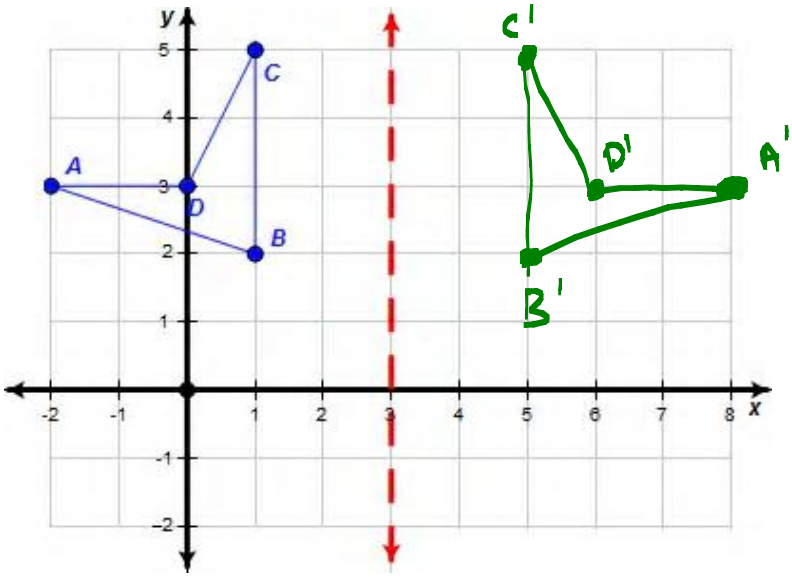
Reflections

5. List the coordinates of the quadrilateral ABCD

A(-2, 3)
B(1, 2)
C(1, 5)
D(0, 3)



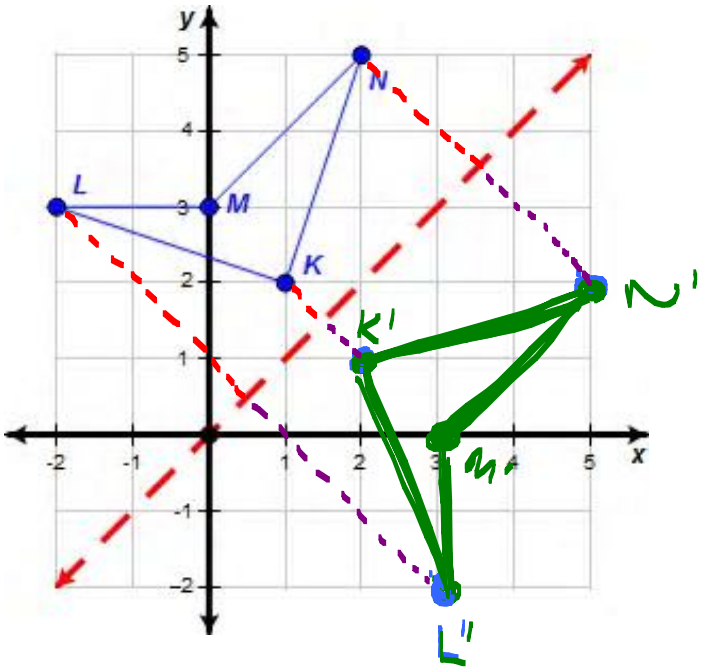
6. Reflect the quadrilateral ABCD over the line **x = 3** and list the coordinates of the vertex A', B', C', and D'.

A'(8, 3)
B'(5, 2)
C'(5, 5)
D'(6, 3)

Reflections

7. List the coordinates of the quadrilateral KLMN

K(1, 2)
L(-2, 3)
M(0, 3)
N(2, 5)



8. Reflect the quadrilateral KLMN over the line **y = x** and list the coordinates of the vertex K', L', M', and N'. Describe what happened to the coordinates from the pre-image to the image.

K'(2, 1)
L'(3, -2)
M'(3, 0)
N'(5, 2)

FROM PRE-IMAGE TO IMAGE THE COORDINATE FLIP PLACES
$(x, y) \rightarrow (y, x)$

Reflections

9. If the point A is located at (– 3, 2) and A' is the image of A after being reflected over the **x-axis**, what are the coordinates of A'?

A'(-3, -2)

CHANGE SIGN OF Y-COORDINATE

10. If the point B is located at (– 4, – 1) and B' is the image of B after being reflected over the **y-axis**, what are the coordinates of B'?

B'(4, -1)

CHANGE SIGN OF X-COORDINATE

11. If the point C is located at (2, – 3) and C' is the image of C after being reflected over the line **y = x**, what are the coordinates of C'?

C'(-3, 2)

FLIP X & Y COORDINATES

Rotations

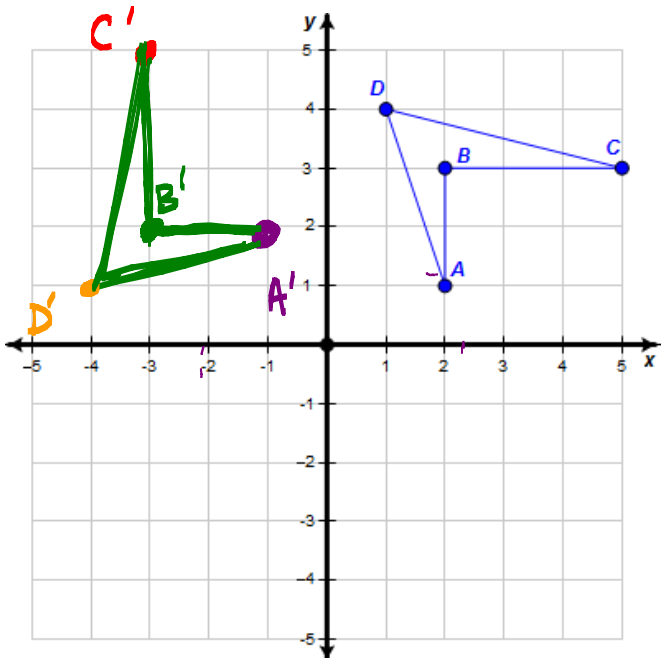
12. List the coordinates of the quadrilateral ABCD.

A(2, 1) C(5, 3)
B(2, 3) D(1, 4)

13. Rotate the quadrilateral **ABCD about the origin by 90°** and list the coordinates of the vertex A', B', C', and D'. Describe what happened to the coordinates from the pre-image to the image.

A'(-1, 2) C'(-3, 5)
B(-3, 2) D'(-4, 1)

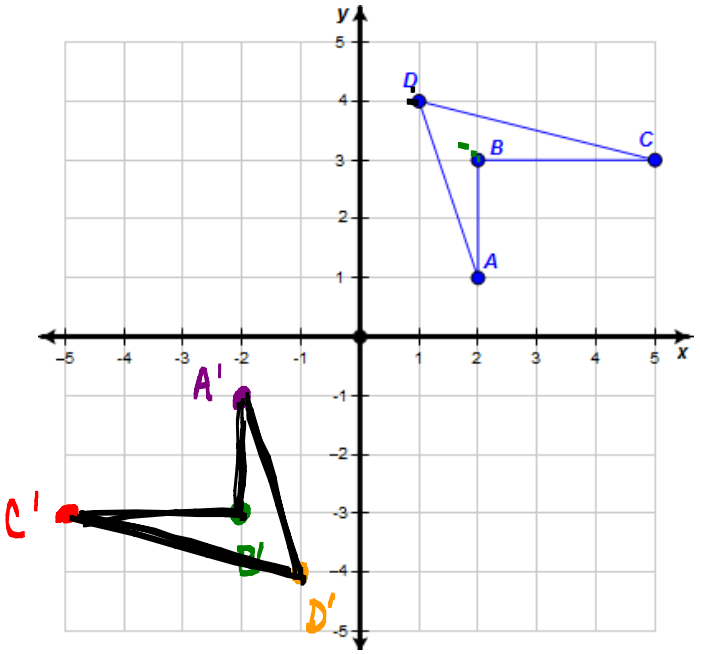
$(x, y) \xrightarrow[90° \text{ ABOUT ORIGIN}]{\text{ROTATE}} (-y, x)$



14. Rotate the quadrilateral **ABCD about the origin by 180°** and list the coordinates of the vertex A', B', C', and D'. Describe what happened to the coordinates from the pre-image to the image.

A'(-2, -1) C'(-5, -3)
B(-2, -3) D'(-1, -4)

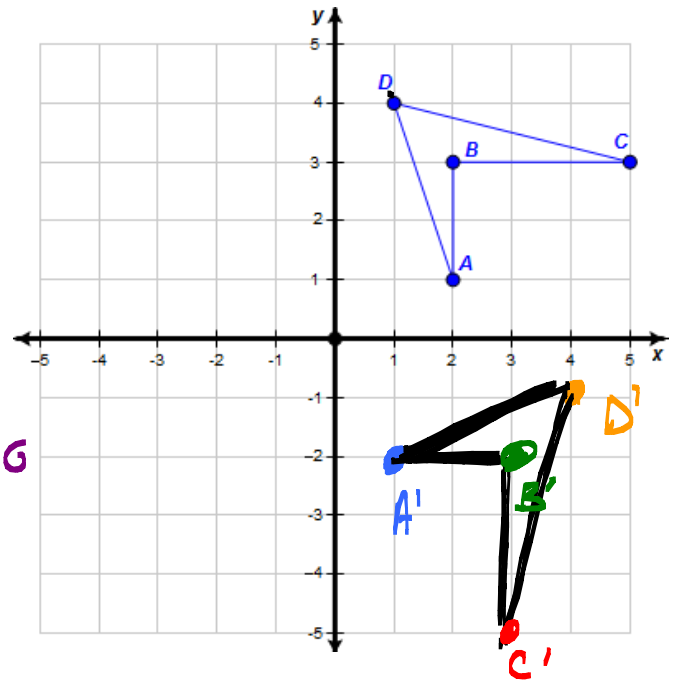
$(x, y) \xrightarrow[\text{ABOUT ORIGIN}]{\text{ROTATE } 180°} (-x, -y)$



15. Rotate the quadrilateral **ABCD about the origin by 270°** and list the coordinates of the vertex A', B', C', and D'. Describe what happened to the coordinates from the pre-image to the image.

A'(1, -2) C'(3, -5)
B'(3, -2) D'(4, -1)

$(x, y) \xrightarrow[\text{ABOUT ORIGIN}]{\text{ROTATE } 270°} (y, -x)$



16. If the point A is located at (– 3, 2) and A' is the image of A after being rotated about the origin by 270. What are the coordinates of A'?

(2, 3)

SUGGESTS CHANGING PRE-IMAGE COORDINATES

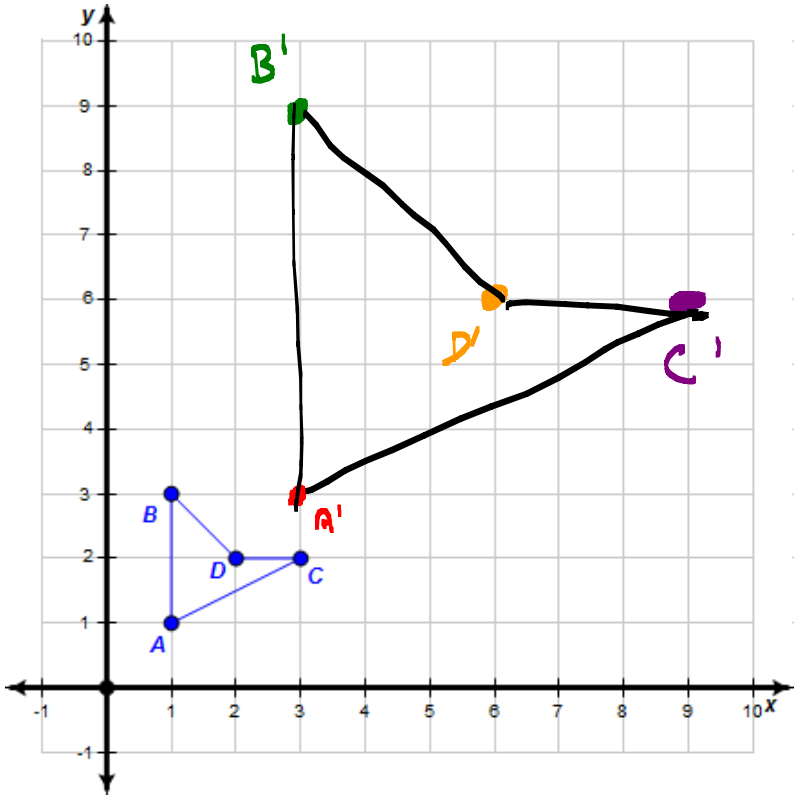
$(x, y) \longrightarrow (y, -x)$
PRE-IMAGE IMAGE

Dilations

17. List the coordinates of the quadrilateral ABCD.

A(1, 1) C(3, 2)

B(1, 3) D(2, 2)



18. Dilate the quadrilateral ABCD **by a scale factor of 3 from the origin** and list the coordinates of the vertex A', B', C', and D'. Describe what happened to the coordinates from the pre-image to the image.

A'(3, 3) C'(9, 6)

B'(3, 9) D'(6, 6)

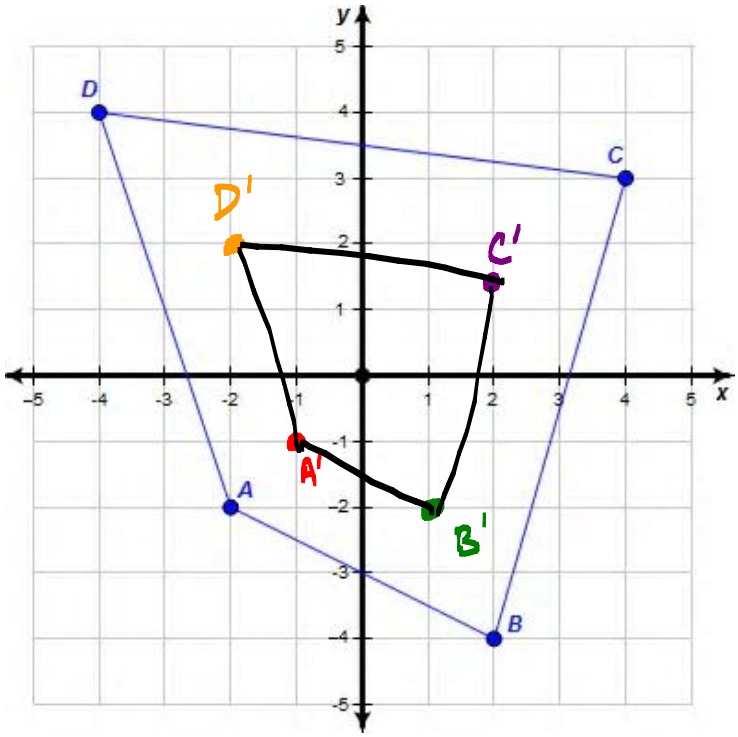
$(x, y) \xrightarrow{\text{DILATE FACTOR 3 FROM ORIGIN}} (3x, 3y)$

PRE IMAGE — IMAGE

19. List the coordinates of the quadrilateral ABCD.

A(−2, −2) C(4, 3)

B(2, −4) D(−4, 4)



20. Dilate the quadrilateral ABCD **by a scale factor of ½ from the origin** and list the coordinates of the vertex A', B', C', and D'. Describe what happened to the coordinates from the pre-image to the image.

A'(−1, −1) C'(2, 1.5)

B'(1, −2) D'(−2, 2)

$(x, y) \xrightarrow{\text{DILATE FACTOR } 1/2 \text{ TO ORIGIN}} (\frac{1}{2}x, \frac{1}{2}y)$

21. If the point A is located at (3, – 2) and A' is the image of A after being dilated by a scale factor of 5 from the origin. What are the coordinates of A'?

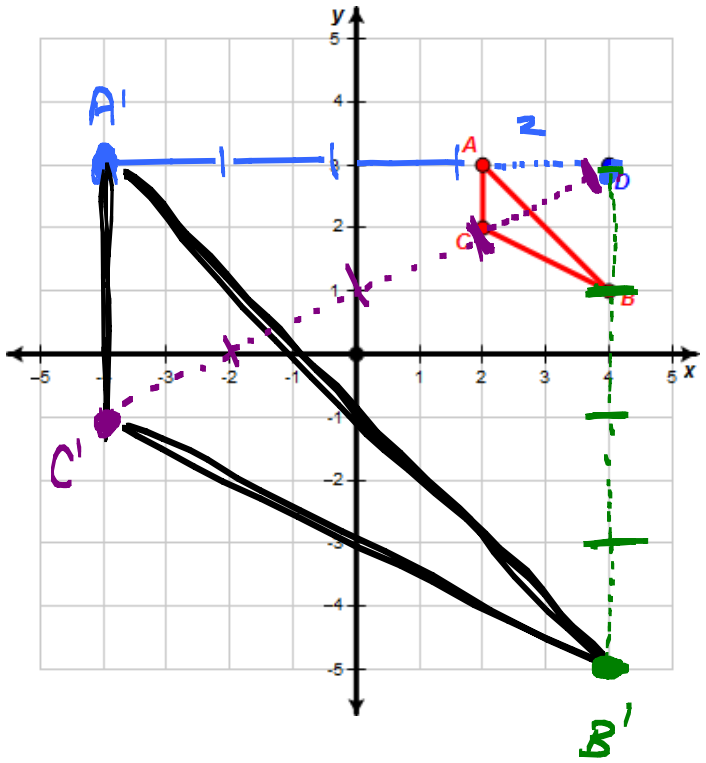
$(x, y) \xrightarrow{\text{DILATE FACTOR 5 FROM ORIGIN}} (5x, 5y)$

A(3, −2) → A'(15, −10)

PRE IMAGE — IMAGE

A'(15, −10)

22. Dilate the triangle ABC **by a scale factor of 4 from the point D** and list the coordinates of the vertex A', B', and C'.



Create a list of all of the basic coordinate transformation rules:

TRANSLATION: $(x,y) \longrightarrow (x+h, y+k)$, TRANSLATE HORIZONTALLY BY h VERTICALLY BY k

PRE IMAGE → IMAGE

[e.g. TRANSLATE $(1,2)$ LEFT 3 & UP 4 → $(1-3, 2+4) = (-2,6)$]

PRE IMAGE → IMAGE

REFLECT OVER Y-AXIS

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

PRE IMAGE → IMAGE

REFLECT OVER X-AXIS

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

PRE IMAGE → IMAGE

REFLECT OVER LINE $y=x$

$(x,y) \longrightarrow (y,x)$

PRE IMAGE → IMAGE

ROTATE 90° ABOUT ORIGIN

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

PREIMAGE → IMAGE

ROTATE 180° ABOUT ORIGIN

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

PREIMAGE → IMAGE

ROTATE 270° ABOUT ORIGIN

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

PREIMAGE → IMAGE

DILATION OF A SCALE FACTOR OF M FROM ORIGIN.

$(x,y) \longrightarrow (M \cdot x, M \cdot y)$

PRE IMAGE → IMAGE

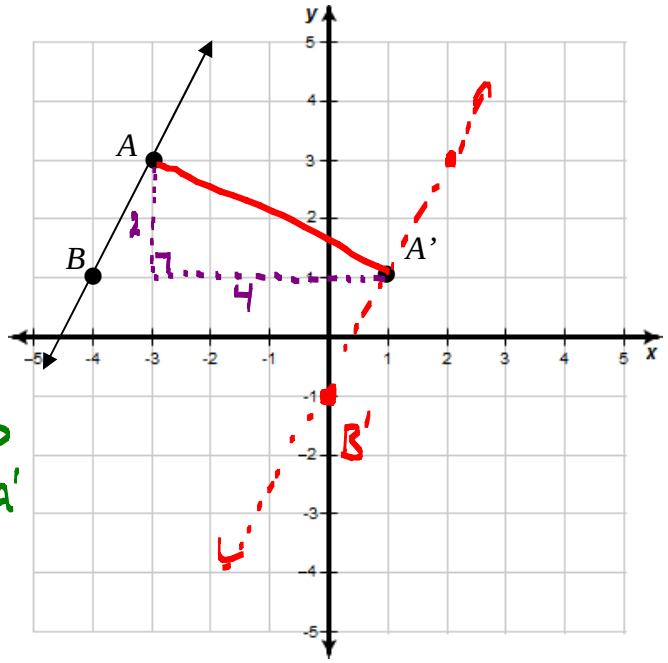
Translations

23. Point A (-3, 3) is on $\overleftrightarrow{AB}$. A translation moves the point A to its image A'(1,1).

A (-3, 3) x_1 y_1 A' (1, 1) x_2 y_2

ALL POINTS WILL BE TRANSLATED BY THE SAME DISTANCE.

What is the distance, in units, between any point on $\overleftrightarrow{AB}$ and its image?



WE COULD USE THE DISTANCE FORMULA TO FIND THE DISTANCE BETWEEN POINT A & POINT A'

$$d = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$$

$$d = \sqrt{(1--3)^2 + (1-3)^2} = \sqrt{(4)^2 + (-2)^2}$$

$$d = \sqrt{16 + 4} = \sqrt{20} = \sqrt{4 \cdot 5} = \sqrt{4} \cdot \sqrt{5} = \boxed{2\sqrt{5}} \approx 4.47$$

$20 = 2 \cdot 10 = 2 \cdot 2 \cdot 5$

ALTERNATELY, WE COULD JUST USE THE PYTHAGOREAN THEOREM TO FIND THE DISTANCE BETWEEN POINT A AND POINT A'.

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

$$4 + 16 = c^2$$

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

$$\sqrt{20} = c$$

$$\boxed{2\sqrt{5} = c}$$

$$4.47 \approx c$$