Chapter Review

Interactive Study Guide
See pages 119–122 for:
- Vocabulary Check
- Key Concept Check
- Problem Solving
- Reflect

Lesson-by-Lesson Review

Lesson 5-1 Ratios (pp. 184–188)

Express each ratio as a fraction in simplest form.

1. 10 girls out of 24 students
2. 6 red cars to 4 blue cars
3. 10 yards to 8 inches
4. 18 ounces to 3 cups
5. Jean got 12 hits out of 16 times at bat. Express this rate as a fraction in simplest form. Explain its meaning.

Example 1

Express the ratio *2 feet to 18 inches* as a fraction in simplest form.

First, convert feet to inches.

$$\frac{2 \text{ ft}}{18 \text{ in.}} = \frac{24 \text{ in.}}{18 \text{ in.}}$$

Next, divide the numerator and denominator by the GCF, 6.

$$\frac{24 \text{ in.} \div 6}{18 \text{ in.} \div 6} = \frac{4 \text{ in.}}{3 \text{ in.}} \text{ or } \frac{4}{3}$$

SPEED = DISTANCE / TIME

Lesson 5-2 Unit Rates (pp. 189–193)

Express each rate as a unit rate. Round to the nearest tenth or to the nearest cent, if necessary.

6. $25.97 for 8 boxes
7. 400 meters in 5 minutes
8. $175 for 4 concert tickets
9. 125 miles in 200 minutes
10. **Financial Literacy** An eight pack of juice boxes costs $4.79, and a twelve pack of juice boxes costs $6.59. Which is a better buy? Explain.

.62
200 | 1250
1200
500

125/200 = 0.6/1

Example 2

Express *274 miles in 14 gallons of gasoline* as a unit rate. Round to the nearest tenth of a mile if necessary.

Write the rate that compares the miles to the number of gallons. Then divide to find the unit rate.

$$\frac{274 \text{ miles}}{14 \text{ gallons}} \overset{\div 14}{=} \frac{19.6 \text{ miles}}{1 \text{ gallon}}$$

So, the car traveled 19.6 miles on 1 gallon of gasoline.

Lesson 5-3 Complex Fractions and Unit Rates (pp. 194–199)

Simplify.

11. $\frac{\frac{6}{2}}{\frac{5}{}}$

$\frac{6}{1} \div \frac{2}{5} = \frac{3}{1} \cdot \frac{5}{1} = 15$

12. $\frac{\frac{5}{3}}{10}$

13. Noreen can walk $1\frac{1}{10}$ miles in $\frac{1}{3}$ hour. Find her average speed in miles per hour.
14. Write $66\frac{2}{3}\%$ as a fraction in simplest form. 2/3
15. Write $6\frac{1}{2}\%$ as a fraction in simplest form.
16. Write $11\frac{1}{3}\%$ as a fraction in simplest form.

Example 3

Simplify $\frac{\frac{5}{3}}{4}$.

$\frac{\frac{5}{3}}{4} = \frac{5}{1} \div \frac{3}{4}$	Write the complex fraction as a division problem.
$= \frac{5}{1} \times \frac{4}{3}$	Multiply by the reciprocal of $\frac{3}{4}$, which is $\frac{4}{3}$.
$= \frac{20}{3}$ or $6\frac{2}{3}$	Simplify.

(14) $66\frac{2}{3} = \frac{190}{3}$ → $\frac{190}{3} \div \frac{100}{1}$

$\frac{200}{3} \div \frac{100}{1}$

$\frac{200}{3} \cdot \frac{1}{100} = \frac{200}{300} = \frac{2}{3}$

(16) $11\frac{1}{3}\%$ → $\frac{34}{3}$

$\frac{\frac{34}{3}}{100} = \frac{34}{3} \cdot \frac{1}{100} = \frac{34}{300} = \frac{17}{150}$

Lesson 5-4 Converting Rates (pp. 200–205)

Complete each conversion. Round to the nearest hundredth, if necessary.

17. 7 in. ≈ ■ cm

18. 20 m ≈ ■ yd

19. 25 fl oz ≈ ■ mL

20. 4 L ≈ ■ gal

21. 18 pt ≈ ■ L

22. 12 oz ≈ ■ g

23. 26 cm ≈ ■ in.

24. 3 qt ≈ ■ L

25. 4 m ≈ ■ ft

26. 68 g ≈ ■ oz

27. STEM A plane is flying at a speed of 425 miles per hour. How far will the plane travel in 0.75 hour?

28. A swimming pool is being drained at a rate of 50 gallons per hour. How many milliliters per second is this? Round to the nearest tenth.

29. A runner runs 2 miles in 9.56 minutes. How many meters per second is this?

30. A family drives their car 135 miles in 3 hours. How many kilometers per hour is this?

Example 4

Complete the conversion. Round to the nearest hundredth.
18 centimeters to inches

Use 1 inch ≈ 2.54 centimeters.

$18 \text{ cm} \approx 18 \text{ cm} \cdot \frac{1 \text{ in.}}{2.54 \text{ cm}}$ Multiply by $\frac{1 \text{ in.}}{2.54 \text{ cm}}$.

$\approx 18 \text{ cm} \cdot \frac{1 \text{ in.}}{2.54 \text{ cm}}$ Divide out common units.

$\approx \frac{18 \text{ in.}}{2.54}$ or 7.09 in. Simplify.

Example 5

A peregrine falcon can fly at a top speed of 200 miles per hour. How many feet per second is this?

First, convert miles to feet and hours to seconds.

$$\frac{200 \text{ mi}}{1 \text{ h}} = \frac{200 \text{ mi}}{1 \text{ h}} \cdot \frac{5280 \text{ ft}}{1 \text{ mi}} \cdot \frac{1 \text{ h}}{3600 \text{ s}}$$

Next, divide out the common factors.

$$= \frac{\cancel{200 \text{ mi}}}{1 \text{ h}} \cdot \frac{\cancel{5280 \text{ ft}}}{1 \cancel{\text{ mi}}} \cdot \frac{1 \cancel{\text{ h}}}{\cancel{3600 \text{ s}}}$$

$$= \frac{293.3 \text{ ft}}{1 \text{ s}}$$

The falcon can fly about 293 feet per second.

Lesson 5-5 Proportional and Nonproportional Relationships (pp. 206–210)

Determine whether the cost is proportional to the number of books purchased. If the relationship is proportional, find the constant of proportionality. Explain your reasoning.

31.

Books	1	2	3	4
Cost ($)	8	16	24	32

32.

Books	2	4	6	8
Cost ($)	2	5	7	10

33. A customer at the ring toss booth gets 8 rings for $2. Find the constant of proportionality. Write an equation relating the cost to the number of rings. At this same rate, how much would a customer pay for 11 rings? for 20 rings?

34. Mrs. Tebon buys 25 party favors for $5. At this same rate, how much would she pay for 40 party favors? for 60 party favors?

Example 6

Determine whether the distance is proportional to the time. If the relationship is proportional, find the constant of proportionality. Explain your reasoning.

Distance (meters)	30	56	69	80
Time (minutes)	1	2	3	4

Write the rate of distance to time for each minute in simplest form.

$\frac{30}{1}$ $\frac{56}{2} = \frac{28}{1}$ $\frac{69}{3} = \frac{23}{1}$ $\frac{80}{4} = \frac{20}{1}$

not equal

Since the rates are not equal, the distance is not proportional to the time, and there is no constant of proportionality.

$\frac{30}{1} \neq \frac{28}{1}$

Lesson 5-6 Graphing Proportional Relationships (pp. 212–217)

35. Determine whether the relationship is proportional by graphing on the coordinate plane. Explain your reasoning.

Time (min)	4	7	8	10
Distance (ft)	8	14	16	20

36. The cost of dance lessons is \$12 for 1 lesson, \$22 for 2 lessons, and \$32 for 3 lessons. Determine whether the cost is proportional to the number of lessons by graphing the ordered pairs on the coordinate plane. Explain your reasoning.

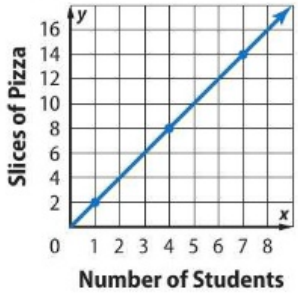
37. The number of squirrels is proportional to the number of trees. A graph of the relationship includes the points (0, 0), (3, 9), and (5, 15).

a. Find and interpret the constant of proportionality.

b. Explain what the points (0, 0), (3, 9), and (5, 15) represent.

Example 7

The number of slices of pizza purchased is proportional to the number of students eating. The graph below shows the relationship (students, slices). Determine the constant of proportionality. Explain what it means.



Use the point (4, 8).

$$\frac{\text{slices of pizza}}{\text{number of students}} = \frac{8}{4} = \frac{2}{1} \text{ or } 2$$

The constant of proportionality is the unit rate, 2 slices per student. It describes the number of slices of pizza purchased for every 1 student eating.

Lesson 5-7 Solving Proportions (pp. 218–223)

Solve each proportion.

38. $\frac{15}{a} = \frac{5}{4}$

39. $\frac{m}{6} = \frac{18}{15}$

40. $\frac{28}{24} = \frac{d}{12}$

41. $\frac{16.5}{21} = \frac{5.5}{t}$

42. Financial Literacy A homeowner whose house is assessed for \$120,000 pays \$1800 in taxes. At the same rate, what is the tax on a house assessed at \$135,000?

$\frac{120{,}000}{1800} = 66.\overline{6}$ $\frac{135{,}000}{2025} = 66.\overline{6}$

Example 8

Solve $\frac{4}{9} = \frac{9}{x}$.

$\frac{4}{9} = \frac{9}{x}$	Write the proportion.
$4 \cdot x = 9 \cdot 9$	Cross products
$4x = 81$	Multiply.
$\frac{4x}{4} = \frac{81}{4}$	Divide each side by 4.
$x = 20.25$	Simplify.

$\frac{120{,}000}{1800} = \frac{135{,}000}{x}$

$\frac{1200}{18} = \frac{135{,}000}{x}$

$\frac{400}{6}$

$\frac{200}{3} = \frac{135{,}000}{x}$

Lesson 5-8 Scale Drawing and Models (pp. 224–229)

On the scale drawing of a museum, the scale is 0.5 inch = 10 feet. Find the actual length of each gallery.

$\frac{0.5 \text{ in}}{10 \text{ ft}} = \frac{6 \text{ in}}{120 \text{ ft}}$ (×12)

	Gallery	Drawing Length
43.	Modern Art	6 in.
44.	Renaissance	4.25 in.
45.	Egypt	7.5 in.

46. The length of a highway is 900 miles. If 0.5 inch on a map represents 50 miles, what is the length of the highway on the map?

Example 9

A scale model of a car has a bumper that is 3.5 inches long. The scale on the model is 1 inch = 2 feet. What is the length of the actual car bumper?

model length ⋯➤ $\frac{1 \text{ in.}}{2 \text{ ft}} = \frac{3.5 \text{ in.}}{x \text{ ft}}$ ⋯➤ model length
actual length ⋯➤ actual length

$1 \cdot x = 2 \cdot 3.5$

$x = 7$

The actual length of the car bumper is 7 feet.

$3(135{,}000) = 200x$

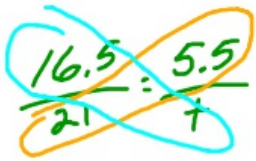
$405{,}000 = 200x$

$4050 = 2x$

$2025 = x$

$\times 3$

$\frac{16.5}{21} = \frac{5.5}{7=7}$



$21(5.5) = 16.5(t)$

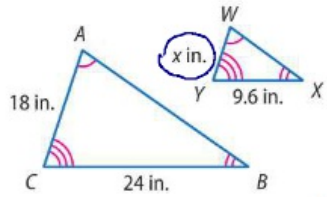
$\frac{115.5}{16.5} = \frac{16.5t}{16.5}$

$7 = t$

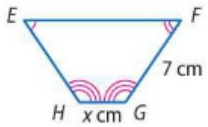
Lesson 5-9 Similar Figures (pp. 232–237)

The figures are similar. Determine each missing measure.

47.



48.

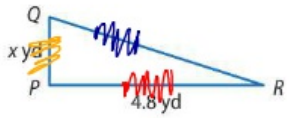


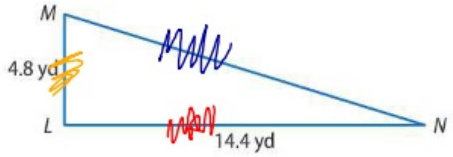
49. A mosaic is created using rectangular blocks. Block *A* has a length of 5 centimeters and a width of 2.5 centimeters. Block *B* is similar to block *A* and has a length of 7 centimeters. What is the width of block *B*?

50. Keshawn enlarges a rectangular photograph to make a poster that is similar to the photograph. The photograph is 4 inches wide and 6 inches long. The poster is 51 inches long. What is the width of the poster?

Example 10

If $\triangle LMN \sim \triangle PQR$, what is the value of x?





$\frac{LM}{PQ} = \frac{LN}{PR}$ Write a proportion.

$\frac{4.8}{x} = \frac{14.4}{4.8}$ Replace $\overline{LM}$ with 4.8, $\overline{PQ}$ with x, $\overline{LN}$ with 14.4, and $\overline{PR}$ with 4.8.

$x = 1.6$ Find cross products and simplify.

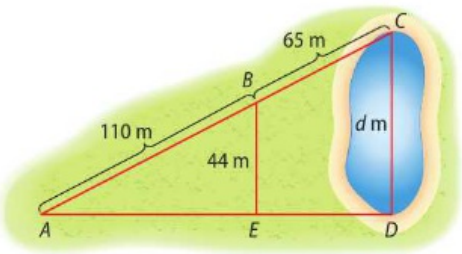
Lesson 5-10 Indirect Measurement (pp. 238–242)

51. At 7 feet 8 inches, the world's tallest woman casts a 46-inch shadow. At the same time, the world's shortest woman casts a 15.5-inch shadow. How tall is the world's shortest woman?

52. The largest known pyramid is the Pyramid of Khufu. At a certain time of day, a vertical yard stick casts a shadow 1.5 feet long, and the pyramid casts a shadow 241 feet long. How tall is the pyramid?

53. Mylie's house is 9 meters tall and casts a shadow 1.5 meters long. At the same time of day, a nearby doghouse casts a shadow that is 0.2 meter long. How tall is the dog house?

54. In the figure below, $\triangle ABE \approx \triangle ACD$. What is the distance across the pond?



Example 11

The Washington Monument casts a 185-foot shadow at the same time as a nearby flagpole casts a 3-foot shadow. If the flagpole is 9 feet tall, how tall is the Washington Monument?

Write and solve a proportion.

flagpole height → $\frac{9 \text{ ft}}{x \text{ ft}} = \frac{3 \text{ ft}}{185 \text{ ft}}$ ← flagpole's shadow
monument height → ← monument's shadow

$9 \cdot 185 = x \cdot 3$ Cross products

$1665 = 3x$ Multiply.

$\frac{1665}{3} = \frac{3x}{3}$ Divide each side by 3.

$555 = x$

The Washington Monument is 555 feet tall.