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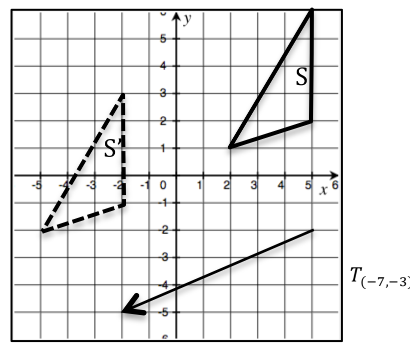
End of Module Study Guide: Concepts of Congruence

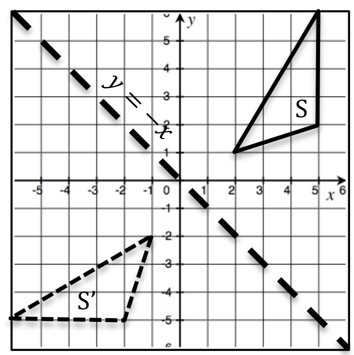
Rigid Motions

Rigid Motions map lines to line, segments to segments, angles to angles. The length of the line segments and the measures of the angles are preserved over the rigid motion. We studied three types of rigid motions:

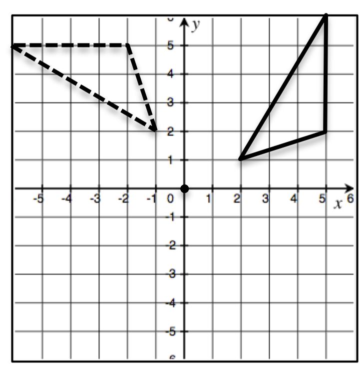
Translation: This ***slides*** a point along a vector. We can express translations using a vector, or using notation such as $T_{(2,5)}$ when we are translating on a coordinate plane.
Example:



Reflection: This is the ***mirror image*** of a point, line, or angle across a line of reflection.
Example:



Rotation: This ***turns*** a point, line or an angle around a point of rotation.
Example: Rotate 90 degrees clockwise around the origin.



****Often we use sequences of rigid motions to map a geometric figure from one location to another. The rigid motions need to be performed in the proper order!**

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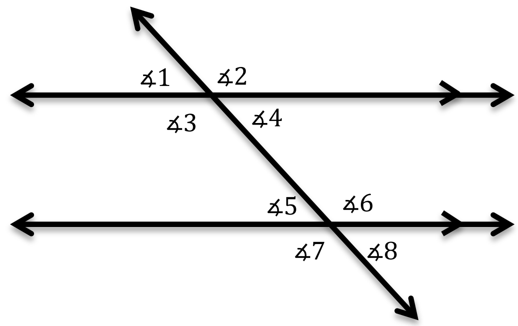
Parallel Lines Cut by a Transversal

When parallel lines are cut by a transversal, the corresponding angles, alternate interior angles, and alternate exterior angles are congruent.
Example:



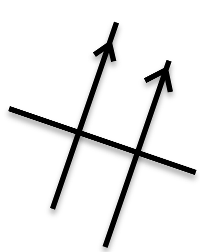
Corresponding Angles: Angles on the same side of the transversal in corresponding positions. Corresponding angles are congruent because you can map one to another by a translation. ∡1 & ∡5, ∡2 & ∡6, ∡3 & ∡7, and ∡4 & ∡8 are all pairs of corresponding angles.

Alternate Interior Angles: Angles on opposite sides of the transversal on the **inside** of the parallel lines. Alternate interior angles are congruent because you can map one to another by rotating 180° around the midpoint between the two parallel lines on the transversal. ∡3 &∡6, and ∡4 & ∡5 are pairs of alternate interior angles.

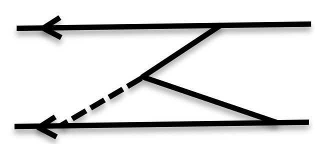
Alternate Exterior Angles: Angles on opposite sides of the transversal on the **outside** of the parallel lines. Alternate exterior angles are congruent because you can map one to another by rotating 180° around the midpoint between the two parallel lines on the transversal. ∡1 & ∡8, and ∡2 & ∡7 are pairs of alternate exterior angles.

Be Careful! Look for the congruency:

You might need to change the orientation of the paper to make parallel lines horizontal to help you



You might need to extend lines and create transversals to prove congruency.



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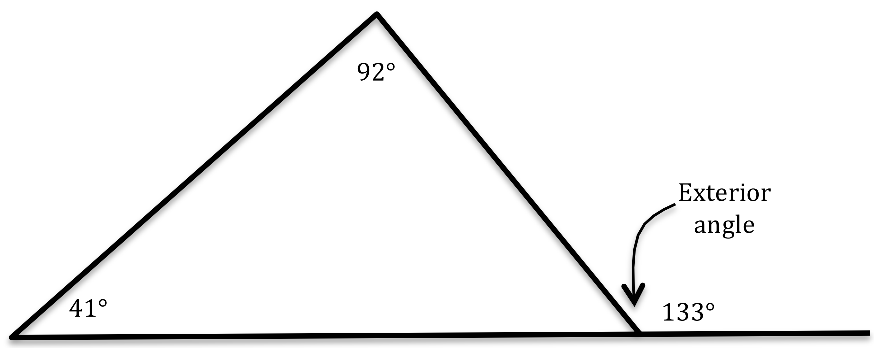
Triangles

Angle Sum Theorem for Triangles: The sum of the interior angles of a triangle is always 180°. *Be ready to prove this using parallel lines and straight angles!!*

Interior Angles of a triangle: the three angles on the inside of the triangle.

Exterior Angles of a triangle: the angle formed by extending one of the sides of the triangle. The angle measure of the exterior angle is equal to the angle measure of the two remote interior angles.

Remote Interior angles of a triangle: the two angles opposite (or farthest away from) the exterior angle.



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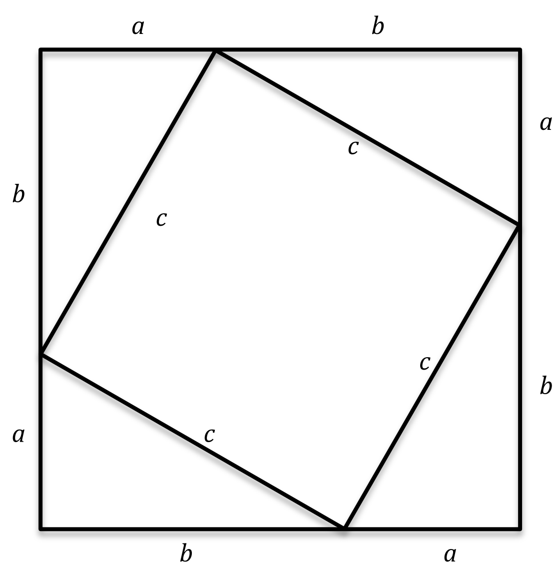
Pythagorean Theorem

Pythagorean Theorem: If the lengths of the legs of a right triangle are a and b, and the length of the hypotenuse is c, then $a^2 + b^2 = c^2$.



Area of big square		Area of small square		Area of 4 triangles
$(a+b)^2$	$=$	c^2	$+$	$4 \cdot \left(\frac{1}{2}ab\right)$

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

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

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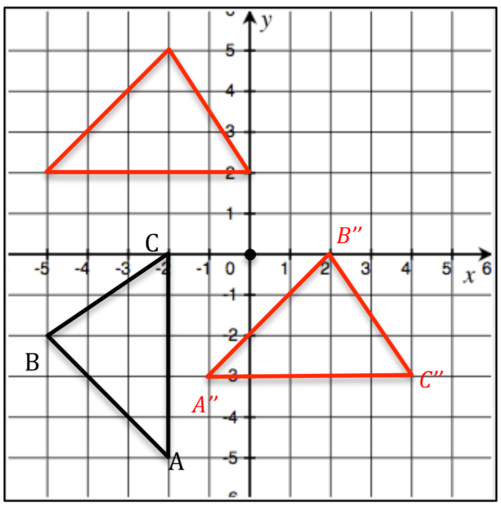
The Questions

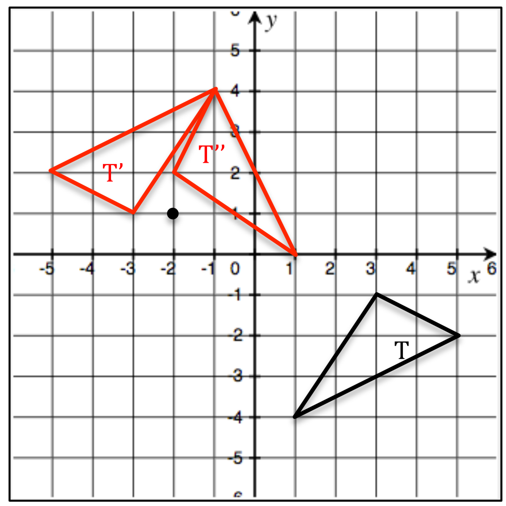
Please complete these questions and turn in the entire study guide completed when you take your assessment.

Perform the rigid motion transformations required on the coordinate plane.

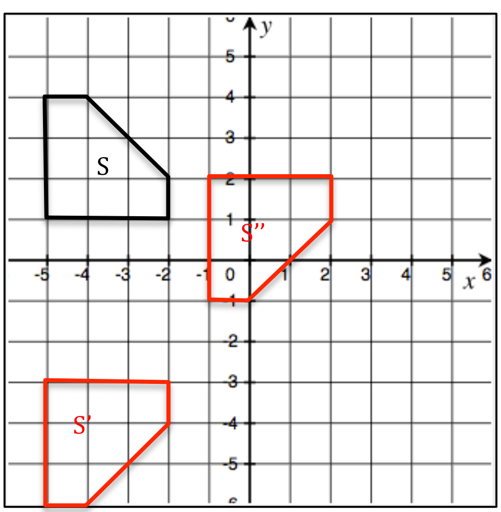
Rotate triangle ABC 90° clockwise around the origin and then perform translation: $T_{(4,-5)}$



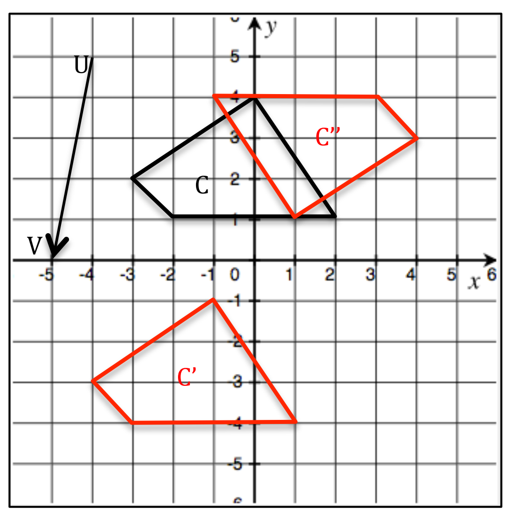
Rotate shape T 180° around the origin and then rotate 90° clockwise around $(-2, 1)$



Reflect shape S across the line $y = -1$ and then perform the translation $T_{(4,5)}$



Translate shape C along the vector $\overrightarrow{UV}$ and then rotate 180° around the origin.



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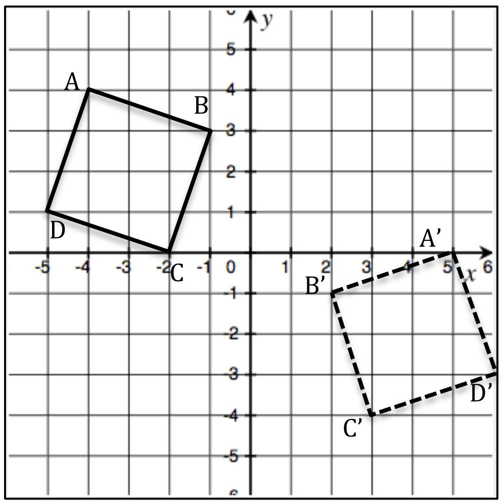
Describe the exact rigid motions necessary (in specific order) to map the original shape onto the shape that with the dashed lines. You do not **need** to use 3 rigid motions.

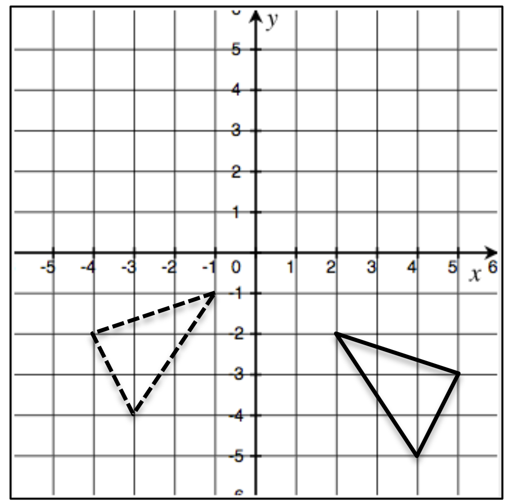


Answers will vary

Rigid Motion #1: $T_{(3,-4)}$

Rigid Motion #2: Reflect across $x = 2$

Rigid Motion #3:

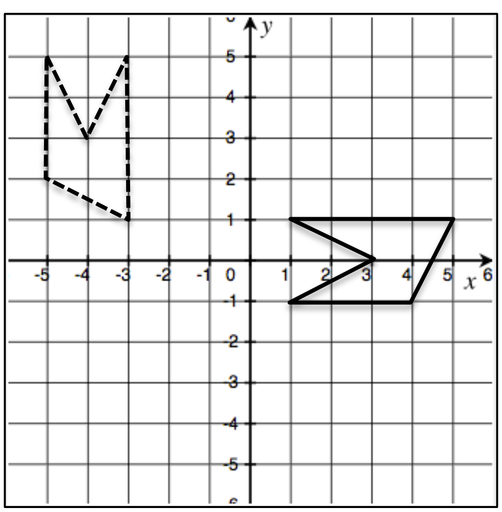


Answers will vary

Rigid Motion #1: Reflect across $x = 1$

Rigid Motion #2: $T_{(-1,1)}$

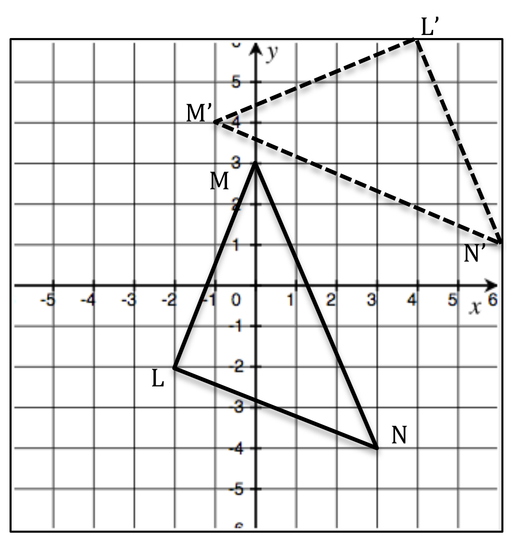
Rigid Motion #3:



(Answers will vary)Rigid Motion #1: Reflect 90 degrees (counter clockwise) around the origin

Rigid Motion #2: $T_{(-4,6)}$

Rigid Motion #3:



(Answers will vary)Rigid Motion #1: Reflect across $y = -x$

Rigid Motion #2: $T_{(2,4)}$

Rigid Motion #3:

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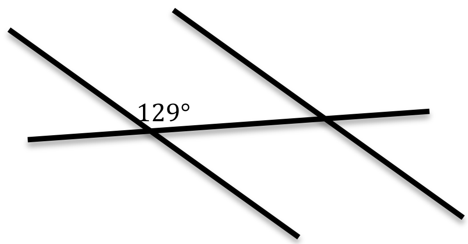
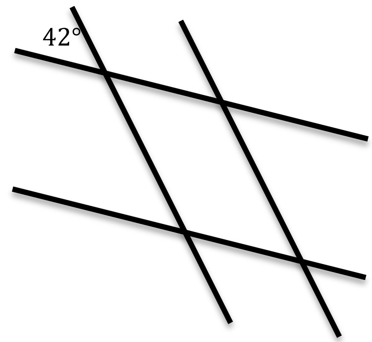
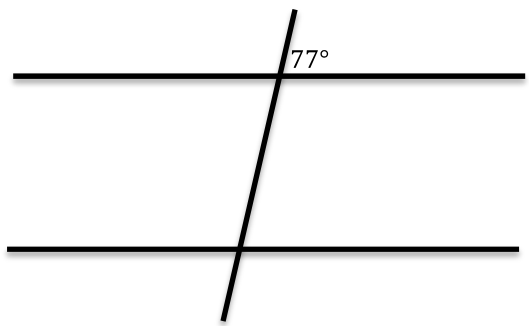
Fill in the missing angle measures. **All pairs of lines are parallel**



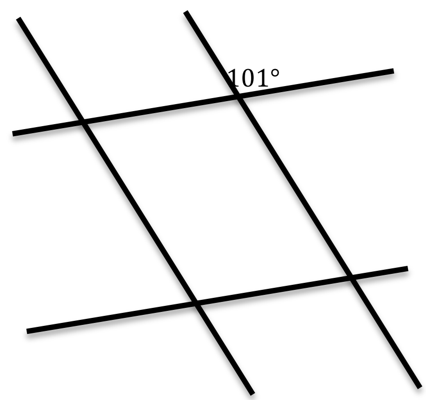
Angles are either 129 or 51.



Angles are either 42 or 138.

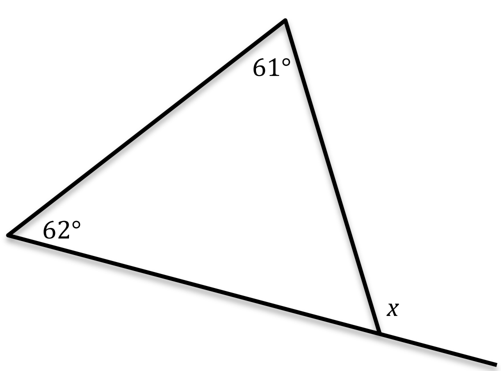


Angles are either 77 or 103.

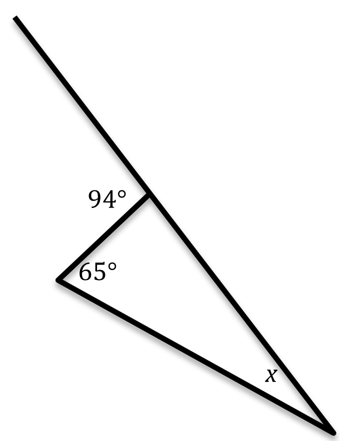


Angles are either 101 or 79.

Fill in the missing angle measure.



$x = 123°$



$x = 29°$

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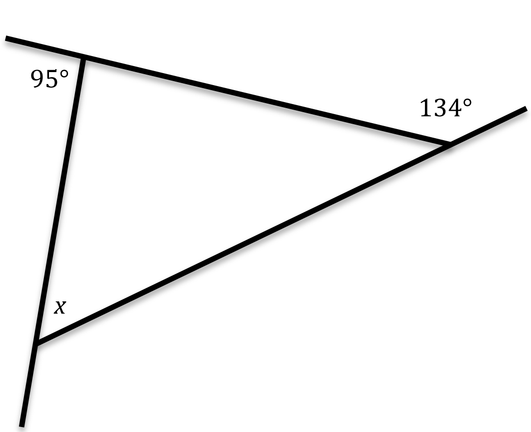
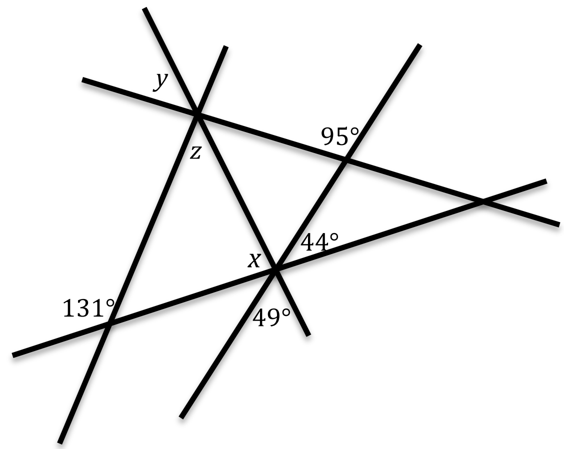
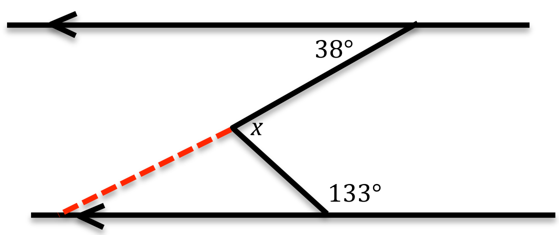
$x = 49°$



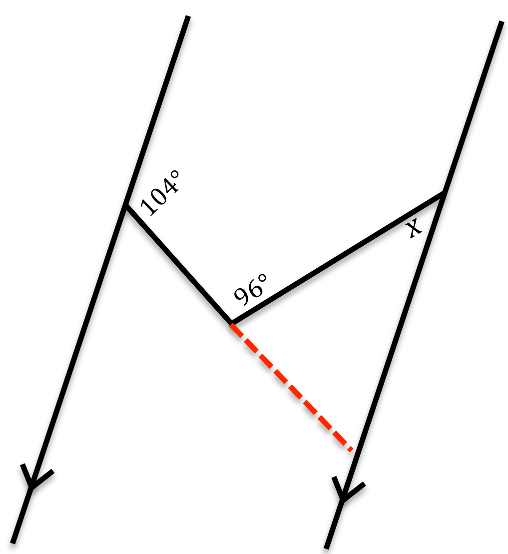


$x = 87°$
$y = 46°$
$z = 44°$



$x = 85°$

$x = 20°$



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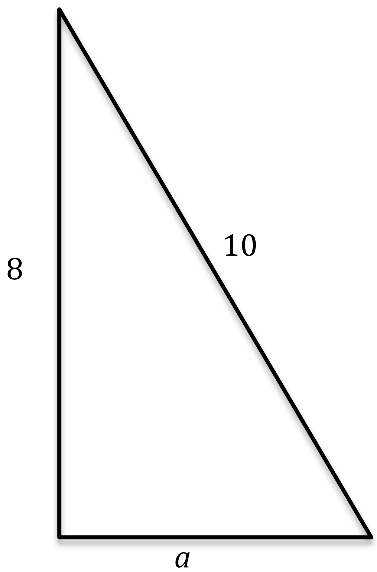
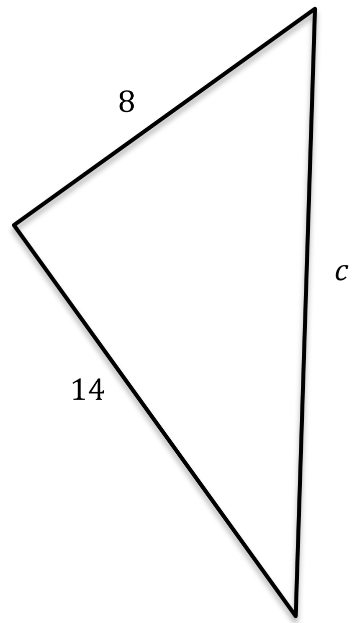
What is the length of the missing side of the right triangle?

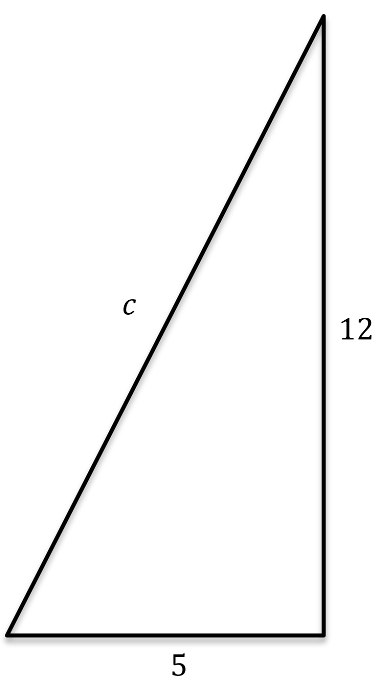


$a = 6$



$c = \sqrt{260}$

$c = 13$



$b = 12$