Transformations

Objectives

I can…

…define what translations, rotations, and reflections are.

…demonstrate translations, rotations, and reflections on a graph.

…apply translations, rotations, and reflections of shapes.

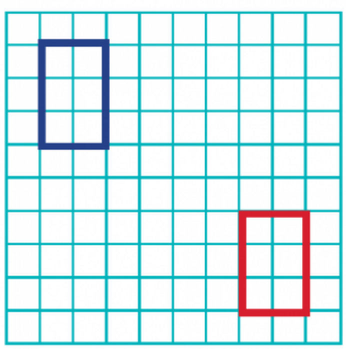
Transformations means to change.

When we move the image without changing shape, size, or orientation it is called translation.

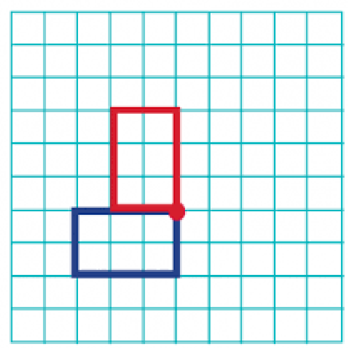
Rotation is when we rotate an image by some degree.

When we flip an image along a line (like a mirror) it is called a reflection.

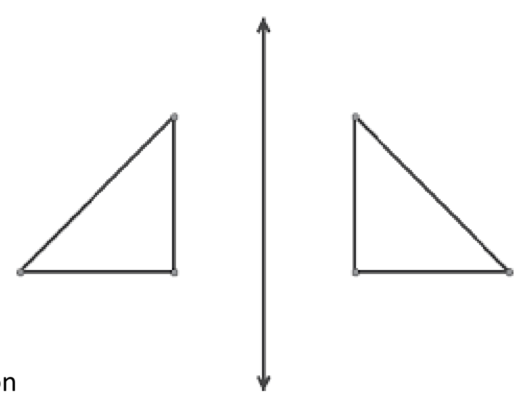
Two figures are congruent if they have the same shape and size.



Translation



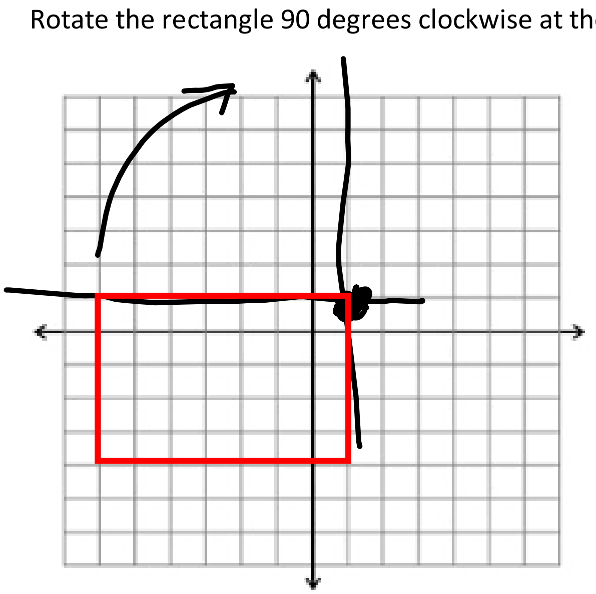
Rotation

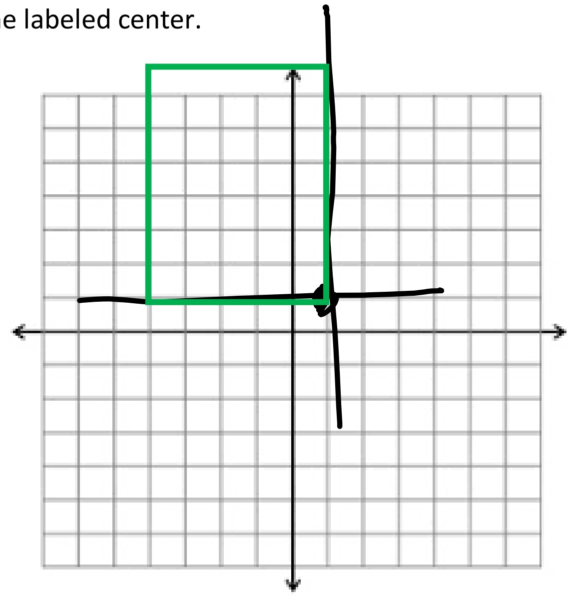


Reflection

Example 1

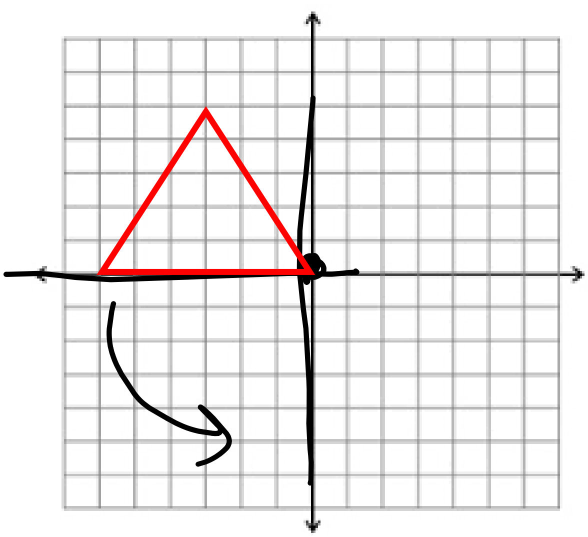
Rotate the rectangle 90 degrees clockwise at the labeled center.

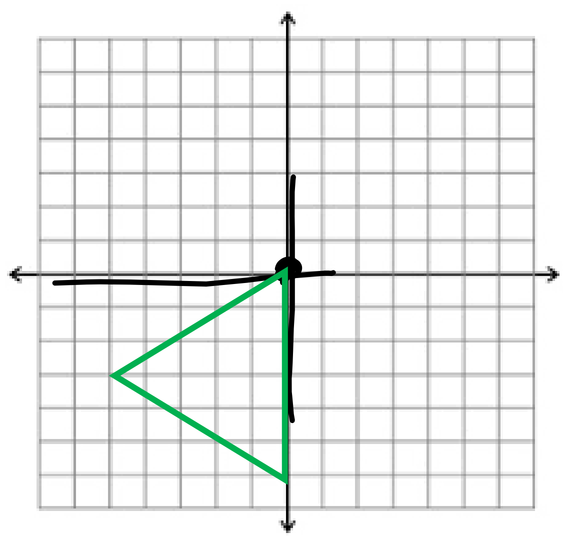




Example 2

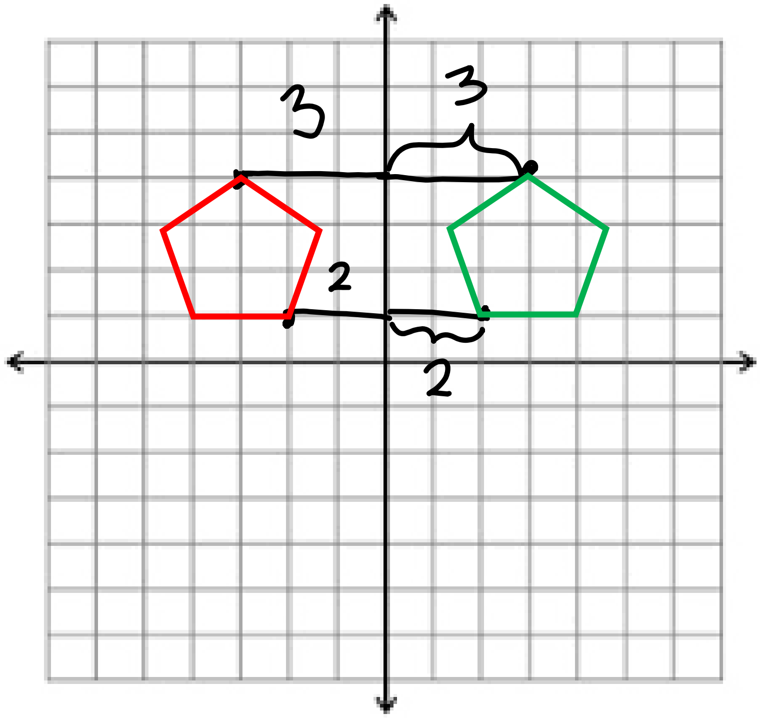
Rotate the triangle 90 degrees counterclockwise at the labeled center, this is the origin(where the x and y axis meet.





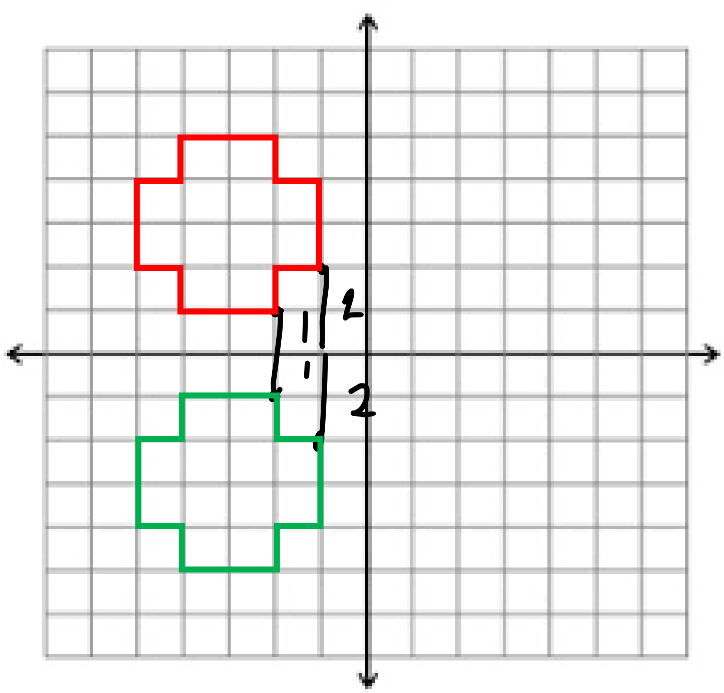
Example 3

Reflect the pentagon over the y-axis.



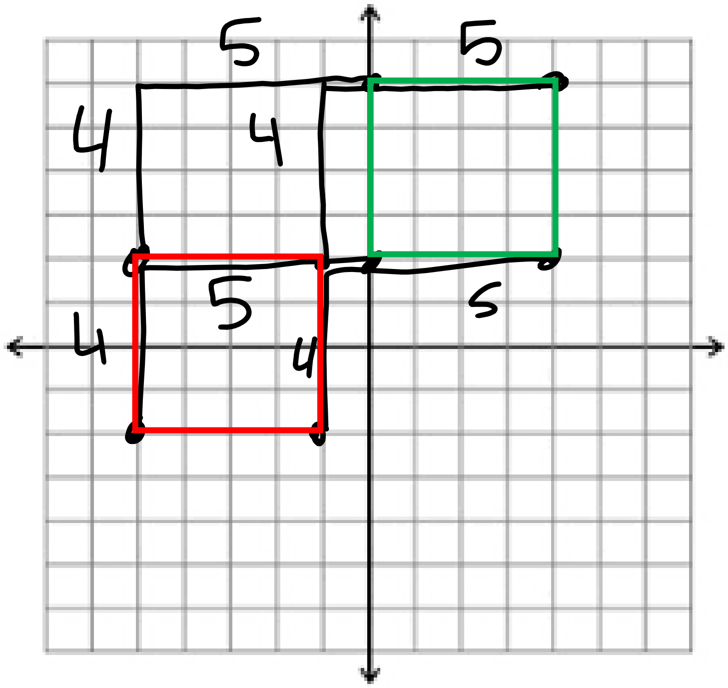
Example 4

Reflect the cross over the x-axis.



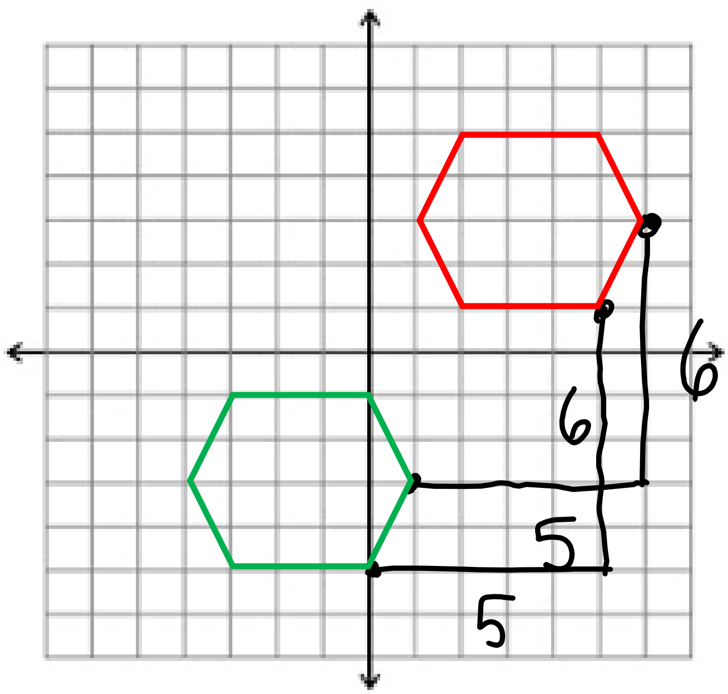
Transformation Example 1

Let’s translate the square up 4 and to the right 5.



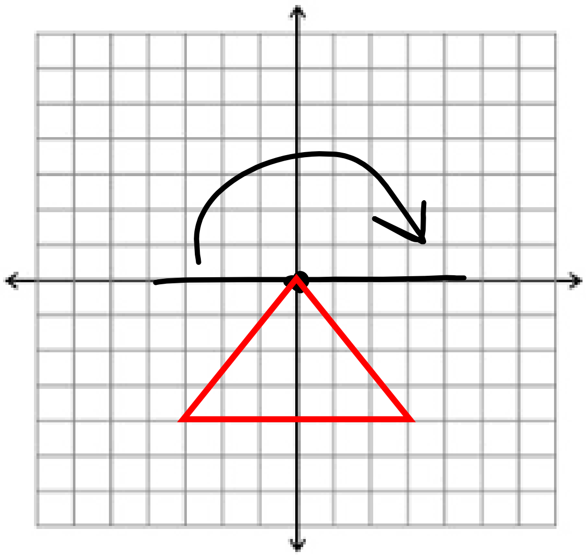
Translation Example 2

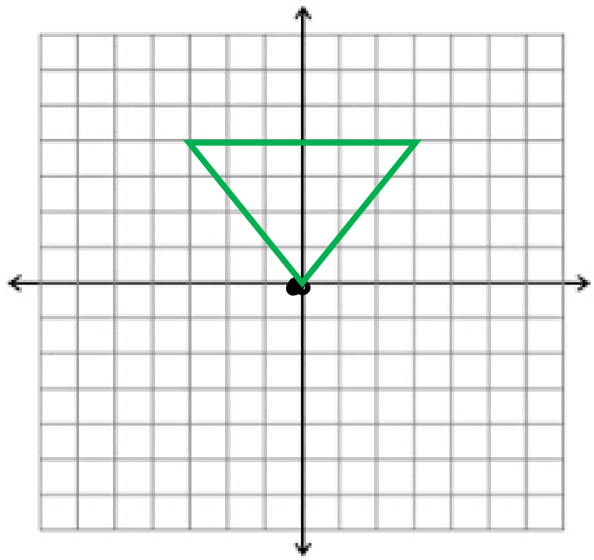
Transform the octagon down 6 and to the left 5.



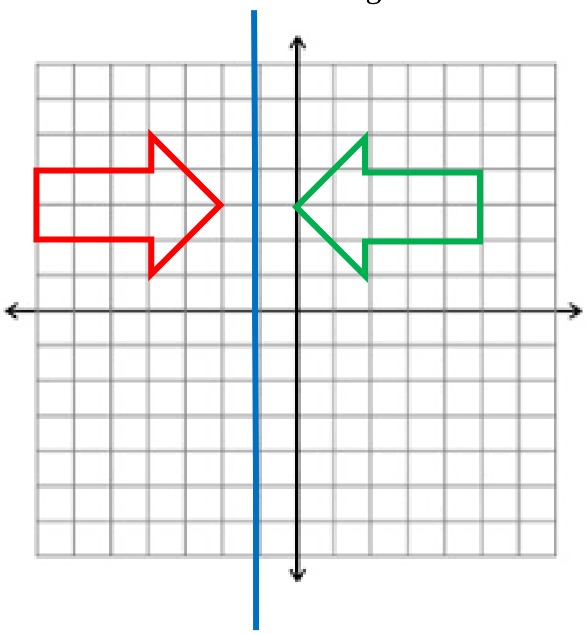
Problems for you.

Rotate the triangle 180 degrees clockwise at the labeled center.

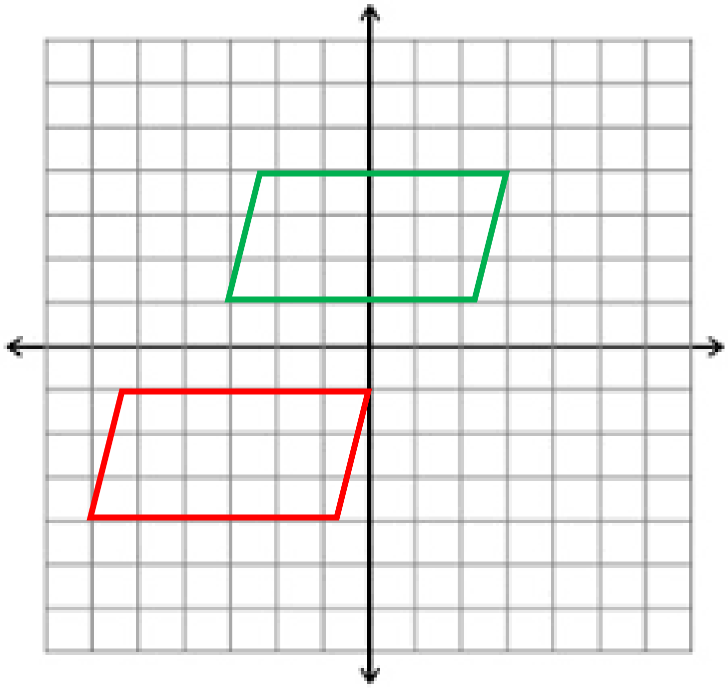




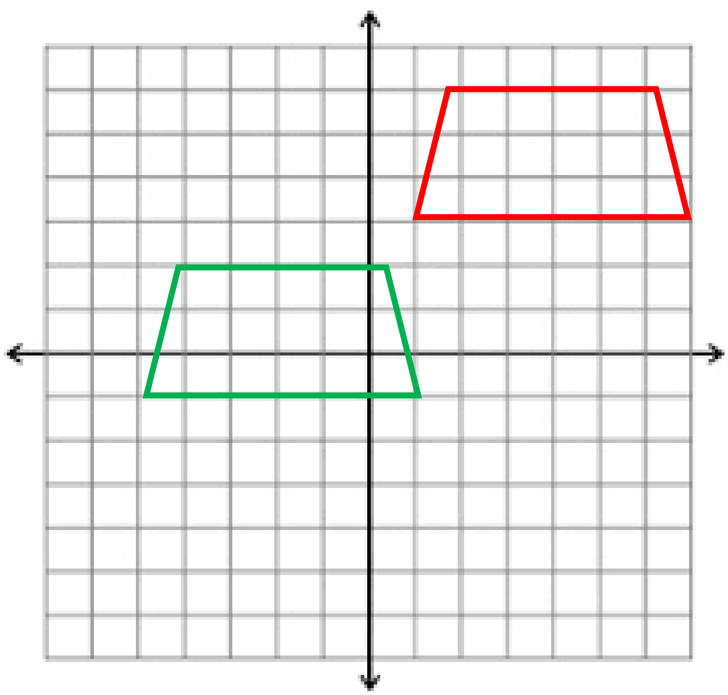
Reflect the arrow across the given blue line.



Translate the parallelogram up 5 and to the right 3



Translate the trapezoid down 4 and to the left 6.



Transformations Continue.

Objectives

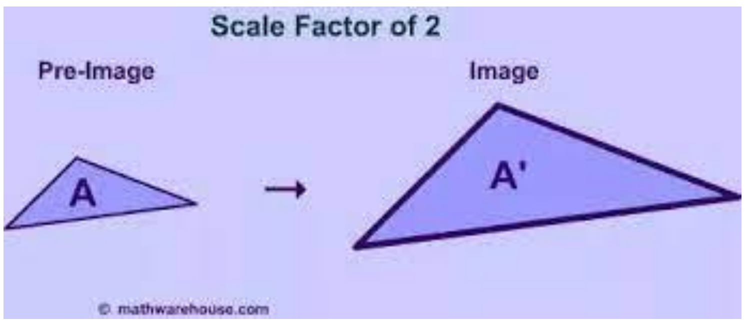
I can…

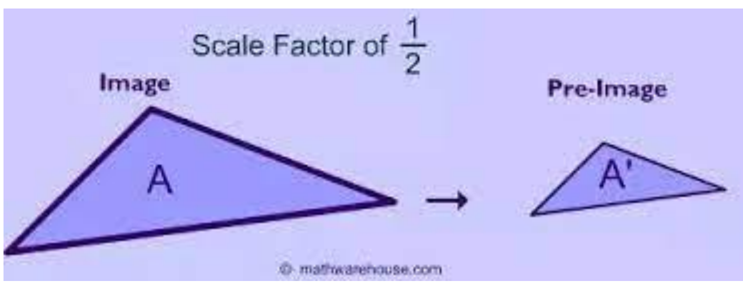
… describe the effects of dilation, transformations, rotations, and reflections.

…modify two-dimensional images given certain dilations, translations, reflections, and rotations.

Dilation is the type of transformation that changes the size of the image.

The Scale factor measures how large or small the image is.





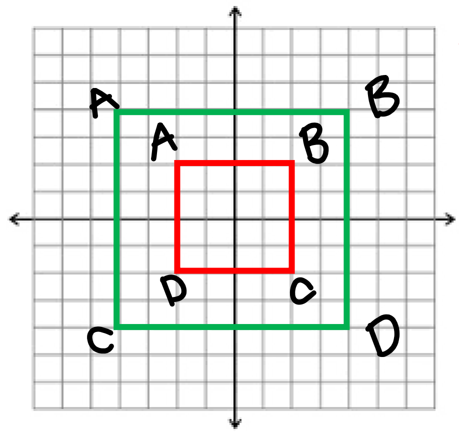
If a dilation creates a larger image it is called enlargement.

If a dilation creates a smaller image it is called reduction.

Example 1

Dilation scale factor 2

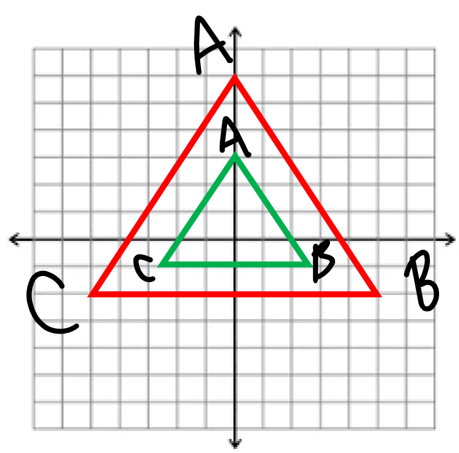
Red



	green
A(-2,2)	A(-4,4)
B(2,2)	B(4,4)
C(2,-2)	C(4,-4)
D(-2,-2)	D(-4,-4)

Example 2

Dilation scale factor ½

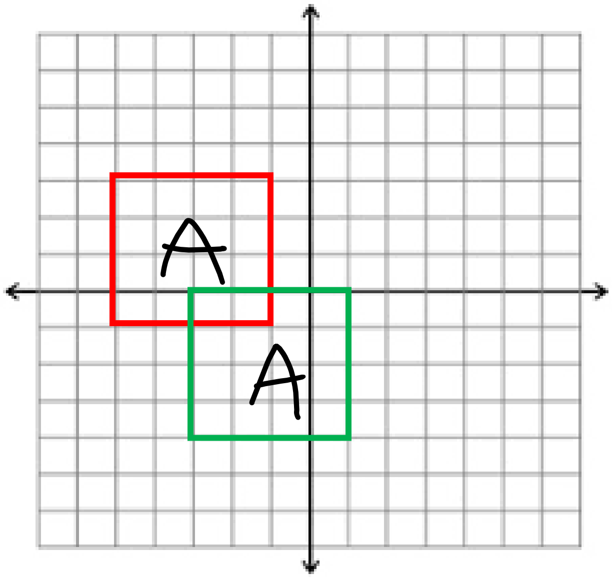


Red	green
A(0,6)	A(0,3)
B(5,-2)	B(2.5,-1)
C(-5,-2)	C(-2.5,-1)

Translation using vectors.

Translate A by a vector of $\begin{pmatrix}2\\-3\end{pmatrix}$.

x-axis



$$\begin{pmatrix} 2 \\ -3 \end{pmatrix}$$ y-axis

Angle sum, exterior angle, transversals, angle-angle congruence.

Objectives

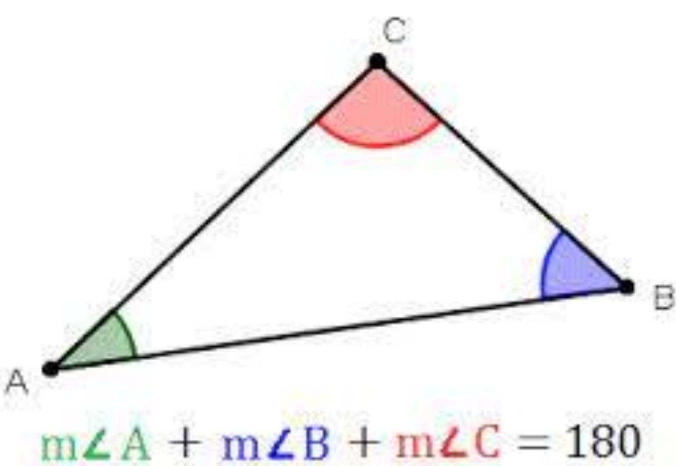
I can…

… solve missing triangle angle measurements.

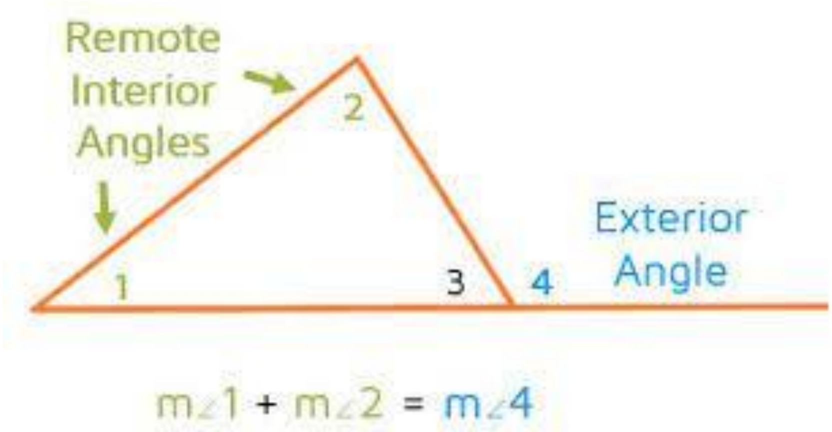
…evaluate angle measurement of a transversal line cutting two parallel lines.

…identify similar triangles.

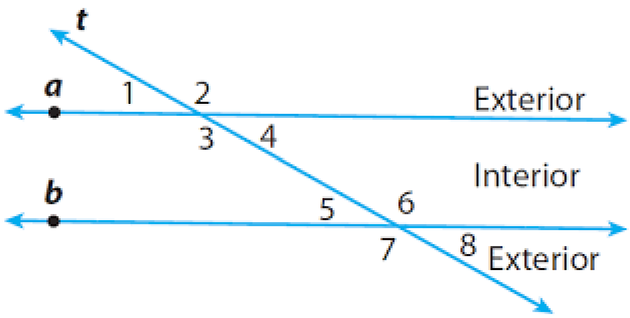
angle sum - The sum of all interior angles of a triangle is 180 degrees.

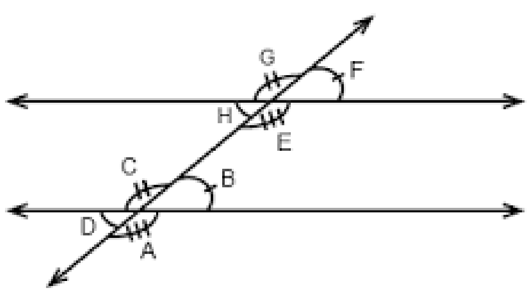


exterior angle - the measure of an exterior angle is equal to the sum of the measures of the two remote interior angles of the triangle.

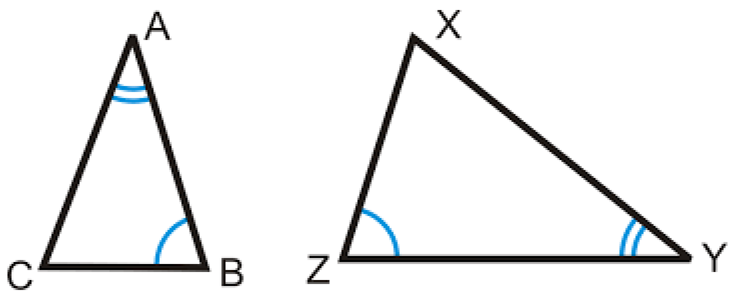


A line that cuts two parallel lines is called a transversal.



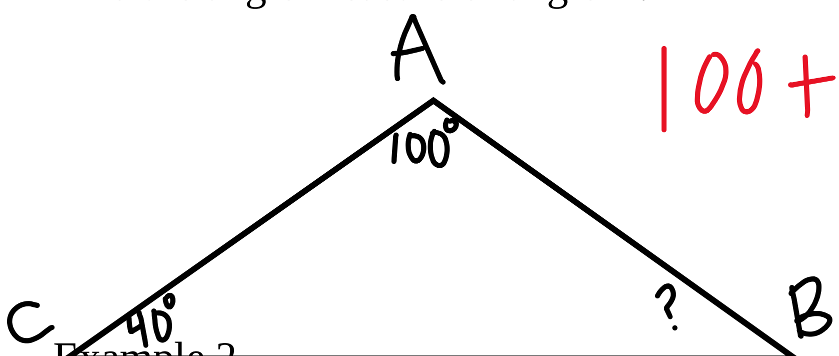


angle-angle similarity theorem states that if two angles in one triangle are equal to two angles in another triangle, then the triangles are similar.



Example 1

Find the angle measure of angle B.



$100+40+B=180$

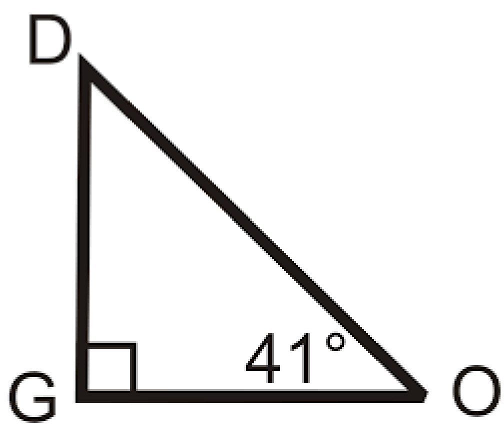
$140+B=180$

$-140 \qquad -140$

$\boxed{B=40}$

Example 2

Find the angle measure of angle D.



$90+41+D=180$

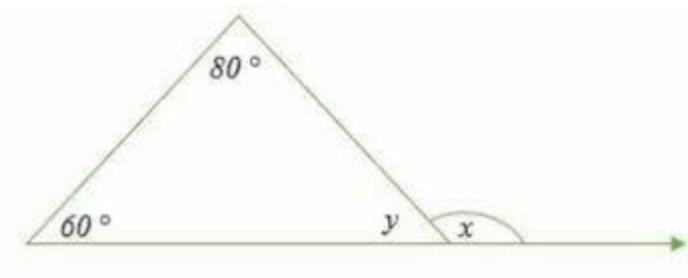
$131+D=180$

$-131 \qquad -131$

$\boxed{D=49}$

Example 3

Find the exterior angle measure at x.

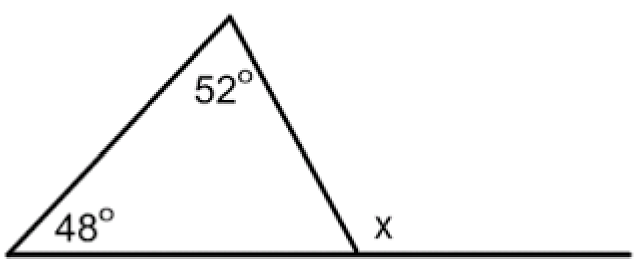


$80+60=X$

$\boxed{140=X}$

Example 4

Find the angle measure at angle x.

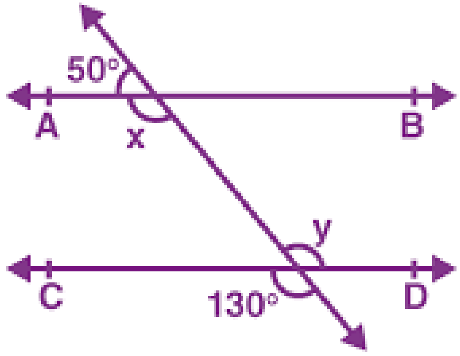


$52+48-x$

$\boxed{100=x}$

Example 5

Find angle measures for x and y.

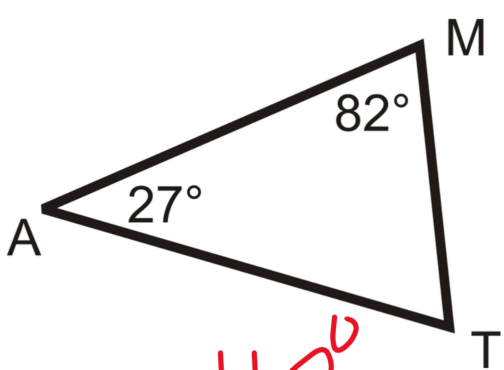


x=130
y=130

Problems for you.

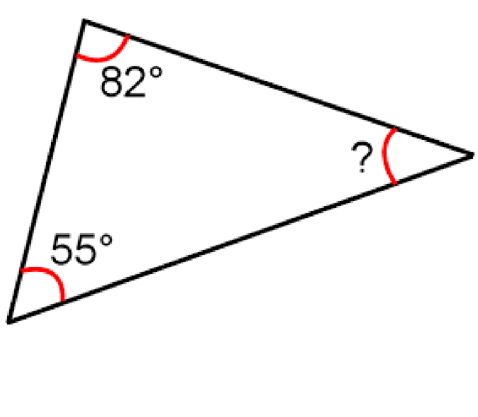
Questions 1-3 find the missing angle measure.

1.

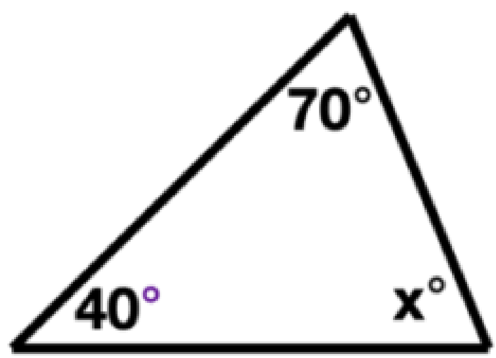


T=71°

2. ?=43°



3. x=70°

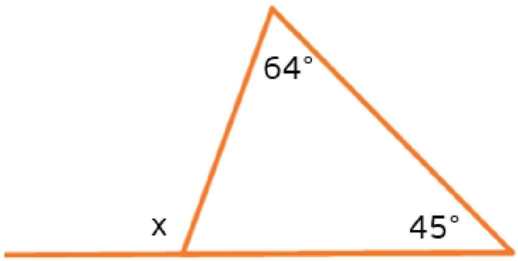


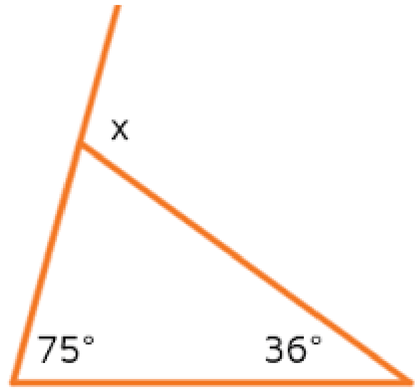
Questions 4-5 find the exterior angle measure.

4.

5. x=111°

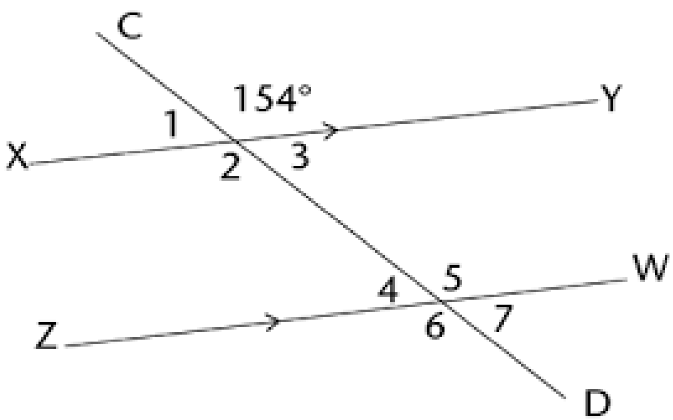
x = 109°





Find and label all the missing angles measures.

6.



1 = 26°

2 = 154°

3 = 26°

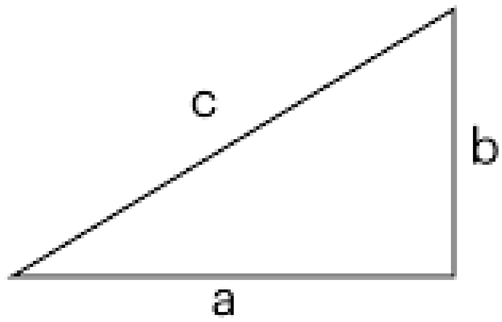
4 = 26°

5 = 154°

6 = 154°

7 = 26°

Pythagorean Theorem



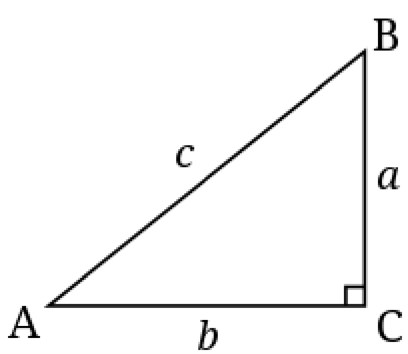
$$c^2 = a^2 + b^2$$

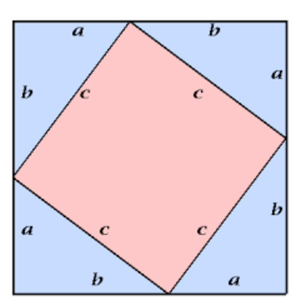
- One of the most well-known theorems.
- The sum of the squares on the legs of a right triangle are equal to the square on the hypotenuse.
- We can use the formula to find distance between two points when it is unclear on a graph.

Let's look at a proof of the Pythagorean Theorem and its converse. The theorem states: "The square of the hypotenuse of a right triangle is equal to the sum of the squares of the two legs."

$$a^2 + b^2 = c^2$$

Let's look at the right triangle ABC. B and A being the legs and C being the hypotenuse.





$$\text{Area} = (a+b)^2 = a^2 + 2ab + b^2$$

$$\text{Area} = 4 \cdot \Delta + \square$$

$$= 4 \cdot \left(\frac{a \cdot b}{2}\right) + c^2$$

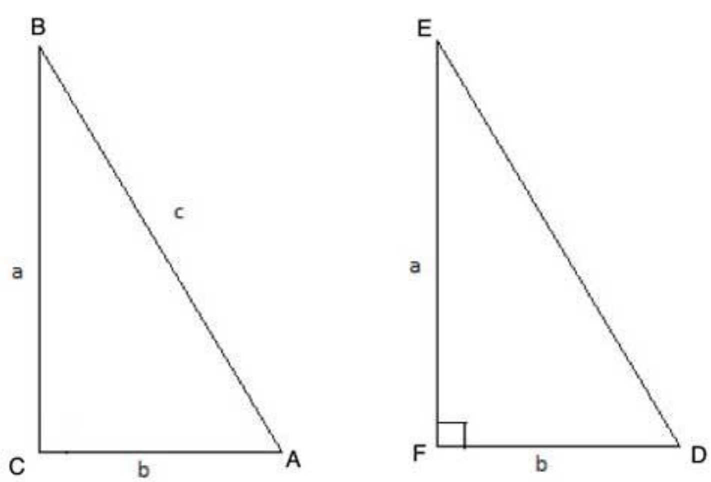
$$= \boxed{2ab + c^2}$$

$$a^2 + \cancel{2ab} + b^2 = \cancel{2ab} + c^2$$

$$a^2 + b^2 = c^2 \quad \square$$

For the convers we will prove that if $a^2 + b^2 = c^2$. We prove that the triangle is a right triangle.
Proof: We will assume the theorem is false.

Let's construct a right triangle DEF such that EF=BC, DF=AC, and the angle EFD=90 degrees.

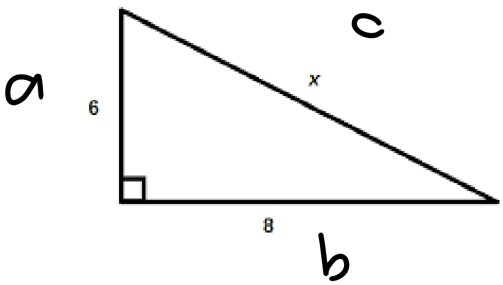


Proof:

1. We assume $\triangle ABC$ is not a right triangle.
2. $EF = BC$ and $DF = AC$ by construction
3. $m\angle EFD = 90°$ by construction
4. $(EF)^2 + (DF)^2 = (ED)^2$ - pythagorean theorem
5. $(BC)^2 + (AC)^2 = (AB)^2$ - given
6. $(EF)^2 + (DF)^2 = (AB)^2$ - substitution
7. $(ED)^2 = (AB)^2$
8. $ED = AB$
9. $\triangle DEF \cong \triangle ABC$ - S-S-S postulat
10. $\angle EFD \cong \angle BAC$
11. $m\angle EFD = m\angle BCA = 90°$
12. $m\angle BCA = 90°$ - contradicts (1)

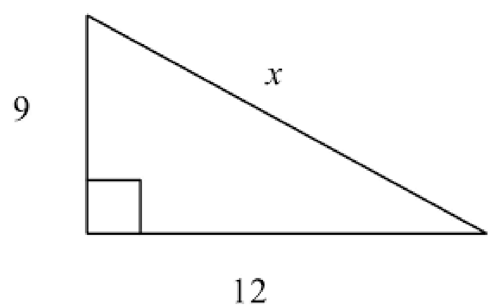
We have now done a proof of Pythagorean Theorem and a converse.

Example 1



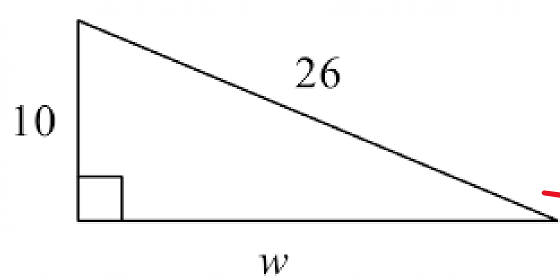
$$a^2 + b^2 = c^2$$
$$6^2 + 8^2 = c^2$$
$$36 + 64 = c^2$$
$$\sqrt{160} = \sqrt{c^2}$$
$$\boxed{10 = c}$$

Example 2



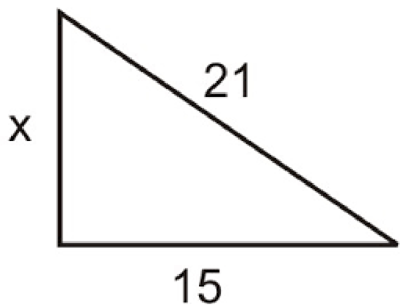
$$9^2 + 12^2 = x^2$$
$$81 + 144 = x^2$$
$$\sqrt{225} = \sqrt{x^2}$$
$$\boxed{15 = x}$$

Example 3



$$10^2 + w^2 = 26^2$$
$$100 + w^2 = 676$$
$$-100 \qquad -100$$
$$\sqrt{w^2} = \sqrt{576}$$
$$\boxed{w = 24}$$

Example 4



$$15^2 + x^2 = 21^2$$

$$225 + x^2 = 441$$

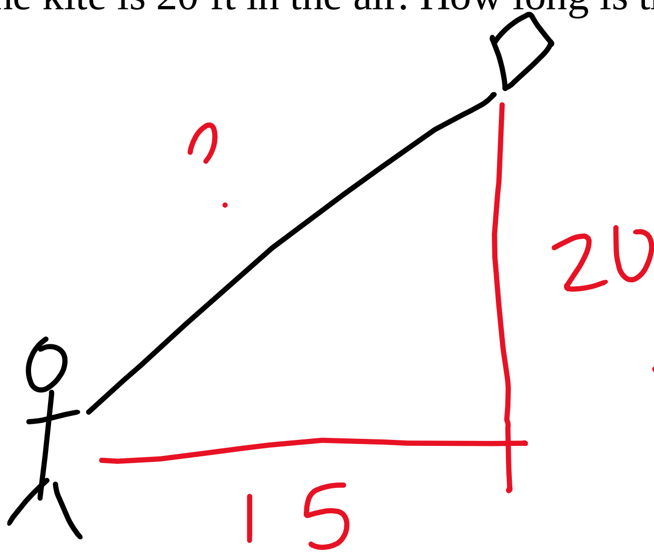
$$-225 \qquad -225$$

$$\sqrt{x^2} = \sqrt{216}$$

$$\boxed{x = \sqrt{216}}$$

Example 5

Dominic is on the ground flying a kite. The kite is 15 ft in front of her and the kite is 20 ft in the air. How long is the kite rope?



$$20^2 + 15^2 = c^2$$

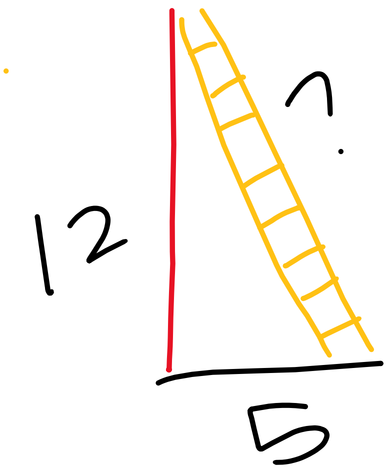
$$400 + 225 = c^2$$

$$\sqrt{625} = \sqrt{c^2}$$

$$\boxed{25 = c}$$

Example 6

There is a ladder leaning against a wall. The ladder touches the building at 12 feet and the bottom of the ladder is 5 ft away from the wall. How long is the ladder?



$$12^2+5^2=C^2$$

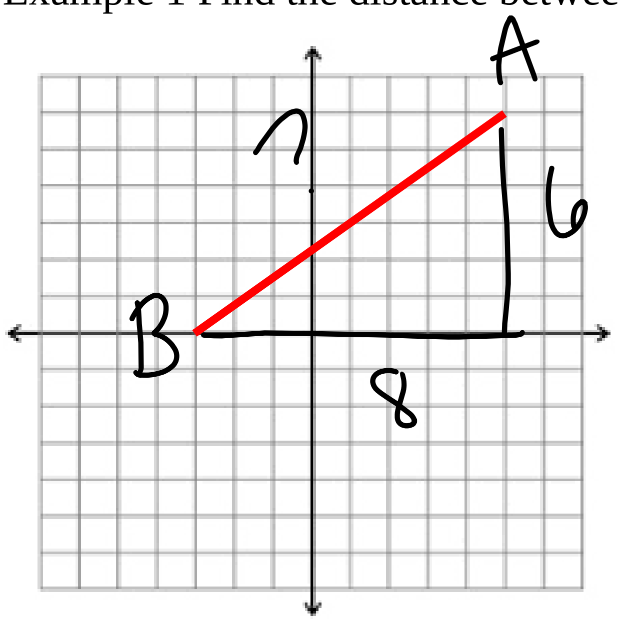
$$144+25=C^2$$

$$\sqrt{169}=\sqrt{C^{\cancel{2}}}$$

$$\boxed{13\text{ft}=C}$$

Finding the distance between two points.

Example 1 Find the distance between point A and B.



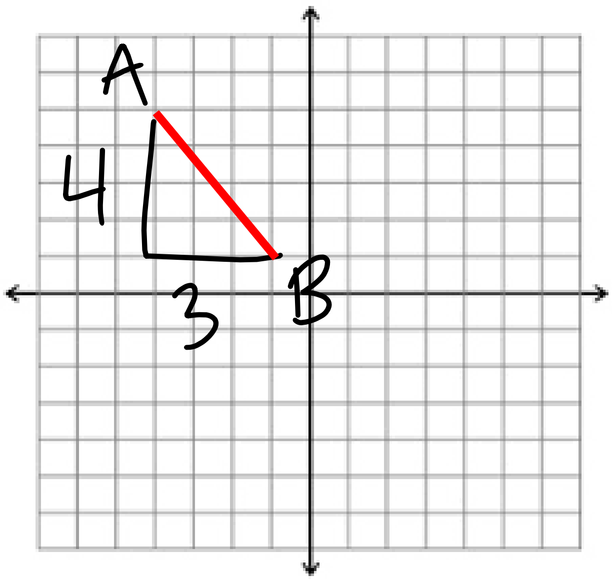
$$8^2+6^2=C^2$$

$$64+36=C^2$$

$$\sqrt{100}=\sqrt{C^{\cancel{2}}}$$

$$\boxed{10=C}$$

Example 2



$$4^2 + 3^2 = c^2$$

$$16 + 9 = c^2$$

$$\sqrt{25} = \sqrt{c^2}$$

$$\boxed{5 = c}$$

Volume of cylinders, cones, and spheres.

Objectives

I can…

…define the formulas for the volume of cylinders, cones, and spheres.

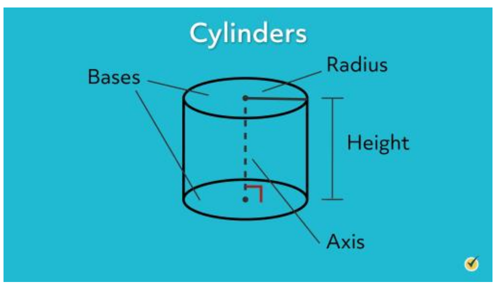
… solve real world problems with volumes of cylinders, cones, and spheres.

…apply the formulas for the volume of cylinders, cones, and spheres.

Volume Formulas

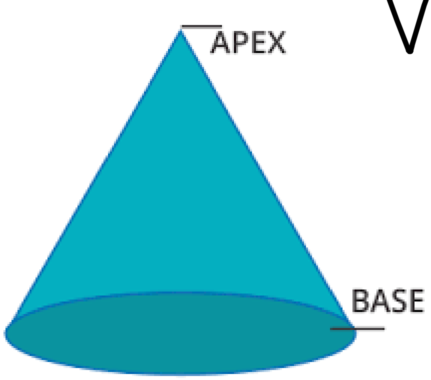
Cylinder-

$V = \pi r^2 h$

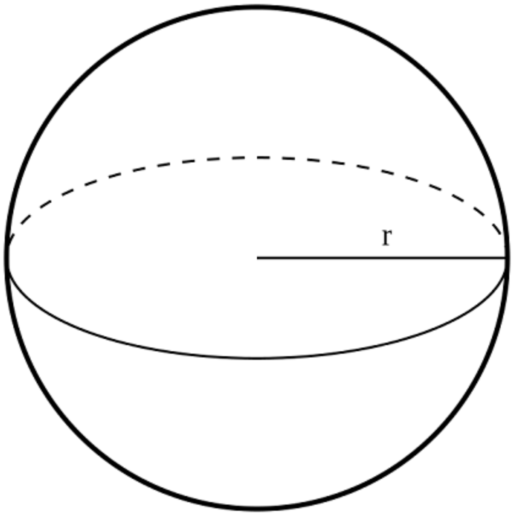


Cones-

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

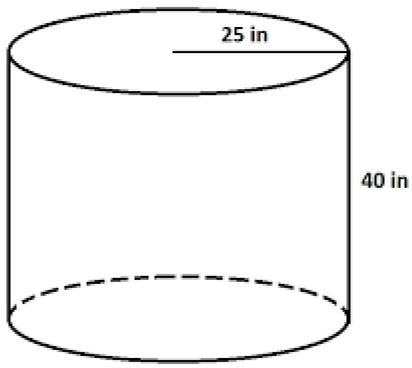


Spheres-

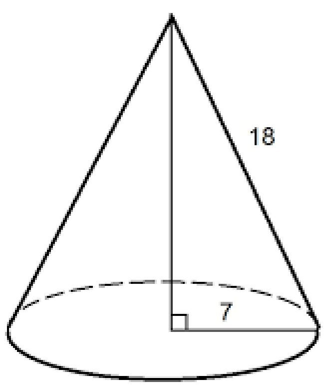


$$V = \frac{4}{3}\pi r^3$$

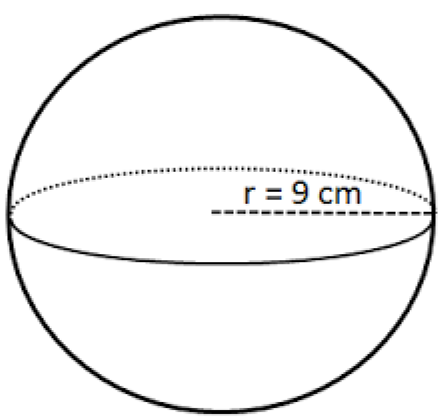
Practice Problems



78,539.82



923.63



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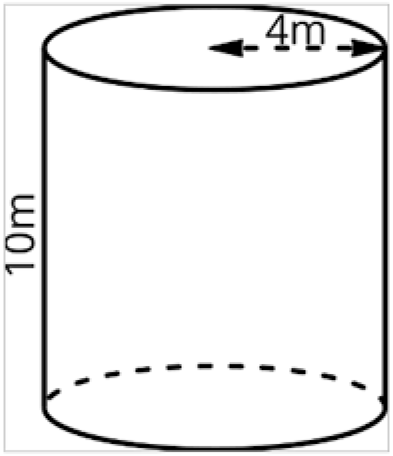

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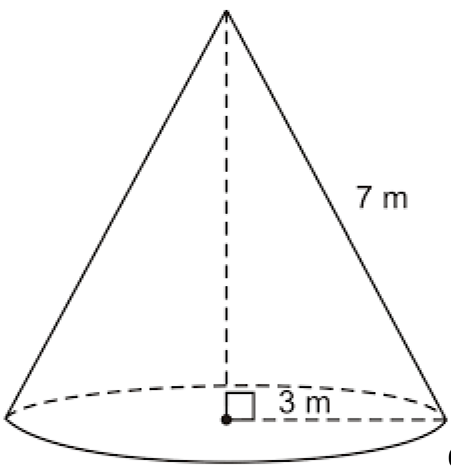

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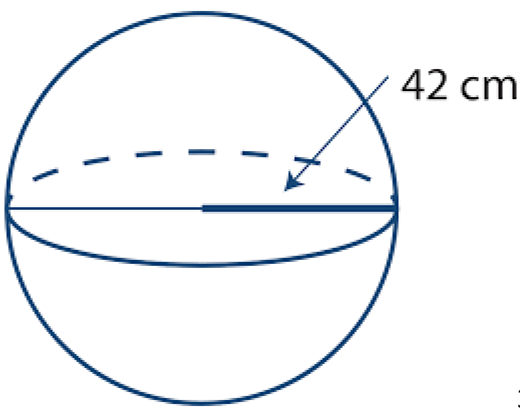

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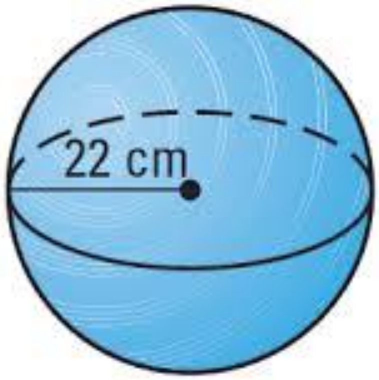

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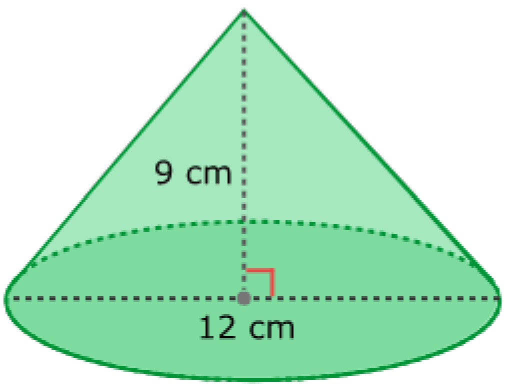

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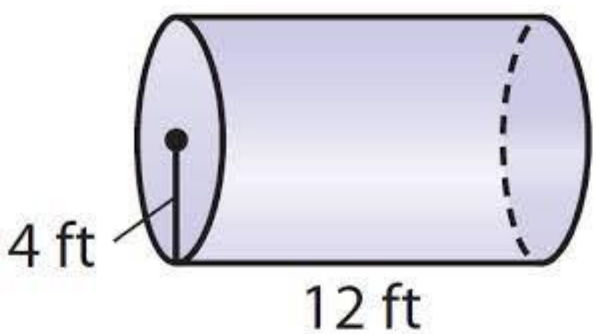

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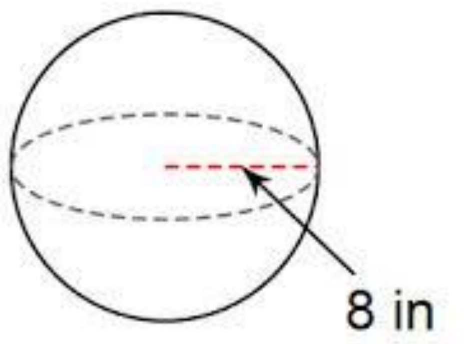

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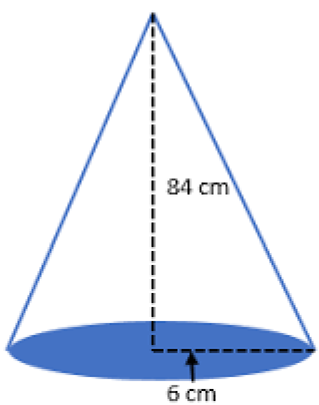

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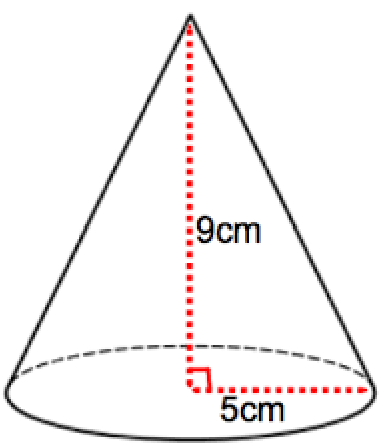

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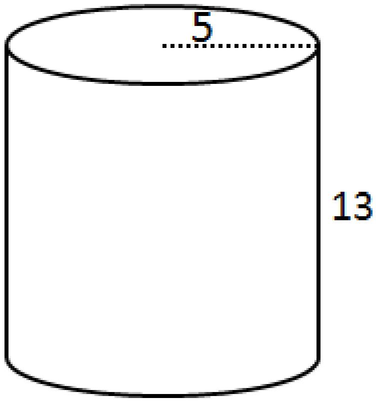

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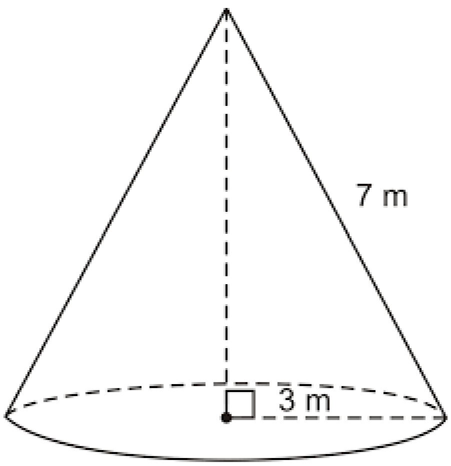

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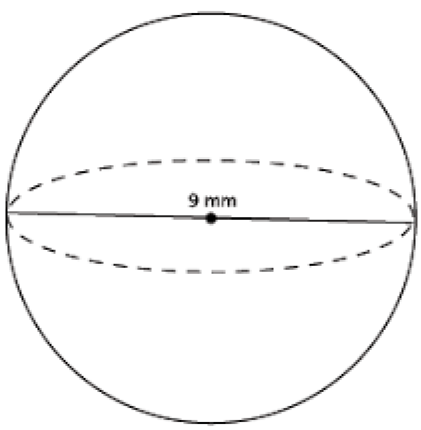

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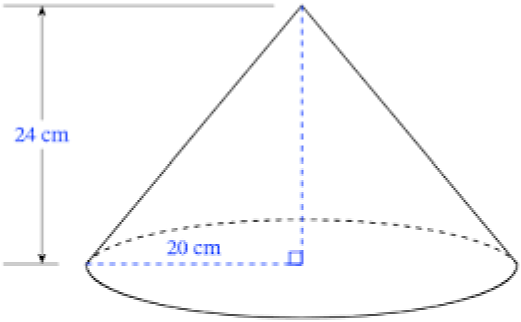

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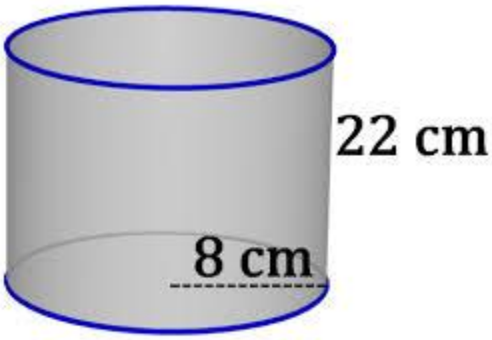

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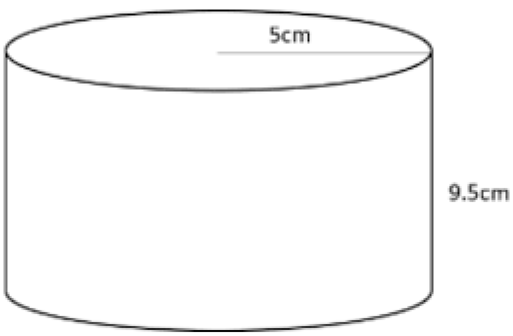

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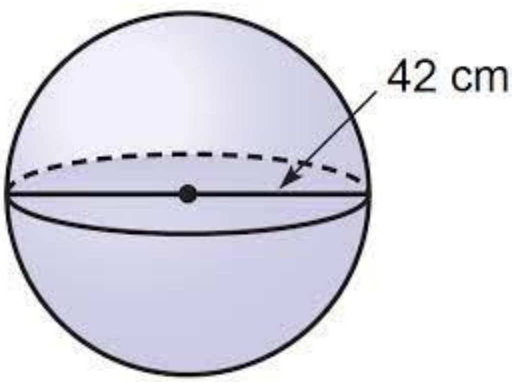

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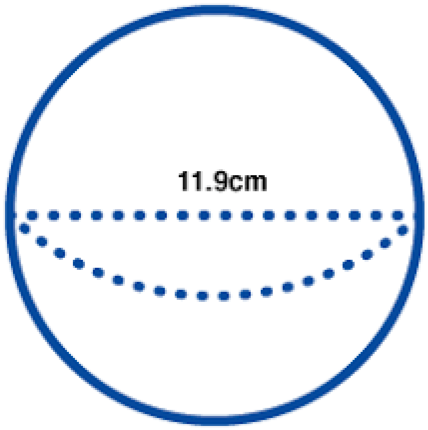

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