REVIEW: Exponents

Name _____

Key Concept and Vocabulary

multiplication — exponent

$2 \cdot 2 \cdot 2 = 2^3$

base

4 to the first power

$4^1 = 4$

$4^2 = 4 \cdot 4$ — 4 squared

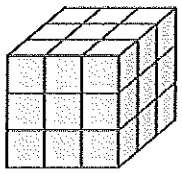
$4^3 = 4 \cdot 4 \cdot 4$ — 4 cubed

Skill Examples

1. $3^2 = 3 \cdot 3 = 9$
2. $2^4 = 2 \cdot 2 \cdot 2 \cdot 2 = 16$
3. $4^3 = 4 \cdot 4 \cdot 4 = 64$
4. $5^4 = 5 \cdot 5 \cdot 5 \cdot 5 = 625$
5. $9^5 = 9 \cdot 9 \cdot 9 \cdot 9 \cdot 9 = 59{,}049$

Application Example

6. How many small cubes are in the stack?



$3^3 = 3 \cdot 3 \cdot 3$

$= 27$

∴ 27 small cubes are in the stack.

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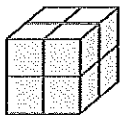
Find the value.

7. $3^4 =$ _____
8. $4^5 =$ _____
9. $12^3 =$ _____
10. $18^1 =$ _____
11. $5^6 =$ _____
12. $2^{10} =$ _____
13. $8^2 =$ _____
14. $7^3 =$ _____

Use an exponent to rewrite the expression.

15. $4 \cdot 4 \cdot 4 \cdot 4 =$ _____
16. $1 \cdot 1 \cdot 1 =$ _____
17. $5 \cdot 5 \cdot 5 =$ _____
18. $3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 =$ _____

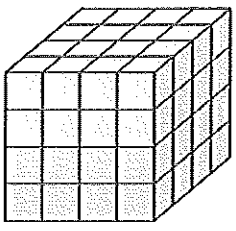
How many small cubes are in the stack?

19. 

_____

_____

_____

20. 

_____

_____

_____

21. **FLYING SAUCERS** You saw 5 flying saucers. Each flying saucer had 5 aliens. Each alien had 5 eyes. How many alien eyes were there altogether? Explain your reasoning.

_____

REVIEW: Cubes

Name _____

Key Concept and Vocabulary

multiplication

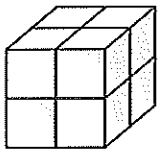
exponent

$2 \cdot 2 \cdot 2 = 2^3$

base

Visual Model

$2^3 =$



Skill Examples

1. $2^3 = 2 \cdot 2 \cdot 2 = 8$
2. $5^3 = 5 \cdot 5 \cdot 5 = 125$
3. $7^3 = 7 \cdot 7 \cdot 7 = 343$
4. $9^3 = 9 \cdot 9 \cdot 9 = 729$
5. $20^3 = 20 \cdot 20 \cdot 20 = 8000$

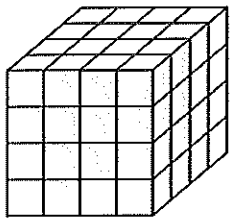
Application Example

6. How many small cubes are in the stack?

$4^3 = 4 \cdot 4 \cdot 4$

$= 64$

∴ 64 small cubes are in the stack.



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Check your answers at BigIdeasMath.com.

Find the value.

7. $6^3 =$ _____
8. $3^3 =$ _____
9. $8^3 =$ _____
10. $10^3 =$ _____
11. $12^3 =$ _____
12. $15^3 =$ _____

Use an exponent to rewrite the expression.

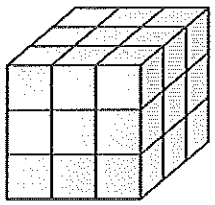
13. $16 \cdot 16 \cdot 16 =$ _____
14. $11 \cdot 11 \cdot 11 =$ _____
15. $25 \cdot 25 \cdot 25 =$ _____

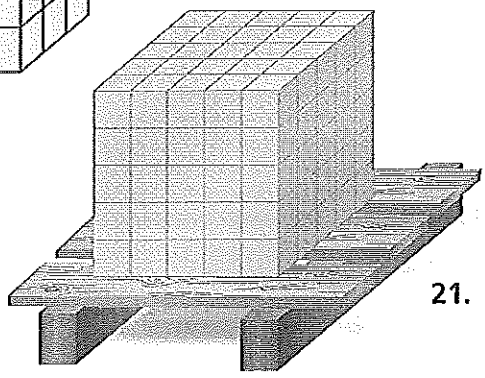
Evaluate the expression when $x = 3$.

16. $x^3 + 1$ _____
17. $2x^3$ _____
18. $6x - x^3$ _____

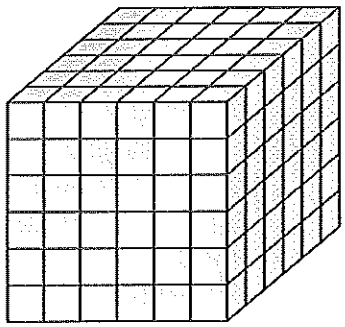
How many small cubes are in the stack?

19. _____





20. _____



21. **SHIPPING** How many boxes are on the pallet?

_____

REVIEW: Order of Operations

Name _____

Key Concept and Vocabulary

"Please Excuse My Dear Aunt Sally"

1st **P**arentheses
2nd **E**xponents
3rd **M**ultiplication and **D**ivision (from left to right)
4th **A**ddition and **S**ubtraction (from left to right)

Simplify $4^2 \div 2 + 3(9 - 5)$.

$$\begin{aligned} 4^2 \div 2 + 3(9 - 5) &= 4^2 \div 2 + 3 \cdot 4 \\ &= 16 \div 2 + 3 \cdot 4 \\ &= 8 + 12 \\ &= 20 \end{aligned}$$

Skill Examples

1. $18 \div 2 - 4 = 9 - 4 = 5$
2. $12 \cdot (6 - 2) = 12 \cdot 4 = 48$
3. $14 \cdot 3 - 19 = 42 - 19 = 23$
4. $20 \div 10 + 21 \cdot 5 = 2 + 105 = 107$
5. $(2 + 3)^2 - 5 = 25 - 5 = 20$

Application Example

6. At a museum, 4 adults pay \$5 each and 6 children pay \$3 each. What is the total cost of the tickets?

$$\begin{aligned} 4 \cdot 5 + 6 \cdot 3 &= 20 + 18 \\ &= 38 \end{aligned}$$

∴ The total cost is \$38.

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Check your answers at BigIdeasMath.com.

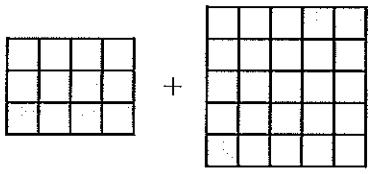
Simplify.

7. $3^2 + 5(4 - 2) =$ _____
8. $3 + 4 \div 2 =$ _____
9. $10 \div 5 \cdot 3 =$ _____
10. $4(3^3 - 8) \div 2 =$ _____
11. $3 \cdot 6 - 4 \div 2 =$ _____
12. $12 + 7 \cdot 3 - 24 =$ _____

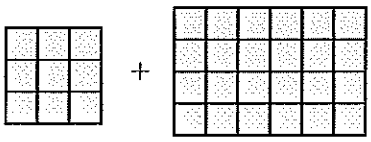
Insert parentheses to make the statement true.

13. $5^2 - 15 \div 5 = 2$
14. $12 \cdot 2^3 + 4 = 144$
15. $91 - 21 \div 7 = 10$

Write an expression for the total area of the two rectangles. Evaluate your expression.

16. 

_____

17. 

_____

18. **ADMISSION** At a baseball game, 6 adults pay \$20 each and 4 children pay \$10 each. What is the total cost of the tickets? _____

19. **INSERTING PARENTHESES** Insert parentheses in the expression $4 + 2^3 - 5 \cdot 2$ in two ways: (a) so that the value is 10 and (b) so that the value is 14.

(a) _____ (b) _____

REVIEW: Adding and Subtracting Fractions with Unlike Denominators

Name _____

Key Concept and Vocabulary

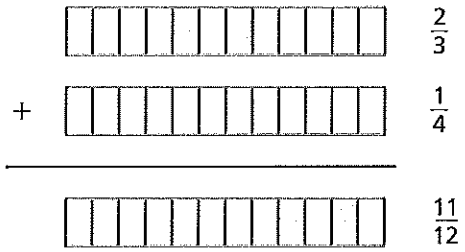
Find products.

Unlike Denominators

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

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

Visual Model



Skill Examples

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

Application Example

5. 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.

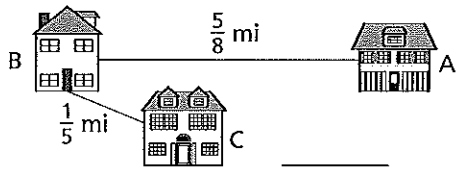
PRACTICE MAKES *PURR*-FECT™

Check your answers at BigIdeasMath.com.

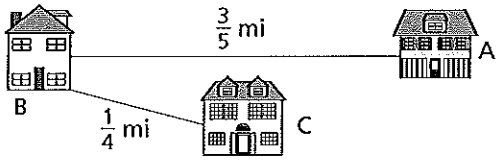
Find the sum or difference. Write your answer in simplified form.

6. $\frac{1}{3} + \frac{1}{8} =$ _____
7. $\frac{2}{3} + \frac{1}{5} =$ _____
8. $\frac{3}{10} + \frac{1}{4} =$ _____
9. $\frac{1}{2} + \frac{2}{5} =$ _____
10. $\frac{3}{7} + \frac{1}{3} =$ _____
11. $\frac{1}{8} + \frac{2}{5} =$ _____
12. $\frac{5}{8} - \frac{1}{3} =$ _____
13. $\frac{5}{6} - \frac{3}{5} =$ _____
14. $\frac{5}{9} - \frac{2}{5} =$ _____
15. $\frac{7}{10} - \frac{1}{4} =$ _____
16. $\frac{3}{5} - \frac{1}{6} =$ _____
17. $\frac{1}{5} - \frac{1}{6} =$ _____

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

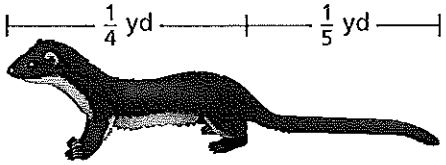
18. 

_____

19. 

_____

20. **WEASEL LENGTH** Find the total length of the weasel. _____



21. **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 Fractions

Name _____

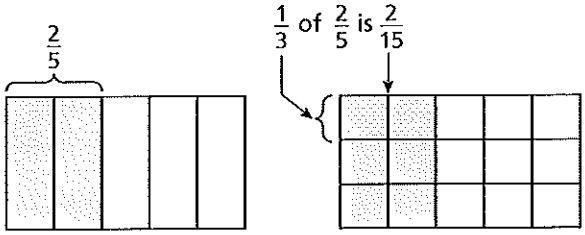
Key Concept and Vocabulary

Multiply numerators.

$$\frac{1}{3} \cdot \frac{2}{5} = \frac{1 \cdot 2}{3 \cdot 5} = \frac{2}{15}$$

Multiply denominators.

Visual Model



Skill Examples

1. $\frac{2}{3} \cdot \frac{1}{4} = \frac{2 \cdot 1}{3 \cdot 4} = \frac{2}{12} = \frac{1}{6}$
2. $\frac{3}{8} \times \frac{2}{9} = \frac{3 \cdot 2}{8 \cdot 9} = \frac{6}{72} = \frac{1}{12}$
3. $\left(\frac{2}{5}\right)\left(\frac{1}{4}\right) = \frac{2 \cdot 1}{5 \cdot 4} = \frac{2}{20} = \frac{1}{10}$
4. $\frac{1}{7} \cdot \frac{3}{5} = \frac{1 \cdot 3}{7 \cdot 5} = \frac{3}{35}$

Application Example

5. A recipe calls for three-fourths cup of flour. You want to make one-half of the recipe. How much flour should you use?

$$\frac{1}{2} \cdot \frac{3}{4} = \frac{1 \cdot 3}{2 \cdot 4} = \frac{3}{8}$$

∴ You should use $\frac{3}{8}$ cup flour.

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Check your answers at BigIdeasMath.com.

Find the product. Write your answer in simplified form.

6. $\frac{1}{3} \cdot \frac{2}{7} =$ _____
7. $\frac{1}{2} \times \frac{1}{4} =$ _____
8. $\frac{1}{10} \cdot \frac{3}{10} =$ _____
9. $\frac{3}{2} \times \frac{2}{5} =$ _____
10. $\frac{3}{8} \times \frac{1}{2} =$ _____
11. $\left(\frac{1}{5}\right)\left(\frac{2}{5}\right) =$ _____
12. $\left(\frac{2}{3}\right)^2 =$ _____
13. $\frac{3}{2} \cdot \frac{2}{3} =$ _____
14. $\left(\frac{3}{1}\right)\left(\frac{1}{3}\right) =$ _____
15. $2 \cdot \frac{1}{4} =$ _____
16. $3 \times \frac{3}{4} =$ _____
17. $\frac{1}{3} \cdot \frac{3}{4} \cdot \frac{4}{5} =$ _____

Find the area of the rectangle or parallelogram.

18. $\frac{1}{2}$ ft, $\frac{1}{2}$ ft

Area = _____

19. $\frac{3}{10}$ cm, $\frac{1}{2}$ cm

Area = _____

20. $\frac{3}{8}$ in., $\frac{5}{8}$ in.

Area = _____

21. $\frac{2}{5}$ m, $\frac{3}{5}$ m

Area = _____

22. **OPEN-ENDED** Find three different pairs of fractions that have the same product.

$$\square \cdot \square = \square \qquad \square \cdot \square = \square \qquad \square \cdot \square = \square$$

REVIEW: Dividing Fractions

Name _____

Key Concept and Vocabulary

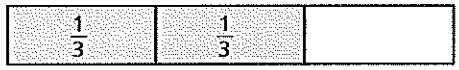
$$\frac{2}{3} \div \frac{1}{2} = \frac{2}{3} \cdot \frac{2}{1} = \frac{2 \cdot 2}{3 \cdot 1} = \frac{4}{3}$$

Invert and multiply.

Visual Model

There are 2 "one-thirds" in two-thirds.

$$\frac{2}{3} \div \frac{1}{3} = \frac{2}{3} \cdot \frac{3}{1} = 2$$



Skill Examples

1. $\frac{2}{5} \div \frac{1}{5} = \frac{2}{5} \cdot \frac{5}{1} = \frac{2 \cdot 5}{5 \cdot 1} = 2$
2. $\frac{2}{5} \div 5 = \frac{2}{5} \cdot \frac{1}{5} = \frac{2 \cdot 1}{5 \cdot 5} = \frac{2}{25}$
3. $\frac{9}{4} \div \frac{3}{4} = \frac{9}{4} \cdot \frac{4}{3} = \frac{9 \cdot 4}{4 \cdot 3} = 3$
4. $6 \div \frac{1}{2} = \frac{6}{1} \cdot \frac{2}{1} = \frac{6 \cdot 2}{1 \cdot 1} = 12$

Application Example

5. You drive 25 miles in one-half hour. What is your average rate?

$$25 \div \frac{1}{2} = \frac{25}{1} \cdot \frac{2}{1} = 50 \text{ mi/h} \qquad r = \frac{d}{t}$$

∴ Your average rate is 50 miles per hour.

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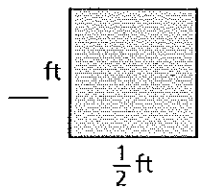
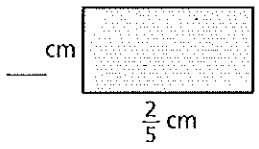
Find the quotient. Write your answer in simplified form.

6. $\frac{3}{5} \div \frac{1}{5} =$ _____
7. $4 \div \frac{1}{2} =$ _____
8. $\frac{2}{3} \div \frac{1}{6} =$ _____
9. $\frac{1}{6} \div \frac{2}{3} =$ _____
10. $\frac{2}{3} \div 2 =$ _____
11. $\frac{3}{4} \div 4 =$ _____
12. $\frac{3}{7} \div \frac{3}{7} =$ _____
13. $\frac{3}{7} \div \frac{7}{3} =$ _____
14. $5 \div \frac{1}{2} =$ _____
15. $\frac{9}{4} \div \frac{1}{4} =$ _____
16. $\frac{1}{4} \div \frac{1}{2} =$ _____
17. $\frac{3}{11} \div 11 =$ _____

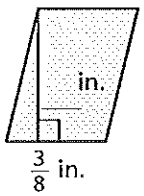
Find the height of the rectangle or parallelogram.

18. 

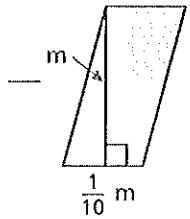
Area $= \frac{1}{4}$ ft^2

19. 

Area $= \frac{2}{25}$ cm^2

20. 

Area $= \frac{3}{16}$ in.^{2}

21. 

Area $= \frac{1}{50}$ m^2

22. **SPEED** You drive 15 miles in one-fourth hour. What is your average speed? _____

23. **MAGNETIC TAPE** A refrigerator magnet uses $\frac{5}{8}$ inch of magnetic tape. How many refrigerator magnets can you make with 10 inches of magnetic tape? Explain.

_____

REVIEW: Multiplying Mixed Numbers

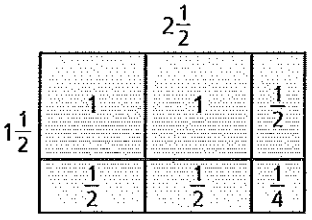
Name _____

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.

Visual Model



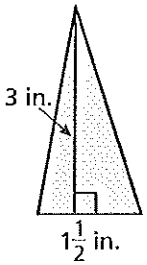
Area $= 2\frac{1}{2} \times 1\frac{1}{2} = \frac{15}{4} = 3\frac{3}{4}$

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.



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

$= \frac{1}{2} \cdot \frac{3}{2} \cdot \frac{3}{1} = \frac{9}{4} = 2\frac{1}{4}$

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

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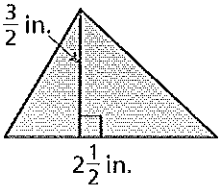
Check your answers at BigIdeasMath.com.

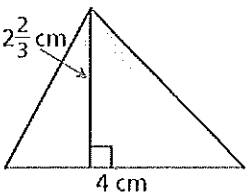
Find the product. Write your answer as a whole number or mixed number in simplified form.

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.

18. 

Area = _____

19. 

Area = _____

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

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

_____ cups flour

_____ tsp baking powder

_____ Tbsp butter

_____ tsp salt

_____ cup milk

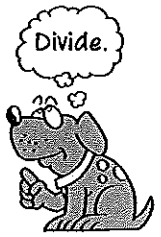
REVIEW: Dividing Mixed Numbers

Name _____

Key Concept and Vocabulary

Rewrite as improper fractions.

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

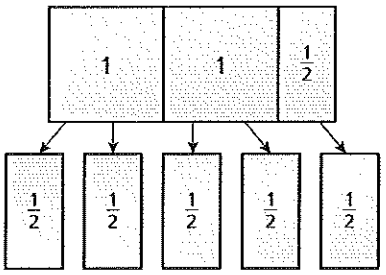


Visual Model

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

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

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.

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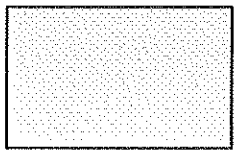
Check your answers at BigIdeasMath.com.

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

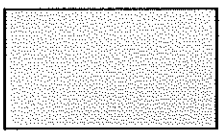
6. $4\frac{1}{2} \div 9 =$ _____
7. $3\frac{3}{7} \div 8 =$ _____
8. $4\frac{2}{3} \div 7 =$ _____
9. $1\frac{7}{9} \div 4 =$ _____
10. $8 \div 1\frac{1}{3} =$ _____
11. $32 \div 3\frac{1}{5} =$ _____
12. $11 \div 2\frac{3}{4} =$ _____
13. $9 \div 1\frac{1}{2} =$ _____
14. $5\frac{1}{2} \div \frac{1}{2} =$ _____
15. $\frac{1}{2} \div 1\frac{1}{2} =$ _____
16. $1\frac{1}{4} \div 1\frac{1}{4} =$ _____
17. $3\frac{1}{2} \div 1\frac{1}{3} =$ _____

Find the missing dimension.

18. $2\frac{1}{2}$ ft, Area = 10 ft², _____ ft



19. _____ cm, Area = 16 cm², $5\frac{1}{3}$ cm



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? _____

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? _____

REVIEW: Finding the Percent of a Number

Name _____

Key Concept and Vocabulary

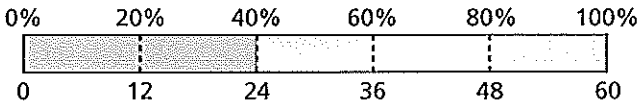
40% of 60 is 24.

$0.4 \times 60 = 24$

$\frac{2}{5} \times 60 = 24$

Write percent as decimal or fraction and multiply.

Visual Model



Skill Examples

1. 30% of 50: $0.3 \times 50 = 15$
2. 45% of 80: $0.45 \times 80 = 36$
3. 110% of 40: $1.1 \times 40 = 44$
4. 25% of 240: $0.25 \times 240 = 60$

Application Example

5. 28% of the 200 people who answered a survey own a dog. How many of the 200 people in the survey own a dog?

$0.28 \times 200 = 56$

∴ 56 of the 200 people own a dog.

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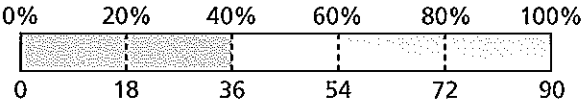
Check your answers at BigIdeasMath.com.

Find the percent of the number.

6. 25% of 40 = _____
7. 20% of 35 = _____
8. 65% of 110 = _____
9. 125% of 20 = _____
10. $33\frac{1}{3}$% of 60 = _____
11. 95% of 400 = _____
12. 200% of 31 = _____
13. 18% of 90 = _____
14. 1% of 800 = _____
15. 60% of 60 = _____
16. 100% of 59 = _____
17. 1000% of 59 = _____

Write the question represented by the model. Then answer the question.

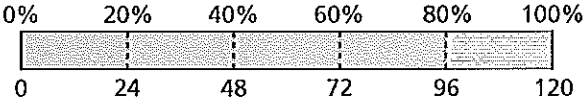
18.



Question: _____

Answer: _____

19.



Question: _____

Answer: _____

20. **ENDANGERED SPECIES** Sixty percent of a species of butterfly died due to loss of habitat. Originally, there were 10,000 butterflies. How many are left? _____

21. **SALES TAX** You buy 4 breakfast sandwiches at $2.59 each, 4 hashbrowns at $1.10 each, and 4 bottles of orange juice at $1.25 each. The sales tax is 6%. Find the total cost of the 4 meals, including sales tax. _____

REVIEW: Rates

Name _____

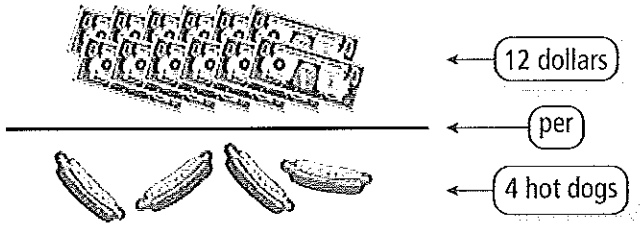
Key Concept and Vocabulary

You pay $12 for 4 hot dogs.

$$\text{Rate} = \frac{\$12}{4 \text{ hot dogs}}$$

$$\text{Unit Rate} = \frac{\$3}{1 \text{ hot dog}}$$

Visual Model



Skill Examples

1. You drive 100 miles in 2 hours.
   Your unit rate is 50 miles per hour.
2. You earn $40 in 5 hours.
   Your unit rate is $8 per hour.
3. You save $240 in 6 months.
   Your unit rate is $40 per month.

Application Example

4. Janice was 44 inches tall when she was 8 years old. She was 52 inches tall when she was 12 years old. What was her unit rate?

   She grew 8 inches in 4 years: $\frac{8}{4} = \frac{2}{1}$.

   ∴ Her unit rate is 2 inches per year.

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Check your answers at BigIdeasMath.com.

Write the unit rate in words and as a fraction for each situation.

5. You fly 2000 miles in 4 hours.
   _____ Words _____ Fraction

6. You pay 15 dollars for 3 pizzas.
   _____ Words _____ Fraction

7. You pay $4 sales tax on a $50 purchase.
   _____ Words _____ Fraction

8. You earn $25 for mowing 5 lawns.
   _____ Words _____ Fraction

Circle the name of the person with the greater unit rate.

9. Maria saves $50 in 4 months.
   Ralph saves $60 in 5 months.

10. John rides his bicycle 36 miles in 3 hours.
    Randy rides his bicycle 30 miles in 2.5 hours.

11. Kim earns $400 for working 40 hours.
    Sam earns $540 for working 45 hours.

12. Arlene scores 450 points on 5 tests.
    Jolene scores 180 points on 2 tests.

Convert the unit rate.

13. $\frac{60 \text{ miles}}{1 \text{ hour}} = \frac{\square \text{ feet}}{1 \text{ second}}$

14. $\frac{2 \text{ gallons}}{1 \text{ hour}} = \frac{\square \text{ cups}}{1 \text{ minute}}$

REVIEW: Proportions

Name _____

Key Concept and Vocabulary

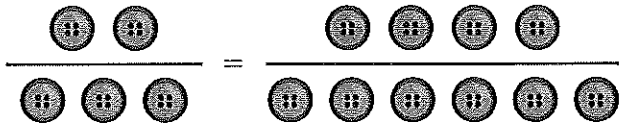
Proportion: "2 is to 3 as 4 is to 6."

$\frac{2}{3} = \frac{4}{6}$

$2 \cdot 6 = 3 \cdot 4$ ← Cross products are equal.

Visual Model

The ratio "2 to 3" is equal to the ratio "4 to 6."



Skill Examples

1. $\frac{3}{5} = \frac{12}{20}$ is a proportion because the cross products are equal.
2. $\frac{1}{7} = \frac{7}{48}$ is *not* a proportion because the cross products are not equal.
3. $\frac{10}{2} = \frac{5}{1}$ is a proportion because the cross products are equal.

Application Example

4. You spend \$5 for 3 tennis balls. Your friend spends \$6.25 for 4 tennis balls. Are the two rates proportional?

$\frac{\$5}{3 \text{ balls}} \stackrel{?}{=} \frac{\$6.25}{4 \text{ balls}}$ $5(4) \neq 3(6.25)$

∴ The rates are *not* proportional.

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Check your answers at BigIdeasMath.com.

Decide whether the statement is a proportion.

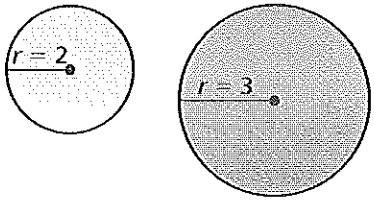
5. $\frac{3}{7} = \frac{6}{14}$ _____
6. $\frac{1}{4} = \frac{4}{1}$ _____
7. $\frac{3}{2} = \frac{9}{4}$ _____
8. $\frac{1.25}{3} = \frac{5}{12}$ _____
9. $\frac{6}{18} = \frac{120}{360}$ _____
10. $\frac{4}{5} = \frac{4+4}{5+5}$ _____

Complete the proportion.

11. $\frac{2}{5} = \frac{\square}{10}$
12. $\frac{1}{6} = \frac{4}{\square}$
13. $\frac{3}{\square} = \frac{9}{24}$

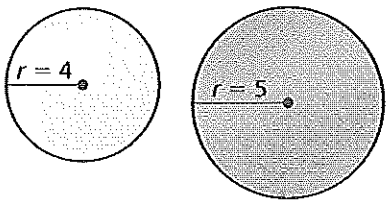
Write the proportion that compares the circumference to the radii of the two circles.

14.



_____

15.



_____

16. **COMPARING RATES** You spend \$20 for 5 T-shirts. Your friend spends \$15 for 3 T-shirts. Are the two rates proportional? _____

REVIEW: Exponents

Name _____

Key Concept and Vocabulary

multiplication: $2 \cdot 2 \cdot 2 = 2^3$

exponent

base

Exponent

4 to the fast power

$4^1 = 4$ $4^2 = 4 \cdot 4$ $4^3 = 4 \cdot 4 \cdot 4$

4 squared

4 cubed

Skill Examples

1. $3^2 = 3 \cdot 3 = 9$
2. $2^4 = 2 \cdot 2 \cdot 2 \cdot 2 = 16$
3. $4^3 = 4 \cdot 4 \cdot 4 = 64$
4. $5^4 = 5 \cdot 5 \cdot 5 \cdot 5 = 625$
5. $9^5 = 9 \cdot 9 \cdot 9 \cdot 9 \cdot 9 = 59{,}049$

Application Example

6. How many small cubes are in the stack?

$3^3 = 3 \cdot 3 \cdot 3$

$= 27$

∴ 27 small cubes are in the stack.

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Check your answers at BigIdeasMath.com.

Find the value.

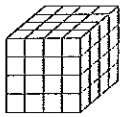
7. $3^4 =$ 81
8. $4^5 =$ 1024
9. $12^3 =$ 1728
10. $18^1 =$ 18
11. $5^6 =$ 15,625
12. $2^{10} =$ 1024
13. $8^2 =$ 64
14. $7^3 =$ 343

Use an exponent to rewrite the expression.

15. $4 \cdot 4 \cdot 4 \cdot 4 =$ 4^4
16. $1 \cdot 1 \cdot 1 =$ 1^3
17. $5 \cdot 5 \cdot 5 =$ 5^3
18. $3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 =$ 3^5

How many small cubes are in the stack?

19.  $2^3 = 8$ small cubes are in the stack.

20.  $4^3 = 64$ small cubes are in the stack.

21. **FLYING SAUCERS** You saw 5 flying saucers. Each flying saucer had 5 aliens. Each alien had 5 eyes. How many alien eyes were there altogether? Explain your reasoning.

125 alien eyes; $5^3 = 5 \cdot 5 \cdot 5 = 125$

REVIEW: Cubes

Name _____

Key Concept and Vocabulary

multiplication: $2 \cdot 2 \cdot 2 = 2^3$

exponent

base

Cubes

Visual Model

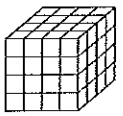
$2^3 =$ 

Skill Examples

1. $2^3 = 2 \cdot 2 \cdot 2 = 8$
2. $5^3 = 5 \cdot 5 \cdot 5 = 125$
3. $7^3 = 7 \cdot 7 \cdot 7 = 343$
4. $9^3 = 9 \cdot 9 \cdot 9 = 729$
5. $20^3 = 20 \cdot 20 \cdot 20 = 8000$

Application Example

6. How many small cubes are in the stack?



$4^3 = 4 \cdot 4 \cdot 4$

$= 64$

∴ 64 small cubes are in the stack.

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Check your answers at BigIdeasMath.com.

Find the value.

7. $6^3 =$ 216
8. $3^3 =$ 27
9. $8^3 =$ 512
10. $10^3 =$ 1000
11. $12^3 =$ 1728
12. $15^3 =$ 3375

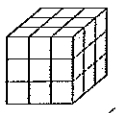
Use an exponent to rewrite the expression.

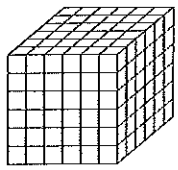
13. $16 \cdot 16 \cdot 16 =$ 16^3
14. $11 \cdot 11 \cdot 11 =$ 11^3
15. $25 \cdot 25 \cdot 25 =$ 25^3

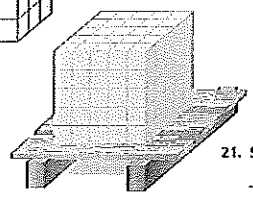
Evaluate the expression when $x = 3$.

16. $x^3 + 1$ 28
17. $2x^3$ 54
18. $6x - x^3$ −9

How many small cubes are in the stack?

19.  27

20.  216



21. **SHIPPING** How many boxes are on the pallet?

125 boxes

REVIEW: Order of Operations

Name _____

Key Concept and Vocabulary

"Please Excuse My Dear Aunt Sally"

1st Parentheses
2nd Exponents
3rd Multiplication and Division (from left to right)
4th Addition and Subtraction (from left to right)

Simplify $4^2 \div 2 + 3(9 - 5)$.

$4^2 \div 2 + 3(9 - 5) = 4^2 \div 2 + 3 \cdot 4$

$= 16 \div 2 + 3 \cdot 4$

$= 8 + 12$

$= 20$

Order of Operations

Skill Examples

1. $18 \div 2 - 4 = 9 - 4 = 5$
2. $12 \cdot (6 - 2) = 12 \cdot 4 = 48$
3. $14 \cdot 3 - 19 = 42 - 19 = 23$
4. $20 \div 10 + 21 \cdot 5 = 2 + 105 = 107$
5. $(2 + 3)^2 - 5 = 25 - 5 = 20$

Application Example

6. At a museum, 4 adults pay $5 each and 6 children pay $3 each. What is the total cost of the tickets?

$4 \cdot 5 + 6 \cdot 3 = 20 + 18$

$= 38$

∴ The total cost is $38.

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Check your answers at BigIdeasMath.com.

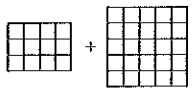
Simplify.

7. $3^2 + 5(4 - 2) =$ 19
8. $3 + 4 \div 2 =$ 5
9. $10 \div 5 \cdot 3 =$ 6
10. $4(3^3 - 8) \div 2 =$ 38
11. $3 \cdot 6 - 4 \div 2 =$ 16
12. $12 + 7 \cdot 3 - 24 =$ 9

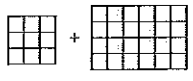
Insert parentheses to make the statement true.

13. $(5^2 - 15) \div 5 = 2$
14. $12 \cdot (2^3 + 4) = 144$
15. $(31 - 21) \div 7 = 10$

Write an expression for the total area of the two rectangles. Evaluate your expression.

16. 

$3 \cdot 4 + 5^2$; 37

17. 

$3^2 + 4 \cdot 6$; 33

18. **ADMISSION** At a baseball game, 6 adults pay $20 each and 4 children pay $10 each. What is the total cost of the tickets? $160

19. **INSERTING PARENTHESES** Insert parentheses in the expression $4 + 2^3 - 5 \cdot 2$ in two ways: (a) so that the value is 10 and (b) so that the value is 14.

(a) $4 + (2^3 - 5) \cdot 2$

(b) $(4 + 2^3 - 5) \cdot 2$

REVIEW: Adding and Subtracting Fractions with Unlike Denominators

Name _____

Key Concept and Vocabulary

Find products.

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

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

Unlike Denominators

Visual Model

$\frac{2}{3}$

$+ \frac{1}{4}$

$\frac{11}{12}$

Skill Examples

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

Application Example

5. 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.

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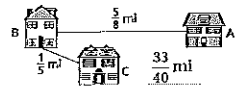
Check your answers at BigIdeasMath.com.

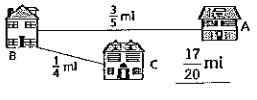
Find the sum or difference. Write your answer in simplified form.

6. $\frac{1}{3} + \frac{1}{8} =$ $\frac{11}{24}$
7. $\frac{2}{3} + \frac{1}{5} =$ $\frac{13}{15}$
8. $\frac{3}{10} + \frac{1}{4} =$ $\frac{11}{20}$
9. $\frac{1}{2} + \frac{2}{5} =$ $\frac{9}{10}$
10. $\frac{3}{7} + \frac{1}{3} =$ $\frac{16}{21}$
11. $\frac{1}{8} + \frac{2}{5} =$ $\frac{21}{40}$
12. $\frac{5}{8} - \frac{1}{3} =$ $\frac{7}{24}$
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.

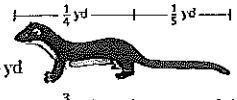
18. 

$\frac{33}{40}$ mi

19. 

$\frac{17}{20}$ mi

20. **WEASEL LENGTH** Find the total length of the weasel.



$\frac{9}{20}$ yd

21. **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 Fractions

Name _____

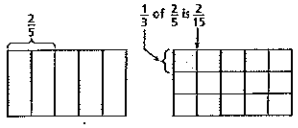
Key Concept and Vocabulary

Multiply numerators.

$\frac{1}{3} \cdot \frac{2}{5} = \frac{1 \cdot 2}{3 \cdot 5} = \frac{2}{15}$

Multiply denominators.

Visual Model



Skill Examples

1. $\frac{2}{3} \cdot \frac{1}{4} = \frac{2 \cdot 1}{3 \cdot 4} = \frac{2}{12} = \frac{1}{6}$
2. $\frac{3}{8} \times \frac{2}{9} = \frac{3 \cdot 2}{8 \cdot 9} = \frac{6}{72} = \frac{1}{12}$
3. $\left(\frac{2}{5}\right)\left(\frac{1}{4}\right) = \frac{2 \cdot 1}{5 \cdot 4} = \frac{2}{20} = \frac{1}{10}$
4. $\frac{1}{7} \cdot \frac{3}{5} = \frac{1 \cdot 3}{7 \cdot 5} = \frac{3}{35}$

Application Example

5. A recipe calls for three-fourths cup of flour. You want to make one-half of the recipe. How much flour should you use?

$\frac{1}{2} \cdot \frac{3}{4} = \frac{1 \cdot 3}{2 \cdot 4} = \frac{3}{8}$

∴ You should use $\frac{3}{8}$ cup flour.

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Check your answers at BigIdeasMath.com.

Find the product. Write your answer in simplified form.

6. $\frac{1}{3} \cdot \frac{2}{7} = \frac{2}{21}$
7. $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$
8. $\frac{1}{10} \cdot \frac{3}{10} = \frac{3}{100}$
9. $\frac{3}{2} \times \frac{2}{5} = \frac{3}{5}$
10. $\frac{3}{8} \times \frac{1}{2} = \frac{3}{16}$
11. $\left(\frac{1}{5}\right)\left(\frac{2}{5}\right) = \frac{2}{25}$
12. $\left(\frac{2}{3}\right)^2 = \frac{4}{9}$
13. $\frac{3}{2} \cdot \frac{2}{3} = 1$
14. $\left(\frac{3}{1}\right)\left(\frac{1}{3}\right) = 1$
15. $2 \cdot \frac{1}{4} = \frac{1}{2}$
16. $3 \times \frac{3}{4} = 2\frac{1}{4}$
17. $\frac{1}{3} \cdot \frac{3}{4} \cdot \frac{4}{5} = \frac{1}{5}$

Find the area of the rectangle or parallelogram.

18. $\frac{1}{2}$ ft, $\frac{1}{2}$ ft — Area = $\frac{1}{4}$ ft²
19. $\frac{3}{10}$ cm, $\frac{1}{2}$ cm — Area = $\frac{3}{20}$ cm²
20. $\frac{3}{8}$ in., $\frac{5}{8}$ in. — Area = $\frac{15}{64}$ in.²
21. $\frac{2}{5}$ m, $\frac{3}{5}$ m — Area = $\frac{6}{25}$ m²

22. **OPEN-ENDED** Find three different pairs of fractions that have the same product.

Sample answer: $\frac{9}{10} \cdot \frac{5}{6} = \frac{3}{4}$ $\quad \frac{7}{8} \cdot \frac{6}{7} = \frac{3}{4}$ $\quad \frac{4}{5} \cdot \frac{15}{16} = \frac{3}{4}$

REVIEW: Dividing Fractions

Name _____

Key Concept and Vocabulary

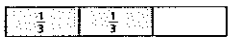
$\frac{2}{3} \div \frac{1}{2} = \frac{2}{3} \cdot \frac{2}{1} = \frac{2 \cdot 2}{3 \cdot 1} = \frac{4}{3}$

Invert and multiply.

Visual Model

There are 2 "one-thirds" in two-thirds.

$\frac{2}{3} \div \frac{1}{3} = \frac{2}{3} \cdot \frac{3}{1} = 2$



Skill Examples

1. $\frac{2}{5} \div \frac{1}{5} = \frac{2}{5} \cdot \frac{5}{1} = \frac{2 \cdot 5}{5 \cdot 1} = 2$
2. $\frac{2}{5} \div 5 = \frac{2}{5} \cdot \frac{1}{5} = \frac{2 \cdot 1}{5 \cdot 5} = \frac{2}{25}$
3. $\frac{9}{4} \div \frac{3}{4} = \frac{9}{4} \cdot \frac{4}{3} = \frac{9 \cdot 4}{4 \cdot 3} = 3$
4. $6 \div \frac{1}{2} = \frac{6}{1} \cdot \frac{2}{1} = \frac{6 \cdot 2}{1 \cdot 1} = 12$

Application Example

5. You drive 25 miles in one-half hour. What is your average rate?

$25 \div \frac{1}{2} = \frac{25}{1} \cdot \frac{2}{1} = 50$ mi/h $\qquad r = \frac{d}{t}$

∴ Your average rate is 50 miles per hour.

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Find the quotient. Write your answer in simplified form.

6. $\frac{3}{5} \div \frac{1}{5} = 3$
7. $4 \div \frac{1}{2} = 8$
8. $\frac{2}{3} \div \frac{1}{6} = 4$
9. $\frac{1}{6} \div \frac{2}{3} = \frac{1}{4}$
10. $\frac{2}{3} \div 2 = \frac{1}{3}$
11. $\frac{3}{4} \div 4 = \frac{3}{16}$
12. $\frac{3}{7} \div \frac{3}{7} = 1$
13. $\frac{3}{7} \div \frac{7}{3} = \frac{9}{49}$
14. $5 \div \frac{1}{2} = 10$
15. $\frac{9}{4} \div \frac{1}{4} = 9$
16. $\frac{1}{4} \div \frac{1}{2} = \frac{1}{2}$
17. $\frac{3}{11} \div 11 = \frac{3}{121}$

Find the height of the rectangle or parallelogram.

18. $\frac{1}{2}$ ft, $\frac{1}{2}$ ft — Area = $\frac{1}{4}$ ft²
19. $\frac{1}{5}$ cm, $\frac{2}{5}$ cm — Area = $\frac{2}{25}$ cm²
20. $\frac{1}{2}$ in., $\frac{3}{8}$ in. — Area = $\frac{3}{16}$ in.²
21. $\frac{1}{5}$ m, $\frac{1}{10}$ m — Area = $\frac{1}{50}$ m²

22. **SPEED** You drive 15 miles in one-fourth hour. What is your average speed? 60 mi/h

23. **MAGNETIC TAPE** A refrigerator magnet uses $\frac{5}{8}$ inch of magnetic tape. How many refrigerator magnets can you make with 10 inches of magnetic tape? Explain.

16 magnets; $10 \div \frac{5}{8} = \frac{10}{1} \cdot \frac{8}{5} = \frac{10 \cdot 8}{1 \cdot 5} = 16$

REVIEW: Multiplying Mixed Numbers

Name _____

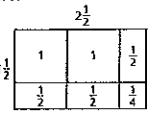
Key Concept and Vocabulary

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

Rewrite as improper fractions.

Multiply.

Visual Model



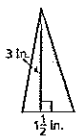
Area = $2\frac{1}{2} \times 1\frac{1}{2} = \frac{15}{4} = 3\frac{3}{4}$

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.



$\text{Area} = \frac{1}{2} \cdot 1\frac{1}{2} \cdot 3 = \frac{1}{2} \cdot \frac{3}{2} \cdot \frac{3}{1} = \frac{9}{4} = 2\frac{1}{4}$

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

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

6. $2\frac{1}{3} \times 1\frac{1}{3} = 3\frac{1}{9}$
7. $4\frac{2}{3} \times 1\frac{1}{2} = 7$
8. $1\frac{1}{2} \times 3 = 4\frac{1}{2}$
9. $5\frac{1}{6} \times \frac{1}{3} = 1\frac{13}{18}$
10. $\frac{3}{4} \cdot 3\frac{1}{2} = 2\frac{5}{8}$
11. $5 \cdot 4\frac{1}{2} = 22\frac{1}{2}$
12. $2\frac{1}{7} \cdot \frac{7}{15} = 1$
13. $1\frac{3}{5} \cdot \frac{3}{8} = \frac{3}{5}$
14. $\left(1\frac{1}{3}\right)^2 = 1\frac{7}{9}$
15. $\left(1\frac{1}{4}\right)^3 = 1\frac{61}{64}$
16. $\left(2\frac{1}{2}\right)\left(3\frac{1}{3}\right) = 8\frac{1}{3}$
17. $\left(3\frac{1}{2}\right)\left(\frac{1}{2}\right)^2 = \frac{7}{8}$

Find the area of the triangle.

18. $\frac{3}{2}$ in., $2\frac{1}{2}$ in. — Area = $1\frac{7}{8}$ in.²
19. $2\frac{2}{3}$ cm, 4 cm — Area = $5\frac{1}{3}$ cm²

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

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

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

REVIEW: Dividing Mixed Numbers

Name _____

Key Concept and Vocabulary

Rewrite as improper fractions.

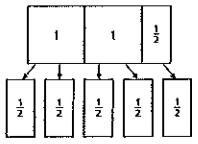
$2\frac{1}{2} \div 5 = \frac{5}{2} \div \frac{5}{1}$
$= \frac{5}{2} \times \frac{1}{5}$
$= \frac{1}{2}$

Divide.

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

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

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.

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

6. $4\frac{1}{2} \div 9 = \frac{1}{2}$
7. $3\frac{3}{7} \div 8 = \frac{3}{7}$
8. $4\frac{2}{3} \div 7 = \frac{2}{3}$
9. $1\frac{7}{9} \div 4 = \frac{4}{9}$
10. $8 \div 1\frac{1}{3} = 6$
11. $32 \div 3\frac{1}{5} = 10$
12. $11 \div 2\frac{3}{4} = 4$
13. $9 \div 1\frac{1}{2} = 6$
14. $5\frac{1}{2} \div \frac{1}{2} = 11$
15. $\frac{1}{2} \div 1\frac{1}{2} = \frac{1}{3}$
16. $1\frac{1}{4} \div 1\frac{1}{4} = 1$
17. $3\frac{1}{2} \div 1\frac{1}{3} = 2\frac{5}{8}$

Find the missing dimension.

18. $2\frac{1}{2}$ ft, 4 ft — Area = 10 ft²
19. 3 cm, $5\frac{1}{3}$ cm — Area = 16 cm²

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

REVIEW: Finding the Percent of a Number

Name _____

Key Concept and Vocabulary

40% of 60 is 24.

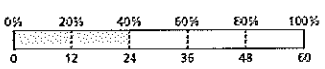
$0.4 \times 60 = 24$

$\frac{2}{5} \times 60 = 24$

Write percent as decimal or fraction and multiply.

Finding a part.

Visual Model



Skill Examples

1. 30% of 50: $0.3 \times 50 = 15$
2. 45% of 80: $0.45 \times 80 = 36$
3. 110% of 40: $1.1 \times 40 = 44$
4. 25% of 240: $0.25 \times 240 = 60$

Application Example

5. 28% of the 200 people who answered a survey own a dog. How many of the 200 people in the survey own a dog?

$0.28 \times 200 = 56$

∴ 56 of the 200 people own a dog.

PRACTICE MAKES *PURR*-FECT™

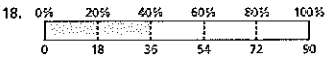
Check your answers at BigIdeasMath.com.

Find the percent of the number.

6. 25% of 40 = 10
7. 20% of 35 = 7
8. 65% of 110 = 71.5
9. 125% of 20 = 25
10. $33\frac{1}{3}$% of 60 = 20
11. 95% of 400 = 380
12. 200% of 31 = 62
13. 18% of 90 = 16.2
14. 1% of 800 = 8
15. 60% of 60 = 36
16. 100% of 59 = 59
17. 1000% of 59 = 590

Write the question represented by the model. Then answer the question.

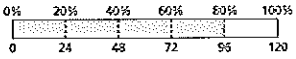
18.



Question: What is 60% of 90?

Answer: 54

19.



Question: What is 80% of 120?

Answer: 96

20. **ENDANGERED SPECIES** Sixty percent of a species of butterfly died due to loss of habitat. Originally, there were 10,000 butterflies. How many are left? 4000 butterflies

21. **SALES TAX** You buy 4 breakfast sandwiches at $2.59 each, 4 hashbrowns at $1.10 each, and 4 bottles of orange juice at $1.25 each. The sales tax is 6%. Find the total cost of the 4 meals, including sales tax. $20.95

REVIEW: Rates

Name _____

Key Concept and Vocabulary

You pay $12 for 4 hot dogs.

Rates

Rate = $\frac{\$12}{4 \text{ hot dogs}}$

Unit Rate = $\frac{\$3}{1 \text{ hot dog}}$

Visual Model

Skill Examples

1. You drive 100 miles in 2 hours.
   Your unit rate is 50 miles per hour.
2. You earn $40 in 5 hours.
   Your unit rate is $8 per hour.
3. You save $240 in 6 months.
   Your unit rate is $40 per month.

Application Example

4. Janice was 44 inches tall when she was 8 years old. She was 52 inches tall when she was 12 years old. What was her unit rate?

   She grew 8 inches in 4 years: $\frac{8}{4} = \frac{2}{1}$.

   ∴ Her unit rate is 2 inches per year.

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Write the unit rate in words and as a fraction for each situation.

5. You fly 2000 miles in 4 hours.
   Words: 500 miles per hour
   Fraction: $\frac{500 \text{ mi}}{1 \text{ h}}$
6. You pay 15 dollars for 3 pizzas.
   Words: 5 dollars per pizza
   Fraction: $\frac{\$5}{1 \text{ pizza}}$
7. You pay $4 sales tax on a $50 purchase.
   Words: 0.08 dollar per 1 dollar purchase
   Fraction: $\frac{\$0.08}{\$1 \text{ purchase}}$
8. You earn $25 for mowing 5 lawns.
   Words: 5 dollars per lawn
   Fraction: $\frac{\$5}{1 \text{ lawn}}$

Circle the name of the person with the greater unit rate.

9. (Maria) saves $50 in 4 months.
   Ralph saves $60 in 5 months.
10. John rides his bicycle 36 miles in 3 hours.
    Randy rides his bicycle 30 miles in 2.5 hours.
    Unit rates are the same.
11. Kim earns $400 for working 40 hours.
    (Sam) earns $540 for working 45 hours.
12. Arlene scores 450 points on 5 tests.
    Jolene scores 180 points on 2 tests.
    Unit rates are the same.

Convert the unit rate.

13. $\frac{60 \text{ miles}}{1 \text{ hour}} = \frac{\boxed{88} \text{ feet}}{1 \text{ second}}$
14. $\frac{2 \text{ gallons}}{1 \text{ hour}} = \frac{\boxed{\frac{8}{15}} \text{ cups}}{1 \text{ minute}}$

REVIEW: Proportions

Name _____

Key Concept and Vocabulary

Proportion: "2 is to 3 as 4 is to 6."

Proportions

$\frac{2}{3} = \frac{4}{6}$

$2 \cdot 6 = 3 \cdot 4$

Cross products are equal.

Visual Model

The ratio "2 to 3" is equal to the ratio "4 to 6."

Skill Examples

1. $\frac{3}{5} = \frac{12}{20}$ is a proportion because the cross products are equal.
2. $\frac{1}{7} = \frac{7}{48}$ is *not* a proportion because the cross products are not equal.
3. $\frac{10}{2} = \frac{5}{1}$ is a proportion because the cross products are equal.

Application Example

4. You spend $5 for 3 tennis balls. Your friend spends $6.25 for 4 tennis balls. Are the two rates proportional?

   $\frac{\$5}{3 \text{ balls}} \stackrel{?}{=} \frac{\$6.25}{4 \text{ balls}}$ $5(4) \neq 3(6.25)$

   ∴ The rates are *not* proportional.

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Decide whether the statement is a proportion.

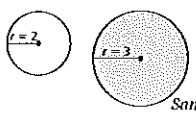
5. $\frac{3}{7} = \frac{6}{14}$ proportion
6. $\frac{1}{4} = \frac{4}{1}$ not a proportion
7. $\frac{3}{2} = \frac{9}{4}$ not a proportion
8. $\frac{1.25}{3} = \frac{5}{12}$ proportion
9. $\frac{6}{18} = \frac{120}{360}$ proportion
10. $\frac{4}{5} = \frac{4+4}{5+5}$ proportion

Complete the proportion.

11. $\frac{2}{5} = \frac{\boxed{4}}{10}$
12. $\frac{1}{6} = \frac{4}{\boxed{24}}$
13. $\frac{3}{\boxed{8}} = \frac{9}{24}$

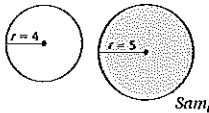
Write the proportion that compares the circumference to the radii of the two circles.

14.



Sample answer: $\frac{4\pi}{6\pi} = \frac{2}{3}$

15.



Sample answer: $\frac{8\pi}{10\pi} = \frac{4}{5}$

16. **COMPARING RATES** You spend $20 for 5 T-shirts. Your friend spends $15 for 3 T-shirts. Are the two rates proportional? no