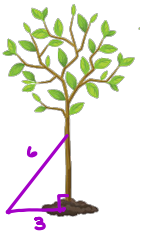
Name Key Block _____ Date _____

Pythagorean Theorem and Transformations Practice

Use the Pythagorean Theorem to solve the following problems. Drawing pictures is always helpful! Show all work and round answers to the nearest tenth.

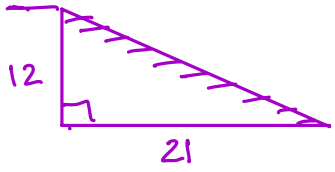
1. Marc wants to support a tree with a 6-foot wire that is attached to the ground 3 feet from the base of the tree. How high up the tree will Marc be able to put the wire?



$a^2+b^2=c^2$
$3^2+b^2=6^2$
$9+b^2=36$
$-9 \quad -9$
$b^2=27$
$\sqrt{b^2}=\sqrt{27}$
$b=5.2$

The wire will be attached 5.2 feet above the ground.

2. Dahlia is trying to figure out the length of a staircase she will need for a deck that is 12 feet high. She wants to start the stairs 21 feet from the deck. How long will her staircase need to be?



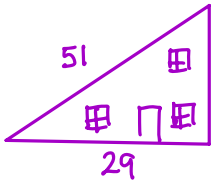
$a^2+b^2=c^2$
$12^2+21^2=c^2$
$144+441=c^2$
$\sqrt{585}=\sqrt{c^2}$
$24.2=c$

The staircase needs to be 24.2 feet long.

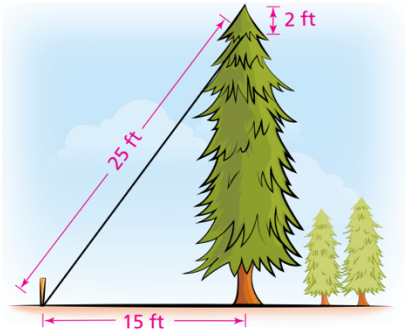
3. In a right triangle shaped house, the roof is 51 feet long (yes, it comes down to the ground) and the base of the house is 29 feet across. Calculate the height of the house at its highest point.

$a^2+b^2=c^2$
$29^2+b^2=51^2$
$841+b^2=2601$
$-841 \quad -841$
$b^2=1760$
$\sqrt{b^2}=\sqrt{1760}$
$b=42.0$

The house is 42 feet tall.



4. At an evergreen farm, the taller trees are braced by wires. A wire extends from 2 feet below the top of the tree to a stake in the ground. What is the tallest tree that can be braced with a 25-foot wire staked 15 feet from the base of the tree?

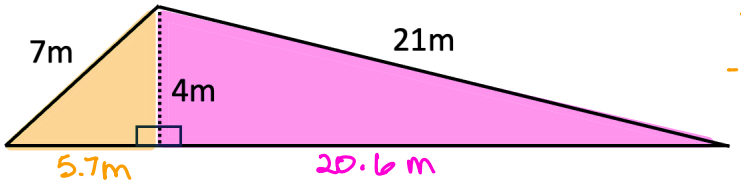


$a^2+b^2=c^2$
$15^2+b^2=25^2$
$225+b^2=625$
$b^2=400$
$\sqrt{b^2}=\sqrt{400}$
$b=20$

The tallest tree would be 22 feet tall.

$20+2=22$ ← space to top of tree

5. Find the missing length of the triangle:



$a^2+b^2=c^2$
$4^2+b^2=7^2$
$16+b^2=49$
$-16 \quad -16$
$b^2=33$
$\sqrt{b^2}=\sqrt{33}$
$b=5.7$

$a^2+b^2=c^2$
$4^2+b^2=21^2$
$16+b^2=441$
$-16 \quad -16$
$b^2=425$
$\sqrt{b^2}=\sqrt{425}$
$b=20.6$

Total length is $5.7m+20.6m=26.3m$

6. Do the following measurements represent the sides of a right triangle? If there is not a right angle, is it an obtuse or an acute angle?

5, 11, 13

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

$5^2 + 11^2 \stackrel{?}{=} 13^2$

$25 + 121 \stackrel{?}{=} 169$

$146 \neq 169$

Not a right angle; it is obtuse.

4, 7.5, 8.5

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

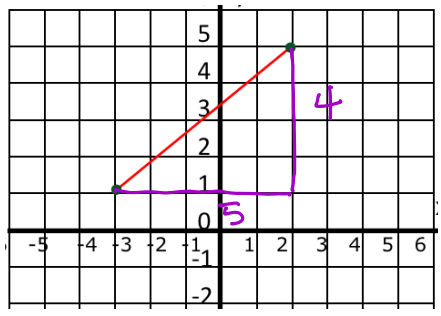
$4^2 + 7.5^2 \stackrel{?}{=} 8.5^2$

$16 + 56.25 \stackrel{?}{=} 72.25$

$72.25 = 72.25$ ✓

This is a right triangle!

7. What is the length of the line on the graph below?



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

$4^2+5^2=c^2$

$16+25=c^2$

$41=c^2$

$\sqrt{41}=\sqrt{c^2}$

$6.4=c$

6.4 units

8. What is the distance between the points (7, 2) and (3, 9)?

7, 2

3, 9

−4 ; +7

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

$4^2+7^2=c^2$

$16+49=c^2$

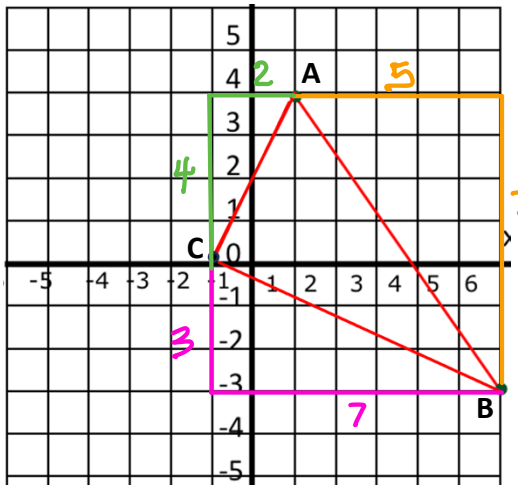
$65=c^2$

$\sqrt{65}=\sqrt{c^2}$

$8.1=c$

8.1 units

9. Prove whether or not triangle ABC is a right triangle.



First find all side lengths.

$\overline{AB}$ $a^2+b^2=c^2$

$7^2+5^2=c^2$

$49+25=c^2$

$74=c^2$

$\sqrt{74}=\sqrt{c^2}$

$8.6=c$

$\overline{BC}$ $a^2+b^2=c^2$

$3^2+7^2=c^2$

$9+49=c^2$

$58=c^2$

$\sqrt{58}=\sqrt{c^2}$

$7.6=c$

$\overline{AC}$ $a^2+b^2=c^2$

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

$16+4=c^2$

$20=c^2$

$\sqrt{20}=\sqrt{c^2}$

$4.5=c$

Now let's check if a 4.5, 7.6, 8.6 triangle is a right triangle.

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

$4.5^2+7.6^2 \stackrel{?}{=} 8.6^2$

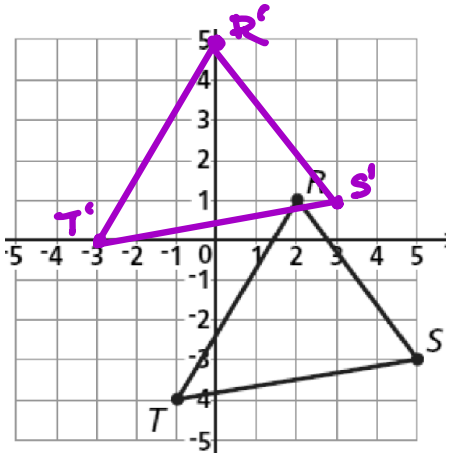
$20.25+57.76 \stackrel{?}{=} 73.96$

$78.01 \neq 73.96$

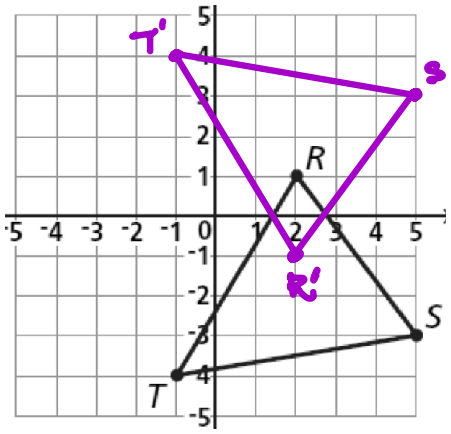
ABC is NOT a right triangle.

Perform the following transformations. (#'s 10-15)

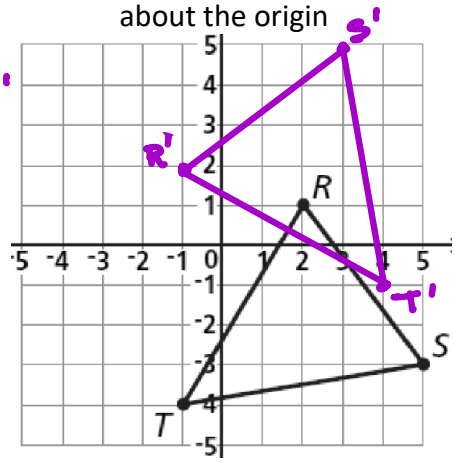
2 units left, 4 units up



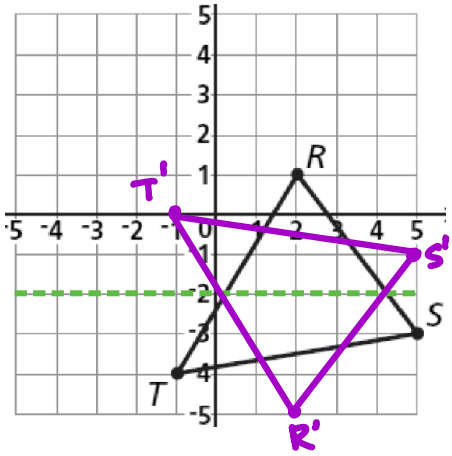
Reflection across the x-axis



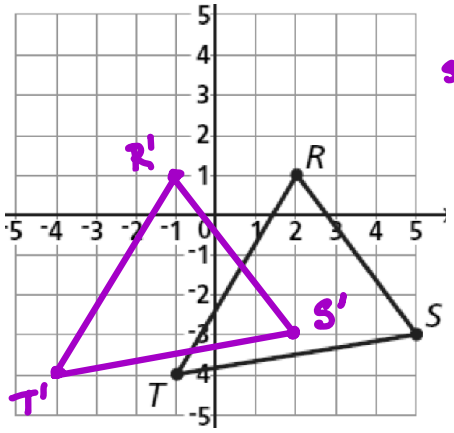
Rotation 90° counter-clockwise about the origin



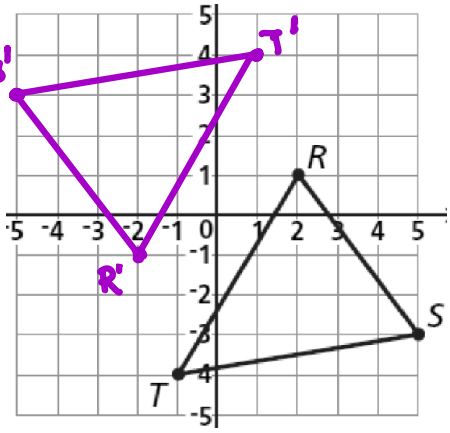
Reflection across y = –2



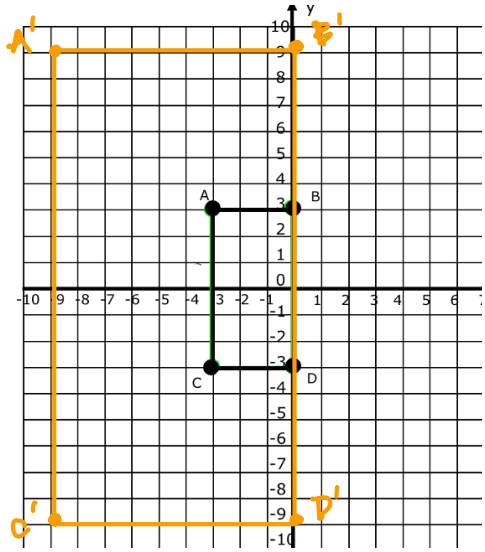
(x, y) → (x–3, y)



Rotation 180° counter-clockwise



16. Graph the image of rectangle ABCD after a dilation of scale factor 3 centered at the origin.



Preimage		Image	
Length AB	3 units	Length A'B'	9 units
Length AC	6 units	Length A'C'	18 units
Perimeter ABCD	18 units	Perimeter A'B'C'D'	54 units
Area ABCD	18 units^2	Area A'B'C'D'	162 units^2

Are the Image and Preimage congruent or similar?

Similar

What is the ratio of the lengths between the Preimage & Image?

Ratio = 3 $\quad \frac{\text{Image}}{\text{Pre Image}} = \frac{9}{3} = \frac{18}{6} = 3$

What is the ratio for the areas between the Preimage and Image?

Ratio = 9 $\quad \frac{\text{Image}}{\text{Pre Image}} = \frac{162}{18} = 9$

17. Rectangle ABCD has a perimeter of 16 units. Side AB is 3 units. ABCD is dilated to form rectangle A'B'C'D' where side A'B' is 6.6 units.

What is the Scale factor? Show how you calculated it.

Scale Factor = $\frac{\text{Image}}{\text{Preimage}} = \frac{6.6}{3} = 2.2$

Scale Factor = 2.2

What is the perimeter of A'B'C'D'?

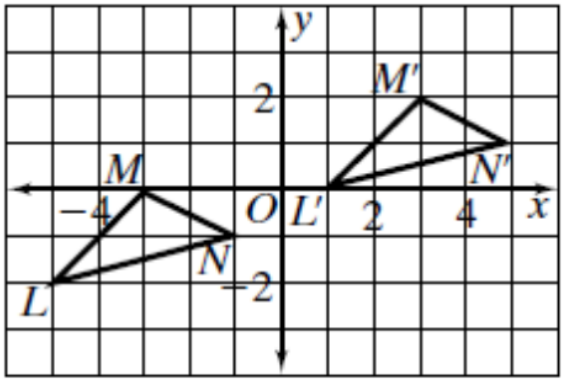
$16 \cdot (2.2) = 35.2$

(Perimeter of preimage) (scale factor)

Perimeter 35.2 units

What was the transformation? Describe the transformation in words.

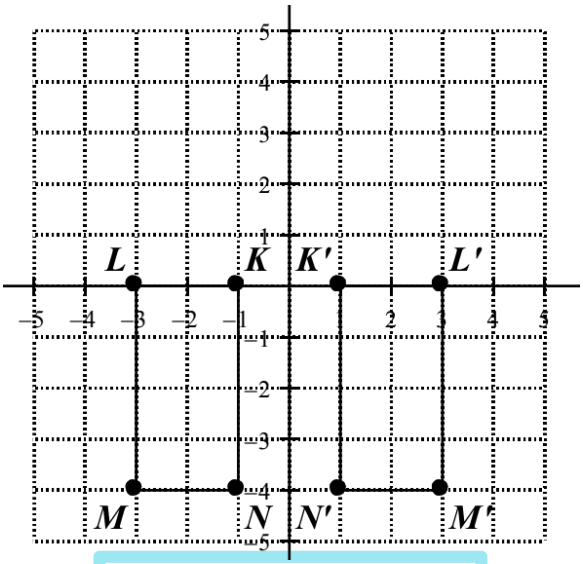
18.



Translation Up 2, Right 6

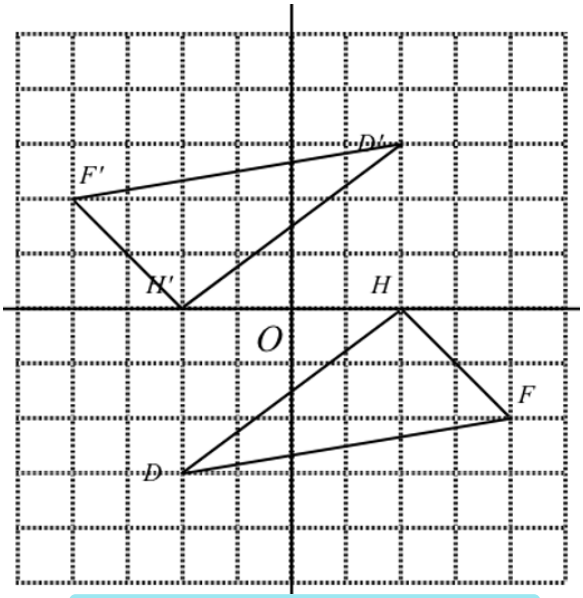
$(x, y) \rightarrow (x+6, y+2)$

19.



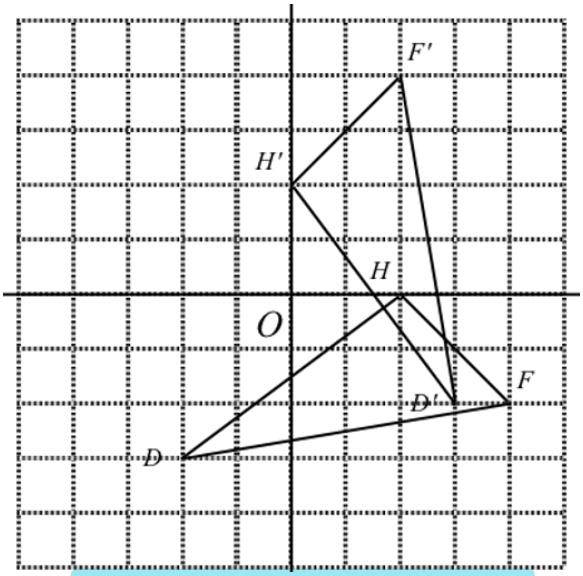
Reflection over y-axis

20.



180° Rotation around the origin

21.



Rotate 90° counter clockwise around the origin.