LESSON 15 Fractions, Decimals, and Percents

A. Fractions, decimals, and percents are all used to represent parts of a whole. They are just different ways of writing the same quantity, as shown below.

$$7\ out\ of\ 10 = \frac{7}{10} = 0.7 = 70\%$$

$$45\ out\ of\ 100 = \frac{45}{100} = 0.45 = 45\%$$

B. Here are the steps for converting between fractions, decimals, and percents.

1. To convert a fraction to a decimal:
1. Reduce the fraction to lowest terms.
2. Divide the numerator by the denominator.

3. To convert a decimal to a percent:
4. Multiply by 100, or move the decimal point 2 places to the right.
5. Add a % sign.

6.
7.

Fractions $\frac{7}{25}$

7 ÷ 25 = 0.28

28/100 = 7/25

Decimals 0.28

0.28 × 100 = 28

28 ÷ 100 = 0.28

Percents 28%

8. To convert a decimal to a fraction:
1. Remove the decimal point.
2. Place the appropriate denominator (a power of 10) under the number.
3. Simplify the fraction.

9. To convert a percent to a decimal:
1. Divide by 100, or move the decimal point 2 places to the left. 1
2. Drop the % sign.
10.

C. Convert between fractions, decimals, and percents. Simplify fractions.

Fraction	Decimal	Percent
$^{4}/_{5}$		
		75%
	0.375	
$^{22}/_{40}$		
	0.64	
$^{47}/_{50}$		

LESSON 15 Practice

A. Convert between fractions, decimals, and percents. Simplify fractions.

Fraction	Decimal	Percent
	0.625	
		60%
$^{6}/_{16}$		
		35%
$^{18}/_{24}$		
	0.84	
	0.46	
$^{9}/_{75}$		

B. Find the mystery numbers.

I am a decimal. As a fraction, my denominator is twice my numerator. What number am I? __________

I am a percent. In fraction form, I am equivalent to five eighths times four tenths. What number am I? __________

I am a decimal between 3 and 4. I have two digits in total and my tenths digit is the square of 3. What number am I? __________

I am a fraction equivalent to three fourths. My denominator is the sum of all prime factors of 66. What number am I? __________

I am a fraction. My numerator and denominator are both prime. In percent form, I can be written as 40%. What number am I? __________

I am a percent. In decimal form, my whole number part is the greatest common factor of 18 and 24. My decimal part is the least common multiple of 21 and 28. What number am I? __________

LESSON 21 Like Terms

A. An algebraic expressions is made up of **terms** separated by plus and minus signs. A term has two parts: the number part, also called the **coefficient**, and the variable part. A term with no variable part is called a **constant**. Let's see an example. Check off each box if you understand it.

$$3x^2 + 4x - 6 + x^2 - 7xy$$

☐ The variables are x and y.

☐ The constant is -6.

☐ There are 5 terms: $3x^2$, $4x$, -6, x^2, and $-7xy$.

☐ The coefficient of $-7xy$ is -7. The variable part is xy.

☐ The coefficient of x^2 is 1. The variable part is x^2.

☐ $3x^2$ and x^2 have the same variable part: x^2.

B. Like terms are terms that have the same variable part. In the expression above, $3x^2$ and x^2 are like terms. Circle the pairs of like terms below. Note that all constants are like terms.

$2x$ and $5x$	x and $8y$	$-x$ and x	9 and -7	$2y$ and $2y^2$
$-4x$ and -4	$5xy$ and $2xy$	x^2 and y^2	$2xy$ and $2y$	y^2 and $-3y^2$

C. You can simplify an expression by combining like terms. To combine like terms, simply combine their coefficients but keep the variable part the same. Here are the steps.

$$5x + x^2 - x + 3 + 4x^2 + 2x + 7$$
$$= (5 - 1 + 2)x + (1 + 4)x^2 + (3 + 7)$$
$$= 6x + 5x^2 + 10$$

12. To combine like terms:
1. Identify like terms.
2. Combine (add or subtract) the coefficients of like terms.
3. Keep the variable part the same.

D. Simplify each expression by combining like terms.

$3x + 7x$

$4m^2 + 3 + 6m^2 - 3$

$7 + 5k - 2$

$9t + 3 - 4t - 6 + 2t$

$4n - 8 + 5n$

$4s^2 + 2 - 4s - s^2 + 2s$

$2a + 9 - 2a$

$8p - 4q + 5 + 9p + 4q$

$6 - xy + 2xy$

$7u + 4u - 7v - 2u - 5v$

LESSON 21 Practice

A. Select all statements that correctly describe the given expression.

$$9x^2 + 4xy + 6 - 2y + y^2 - 7xy + 1$$

☐ The coefficient of y^2 is 0.
☐ $4xy$ and $7xy$ are like terms.
☐ There are 7 terms in the expression.
☐ $9x^2$ and y^2 are like terms.
☐ The expression evaluates to 5 when $x = y = 0$.
☐ There are two variables: x and y.

B. Circle the pairs of like terms.

$4x$ and $4y$	$8x^2$ and x^2	-16 and 12	$5x^2$ and $5x$	9 and $9x$
$-7x$ and $-x$	$2x$ and $2y$	$6y$ and $6xy$	$-3y$ and $3y$	xy and $-xy$

C. Simplify each expression by combining like terms.

$5a + 9a$

$6r + 3 + 2 + 5r + r$

$5 + 7k - 3$

$6m + 2n - 2m + 5n$

$-x + x + 15$

$9p - 3q + 2 + p + 4$

$4m - 9 + 8$

$2s - 5t + 5s - 2s + 6t$

$9n + 3 - 2n$

$4k^2 - 3k - k^2 + 7 + 3k$

$4b^2 + 3b^2 + 2$

$2x^2 + 4xy + 4y^2 - 5xy$

D. Evaluate each expression for the given value of the variable.

$5a - 3;\ a = 9$

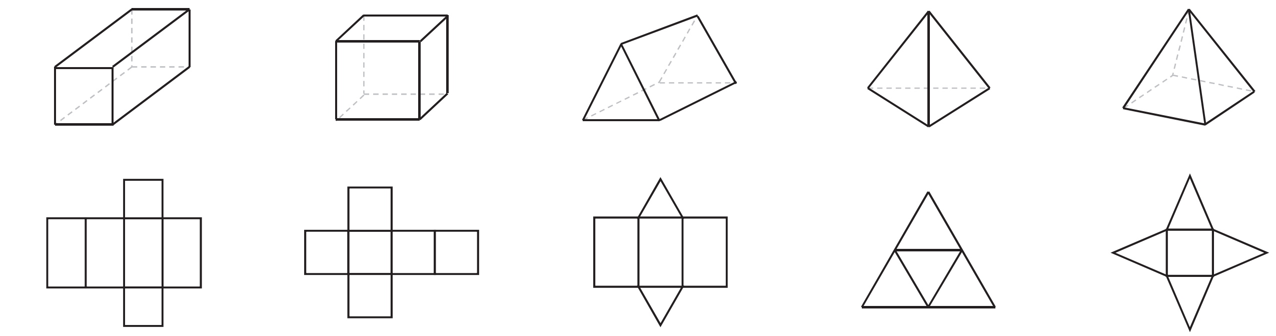
$3 + 6b;\ b = 4$

$4c \div 5;\ c = 25$

A math riddle for you! Change 10 10 10 into 9:50 with a single pen stroke.

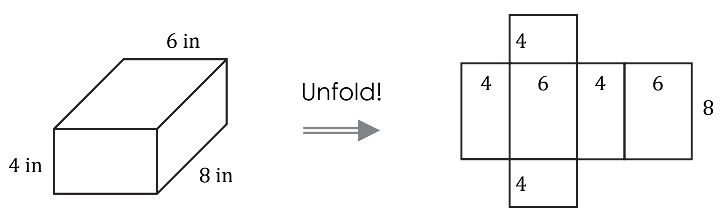
LESSON 36 Surface Area of Prisms

A. A **net** is a 2-dimensional shape that can be folded to form a 3-dimensional object. A net of a polyhedron is made of polygons joined at their edges. Here are some examples. Cover the first row and see if you can visualize the shape formed by each net.



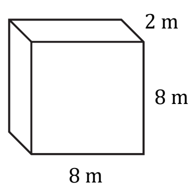
Rectangular prism (Cuboid) | Cube | Triangular prism | Triangular pyramid | Square pyramid

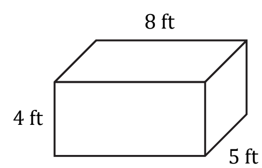
B. **Surface area** is the sum of the areas of all surfaces of a 3-dimensional object. The surface area of a prism is the area of its net. Surface area is measured in square units. Here is an example.

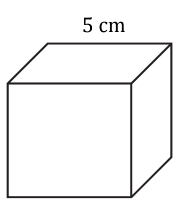


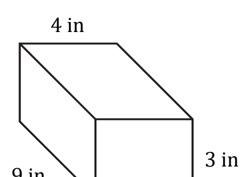
13. The surface area of the cuboid
14. = Front + Top + Left +
15. Back + Bottom + Right
16. $= (4 \times 6) + (6 \times 8) + (4 \times 8) +$
17. $(4 \times 6) + (6 \times 8) + (4 \times 8)$
18. $= 208 \text{ in}^2$

C. Find the surface area of each solid.



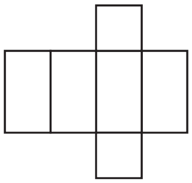


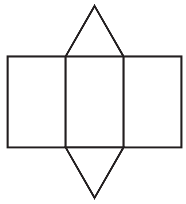


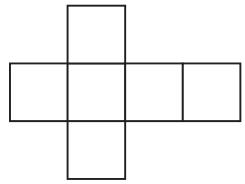


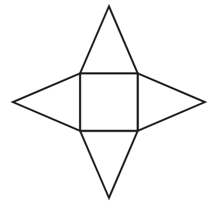
LESSON 36 Practice

A. Write the name of the solid formed by each net.

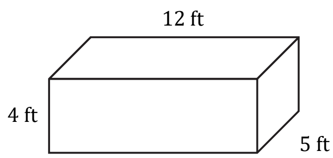








B. Find the area of each face of the prism and then add them all to find its surface area.



Front =

Top =

Left =

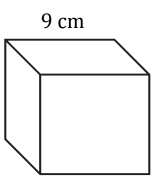
Back =

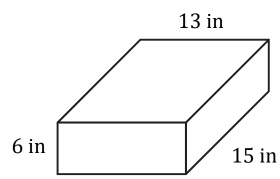
Bottom =

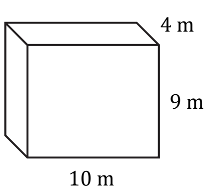
Right =

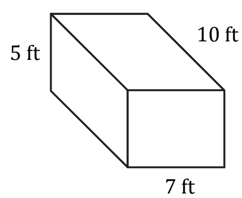
Surface area =

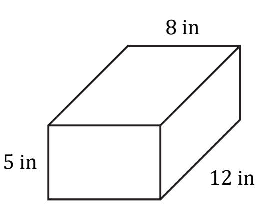
C. Find the surface area of each solid.

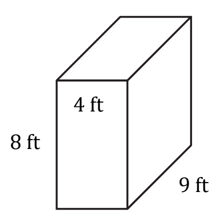












LESSON 92 Catch up and Review!

A. Catch up if you are behind. You can go back and redo a lesson that caused you trouble.

B. Use the review problems below to make sure you're on track. If you get any problem wrong, go back and redo the corresponding lesson. Evaluate the expression or solve for *x*.

Lesson 63 $\frac{5^2 - 2 \cdot 8}{-3}$

Lesson 67 $\frac{3.24}{2.7}$

Lesson 69 $6\frac{3}{8} + -3\frac{3}{4}$

Lesson 71 $5\frac{1}{4} \times -3\frac{5}{9}$

Lesson 73 $5\frac{1}{4} \div -2\frac{5}{8}$

Lesson 81 $\frac{x}{-7} = -18$

Lesson 83 $2.96 = -5.2 + x$

Lesson 84 $x - \frac{5}{6} = \frac{1}{5}$

Lesson 85 $7 + \frac{x}{6} = -8$

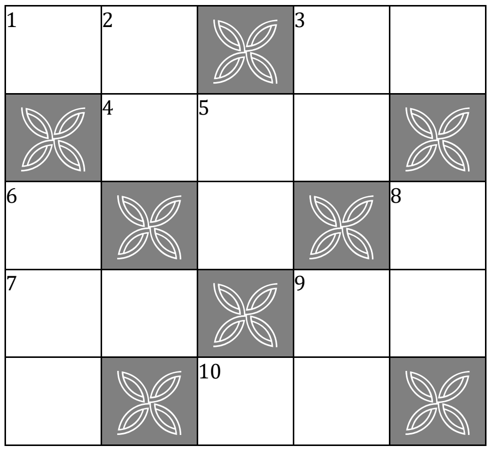
Lesson 86 $-\frac{1}{2}x - \frac{5}{6} = 3\frac{1}{2}$

C. Make sure you know these key terms. Can you explain each term in your own words?

- ☐ Commutative property
- ☐ Associative property
- ☐ Identity property
- ☐ Inverse property
- ☐ Distributive property
- ☐ Absolute value
- ☐ Opposite number
- ☐ Integer
- ☐ Rational number
- ☐ Repeating decimal
- ☐ Variable
- ☐ Coefficient
- ☐ Like terms
- ☐ Inverse operation
- ☐ Equivalent equation

LESSON 92 Practice

A. Solve for *x*. Use the answers to fill in the crossword puzzle.



Across:

1. $x/5 = 9$
3. $2x - 53 = 95$
4. $x - 216 = -3$
7. $70 = 4x - 82$
9. $35 - 2x = 11$
10. $x + 18 = 64$

Down:

2. $2x - 48 = 56$
3. $15 - x = -58$
5. $8 = 0.4x + 2$
6. $x - 700 = -68$
8. $-17 = 27 - 2x$
9. $x/4 + 3 = 7$

B. Solve each equation. Simplify fractions.

$3.72 - 2.4x = -0.12$

$-2x + 3.74 = 5.54$

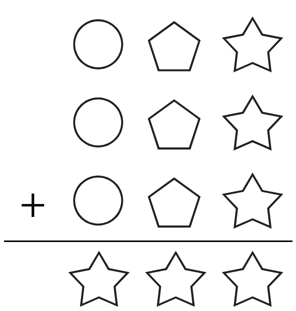
$0.4x + 5 = 3.84$

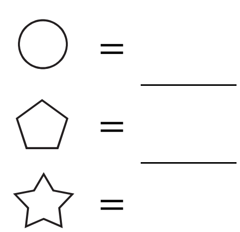
$1\frac{1}{3} + \frac{3}{4}x = 2\frac{1}{4}$

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

$1\frac{3}{8}x - 3\frac{3}{4} = -4\frac{1}{2}$

C. Here is a tricky equation puzzle. Each shape represents a single digit. Can you find the digits? (Hint: Find the value of the star first.)

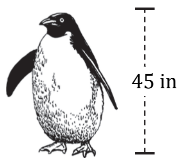


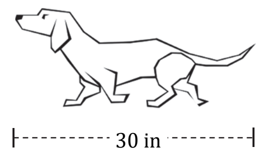


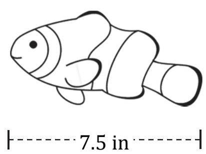
LESSON 113 Scale Drawings

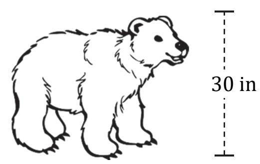
A. A map has a scale of 1 inch = 25 miles and two cities on the map are 3 inches apart. Show how to find the actual distance between the two cities. Review Lesson 112 if needed.

B. In a scale drawing (or model), the **scale** or **scale factor** is always the ratio of a distance in the drawing to the corresponding distance in the real world. Use an inch ruler to measure the width or height of each model below and find the scale factor as a fraction in simplest form.









C. All models use a scale of 1 to 24. Find the missing dimensions.

Model	Model dimension	Actual dimension
Car	Length: 7 in	Length:
Tree	Height:	Height: 28.8 ft
Desk	Width: 2.5 in	Width:
Whale	Length: 2 ft	Length:
House	Height:	Height: 14.4 ft

D. Solve each problem.

A map has a scale of 0.5 in = 25 miles. What is the actual distance when the distance on the map is 2.2 inches? __________

Jackson made a scale drawing of a nearby park. In real life, the park is 120 feet wide. In his drawing, it is 8 inches wide. What scale did Jackson use for his drawing? __________

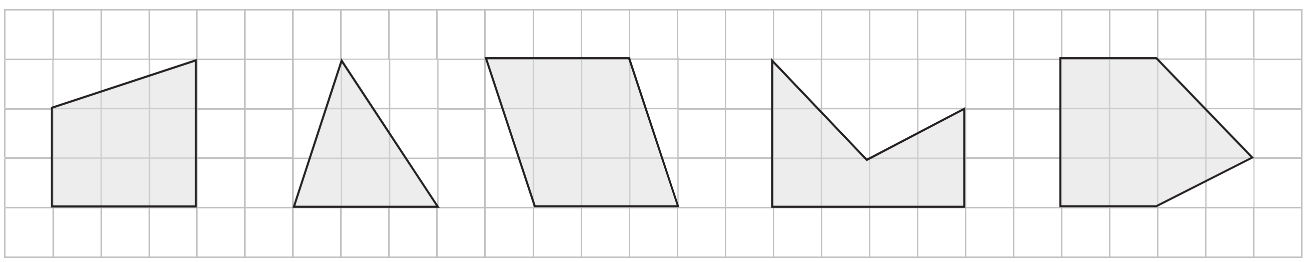
Betty's scale drawing of her house uses a scale of 1 in = 5 feet. The actual dimensions of her house are 55 feet by 80 feet. What are the dimensions of Betty's house on the drawing? __________

LESSON 113 Practice

A. Find the drawing length or actual length for each scale.

Scale	Drawing length	Actual length
1 in = 6 ft	3.5 in	
½ in : 4 ft	12 in	
1 cm : 5 m		46 m
¼ in : 10 mi		600 mi

B. Below are five polygons scaled down and drawn on 1 cm grid paper. The scale is 1 cm = 4 in. Find the actual area of each shape.



C. Maria is taking a road trip. Her map has a scale of 1 inch = 50 miles. Answer each question.

Maria left Cincinnati for Indianapolis. On her map, the two cities are 2.4 inches apart. What is the actual distance between them? __________

She left Cincinnati at 9 a.m. and drove at an average speed of 60 mph (miles per hour). What time did she arrive in Indianapolis? __________

She then drove 240 miles to St. Louis. What would be the distance between Indianapolis and St. Louis on her map? __________

Maria left Indianapolis at 2 p.m. and reached St. Louis at 5:45 p.m. What was her average speed from Indianapolis to St. Louis? __________

Maria's car gets 40 miles per gallon. The price of gas is $2.70/gallon. How much did Maria spend on gas going from Cincinnati to St. Louis? __________

The straight-line distance between Cincinnati and St. Louis is 6 inches on the map. What is the actual straight-line distance between them? __________

Lesson 152 Sample Spaces

A. A **sample space** is the set of all possible outcomes. It can be represented by using an organized list, a table, or a tree diagram. Shown below is the sample space of tossing a coin twice. The possible outcomes are HH, HT, TH, and TT where H stands for heads and T for tails.

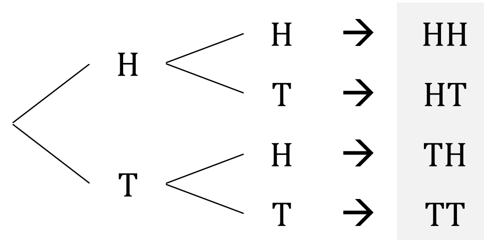
Organized list:

HH, HT, TH, TT

Table:

2nd \ 1st	H	T
H	HH	HT
T	TH	TT

Tree diagram:



B. The **fundamental counting principle** is a way of figuring out the total number of outcomes without listing them all. It states that if one event has p possible outcomes and another event has q possible outcomes, then there are a total of $p \times q$ possible outcomes for the two events together. In the example above, each coin toss has 2 possible outcomes, so the sample space has $2 \times 2 = 4$ possible outcomes. What if you toss two coins and roll a die? Then the sample space will have $2 \times 2 \times 6 = 24$ possible outcomes.

C. List the sample space for each situation.

Drawing a single coin from a coin jar containing pennies, nickels, dimes, and quarters

Making a 2-digit number using the numbers 1, 2, and 3 with repetition allowed

Tossing a coin three times

D. Find the total number of possible outcomes in each situation.

Jack selects a day from a non-leap year. (A leap year has 366 days.) ________

Chloe takes a quiz consisting of 5 true-false questions. ________

Eli tosses a coin and selects a letter from the alphabet. ________

Brian makes an outfit from 3 different shirts, 3 different pairs of pants, and 2 different pairs of shoes. ________

Jack buys a combo meal that consists of 1 sandwich, 1 side, and 1 drink. He has 5 choices of sandwiches, 6 choices of sides, and 2 choices of drinks. ________

LESSON 152 Practice

A. List the sample space for each situation.

Drawing a number from 2-digit square numbers

Drawing a letter from the alphabet of 26 letters

Tossing a coin and rolling a die

Answering 3 true-false questions

Making an outfit from 3 shirts (red, blue, and tan) and 2 pairs of pants (tan and blue)

B. Find the total number of possible outcomes in each situation.

Jacob rolls a die twice. ____________

Larry tosses a coin five times. ____________

Jamal rolls a die and selects one day of the week. ____________

Cheryl tosses a coin and selects a month of the year. ____________

Mark selects an integer from 1 to 10 and a letter from the word SAMPLE. ____________

Ron has a choice of ham, tuna, or turkey and a choice of white or wheat bread to make a sandwich. ____________

A café sells fruit smoothies. Chad can choose small, medium, or large. Then he can choose bananas, kiwis, or oranges. ____________

Cheyenne tosses two coins and spins a spinner with eight equal sections numbered 1 through 8. ____________

Alison takes a multiple choice test which consists of 4 questions. Each question has 4 choices. You may use a calculator. ____________

Grace makes a 4-digit password using the numbers 1 to 9 with repetition allowed. You may use a calculator. ____________