Course 3 Math Students,
To help you prepare for the upcoming school year we have identified exercises representing material you already know that you should be ready to use again when the school year begins. Knowledge of this content will be important for your success in Math Course 3.

The exercises review and practice skills you learned in 7th grade.

The following skills are included:

- Order of Operations
- Solving Equations by Adding or Subtracting and Multiplying and Dividing
- Subtracting, Multiplying and Dividing Integers
- Solving Equations Containing Integers
- Adding and Subtracting Fractions and Mixed Numbers
- Multiplying and Dividing Fractions and Mixed Numbers
- Solving Equations Containing Fractions
- Solving Proportions
- Solving Two-Step Equations

To assist your efforts you may find it helpful to visit the Khan Academy. [https://www.khanacademy.org/math/pre-algebra](https://www.khanacademy.org/math/pre-algebra) This website provides free tutorial support for all levels of mathematics.

Thank you.
LESSON 1-4
Review for Mastery
Order of Operations

To help you remember the order of operations use the phrase
“Please Excuse My Dear Aunt Sally.”

**P**: first, parentheses (if any)
**E**: second, exponents (if any)
**M** and **D**: then, multiplication and division, in order from left to right
**A** and **S**: finally, addition and subtraction, in order from left to right

Evaluate.

\[
39 \div (9 + 4) + 5 - 2^2
\]

Parentheses \(39 \div 13 + 5 - 2^2\)

Exponents \(39 \div 13 + 5 - 4\)

Multiply and divide from left to right \(3 + 5 - 4\)

Add and subtract from left to right \(8 - 4 = 4\)

Simplify each expression.

1. \(12 \cdot 4 - 2\)
2. \(15 \div 3 \cdot 5\)
3. \(15 \cdot 3 \div 5\)

\[
\quad - 2 \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \q
Solving an equation is like balancing a scale. If you add the same weight to both sides of a balanced scale, the scale will remain balanced. You can use this same idea to solve an equation.

Think of the equation \( x - 7 = 12 \) as a balanced scale. The equal sign keeps the balance.

\[
\begin{align*}
x - 7 &= 12 \\
-7 + 7 &= 12 + 7 \\
x + 0 &= 19 \\
x &= 19
\end{align*}
\]

When you solve an equation, the idea is to get the variable by itself. What you do to one side of the equation, you must do to the other side.

• To solve a subtraction equation, use addition.
• To solve an addition equation, use subtraction.

Solve and check: \( y + 8 = 14 \).

\[
\begin{align*}
y + 8 &= 14 \\
+8 - 8 &= 14 - 8 \\
y + 0 &= 6 \\
y &= 6
\end{align*}
\]

Check:
\[
\begin{align*}
y + 8 &= 14 & \text{To check, substitute 6 for } y. \\
6 + 8 &= 14 & 14 = 14
\end{align*}
\]

A true sentence, \( 14 = 14 \), means the solution is correct.

Solve and check.

1. \( x - 2 = 8 \)

\[
\begin{align*}
x - 2 + ____ &= 8 + ____ \\
x - 0 &= ____
\end{align*}
\]

2. \( b + 5 = 11 \)

\[
\begin{align*}
b + 5 - ____ &= 11 - ____ \\
b + 0 &= ____
\end{align*}
\]

3. \( n + 8 = 11 \)

4. \( y - 6 = 2 \)

5. \( a - 9 = 4 \)

6. \( m + 2 = 18 \)
Review for Mastery

Solving Equations by Multiplying or Dividing

When you solve an equation, you must get the variable by itself. Remember, what you do to one side of an equation, you must do to the other side.

- To solve a division equation, multiply both sides of the equation by the same number.

Solve and check: \( \frac{a}{3} = 4 \).

\[
\begin{align*}
3 \cdot \frac{a}{3} &= 3 \cdot 4 \\
\frac{3a}{3} &= 12 \\
3a &= 12 \\
\frac{3a}{3} &= \frac{12}{3} \\
a &= 4
\end{align*}
\]

Check: \( \frac{a}{3} = 4 \)

Replace the variable with the solution.

Multiply to solve a division equation.

A true sentence means the solution is correct.

Solve and check.

1. \( \frac{x}{6} = 3 \)
2. \( \frac{s}{8} = 8 \)
3. \( \frac{c}{10} = 7 \)
4. \( \frac{n}{3} = 12 \)

- To solve a multiplication equation, divide both sides of the equation by the same number.

Solve and check: \( 5k = 30 \).

\[
\begin{align*}
\frac{5k}{5} &= \frac{30}{5} \\
5k &= 30 \\
\frac{5k}{5} &= \frac{30}{5} \\
k &= 6
\end{align*}
\]

Check: \( 5k = 30 \)

Replace the variable with the solution.

Divide to solve a multiplication equation.

True

Solve and check.

5. \( 2w = 16 \)
6. \( 4b = 24 \)
7. \( 9z = 45 \)
8. \( 10m = 40 \)
The total value of the three cards shown is \(-6\).

What if you **take away** the 3 card? Cards \(-4\) and \(-5\) are left. The new value is \(-9\).

\[-6 - 3 = -9\]

What if you **take away** the \(-4\) card? Cards 3 and \(-5\) are left. The new value is \(-2\).

\[-6 - (-4) = -2\]

**Answer each question.**

1. Suppose you have the cards shown. The total value of the cards is 12.

   a. What if you take away the 7 card? \(12 - 7 = \) ________________

   b. What if you take away the 13 card? \(12 - 13 = \) ________________

   c. What if you take away the \(-8\) card? \(12 - (-8) = \) ________________

2. Subtract \(-4 - (-2)\).
   a. \(-4 < -2\). Will the answer be positive or negative? ________________
   b. \(|4| - |2| = \) ________________
   c. \(-4 - (-2) = \) ________________

3. Subtract \(21 - 13\).
   a. \(21 > 13\). Will the answer be positive or negative? ________________
   b. \(|21| - |13| = \) ________________
   c. \(21 - 13 = \) ________________

**Subtract.**

4. \(31 - (-9) = \) _____

5. \(15 - 18 = \) _____

6. \(-9 - 17 = \) _____

7. \(-8 - (-8) = \) _____

8. \(29 - (-2) = \) _____

9. \(13 - 18 = \) _____
Review for Mastery

Multiplying and Dividing Integers

Look for the patterns in these products and quotients.

\[1 \cdot 3 = 3\]
\[-1 \cdot 3 = -3\]
\[3 \div 1 = 3\]
\[3 \div (-1) = -3\]
\[2 \cdot 3 = 6\]
\[-2 \cdot 3 = -6\]
\[6 \div 2 = 3\]
\[6 \div (-2) = -3\]
\[-3 \cdot (-3) = 9\]
\[3 \cdot (-3) = -9\]
\[-9 \div (-3) = 3\]
\[-9 \div 3 = -3\]
\[-4 \cdot (-3) = 12\]
\[4 \cdot (-3) = -12\]
\[-12 \div (-4) = 3\]
\[-12 \div 4 = -3\]

Look at how to find the signs of the products.

• The product of two integers with the **same sign** is **positive**.

\[ (+) \cdot (+) = (+) \]
\[ (-) \cdot (-) = (+) \]

• The product of two integers with **different signs** is **negative**.

\[ (+) \cdot (-) = (-) \]
\[ (-) \cdot (+) = (-) \]

Look at how to find the signs of the quotients.

• The quotient of two integers with the **same sign** is **positive**.

\[ (+) \div (+) = (+) \]
\[ (-) \div (-) = (+) \]

• The quotient of two integers with **different signs** is **negative**.

\[ (+) \div (-) = (-) \]
\[ (-) \div (+) = (-) \]

Find each product or quotient.

1. \(-5 \cdot 4\)
2. \(2 \cdot (-8)\)
3. \(-1 \cdot (-1)\)
4. \(-6 \cdot 3\)

5. \(7 \cdot (-3)\)
6. \(-8 \cdot (-4)\)
7. \(-6 \cdot 5\)
8. \(-9 \cdot (-9)\)

9. \(36 \div (-4)\)
10. \(-27 \div 9\)
11. \(-24 \div (-6)\)
12. \(-30 \div 5\)

13. \(18 \div 6\)
14. \(32 \div (-8)\)
15. \(-45 \div 9\)
16. \(-40 \div (-10)\)

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LESSON 2-5

Review for Mastery

Solving Equations Containing Integers

• You can use addition to solve an equation involving subtraction.
    Addition undoes subtraction. Adding the same number to both sides of the equation keeps the equation balanced.

    Check
    \[ x - 5 = -6 \]
    \[ x - 5 + 5 = -6 + 5 \]
    \[ x = -1 \]

• You can use subtraction to solve an equation involving addition.
    Subtraction undoes addition. Subtracting the same number from both sides of the equation keeps the equation balanced.

    Check
    \[ n + 4 = -15 \]
    \[ n + 4 - 4 = -15 - 4 \]
    \[ n = -19 \]

Solve. Check your answer.

1. \[ p - 9 = -3 \]
   \[ p - 9 + \underline{\text{_____}} = -3 + \underline{\text{_____}} \]

2. \[ w - 2 = -14 \]
   \[ w - 2 + \underline{\text{_____}} = -14 + \underline{\text{_____}} \]

3. \[ x - 12 = -5 \]
   \[ x - 12 + \underline{\text{_____}} = -5 + \underline{\text{_____}} \]

4. \[ f - 8 = 6 \]
   \[ f - 8 + \underline{\text{_____}} = 6 + \underline{\text{_____}} \]

5. \[ 6 = m - 7 \]

6. \[ -4 = s - 10 \]

7. \[ -8 = y - 2 \]

8. \[ a + 19 = 7 \]

9. \[ b + 15 = -9 \]

10. \[ 39 + t = 45 \]

11. \[ -5 = x + 7 \]

12. \[ -2 = k + 11 \]

13. \[ 10 = -3 + j \]
Review for Mastery

LESSON 2-5

Solving Equations Containing Integers (continued)

• You can use division to solve an equation involving multiplication.
  Division undoes multiplication. Dividing both sides of the equation by
  the same number keeps the equation balanced.

  \[
  3y = -9 \\
  \frac{3y}{3} = \frac{-9}{3} \\
  y = -3
  \]

  Check
  \[
  3y = -9 \\
  \frac{3y}{3} = \frac{-9}{3} \\
  y = -3
  \]

• You can use multiplication to solve an equation involving division.
  Multiplication undoes division. Multiplying both sides of an equation by
  the same number keeps the equation balanced.

  \[
  \frac{a}{-5} = -8 \\
  -5 \cdot \frac{a}{-5} = -8 \cdot (-5) \\
  a = 40
  \]

  Check
  \[
  \frac{a}{-5} = -8 \\
  -5 \cdot \frac{a}{-5} = -8 \cdot (-5) \\
  a = 40
  \]

Solve. Check your answer.

14. \[5g = -35\]  
   \[
   \frac{5g}{-35} = \frac{-35}{-35} \\
   g = \frac{-35}{-35} \\
   g = 1
   \]

15. \[-8y = -96\]  
   \[
   \frac{-8y}{-96} = \frac{-96}{-96} \\
   y = \frac{-96}{-96} \\
   y = 1
   \]

16. \[54 = -6f\]  
   \[
   \frac{54}{-6} = \frac{-6f}{-6} \\
   f = \frac{-6f}{-6} \\
   f = 9
   \]

17. \[3e = -33\]  
   \[
   \frac{3e}{-33} = \frac{-33}{-33} \\
   e = \frac{-33}{-33} \\
   e = -1
   \]

18. \[-49 = 7n\]  
   \[
   \frac{-49}{7} = \frac{7n}{7} \\
   n = \frac{7n}{7} \\
   n = -7
   \]

19. \[-75 = -5c\]  
   \[
   \frac{-75}{-5} = \frac{-5c}{-5} \\
   c = \frac{-5c}{-5} \\
   c = 15
   \]

20. \[\frac{n}{4} = -15\]  
   \[
   \frac{\frac{n}{4}}{-15} = \frac{-15}{-15} \\
   n = \frac{-15}{-15} \\
   n = -60
   \]

21. \[\frac{m}{-6} = -9\]  
   \[
   \frac{\frac{m}{-6}}{-9} = \frac{-9}{-9} \\
   m = \frac{-9}{-9} \\
   m = 54
   \]

22. \[\frac{s}{-10} = 8\]  
   \[
   \frac{\frac{s}{-10}}{8} = \frac{8}{8} \\
   s = \frac{8}{8} \\
   s = -80
   \]

23. \[4 = \frac{w}{-6}\]  
   \[
   \frac{4}{-6} = \frac{\frac{w}{-6}}{-6} \\
   w = \frac{w}{-6} \\
   w = -24
   \]

24. \[9 = \frac{z}{5}\]  
   \[
   \frac{9}{5} = \frac{\frac{z}{5}}{5} \\
   z = \frac{z}{5} \\
   z = 45
   \]

25. \[-11 = \frac{h}{6}\]  
   \[
   \frac{-11}{6} = \frac{\frac{h}{6}}{6} \\
   h = \frac{h}{6} \\
   h = -66
   \]
Review for Mastery

Adding and Subtracting Fractions

To add or subtract fractions with different denominators:

**Step 1:** Find the least common multiple of the denominators.

**Step 2:** Write both fractions with the least common multiple (LCM) as the denominator.

**Step 3:** Add or subtract the numerators, keeping the denominator the same. Write the answer in simplest form.

\[
\frac{1}{4} + \frac{5}{6} = \frac{3}{12} + \frac{10}{12} = \frac{13}{12} = 1\frac{1}{12}
\]

The LCM of 4 and 6 is 12.

\[
\frac{2}{3} - \frac{1}{2} = \frac{4}{6} - \frac{3}{6} = \frac{1}{6}
\]

The LCM of 3 and 2 is 6.

Add or subtract. Write each answer in simplest form.

1. \(\frac{3}{5} + \frac{1}{3} = \frac{9}{15} + \frac{5}{15} = \frac{14}{15}\)
2. \(\frac{8}{9} - \frac{1}{3} = \frac{8}{9} - \frac{3}{9} = \frac{5}{9}\)
3. \(\frac{2}{5} + \frac{1}{2} = \frac{4}{10} + \frac{5}{10} = \frac{9}{10}\)
4. \(\frac{3}{4} - \frac{1}{3} = \frac{9}{12} - \frac{4}{12} = \frac{5}{12}\)
5. \(\frac{2}{3} + \frac{3}{4} = \frac{8}{12} + \frac{9}{12} = \frac{17}{12} = 1\frac{5}{12}\)
6. \(\frac{1}{4} - \frac{5}{8} = \frac{2}{8} - \frac{5}{8} = -\frac{3}{8}\)
7. \(\frac{1}{4} + \frac{2}{3} = \frac{3}{12} + \frac{8}{12} = \frac{11}{12}\)
8. \(\frac{9}{10} - \frac{1}{2} = \frac{9}{10} - \frac{5}{10} = \frac{4}{10} = \frac{2}{5}\)
9. \(\frac{7}{10} + \frac{2}{5} = \frac{7}{10} + \frac{4}{10} = \frac{11}{10}\)
10. \(\frac{11}{12} - \frac{2}{3} = \frac{11}{12} - \frac{8}{12} = \frac{3}{12} = \frac{1}{4}\)
11. \(\frac{1}{4} - \frac{7}{10} = \frac{5}{20} - \frac{14}{20} = -\frac{9}{20}\)
12. \(\frac{3}{4} + \frac{4}{5} = \frac{15}{20} + \frac{16}{20} = \frac{31}{20}\)
Review for Mastery

Adding and Subtracting Mixed Numbers

You can write mixed numbers as improper fractions before adding.

Add: \(4 \frac{5}{8} + 2 \frac{7}{8}\)
• Write improper fractions.
\[
4 \frac{5}{8} = \frac{37}{8} \quad \text{and} \quad 2 \frac{7}{8} = \frac{23}{8}
\]
• The denominators are the same.
Add and simplify.
\[
\frac{37}{8} + \frac{23}{8} = \frac{60}{8} = 7 \frac{4}{8} = 7 \frac{1}{2}
\]

Add: \(1 \frac{2}{5} + 3 \frac{3}{4}\)
• Write improper fractions.
\[
1 \frac{2}{5} = \frac{7}{5} \quad \text{and} \quad 3 \frac{3}{4} = \frac{15}{4}
\]
• Find a common denominator.
The LCD is 20.
\[
\frac{7}{5} = \frac{28}{20} \quad \text{and} \quad \frac{15}{4} = \frac{75}{20}
\]
• Add and simplify.
\[
\frac{28}{20} + \frac{75}{20} = \frac{103}{20} = 5 \frac{3}{20}
\]

Add. Write each answer in simplest form.

1. \(4 \frac{7}{10} + 2 \frac{9}{10} = \frac{10}{10} + \frac{10}{10} = \frac{20}{10} = \frac{2}{1} = 2\)

2. \(2 \frac{1}{2} + 1 \frac{3}{8} = \frac{2}{2} + \frac{8}{8} = \frac{10}{8} = \frac{5}{4} = 1 \frac{1}{4}\)

3. \(3 \frac{1}{5} + 2 \frac{1}{3} = \frac{5}{5} + \frac{3}{15} = \frac{15}{15} + \frac{15}{15} = \frac{30}{15} = 2\)

4. \(1 \frac{2}{7} + 5 \frac{3}{7} = \frac{5}{7} + \frac{3}{7} = \frac{8}{7} = 1 \frac{1}{7}\)

5. \(5 \frac{3}{8} + 3 \frac{7}{8} = \frac{15}{8} + \frac{15}{8} = \frac{30}{8} = 3 \frac{6}{8} = 3 \frac{3}{4}\)

6. \(4 \frac{4}{9} + 2 \frac{2}{3} = \frac{16}{9} + \frac{8}{3} = \frac{16}{9} + \frac{24}{9} = \frac{40}{9} = 4 \frac{4}{9}\)

7. \(2 \frac{3}{5} + 3 \frac{7}{10} = \frac{13}{5} + \frac{17}{10} = \frac{26}{10} + \frac{17}{10} = \frac{43}{10} = 4 \frac{3}{10}\)

5. \(2 \frac{3}{4} + 1 \frac{5}{6} = \frac{11}{4} + \frac{11}{6} = \frac{33}{12} + \frac{22}{12} = \frac{55}{12} = 4 \frac{7}{12}\)

9. \(4 \frac{1}{3} + 2 \frac{1}{2} = \frac{13}{3} + \frac{5}{2} = \frac{26}{6} + \frac{15}{6} = \frac{41}{6} = 6 \frac{5}{6}\)
Adding and Subtracting Mixed Numbers (continued)

You can write whole numbers as fractions and mixed numbers as improper fractions before subtracting.

6 - \(2 \frac{5}{9}\)

4 - \(\frac{1}{4} - \frac{5}{6}\)

• Write 6 as a fraction and \(2 \frac{5}{9}\) as an improper fraction.

6 = \(\frac{6}{1}\) and \(2 \frac{5}{9} = \frac{23}{9}\)

4 \(\frac{1}{4} = \frac{17}{4}\) and \(1 \frac{5}{6} = \frac{11}{6}\)

• Find a common denominator.
The LCD is 9.

\(\frac{6}{1} = \frac{54}{9}\)

\(\frac{17}{4} = \frac{51}{12}\) and \(\frac{11}{6} = \frac{22}{12}\)

• Subtract and simplify.

\(\frac{54}{9} - \frac{23}{9} = \frac{31}{9} = 3 \frac{4}{9}\)

\(\frac{51}{12} - \frac{22}{12} = \frac{29}{12} = 2 \frac{5}{12}\)

Subtract. Write each answer in simplest form.

10. \(\frac{6}{4} - \frac{1}{4} - \frac{3}{4} = \frac{4}{4} - \frac{4}{4} = \frac{4}{4} = 1\)

11. \(\frac{5}{3} - \frac{2}{3} = \frac{5}{3} - \frac{3}{3} = \frac{3}{3} = \frac{3}{3} = 1\)

12. \(\frac{5}{4} - \frac{1}{8} = \frac{4}{8} - \frac{1}{8} = \frac{4}{8} = \frac{8}{8} = \frac{8}{8} = \frac{8}{8}\)

13. \(\frac{3}{4} - \frac{2}{5} = \frac{4}{6} - \frac{12}{12} = \frac{12}{12} = \frac{12}{12}\)

14. \(\frac{8}{5} - \frac{3}{6} = \frac{4}{10} - \frac{6}{10} = \frac{4}{10} = \frac{10}{10}\)

15. \(5 - \frac{4}{7}\)

16. \(10 - \frac{7}{10}\)

17. \(\frac{7}{2} - \frac{3}{10}\)

18. \(\frac{2}{3} - \frac{1}{5}\)

19. \(\frac{5}{2} - \frac{3}{3}\)

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**Review for Mastery**

**Multiplying Fractions and Mixed Numbers**

To multiply fractions and mixed numbers:

**Step 1:** Write any mixed numbers as improper fractions.

**Step 2:** Multiply the numerators.

**Step 3:** Multiply the denominators.

**Step 4:** Write the answer in simplest form.

### Multiply:

- **4/9 • 3/8:**
  
  \[
  \frac{4}{9} \times \frac{3}{8} = \frac{4 \times 3}{9 \times 8} = \frac{12}{72} = \frac{1}{6}
  \]

- **6 1/4 • (-4/5):**
  
  \[
  6\frac{1}{4} \times (-\frac{4}{5}) = \frac{25}{4} \times \left(-\frac{9}{5}\right) = \frac{25 \times (-9)}{4 \times 5} = \frac{-225}{20} = -11\frac{1}{4}
  \]

### Multiply. Write each answer in simplest form.

1. **6 • 1/9 = 6/9 = — = —**

2. **-4/5 • 5/7 = -4/5 • -4/5**

3. **3 1/3 • 9 = 10/3 • 9 = 10/3 • 9**

4. **3/10 • 2 1/2 = 3/10 • 5/2 = 3/10 • 5/2**

5. **2/7 • 7/8**

6. **-5/9 • 3/4**

7. **9/10 • (-2/3)**

8. **2 5/8 • 2/3**

9. **1/2 • 4 1/4**

10. **-2/3 • 1 3/4**

11. **5 1/5 • (-1 2/3)**

12. **4 1/2 • 1 1/9**

13. **-2 3/4 • (-1 1/3)**

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*Remember, positive times negative equals negative.*

Divide numerator and denominator by 12, the GCF.
Dividing fractions and mixed numbers is very much like multiplying fractions and mixed numbers. Just follow these steps:

**Step 1:** Write any mixed numbers as improper fractions.
**Step 2:** Invert the divisor.
**Step 3:** Multiply and write the quotient in simplest form.

Divide: $1\frac{1}{8} \div \frac{1}{3}$

*Step 1:* $\frac{9}{8} \div \frac{1}{3} = \frac{9}{8} \cdot \frac{3}{1}$

*Step 2:* $\frac{9}{8} \cdot \frac{3}{1} = \frac{27}{8} = 3\frac{3}{8}$

Divide: $1\frac{1}{4} \div 3\frac{1}{3}$

*Step 1:* $\frac{5}{4} \div \frac{10}{3} = \frac{5}{4} \cdot \frac{3}{10}$

*Step 2:* $\frac{5}{4} \cdot \frac{3}{10} = \frac{15}{40} = \frac{3}{8}$

Divide. Write each answer in simplest form.

1. $\frac{4}{5} \div \frac{1}{2} = \frac{4}{5} \cdot \frac{2}{1} = \frac{8}{5} = \frac{16}{10}$

2. $\frac{5}{8} \div \frac{5}{6} = \frac{5}{8} \cdot \frac{6}{5} = \frac{30}{40} = \frac{3}{4}$

3. $2\frac{1}{2} \div 1\frac{3}{4} = \frac{5}{2} \div \frac{7}{4} = \frac{5}{2} \cdot \frac{4}{7} = \frac{20}{14} = \frac{10}{7} = 1\frac{3}{7}$

4. $2\frac{2}{3} \div 1\frac{1}{5} = \frac{7}{3} \div \frac{6}{5} = \frac{7}{3} \cdot \frac{5}{6} = \frac{35}{18} = 1\frac{17}{18}$

5. $\frac{3}{5} \div \frac{3}{10} = \frac{3}{5} \cdot \frac{10}{3} = \frac{30}{15} = \frac{2}{1} = 2$

6. $\frac{7}{8} \div \frac{1}{3} = \frac{7}{8} \cdot \frac{3}{1} = \frac{21}{8}$

7. $\frac{5}{12} \div \frac{1}{2} = \frac{5}{12} \cdot \frac{2}{1} = \frac{10}{12} = \frac{5}{6}$

8. $4\frac{1}{3} \div 1\frac{1}{9} = \frac{13}{3} \div \frac{10}{9} = \frac{13}{3} \cdot \frac{9}{10} = \frac{117}{30} = 3\frac{17}{30}$

9. $2\frac{1}{3} \div 1\frac{3}{4} = \frac{7}{3} \div \frac{7}{4} = \frac{7}{3} \cdot \frac{4}{7} = \frac{28}{21} = \frac{4}{3} = 1\frac{1}{3}$

10. $5\frac{5}{8} \div 2\frac{1}{2} = \frac{49}{8} \div \frac{5}{2} = \frac{49}{8} \cdot \frac{2}{5} = \frac{98}{40} = \frac{24.5}{10} = 2.45$
Review for Mastery

Solving Equations Containing Fractions

You can use addition to solve a subtraction equation involving fractions.

\[
x - \frac{4}{9} = \frac{1}{3}
\]

\[
x - \frac{4}{9} + \frac{4}{9} = \frac{1}{3} + \frac{4}{9}
\]

\[
x = \frac{3}{9} + \frac{4}{9}
\]

\[
x = \frac{7}{9}
\]

You can use subtraction to solve an addition equation involving fractions.

\[
n + \frac{2}{5} = \frac{9}{10}
\]

\[
n + \frac{2}{5} - \frac{2}{5} = \frac{9}{10} - \frac{2}{5}
\]

\[
n = \frac{9}{10} - \frac{4}{10}
\]

\[
n = \frac{5}{10} = \frac{1}{2}
\]

Solve. Write each answer in simplest form.

1. \[d - \frac{1}{6} = \frac{3}{4}\]
   \[d = \frac{3}{4} + \frac{1}{6} = \frac{3}{4} + \frac{1}{6} = \frac{12}{12} + \frac{2}{12} = \frac{14}{12} = \frac{7}{6}
   \]

2. \[y + \frac{4}{5} = \frac{14}{15}\]
   \[y = \frac{14}{15} - \frac{4}{5} = \frac{14}{15} - \frac{12}{15} = \frac{2}{15}
   \]

3. \[t - \frac{1}{8} = \frac{3}{4}\]
   \[t = \frac{3}{4} + \frac{1}{8} = \frac{6}{8} + \frac{1}{8} = \frac{7}{8}
   \]

4. \[k + \frac{1}{2} = \frac{5}{8}\]
   \[k = \frac{5}{8} - \frac{1}{2} = \frac{5}{8} - \frac{4}{8} = \frac{1}{8}
   \]

5. \[a - \frac{3}{5} = \frac{7}{10}\]
   \[a = \frac{7}{10} + \frac{3}{5} = \frac{7}{10} + \frac{6}{10} = \frac{13}{10}
   \]
Review for Mastery

Solving Equations Containing Fractions (continued)

You can use division to solve a multiplication equation involving fractions. Multiply both sides of the equation by the reciprocal of the coefficient of the variable.

\[
3y = \frac{9}{10}
\]

\[
3y \cdot \frac{1}{3} = \frac{9}{10} \cdot \frac{1}{3}
\]

\[
y = \frac{9}{10} \cdot \frac{1}{3}
\]

\[
y = \frac{9}{30} = \frac{3}{10}
\]

\[
\frac{5}{6}a = 1
\]

\[
\frac{5}{6}a \cdot \frac{6}{5} = 1 \cdot \frac{6}{5}
\]

\[
a = \frac{1}{2} \cdot \frac{6}{5}
\]

\[
a = \frac{6}{10} = \frac{3}{5}
\]

Solve. Write each answer in simplest form.

6. \(8x = \frac{3}{5}\)

\[
8x = \frac{3}{5}
\]

\[
8x \cdot \frac{5}{1} = \frac{3}{5} \cdot \frac{5}{1}
\]

\[
x = \frac{3}{5}
\]

7. \(\frac{2}{3}k = \frac{5}{6}\)

\[
\frac{2}{3}k \cdot \frac{3}{2} = \frac{5}{6} \cdot \frac{3}{2}
\]

\[
k = \frac{5}{6}
\]

8. \(\frac{3}{4}d = 5\)

\[
\frac{3}{4}d = 5
\]

\[
\frac{3}{4}d \cdot \frac{4}{3} = 5 \cdot \frac{4}{3}
\]

\[
d = \frac{20}{3}
\]

9. \(6y = \frac{2}{3}\)

\[
6y = \frac{2}{3}
\]

\[
6y \cdot \frac{3}{6} = \frac{2}{3} \cdot \frac{3}{6}
\]

\[
y = \frac{1}{9}
\]

10. \(\frac{1}{5}s = \frac{5}{8}\)

\[
\frac{1}{5}s = \frac{5}{8}
\]

\[
\frac{1}{5}s \cdot \frac{5}{1} = \frac{5}{8} \cdot \frac{5}{1}
\]

\[
s = \frac{25}{4}
\]
Solving a proportion is like solving an equation involving fractions.

- Multiply both sides of the equation by the denominator of the fraction containing the variable.
- If the variable is in the denominator, invert both fractions in the proportion.

\[
\frac{n}{7} = \frac{20}{28} \quad \frac{12}{x} = \frac{9}{6}
\]

\[7 \cdot n = 7 \cdot \frac{20}{28} \quad \frac{x}{12} = \frac{6}{9}
\]

\[n = \frac{7 \cdot 20}{28} = \frac{140}{28} \quad 12 \cdot x = 12 \cdot \frac{6}{9}
\]

\[n = 5 \quad x = \frac{12 \cdot 6}{9} = \frac{72}{9}
\]

\[x = 8
\]

Solve the proportion.

1. \(\frac{a}{2} = \frac{27}{18}\)
2. \(\frac{8}{12} = \frac{n}{9}\)
3. \(\frac{10}{t} = \frac{4}{6}\)

\[\frac{a}{2} = \frac{27}{18} \quad \frac{8}{12} = \frac{n}{9} \quad \frac{t}{10} = \frac{6}{4}
\]

\[a = \frac{27 \cdot 18}{18} \quad 8 = n \quad t = \frac{6 \cdot 4}{4}
\]

\[a = \frac{27}{18} \quad 8 = n \quad t = \frac{6}{4}
\]

\[t = \frac{4}{4}
\]

4. \(\frac{x}{15} = \frac{8}{10}\)
5. \(\frac{7}{3} = \frac{w}{18}\)
6. \(\frac{3}{2} = \frac{15}{c}\)

\[x = \frac{8 \cdot 15}{10} \quad w = \frac{7 \cdot 18}{3}
\]

\[c = \frac{15 \cdot 2}{3}
\]
You can use proportions to solve word problems.

A fruit punch is made with 32 ounces of ginger ale for every 12 ounces of frozen orange juice concentrate. How much ginger ale should you use for 30 ounces of orange juice concentrate?

- Set up a proportion comparing the amounts of ginger ale to orange juice concentrate.

- The first ratio shows the given recipe for the fruit punch.

- The second ratio shows the unknown amount of ginger ale as the variable \( g \).

- Then solve the proportion.

\[
\frac{g}{30} = \frac{32}{12}
\]

\[
30 \cdot \frac{g}{30} = 30 \cdot \frac{32}{12}
\]

\[
g = \frac{30 \cdot 32}{12} = \frac{960}{12}
\]

\[
g = 80
\]

You should use 80 ounces of ginger ale for 30 ounces of frozen orange juice concentrate.

Solve.

7. Pecans cost $8.25 for 3 pounds. What is the cost of 5 pounds of pecans?

\[
\frac{\text{dollars}}{\text{pounds}} = \frac{c}{3} = \frac{8.25}{3}
\]

\[
c = \frac{8.25 \cdot 3}{3}
\]

8. Mandy drove 90 miles in 2 hours at a constant speed. How long would it take her to drive 225 miles at the same speed?

\[
\frac{\text{miles}}{\text{hours}} = \frac{90}{2} = \frac{225}{h}
\]

\[
h = \frac{225 \cdot 2}{90}
\]

9. Last week Geraldo bought 7 pounds of apples for $5.95. This week apples are the same price, and he buys 4 pounds. How much will he pay?

10. Aretha can type 55 words per minute. At that rate, how long will it take her to type a letter containing 935 words?
Complete the steps to solve each equation.

1. \(7x + 3 = 31\)
   \(7x + 3 - \text{____} = 31 - \text{____}\) Subtract \text{____} from both sides to undo addition.
   \(7x = 28\)
   \(\frac{7x}{7} = \frac{28}{7}\) Divide both sides by \text{____} to undo multiplication.
   \(x = 4\)

Check
\(7x + 3 = 31\)
\(7(\text{____}) + 3 \neq 31\) Substitute \text{____} for \(x\).
\(\text{____} + 3 \neq 31\)
\(31 \neq 31\) 4 is a solution.

2. \(\frac{n}{6} - 8 = 4\)
3. \(8a - 5 = 11\)
4. \(9 + \frac{w}{2} = 12\)
   \(\frac{n}{6} - 8 + \text{____} = 4 + \text{____}\)
   \(8a - 5 + \text{____} = 11 + \text{____}\)
   \(9 - \text{____} + \frac{w}{2} = 12 - \text{____}\)
   \(\frac{n}{6} = 12\)
   \(8a = \text{____}\)
   \(\frac{w}{2} = \text{____}\)
   \(6 \cdot \frac{n}{6} = \text{____} \cdot 12\)
   \(\frac{8a}{8} = \frac{16}{8}\)
   \(2 \cdot \frac{w}{2} = \text{____} \cdot 3\)
   \(n = \text{____}\)
   \(a = \text{____}\)
   \(w = \text{____}\)

Solve.

5. \(4n + 11 = 27\)
6. \(\frac{z}{7} - 6 = 3\)
7. \(3 - 2k = -7\)