{\$72}$$

$$12x = 4 \cdot 72 ; x = \frac{4 \cdot 72}{12} = 4 \cdot 6 = \boxed{24}$$

(b) A motorbike can go 140 miles on 5 gallons of gas. How many gallons of gas is needed to travel 196 miles?

$$\frac{140 \text{ mi}}{5 \text{ gal}} = \frac{196 \text{ mi}}{x \text{ gal}}$$

$$140x = 5 \cdot 196 ; x = \frac{5 \cdot 196}{140} = \frac{196}{28} = \boxed{7}$$

(c) On a map, $\frac{2}{5}$ inch represents 20 miles. How many miles would 5 inches represent?

$$\frac{\frac{2}{5} \text{ inch}}{20 \text{ mile}} = \frac{5 \text{ inch}}{x \text{ mile}}$$

$$\frac{2}{5}x = (20)(5) ; \frac{5}{2} \left(\frac{2}{5}x \right) = \frac{5}{2} (20 \cdot 5)$$

$$x = \boxed{250} \text{ miles}$$

[4]

(a) Find $f(4)$ if $f(x) = 2x^2 - 8x - 12$

$$f(4) = 2(4)^2 - 8(4) - 12$$

$$= 2 \cdot 16 - 32 - 12$$

$$= 32 - 32 - 12 = \boxed{-12}$$

(b) Find $2f(3)$ if $f(x) = -4x^2 + 3x + 6$

$$2 \cdot f(3) = 2[-4(3)^2 + 3(3) + 6]$$

$$= 2[-4 \cdot 9 + 9 + 6]$$

$$= 2[-36 + 9 + 6]$$

$$= 2[-21] = \boxed{-42}$$

(c) Find $-6f(-3)$ if $f(x) = 5x^2 - x - 3$

$$-6f(-3) = -6[5(-3)^2 - (-3) - 3]$$

$$= -6[5 \cdot 9 + 3 - 3] = -6[45]$$

$$= \boxed{-270}$$

CUNY Final Test Sample- **A2**

1. Which of the following is a factor of the polynomial? $2x^2 + 9x - 56$

C

$$\begin{array}{r} 2x \cancel{-7} - 8 \\ x \cancel{+8} \end{array}$$

(2x-7)(x+8)

$16x - 7x = 9x$

2. Simplify. $7\sqrt{50} - 5\sqrt{18}$

C

$7\sqrt{25 \cdot 2} - 5\sqrt{9 \cdot 2}$

$7 \cdot 5\sqrt{2} - 5 \cdot 3\sqrt{2}$

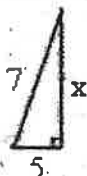
$35\sqrt{2} - 15\sqrt{2}$

$(35 - 15)\sqrt{2} = \boxed{20\sqrt{2}}$

3. What is the value of x in the right triangle?

A

$$\begin{array}{r} x^2 + 5^2 = 7^2 \\ x^2 + 25 = 49 \\ -25 \quad -25 \\ \hline x^2 = 24 \end{array}$$



$x = \pm\sqrt{24}$

$x = +\sqrt{24} = \sqrt{4 \cdot 6} = \boxed{2\sqrt{6}}$

4. Find all solutions to the equation. $4b^2 + 12b = 0$

B

$4b(\frac{4b}{4b} + \frac{12b}{4b}) = 0$

-3, 0

$4b(b+3) = 0$

$b=0$ or $b+3=0 \Rightarrow b = \boxed{-3}$

5. Solve for a.

A

$x = 3a + 2b$

$3a + 2b = x$

$3a = x - 2b$

$a = \frac{x - 2b}{3}$

6. Factor completely. $8x^2y - 18y^3$

C

$2y(\frac{8x^2y}{2y} - \frac{18y^3}{2y})$

GCF = 2y

$= 2y(4x^2 - 9y^2)$

$= 2y((2x)^2 - (3y)^2) = \boxed{2y(2x+3y)(2x-3y)}$

7. Multiply. Give the answer in scientific notation.

B

$(8 \times 10^5)(3 \times 10^{-2})$

$= (8 \cdot 3) \times (10^{5+(-2)})$

$= 24 \times 10^3$

$= \boxed{2.4 \times 10^4}$

8. Simplify.

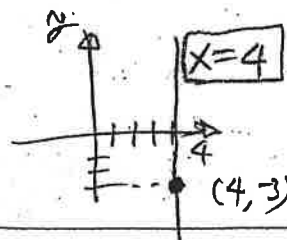
B

$\frac{x^7 x^9}{(x^2)^2} = \frac{x^{7+9}}{x^{2 \cdot 2}} = \frac{x^{16}}{x^4}$

$= x^{16-4} = \boxed{x^{12}}$

9. Find the equation of the vertical line passing through the point (4, -3).

C



10. Find all solutions to the equation. $7x^2 = 112$

C

$\frac{7x^2}{7} = \frac{112}{7}$

$x^2 = 16$

$x = \pm\sqrt{16} \Rightarrow x = \boxed{\pm 4} = \boxed{+4 \text{ or } -4}$

11. What is the value of the y-coordinate of the solution to the system of equations?

D

$3x + 2y = 24$

$6x + 4y = 48$

$-2x + 4y = 16$

$8x = 32$

$\frac{8x}{8} = \frac{32}{8}$

$x = \boxed{4}$

$3(4) + 2y = 24$

$12 + 2y = 24$

$-12 \quad -12$

$2y = 12$

$\frac{2y}{2} = \frac{12}{2}; \boxed{y = 6}$

12. Simplify completely. $(6x^2 - 2x + 3) - (-4x^2 - 5x + 3)$

D

$6x^2 - 2x + 3 + 4x^2 + 5x - 3$

$(6x^2 + 4x^2) + (-2x + 5x) + (3 - 3)$

$10x^2 + 3x + 0$

$\boxed{10x^2 + 3x}$

13. Find the slope and y-intercept for the graph of the equation. $5x + 2y = 4$

A

$$5x + 2y = 4$$

$$\begin{array}{r} -5x \quad -5x \\ \hline 2y = -5x + 4 \\ \hline \end{array}$$

$$y = -\frac{5}{2}x + \frac{4}{2}$$

$$y = -\frac{5}{2}x + 2$$

Slope = $-\frac{5}{2}$
y-intercept = $(0, 2)$

14. Find the equation of the line passing through the points $(2, 6)$ and $(4, 10)$. Write the equation in slope-intercept form.

B

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{10 - 6}{4 - 2} = \frac{4}{2} = 2$$

$$y - y_1 = m(x - x_1); \quad y - 6 = 2(x - 2)$$

$$y - 6 = 2x - 4$$

$$y = 2x + 2$$

15. Find the graph of the solution to the inequality.

A

$$6x + 2 > 7x - 5$$

$$\begin{array}{r} -6x \quad -6x \\ \hline 2 > x - 5 \\ +5 \quad +5 \\ \hline 7 > x \end{array}$$

$$x < 7$$

16. If 8 gallons of gas cost \$32, how much does 12 gallons of gas cost?

B

$$\frac{8 \text{ gal}}{\$32} = \frac{12 \text{ gal}}{\$x}$$

$$8x = (32)(12)$$

$$x = \frac{(32)(12)}{8}$$

$$x = 4 \cdot 12 = 48$$

17. Which of the following is a factor of the polynomial? $12ab - 12ay + 3xb - 3xy$

C

$$3 \left[\frac{12ab}{3} - \frac{12ay}{3} + \frac{3xb}{3} - \frac{3xy}{3} \right]$$

$$3 [4ab - 4ay + xb - xy]$$

$$3 [4a(\frac{4ab}{4a} - \frac{4ay}{4a}) + x(\frac{xb}{x} - \frac{xy}{x})]$$

$$3 [4a(b-y) + x(b-y)] = 3 [(b-y)(4a+x)]$$

GCF = 3

18. During the course of a year, the price of a house increased from \$250,000 to \$350,000. What was the percent increase in price?

B

$$\text{Percent Increase} = \frac{\text{2nd Number} - \text{1st Number}}{\text{1st Number}} \times 100$$

$$= \frac{350,000 - 250,000}{250,000} \times 100 = \frac{100,000}{250,000} \times 100 = 40\%$$

19. If n represents a number, which equation is a correct translation of the sentence?

A

14 is 13 less than 3 times a number.

$$14 = 3n - 13$$

20. Solve for n .

C

$$2(n+6) = 5n - 9$$

$$\begin{array}{r} 2n + 12 = 5n - 9 \\ -2n \quad -2n \\ \hline 12 = 3n - 9 \\ +9 \quad +9 \\ \hline 21 = 3n \\ \div 3 \quad \div 3 \\ 7 = n \end{array}$$

21. Which of the following is the graph of the equation?

D

$$-2x + 6y = 12$$

$$\begin{array}{r} -2x + 6y = 12 \\ +2x \quad +2x \\ \hline 6y = 2x + 12 \\ \div 6 \quad \div 6 \quad \div 6 \\ y = \frac{1}{3}x + 2 \end{array}$$

slope = $\frac{1}{3}$, y-intercept = 2

22. Evaluate $g(5)$ for the function $g(x)$.

C

$$g(x) = 3x^2 - 3x + 9$$

$$g(5) = 3(5)^2 - 3(5) + 9$$

$$= 3(25) - 15 + 9$$

$$= 75 - 15 + 9 = 69$$

23. Simplify completely. $\frac{49x^3 - 28x^2 + 7x}{-7x}$

C

$$= \frac{49x^3}{-7x} + \frac{-28x^2}{-7x} + \frac{7x}{-7x}$$

$$= -7x^2 + 4x - 1 = -7x^2 + 4x - 1$$

24. Multiply. $(4x - 7)(x^2 + 3x - 5)$

A

$$(4x)(x^2) + (4x)(3x) + (4x)(-5) + (-7)(x^2) + (-7)(3x) + (-7)(-5)$$

$$= 4x^3 + 12x^2 - 20x - 7x^2 - 21x + 35$$

$$= 4x^3 + 5x^2 - 41x + 35$$

25. Simplify completely. $\sqrt{8}(\sqrt{2} + \sqrt{3})$

C

$$\sqrt{8}\sqrt{2} + \sqrt{8}\sqrt{3}$$

$$= \sqrt{16} + \sqrt{24}$$

$$= 4 + \sqrt{4 \cdot 6}$$

$$= 4 + 2\sqrt{6}$$

D 1. Factor completely. $2x^3 - 18xy^2$

GCF = $2x$

$$2x \left(\frac{2x^3}{2x} - \frac{18xy^2}{2x} \right)$$

$$= 2x(x^2 - 9y^2)$$

$$= 2x(x^2 - (3y)^2) = \boxed{2x(x+3y)(x-3y)}$$

A 2. Multiply. $(2x-3)(2x^2-4x+6)$

$$(2x)(2x^2) + (2x)(-4x) + (2x)(6) + (-3)(2x^2) + (-3)(-4x) + (-3)(6)$$

$$= 4x^3 + \underline{-8x^2} + \underline{12x} + \underline{6x^2} + \underline{12x} + \underline{-18}$$

$$= 4x^3 + (-8x^2 + 6x^2) + (12x + 12x) - 18$$

$$= \boxed{4x^3 - 2x^2 + 24x - 18}$$

B 3. Simplify completely. $(2x^2 + 4x + 5) - (4x^2 - 5x + 4)$

$$\underline{2x^2} + \underline{4x} + \underline{5} + \underline{-4x^2} + \underline{5x} + \underline{-4}$$

$$(2x^2 - 4x^2) + (4x + 5x) + (5 - 4)$$

$$= \boxed{-2x^2 + 9x + 1}$$

C 4. Simplify completely. $\frac{\sqrt{5}\sqrt{15}}{\sqrt{3}}$

$$= \sqrt{\frac{5 \cdot 15}{3}} = \sqrt{5 \cdot 5} = \boxed{5}$$

A 5. Divide. Give the answer in scientific notation.

$$\frac{15 \times 10^3}{6 \times 10^5} = \left(\frac{15}{6}\right) \times \left(\frac{10^3}{10^5}\right) = (2.5) \times 10^{-2}$$

$$= \boxed{2.5 \times 10^{-2}}$$

D 6. Simplify. $\sqrt{12} + \sqrt{56}$

$$= \sqrt{4}\sqrt{3} + \sqrt{4}\sqrt{14}$$

$$= \boxed{2\sqrt{3} + 2\sqrt{14}}$$

C 7. Simplify. $\frac{w^8x^3}{w^7x^{-2}} = \left(\frac{w^8}{w^7}\right) \left(\frac{x^3}{x^{-2}}\right)$

$$= (w^{8-7})(x^{3-(-2)}) = (w^1)(x^{3+2}) = \boxed{wx^5}$$

8. Find all solutions to the equation. $x^2 - 2x = 24$

A $x^2 - 2x - 24 = 0$

$$\begin{array}{r} x \nearrow -6 \\ x \searrow +4 \end{array}$$

$$4x + -6x = -2x$$

$$(x-6)(x+4) = 0$$

$$\begin{array}{l} x-6=0 \\ x+4=0 \end{array} \Rightarrow \begin{array}{l} x=6 \\ x=-4 \end{array}$$

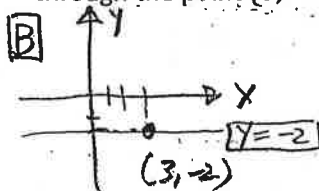
9. Evaluate $f(2)$ for the function $f(x) = 6x^2 - 4x + 7$

D $f(2) = 6(2)^2 - 4(2) + 7$

$$= 6 \cdot 4 - 8 + 7$$

$$= 24 - 8 + 7 = \boxed{23}$$

10. Find the equation of the horizontal line passing through the point $(3, -2)$.



11. Find the graph of the solution to the inequality. $4x - 2 \leq 2x + 4$

B

$$4x - 2 \leq 2x + 4$$

$$\begin{array}{r} -2x \quad -2x \\ \hline 2x - 2 \leq 4 \\ +2 \quad +2 \\ \hline 2x \leq 6 \\ \frac{2x}{2} \quad \frac{6}{2} \end{array}$$

$$x \leq 3$$

12. Solve for x. $y = 3x + 9z$

B

$$3x + 9z = y$$

$$\begin{array}{r} -9z \quad -9z \\ \hline 3x = y - 9z \end{array}$$

$$\frac{3x}{3} = \frac{y - 9z}{3}$$

$$x = \frac{y - 9z}{3}$$

$$x = \frac{y}{3} - 3z$$

13. In 2008, there were 90 fish in a pond. One year later, the number of fish decreased by 30%. How many fish were in the pond in 2009?

30%

$$\frac{30}{100} = \frac{x}{90}$$

$$100x = (30)(90)$$

$$x = \frac{(30)(90)}{100} = 27$$

$$90 - 27 = \boxed{63}$$

14. If y represents a number, which equation is a correct translation of the sentence?

D 39 subtracted from 4 times a number is 15 .

$$4y - 39 = 15$$

15. Simplify completely. $\frac{32x^6 - 16x^7 + 4x^3}{-4x^3}$

C

$$\frac{32x^6}{-4x^3} + \frac{-16x^7}{-4x^3} + \frac{4x^3}{-4x^3}$$

$$= -8x^3 + 4x^4 - 1$$

16. Which of the following is a factor of the polynomial? $8x^2 - 22x - 21$

A

$$2x \begin{array}{r} -7 \\ +3 \end{array}$$

$$4x \begin{array}{r} -7 \\ +3 \end{array}$$

$$6x + -22x = -22x$$

$(2x-7)(4x+3)$

17. Find the equation of the line passing through the points $(-1, 7)$ and $(2, -8)$. Write the equation in slope-intercept form.

D $m = \frac{y_2 - y_1}{x_2 - x_1} \Rightarrow \frac{-8 - 7}{2 - (-1)} = \frac{-15}{3} = -5$

E $y - y_1 = m(x - x_1) \Rightarrow y - 7 = -5(x - (-1))$
 $y - 7 = -5(x + 1)$
 $y - 7 = -5x - 5$
 $y = -5x + 2$

18. Which of the following is the graph of the equation? $6x + 4y = 26$

A

$$4x + 6y = 26$$

$$-4x \quad -4x$$

$$6y = -4x + 26$$

$$\frac{6y}{6} = \frac{-4x}{6} + \frac{26}{6}$$

$$y = -\frac{4}{6}x + \frac{26}{6}$$

$$y = -\frac{2}{3}x + \frac{13}{3}$$

19. Which of the following is a factor of the polynomial? $18dw - 6dz + 63cw - 21cz$

D

$$3 \left(\frac{18dw}{3} - \frac{6dz}{3} + \frac{63cw}{3} - \frac{21cz}{3} \right)$$

$$= 3(6dw - 2dz + 21cw - 7cz)$$

$$= 3 \left[2d \left(\frac{6dw}{2d} - \frac{2dz}{2d} \right) + 7c \left(\frac{21cw}{7c} - \frac{7cz}{7c} \right) \right]$$

$$= 3 [2d(3w - z) + 7c(3w - z)]$$

$$= 3 [(3w - z)(2d + 7c)]$$

GCF = 3

20. Solve for x . $21 - 6x = 24 + 7x$

A

$$21 - 6x = 24 + 7x$$

$$+7x \quad +7x$$

$$21 + x = 24$$

$$-21 \quad -21$$

$$x = 3$$

21. Find the slope and y-intercept for the graph of the equation. $7x - 14y = 35$

B

$$7x - 14y = 35$$

$$-7x \quad -7x$$

$$-14y = -7x + 35$$

$$\frac{-14y}{-14} = \frac{-7x}{-14} + \frac{35}{-14}$$

$$y = \frac{-7x}{-14} + \frac{35}{-14}$$

$$y = \frac{7.1}{7.2}x + \frac{7.5}{-7.2}$$

$$y = \frac{1}{2}x - \frac{5}{2}$$

slope $m = \frac{1}{2}$

y-intercept $(0, -\frac{5}{2})$

22. What is the value of the x-coordinate of the solution to the system of equations? $3x - y = 8$
 $-6x + 3y = -9$

A

$$3x - y = 8 \quad (\times 3)$$

$$9x - 3y = 24$$

$$-6x + 3y = -9 \quad (+)$$

$$3x = 15$$

$$\frac{3x}{3} = \frac{15}{3} \rightarrow x = 5$$

23. If 8 beads weigh 32 grams, how many beads weigh 52 grams?

C

$$\frac{8 \text{ beads}}{32 \text{ g}} = \frac{x \text{ beads}}{52 \text{ g}}$$

$$32x = 8 \cdot 52$$

$$x = \frac{8 \cdot 52}{32} = 13$$

24. Find all solutions to the equation. $4x^2 = 196$

A

$$4x^2 = 196$$

$$\frac{4x^2}{4} = \frac{196}{4}$$

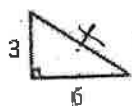
$$x^2 = 49$$

$$x = \pm \sqrt{49}$$

$$x = \pm 7$$

25. What is the value of x in the right triangle?

D



$$x^2 = 3^2 + 6^2$$

$$x^2 = 9 + 36$$

$$x^2 = 45$$

$$x = \pm \sqrt{45}$$

$$x = +\sqrt{45}$$

$$x = \sqrt{9 \cdot 5}$$

$$x = 3\sqrt{5}$$

