



# Incoming 8th Grade Summer Packet 2015- 2016

## Fox Ridge Middle School

Greetings 2016-2017 8th grade parents and students!

This packet includes both online and paper resources to enrich your student's knowledge of foundational skills needed for success in 8th grade mathematics. Although this packet is not required, it is strongly encouraged that your student practices his/her skills over the summer break.

Included in this packet you will find an online practice list with IXL ([www.ixl.com](http://www.ixl.com)), a packet of printable worksheets, and answer keys. Khan Academy is another free, online resource ([www.khanacademy.org](http://www.khanacademy.org)). Do not use a calculator when working on these problems.

### Topics for Paper- Copy Problems

- Comparing, Ordering, and Graphing Integers
- Adding and Subtracting Integers
- Multiplying and Dividing Integers
- Adding and Subtracting Fractions with Unlike Denominators
- Multiplying Mixed Numbers
- Dividing Mixed Numbers
- Operations with Rational Numbers
- Evaluating Algebraic Expressions
- Writing Expressions and Equations
- Percents and Proportions
- Angles of Triangles
- Order of Operations
- Combining Like-Terms
- Solving One Step Equations
- Solving Two Step Equations

## IXL PRACTICE – Incoming 8<sup>th</sup> graders

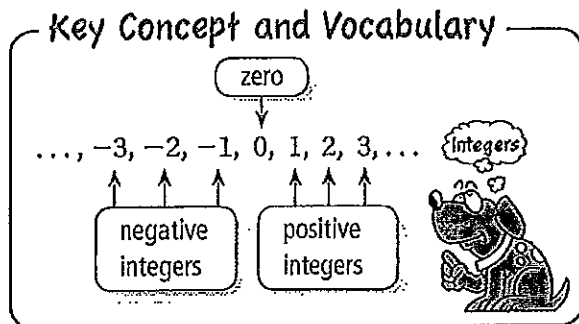
Practice the following skills on <http://www.ixl.com/math/grade-8>. For each skill you need to record the date of completion, how long it took you, and your smart score after you finished 20 questions. If you earn lower than a 60 on your smart score, you need to try again (20 more questions). You need a parent signature to verify you practiced each skill. Remember you can only complete 20 questions per day per browser, so if you want to work on two skills on the same day, you will need to open the website in two different browsers.

| Skill  | Date | Time used | Smart Score (at least 60%) | Parent Signature |
|--|------|-----------|----------------------------|------------------|
| A.1<br>Factors   |      |           |                            |                  |
| C.3<br>Add and Subtract Integers                               |      |           |                            |                  |
| C.7<br>Multiply and Divide Integers                            |      |           |                            |                  |
| D.2<br>Simplify Fractions                                      |      |           |                            |                  |
| D.6<br>Convert between decimals and fractions or mixed numbers |      |           |                            |                  |
| E.1<br>Reciprocals and multiplicative inverses                 |      |           |                            |                  |
| E.2<br>Add and subtract rational numbers                       |      |           |                            |                  |
| E.5<br>Multiply and divide rational numbers                    |      |           |                            |                  |
| H.8<br>Solve Proportions                                       |      |           |                            |                  |
| T.1<br>Write variable expressions                              |      |           |                            |                  |
| T.5<br>Evaluate multi-variable expressions                     |      |           |                            |                  |
| U.5<br>Solve two-step linear equations                         |      |           |                            |                  |

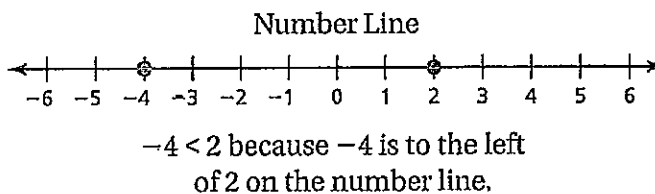
# Printable Review Packet

# REVIEW: Comparing, Ordering, and Graphing Integers

Name \_\_\_\_\_



## Visual Model



## Skill Examples

- $0 \leq 4$  "0 is less than or equal to 4"
- $-1 > -3$  "-1 is greater than -3"
- $-2 < -1$  "-2 is less than -1"
- $2 > -2$  "2 is greater than -2"
- $3 \geq 2$  "3 is greater than or equal to 2"

## Application Example

- The temperature in Seattle is  $4^{\circ}\text{F}$ .  
The temperature in Denver is  $-6^{\circ}\text{F}$ .  
Which temperature is greater?  
 $-6 < 4$  " -6 is less than 4"
- The temperature is greater in Seattle.

## PRACTICE MAKES PURR-FECT™



Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Graph the two numbers. Then compare them using  $<$  or  $>$ .

- |                                       |  |                                       |  |
|---------------------------------------|--|---------------------------------------|--|
| 7. $-3$ <input type="checkbox"/> $2$  |  | 8. $-1$ <input type="checkbox"/> $0$  |  |
| 9. $-1$ <input type="checkbox"/> $-4$ |  | 10. $1$ <input type="checkbox"/> $3$  |  |
| 11. $0$ <input type="checkbox"/> $2$  |  | 12. $3$ <input type="checkbox"/> $-1$ |  |

Order the temperatures from least to greatest.

- |  |  |
|--|--|
| 13. $-5^{\circ}\text{F}$ , $13^{\circ}\text{F}$ , $0^{\circ}\text{F}$ , $5^{\circ}\text{F}$ , $2^{\circ}\text{F}$ , $20^{\circ}\text{F}$ | 14. $7^{\circ}\text{C}$ , $-4^{\circ}\text{C}$ , $-11^{\circ}\text{C}$ , $0^{\circ}\text{C}$ , $8^{\circ}\text{C}$ , $-12^{\circ}\text{C}$ |
|--|--|

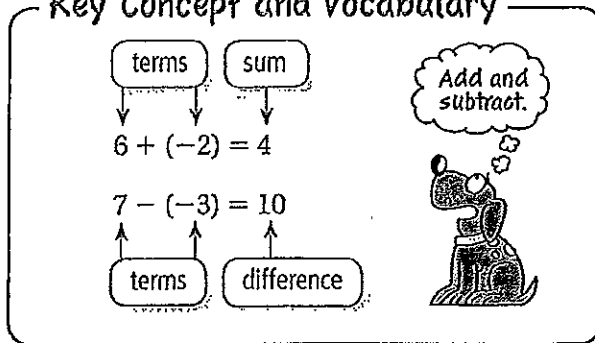
Use an integer to describe the real-life situation.

- |                           |                           |   |
|---------------------------|---------------------------|---|
| 15. A profit of \$5 _____ | 16. A depth of 8 ft _____ | 17. A decrease of $5^{\circ}\text{F}$ _____ |
| A loss of \$5 _____       | A height of 4 ft _____    | An increase of $8^{\circ}\text{F}$ _____    |
18. **BUSINESS LOSS** During its first week, a business had a loss that was greater than \$4, but less than \$6. Circle each integer that could represent this loss.  
 $-\$7$ ,  $-\$6$ ,  $-\$5$ ,  $-\$4$ ,  $-\$3$ ,  $-\$2$ ,  $-\$1$ ,  $\$0$ ,  $\$1$ ,  $\$2$ ,  $\$3$ ,  $\$4$ ,  $\$5$ ,  $\$6$ ,  $\$7$

# REVIEW: Adding and Subtracting Integers

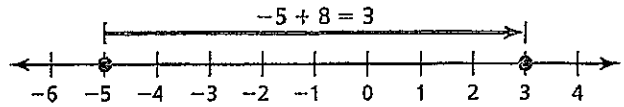
Name \_\_\_\_\_

## Key Concept and Vocabulary



## Visual Model

To add a positive number, move to the *right*.



To subtract a positive number, move to the *left*.

## Skill Examples

1.  $5 + (-3) = 5 - 3 = 2$

2.  $5 - (-2) = 5 + 2 = 7$

3.  $-2 + 4 = 2$

4.  $-3 - (-2) = -3 + 2 = -1$

5.  $8 - (-3) = 8 + 3 = 11$

To subtract, change the sign and add.

## Application Example

6. The temperature is  $8^{\circ}\text{F}$  in the morning and drops to  $-5^{\circ}\text{F}$  in the evening. What is the difference between these temperatures?

$$8 - (-5) = 8 + 5$$

$$= 13$$

∴ The difference is 13 degrees.

## PRACTICE MAKES PURR-FECT™



Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Find the sum or difference.

7.  $-2 + 3 =$  \_\_\_\_\_

8.  $-4 - 5 =$  \_\_\_\_\_

9.  $8 - 2 =$  \_\_\_\_\_

10.  $8 - (-2) =$  \_\_\_\_\_

11.  $-4 - (-1) =$  \_\_\_\_\_

12.  $-5 + (-5) =$  \_\_\_\_\_

13.  $4 - (-8) =$  \_\_\_\_\_

14.  $4 - 8 =$  \_\_\_\_\_

15.  $-4 + (-6) =$  \_\_\_\_\_

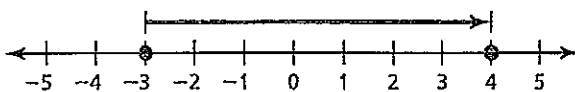
16.  $-4 - (-6) =$  \_\_\_\_\_

17.  $10 - 13 =$  \_\_\_\_\_

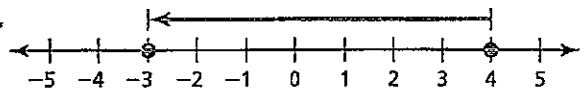
18.  $13 - (-10) =$  \_\_\_\_\_

Write the addition or subtraction shown by the number line.

19.



20.



21. **TEMPERATURE** The temperature is  $16^{\circ}\text{F}$  in the morning and drops to  $-15^{\circ}\text{F}$  in the evening. What is the difference between these temperatures? \_\_\_\_\_

22. **SUBMARINE** A submarine is 450 feet below sea level. It descends 300 feet. What is its new position? Show your work.



**REVIEW:** Adding and Subtracting Fractions with Unlike Denominators

Name \_\_\_\_\_

**Key Concept and Vocabulary**

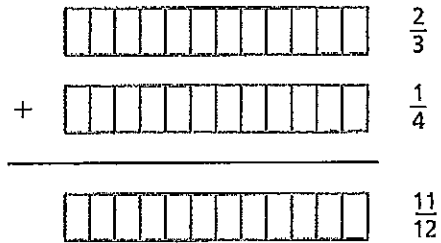
Find products.

$$\frac{2}{3} \times \frac{1}{4} = \frac{2 \cdot 4 + 3 \cdot 1}{3 \cdot 4} = \frac{11}{12}$$

$$\frac{2}{3} \times \frac{1}{4} = \frac{2 \cdot 4 - 3 \cdot 1}{3 \cdot 4} = \frac{5}{12}$$



**Visual Model**



**Skill Examples**

- $\frac{1}{5} + \frac{2}{3} = \frac{1 \cdot 3 + 5 \cdot 2}{5 \cdot 3} = \frac{13}{15}$
- $\frac{1}{2} + \frac{1}{4} = \frac{1 \cdot 4 + 2 \cdot 1}{2 \cdot 4} = \frac{6}{8} = \frac{3}{4}$
- $\frac{1}{3} - \frac{1}{4} = \frac{1 \cdot 4 - 3 \cdot 1}{3 \cdot 4} = \frac{1}{12}$
- $\frac{3}{7} - \frac{2}{5} = \frac{3 \cdot 5 - 7 \cdot 2}{7 \cdot 5} = \frac{1}{35}$

**Application Example**

- You ride your bike  $\frac{3}{8}$  mile to the store. Then you ride  $\frac{1}{6}$  mile to school. How far do you ride altogether?

$$\frac{3}{8} + \frac{1}{6} = \frac{3 \cdot 6 + 8 \cdot 1}{8 \cdot 6} = \frac{26}{48} = \frac{13}{24}$$



You ride  $\frac{13}{24}$  mile.

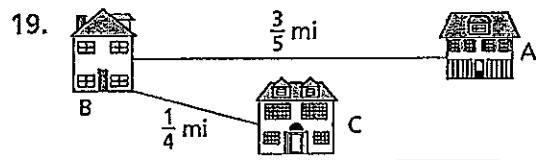
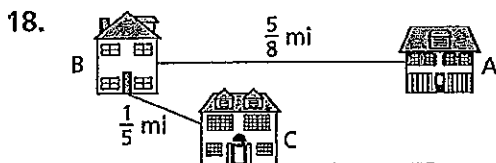
**PRACTICE MAKES PURR-FECT™**

Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

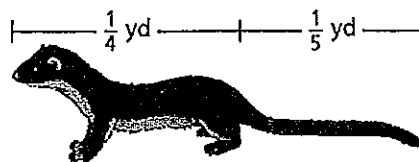
Find the sum or difference. Write your answer in simplified form.

- $\frac{1}{3} + \frac{1}{8} =$  \_\_\_\_\_
- $\frac{2}{3} + \frac{1}{5} =$  \_\_\_\_\_
- $\frac{3}{10} + \frac{1}{4} =$  \_\_\_\_\_
- $\frac{1}{2} + \frac{2}{5} =$  \_\_\_\_\_
- $\frac{3}{7} + \frac{1}{3} =$  \_\_\_\_\_
- $\frac{1}{8} + \frac{2}{5} =$  \_\_\_\_\_
- $\frac{5}{8} - \frac{1}{3} =$  \_\_\_\_\_
- $\frac{5}{6} - \frac{3}{5} =$  \_\_\_\_\_
- $\frac{5}{9} - \frac{2}{5} =$  \_\_\_\_\_
- $\frac{7}{10} - \frac{1}{4} =$  \_\_\_\_\_
- $\frac{3}{5} - \frac{1}{6} =$  \_\_\_\_\_
- $\frac{1}{5} - \frac{1}{6} =$  \_\_\_\_\_

Find the total distance from House A to House B and then to House C.



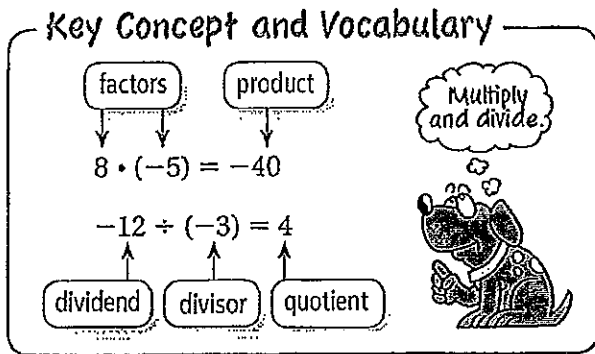
- WEASEL LENGTH** Find the total length of the weasel. \_\_\_\_\_



- IMPROVING YOUR SPEED** You swam at a rate of  $\frac{3}{8}$  mile per hour in March. You swam at a rate of  $\frac{3}{7}$  mile per hour in April. How much faster did you swim in April? \_\_\_\_\_

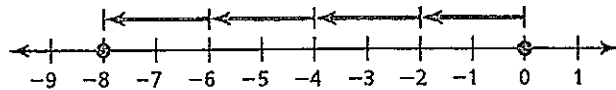
# REVIEW: Multiplying and Dividing Integers

Name \_\_\_\_\_



## Visual Model

$$4 \cdot (-2) = (-2) + (-2) + (-2) + (-2)$$



## Skill Examples

- $-3 \cdot (-4) = 12$  ← same sign, product and quotient positive
- $-36 \div (-6) = 6$  ← same sign, product and quotient positive
- $-7 \cdot 0 = 0$
- $-10 \div 5 = -2$  ← different signs, product and quotient negative
- $-5 \cdot 6 = -30$  ← different signs, product and quotient negative

## Application Example

- Each of your six friends owes you \$5. Use integer multiplication to represent the total amount your friends owe you.

$$6 \cdot (-5) = -30$$

∴ The total amount owed is \$30.

## PRACTICE MAKES PURR-FECT™



Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Find the product or quotient.

- $-3 \times (-5) = \underline{\quad}$
- $7(-3) = \underline{\quad}$
- $0 \cdot (-5) = \underline{\quad}$
- $(-5)(-7) = \underline{\quad}$
- $-8 \cdot 2 = \underline{\quad}$
- $(-5)^2 = \underline{\quad}$
- $(-3)^3 = \underline{\quad}$
- $4(-2)(-3) = \underline{\quad}$
- $-16 \div 4 = \underline{\quad}$
- $-20 \div (-5) = \underline{\quad}$
- $\frac{-9}{3} = \underline{\quad}$
- $\frac{-20}{-10} = \underline{\quad}$

Complete the multiplication or division equation.

- $-15 \div \underline{\quad} = -3$
- $45 \div \underline{\quad} = -5$
- $\underline{\quad} \div (-20) = 5$
- $8 \cdot \underline{\quad} = -64$
- $\underline{\quad} \cdot (-9) = 27$
- $-12 \cdot \underline{\quad} = -96$

- TOTAL OWED** Each of your eight friends owes you \$10. Use integer multiplication to represent the total amount your friends owe you. \_\_\_\_\_

- TEMPERATURE** The low temperatures for a week in Edmonton, Alberta are  $-15^\circ\text{C}$ ,  $-12^\circ\text{C}$ ,  $-10^\circ\text{C}$ ,  $-12^\circ\text{C}$ ,  $-18^\circ\text{C}$ ,  $-20^\circ\text{C}$ , and  $-25^\circ\text{C}$ . What is the mean low temperature for the week? Show your work.  
\_\_\_\_\_

# REVIEW: Multiplying Mixed Numbers

Name \_\_\_\_\_

## Key Concept and Vocabulary

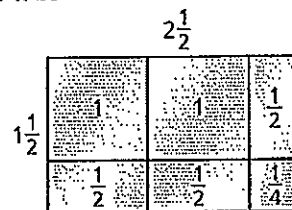
$$2\frac{1}{2} \times 1\frac{1}{2} = \frac{5}{2} \times \frac{3}{2} = \frac{15}{4}$$

Rewrite as improper fractions.

Multiply.



## Visual Model



$$\text{Area} = 2\frac{1}{2} \times 1\frac{1}{2} = \frac{15}{4} = 3\frac{3}{4}$$

## Skill Examples

1.  $3\frac{1}{2} \times 2\frac{1}{3} = \frac{7}{2} \times \frac{7}{3} = \frac{49}{6} = 8\frac{1}{6}$

2.  $1\frac{3}{4} \cdot 4\frac{1}{2} = \frac{7}{4} \cdot \frac{9}{2} = \frac{63}{8} = 7\frac{7}{8}$

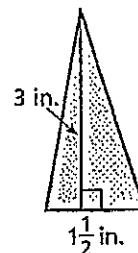
3.  $2\frac{2}{5} \times 1\frac{2}{3} = \frac{12}{5} \times \frac{5}{3} = \frac{60}{15} = 4$

4.  $\left(1\frac{1}{2}\right)\left(1\frac{1}{2}\right) = \left(\frac{3}{2}\right)\left(\frac{3}{2}\right) = \frac{9}{4} = 2\frac{1}{4}$

## Application Example

5. Find the area of the triangle.

$$\begin{aligned} \text{Area} &= \frac{1}{2} \cdot 1\frac{1}{2} \cdot 3 \\ &= \frac{1}{2} \cdot \frac{3}{2} \cdot \frac{3}{1} = \frac{9}{4} = 2\frac{1}{4} \end{aligned}$$



∴ The area is  $2\frac{1}{4}$  square inches.

## PRACTICE MAKES PURR-FECT™



Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Find the product. Write your answer as a whole number or mixed number in simplified form.

6.  $2\frac{1}{3} \times 1\frac{1}{3} =$  \_\_\_\_\_

7.  $4\frac{2}{3} \times 1\frac{1}{2} =$  \_\_\_\_\_

8.  $1\frac{1}{2} \times 3 =$  \_\_\_\_\_

9.  $5\frac{1}{6} \times \frac{1}{3} =$  \_\_\_\_\_

10.  $\frac{3}{4} \cdot 3\frac{1}{2} =$  \_\_\_\_\_

11.  $5 \cdot 4\frac{1}{2} =$  \_\_\_\_\_

12.  $2\frac{1}{7} \cdot \frac{7}{15} =$  \_\_\_\_\_

13.  $1\frac{3}{5} \cdot \frac{3}{8} =$  \_\_\_\_\_

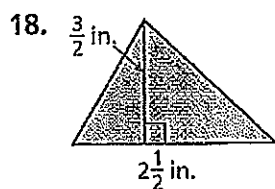
14.  $\left(1\frac{1}{3}\right)^2 =$  \_\_\_\_\_

15.  $\left(1\frac{1}{4}\right)^3 =$  \_\_\_\_\_

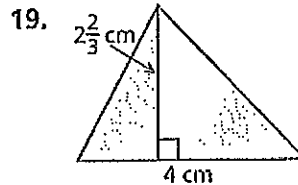
16.  $\left(2\frac{1}{2}\right)\left(3\frac{1}{3}\right) =$  \_\_\_\_\_

17.  $\left(3\frac{1}{2}\right)\left(\frac{1}{2}\right)^2 =$  \_\_\_\_\_

Find the area of the triangle.



Area = \_\_\_\_\_



Area = \_\_\_\_\_

20. **RECIPE** Rewrite the recipe so that each item is one-third of the full recipe.

$\frac{1}{2}$  cups flour  
2 tsp baking powder  
4 Tbsp butter  
 $\frac{1}{2}$  tsp salt  
 $\frac{3}{4}$  cup milk

\_\_\_\_\_ cups flour

\_\_\_\_\_ tsp salt

\_\_\_\_\_ tsp baking powder

\_\_\_\_\_ cup milk

\_\_\_\_\_ Tbsp butter



# REVIEW: Dividing Mixed Numbers

Name \_\_\_\_\_

## Key Concept and Vocabulary

Rewrite as improper fractions.

$$2\frac{1}{2} \div 5 = \frac{5}{2} \div \frac{5}{1}$$

$$= \frac{5}{2} \times \frac{1}{5}$$

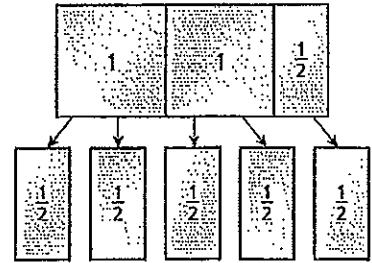
$$= \frac{1}{2}$$



## Visual Model

Divide  $2\frac{1}{2}$  into five equal parts.  
Each part is  $\frac{1}{2}$ .

$$2\frac{1}{2} \div 5 = \frac{1}{2}$$



## Skill Examples

- $5 \div 2\frac{1}{2} = \frac{5}{1} \div \frac{5}{2} = \frac{5}{1} \times \frac{2}{5} = 2$
- $3\frac{3}{4} \div 2\frac{1}{2} = \frac{15}{4} \div \frac{5}{2} = \frac{15}{4} \times \frac{2}{5} = \frac{3}{2} = 1\frac{1}{2}$
- $4\frac{1}{6} \div 1\frac{2}{3} = \frac{25}{6} \div \frac{5}{3} = \frac{25}{6} \times \frac{3}{5} = \frac{5}{2} = 2\frac{1}{2}$
- $7\frac{1}{3} \div 11 = \frac{22}{3} \div \frac{11}{1} = \frac{22}{3} \times \frac{1}{11} = \frac{2}{3}$

## Application Example

- You need  $2\frac{1}{2}$  inches of ribbon to make a Blue-Ribbon award. How many awards can you make with 35 inches of ribbon?

$$35 \div 2\frac{1}{2} = \frac{35}{1} \div \frac{5}{2} = \frac{35}{1} \times \frac{2}{5} = 14$$

∴ You can make 14 awards.



## PRACTICE MAKES PURR-FECT™

Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Find the quotient. Write your answer as a whole or mixed number in simplest form.

- $4\frac{1}{2} \div 9 = \underline{\hspace{2cm}}$
- $3\frac{3}{7} \div 8 = \underline{\hspace{2cm}}$
- $4\frac{2}{3} \div 7 = \underline{\hspace{2cm}}$
- $1\frac{7}{9} \div 4 = \underline{\hspace{2cm}}$
- $8 \div 1\frac{1}{3} = \underline{\hspace{2cm}}$
- $32 \div 3\frac{1}{5} = \underline{\hspace{2cm}}$
- $11 \div 2\frac{3}{4} = \underline{\hspace{2cm}}$
- $9 \div 1\frac{1}{2} = \underline{\hspace{2cm}}$
- $5\frac{1}{2} \div \frac{1}{2} = \underline{\hspace{2cm}}$
- $\frac{1}{2} \div 1\frac{1}{2} = \underline{\hspace{2cm}}$
- $1\frac{1}{4} \div 1\frac{1}{4} = \underline{\hspace{2cm}}$
- $3\frac{1}{2} \div 1\frac{1}{3} = \underline{\hspace{2cm}}$

Find the missing dimension.

18. Area = 10 ft<sup>2</sup>

19. Area = 16 cm<sup>2</sup>

- RED RIBBONS** You need  $3\frac{1}{2}$  inches of ribbon to make a Red-Ribbon award. How many awards can you make with 35 inches of ribbon? \_\_\_\_\_
- SHIPPING** You are stacking books into a shipping box that is 15 inches high. Each book is  $1\frac{1}{4}$  inches thick. How many books can you fit in a stack? \_\_\_\_\_

**5.6****Study Guide**

For use with pages 247-252

**GOAL** Use multiplicative inverses to solve equations.**VOCABULARY**

The multiplicative inverse of a nonzero number is the number's reciprocal.

Lesson 5.6

**EXAMPLE 1** Solving a One-Step Equation

$$\frac{4}{15}x = -\frac{10}{33} \quad \text{Original equation}$$

$$-\frac{15}{4}\left(-\frac{4}{15}\right)x = -\frac{15}{4}\left(-\frac{10}{33}\right) \quad \text{Multiply each side by multiplicative inverse of } -\frac{4}{15}.$$

$$1x = -\frac{15}{4}\left(-\frac{10}{33}\right) \quad \text{Multiplicative inverse property}$$

$$x = \frac{\cancel{15}^{-5} \cdot \cancel{10}^{-5}}{4 \cdot \cancel{33}^{11}} \quad \begin{array}{l} \text{Use rule for multiplying fractions.} \\ \text{Divide out common factors.} \end{array}$$

$$= \frac{25}{22} \quad \text{Multiply.}$$

$$= 1\frac{3}{22} \quad \text{Write fraction as a mixed number.}$$

Answer: The solution is  $1\frac{3}{22}$ .**EXAMPLE 2** Solving a Two-Step Equation

$$\frac{8}{15}x + \frac{7}{20} = \frac{13}{20} \quad \text{Original equation}$$

$$\frac{8}{15}x + \frac{7}{20} - \frac{7}{20} = \frac{13}{20} - \frac{7}{20} \quad \text{Subtract } \frac{7}{20} \text{ from each side.}$$

$$\frac{8}{15}x = \frac{13}{20} - \frac{7}{20} \quad \text{Simplify.}$$

$$\frac{8}{15}x = \frac{6}{20} \quad \text{Subtract.}$$

$$\frac{15}{8}\left(\frac{8}{15}x\right) = \frac{15}{8}\left(\frac{6}{20}\right) \quad \begin{array}{l} \text{Multiply each side by multiplicative inverse of } \frac{8}{15}. \\ \text{Divide out common factors.} \end{array}$$

$$x = \frac{9}{16} \quad \text{Simplify.}$$

## Practice A

For use with pages 247-252

Solve the equation. Check your solution.

1.  $\frac{2}{3}x = 36$

2.  $-\frac{4}{5}x = 16$

3.  $\frac{5}{9}x = 10$

4.  $\frac{3}{4}x = 12$

5.  $-\frac{3}{5}x = 16$

6.  $-\frac{3}{4}x = 18$

7.  $-\frac{9}{17}x = \frac{3}{17}$

8.  $\frac{5}{9}x = \frac{7}{18}$

9.  $-\frac{1}{2}x = \frac{3}{4}$

10.  $-\frac{2}{3}x = \frac{7}{18}$

11.  $-\frac{11}{18}x = \frac{1}{3}$

12.  $-\frac{7}{10}x = -\frac{2}{5}$

Solve the equation. Check your solution.

13.  $\frac{1}{2}x - 1 = 4$

14.  $\frac{2}{3}x + 2 = 12$

15.  $20 = \frac{8}{13}x + 12$

16.  $-\frac{1}{2}x + (-6) = 14$

17.  $-22 = 14 - \frac{9}{10}x$

18.  $-16 = \frac{3}{5}x + 8$

19.  $20 = -\frac{8}{15}x - 12$

20.  $\frac{2}{5}x + \frac{1}{5} = \frac{2}{5}$

21.  $\frac{11}{13}x + \frac{9}{13} = -\frac{10}{13}$

22.  $\frac{7}{15} - \frac{3}{5}x = \frac{3}{5}$

23.  $\frac{11}{24} = \frac{5}{12} - \frac{1}{2}x$

24.  $-\frac{13}{21} = \frac{2}{3}x + \frac{4}{7}$

# Operations with Rational Numbers

To add, subtract, multiply, or divide rational numbers, use the same rules for signs as you used for integers.

**Example 1** Find (a)  $-\frac{5}{6} + \frac{2}{3}$  and (b)  $7.3 - (-4.8)$ .

a. Write the fractions with the same denominator, then add.

$$-\frac{5}{6} + \frac{2}{3} = -\frac{5}{6} + \frac{4}{6} = \frac{-5 + 4}{6} = \frac{-1}{6} = -\frac{1}{6}$$

b. To subtract a rational number, add its opposite.

$$7.3 - (-4.8) = 7.3 + 4.8 = 12.1 \quad \text{The opposite of } -4.8 \text{ is } 4.8.$$

**Example 2** Find (a)  $2.25 \cdot 8$ , (b)  $-2.25 \cdot (-8)$ , and (c)  $-2.25 \cdot 8$ .

a.  $2.25 \cdot 8 = 18$

b.  $-2.25 \cdot (-8) = 18$

c.  $-2.25 \cdot 8 = -18$

**Example 3** Find  $-\frac{4}{9} \div \frac{3}{4}$ .

To divide by a fraction, multiply by its reciprocal.

$$-\frac{4}{9} \div \frac{3}{4} = -\frac{4}{9} \cdot \frac{4}{3} = -\frac{4 \cdot 4}{9 \cdot 3} = -\frac{16}{27} \quad \text{The reciprocal of } \frac{3}{4} \text{ is } \frac{4}{3}.$$

## Practice

Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Add, subtract, multiply, or divide.

1.  $-7.5 + 3.8$

2.  $-18.3 + (-6.7)$

3.  $0.6 - 0.85$

4.  $6.13 - (-2.82)$

5.  $-6 \cdot 4.75$

6.  $-3.2 \cdot (-4.8)$

7.  $-1.8 \div (-9)$

8.  $3.6 \div (-1.5)$

9.  $-\frac{1}{6} + \frac{5}{6}$

10.  $-\frac{7}{10} + \left(-\frac{3}{5}\right)$

11.  $\frac{4}{9} - \frac{2}{3}$

12.  $-\frac{5}{6} - \frac{1}{4}$

13.  $-\frac{3}{2} \cdot \left(-\frac{1}{8}\right)$

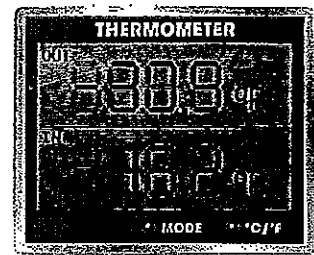
14.  $\frac{3}{4} \cdot \frac{7}{12}$

15.  $\frac{5}{8} \div \left(-\frac{1}{4}\right)$

16.  $-\frac{4}{7} \div \frac{2}{5}$

17. **TEMPERATURE** The temperature at midnight is shown. The outside temperature decreases  $2.3^\circ\text{C}$  over the next two hours. What is the outside temperature at 2 A.M.?

18. **SNOWFALL** In January, a city's snowfall was  $\frac{5}{8}$  foot below the historical average. In February, the snowfall was  $\frac{3}{4}$  foot above the historical average. Was the city's snowfall in the two-month period above or below the historical average? By how much?



# Evaluating Algebraic Expressions

An **algebraic expression** is an expression that may contain numbers, operations, and one or more symbols. A symbol that represents one or more numbers is called a **variable**. To evaluate an algebraic expression, substitute a number for each variable. Then use the order of operations to find the value of the numerical expression.

**Example 1** Evaluate each expression when  $x = 3$ .

a.  $5x + 7$

$$\begin{aligned} 5x + 7 &= 5(3) + 7 && \text{Substitute 3 for } x. \\ &= 15 + 7 && \text{Multiply.} \\ &= 22 && \text{Add.} \end{aligned}$$

b.  $14 - x^2$

$$\begin{aligned} 14 - x^2 &= 14 - 3^2 && \text{Substitute 3 for } x. \\ &= 14 - 9 && \text{Evaluate power.} \\ &= 5 && \text{Subtract.} \end{aligned}$$

c.  $2x^2 - 8x + 4$

$$\begin{aligned} 2x^2 - 8x + 4 &= 2(3)^2 - 8(3) + 4 && \text{Substitute 3 for } x. \\ &= 2(9) - 8(3) + 4 && \text{Evaluate power.} \\ &= 18 - 24 + 4 && \text{Multiply.} \\ &= -2 && \text{Simplify.} \end{aligned}$$

**Example 2** Evaluate each expression when  $x = -2$  and  $y = 6$ .

a.  $7x - 5y$

$$\begin{aligned} 7x - 5y &= 7(-2) - 5(6) \\ &= -14 - 30 \\ &= -44 \end{aligned}$$

b.  $x^2 - 2xy + y^2$

$$\begin{aligned} x^2 - 2xy + y^2 &= (-2)^2 - 2(-2)(6) + 6^2 \\ &= 4 - 2(-2)(6) + 36 \\ &= 4 - (-24) + 36 \\ &= 64 \end{aligned}$$

## Practice

Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Evaluate the expression when  $x = 2$  and  $y = -3$ .

1.  $3x + 10$

2.  $14 - 2y$

3.  $5 - y^2$

4.  $4x^2 + 9$

5.  $y^2 + 8y - 4$

6.  $-3x^2 - x + 7$

7.  $0.75x - 4x - 1.5$

8.  $3(y + 8 - 4y)$

9.  $2x + 3y$

10.  $6y - 5x$

11.  $4x^2 + 3y$

12.  $x^2 - y^2$

13.  $y - x + y^2$

14.  $x^2y^2 + xy$

15.  $\frac{x+y}{y-x}$

16.  $\frac{2x+y}{xy}$

Copy and complete the table.

17.

|          |   |   |   |   |   |
|----------|---|---|---|---|---|
| $x$      | 0 | 1 | 2 | 3 | 4 |
| $3x - 2$ |   |   |   |   |   |

18.

|           |    |    |   |   |   |
|-----------|----|----|---|---|---|
| $x$       | -2 | -1 | 0 | 1 | 2 |
| $-4x + 1$ |    |    |   |   |   |

19. **MONEY** You earn  $8x + 7y$  dollars for working  $x$  hours at a restaurant and  $y$  hours at a bus station. How much do you earn for working 12 hours at the restaurant and 16 hours at the bus station?

# REVIEW: Writing Expressions and Equations

Name \_\_\_\_\_

## Key Concept and Vocabulary

Phrase: Two more than a number

Expression:  $2 + n$

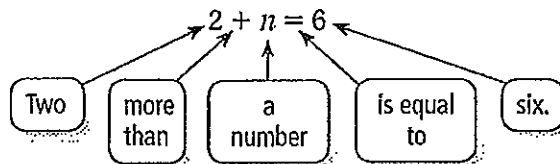
Sentence: Two more than a number is equal to six.

Equation:  $2 + n = 6$

Writing Expressions



## Visual Model



## Skill Examples

- Five times a number:  $5n$
- Six less than three times a number:  $3n - 6$
- The sum of a number and one:  $n + 1$
- A number divided by three:  $n \div 3$

## Application Example

- Write an equation for the following.  
"The price of \$15 is the wholesale cost plus a markup of fifty percent."

Let  $C$  be the wholesale cost.

50% of  $C$  is  $0.5C$ .

∴ An equation is  $15 = C + 0.5C$ .

## PRACTICE MAKES PURR-FECT™



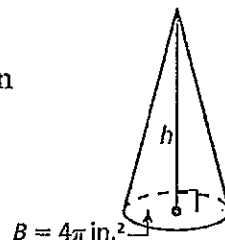
Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Write the verbal phrase as a mathematical expression.

- |   |  |
|---|--|
| 6. The product of a number and two<br>_____         | 7. 10 subtracted from a number<br>_____                    |
| 8. 19 less than twice a number<br>_____             | 9. The sum of a number and three, divided by four<br>_____ |
| 10. Five times the sum of a number and two<br>_____ | 11. Seven less than four times a number<br>_____           |

Write the sentence as an equation.

- |  |   |
|--|---|
| 12. Three times a number equals nine.<br>_____   | 13. The difference of a number and nine is four.<br>_____ |
| 14. Twelve divided by a number is four.<br>_____   | 15. The sum of a number and seven is eighteen.<br>_____   |
| 16. The volume of a cone is one-third the area of the base times the height. A cone has a volume of $20\pi$ cubic inches. Write an equation that can be used to solve for the height of the cone.<br>_____ |   |



# REVIEW: Percents and Proportions

Name \_\_\_\_\_

**Key Concept and Vocabulary**


To represent “ $a$  is  $p$  percent of  $w$ ,” use a proportion.

part of the whole →  $\frac{a}{w}$

whole →  $\frac{p}{100}$

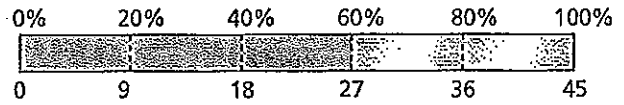
percent

$\frac{a}{w} = \frac{p}{100}$



Proportion

## Visual Model



27 is 60% of 45.

## Skill Examples

1.  $\frac{36}{50} = \frac{p}{100}$

$$100 \cdot \frac{36}{50} = 100 \cdot \frac{p}{100}$$

$$72 = p$$

∴ So, 36 is 72% of 50.

2.  $\frac{a}{36} = \frac{20}{100}$

$$36 \cdot \frac{a}{36} = 36 \cdot \frac{20}{100}$$

$$a = 7.2$$

∴ So, 7.2 is 20% of 36.

## Application Example

3. A basketball player makes 45%, or 9 shots, of her attempted shots. How many shots did the basketball player attempt?

$$\frac{9}{w} = \frac{45}{100}$$

$$9 \cdot 100 = w \cdot 45$$

$$900 = 45w$$

$$\frac{900}{45} = \frac{45w}{45}$$

$$20 = w$$

- ∴ The basketball player attempted 20 shots.



## PRACTICE MAKES PURR-FECT™



Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Write and solve a proportion to answer the question.

4. 68 is what percent of 80?

\_\_\_\_\_

5. What number is 25% of 116?

\_\_\_\_\_

6. 36 is 16% of what number?

\_\_\_\_\_

7. 48 is what percent of 128?

\_\_\_\_\_

8. What number is 64% of 40?

\_\_\_\_\_

9. 77 is 55% of what number?

\_\_\_\_\_

10. **PLAY** Students are auditioning for a play. Of the 60 students auditioning, 12 will get a part in the play. What percent of the students who audition will get a part in the play?

\_\_\_\_\_

11. **HOMEWORK** You have completed 60% of your English homework. The assignment has 25 questions. How many questions are left? \_\_\_\_\_

# REVIEW: Angles of Triangles

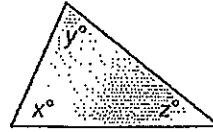
Name \_\_\_\_\_

## Key Concept and Vocabulary

The sum of the angle measures of a triangle is  $180^\circ$ .



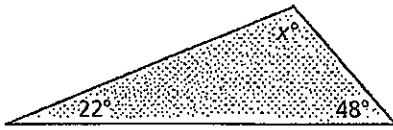
## Visual Model



$$x + y + z = 180$$

## Skill Example

1.



$$x + 22 + 48 = 180$$

$$x + 70 = 180$$

$$x = 110$$

## Application Example

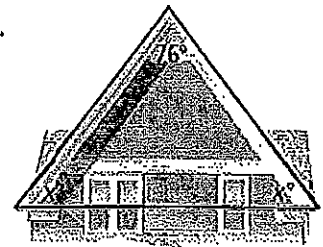
2. Find the value of  $x$ .

$$x + x + 76 = 180$$

$$2x - 76 = 180$$

$$2x = 104$$

$$x = 52$$



∴ The value of  $x$  is 52.

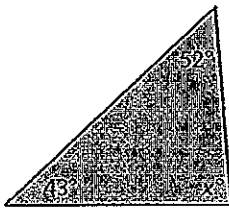
## PRACTICE MAKES PURR-FECT™



Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

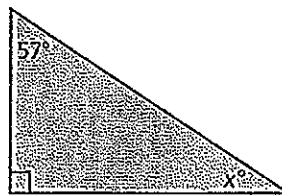
Find the value of  $x$ .

3.



$$x = \underline{\hspace{2cm}}$$

4.



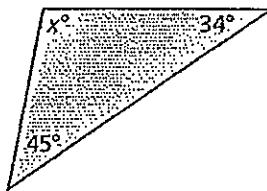
$$x = \underline{\hspace{2cm}}$$

5.



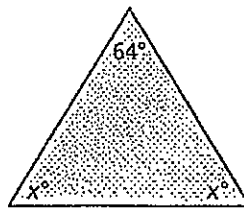
$$x = \underline{\hspace{2cm}}$$

6.



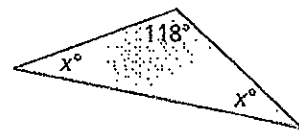
$$x = \underline{\hspace{2cm}}$$

7.



$$x = \underline{\hspace{2cm}}$$

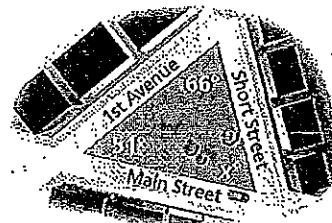
8.



$$x = \underline{\hspace{2cm}}$$

9. **PARK** A car travels around the park shown at the right. What is the value of  $x$ ?

\_\_\_\_\_





## Order of Operations

**Evaluate each expression.**

1)  $3(6 + 7)$

2)  $5 \times 3 \times 2$

3)  $72 \div 9 + 7$

4)  $2 + 7 \times 5$

5)  $9 + 8 - 7$

6)  $9 - 32 \div 4$

7)  $5(10 - 1)$

8)  $48 \div (4 + 4)$

9)  $20 \div (4 - (10 - 8))$

10)  $40 \div 4 - (5 - 3)$

11)  $9 + 9 + 6 - 5$

12)  $(5 + 16) \div 7 - 2$

13)  $7 + 10 \times 5 + 10$

14)  $(6 + 25 - 7) \div 6$

$$15) (6 - 4) \times 49 \div 7$$

$$16) (7 \times 5) \div 5$$

$$17) \frac{43 - 1}{4 + 2} + 10$$

$$18) (8 + 5) \times \frac{35}{5} + 6$$

$$19) \frac{27}{2 + 3 + 4} + 3$$

$$20) \frac{45}{8(5 - 4) - 3}$$

$$21) 8 \times \frac{15}{5} - (5 + 9)$$

$$22) 2 \times 7 - \frac{10}{9 - 4}$$

$$23) (10 + 2 - 2) \times 6 - 1$$

$$24) \frac{49}{7} \times \frac{60}{2 \times 5}$$

$$25) (2 + 6 \times 2 + 2 - 4) \times 2$$

$$26) \frac{8}{5 - 1} \times (3 + 6) \times 3$$

## Combining Like Terms

**Simplify each expression.**

1)  $-6k + 7k$

2)  $12r - 8 - 12$

3)  $n - 10 + 9n - 3$

4)  $-4x - 10x$

5)  $-r - 10r$

6)  $-2x + 11 + 6x$

7)  $11r - 12r$

8)  $-v + 12v$

9)  $-8x - 11x$

10)  $4p + 2p$

11)  $5n + 11n$

12)  $n + 4 - 9 - 5n$

13)  $12r + 5 + 3r - 5$

14)  $-5 + 9n + 6$

$$15) n - 4 - 9$$

$$16) 4n - n$$

$$17) -3x - 9 + 15x$$

$$18) -9k + 8k$$

$$19) -16n - 14n$$

$$20) 15n - 19n$$

$$21) -4 + 7(1 - 3m)$$

$$22) -5n + 3(6 + 7n)$$

$$23) -2n - (9 - 10n)$$

$$24) 10 - 5(9n - 9)$$

$$25) 9a + 10(6a - 1)$$

$$26) -9(6m - 3) + 6(1 + 4m)$$

$$27) -10(1 - 9x) + 6(x - 10)$$

$$28) 5(-2n + 4) + 2(n + 3)$$

$$29) -3(10b + 10) + 5(b + 2)$$

$$30) -7(n + 3) - 8(1 + 8n)$$

Student Name: \_\_\_\_\_

Score: \_\_\_\_\_

**One-Step Equations – Integers**

Solve the one-step equations:

$$8 = -4 + x$$

$$-9 = \frac{u}{-6}$$

$$-1 = b - 15$$

$$96 = -8s$$

$$7 = \frac{b}{-12}$$

$$-15 = -11 + v$$

$$-165 = 15a$$

$$20 = k - 10$$

Student Name: \_\_\_\_\_

Score: \_\_\_\_\_

**Solve the Two-Step Equations – Integers**

$$4 + 3p = 19$$

$$\frac{x}{-3} - 2 = 9$$

$$-6k - 13 = 83$$

$$17(x + 5) = 0$$

$$7 = \frac{10 - g}{-2}$$

$$-7 = -11 + \frac{v}{5}$$

# Answer Keys

# Answer Keys

Name \_\_\_\_\_ Date \_\_\_\_\_

## Evaluating Algebraic Expressions

An algebraic expression is an expression that may contain numbers, operations, and one or more symbols. A symbol that represents one or more numbers is called a variable. To evaluate an algebraic expression, substitute a number for each variable. Then use the order of operations to find the value of the numerical expression.

Example 1 Evaluate each expression when  $x = 3$ .

a.  $5x + 7$   
 $5x + 7 = 5(3) + 7$  *Substitute 3 for x.*  
 $= 15 + 7$  *Multiply.*  
 $= 22$  *Add.*

b.  $14 - x^2$   
 $14 - x^2 = 14 - 3^2$  *Substitute 3 for x.*  
 $= 14 - 9$  *Evaluate power.*  
 $= 5$  *Subtract.*

c.  $2x^2 - 8x + 4$   
 $2x^2 - 8x + 4 = 2(3)^2 - 8(3) + 4$  *Substitute 3 for x.*  
 $= 2(9) - 8(3) + 4$  *Evaluate power.*  
 $= 18 - 24 + 4$  *Multiply.*  
 $= -2$  *Simplify.*

Example 2 Evaluate each expression when  $x = -2$  and  $y = 6$ .

a.  $7x - 5y$   
 $7x - 5y = 7(-2) - 5(6)$   
 $= -14 - 30$   
 $= -44$

b.  $x^2 - 2xy + y^2$   
 $x^2 - 2xy + y^2 = (-2)^2 - 2(-2)(6) + 6^2$   
 $= 4 - 2(-2)(6) + 36$   
 $= 4 - (-24) + 36$   
 $= 64$

### Practice

Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Evaluate the expression when  $x = 2$  and  $y = -3$ .

- $3x + 10$  16
- $14 - 2y$  20
- $5 - y^2$  -4
- $4x^2 + 9$  25
- $y^3 + 8y - 4$  -19
- $-3x^2 - x + 7$  -7
- $0.75x - 4x - 1.5$  -8
- $3(y + 8 - 4y)$  51
- $2x + 3y$  -5
- $6y - 5x$  -28
- $4x^2 + 3y$  7
- $x^2 - y^2$  -5
- $y - x + y^2$  4
- $x^2y^2 + xy$  30
- $\frac{x+y}{y-x}$   $\frac{1}{5}$
- $\frac{2x+y}{xy}$   $-\frac{1}{6}$

Copy and complete the table.

|     |          |    |   |   |   |    |
|-----|----------|----|---|---|---|----|
| 17. | $x$      | 0  | 1 | 2 | 3 | 4  |
|     | $3x - 2$ | -2 | 1 | 4 | 7 | 10 |

|     |           |    |    |   |    |    |
|-----|-----------|----|----|---|----|----|
| 18. | $x$       | -2 | -1 | 0 | 1  | 2  |
|     | $-4x + 1$ | 9  | 5  | 1 | -3 | -7 |

19. MONEY You earn  $8x + 7y$  dollars for working  $x$  hours at a restaurant and  $y$  hours at a bus station. How much do you earn for working 12 hours at the restaurant and 16 hours at the bus station? \$203

# Do not do!

## REVIEW: Writing and Graphing Inequalities

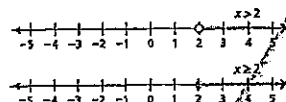
Name \_\_\_\_\_

### Key Concept and Vocabulary

- $x > 2$ : All numbers greater than 2
- $x \geq 2$ : All numbers greater than or equal to 2
- $x < 2$ : All numbers less than 2
- $x \leq 2$ : All numbers less than or equal to 2



### Visual Model



### Skill Examples

- $x > 0$ : All positive numbers
- $x \geq 0$ : All nonnegative numbers
- $x < 0$ : All negative numbers
- $x \leq 0$ : All nonpositive numbers

### Application Example

5. A sign at a clothing store reads "Savings up to 70%." Let  $S$  represent the percent of savings. Write an inequality to describe  $S$ .
- $S$  can be equal to 70%.  
 Or  $S$  can be less than 70%.
- An inequality is  $S \leq 70\%$ .

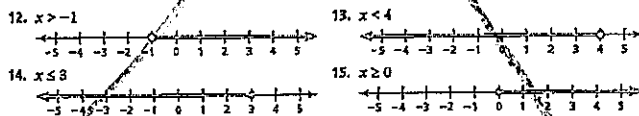
## PRACTICE MAKES PURR-FECT™

Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Write an inequality for the statement.

- All numbers that are less than 24  
 $x < 24$
- All numbers greater than 10  
 $x > 10$
- All numbers that are at least 11  
 $x \geq 11$
- All numbers that are at most 3  
 $x \leq 3$
- All numbers that are no more than 5  
 $x \leq 5$
- All numbers less than or equal to 8  
 $x \leq 8$

Graph the inequality:



16. A sign at a shoe store reads "Savings up to 60%." Let  $P$  represent the percent of savings. Write an inequality to describe  $P$ .
- $P \leq 60\%$



## REVIEW: Writing Expressions and Equations

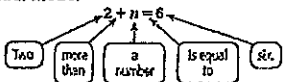
Name \_\_\_\_\_

### Key Concept and Vocabulary

Phrase: Two more than a number  
 Expression:  $2 + n$   
 Sentence: Two more than a number is equal to six.  
 Equation:  $2 + n = 6$



### Visual Model



### Skill Examples

- Five times a number:  $5n$
- Six less than three times a number:  $3n - 6$
- The sum of a number and one:  $n + 1$
- A number divided by three:  $n \div 3$

### Application Example

5. Write an equation for the following.  
 "The price of \$15 is the wholesale cost plus a markup of fifty percent."  
 Let  $C$  be the wholesale cost.  
 50% of  $C$  is 0.5C.

An equation is  $15 = C + 0.5C$ .

## PRACTICE MAKES PURR-FECT™

Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Write the verbal phrase as a mathematical expression.

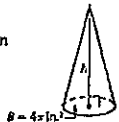
- The product of a number and two  
 $2n$
- 10 subtracted from a number  
 $n - 10$
- 19 less than twice a number  
 $2n - 19$
- Five times the sum of a number and two  
 $5(n + 2)$
- Seven less than four times a number  
 $4n - 7$

Write the sentence as an equation.

- Three times a number equals nine.  
 $3n = 9$
- The difference of a number and nine is four.  
 $n - 9 = 4$
- Twelve divided by a number is four.  
 $\frac{12}{n} = 4$
- The sum of a number and seven is eighteen.  
 $n + 7 = 18$

16. The volume of a cone is one-third the area of the base times the height. A cone has a volume of  $20\pi$  cubic inches. Write an equation that can be used to solve for the height of the cone.

$$20\pi = \frac{1}{3} \cdot 4\pi \cdot h$$



$$8 = 4\pi h$$

## REVIEW: Percents and Proportions

Name \_\_\_\_\_

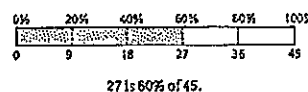
### Key Concept and Vocabulary

To represent " $n$  is  $p$  percent of  $w$ ," use a proportion.

$$\frac{\text{part of the whole}}{\text{whole}} = \frac{a}{w} = \frac{p}{100} = \frac{\text{percent}}{100}$$



### Visual Model



### Skill Examples

- $\frac{36}{50} = \frac{p}{100}$   
 $100 \cdot \frac{36}{50} = 100 \cdot \frac{p}{100}$   
 $72 = p$   
 So, 36 is 72% of 50.
- $\frac{a}{36} = \frac{20}{100}$   
 $36 \cdot \frac{a}{36} = 36 \cdot \frac{20}{100}$   
 $a = 7.2$   
 So, 7.2 is 20% of 36.

### Application Example

3. A basketball player makes 45%, or 9 shots, of her attempted shots. How many shots did the basketball player attempt?
- $$\frac{9}{w} = \frac{45}{100}$$
- $$9 \cdot 100 = 45w$$
- $$900 = 45w$$
- $$\frac{900}{45} = \frac{45w}{45}$$
- $$20 = w$$
- The basketball player attempted 20 shots.



## PRACTICE MAKES PURR-FECT™

Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Write and solve a proportion to answer the question.

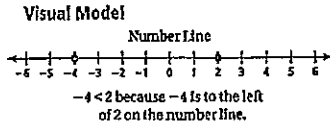
- 68 is what percent of 80?  
 $85\%$
- What number is 25% of 116?  
 $29$
- 36 is 16% of what number?  
 $225$
- 48 is what percent of 128?  
 $37.5\%$
- What number is 61% of 40?  
 $25.6$
- 77 is 55% of what number?  
 $140$
- PLAY Students are auditioning for a play. Of the 60 students auditioning, 12 will get a part in the play. What percent of the students who audition will get a part in the play?  
 $20\%$
- HOMEWORK You have completed 60% of your English homework. The assignment has 25 questions. How many questions are left?  
 $10$



**REVIEW: Comparing, Ordering, and Graphing Integers**

Name \_\_\_\_\_

**Key Concept and Vocabulary**



**Skill Examples**

- $0 \leq 4$  "0 is less than or equal to 4"
- $-1 > -3$  "-1 is greater than -3"
- $-2 < -1$  "-2 is less than -1"
- $2 > -2$  "2 is greater than -2"
- $3 \geq 2$  "3 is greater than or equal to 2"

**Application Example**

- The temperature in Seattle is  $4^{\circ}\text{F}$ . The temperature in Denver is  $-6^{\circ}\text{F}$ . Which temperature is greater?  
 $-6 < 4$  "-6 is less than 4"  
∴ The temperature is greater in Seattle.

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Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Graph the two numbers. Then compare them using  $<$ ,  $>$ , or  $=$ .

|              |  |              |  |
|--------------|--|--------------|--|
| 7. $-3 < 2$  |  | 8. $-1 < 0$  |  |
| 9. $-1 > -4$ |  | 10. $1 < 3$  |  |
| 11. $0 < 2$  |  | 12. $3 > -1$ |  |

Order the temperatures from least to greatest.

- $-5^{\circ}\text{F}$ ,  $13^{\circ}\text{F}$ ,  $0^{\circ}\text{F}$ ,  $5^{\circ}\text{F}$ ,  $2^{\circ}\text{F}$ ,  $20^{\circ}\text{F}$   
 $-5^{\circ}\text{F}$ ,  $0^{\circ}\text{F}$ ,  $2^{\circ}\text{F}$ ,  $5^{\circ}\text{F}$ ,  $13^{\circ}\text{F}$ ,  $20^{\circ}\text{F}$
- $7^{\circ}\text{C}$ ,  $-4^{\circ}\text{C}$ ,  $-11^{\circ}\text{C}$ ,  $0^{\circ}\text{C}$ ,  $8^{\circ}\text{C}$ ,  $-12^{\circ}\text{C}$   
 $-12^{\circ}\text{C}$ ,  $-11^{\circ}\text{C}$ ,  $-4^{\circ}\text{C}$ ,  $0^{\circ}\text{C}$ ,  $7^{\circ}\text{C}$ ,  $8^{\circ}\text{C}$

Use an integer to describe the real-life situation.

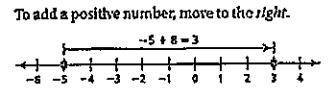
- A profit of \$5 5    16. A depth of 8 ft -8    17. A decrease of  $5^{\circ}\text{F}$  -5  
A loss of \$5 -5    A height of 4 ft 4    An increase of  $8^{\circ}\text{F}$  8
- BUSINESS LOSS** During its first week, a business had a loss that was greater than \$4, but less than \$6. Circle each integer that could represent this loss.  
 $-\$7$ ,  $-\$6$ ,  $-\$5$ ,  $-\$4$ ,  $-\$3$ ,  $-\$2$ ,  $-\$1$ ,  $\$0$ ,  $\$1$ ,  $\$2$ ,  $\$3$ ,  $\$4$ ,  $\$5$ ,  $\$6$ ,  $\$7$

**REVIEW: Adding and Subtracting Integers**

Name \_\_\_\_\_

**Key Concept and Vocabulary**

**Visual Model**



To subtract a positive number, move to the left.

**Skill Examples**

- $5 + (-3) = 5 - 3 = 2$
- $5 - (-2) = 5 + 2 = 7$
- $-2 + 4 = 2$
- $-3 - (-2) = -3 + 2 = -1$
- $8 - (-3) = 8 + 3 = 11$

To subtract, change the sign and add.

**Application Example**

- The temperature is  $6^{\circ}\text{F}$  in the morning and drops to  $-5^{\circ}\text{F}$  in the evening. What is the difference between these temperatures?  
 $6 - (-5) = 6 + 5 = 11$   
∴ The difference is 11 degrees.

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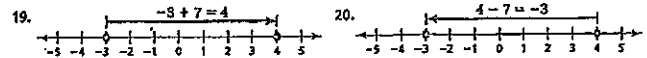


Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Find the sum or difference.

- |                       |                       |                     |                       |
|-----------------------|-----------------------|---------------------|-----------------------|
| 7. $-2 + 3 = 1$       | 8. $-4 - 5 = -9$      | 9. $0 - 2 = -2$     | 10. $8 - (-2) = 10$   |
| 11. $-4 - (-1) = -3$  | 12. $-5 + (-5) = -10$ | 13. $4 - (-8) = 12$ | 14. $4 - 8 = -4$      |
| 15. $-4 + (-6) = -10$ | 16. $-4 - (-6) = 2$   | 17. $10 - 13 = -3$  | 18. $13 - (-10) = 23$ |

Write the addition or subtraction shown by the number line.



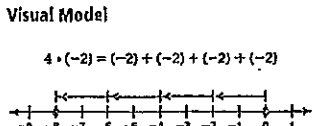
- TEMPERATURE** The temperature is  $16^{\circ}\text{F}$  in the morning and drops to  $-15^{\circ}\text{F}$  in the evening. What is the difference between these temperatures? 31 degrees
- SUBMARINE** A submarine is 450 feet below sea level. It descends 300 feet. What is its new position? Show your work.  
750 feet below sea level;  $-450 - 300 = -750$



**REVIEW: Multiplying and Dividing Integers**

Name \_\_\_\_\_

**Key Concept and Vocabulary**



**Skill Examples**

- $-3 \cdot (-4) = 12$  ← same sign, product and quotient positive
- $-36 \div (-6) = 6$
- $-7 \cdot 0 = 0$
- $-10 \div 5 = -2$  ← different sign, product and quotient negative
- $-5 \cdot 6 = -30$

**Application Example**

- Each of your six friends owes you \$5. Use integer multiplication to represent the total amount your friends owe you.  
 $6 \cdot (-5) = -30$   
∴ The total amount owed is \$30.

**PRACTICE MAKES PURR-FECT™**



Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Find the product or quotient.

- |                          |                         |                         |                           |
|--------------------------|-------------------------|-------------------------|---------------------------|
| 7. $-9 \times (-5) = 45$ | 8. $7(-3) = -21$        | 9. $0 \cdot (-5) = 0$   | 10. $(-5)(-7) = 35$       |
| 11. $-8 \cdot 2 = -16$   | 12. $(-5)^2 = 25$       | 13. $(-3)^3 = -27$      | 14. $4(-2)(-3) = 24$      |
| 15. $-16 \div 4 = -4$    | 16. $-20 \div (-5) = 4$ | 17. $\frac{-9}{3} = -3$ | 18. $\frac{-20}{-10} = 2$ |

Complete the multiplication or division equation.

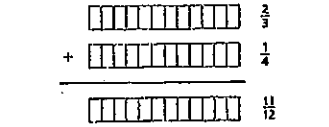
- $-15 \div \underline{5} = -3$
- $45 \div \underline{(-9)} = -5$
- $\underline{-100} \div (-20) = 5$
- $8 \cdot \underline{(-8)} = -64$
- $\underline{-3} \cdot (-9) = 27$
- $-12 \cdot \underline{8} = -96$
- TOTAL OWED** Each of your eight friends owes you \$10. Use integer multiplication to represent the total amount your friends owe you.  $8 \cdot (-10) = -80$ .  
The total amount owed is \$80.
- TEMPERATURE** The low temperatures for a week in Edmonton, Alberta are  $-16^{\circ}\text{C}$ ,  $-12^{\circ}\text{C}$ ,  $-10^{\circ}\text{C}$ ,  $-12^{\circ}\text{C}$ ,  $-18^{\circ}\text{C}$ ,  $-20^{\circ}\text{C}$ , and  $-25^{\circ}\text{C}$ . What is the mean low temperature for the week? Show your work.  
 $-16^{\circ}\text{C}$ ;  $(-16 + (-12) + (-10) + (-12) + (-18) + (-20) + (-25)) \div 7 = -112 \div 7 = -16$

**REVIEW: Adding and Subtracting Fractions with Unlike Denominators**

Name \_\_\_\_\_

**Key Concept and Vocabulary**

**Visual Model**



**Skill Examples**

- $\frac{1}{5} + \frac{2}{3} = \frac{1 \cdot 3 + 2 \cdot 5}{5 \cdot 3} = \frac{13}{15}$
- $\frac{1}{2} + \frac{1}{4} = \frac{1 \cdot 4 + 1 \cdot 2}{2 \cdot 4} = \frac{6}{8} = \frac{3}{4}$
- $\frac{1}{3} - \frac{1}{4} = \frac{1 \cdot 4 - 3 \cdot 1}{3 \cdot 4} = \frac{1}{12}$
- $\frac{3}{7} - \frac{2}{5} = \frac{3 \cdot 5 - 2 \cdot 7}{7 \cdot 5} = \frac{1}{35}$

**Application Example**

- You ride your bike  $\frac{3}{8}$  mile to the store. Then you ride  $\frac{1}{6}$  mile to school. How far do you ride altogether?  
 $\frac{3}{8} + \frac{1}{6} = \frac{3 \cdot 6 + 1 \cdot 8}{8 \cdot 6} = \frac{26}{48} = \frac{13}{24}$   
∴ You ride  $\frac{13}{24}$  miles.

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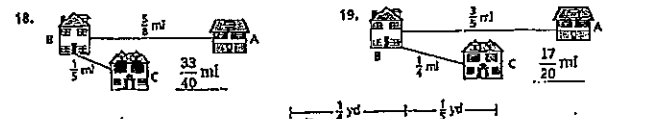


Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Find the sum or difference. Write your answer in simplified form.

- |   |   |   |  |
|---|---|---|--|
| 6. $\frac{1}{3} + \frac{1}{8} = \frac{11}{24}$  | 7. $\frac{2}{3} + \frac{1}{5} = \frac{13}{15}$  | 8. $\frac{3}{10} + \frac{1}{4} = \frac{7}{20}$  | 9. $\frac{1}{2} + \frac{2}{5} = \frac{9}{10}$  |
| 10. $\frac{3}{7} + \frac{1}{3} = \frac{16}{21}$ | 11. $\frac{1}{8} + \frac{2}{3} = \frac{17}{24}$ | 12. $\frac{5}{6} - \frac{1}{3} = \frac{1}{2}$   | 13. $\frac{5}{6} - \frac{3}{5} = \frac{7}{30}$ |
| 14. $\frac{5}{9} - \frac{2}{5} = \frac{7}{45}$  | 15. $\frac{7}{10} - \frac{1}{4} = \frac{9}{20}$ | 16. $\frac{3}{5} - \frac{1}{6} = \frac{13}{30}$ | 17. $\frac{1}{5} - \frac{1}{6} = \frac{1}{30}$ |

Find the total distance from House A to House B and then to House C.



- WEASEL LENGTH** Find the total length of the weasel.  $\frac{9}{20}$  yd
- IMPROVING YOUR SPEED** You swam at a rate of  $\frac{3}{8}$  mile per hour in March. You swam at a rate of  $\frac{3}{7}$  mile per hour in April. How much faster did you swim in April?  
 $\frac{3}{56}$  mile per hour

## REVIEW: Multiplying Mixed Numbers

Name \_\_\_\_\_

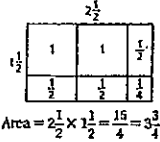
### Key Concept and Vocabulary

$$\frac{1}{2} \times \frac{1}{2} = \frac{1}{2} \times \frac{2}{2} = \frac{1}{4}$$

↑ ↑  
Rewrite as improper fractions.



### Visual Model



### Application Example

5. Find the area of the triangle.

$$\text{Area} = \frac{1}{2} \cdot \frac{1}{2} \cdot 3 = \frac{3}{4}$$



The area is  $2\frac{1}{4}$  square inches.

### Skill Examples

- $3\frac{1}{2} \times 2\frac{1}{3} = \frac{7}{2} \times \frac{4}{3} = \frac{14}{3} = 4\frac{2}{3}$
- $1\frac{3}{4} \cdot 4\frac{1}{2} = \frac{7}{4} \cdot \frac{9}{2} = \frac{63}{8} = 7\frac{7}{8}$
- $2\frac{2}{5} \times 1\frac{2}{3} = \frac{12}{5} \times \frac{5}{3} = \frac{60}{15} = 4$
- $(1\frac{1}{2})(1\frac{1}{2}) = (\frac{3}{2})(\frac{3}{2}) = \frac{9}{4} = 2\frac{1}{4}$

## PRACTICE MAKES PURR-FECT™

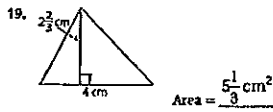
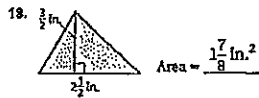


Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Find the product. Write your answer as a whole number or mixed number in simplest form.

- $2\frac{1}{3} \times 1\frac{1}{3} = \frac{8}{3}$
- $4\frac{2}{3} \times 1\frac{1}{2} = 7$
- $1\frac{1}{2} \times 3 = 4\frac{1}{2}$
- $5\frac{1}{6} \times \frac{1}{3} = \frac{13}{18}$
- $\frac{3}{4} \cdot 3\frac{1}{2} = \frac{9}{8}$
- $5 \cdot 4\frac{1}{2} = 22\frac{1}{2}$
- $2\frac{1}{7} \cdot \frac{7}{15} = \frac{1}{3}$
- $1\frac{3}{5} \cdot \frac{3}{8} = \frac{3}{8}$
- $(\frac{11}{3})^2 = \frac{121}{9}$
- $(1\frac{1}{3})^3 = \frac{64}{27}$
- $(2\frac{1}{2})(\frac{2}{3}) = \frac{5}{3}$
- $(3\frac{1}{2})(\frac{1}{2})^2 = \frac{7}{8}$

Find the area of the triangle.



20. **RECIPE** Rewrite the recipe so that each item is one-third of the full recipe.

|                                 |
|---------------------------------|
| $\frac{1}{3}$ cups flour        |
| $\frac{2}{3}$ tsp baking powder |
| $\frac{1}{3}$ tsp salt          |
| $\frac{1}{3}$ cup milk          |

|                                 |
|---------------------------------|
| $\frac{5}{6}$ cups flour        |
| $\frac{2}{3}$ tsp baking powder |
| $\frac{1}{6}$ tsp salt          |
| $\frac{1}{4}$ cup milk          |
| $\frac{1}{9}$ tsp butter        |

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Topic 7.3

Name \_\_\_\_\_ Date \_\_\_\_\_

## Operations with Rational Numbers

To add, subtract, multiply, or divide rational numbers, use the same rules for signs as you used for integers.

Example 1 Find (a)  $-\frac{5}{6} + \frac{2}{3}$  and (b)  $7.3 - (-4.8)$ .

- a. Write the fractions with the same denominator, then add.

$$-\frac{5}{6} + \frac{2}{3} = -\frac{5}{6} + \frac{4}{6} = \frac{-5+4}{6} = -\frac{1}{6}$$

- b. To subtract a rational number, add its opposite.

$$7.3 - (-4.8) = 7.3 + 4.8 = 12.1 \quad \text{The opposite of } -4.8 \text{ is } 4.8.$$

Example 2 Find (a)  $2.25 \cdot 8$ , (b)  $-2.25 \cdot (-8)$ , and (c)  $-2.25 \cdot 8$ .

- a.  $2.25 \cdot 8 = 18$       b.  $-2.25 \cdot (-8) = 18$       c.  $-2.25 \cdot 8 = -18$

Example 3 Find  $\frac{4}{9} \div \frac{3}{4}$ .

To divide by a fraction, multiply by its reciprocal.

$$\frac{4}{9} \div \frac{3}{4} = \frac{4}{9} \cdot \frac{4}{3} = \frac{4 \cdot 4}{9 \cdot 3} = \frac{16}{27} \quad \text{The reciprocal of } \frac{3}{4} \text{ is } \frac{4}{3}.$$

### Practice

Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Add, subtract, multiply, or divide.

- $-7.5 + 3.8 = -3.7$
- $-18.3 + (-6.7) = -25$
- $0.6 - 0.85 = -0.25$
- $6.13 - (-2.82) = 8.95$
- $-6 \cdot 4.75 = -28.5$
- $-3.2 \cdot (-4.8) = 15.36$
- $-1.8 \div (-9) = 0.2$
- $3.6 \div (-1.5) = -2.4$
- $\frac{1}{6} + \frac{5}{6} = \frac{2}{3}$
- $-\frac{7}{10} + (-\frac{3}{10}) = -\frac{10}{10} = -1$
- $\frac{4}{9} - \frac{2}{3} = -\frac{2}{9}$
- $\frac{5}{6} - \frac{1}{4} = \frac{11}{12}$
- $-\frac{3}{2} \cdot (-\frac{1}{8}) = \frac{3}{16}$
- $-\frac{3}{4} \cdot \frac{7}{12} = -\frac{7}{16}$
- $\frac{5}{8} \div (-\frac{1}{4}) = -2\frac{1}{2}$
- $-\frac{4}{7} \div \frac{2}{3} = -\frac{6}{7}$

17. **TEMPERATURE** The temperature at midnight is shown. The outside temperature decreases  $2\frac{3}{4}^\circ\text{C}$  over the next two hours. What is the outside temperature at 2 A.M.?  $-33.2^\circ\text{C}$

18. **SNOWFALL** In January, a city's snowfall was  $\frac{1}{2}$  foot below the historical average. In February, the snowfall was  $\frac{1}{3}$  foot above the historical average. Was the city's snowfall in the two-month period above or below the historical average? By how much?  $\frac{1}{6}$  foot



## REVIEW: Dividing Mixed Numbers

Name \_\_\_\_\_

### Key Concept and Vocabulary

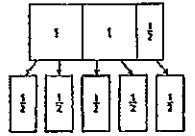
Rewrite as improper fractions

$$\begin{aligned} 2\frac{1}{2} \div 5 &= \frac{5}{2} \div \frac{5}{1} = \frac{5}{2} \times \frac{1}{5} = 2 \\ &= \frac{5}{2} \times \frac{1}{5} = \frac{5}{10} = \frac{1}{2} \end{aligned}$$



### Visual Model

Divide  $2\frac{1}{2}$  into five equal parts. Each part is  $\frac{1}{2}$ .



### Skill Examples

- $5 \div 2\frac{1}{2} = \frac{5}{1} \div \frac{5}{2} = \frac{5}{1} \times \frac{2}{5} = 2$
- $3\frac{3}{4} \div 2\frac{1}{4} = \frac{15}{4} \div \frac{5}{4} = \frac{15}{4} \times \frac{4}{5} = \frac{3}{1} = 3$
- $4\frac{1}{6} \div 1\frac{2}{3} = \frac{25}{6} \div \frac{5}{3} = \frac{25}{6} \times \frac{3}{5} = \frac{5}{2} = 2\frac{1}{2}$
- $7\frac{1}{3} \div 11 = \frac{22}{3} \div \frac{11}{1} = \frac{22}{3} \times \frac{1}{11} = \frac{2}{3}$

### Application Example

5. You need  $2\frac{1}{2}$  inches of ribbon to make a Blue-Ribbon award. How many awards can you make with 35 inches of ribbon?
- $$35 \div 2\frac{1}{2} = \frac{35}{1} \div \frac{5}{2} = \frac{35}{1} \times \frac{2}{5} = 14$$
- You can make 14 awards.

## PRACTICE MAKES PURR-FECT™

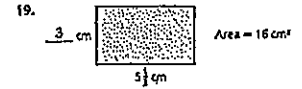
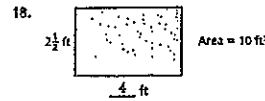


Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Find the quotient. Write your answer as a whole or mixed number in simplest form.

- $4\frac{1}{2} \div 9 = \frac{1}{2}$
- $3\frac{3}{7} \div 8 = \frac{3}{7}$
- $4\frac{2}{3} \div 7 = \frac{2}{3}$
- $1\frac{7}{9} \div 4 = \frac{4}{9}$
- $8 \div 1\frac{1}{3} = 6$
- $32 \div 3\frac{1}{5} = 10$
- $11 \div 2\frac{3}{4} = 4$
- $9 \div 1\frac{1}{2} = 6$
- $5\frac{1}{2} \div \frac{1}{2} = 11$
- $\frac{1}{2} \div 1\frac{1}{2} = \frac{1}{3}$
- $1\frac{1}{4} \div 1\frac{1}{4} = 1$
- $3\frac{1}{2} \div 1\frac{1}{3} = \frac{25}{6}$

Find the missing dimension.



20. **RED RIBBONS** You need  $3\frac{1}{2}$  inches of ribbon to make a Red-Ribbon award. How many awards can you make with 35 inches of ribbon? 10 awards
21. **SHIPPING** You are stacking books into a shipping box that is 15 inches high. Each book is  $1\frac{1}{4}$  inches thick. How many books can you fit in a stack? 12 books

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Topic 7.4

## LESSON 5.6 Practice A

For use with pages 247–252

Solve the equation. Check your solution.

- $\frac{2}{3}x = 36$  54
- $-\frac{4}{5}x = 16$  -20
- $\frac{5}{9}x = 10$  18
- $-\frac{3}{4}x = 32$  14
- $-\frac{3}{8}x = 16$  -26  $\frac{2}{3}$
- $-\frac{3}{4}x = 18$  -24
- $\frac{9}{17}x = \frac{3}{17}$   $\frac{1}{3}$
- $\frac{5}{8}x = \frac{7}{18}$   $\frac{7}{10}$
- $-\frac{1}{2}x = \frac{3}{4}$   $-\frac{3}{2}$
- $-\frac{2}{3}x = \frac{7}{18}$   $-\frac{7}{12}$
- $\frac{11}{18}x = \frac{1}{3}$   $\frac{6}{11}$
- $\frac{7}{10}x = -\frac{2}{5}$   $-\frac{4}{7}$

Solve the equation. Check your solution.

- $\frac{1}{2}x - 1 = 4$  10
- $\frac{2}{3}x + 2 = 12$  15
- $20 = \frac{8}{13}x + 12$  13
- $-\frac{1}{2}x + (-6) = 14$  -40
- $-22 = 14 - \frac{8}{10}x$  40
- $-16 = \frac{2}{3}x + 8$  -40
- $20 = -\frac{8}{13}x - 12$  -60
- $\frac{2}{5}x + \frac{1}{3} = \frac{2}{3}$   $\frac{1}{2}$
- $\frac{11}{13}x + \frac{9}{13} = -\frac{10}{13}$   $-\frac{19}{11}$
- $\frac{7}{15} - \frac{3}{5}x = \frac{3}{5}$   $-\frac{2}{9}$
- $\frac{11}{24} = \frac{5}{12} - \frac{1}{2}x$   $-\frac{1}{12}$
- $\frac{13}{21} - \frac{2}{3}x + \frac{4}{7} = -\frac{11}{14}$

REVIEW: Angles of Triangles

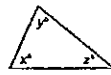
Name \_\_\_\_\_

Key Concept and Vocabulary

The sum of the angle measures of a triangle is 180°.



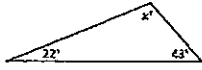
Visual Model



$$x + y + z = 180$$

Skill Example

1.



$$x + 22 + 48 = 180$$

$$x + 70 = 180$$

$$x = 110$$

Application Example

2. Find the value of  $x$ .

$$x + x + 76 = 180$$

$$2x - 76 = 180$$

$$2x = 104$$

$$x = 52$$



∴ The value of  $x$  is 52.

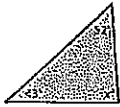
PRACTICE MAKES PURR-FECT™



Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

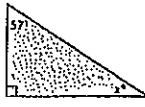
Find the value of  $x$ .

3.



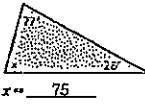
$$x = 85$$

4.



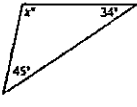
$$x = 33$$

5.



$$x = 75$$

6.



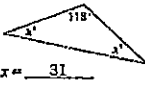
$$x = 101$$

7.



$$x = 58$$

8.



$$x = 31$$

9. PARK A car travels around the park shown at the right. What is the value of  $x$ ?

$$x = 63$$



## Order of Operations

Evaluate each expression.

1)  $3(6 + 7)$

39

2)  $5 \times 3 \times 2$

30

3)  $72 \div 9 + 7$

15

4)  $2 + 7 \times 5$

37

5)  $9 + 8 - 7$

10

6)  $9 - 32 \div 4$

1

7)  $5(10 - 1)$

45

8)  $48 \div (4 + 4)$

6

9)  $20 \div (4 - (10 - 8))$

10

10)  $40 \div 4 - (5 - 3)$

8

11)  $9 + 9 + 6 - 5$

19

12)  $(5 + 16) \div 7 - 2$

1

13)  $7 + 10 \times 5 + 10$

67

14)  $(6 + 25 - 7) \div 6$

4

$$15) (6 - 4) \times 49 \div 7$$

14

$$16) (7 \times 5) \div 5$$

7

$$17) \frac{43 - 1}{4 + 2} + 10$$

17

$$18) (8 + 5) \times \frac{35}{5} + 6$$

97

$$19) \frac{27}{2 + 3 + 4} + 3$$

6

$$20) \frac{45}{8(5 - 4) - 3}$$

9

$$21) 8 \times \frac{15}{5} - (5 + 9)$$

10

$$22) 2 \times 7 - \frac{10}{9 - 4}$$

12

$$23) (10 + 2 - 2) \times 6 - 1$$

59

$$24) \frac{49}{7} \times \frac{60}{2 \times 5}$$

42

$$25) (2 + 6 \times 2 + 2 - 4) \times 2$$

24

$$26) \frac{8}{5 - 1} \times (3 + 6) \times 3$$

54

## Combining Like Terms

Simplify each expression.

1)  $-6k + 7k$

$k$

2)  $12r - 8 - 12$

$12r - 20$

3)  $n - 10 + 9n - 3$

$10n - 13$

4)  $-4x - 10x$

$-14x$

5)  $-r - 10r$

$-11r$

6)  $-2x + 11 + 6x$

$4x + 11$

7)  $11r - 12r$

$-r$

8)  $-v + 12v$

$11v$

9)  $-8x - 11x$

$-19x$

10)  $4p + 2p$

$6p$

11)  $5n + 11n$

$16n$

12)  $n + 4 - 9 - 5n$

$-4n - 5$

13)  $12r + 5 + 3r - 5$

$15r$

14)  $-5 + 9n + 6$

$1 + 9n$

Student Name: \_\_\_\_\_

Score: \_\_\_\_\_

## Answers

$$8 = -4 + x$$

$$-9 = \frac{u}{-6}$$

$$x = 12$$

$$u = 54$$

$$-1 = b - 15$$

$$96 = -8s$$

$$b = 14$$

$$s = -12$$

$$7 = \frac{b}{-12}$$

$$-15 = -11 + v$$

$$b = -84$$

$$v = -4$$

$$-165 = 15a$$

$$20 = k - 10$$

$$a = -11$$

$$k = 30$$

Student Name: \_\_\_\_\_

Score: \_\_\_\_\_

### Answers

$$4 + 3p = 19$$

$$p = 5$$

$$\frac{x}{-3} - 2 = 9$$

$$x = -33$$

$$-6k - 13 = 83$$

$$k = -16$$

$$17(x + 5) = 0$$

$$x = -5$$

$$7 = \frac{10 - g}{-2}$$

$$g = 24$$

$$-7 = -11 + \frac{v}{5}$$

$$v = 20$$