Warm-Up:

1. Describe in words the translation represented by $(x + 6, y - 3)$.

   a) 3 units to the left, 6 units up

   b) 3 units to the right, 6 units down

   c) 6 units to the right, 3 units down

   d) 6 units to the left, 3 units up

2. Which letter has at least one line of symmetry?

   a) R

   b) Z

   c) Y

   d) F

3. Write a rule to describe a reflection over the y-axis.

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

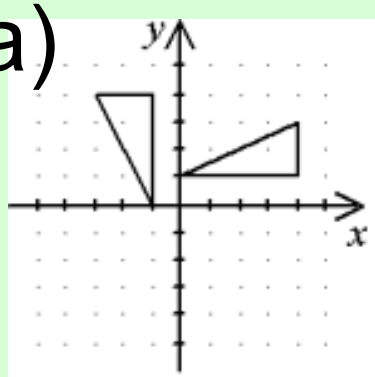
   b) $(x, y) \rightarrow (-x, -y)$

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

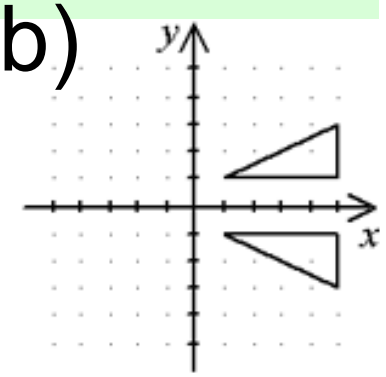
   d) $(x, y) \rightarrow (y, x)$

4. Which graph shows a triangle and its reflection image in the y-axis?

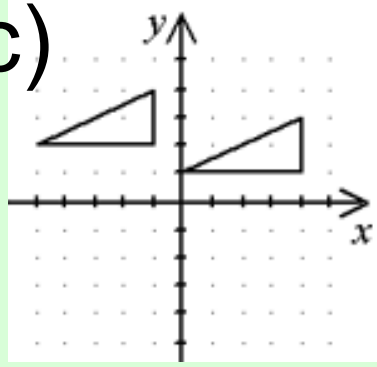
a)



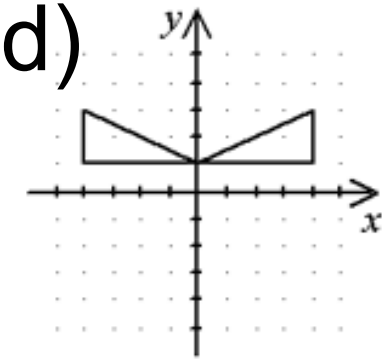
b)



c)



d)



Reflection/Translation

1. Rectangle PQRS has coordinates: **P (2, 4) Q (6, 4) R (6, 6) S (2, 6)**
   Write the coordinates of Rectangle P'Q'R'S' after a reflection over the y-axis.

2. Triangle XYZ has coordinates: **X (-3, 0) Y (-3, 2) Z (-1, 2)**
   Write the coordinates of Triangle X'Y'Z' after a reflection over the x-axis.

3. A point J located at coordinate **(-4, 5)** is translated **6 units left**, and **6 units down.** What are the new coordinates of J'?

4. Triangle ABC has coordinates: **A (-2, -2) B (-4, -2) C (-1, 2)**
   Write the coordinates of Triangle A'B'C' after it is translated **5 units right**.

5. The ordered pair R (-2, 7) is translated using **(x - 2, y - 5)**.
   Describe the movement of point R to its new position and give the coordinates or R'.

Properties of Transformations:

Rotation

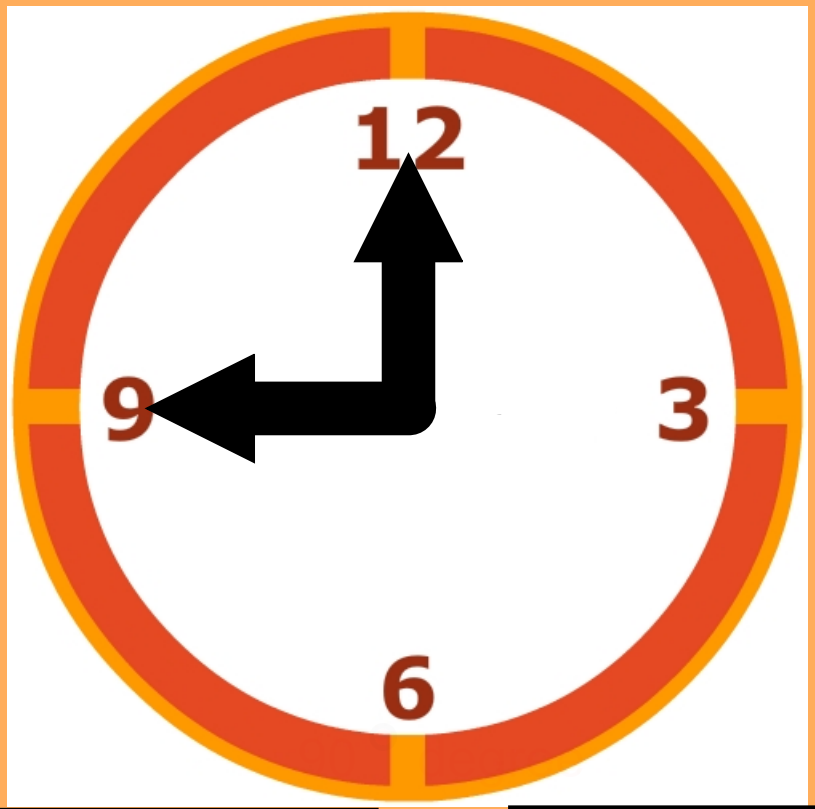
You can relate turns in degrees to the hands on a clock.
Every 15 minutes=90^{o}

This is a 90 degree or $\frac{1}{4}$ turn

Every 30 minutes=180°

This is a 180 degee or $\frac{1}{2}$ turn

Every 45 minutes=270°

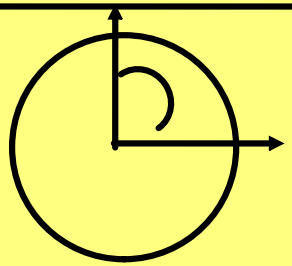
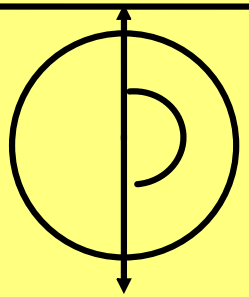
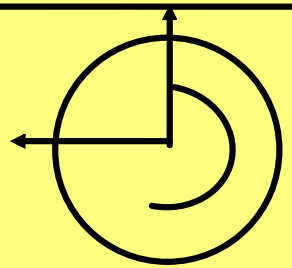
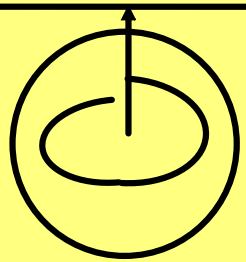


This is a 270 degree or $\frac{3}{4}$ turn

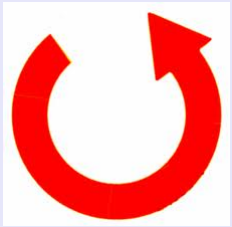
Every 60 minutes=360°

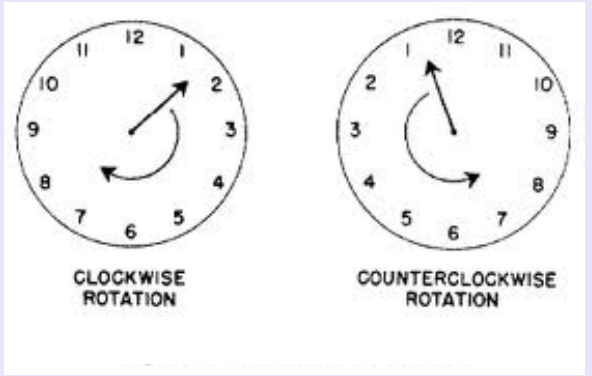
This is a 360 degree or Full Turn

Use the fractions and degees to complete the chart below.

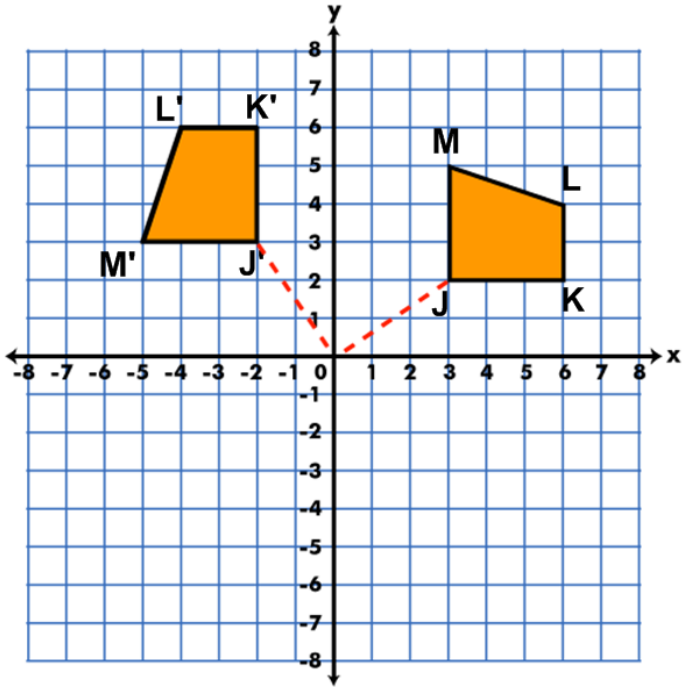
Picture				
Degrees	90°	180°	270°	360°
Fraction	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	Full

The Clock moves in a **clockwise** motion (to the right).

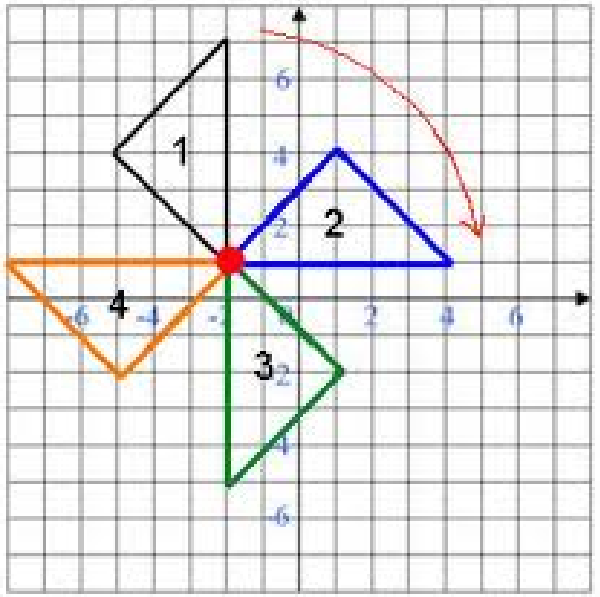




The opposite direction of a Clock is called a **counter clockwise** motion (to the left).



Rotated about the origin (0, 0)

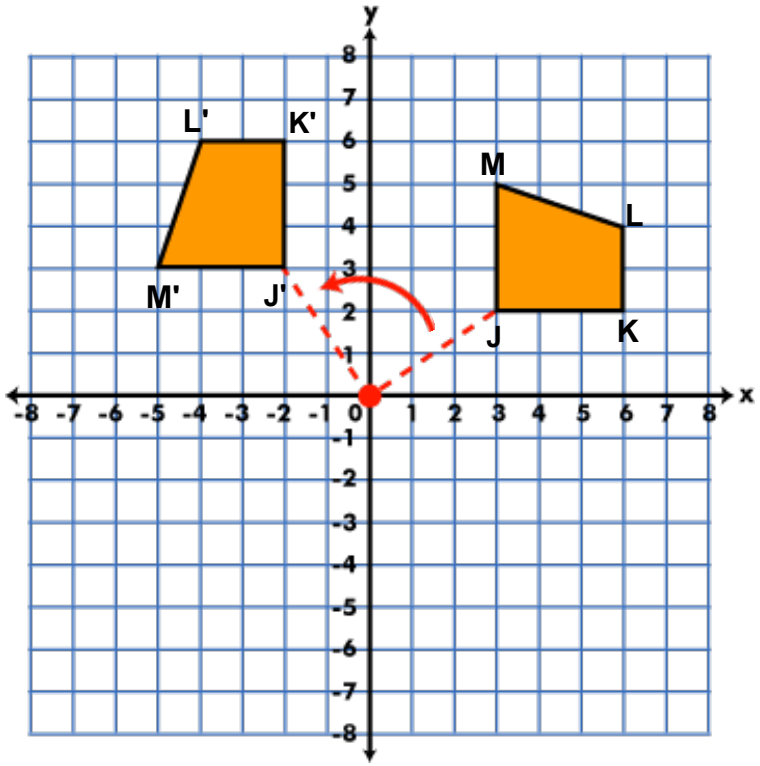


Rotated about a point on the figure (-2, 1)

Describing a rotation or a *turn*

Rotation of 90° counter-clockwise about (0,0)

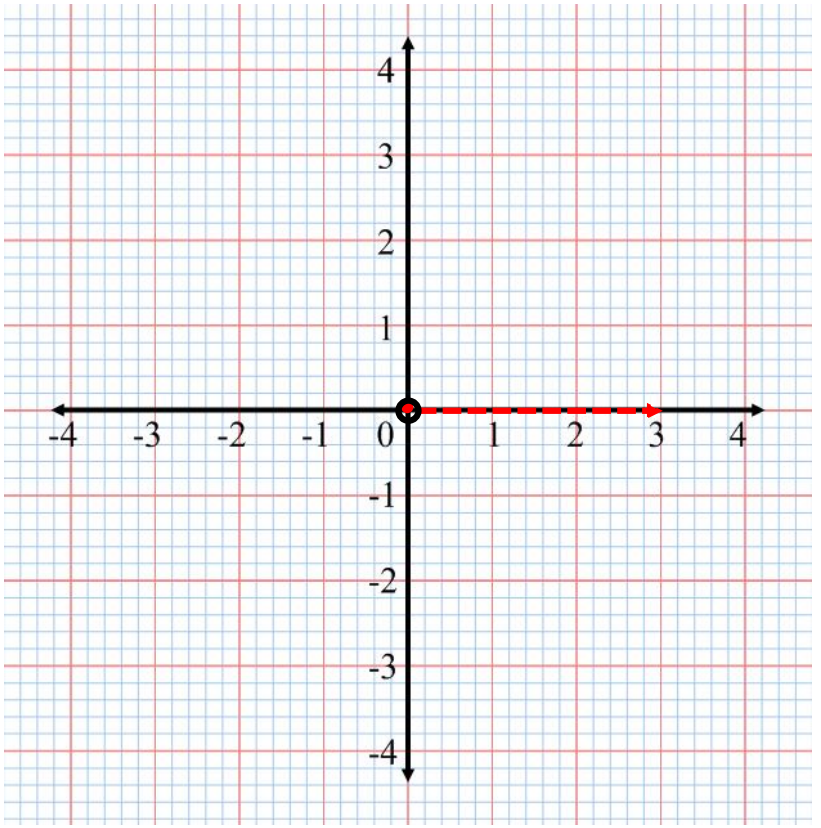
DRAG



1. An **angle** of rotation
   (Degree or Fraction)
2. A **direction** (clockwise or counterclockwise).
3. A **center** of rotation (the point the object is rotated around)

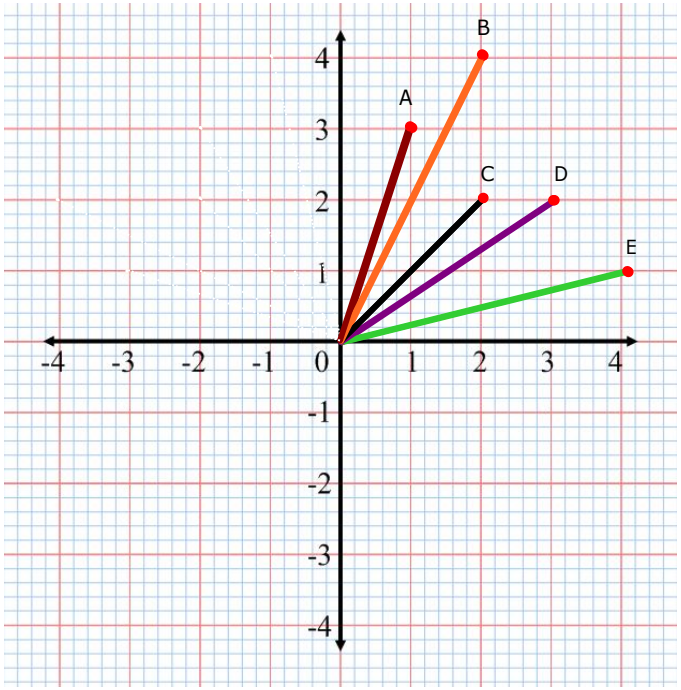
Counter Clockwise Rotation in Cartesian Plane

Angle	Coordinates
0^o	
90^o	
180^o	
360^o	



Counter Clockwise Rotation by 90°

Point	Coordinates	
	Original	Image
A		
B		
C		
D		
E		



Teacher's Notes 2

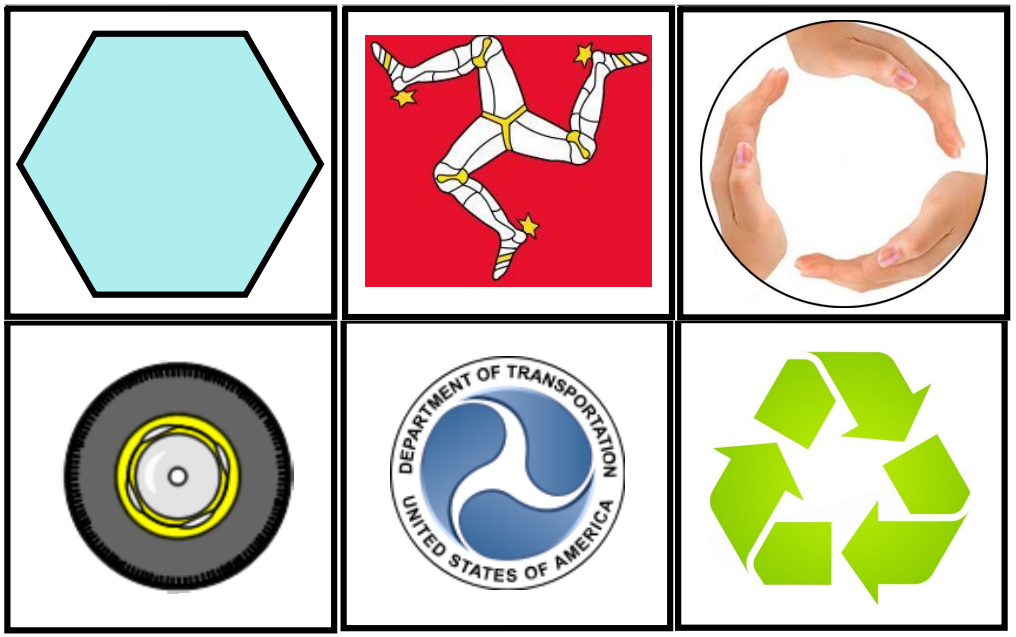
Edit | Check | Reset | Solve | ?

Coordinates	Rotation	
	P (-2, -3) when rotated by 180 degrees.	(-4, 2)
	P (2, 4) when rotated by 90 degrees.	(2, -4)
	P (2, 4) when rotated by 180 degrees.	(3, 2)
	P (1, 3) when rotated by 180 degrees.	(-3, 1)
	P (-4, -2) when rotated by 90 degrees.	(-2, -4)
	P (-2, 4) when rotated by 90 degrees.	(-4, -2)
	P (1, 3) when rotated by 90 degrees.	(2, 3)
	P (2, -3) when rotated by 90 degrees.	(-1, -3)

Rotational Symmetry

The property of an image gaining the same shape and orientation when it is rotated by certain angle, other than 360°, is known as rotational symmetry.

Teacher's Notes

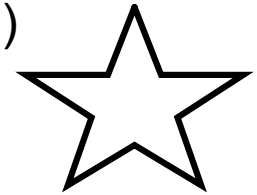


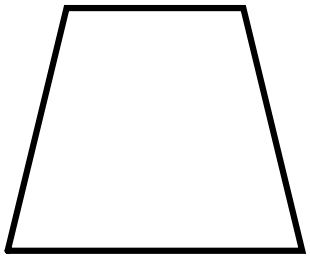

Edit
Reset
?
asymmetric
symmetric.

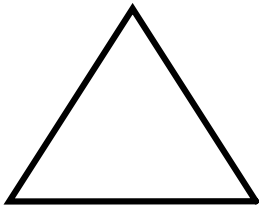
Rotational Symmetry(Point Symmetry)

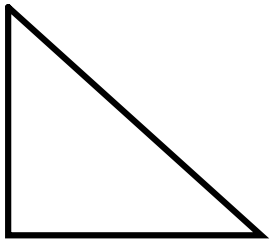
If a figure can be turned 180º or less and it looks exactly the same as the original then it has rotational symmetry.

Determine if each figure has rotational symmetry.

1) 

2) 

3) 

4) 

5) S

6) B

7) SOS

Check Your Understanding

1 What are the coordinates of the image of the point P(x, y) when rotated counter-clockwise at an angle 360° around the origin?

A P'(x, y)

B P'(–x, y)

C P'(–x, –y)

D P'(–y, x)

Select the correct answer.

Check Your Understanding

2 What are the coordinates of the point P(2, –3) when rotated clockwise at an angle 90° around the origin?

A P'(–3, 2)

B P'(–2, –3)

C P'(2, 3)

D P'(-3, -2)

Select the correct answer.

Check Your Understanding

3 Which of the following shapes are rotational symmetric?

A Trapezoid

B Isosceles triangle

C Equilateral triangle

D Rectangle

Select the correct answers.

Check Your Understanding

4 What are the coordinates of the point P(3, –2) when rotated counter-clockwise at an angle 90° around the origin?

A P'(–3, 2)

B P'(3, –2)

C P'(2, 3)

D P'(–2, –3)

Select the correct answer.

Check Your Understanding

5 What are the coordinates of the point P(–4, 1) when rotated counter-clockwise at an angle 180° around the origin?

A P'(–4, 1)

B P'(4, –1)

C P'(4, 1)

D P'(–4, –1)

Select the correct answer.

Check Your Understanding

6 A point P(2, 3) is rotated counter-clockwise at an angle 90°. What is the quadrant in which the image falls?

A Quadrant I

B Quadrant II

C Quadrant III

D Quadrant IV

Select the correct answer.

Check Your Understanding

7 A point P(–4, 2) is rotated counter-clockwise at an angle 180°. What is the quadrant in which the image falls?

A Quadrant I

B Quadrant II

C Quadrant III

D Quadrant IV

Select the correct answer.

Check Your Understanding

8 What are the coordinates of the point P(–6, –2) when rotated counter-clockwise at an angle 90° around the origin?

A P'(–6, 2)

B P'(6, –2)

C P'(–2, 6)

D P'(2, –6)

Select the correct answer.

Check Your Understanding

9 What are the coordinates of the point P(5, –3) when rotated counter-clockwise at an angle 180° around the origin?

A P'(–5, 3)

B P'(5, –3)

C P'(3, 5)

D P'(–3, 5)

Select the correct answer.

Check Your Understanding

10 By what angle should an equilateral triangle be rotated counter-clockwise around its center of rotation to appear as the same shape?

A 60°

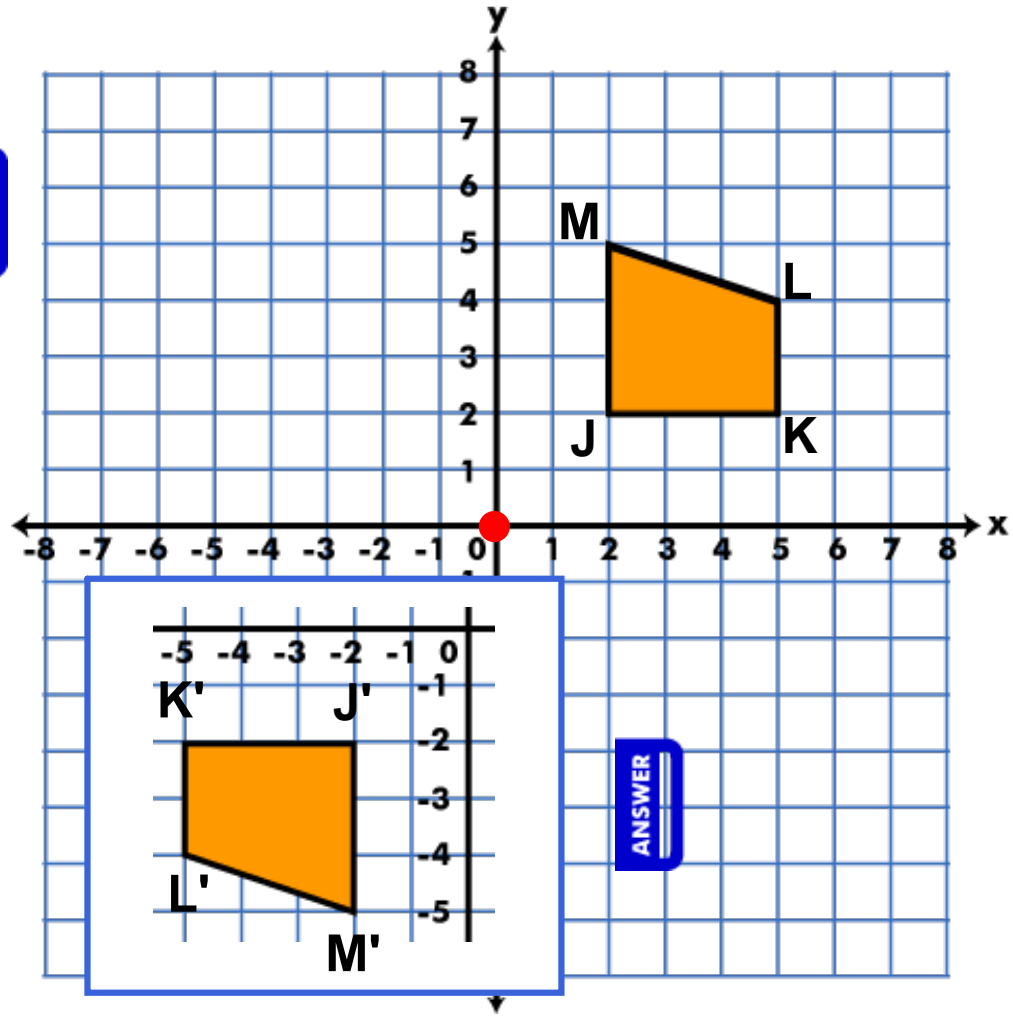
B 90°

C 120°

D 180°

Select the correct answer.

Rotate JKLM 180 degrees about (0,0), label the image J'K'L'M'



HINT

ANSWER

DRAG

J' K' L' M'

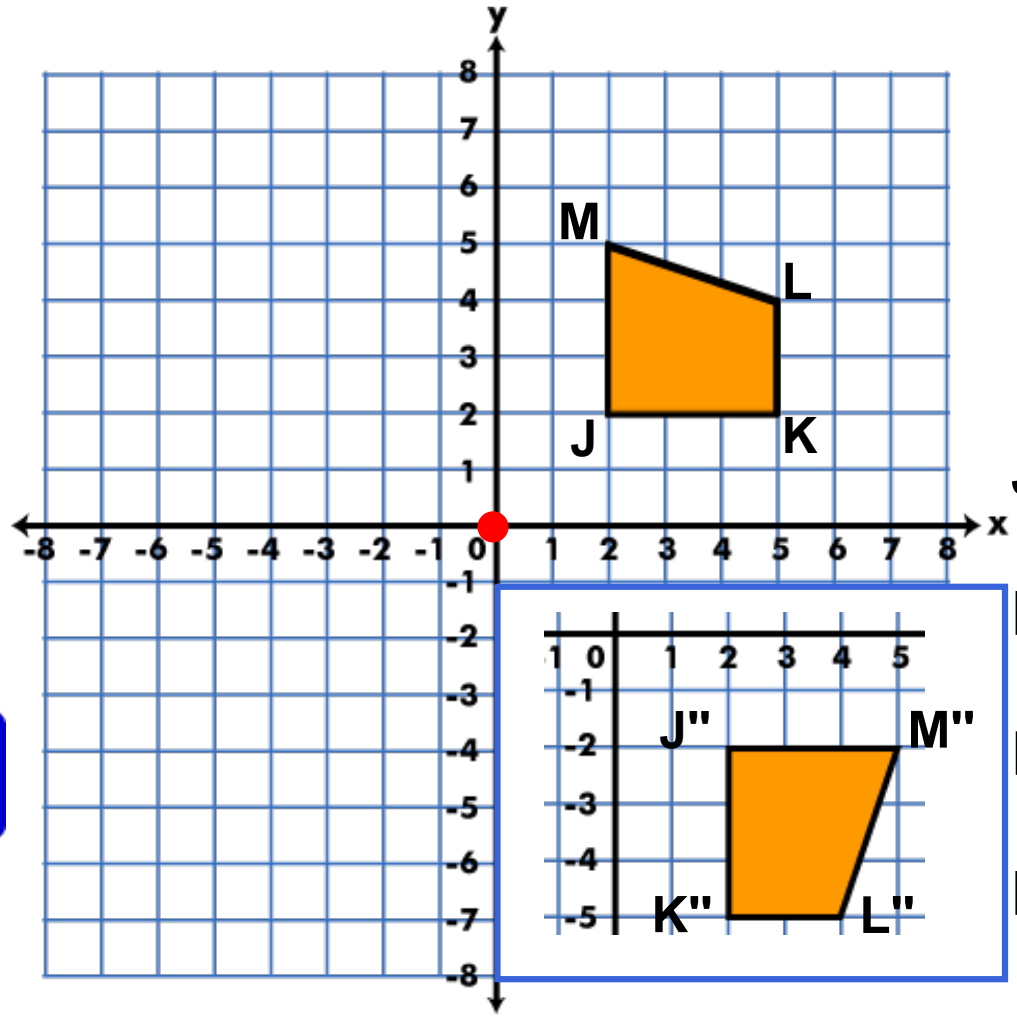
J(2,2) J'(__,__)

K(5,2) K'(__,__)

L(5,4) L'(__,__)

M(2,5) M'(__,__)

Rotate JKLM 270 degrees counterclockwise about (0,0), label the image J"K"L"M"



J" K" L" M"

DRAG

J(2,2) J"(__,__)

K(5,2) K"(__,__)

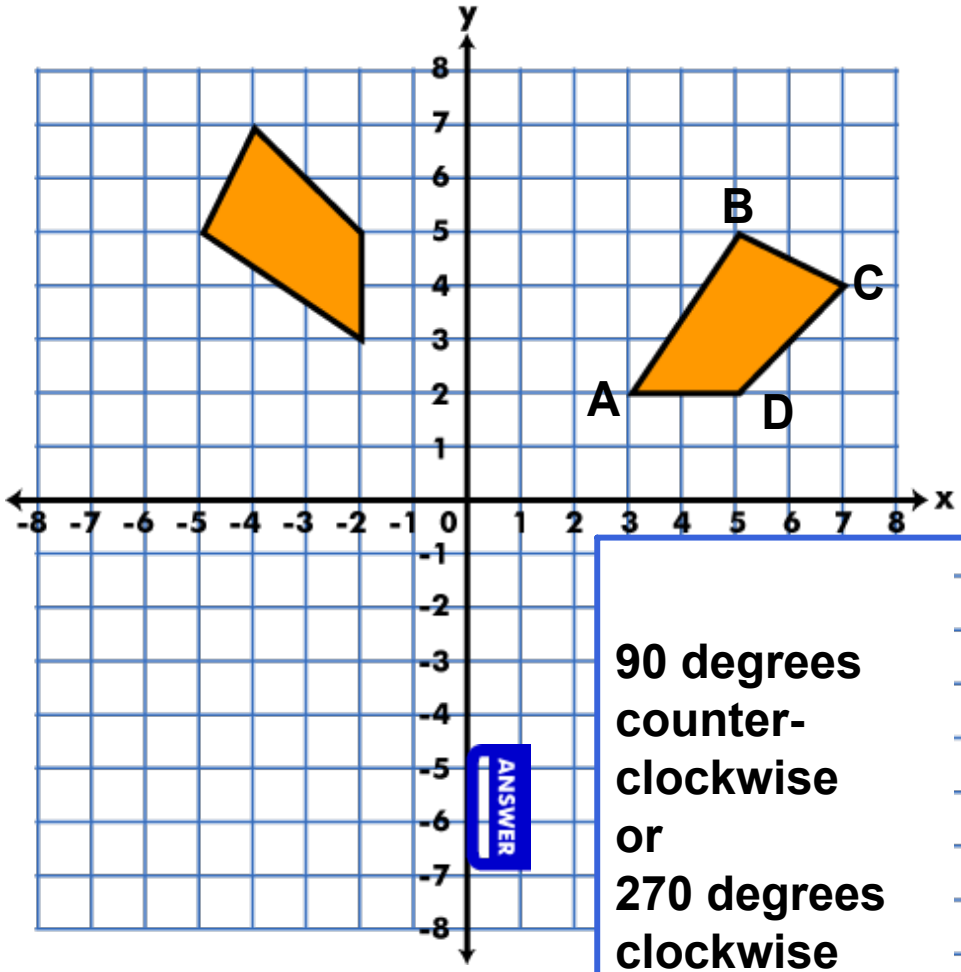
L(5,4) L"(__,__)

M(2,5) M"(__,__)

HINT

ANSWER

ABCD has been rotated how many degrees about (0,0)?

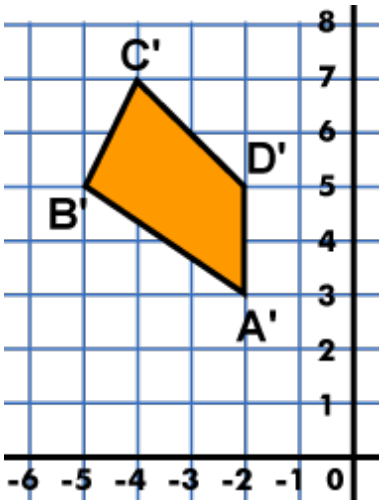


A' B' C' D'

DRAG

HINT

90 degrees counter-clockwise
or
270 degrees clockwise



Rotation by 180°

Teacher's Notes 1

Teacher's Notes 2

Solution

Point	Coordinates	
	Original	Image
A		
B		
C		
D		
E