

ARITHMETIC:
A Textbook for Math 01
3rd edition (2012)

Answers to odd numbered exercises for Chapters 1, 2 by Natalia Novak

Section 1.1.3 Exercises

1.

$$\begin{array}{r} \{1\} \\ 2 \quad 6 \\ + \quad 5 \quad 5 \\ \hline 8 \quad 1 \end{array}$$

3.

$$\begin{array}{r} \{1\} \quad \{1\} \\ \quad 3 \quad 2 \\ \quad 4 \quad 5 \\ + \quad 6 \quad 4 \\ \hline 1 \quad 4 \quad 1 \end{array}$$

5.

$$\begin{array}{r} \{2\} \quad \{1\} \quad \{2\} \\ \quad 9 \quad 0 \quad 9 \\ \quad 7 \quad 7 \quad 7 \\ + \quad 6 \quad 9 \quad 6 \quad 4 \\ \hline 8, \quad 6 \quad 5 \quad 0 \end{array}$$

7.

$$\begin{array}{r} \{2\} \quad \{1\} \quad \{2\} \\ \quad \quad \quad 9 \quad 9 \quad 9 \\ \quad \quad \quad 9 \quad 0 \quad 2 \\ + \quad 9 \quad 5 \quad 0 \quad 2 \\ \hline 1 \quad 1, \quad 4 \quad 1 \quad 2 \end{array}$$

9.

$$\begin{array}{r} \{1\} \quad \{2\} \\ 3 \quad 2 \quad 0 \quad 0 \quad 0 \\ \quad 9 \quad 8 \quad 4 \quad 4 \\ \quad \quad 9 \quad 0 \quad 2 \\ + \quad 4 \quad 5 \quad 0 \quad 3 \\ \hline 4 \quad 7, \quad 2 \quad 4 \quad 9 \end{array}$$

Section 1.2.5 Exercises

1.

$$\begin{array}{r} \{8\} \quad \{14\} \\ 9 \quad 4 \\ - \quad 3 \quad 7 \\ \hline 5 \quad 7 \end{array}$$

3.

$$\begin{array}{r} \{2\} \quad \{14\} \quad \{10\} \\ 3 \quad 5 \quad 0 \\ - \quad 7 \quad 6 \\ \hline 2 \quad 7 \quad 4 \end{array}$$

5.

$$\begin{array}{r} \{5\} \quad \{9\} \quad \{10\} \\ 6 \quad 0 \quad 0 \\ - 1 \quad 9 \quad 9 \\ \hline 4 \quad 0 \quad 1 \end{array}$$

7.

$$\begin{array}{r} 5 \quad 6 \quad 7 \quad 8 \\ - 4 \quad 5 \quad 6 \quad 7 \\ \hline 1, \quad 1 \quad 1 \quad 1 \end{array}$$

9.

$$\begin{array}{r} \{7\} \quad \{10\} \\ 8 \quad 0 \quad 1 \\ - 7 \quad 9 \quad 0 \\ \hline \quad 1 \quad 1 \end{array}$$

11.

$$\begin{array}{r} \{4\} \quad \{9\} \quad \{9\} \quad \{9\} \quad \{10\} \\ 5 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \\ - \quad 4 \quad 3 \quad 2 \quad 1 \quad 0 \\ \hline 4 \quad 5 \quad 6, \quad 7 \quad 9 \quad 0 \end{array}$$

Section 1.3.3 Exercises

1.

$$\begin{array}{r} 1 \quad 2 \quad 2 \\ \times \quad \quad 4 \\ \hline 4 \quad 8 \quad 8 \end{array}$$

3.

$$\begin{array}{r} \{2\} \\ 1 \quad 0 \quad 4 \\ \times \quad \quad 7 \\ \hline 7 \quad 2 \quad 8 \end{array}$$

5.

$$\begin{array}{r} \quad 2 \quad 1 \quad 2 \\ \times \quad \quad 4 \quad 3 \\ \hline \quad 6 \quad 3 \quad 6 \\ + 8 \quad 4 \quad 8 \\ \hline 9, \quad 1 \quad 1 \quad 6 \end{array}$$

7.

$$\begin{array}{r} \quad 1 \quad 3 \quad 6 \\ \times \quad \quad 2 \quad 7 \\ \hline \quad 9 \quad 5 \quad 2 \\ + 2 \quad 7 \quad 2 \\ \hline 3, \quad 6 \quad 7 \quad 2 \end{array}$$

9.

$$\begin{array}{r} \quad 2 \quad 1 \quad 0 \quad 3 \\ \times \quad \quad 4 \quad 4 \\ \hline \quad 8 \quad 4 \quad 1 \quad 2 \\ + 8 \quad 4 \quad 1 \quad 2 \\ \hline 9 \quad 2, \quad 5 \quad 3 \quad 2 \end{array}$$

Section 1.4.2 Exercises

1. $8 \times 8 \times 8 \times 8 = 8^4$
3. $2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$
5. $0^7 = 0 \times 0 \times 0 \times 0 \times 0 \times 0 \times 0 = 0$
7. $10^2 = 10 \times 10 = 100$
9. $0^3 = 0, 1^3 = 1, 2^3 = 8, 3^3 = 27, 5^3 = 125, \dots, 9^3 = 729, 10^3 = 1000, 100^3 = 1000000.$

Section 1.4.4 Exercises

1. $\sqrt{49} = 7$
3. $\sqrt{169} = 13$
5. $\sqrt{64} = 8$
7. $\sqrt{75}$ is between $\sqrt{64} = 8$ and $\sqrt{81} = 9$
9. $\sqrt{32}$ is between $\sqrt{25} = 5$ and $\sqrt{36} = 6$

Section 1.5.3 Exercises

1. $4 \times 22 = 88$
3. $3 \times 17 = 51$
5. $8 \times 12 = 96$
7. $712 \div 101 = 7R5$
9. $3333 \div 111 = 10R3$
11. $457 \div 41 = 11R6$
13. $317 \div 21 = 15R2$

$$\begin{array}{r} 15 \\ 21 \overline{)317} \\ \underline{-21} \\ 107 \\ \underline{-105} \\ 2 \end{array}$$

15. $712 \div 21 = 33R19$

$$\begin{array}{r} 33 \\ 21 \overline{)712} \\ \underline{-63} \\ 82 \\ \underline{-63} \\ 19 \end{array}$$

Section 1.6.1 Exercises

1. $6 + 16 \div 4 = 6 + 4 = 10$

- $15 - 9 - 4 = 6 - 4 = 2$
- $4 \times 3 \times 2 \div 8 - 3 = 12 \times 2 \div 8 - 3 = 24 \div 8 - 3 = 3 - 3 = 0$
- $\sqrt{21 - 30 \div 6} = \sqrt{21 - 5} = \sqrt{16} = 4$
- $2 + 2 \times 8 - (4 + 4 \times 3) = 2 + 2 \times 8 - (4 + 12) = 2 + 2 \times 8 - (16) = 2 + 16 - 16 = 18 - 16 = 2$

Section 1.7.1 Exercises

- $\frac{1 + 2 + 3 + 4 + 5 + 6 + 7}{7} = \frac{28}{7} = 4$
- $\frac{206 + 196 + 204}{3} = \frac{606}{3} = 202$
- Note that there were 9 seasons: 2002-2009 and 2010 years.
 $\frac{5 + 6 + 2 + 10 + 9 + 4 + 6 + 5 + 7}{9} = \frac{54}{9} = 6$

Answer: on average, 6 games were canceled for the 2002-2010 seasons.

Section 1.8.1 Exercises

- Two of these triangles make up a rectangle of 5" wide and 12" long. So, the area of the triangle is half the area of the rectangle. $A = \frac{1}{2} \times 5 \times 12 = \frac{1}{2} \times 60 = 30 \text{ in}^2$.
- $A = W \times L = 7 \times 8 = 56 \text{ ft}^2$
- The diagonal is a hypotenuse of a right triangle with legs 2 cm and 2 cm. Therefore, by the Pythagorean Theorem, $c^2 = 2^2 + 2^2$, i.e. $c^2 = 8$, i.e. $c = \sqrt{8}$. $\sqrt{4} < \sqrt{8} < \sqrt{9}$, i.e. $2 < \sqrt{8} < 3$.

Answer: the length of the diagonal is $\sqrt{8}$ cm, and it is a value between 2 and 3.

Section 2.2.2 Exercises

- The picture has two whole circles and $\frac{5}{6}$ of a circle. We can think of each whole circle as 6 sixths, so altogether the picture represents $6 + 6 + 5 = 17$ sixths, i.e. $\frac{17}{6}$.
- Divide a circle into 4 equal parts and shade in three of the parts.
- With circles, we would have a whole circle (6 sixths) and 5 sixths of a circle. So we need the same picture as question 1, but with one whole circle removed.
- We can represent $\frac{6}{2}$ as 3 whole squares, since each square is $\frac{2}{2}$: $\blacksquare + \blacksquare + \blacksquare$
- Examples of five fractions that equal 0 are: $\frac{0}{1}, \frac{0}{2}, \frac{0}{3}, \frac{0}{10}, \frac{0}{2107}$

Section 2.3.2 Exercises

- $\frac{19}{3} = 6\frac{1}{3}$ (because $19 \div 3 = 6R1$)
- $\frac{135}{5} = 27$ (because $135 \div 5 = 27$)
- $\frac{77}{5} = 15\frac{2}{5}$ (because $77 \div 5 = 15R2$)
- average = $\frac{11 + 14 + 9 + 12}{4} = \frac{46}{4} = 11\frac{2}{4} = 11\frac{1}{2}$

Section 2.3.4 Exercises

1. $1\frac{1}{2} = \frac{1 \cdot 2 + 1}{2} = \frac{3}{2}$
3. $15\frac{3}{8} = \frac{15 \cdot 8 + 3}{8} = \frac{123}{8}$
5. $11\frac{5}{6} = \frac{11 \cdot 6 + 5}{6} = \frac{71}{6}$
7. $11 = \frac{11}{1} = \frac{22}{2} = \frac{44}{4}$

Section 2.4.1 Exercises

1. $\frac{1}{3} \cdot \frac{5}{7} = \frac{5}{21}$
3. Two thirds of one third = $\frac{2}{3} \cdot \frac{1}{3} = \frac{2}{9}$
5. $3 \cdot \frac{5}{8} = \frac{3}{1} \cdot \frac{5}{8} = \frac{15}{8}$
7. $\frac{1}{2} \cdot \frac{7}{8} \cdot 3 = \frac{1}{2} \cdot \frac{7}{8} \cdot \frac{3}{1} = \frac{21}{16}$

Section 2.5.2 Exercises

1. $\frac{1}{4} = \frac{2}{8} = \frac{3}{12} = \frac{10}{40} = \frac{11}{44}$
3. $\frac{1}{5} = \frac{10}{50} = \frac{2}{10} = \frac{3}{15} = \frac{8}{40}$
5. $\frac{1}{8} = \frac{11}{88} = \frac{2}{16} = \frac{3}{24} = \frac{10}{80}$
7. $\frac{12}{8} = \frac{12 \div 4}{8 \div 4} = \frac{3}{2} = 1\frac{1}{2}$
9. $\frac{20}{45} = \frac{20 \div 5}{45 \div 5} = \frac{4}{9}$
11. $\frac{54}{108} = \frac{54 \div 54}{108 \div 54} = \frac{1}{2}$

Section 2.6.1 Exercises

1. $60 = 2 \cdot 30 = 2 \cdot 15 \cdot 2 = 2 \cdot 3 \cdot 5 \cdot 2 = 2^2 \cdot 3 \cdot 5$, therefore $60 = 2^2 \cdot 3 \cdot 5$
3. $81 = 9 \cdot 9 = 3^4$, so $81 = 3^4$
5. $85 = 5 \cdot 17$
7. The only numbers divisible by 3 in the list 60, 48, 81, 360, 85 and 154 are: 60, 48 and 360

Section 2.6.3 Exercises

1. $\text{GCF}(72,48) = 24$
3. $\text{GCF}(72,36) = 36$
5. $\text{GCF}(36,15) = 3$
7. $\text{GCF}(15,14) = 1$

Section 2.6.5 Exercises

- $\frac{36}{72} = \frac{36 \div 36}{72 \div 36} = \frac{1}{2}$
- $\frac{14}{48} = \frac{14 \div 2}{48 \div 2} = \frac{7}{24}$
- $\frac{14}{15} = \frac{14}{15}$
- $\frac{48}{180} = \frac{48 \div 12}{180 \div 12} = \frac{4}{15}$
- $\frac{105}{147} = \frac{105 \div 21}{147 \div 21} = \frac{5}{7}$

Section 2.7.1 Exercises

- $\frac{4^{\div 4}}{5} \cdot \frac{7}{12^{\div 4}} = \frac{1}{5} \cdot \frac{7}{3} = \frac{7}{15}$
- $12 \cdot \frac{5}{8} \cdot \frac{2}{5} = \frac{12}{1} \cdot \frac{5^{\div 5}}{8} \cdot \frac{2}{5^{\div 5}} = \frac{12^{\div 4}}{1} \cdot \frac{1}{8^{\div 4}} \cdot \frac{2}{1} = \frac{3}{1} \cdot \frac{1}{2} \cdot \frac{2}{1} = 3$
- $\frac{2}{3}$ of 24 = $\frac{2}{3} \cdot \frac{24}{1} = \frac{16}{1} = 16$
- $2\frac{2}{3} \cdot 1\frac{3}{4} = \frac{8^{\div 4}}{3} \cdot \frac{7}{4^{\div 4}} = \frac{14}{3} = 4\frac{2}{3}$
- If the tank is only three-fifths full ($\frac{3}{5}$ of the aquariums capacity), then we need to add $\frac{2}{5}$ of $12\frac{1}{2}$ gallons of water. So, we get $\frac{2}{5} \cdot 12\frac{1}{2} = \frac{2}{5} \cdot \frac{25}{2} = 5$ gallons.

Section 2.8.1 Exercises

- $\frac{1}{5} + \frac{3}{5} = \frac{4}{5}$
- $\frac{11}{15} + \frac{13}{15} + \frac{8}{15} = \frac{32}{15} = 2\frac{2}{15}$
- $\frac{5}{13} - \frac{4}{13} = \frac{1}{13}$
- $\frac{109}{7} - \frac{11}{7} = \frac{98}{7} = 14$
- $\frac{10}{7} + \frac{6}{7} - \frac{11}{7} = \frac{10+6-11}{7} = \frac{16-11}{7} = \frac{5}{7}$

Section 2.8.4 Exercises

- LCM is 50
- LCM is 150
- LCM is 36
- LCM is 102
- LCM is 72
- LCM is 28

13. LCM is $3^4 \cdot 5^2 \cdot 7^2 \cdot 11$

Section 2.8.6 Exercises

1. $\frac{1}{5} + \frac{3}{6} = \frac{1 \times 6}{5 \times 6} + \frac{3 \times 5}{6 \times 5} = \frac{6 + 15}{30} = \frac{21}{30} = \frac{7}{10}$

LCD = 30

3. $\frac{15 \times 3}{1 \times 3} + \frac{2}{3} = \frac{47}{3} = 15\frac{2}{3}$

LCD = 3

5. $\frac{2 \times 20}{3 \times 20} + \frac{3 \times 15}{4 \times 15} + \frac{4 \times 12}{5 \times 12} = \frac{133}{60} = 2\frac{13}{60}$

LCD = 60

7. $\frac{17}{51} - \frac{3}{50} = \frac{17 \div 17}{51 \div 17} - \frac{3}{50} = \frac{1}{3} - \frac{3}{50} = \frac{1 \times 50}{3 \times 50} - \frac{3 \times 3}{50 \times 3} = \frac{59}{150}$

LCD = 150

9. $\frac{11 \times 5}{5 \times 5} - \frac{2}{25} = \frac{55 - 2}{25} = \frac{53}{25} = 2\frac{3}{25}$

LCD = 25

11. $\frac{3 \times 6}{2 \times 6} - \frac{1}{12} = \frac{18 - 1}{12} = \frac{17}{12} = 1\frac{5}{12}$

LCD = 12

13. $\frac{11 \times 5}{20 \times 5} - \frac{2 \times 4}{25 \times 4} = \frac{55 - 8}{100} = \frac{47}{100}$

LCD = $2^2 \cdot 5^2 = 100$

Section 2.9.1 Exercises

1. Use LCD = 72. Decreasing order: $\frac{4}{9}, \frac{3}{8}, \frac{1}{3}$

3. $\frac{5}{12}$ is less than $\frac{7}{16}$. The LCD is 48.

5. The price went up.

Section 2.10.2 Exercises

1. $2\frac{1}{3}$

3. $\frac{5}{14}$

5. $1\frac{1}{5}$

Section 2.10.4 Exercises

1. $\frac{2}{15}$

3. $\frac{7}{10}$

5. $\frac{1}{6}$

7. $3\frac{1}{33}$

9. We need $36 \div 1\frac{1}{2} = 36 \div \frac{3}{2} = \frac{36}{1} \cdot \frac{2}{3} = 24$

Answer: 24 of these pieces can be cut.

Section 2.11.2 Exercises

1. $1\frac{1}{3} + \frac{1}{2} = 1\frac{5}{6}$

$1+0 = 1$

$\frac{1}{3} + \frac{1}{2} = \frac{2+3}{6} = \frac{5}{6}$

3. $1\frac{1}{5} + 10 = 11\frac{1}{5}$

5. $12\frac{11}{15} - 2\frac{13}{20} = 10\frac{1}{12}$

$12 - 2 = 10$

$\frac{11}{15} - \frac{13}{20} = \frac{44 - 39}{60} = \frac{5}{60} = \frac{1}{12}$

7. $1\frac{2}{3} - 1\frac{4}{13} = \frac{14}{39}$

$1-1 = 0$

$\frac{2}{3} - \frac{4}{13} = \frac{26 - 12}{39} = \frac{14}{39}$

9. $1\frac{1}{7} - \frac{3}{7} = \frac{8}{7} - \frac{3}{7} = \frac{5}{7}$

11. $3\frac{6}{7} - \frac{11}{12} = 2\frac{79}{84}$

$3 - 0 = 3$; borrow 1 from 3, getting 2

$1\frac{6}{7} - \frac{11}{12} = \frac{13}{7} - \frac{11}{12} = \frac{156 - 77}{84} = \frac{79}{84}$

Section 2.11.4 Exercises

1. $9\text{ ft } 4\text{ in} - 6\text{ ft } 7\text{ in} = 8\text{ ft } 16\text{ in} - 6\text{ ft } 7\text{ in} = 2\text{ ft } 9\text{ in}$

Answer: The length of the leftover pieces is 2 ft 9 in.

3. (a) The total length is $2\text{ hrs } 30\text{ min} + 2\text{ hrs } 15\text{ min} + 1\text{ hr } 45\text{ min} = 5\text{ hrs } 90\text{ min} = 6\text{ hrs } 30\text{ min}$

(6) The average is the total divided by 3. **Answer:** 2 hrs 10 min.

Section 2.12.1 Exercises

1. $\frac{3}{4} + \frac{2}{3} \div \frac{4}{9} = \frac{3}{4} + \frac{2 \div 2}{3 \div 3} \times \frac{9 \div 3}{4 \div 2} = \frac{3}{4} + \frac{3}{2} = \frac{3}{4} + \frac{6}{4} = \frac{9}{4} = 2\frac{1}{4}$

3. $\left(\frac{3}{4} + 3\frac{1}{2}\right) - 2 = 4\frac{1}{4} - 2 = 2\frac{1}{4}$

$0 + 3 = 3$

$\frac{3}{4} + \frac{1}{2} = \frac{3}{4} + \frac{2}{4} = \frac{5}{4} = 1\frac{1}{4}$

5. $7\frac{1}{2} \div \frac{3}{5} + 1\frac{7}{8} \cdot 2\frac{2}{5} = \frac{15}{2} \cdot \frac{5}{3} + \frac{15}{8} \cdot \frac{12}{5} = \frac{25}{2} + \frac{9}{2} = \frac{34}{2} = 17$

7. The perimeter of a rectangle $P = 2W + 2L = 2 \cdot 1\frac{3}{4} + 2 \cdot 2\frac{1}{2} = \frac{7}{2} + 5 = 8\frac{1}{2}\text{ ft.}$