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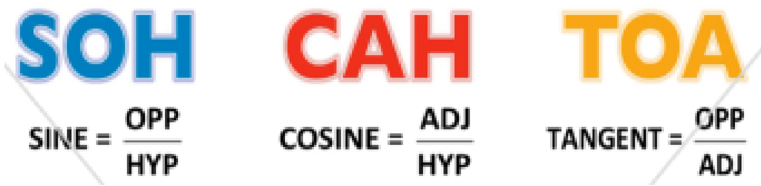
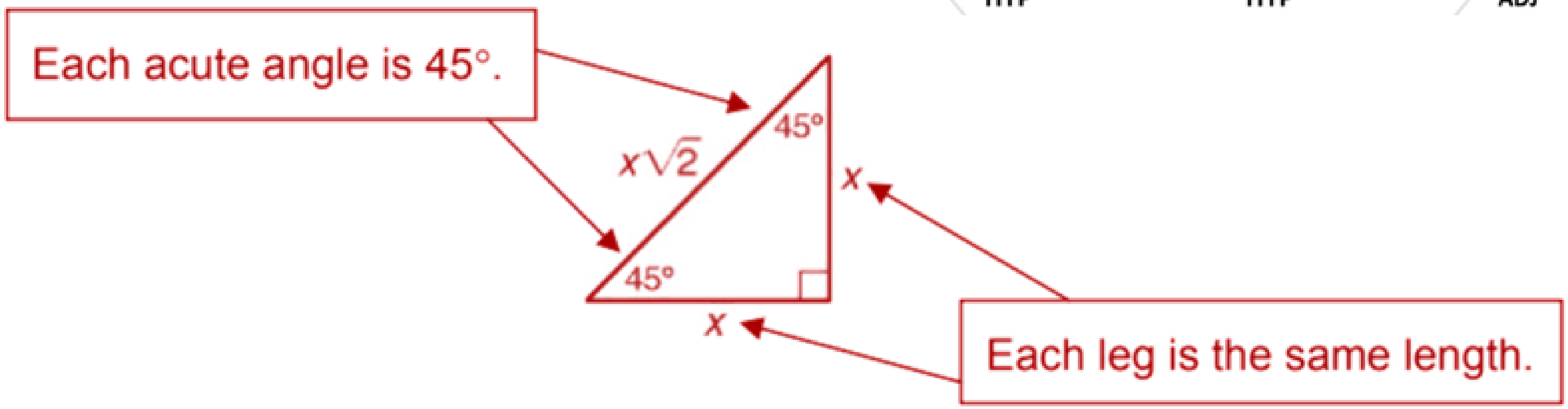
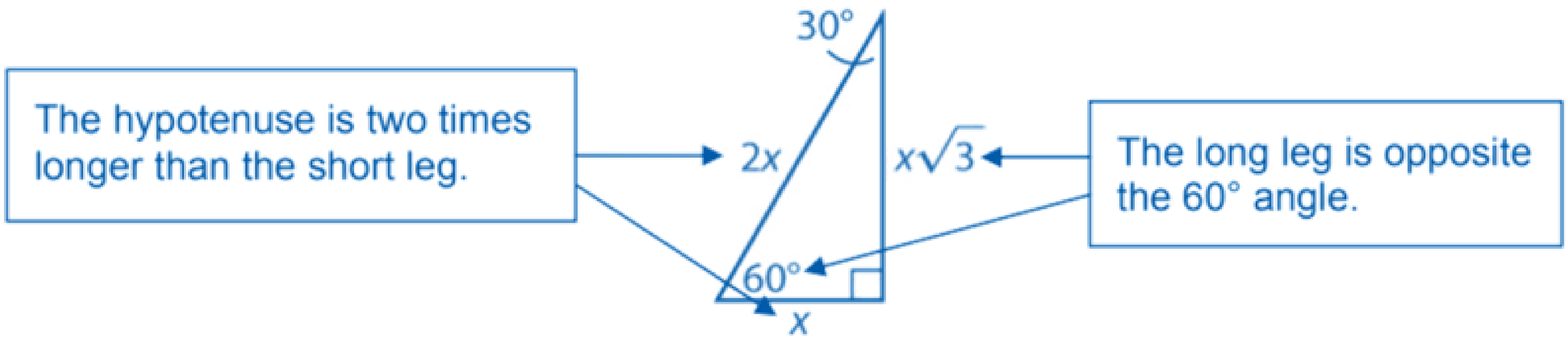
16.3 Representing and Describing Transformations

16.3


SOH
CAH
TOA
SINE = OPP / HYP
COSINE = ADJ / HYP
TANGENT = OPP / ADJ


Each acute angle is 45°.
45°
45°
x√2
x
x
Each leg is the same length.

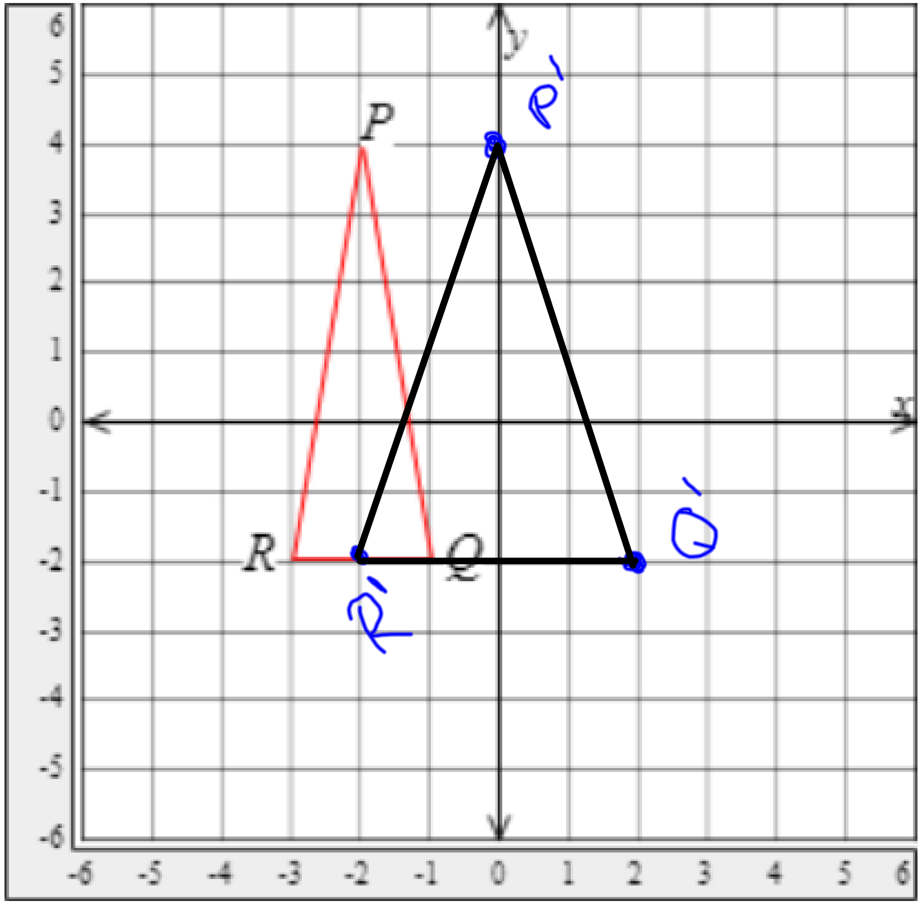

30°
The hypotenuse is two times longer than the short leg.
2x
x√3
The long leg is opposite the 60° angle.
60°
x

Drag and drop each description of a transformation next to the appropriate coordinate notation.

$(x, y) \rightarrow (4x, y)$	horizontal stretch by a factor of 4
$(x, y) \rightarrow (x + 4, y)$	translation 4 units right
$(x, y) \rightarrow (x, 4y)$	vertical stretch by a factor of 4
$(x, y) \rightarrow (x, y + 4)$	translation 4 units up
$(x, y) \rightarrow (4x, 4y)$	dilation with scale factor 4

2 Draw the image of the figure under the given transformation. Then describe the transformation as a rigid motion or not a rigid motion by completing the justification.

$(x, y) \rightarrow (2x + 4, y)$



Apply the rule

$P\ (-2, 4) \rightarrow P'\ (0, 4)$

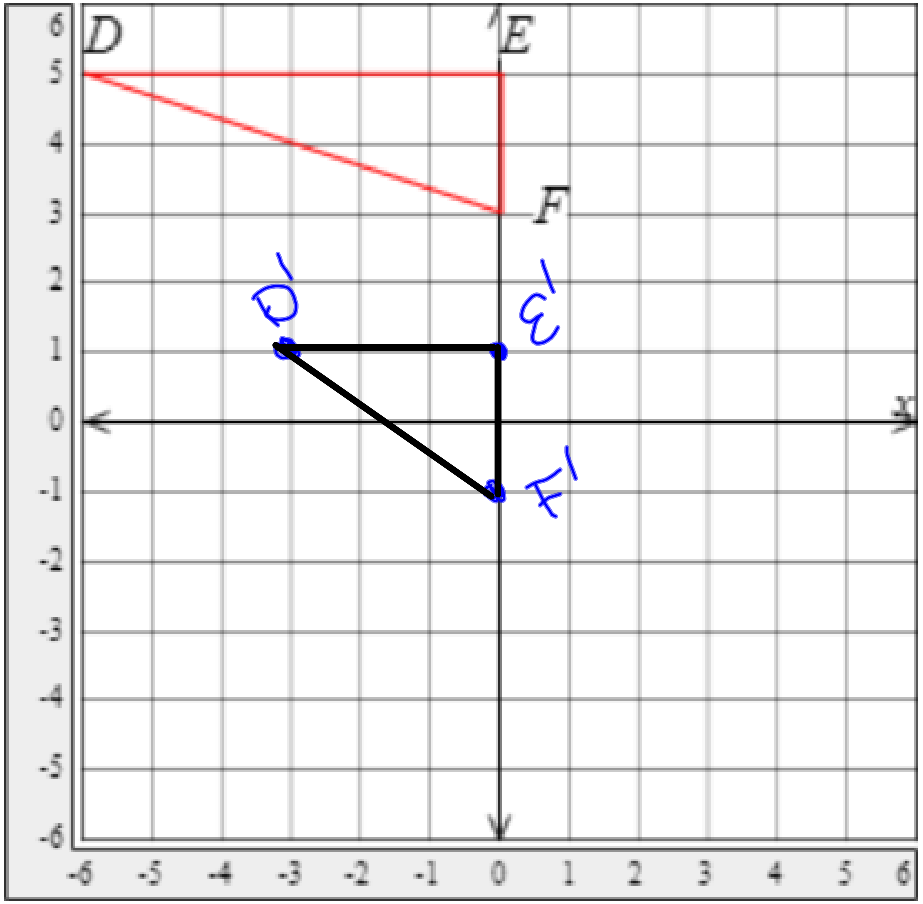
$Q\ (-1, -2) \rightarrow Q'\ (2, -2)$

$R\ (-3, -2) \rightarrow R'\ (-2, -2)$

Since QR ≠ Q R , the transformation is <u>not</u> a rigid motion.

3

Draw the image of the figure under the given transformation. Then describe the transformation as a rigid motion or not a rigid motion by completing the justification.



$$(x, y) \rightarrow (0.5x, y - 4)$$

$D\ (-6, 5) \rightarrow D'\ (-3, 1)$

$E\ (0, 5) \rightarrow E'\ (0, 1)$

$F\ (0, 3) \rightarrow F'\ (0, -1)$

Since $DE \neq D'E'$, the transformation is not a rigid motion.

4 Enter the translated coordinate pairs using coordinate notation. Then select the description and the graph of the given transformation.

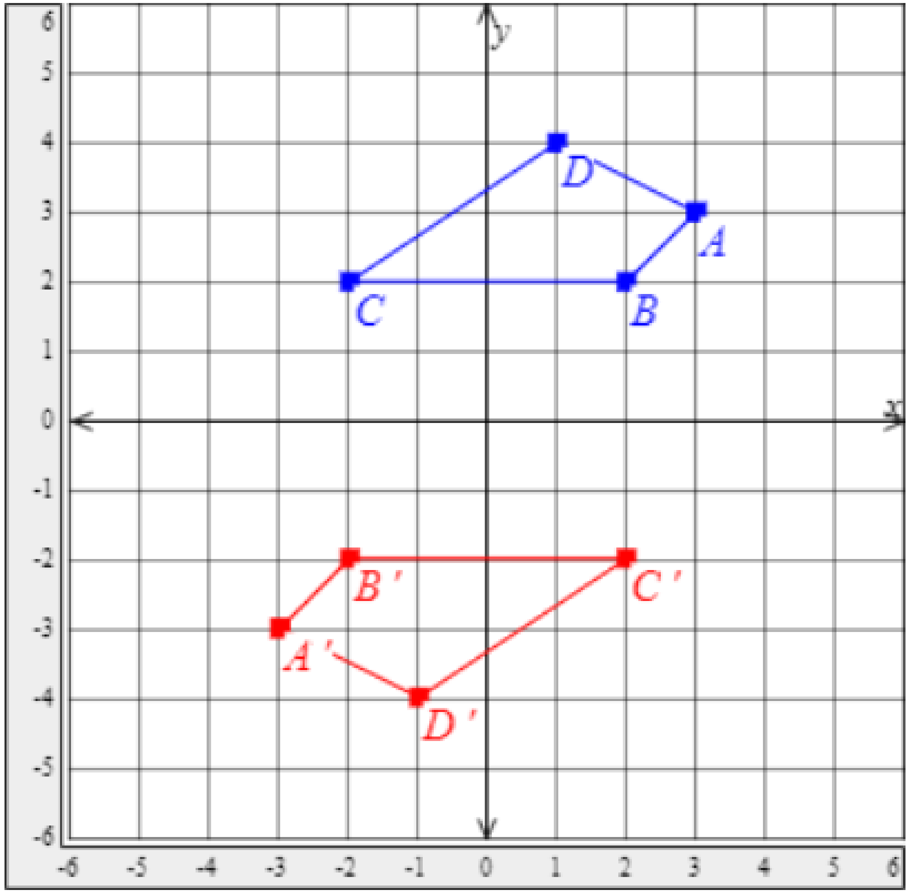
$(x, y) \rightarrow (-x, -y)$

$A(3, 3) \rightarrow A'$ (−3,−3)

$B(2, 2) \rightarrow B'$ (−2,−2)

$C(-2, 2) \rightarrow C'$ (2,−2)

$D(1, 4) \rightarrow D'$ (−1,−4)



The transformation is a rotation of 180 ▾ ° about the origin.

5

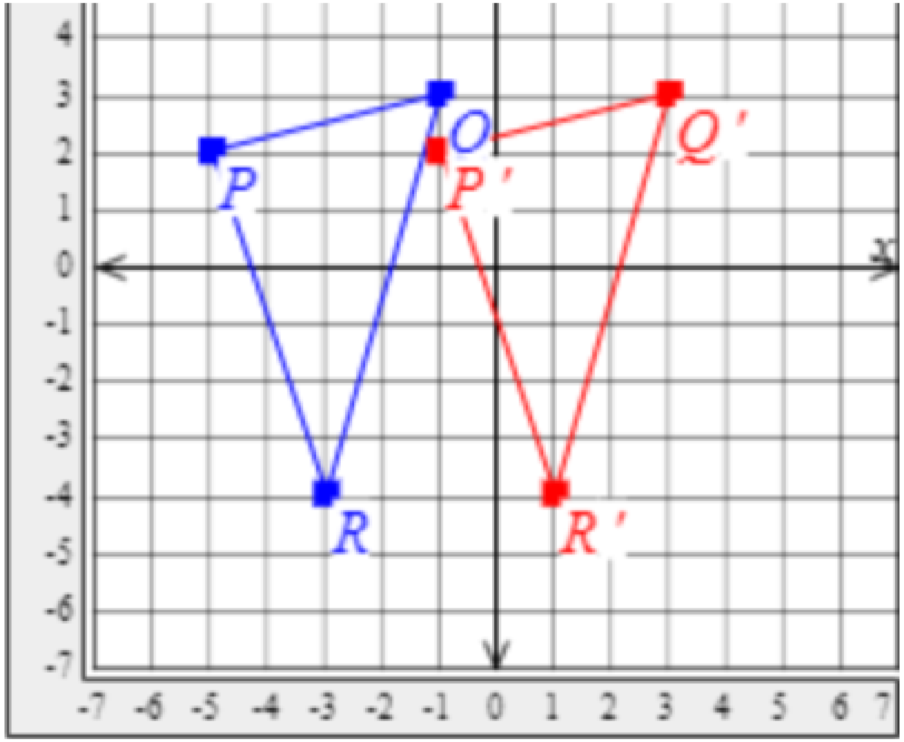
Enter the translated coordinate pairs using coordinate notation. Then enter the description and select the graph of the given transformation.

$(x, y) \rightarrow (x + 4, y)$

$P(-5, 2) \rightarrow P'$ (−1,2)

$Q(-1, 3) \rightarrow Q'$ (3,3)

$R(-3, -4) \rightarrow R'$ (1,−4)



The transformation is a translation of 4 units.

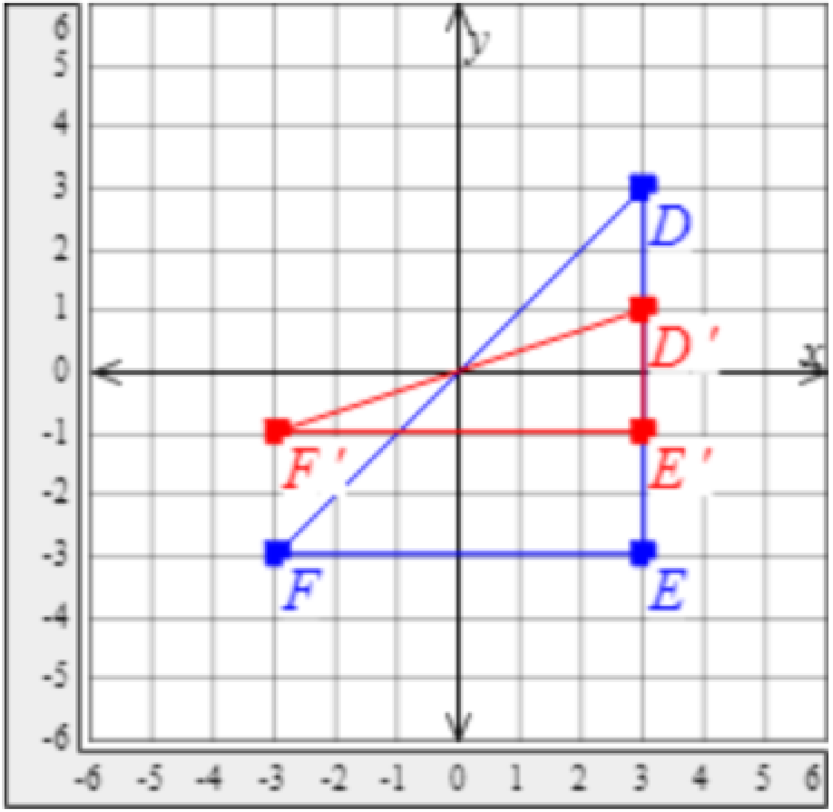
6 Enter the translated coordinate pairs using coordinate notation. Then enter the description and select the graph of the given transformation.

$$(x, y) \rightarrow (x, \frac{1}{3}y)$$

$D\ (3, 3) \rightarrow D'$ (3,1)

$E\ (3, -3) \rightarrow E'$ (3,−1)

$F\ (-3, -3) \rightarrow F'$ (−3,−1)



The transformation is vertical compression by a factor of $\frac{1}{3}$.

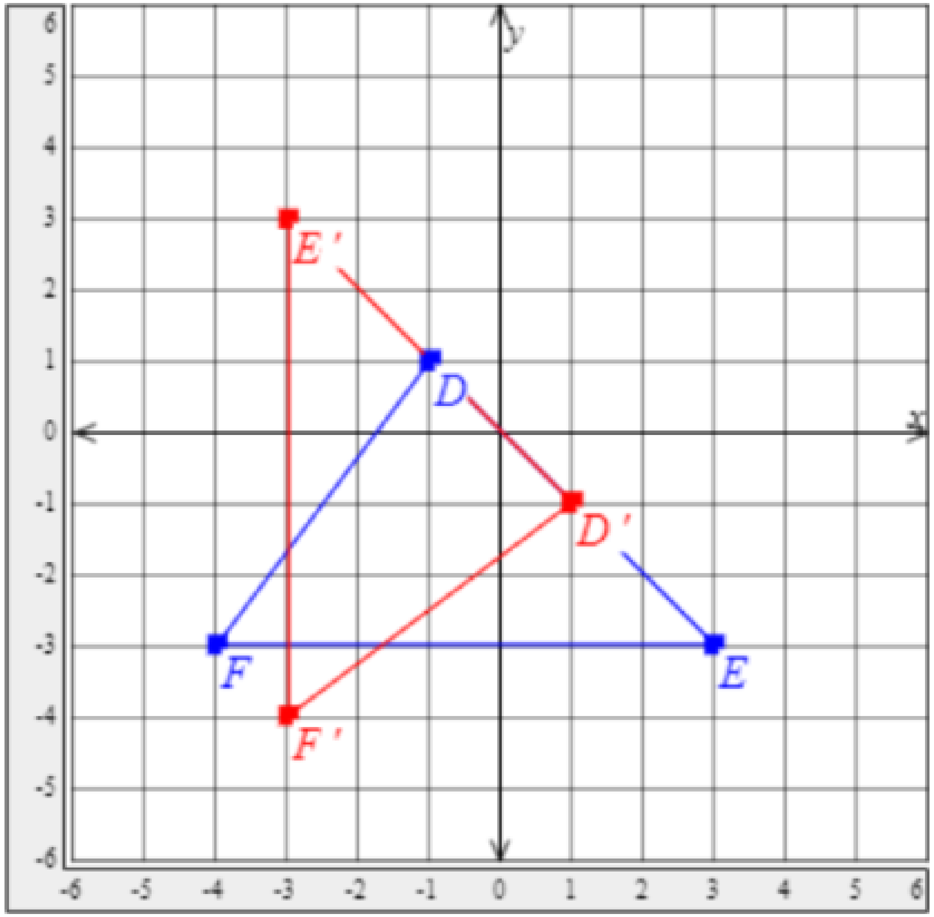
7 Enter the translated coordinate pairs using coordinate notation. Then select the description and the graph of the given transformation.

$(x, y) \rightarrow (y, x)$

$D(-1, 1) \rightarrow D'$ (1,–1)

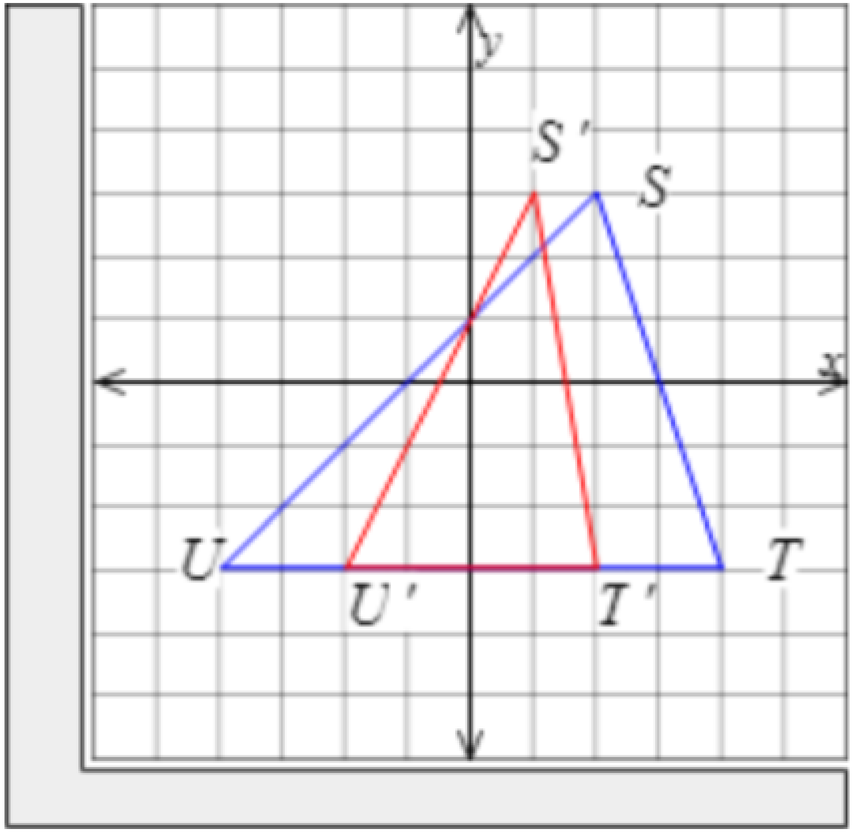
$E(3, -3) \rightarrow E'$ (–3, 3)

$F(-4, -3) \rightarrow F'$ (–3,–4)



The transformation is a reflection across the line y = x ▼.

8 Enter a rule for a transformation that maps $\triangle STU$ to $\triangle S'T'U'$.



$S\ (2, 3) \rightarrow S'$ (1, 3)

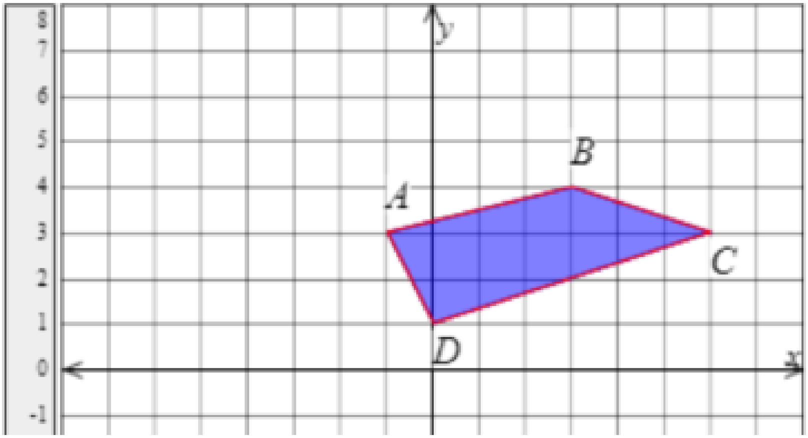
$T\ (4, -3) \rightarrow T'$ (2, −3)

$U\ (-4, -3) \rightarrow U'$ (−2, −3)

So, the transformation divides each x−coordinate ▼ by 2 but leaves the y−coordinate ▼ unchanged.

The rule is $(x, y) \rightarrow (\frac{1}{2}x,\ y)$.

9 A landscape architect designs a flower bed that is a quadrilateral, as shown in the figure. The plans call for a light to be placed at the midpoint of the longest side of the flower bed. The architect decides to change the location of the flower bed using the transformation (x, y) arrowright (x, y). Describe the location of the light in the transformed flower bed. Use coordinate notation to input the points.



The coordinates of the transformed flowerbed are:

$A\ (-1, 3) \rightarrow A'$ (−1, −3) $(x, y) \longrightarrow (x, -y)$

$B\ (3, 4) \rightarrow B'$ (3, −4)

$C\ (6, 3) \rightarrow C'$ (6, −3)

$D\ (0, 1) \rightarrow D'$ (0, −1)

The longest side of $ABCD$ is CD ▾. $\left(\frac{6+0}{2}, \frac{3+1}{2}\right)$

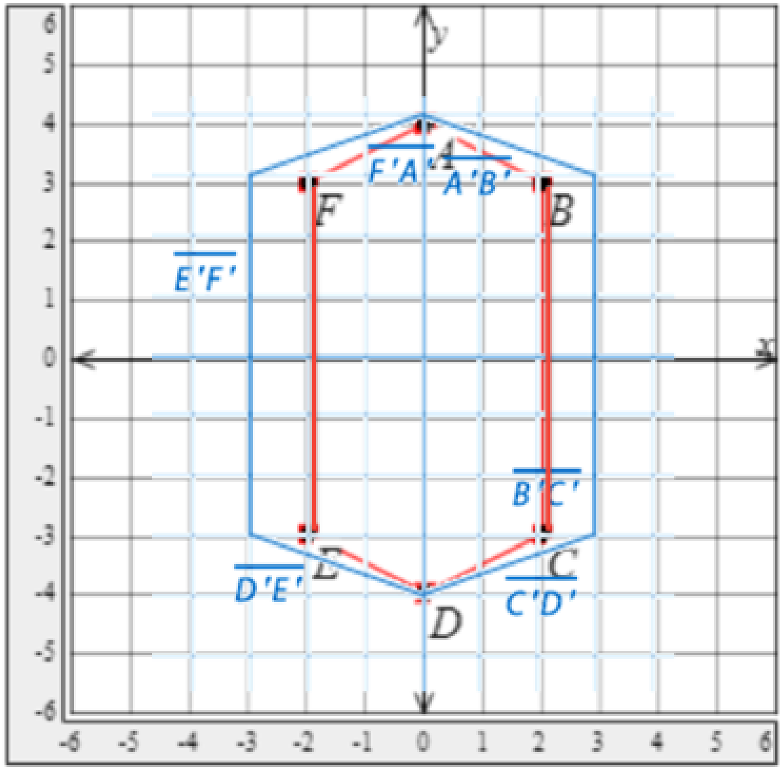
Midpoint: (3, 2)

The longest side of the transformed flowerbed is C′D′ ▾. $(x, y) \longrightarrow (x, -y)$

Midpoint: (3, −2)

The light in the transformed flowerbed is at coordinate (3, −2) .

10 A mineralogist is studying a quartz crystal. She uses a computer program to draw a side view of the crystal, as shown. She decides to make the drawing 50% wider, but to keep the same height. Draw the transformed view of the crystal. Then enter a rule for the transformation using coordinate notation. Check your rule using the original coordinates.



The rule is $(x, y) \rightarrow$ $(1.5x, y)$

$A\ (0,4) \rightarrow A'$ $(0, 4)$

$B\ (2,3) \rightarrow B'$ $(3, 3)$

$C\ (2,-3) \rightarrow C'$ $(3, -3)$

$D\ (0,-4) \rightarrow D'$ $(0, -4)$

$E\ (-2,-3) \rightarrow E'$ $(-3, -3)$

$F\ (-2,3) \rightarrow F'$ $(-3, 3)$

Never say,
"I can't"
Always say,
"I'll try"