Name_________________________ Period___________

Geometry Honors Incoming Assignment

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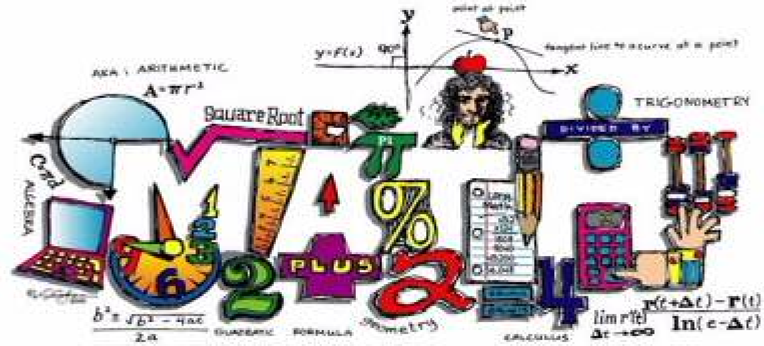
Bak MSOA Summer Required Mathematics Assignment Directions:



Each student shall print and complete <u>ONE</u> Math packet during the summer, based on the class in which he or she will be enrolled this August.

Complete the <u>ODD</u> Problems, only, on each page.
Show all appropriate work and circle your answers.
The work will not be collected on the first day of school.
This will be a part of your first nine weeks Assignment grade.

Consider these helpful websites during the Summer and the School Year!

ixl.com, khanacademy.org, tenmarks.com, learnzillion.com

GOOD LUCK WITH YOUR ASSIGNMENT!

WE LOOK FORWARD TO SEEING YOU IN AUGUST. ☺

NAME ______________________________ DATE ____________ PERIOD _____

9-1 A

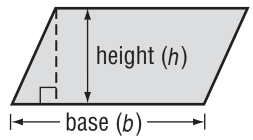
Reteach

Area of Parallelograms

The area A of a parallelogram is the product of any base b and its height h.

Symbols $A = bh$

Model



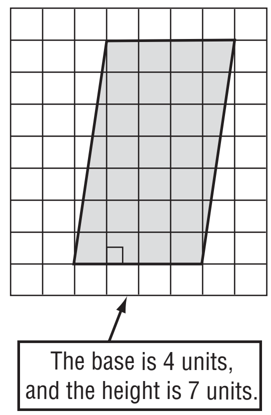
Example 1 **Find the area of the parallelogram.**

$A = bh$

$A = 4 \times 7$

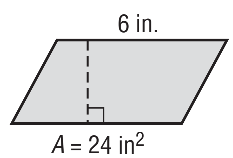
$A = 28$

The area is 28 square units or 28 units^2.



Example 2 **Find the height of the parallelogram.**

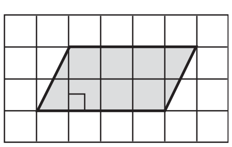
$A = bh$	Area of parallelogram
$24 = 6 \cdot h$	Replace A with 24 and b with 6.
$\frac{24}{6} = \frac{6h}{6}$	Divide each side by 6.
$4 = h$	Simplify.



So, the height is 4 inches.

Find the area of each parallelogram.

1.



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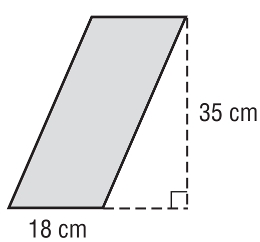

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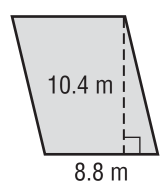

4. Find the height of a parallelogram if its base is 9 feet and its area is 27 square feet.

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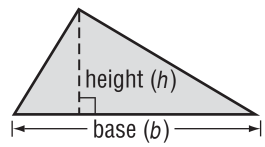
Reteach

Area of Triangles

The area *A* of a triangle is one half the product of any base *b* and its height *h*.

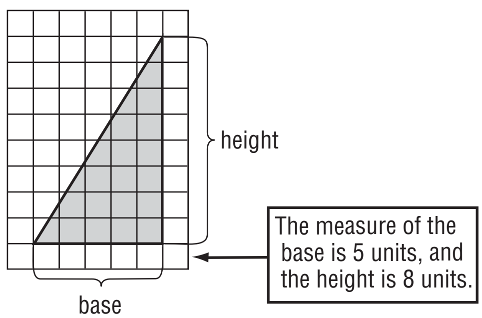
Symbols $A = \frac{1}{2}bh$ or $A = \frac{bh}{2}$

Model



Examples

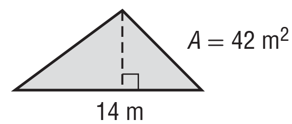
1 Find the area.



$A = \frac{bh}{2}$	Area of a triangle
$A = \frac{5 \times 8}{2}$	Replace *b* with 5 and *h* with 8.
$A = \frac{40}{2}$	Simplify the numerator.
$A = 20$	Divide.

The area is 20 square units.

2 Find the height.



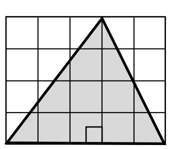
$A = \frac{bh}{2}$	Area of a triangle
$42 = \frac{14 \cdot h}{2}$	Replace *A* with 42 and *b* with 14.
$42(2) = \frac{14 \cdot h}{2}(2)$	Multiply both sides by 2.
$84 = 14 \cdot h$	Simplify.
$\frac{84}{14} = \frac{14 \cdot h}{14}$	Divide by 14.
$6 = h$	Simplify.

The height is 6 meters.

Exercises

Find the area of each triangle.

1.



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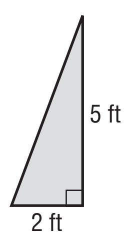

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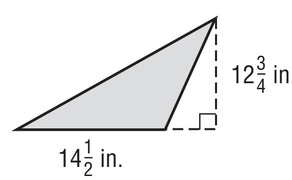

Find the missing dimension.

4. height: 12 in., area: 24 in^2

5. base: 15m, area: 37.5 m^2

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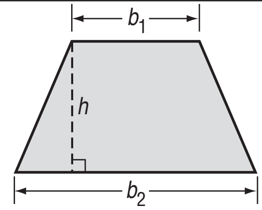
9-1 D

Reteach

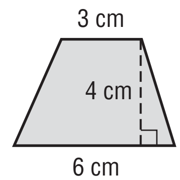
Area of Trapezoids

A trapezoid has two bases, b_1 and b_2. The height of a trapezoid is the distance between the two bases. The area A of a trapezoid equals half the product of the height h and the sum of the bases b_1 and b_2.

$$A = \frac{1}{2}h(b_1 + b_2)$$



Example **Find the area of the trapezoid.**



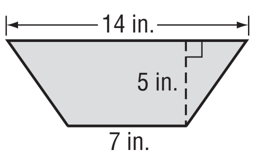
$A = \frac{1}{2}h(b_1 + b_2)$	Area of a trapezoid
$A = \frac{1}{2}(4)(3 + 6)$	Replace h with 4, b_1 with 3, and b_2 with 6.
$A = \frac{1}{2}(4)(9)$	Add 3 and 6.
$A = 18$	Simplify.

The area of the trapezoid is 18 square centimeters.

Exercises

Find the area of each figure. Round to the nearest tenth if necessary.

1.



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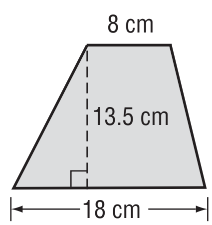

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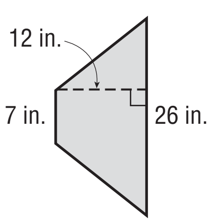

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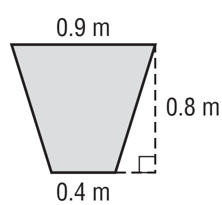
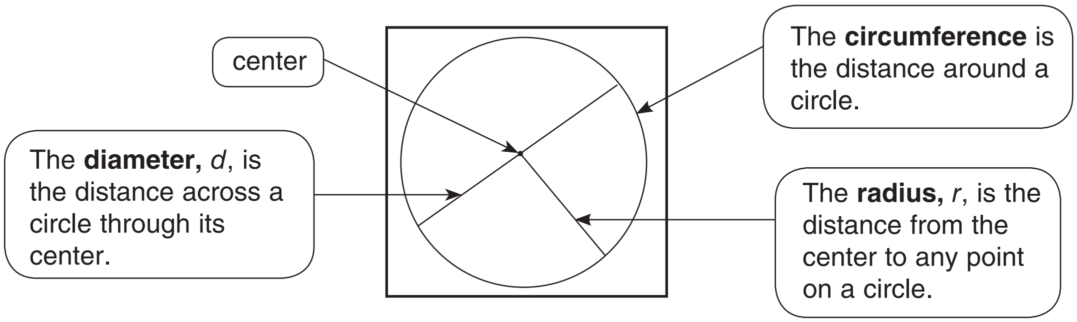


NAME ______________________________ DATE ____________ PERIOD _____

9-2 B

Reteach

Circumference



The diameter of a circle is twice its radius. $d = 2r$

The radius is half the diameter. $r = \frac{d}{2}$

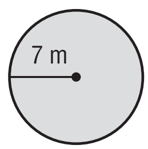
Example 1 **The radius of a circle is 7 meters. Find the diameter.**

$d = 2r$

$d = 2 \cdot 7$ Replace *r* with 7.

$d = 14$ Multiply.

The diameter is 14 meters.



The circumference of a circle is equal to π times its diameter or π times twice its radius. $C = \pi d$ $C = 2\pi r$

Example 2 **Find the circumference of a circle with a radius that is 13 inches. Use 3.14 for π. Round to the nearest tenth.**

$C = 2\pi r$ Write the formula.

$C \approx 2 \times 3.14 \times 13$ Replace *r* with 13 and π with 3.14.

$C \approx 81.64$ Multiply.

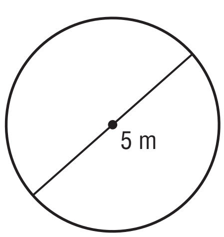
Rounded to the nearest tenth, the circumference is about 81.6 inches.

Another approximation for π is $\frac{22}{7}$. This approximation is convenient when the radius or diameter is a multiple of 7.

Exercises

Find the circumference of each circle. Use 3.14 or $\frac{22}{7}$ for π. Round to the nearest tenth if necessary.

1.



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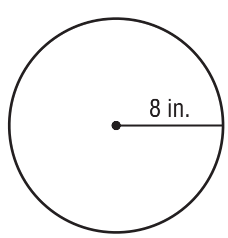

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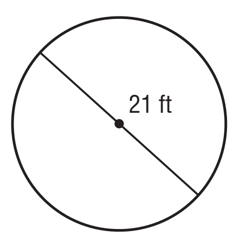

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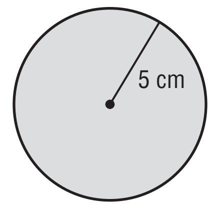
Reteach

Area of Circles

The area A of a circle equals the product of pi (π) and the square of its radius r.

$A = \pi r^2$

Example 1 **Find the area of the circle. Use 3.14 for π.**



$A = \pi r^2$ Area of circle

$A \approx 3.14 \cdot 5^2$ Replace π with 3.14 and r with 5.

$A \approx 3.14 \cdot 25$ $5^2 = 5 \cdot 5 = 25$

$A \approx 78.5$

The area of the circle is approximately 78.5 square centimeters.

Example 2 **Find the area of a circle that has a diameter of 9.4 millimeters. Use 3.14 for π. Round to the nearest tenth.**

$A = \pi r^2$ Area of circle

$A \approx 3.14 \cdot 4.7^2$ Replace π with 3.14 and r with $9.4 \div 2$ or 4.7.

$A \approx 69.4$ Multiply.

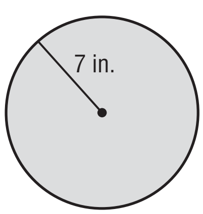
The area of the circle is approximately 69.4 square millimeters.

The formula for the area of a semicircle, or half a circle, is $A = \frac{1}{2}\pi r^2$.

Exercises

Find the area of each circle. Use 3.14 or $\frac{22}{7}$ for π. Round to the nearest tenth.

1.



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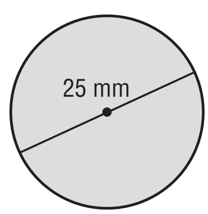

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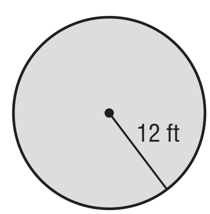
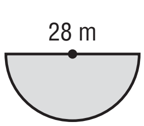


Approximate the area of each semicircle.

4.



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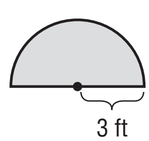


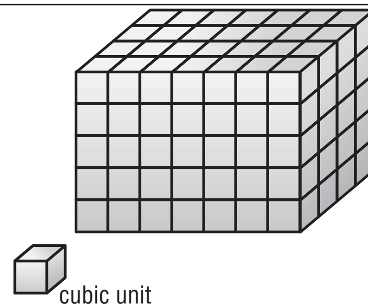
NAME ________________________ DATE ____________ PERIOD _____

9-4 B

Reteach

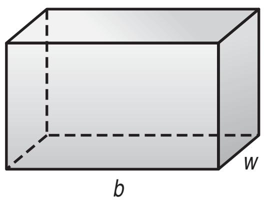
Volume of Rectangular Prisms

The amount of space inside a three-dimensional figure is the **volume** of the figure. Volume is measured in **cubic units**. This tells you the number of cubes of a given size it will take to fill the prism.



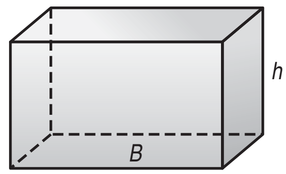
The volume V of a rectangular prism is the product of its base b, width w, and height h.
Symbols $V = bwh$

Model

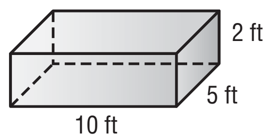


You can also multiply the area of the base B by the height h to find the volume V.
Symbols $V = Bh$

Model



Example **Find the volume of the rectangular prism.**



Method 1 Use $V = bwh$.

$V = bwh$

$V = 10 \times 5 \times 2$

$V = 100$

The volume is 100 ft^3.

Method 2 Use $V = Bh$.

$V = Bh$

$V = 50 \times 2$

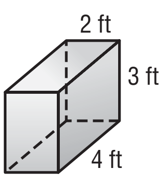
$V = 100$

The volume is 100 ft^3.

Exercises

Find the volume of each prism.

1.



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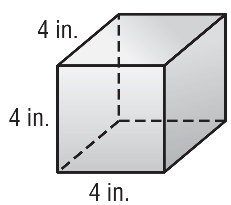

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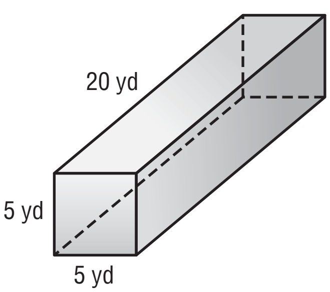

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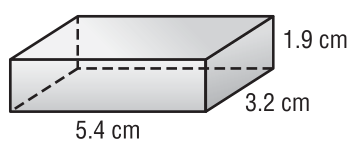

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4-3 A Reteach

Similar Figures

Figures that have the same shape but not necessarily the same size are **similar figures.** The symbol ~ means *is similar to*. You can use proportions to find the missing length of a side in a pair of similar figures.

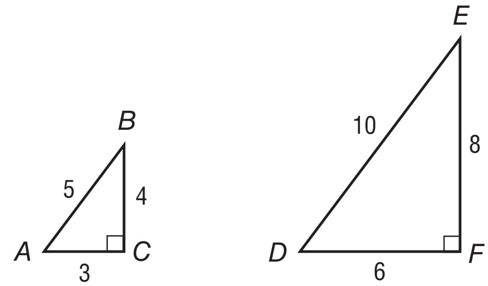
For example, $\triangle ABC \sim \triangle DEF$.

Corresponding angles: $\angle A \cong \angle D$, $\angle B \cong \angle E$, $\angle C \cong \angle F$

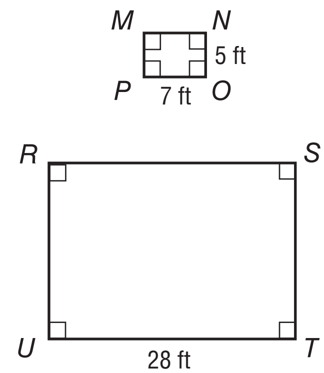
Corresponding sides:

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD}$$

$$\frac{5}{10} = \frac{4}{8} = \frac{3}{6}$$



Example 1 **If *MNOP* ~ *RSTU*, find the length of $\overline{ST}$.**



Since the two figures are similar, the ratios of their corresponding sides are equal. You can write and solve a proportion to find $\overline{ST}$.

$\frac{PO}{UT} = \frac{NO}{ST}$ Write a proportion.

$\frac{7}{28} = \frac{5}{n}$ Let n represent the length of $\overline{ST}$. Then substitute.

$7n = 28(5)$ Find the cross products.

$7n = 140$ Simplify.

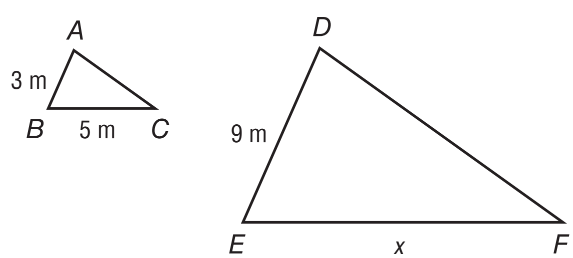
$n = 20$ Divide each side by 7.

The length of $\overline{ST}$ is 20 feet.

Exercises

Find the value of *x* in each pair of similar figures.

1.



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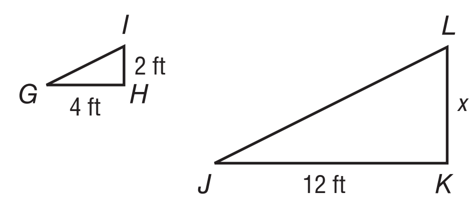

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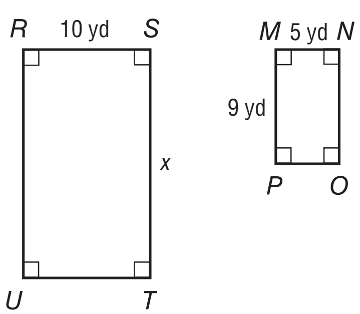

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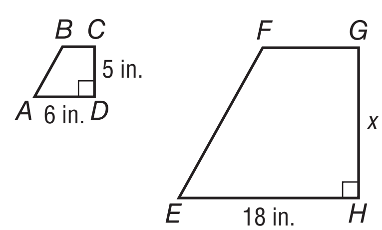

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4-3 B

Reteach

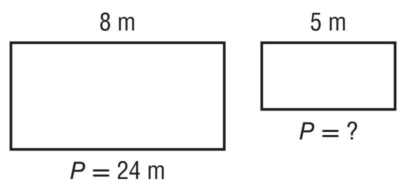
Perimeter and Area of Similar Figures

Ratios of Similar Figures

- If two figures are similar with a scale factor of $\frac{a}{b}$, then the perimeters of the two figures have a ratio of $\frac{a}{b}$.
- If two figures are similar with a scale factor of $\frac{a}{b}$, then the areas of the two figures have a ratio of $\left(\frac{a}{b}\right)^2$.

Example **For the pair of similar figures, find the perimeter of the second figure.**

Use a proportion to solve.



The scale factor of the two similar figures is $\frac{8}{5}$. The perimeter of the first figure is 24 meters.

$\frac{8}{5} = \frac{24}{x}$ Write a proportion. Let x represent the unknown perimeter.

$8 \bullet x = 5 \bullet 24$ Find the cross products.

$8x = 120$ Simplify.

$x = 15$ Divide by 8.

The perimeter is 15 meters.

Exercises

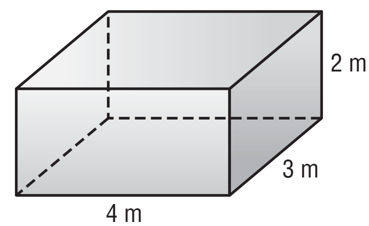
1. **PICTURE FRAME** Pauline made a picture frame to give her friend as a gift. The length of the frame was 5 inches and the perimeter was 16 inches. Pauline decided to make a similar frame with a length twice as long as the first one. What is the perimeter of the new picture frame?

2. **QUILT** Breanne put a triangular-shaped piece on her quilt, with one side 6 inches. The area of the triangle is 36 square inches. She placed another similar triangle next to it with the side corresponding to the 6-inch side as 3 inches. What is the area of the smaller triangle?

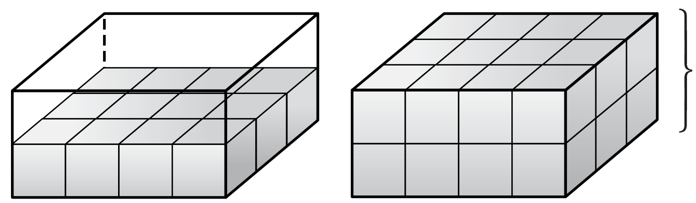
8-1 B Reteach

Volume of Prisms

The **volume** of a three-dimensional shape is the measure of space occupied by it. It is measured in cubic units such as cubic centimeters (cm^3) or cubic inches (in^3). The volume of the shape at the right can be shown using cubes.



The bottom layer, or base, has 4 • 3 or 12 cubes.



There are two layers.

It takes 12 • 2 or 24 cubes to fill the box. So, the volume of the box is 24 cubic meters.

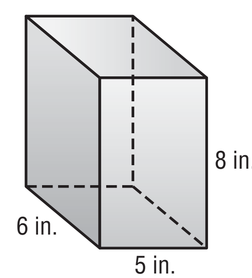
A **rectangular prism** is a three-dimensional shape that has two parallel and congruent sides, or bases, that are rectangles. To find the volume of a rectangular prism, multiply the area of the base times the height, or find the product of the base *b*, the width *w*, and the height *h*.

$V = Bh$ or $V = bwh$

Example **Find the volume of the rectangular prism.**

$V = bwh$	Volume of a rectangular prism
$V = 5 \cdot 6 \cdot 8$	Replace *b* with 5, *w* with 6, and *h* with 8.
$V = 240$	Multiply.

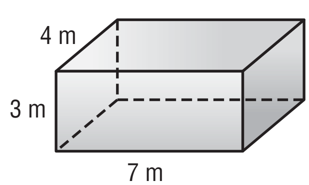
The volume is 240 cubic inches.



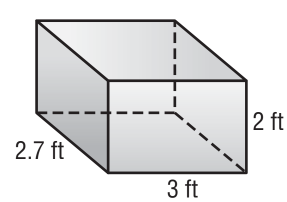
Exercises

Find the volume of each prism. Round to the nearest tenth if necessary.

1.



2.



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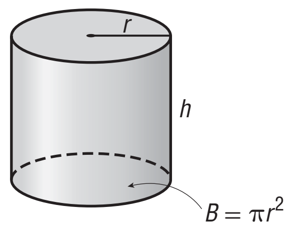
8-1 C

Reteach

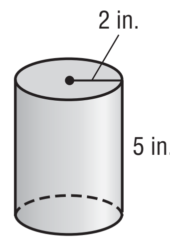
Volume of Cylinders

As with prisms, the area of the base of a **cylinder** tells the number of cubic units in one layer. The height tells how many layers there are in the cylinder. The volume V of a cylinder with radius r is the area of the base B times the height h.

$V = Bh$ or $V = \pi r^2 h$, where $B = \pi r^2$



Example **Find the volume of the cylinder. Round to the nearest tenth.**



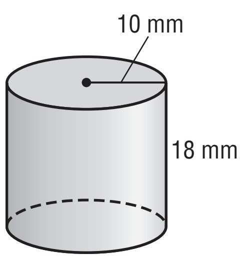
$V = \pi r^2 h$	Volume of a cylinder
$V = \pi (2)^2(5)$	Replace r with 2 and h with 5.
$V \approx 62.8318$	Use a calculator.

The volume is about 62.8 cubic inches.

Exercises

Find the volume of each cylinder. Round to the nearest tenth.

1.



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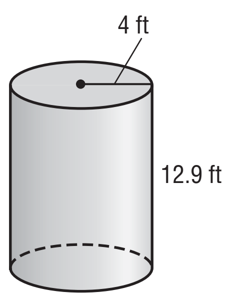
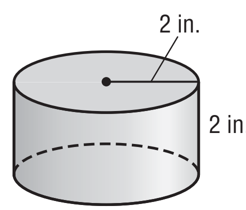


3.



4. radius = 9.5 yd
height = 2.2 yd

5. diameter = 6 cm
height = 11 cm

6. diameter = 3.4 m
height = 1.25 m

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8-1 E

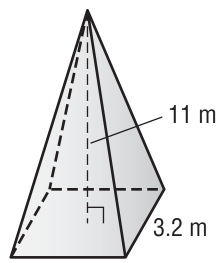
Reteach

Volume of Pyramids

A **pyramid** is a three-dimensional shape with one base and triangular lateral faces. The volume V of a pyramid is one third the area of the base B times the height h.

$V = \frac{1}{3}Bh$

Example **Find the volume of the pyramid. Round to the nearest tenth.**



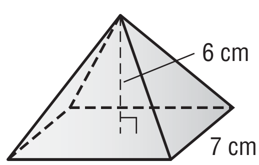
$V = \frac{1}{3}Bh$	Volume of a pyramid
$V = \frac{1}{3}(bw)h$	The base is a rectangle, so $B = bw$.
$V = \frac{1}{3}(4.3 \cdot 3.2) \cdot 11$	$b = 4.3$, $w = 3.2$, $h = 11$
$V \approx 50.5$	Simplify.

The volume is about 50.5 cubic meters.

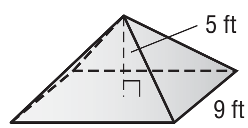
Exercises

Find the volume of each figure. Round to the nearest tenth if necessary.

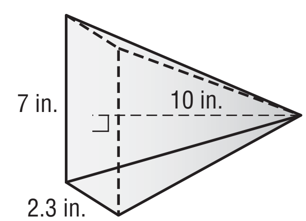
1.



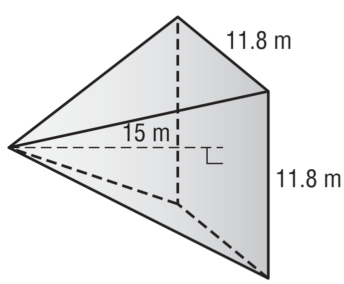
2.



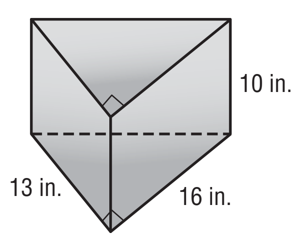
3.



4.



5.



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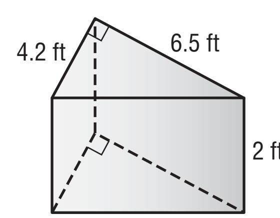

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8-1 F

Reteach

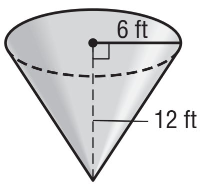
Volume of Cones

A **cone** is a three-dimensional shape with one circular base.

The volume V of a cone with radius r is one third the area of the base B times the height h.

$V = \frac{1}{3}Bh$ or $V = \frac{1}{3}\pi r^2 h$

Example **Find the volume of the cone. Round to the nearest tenth.**



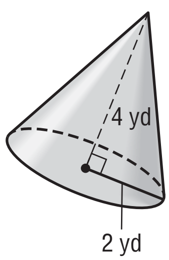
$V = \frac{1}{3}\pi r^2 h$	Volume of a cone
$V = \frac{1}{3}(\pi \cdot 6^2 \cdot 12)$	$r = 6$ and $h = 12$
$V \approx 452.4$	Simplify.

The volume is about 452.4 cubic feet.

Exercises

Find the volume of each cone. Round to the nearest tenth.

1.



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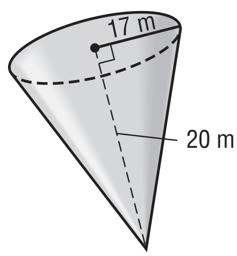

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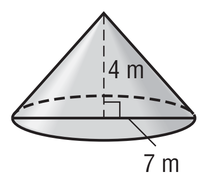
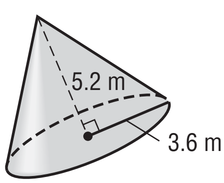
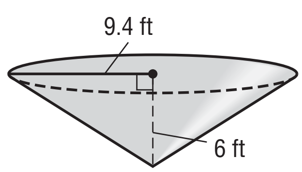


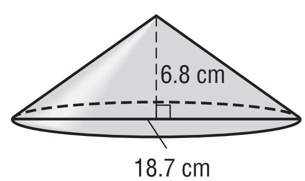
4.



5.



6.



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8-2 B

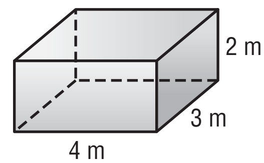
Reteach

Surface Area of Prisms

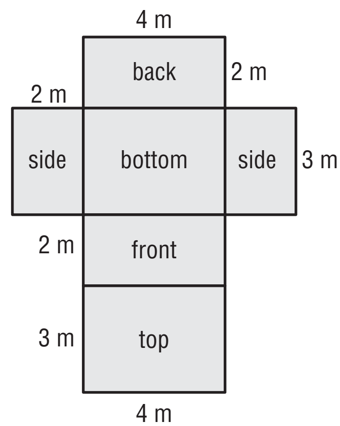
The sum of the areas of all the surfaces, or faces, of a three-dimensional shape is the **surface area**. The surface area *S.A.* of a rectangular prism with base *b*, width *w*, and height *h* is the sum of the areas of its faces.

$S.A. = 2(bw) + 2(bh) + 2(wh)$

Example **Find the surface area of the rectangular prism.**



Faces	**Area**
top and bottom	$2\,(4 \cdot 3) = 24$
front and back	$2\,(4 \cdot 2) = 16$
two sides	$2\,(2 \cdot 3) = 12$
sum of the areas	$24 + 16 + 12 = 52$



Alternatively, replace *b* with 4, *w* with 3, and *h* with 2 in the formula for surface area.

$S.A. = 2(bw) + 2(bh) + 2(wh)$

$= 2\,(4 \cdot 3) + 2\,(4 \cdot 2) + 2\,(3 \cdot 2)$

$= 24 + 16 + 12$

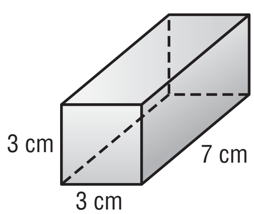
$= 52$

So, the surface area of the rectangular prism is 52 square meters.

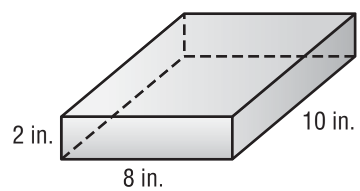
Exercises

Find the surface area of each prism.

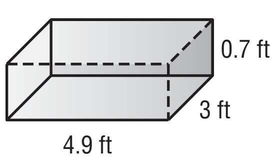
1.



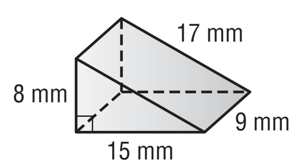
2.



3.



4.



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8-2 C

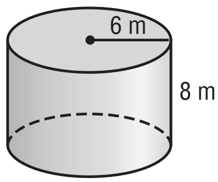
Reteach

Surface Area of Cylinders

The surface area *S.A.* of a cylinder with height h and radius r is the sum of the area of the curved surface and the area of the circular bases.

$S.A. = 2\pi rh + 2\pi r^2$

Example **Find the surface area of the cylinder. Round to the nearest tenth.**



$S.A. = 2\pi rh + 2\pi r^2$ Surface area of a cylinder

$S.A. = 2\pi(6)(8) + 2\pi(6)^2$ Replace r with 6 and h with 8.

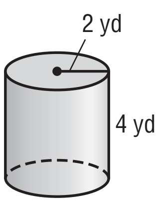
$S.A. \approx 527.7876$ Simplify.

The surface area of the cylinder is about 527.8 square meters.

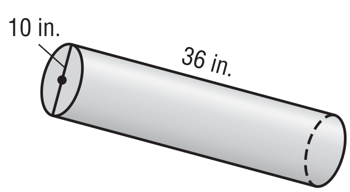
Exercises

Find the surface area of each cylinder. Round to the nearest tenth.

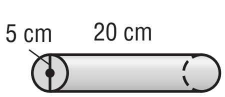
1.



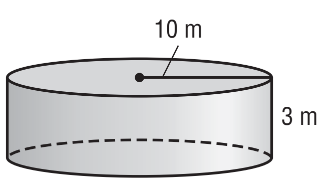
2.



3.



4.



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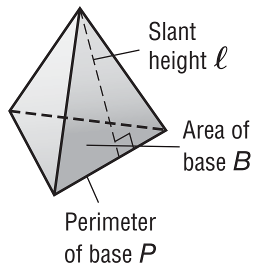
8-2
E

Reteach

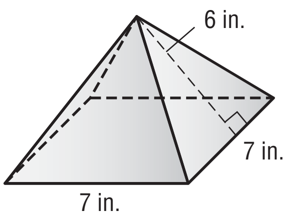
Surface Area of Pyramids

The total surface area *S.A.* of a regular pyramid is the lateral area *L* plus the area of the base.

$S.A. = L + B$ or $S.A. = \frac{1}{2}P\ell + B$



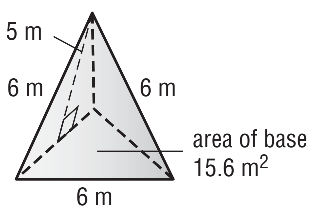
Example 1 **Find the total surface area of the pyramid.**



$S.A. = \frac{1}{2}P\ell + B$	Surface area of a pyramid
$S.A. = \frac{1}{2}(28 \cdot 6) + 49$	$P = 4(7)$ or 28, $\ell = 6$, $B = 7 \cdot 7$ or 49
$S.A. = 133$	Simplify.

The surface area of the pyramid is 133 square inches.

Example 2 **Find the total surface area of the pyramid.**



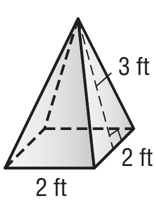
$S.A. = \frac{1}{2}P\ell + B$	Surface area of a pyramid
$S.A. = \frac{1}{2}(18 \cdot 5) + 15.6$	$P = 3(6)$ or 18, $\ell = 5$, $B = 15.6$
$S.A. = 60.6$	Simplify.

The surface area of the pyramid is 60.6 square meters.

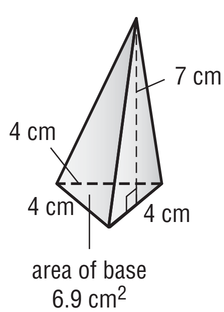
Exercises

Find the total surface area of each pyramid. Round to the nearest tenth.

1.



2.



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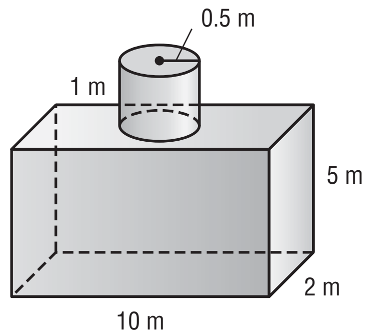
8-3 C

Reteach

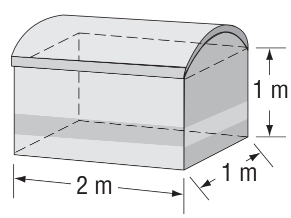
Volume and Surface Area of Composite Figures

Example 1 **Find the surface area of the composite figure.**



To find the surface area, find the area of each exposed surface and add them together. The lateral area of the prism is $50 + 10 + 50 + 10 = 120$ m^2. The area of the bottom of the prism is $10 \times 2 = 20$ m^2. The lateral area of the cylinder is height multiplied by circumference: $1 \times 2 \times \pi \times 0.5 \approx 3.1$ m^2. The exposed area of the top of the prism plus the top of the cylinder is 20 m^2. So, the surface area is $120 + 20 + 3.1 + 20 = 163.1$ m^2.

Example 2 **Find the volume of the composite figure. Round to the nearest tenth.**



The figure is made up of a rectangular prism and half a cylinder.

$V = \ell wh + \frac{1}{2}\pi r^2 h$

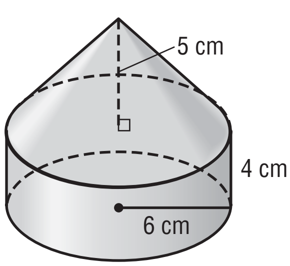
$V = 2 \cdot 1 \cdot 1 + \frac{1}{2}\pi (0.5)^2 \cdot 2$

$V \approx 2 + 0.785$ or 2.785

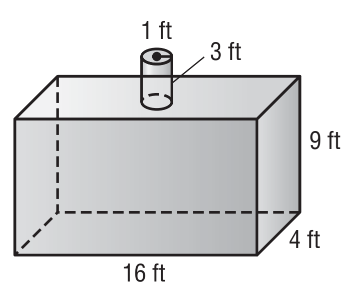
The volume of the composite figure is about 2.8 cubic meters.

Exercises

1. Find the volume of the composite figure. Round to the nearest tenth.



2. Find the surface area of the composite figure. Round to the nearest tenth.



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9-1 E

Reteach

Convert Rates

Unit ratios and their reciprocals can be used to convert rates. Sometimes you have to multiply more than once.

Example **The speed limit on the interstate is 65 miles per hour. How many feet per minute is this?**

Because the unit of miles must divide out, use the unit ratio $\frac{5{,}280 \text{ ft}}{1 \text{ mi}}$ because the unit of miles is in the denominator. Use $\frac{1 \text{ h}}{60 \text{ min}}$ to convert from hours to minutes.

$$\frac{65 \text{ mi}}{1 \text{ h}} = \frac{65 \text{ mi}}{1 \text{ h}} \cdot \frac{5{,}280 \text{ ft}}{1 \text{ mi}} \cdot \frac{1 \text{ h}}{60 \text{ min}}$$ Multiply by the appropriate ratios.

$$= \frac{65 \cancel{\text{mi}}}{1 \cancel{\text{h}}} \cdot \frac{5{,}280 \text{ ft}}{1 \cancel{\text{mi}}} \cdot \frac{1 \cancel{\text{h}}}{60 \text{ min}}$$ Divide out common units.

$$= \frac{65 \cdot 5{,}280 \text{ ft} \cdot 1}{1 \cdot 1 \cdot 60 \text{ min}} = \frac{343{,}200 \text{ ft}}{60 \text{ min}} \text{ or } \frac{5{,}720 \text{ ft}}{1 \text{ min}}$$ Simplify.

The speed limit is 5,720 feet per minute.

Exercises

Convert each rate.

1. 10 mi/h = __________ ft/min

2. 35 cm/sec = __________ m/min

3. 4.5 mi/h = __________ ft/sec

4. **WALK** Tina walks at a rate of 180 feet per minute. How many feet per second is this?

5. **TRAVELING** A car is traveling at a rate of 55 miles per hour. How many feet per hour is this?

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9-1 F

Reteach

Convert Units of Area and Volume

Area relationships are the square of the relationships you already know.

$1 \text{ ft} = 12 \text{ in.}$

$1 \text{ ft}^2 = 144 \text{ in}^2$

Likewise, volume relationships are the cube of the relationships.

$1 \text{ yd} = 3 \text{ ft}$

$1 \text{ yd}^3 = 27 \text{ ft}^3$

	Customary Units	Metric Units
Area	$1 \text{ ft}^2 = 144 \text{ in}^2$	$1 \text{ m}^2 = 10{,}000 \text{ cm}^2$
	$1 \text{ yd}^2 = 9 \text{ ft}^2$	$1 \text{ cm}^2 = 100 \text{ mm}^2$
Volume	$1 \text{ ft}^3 = 1{,}728 \text{ in}^3$	$1 \text{ m}^3 = 1{,}000{,}000 \text{ cm}^3$
	$1 \text{ yd}^3 = 27 \text{ ft}^3$	$1 \text{ cm}^3 = 1{,}000 \text{ mm}^3$
Volume/Capacity		1 cc = 1 mL
Water		$1 \text{ mL} \approx 1 \text{ g}$

Example **A living room measures 12 feet by 16 feet. What is the area of the living room in square yards?**

Step 1 Find the area of the room in square feet: $12 \times 16 = 192 \text{ ft}^2$.

Step 2 Use the ratio $\frac{1 \text{ yd}^2}{9 \text{ ft}^2}$.

$192 \text{ ft}^2 = 192 \text{ ft}^2 \cdot \frac{1 \text{ yd}^2}{9 \text{ ft}^2}$ Multiply.

$= 192 \cancel{\text{ft}^2} \cdot \frac{1 \text{ yd}^2}{9 \cancel{\text{ft}^2}}$ Divide out the common unit. Square yards remain.

$\approx 21.33 \text{ yd}^2$

The living room has an area of about 21.33 square yards.

Exercises

Complete. Round to the nearest hundredth if necessary.

1. $12.5 \text{ ft}^2 =$ ________ in^2

2. $0.03 \text{ m}^3 =$ ________ cm^3

3. $62.8 \text{ m}^2 =$ ________ cm^2

4. $4 \text{ yd}^3 =$ ________ ft^3

5. **FRAMES** A picture frame measures 10 inches by 14 inches. Find the area in square feet.

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10-1 B

Reteach

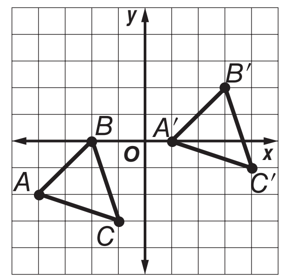
Translations in the Coordinate Plane

A **translation** is the movement of a geometric figure in some direction without turning the figure. When translating a figure, every point of the original figure is moved the same distance and in the same direction. To graph a translation of a figure, move each vertex of the figure in the given direction. Then connect the new vertices.

Example **Triangle *ABC* has vertices *A*(–4, –2), *B*(–2, 0), and *C*(–1, –3). Find the vertices of triangle *A′B′C′* after a translation of 5 units right and 2 units up.**

Add 5 to each *x*-coordinate. Add 2 to each *y*-coordinate.

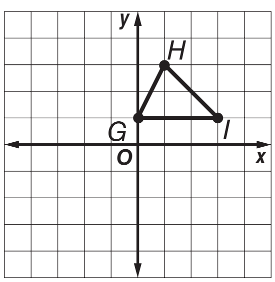
Vertices of △*ABC*	(*x* + 5, *y* + 2)	Vertices of △*A′B′C′*
A(–4, –2)	(–4 + 5, –2 + 2)	*A′*(1, 0)
B(–2, 0)	(–2 + 5, 0 + 2)	*B′*(3, 2)
C(–1, –3)	(–1 + 5, –3 + 2)	*C′*(4, –1)



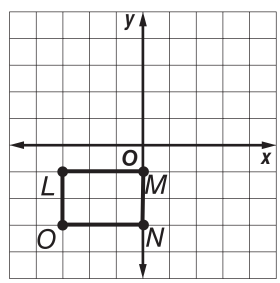
The coordinates of the vertices of △ *A′B′C′* are *A′*(1, 0), *B′*(3, 2), and *C′*(4, –1).

Exercises

1. Translate △*GHI* 1 unit left and 5 units down.

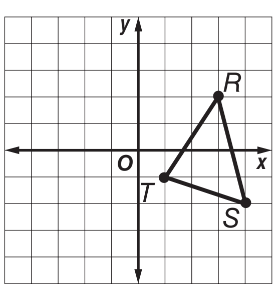


2. Translate rectangle *LMNO* 4 units right and 3 units up.

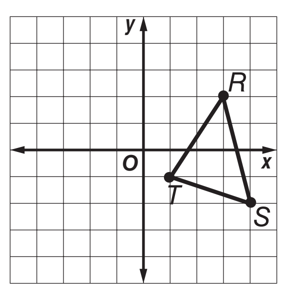


Triangle *RST* has vertices *R*(3, 2), *S*(4, –2), and *T*(1, –1). Find the vertices of *R′S′T′* after each translation. Then graph the figure and its translated image.

3. 5 units left, 1 unit up



4. 3 units left, 2 units down



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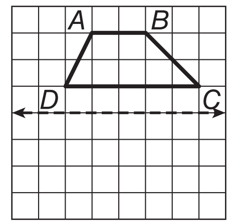
10-2 B

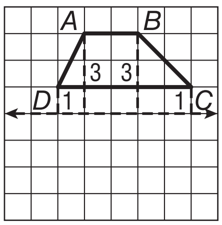
Reteach

Reflections in the Coordinate Plane

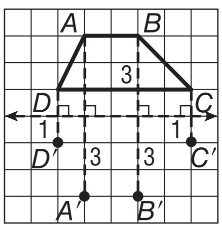
The mirror image produced by flipping a figure over a line is called a **reflection**. This line is called the **line of reflection**. A reflection is one type of **transformation** or mapping of a geometric figure. In mathematics, an **image** is the position of a figure after a transformation. The image of point A is written A'. A' is read as A *prime*.

Example **Draw the image of quadrilateral *ABCD* after a reflection over the given line.**

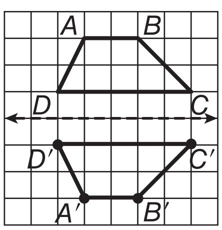




Step 1 Count the number of units between each vertex and the line of reflection.



Step 2 To find the corresponding point for vertex A, move along the line through vertex A perpendicular to the line of reflection until you are 3 units from the line on the opposite side. Draw a point and label it A'. Repeat for each vertex.



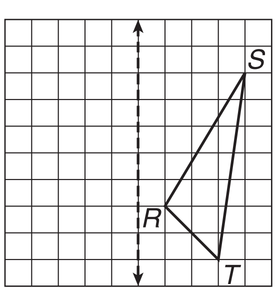
Step 3 Connect the new vertices to form quadrilateral $A'B'C'D'$.

Notice that if you move along quadrilateral $ABCD$ from A to B to C to D, you are moving in the clockwise direction. However, if you move along quadrilateral $A'B'C'D'$ from A' to B' to C' to D', you are moving in the counterclockwise direction. A figure and its reflection have opposite orientations.

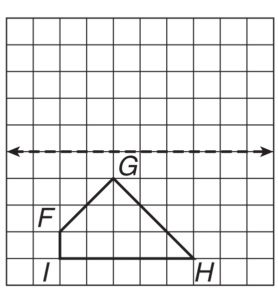
Exercises

Draw the image of the figure after a reflection over the given line.

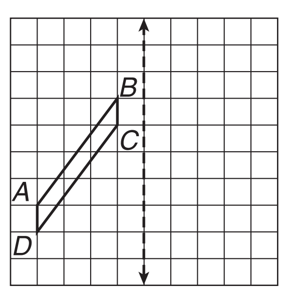
1.



2.



3.



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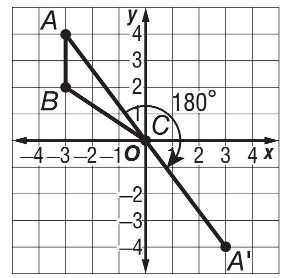
10-3 B

Reteach

Rotations in the Coordinate Plane

- A rotation occurs when a figure is rotated around a point.
- Another name for a rotation is a turn.
- In a clockwise rotation of 90° about the origin, the point (x, y) becomes $(y, -x)$.
- In a clockwise rotation of 180° about the origin, the point (x, y) becomes $(-x, -y)$.
- In a clockwise rotation of 270° about the origin, the point (x, y) becomes $(-y, x)$.

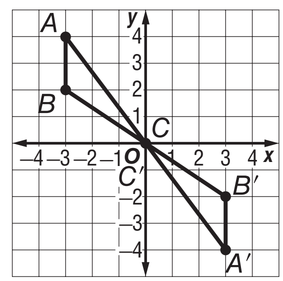
Example **Triangle *ABC* has vertices *A*(–3, 4), *B*(–3, 2), *C*(0, 0). Rotate triangle *ABC* clockwise 180° about the origin.**



Step 1 Graph triangle *ABC* on a coordinate plane.

Step 2 Sketch segment *AO* connecting point *A* to the origin. Sketch another segment *A′O* so that the angle between points *A, O,* and *A′* measures 180° and the segment is congruent to *AO*.

Step 3 Repeat for point *B* (point *C* won't move since it is at the origin). Then connect the vertices to form triangle *A′B′C′*.



Exercises

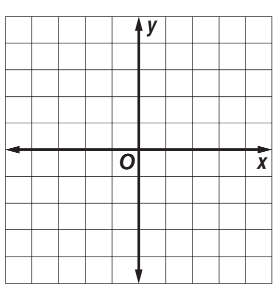
Find the coordinates of the image of (2, 4), (1, 5), (1, –3) and (3, –4) under each transformation.

1. a clockwise rotation of 90° about the origin

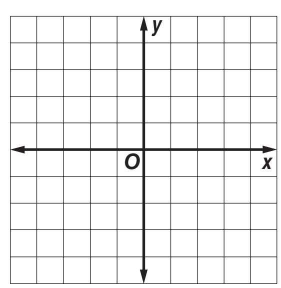
2. a clockwise rotation of 270° about the origin

△*RST* has vertices *R*(–2, 1), *S*(3, 3), and *T*(0, 0). Graph the figure and its image after each rotation. Then give the coordinates of the vertices for triangle *R′S′T′*.

3. 180° counterclockwise about the origin



4. 90° counterclockwise about the origin



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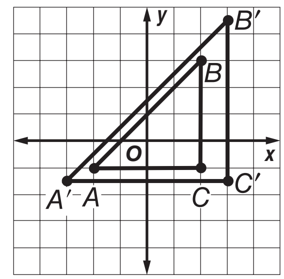
10-4 A Reteach

Dilations

The image produced by enlarging or reducing a figure is called a **dilation**.

Example 1 **Graph $\triangle ABC$ with vertices $A(-2, -1)$, $B(2, 3)$, and $C(2, -1)$. Then graph its image $\triangle A'B'C'$ after a dilation with a scale factor of $\frac{3}{2}$.**



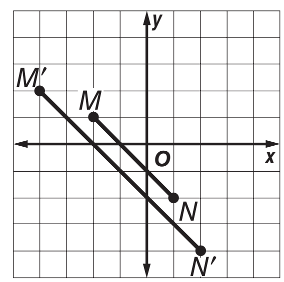
$A(-2, -1) \rightarrow \left(-2 \cdot \frac{3}{2}, -1 \cdot \frac{3}{2}\right) \rightarrow A'\left(-3, -1\frac{1}{2}\right)$

$B(2, 3) \rightarrow \left(2 \cdot \frac{3}{2}, 3 \cdot \frac{3}{2}\right) \rightarrow B'\left(3, 4\frac{1}{2}\right)$

$C(2, -1) \rightarrow \left(2 \cdot \frac{3}{2}, -1 \cdot \frac{3}{2}\right) \rightarrow C'\left(3, -1\frac{1}{2}\right)$

Example 2 **Segment $M'N'$ is a dilation of segment MN. Find the scale factor of the dilation, and classify it as an *enlargement* or a *reduction*.**

Write the ratio of the x- or y-coordinate of one vertex of the dilated figure to the x- or y-coordinate of the corresponding vertex of the original figure. Use the x-coordinates of $N(1, -2)$ and $N'(2, -4)$.

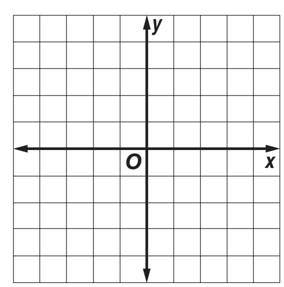


$$\frac{x\text{-coordinate of point } N'}{x\text{-coordinate of point } N} = \frac{2}{1} \text{ or } 2$$

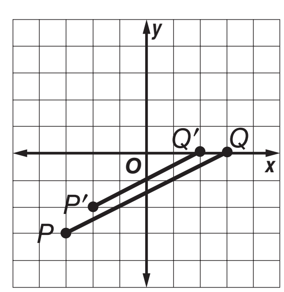
The scale factor is 2. Since the image is larger than the original figure, the dilation is an enlargement.

Exercises

1. Polygon $ABCD$ has vertices $A(2, 4)$, $B(-1, 5)$, $C(-3, -5)$, and $D(3, -4)$. Find the coordinates of its image after a dilation with a scale factor of $\frac{1}{2}$. Then graph polygon $ABCD$ and its dilation.



2. Segment $P'Q'$ is a dilation of segment PQ. Find the scale factor of the dilation, and classify it as an *enlargement* or a *reduction*.



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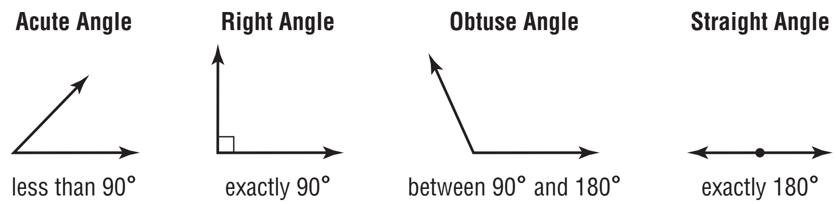
Reteach

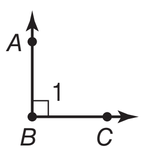
Classify Angles

- An angle is formed by two rays that share a common endpoint called the vertex.
- An angle can be named in several ways. The symbol for angle is ∠.
- Angles are classified according to their measure. Two angles that have the same measure are said to be **congruent**.
- Two angles are **vertical** if they are opposite angles formed by the intersection of two lines. Vertical angles are congruent.
- Two angles are **adjacent** if they share a common vertex, a common side, and do not overlap.



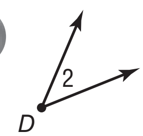
Examples **Name each angle below. Then classify the angle as *acute*, *right*, *obtuse*, or *straight*.**

1



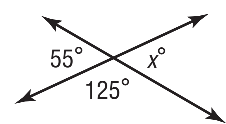
Use the vertex as the middle letter and a point from each side, $\angle ABC$, $\angle CBA$, or use the vertex or the number only, $\angle B$ or $\angle 1$. The angle is 90°, so it is a right angle.

2



Use the vertex or the number only, $\angle D$ or $\angle 2$. The angle is less than 90°, so it is an acute angle.

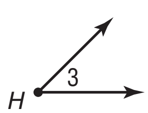
3 **What is the value of *x* in the figure at the right?**
The angle labeled $x°$ and the angle labeled 55° are vertical angles. Since vertical angles are congruent, the value of x is 55.



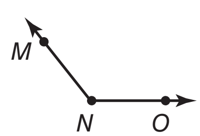
Exercises

Name each angle. Then classify the angle as *acute*, *right*, *obtuse*, or *straight*.

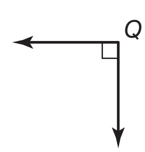
1.



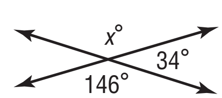
2.



3.



4. Find the value of x in the figure at the right.



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6-1 C

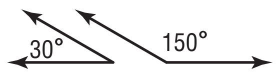
Reteach

Complementary and Supplementary Angles

- Two angles are **complementary** if the sum of their measures is 90°.
- Two angles are **supplementary** if the sum of their measures is 180°.

Examples **Identify each pair of angles as *complementary*, *supplementary*, or *neither*.**

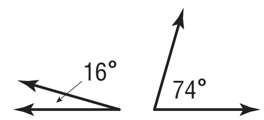
1



$30° + 150° = 180°$

The angles are supplementary.

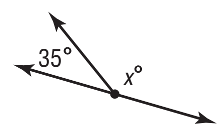
2



$16° + 74° = 90°$

The angles are complementary.

Example 3 ALGEBRA **Find the value of *x*.**



Since the two angles are supplementary, the sum of their measures is 180°.

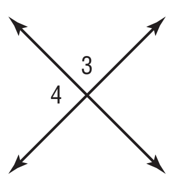
$x + 35 = 180$	Write the equation.
$-35 \quad -35$	Subtract 35 from each side.
$x \quad = 145$	Simplify.

So, the value of x is 145.

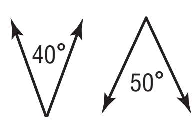
Exercises

Identify each pair of angles as *complementary*, *supplementary*, or *neither*.

1.



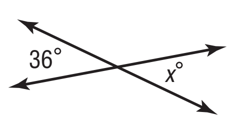
2.



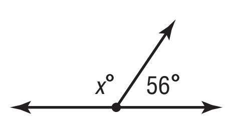
3.

ALGEBRA **Find the value of *x* in each figure.**

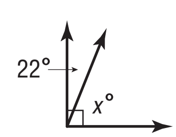
4.



5.



6.



6-2 B

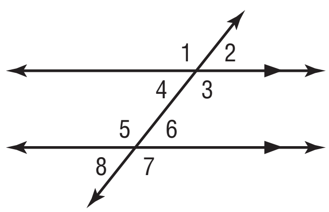
NAME ________________ DATE ________ PERIOD _____

Reteach

Lines

- **Perpendicular lines** are lines that intersect at right angles.
- **Parallel lines** are two lines in a plane that never intersect or cross.
- A line that intersects two or more other lines is called a **transversal.**
- If the two lines cut by a transversal are parallel, then these are special pairs of angles are congruent: ***alternate interior angles, alternate exterior angles, and corresponding angles.***

Example 1 **Classify ∠4 and ∠8 as *alternate interior, alternate exterior,* or *corresponding.***



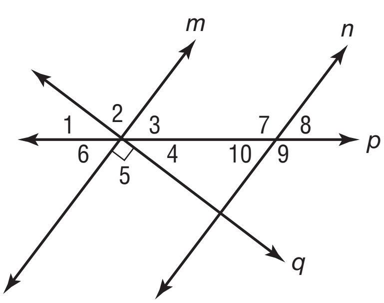
∠4 and ∠8 are in the same position in relation to the transversal on the two lines. They are corresponding angles.

Example 2 **Refer to the figure in Example 1. Find $m\angle 2$ if $m\angle 8 = 58°$.**

Since ∠2 and ∠8 are alternate exterior angles, $m\angle 2 = 58°$

Exercises

In the figure at the right, lines *m* and line *n* are parallel. If $m\angle 3 = 64°$, find each given angle measure. Justify each answer.



1. $m\angle 8$

2. $m\angle 10$

3. $m\angle 4$

4. $m\angle 6$

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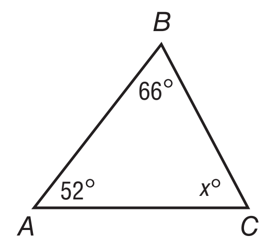
6-3 B Reteach

Triangles

- A **triangle** is formed by three line segments that intersect only at their endpoints.
- A point where the segments intersect is a **vertex** of the triangle.
- Every triangle also has three angles. The sum of the measure of the angles is 180°.
- All triangles have at least two acute angles. Triangles can be classfied by the measure of its third angle: *acute, right,* or *obtuse.*
- Another way to classify triangles is by their sides: *scalene*, *isosceles*, or *equilateral.*

Example 1 **Find the value of x in $\triangle ABC$.**



$x + 66 + 52 = 180$ The sum of the measures is 180.

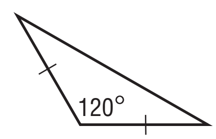
$x + 118 = 180$ Simplify.

$-118 \quad -118$ Subtract 118 from each side.

$x = 62$

The value of x is 62.

Example 2 **Classify the triangle by its angles and by its sides.**

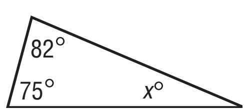


The triangle has one obtuse angle and two sides the same length. So, it is an obtuse, isosceles triangle.

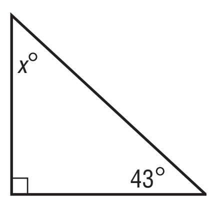
Exercises

Find the the value of x in each triangle. Then classify the triangle as *acute*, *right*, or *obtuse*.

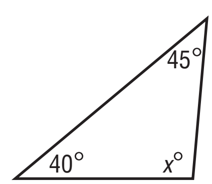
1.



2.

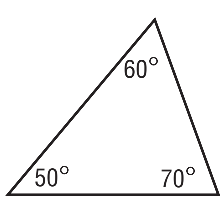


3.

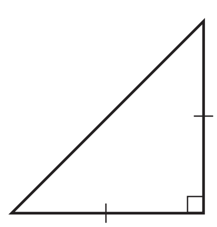


Classify each triangle by its angles and by its sides.

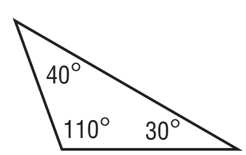
4.



5.



6.



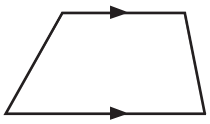
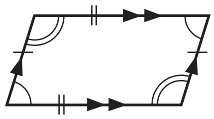
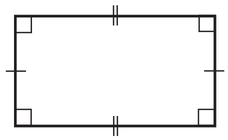
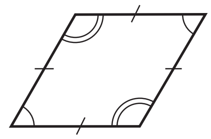
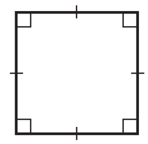
6-3 D

NAME ______________________________________ DATE _____________ PERIOD _____

Reteach

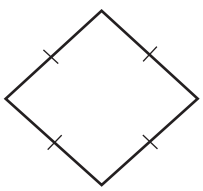
Quadrilaterals

- A **quadrilateral** is a closed figure with four sides and four angles.
- Quadrilaterals are named based on their sides and angles.

				
Trapezoid quadrilateral with exactly one pair of parallel sides	**Parallelogram** quadrilateral with opposite sides parallel and opposite sides congruent	**Rectangle** parallelogram with 4 right angles	**Rhombus** parallelogram with 4 congruent sides	**Square** parallelogram with 4 right angles and 4 congruent sides

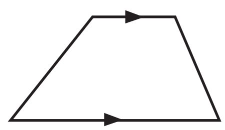
Examples

1



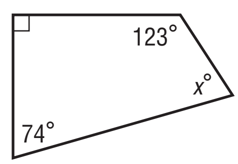
The quadrilateral is a parallelogram with 4 congruent sides. It is a rhombus.

2



The quadrilateral has one pair of parallel sides. It is a trapeziod.

Example 3 **Find the value of x in the quadrilateral shown.**



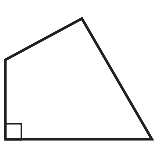
$$\begin{aligned} 123 + 90 + 74 + x &= 360 && \text{Write the equation.} \\ 287 + x &= 360 && \text{Simplify.} \\ -287 \quad &= -287 && \text{Subtract.} \\ x &= 73 \end{aligned}$$

So, the value of x is 73.

Exercises

Classify the quadrilateral using the name that best describes it.

1.



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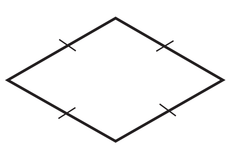
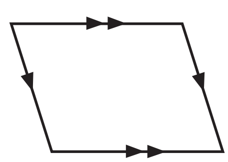


3.



NAME ________________________________ DATE ____________ PERIOD _____

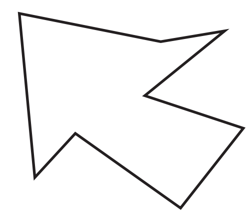
6-3 E

Reteach

Polygons and Angles

- A **polygon** is a simple, closed figure formed by three or more line segments. The segments intersect only at their endpoints.
- Polygons can be classified by the number of sides they have.
- The sum of the measures of the **interior angles** of a polygon is $(n - 2)180$, where n represents the number of sides.

Example 1 **Determine whether the figure is a polygon. If it is, classify the polygon. If it is not a polygon, explain why.**



The figure has 8 sides that only intersect at their endpoints.
It is an octagon.

Example 2 **The defense department of the United States has its headquarters in a building called the Pentagon because it is shaped like a regular pentagon. Find the measure of an interior angle of a regular pentagon.**

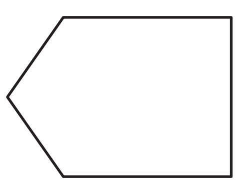
$S = (n - 2)180$	Write an equation.
$S = (5 - 2)180$	Replace n with 5. Subtract.
$S = (3)180$	Multiply.
$S = 540$	The sum of the interior angles is 540°.
$540 \div 5 = 108$	Divide by the number of interior angles to find the measure of one angle.

The measure of one interior angle of a regular pentagon is 108°.

Exercises

Determine whether the figure is a polygon. If it is, classify the polygon. If it is not a polygon, explain why.

1.



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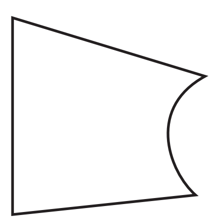
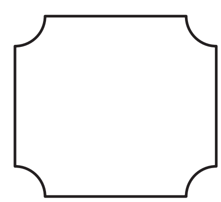


3.



Find the sum of the interior angle measures of each polygon.

4. nonagon (9-sided)

5. 14-gon

Find the measure of one interior angle in each regular polygon.

6. hexagon

7. 15-gon

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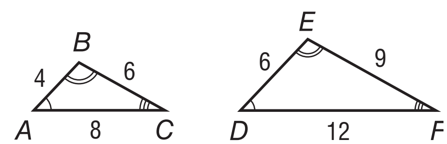
7-1 B

Reteach

Similar Polygons

Two polygons are **similar** if they have the same shape. If the polygons are similar, then their corresponding angles are congruent and the measures of their corresponding sides are proportional. Use the symbol ~ for similarity.

Example 1 **Determine whether △*ABC* is similar to △*DEF*. Explain.**



$\angle A \cong \angle D$, $\angle B \cong \angle E$, $\angle C \cong \angle F$,

$\frac{AB}{DE} = \frac{4}{6}$ or $\frac{2}{3}$, $\frac{BC}{EF} = \frac{6}{9}$ or $\frac{2}{3}$, $\frac{AC}{DF} = \frac{8}{12}$ or $\frac{2}{3}$

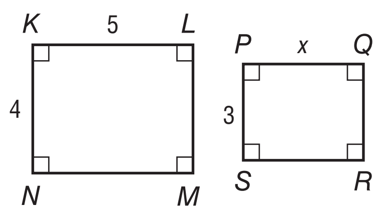
The corresponding angles are congruent, and the corresponding sides are proportional.

So, △*ABC* is similar to △*DEF*, or $\triangle ABC \sim \triangle DEF$.

Example 2 **Given that polygon *KLMN* ~ polygon *PQRS*, find the missing measure.**

Find the scale factor from polygon *KLMN* to polygon *PQRS*.

scale factor: $\frac{PS}{KN} = \frac{3}{4}$ The scale factor is the constant of proportionality.



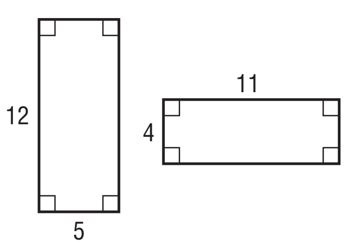
A length on polygon *PQRS* is $\frac{3}{4}$ times as long as a corresponding length on polygon *KLMN*.

$x = \frac{3}{4}(5)$ Write the equation.

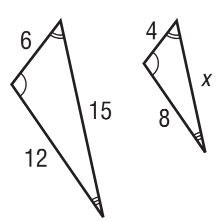
$x = \frac{15}{4}$ or 3.75 Multiply.

Exercises

1. Determine whether the polygons below are similar. Explain.



2. The triangles below are similar. Find the missing measure.



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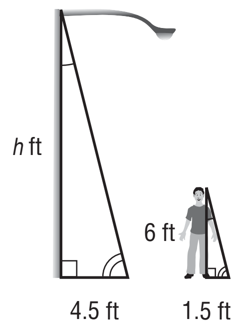
7-1 D

Reteach

Indirect Measurement

Indirect measurement allows you to use properties of similar polygons to find distances or lengths that are difficult to measure directly.

Example LIGHTING **Tyrone is standing next to a lightpole in the middle of the day. Tyrone's shadow is 1.5 feet long, and the lightpole's shadow is 4.5 feet long. If Tyrone is 6 feet tall, how tall is the lightpole?**



Write a proportion and solve.

Tyrone's shadow → $\frac{1.5}{4.5} = \frac{6}{h}$ ← Tyrone's height
lightpole's shadow → ← lightpole's height

$1.5 \cdot h = 4.5 \cdot 6$ Find the cross products.

$1.5h = 27$ Multiply.

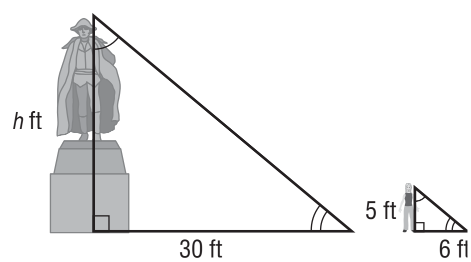
$\frac{1.5h}{1.5} = \frac{27}{1.5}$ Division Property of Equality

$h = 18$ Simplify.

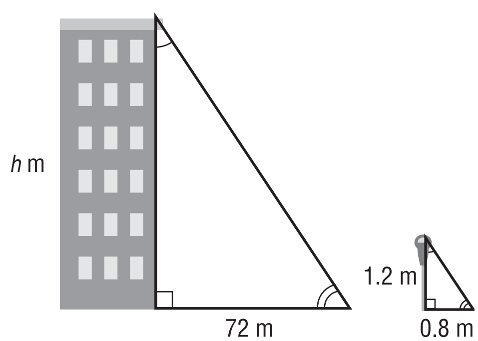
The lightpole is 18 feet tall.

Exercises

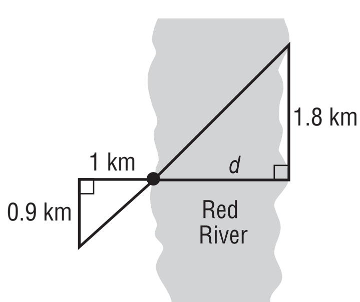
1. **MONUMENTS** A statue casts a shadow 30 feet long. At the same time, a person who is 5 feet tall casts a shadow that is 6 feet long. How tall is the statue?



2. **BUILDINGS** A building casts a shadow 72 meters long. At the same time, a parking meter that is 1.2 meters tall casts a shadow that is 0.8 meter long. How tall is the building?



3. **SURVEYING** The two triangles shown in the figure are similar. Find the distance d across Red River.



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7-2 B

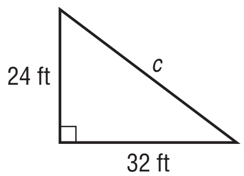
Reteach

The Pythagorean Theorem

The **Pythagorean Theorem** describes the relationship between the lengths of the legs and the hypotenuse for any right triangle. In a right triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the legs. You can use the Pythagorean Theorem to find the length of a side of a right triangle if the lengths of the other two sides are known.

Examples **Write an equation you could use to find the length of the missing side of each right triangle. Then find the missing length. Round to the nearest tenth if necessary.**

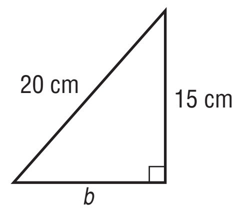
1



$$a^2 + b^2 = c^2$$
$$24^2 + 32^2 = c^2$$
$$576 + 1{,}024 = c^2$$
$$1{,}600 = c^2$$
$$\pm\sqrt{1{,}600} = c$$
$$c = 40 \text{ or } -40$$

Length must be positive, so the length of the hypotenuse is 40 feet.

2



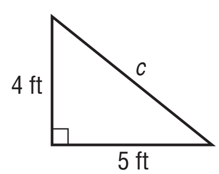
$$a^2 + b^2 = c^2$$
$$15^2 + b^2 = 20^2$$
$$225 + b^2 = 400$$
$$225 + b^2 - 225 = 400 - 225$$
$$b^2 = 175$$
$$\sqrt{b^2} = \pm\sqrt{175}$$
$$b \approx \pm 13.2$$

The length of the other leg is about 13.2 centimeters.

Exercises

Write an equation you could use to find the length of the missing side of each right triangle. Then find the missing length. Round to the nearest tenth if necessary.

1.



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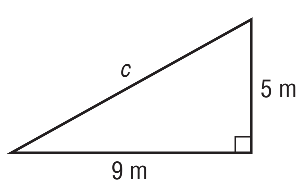

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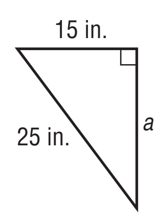

4. $a = 7$ km, $b = 12$ km

5. $a = 10$ yd, $c = 25$ yd

6. $b = 14$ ft, $c = 20$ ft

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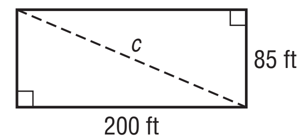
7-2 C

Reteach

Use the Pythagorean Theorem

The Pythagorean Theorem can be used to solve a variety of problems.

Example **A professional ice hockey rink is 200 feet long and 85 feet wide. What is the length of the diagonal of the rink?**



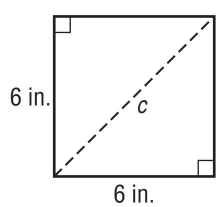
$a^2 + b^2 = c^2$	The Pythagorean Theorem
$200^2 + 85^2 = c^2$	Replace a with 200 and b with 85.
$40{,}000 + 7{,}225 = c^2$	Evaluate 200^2 and 85^2.
$47{,}225 = c^2$	Add 40,000 and 7,225.
$\sqrt{47{,}225} = c^2$	Definition of square root
$\sqrt{217.3} \approx c$	Use a calculator.

The length of the diagonal of an ice hockey rink is about 217.3 feet.

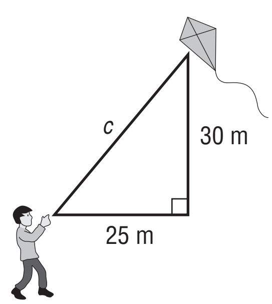
Exercises

Write an equation that can be used to answer the question. Then solve. Round to the nearest tenth if necessary.

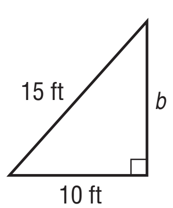
1. What is the length of the diagonal?



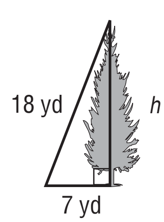
2. How long is the kite string?



3. What is the height of the ramp?



4. How tall is the tree?



7-2 D

NAME ______________________________ DATE ____________ PERIOD _____

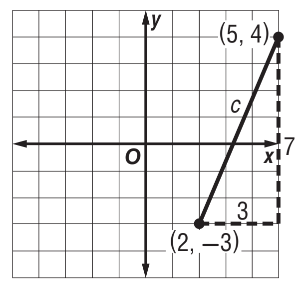
Reteach

Distance on the Coordinate Plane

You can use the Pythagorean Theorem to find the distance between two points on the coordinate plane.

Example

Graph the ordered pairs (2, –3) and (5, 4). Then find the distance *c* between the two points.



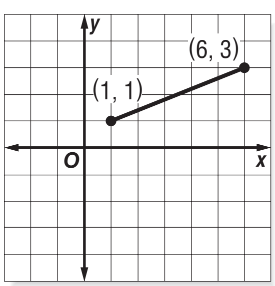
$a^2 + b^2 = c^2$	The Pythagorean Theorem
$3^2 + 7^2 = c^2$	Replace *a* with 3 and *b* with 7.
$58 = c^2$	$3^2 + 7^2 = 9 + 49$, or 58.
$\pm\sqrt{58} = \sqrt{c^2}$	Definition of square root
$\pm 7.6 \approx c$	Use a calculator.

The points are about 7.6 units apart.

Exercises

Find the distance between each pair of points whose coordinates are given. Round to the nearest tenth if necessary.

1.



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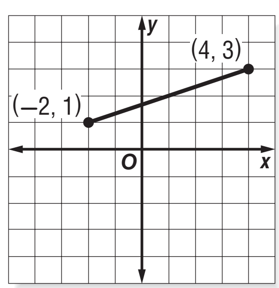

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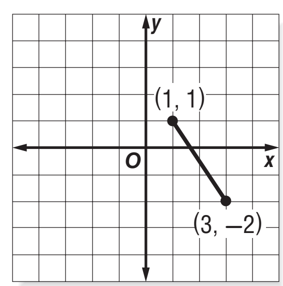
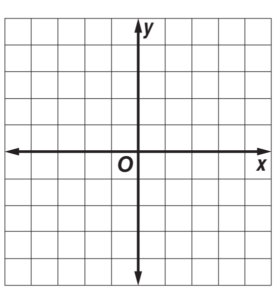
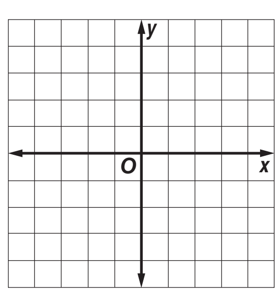


Graph each pair of ordered pairs. Then find the distance between the points. Round to the nearest tenth if necessary.

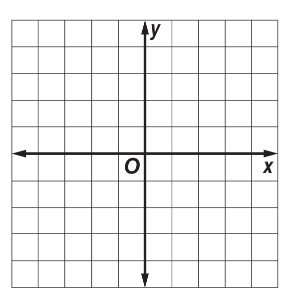
4. (4, 5), (0, 2)



5. (0, –4), (–3, 0)



6. (–1, 1), (–4, 4)



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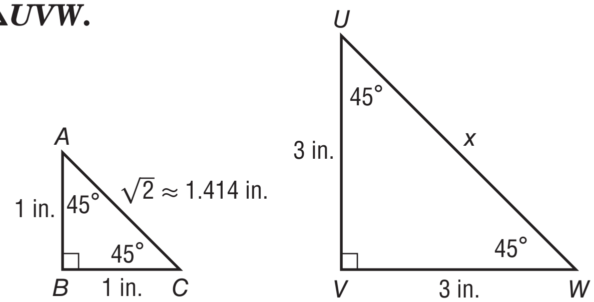
7-2 F

Reteach

Special Right Triangles

Example 1 **Triangle *ABC* and triangle *UVW* are 45°-45°-90° triangles. Find the length of the hypotenuse in Δ*UVW*.**

The scale factor from Δ*ABC* to Δ*UVW* is $\frac{3}{1}$ or 3. Use the scale factor to find the hypotenuse.



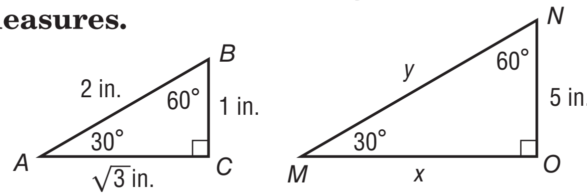
$x = 3 \cdot \sqrt{2}$ — Multiply the length of $\overline{AC}$

$= 3\sqrt{2}$ — by the scale factor, 3.

So, the hypotenuse of Δ*UVW* measures $3\sqrt{2}$ inches.

Example 2 **Triangle *ABC* and triangle *MNO* are 30°-60°-90° triangles. Find the exact length of the missing measures.**

The scale factor from Δ*ABC* to Δ*MNO* is 5. Use the scale factor to find the missing measures.



$y = 5 \cdot 2$ or 10 — Multiply the length $\overline{AB}$ by the scale factor.

So, y is 10 inches.

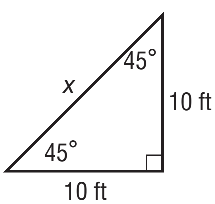
$x = 5 \cdot \sqrt{3}$ or $5\sqrt{3}$ — Multiply the length of $\overline{AC}$ by the scale factor.

So, x is $5\sqrt{3}$ inches.

Exercises

Find each missing measure.

1.



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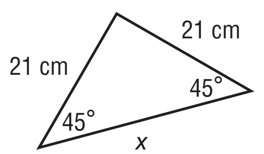
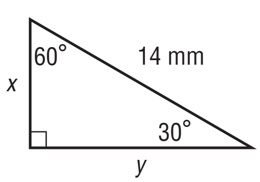


3.



4.