Math 05 Skills Practice: Basic operations

For adding and subtracting small signed numbers you can use the number line. Just remember that $-$ goes left and $+$ goes right. For example

$$\begin{aligned} 3+5 &= 8 \\ 3+(-5) &= -2 \\ 3-5 &= -2 \\ -3+5 &= 2 \\ 3-(-5) &= 8 \\ -3+(-5) &= -8 \\ -3-(-5) &= 2 \\ -3-5 &= -8. \end{aligned}$$

Also remember that $-(-5) = +5$. You can check all of these on your calculator or phone. To compute $-3+5$ you would hit the key 3 then $\pm$ or $(-)$ to make it -3 and then $+$ and 5 and $=$.

The rule for adding two signed numbers is as follows.

- If signs same: add magnitudes and answer has same sign as both numbers.
- If signs different: subtract magnitudes and answer has sign of number with the bigger magnitude.

The magnitude of a number is just its absolute value or positive part.

Examples for adding fractions.

- Find $1/2 + 2/2$.

  $$\frac{1}{2} + \frac{2}{2} = \frac{1+2}{2} = \frac{3}{2},$$

  Answer is $3/2$.

- Find $1/2 + 5/2$.

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

  Answer is 3.

- Find $1/5 + 3/10$.

  $$\frac{1}{5} + \frac{3}{10} = \frac{1 \cdot 2}{5 \cdot 2} + \frac{3}{10} = \frac{2}{10} + \frac{3}{10} = \frac{5}{10} = \frac{1 \cdot 5}{2 \cdot 5} = \frac{1}{2}.$$

  Answer is $1/2$. (We need a common denominator to add fractions with different denominators.)

For multiplying or dividing two signed numbers the rule is very simple.

- If signs same: answer is positive.
- If signs different: answer is negative.

For example

$$\begin{aligned}(2)(5) &= 10\\ (-2)(5) &= -10\\ (2)(-5) &= -10\\ (-2)(-5) &= 10\\ \frac{-2}{5} &= -\frac{2}{5}\\ \frac{2}{-5} &= -\frac{2}{5}\\ \frac{-2}{-5} &= \frac{2}{5}.\end{aligned}$$

Application: Find the slope of the line joining the two points $(2, -4)$ and $(-1, 2)$.
Solution: We let $x_1 = 2$, $y_1 = -4$, $x_2 = -1$, $y_2 = 2$ and put these into the slope formula

$$\text{slope} = m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{(2) - (-4)}{(-1) - (2)} = \frac{6}{-3} = -2.$$

So the slope we want is -2.

Multiplying and dividing fractions works like this:

- Multiply $2/3$ by $5/7$.

$$\frac{2}{3} \cdot \frac{5}{7} = \frac{2 \cdot 5}{3 \cdot 7} = \frac{10}{21}.$$

  Answer is $10/21$.

- Multiply $6/7$ by $-7/9$.

$$\frac{6}{7}\left(-\frac{7}{9}\right) = -\frac{6 \cdot 7}{7 \cdot 9} = -\frac{42}{63} = -\frac{2 \cdot 3 \cdot 7}{3 \cdot 3 \cdot 7} = -\frac{2}{3}.$$

  Answer is $-2/3$.

- Divide $2/5$ by $3/2$.

$$\frac{2}{5} \div \frac{3}{2} = \frac{2}{5} \cdot \frac{2}{3} = \frac{2 \cdot 2}{5 \cdot 3} = \frac{4}{15}.$$

  Answer is $4/15$. (We don't need a common denominator to multiply or divide fractions.)

Correct order for calculating:

- "P": Work out things in parentheses first. Also work out things on the top and bottom of fractions separately and combine things inside radicals before taking the root.
- "E": Next do any exponents (powers).
- "MD": Next do all multiplications and divisions working from left to right (so multiplication does not always come before division).
- "AS": Lastly do all additions and subtractions working from left to right (so addition does not always come before subtraction).

Here are questions for you to practice on. Answers to odd numbered questions are at the end - so make sure you're getting the right answers! You will need to do similar computations on the final.

Q1. Evaluate: $13 - 9$

Q2. Evaluate: $17 - 8$

Q3. Calculate: $6 - 10$

Q4. Calculate: $11 + (-8)$

Q5. Find: $-6 + (-7)$

Q6. Find: $2 - 9 + 3$

Q7. Find: $-7 + 3 - 8 + 8$

Q8. Calculate: $-11 - 3$

Q9. Evaluate: $0 \div (-5)$

Q10. Evaluate: $-64 \div (-16)$

Q11. Evaluate: $-17 + 9$

Q12. Evaluate: $-11 + 18$

Q13. Evaluate: $-8 - (-13)$

Q14. Evaluate: $-1 - (-42)$

Q15. Find: $-4(-9)$

Q16. Find: $7(-11)$

Q17. Find: $4 + 9 \times 2$

Q18. Find: $3 + 6 \times 4$

Q19. Compute: $-3^4 + 4^2$

Q20. Compute: $(-2)^3 + 3^2$

Q21. Evaluate: $3 - 5(9 - 2)$

Q22. Evaluate: $2 - 7(8 - 3)$

Q23. Calculate: $9(1 - 2) + (-3)8$

Q24. Calculate: $(4 - 6)3 + (-9)7$

Q25. Find: $77 \div (-11)$

Q26. Find: $-65 \div 5$

Q27. Multiply -30 by 200

Q28. Multiply 70 by -100

Q29. Evaluate: $(-8) - (-8)$

Q30. Evaluate: $-13 + (-13)$

Q31. Evaluate: $(-2)^7$

Q32. Evaluate: $-(-3)^4$

Q33. Evaluate: $3(9 - 7) - 4 \cdot 2 + 16 \div 4$

Q34. Evaluate: $9(3 - 7) - 3 \cdot 3 + 8 \div 2$

Q35. Find: $9 - (4 - 5)6 + \sqrt{81}$

Q36. Find: $8 - (4 - 3)5 - \sqrt{121}$

Q37. Find: $(-1)^{500} + 8^0 + 0^7$

Q38. Find: $(-1)^{501} + 7^0 + 0^8$

Q39. Compute: $2 \cdot 3^2 - 4 \cdot 3 + 5$

Q40. Compute: $2(-3)^2 - 4(-3) + 5$

Answers to odd numbered questions.

Q1: 4 **Q3:** -4 **Q5:** -13 **Q7:** -4 **Q9:** 0 **Q11:** -8 **Q13:** 5 **Q15:** 36 **Q17:** 22 **Q19:** -65 **Q21:** -32 **Q23:** -33 **Q25:** -7 **Q27:** -6000 **Q29:** 0 **Q31:** -128 **Q33:** 2 **Q35:** 24 **Q37:** 2 **Q39:** 11

Here is another set to practice calculating with fractions. Answers to odd numbered questions are at the end again.

Q1. Evaluate: $\frac{1}{4} + \frac{2}{4}$

Q2. Evaluate: $\frac{5}{7} + \frac{4}{7}$

Q3. Calculate: $\frac{3}{8} + \frac{3}{20}$

Q4. Calculate: $\frac{1}{8} + \frac{9}{22}$

Q5. Find: $\frac{7}{8} - \frac{3}{16}$

Q6. Find: $\frac{5}{6} - \frac{2}{9}$

Q7. Multiply $\frac{2}{7}$ by $\frac{5}{6}$

Q8. Multiply $\frac{3}{8}$ by $\frac{7}{20}$

Q9. Evaluate: $\frac{30}{55} \times \frac{20}{45}$

Q10. Evaluate: $\frac{22}{28} \times \frac{14}{33}$

Q11. Evaluate: $\frac{15}{28} \div \frac{25}{21}$

Q12. Evaluate: $\frac{15}{99} \div \frac{5}{33}$

Q13. Evaluate: $\frac{1}{3} + \frac{4}{5} + \frac{7}{15}$

Q14. Evaluate: $\frac{2}{5} + \frac{3}{2} + \frac{7}{10}$

Q15. Find: $4 + \frac{5}{7} - \frac{1}{14} + \frac{5}{14}$

Q16. Find: $3 + \frac{1}{3} + \frac{1}{9} - \frac{5}{6}$

Q17. Evaluate: $\frac{1}{4} + \frac{2}{5}$

Q18. Evaluate: $\frac{1}{3} + \frac{2}{7}$

Q19. Compute: $\frac{1}{8} - \frac{1}{2}$

Q20. Compute: $\frac{1}{9} - \frac{1}{3}$

Q21. Evaluate: $\dfrac{-3-5}{-3+7}$

Q22. Evaluate: $\dfrac{2-7}{-2+(-3)}$

Q23. Calculate: $\dfrac{-3+6+5}{-2}$

Q24. Calculate: $\dfrac{-9+2-11}{-9}$

Q25. Multiply -3 by $\dfrac{5}{6}$

Q26. Multiply -8 by $\dfrac{-3}{20}$

Q27. Put these fractions in order from smallest to largest: $\dfrac{3}{5},\ \dfrac{4}{7},\ \dfrac{19}{35}$

Q28. Put these fractions in order from smallest to largest: $\dfrac{1}{2},\ \dfrac{1}{3},\ \dfrac{3}{7}$

Q29. Evaluate: $\dfrac{3}{4}-\dfrac{1}{20}+\dfrac{3}{5}\times\dfrac{7}{2}$

Q30. Evaluate: $\dfrac{2}{3}+\dfrac{11}{12}-\dfrac{3}{4}\div\dfrac{3}{7}$

Answers to odd numbered questions.

Q1: $\dfrac{3}{4}$ **Q3:** $\dfrac{21}{40}$ **Q5:** $\dfrac{11}{16}$ **Q7:** $\dfrac{5}{21}$ **Q9:** $\dfrac{8}{33}$ **Q11:** $\dfrac{9}{20}$ **Q13:** $\dfrac{24}{15}$ **Q15:** 5 **Q17:** $\dfrac{13}{20}$ **Q19:** $-\dfrac{3}{8}$
Q21: -2 **Q23:** -4 **Q25:** $-\dfrac{5}{2}$ **Q27:** $\dfrac{19}{35},\ \dfrac{4}{7},\ \dfrac{3}{5}$ **Q29:** $\dfrac{14}{5}$

C. O'S. 11/28/15