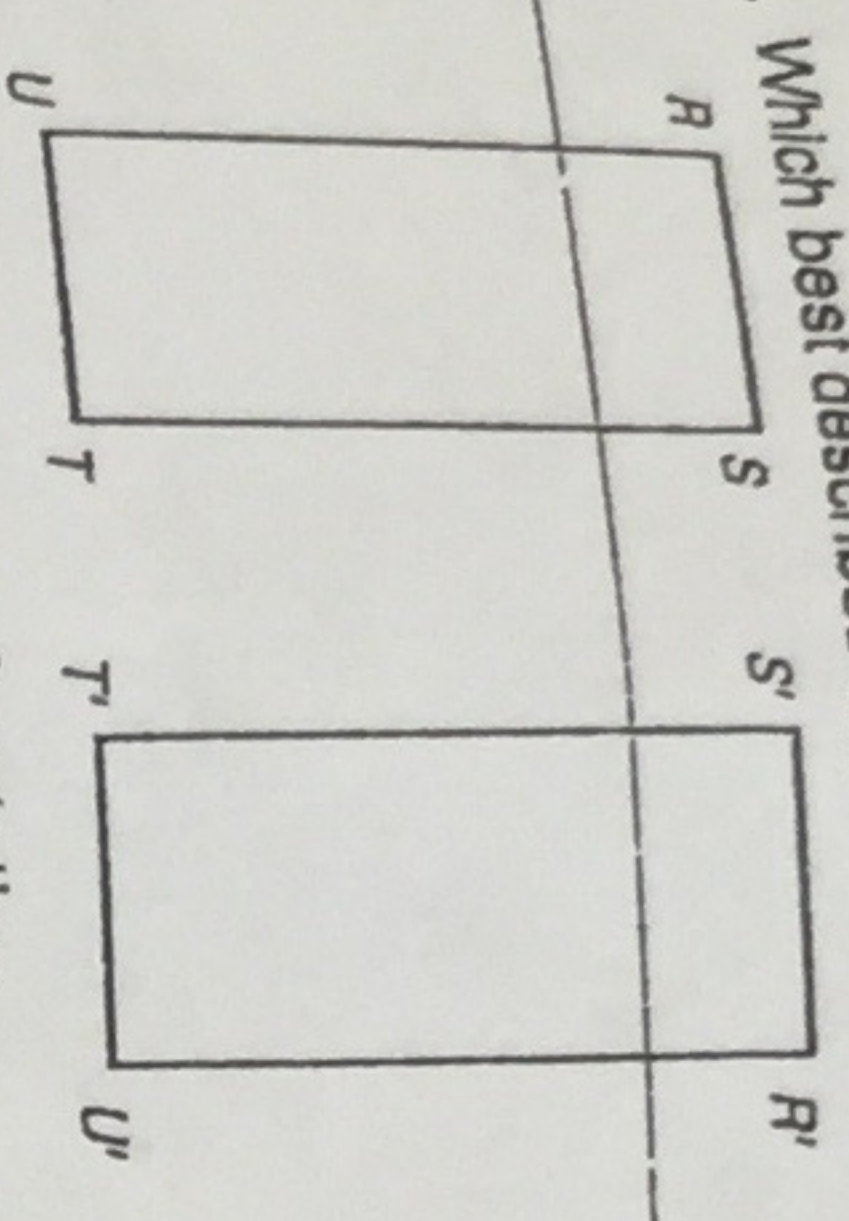


### Transformations

#### Study Guide

Select the best answer.

1. Which best describes the transformation?



- A preimage
- B reflection
- C rotation
- D translation

2. A figure has vertices at  $K(5, 5)$ ,  $L(5, 3)$ ,  $M(1, 1)$ , and  $N(3, 5)$ . After a transformation, the image of the figure has vertices at  $K'(-5, -5)$ ,  $L'(-3, -5)$ ,  $M'(-1, -1)$ , and  $N'(-5, -3)$ . Which best describes the transformation?

- F preimage
- G reflection
- H rotation
- J translation

3. What is the image of  $(-8, -1)$  when it is reflected across the line  $y = x$ ?

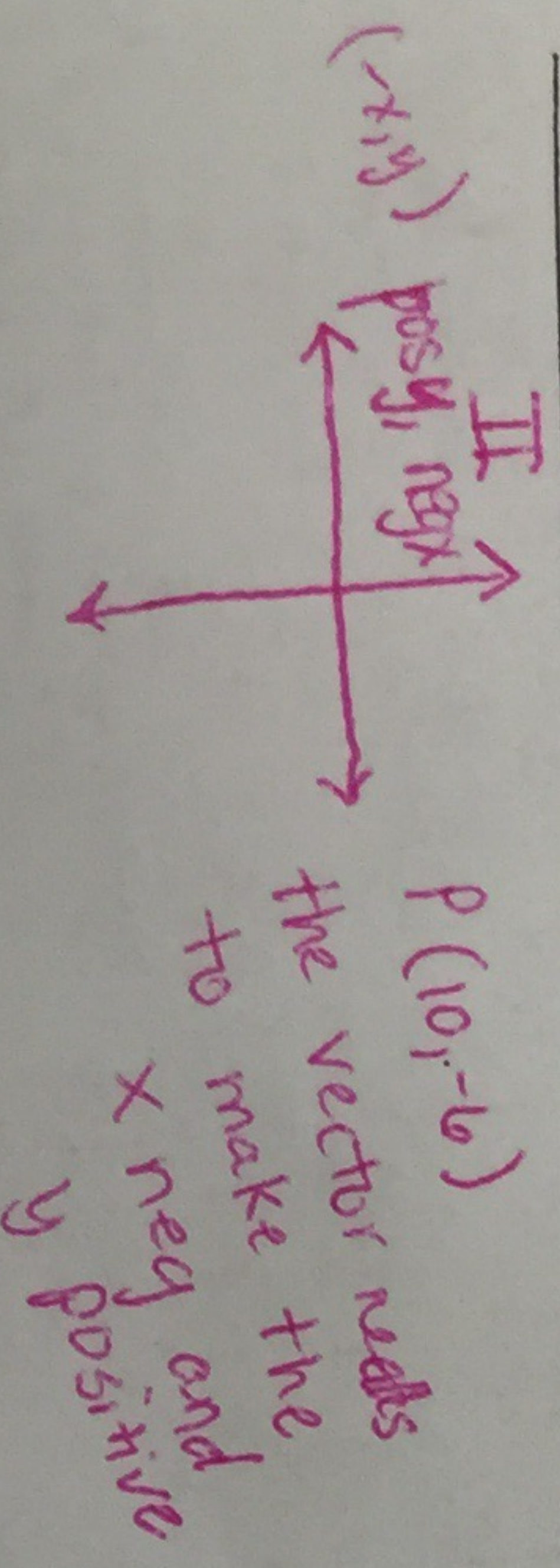
- A  $(-1, -8)$
- C  $(1, 8)$
- B  $(-\frac{1}{8}, -1)$
- D  $(-1, -\frac{1}{8})$

4. Which of the following capital letters is a reflection image of itself across a horizontal line?

- F M
- G N
- H O
- J P

5. The vertices of  $\triangle PQR$  are  $P(10, -8)$ ,  $Q(6, 2)$ , and  $R(4, -1)$ . The triangle is translated along a vector. Which vector places the image of the triangle entirely in Quadrant II?

- A  $\langle -6, 10 \rangle$
- B  $\langle -10, 7 \rangle$
- C  $\langle -11, 6 \rangle$
- D  $\langle -12, 8 \rangle$



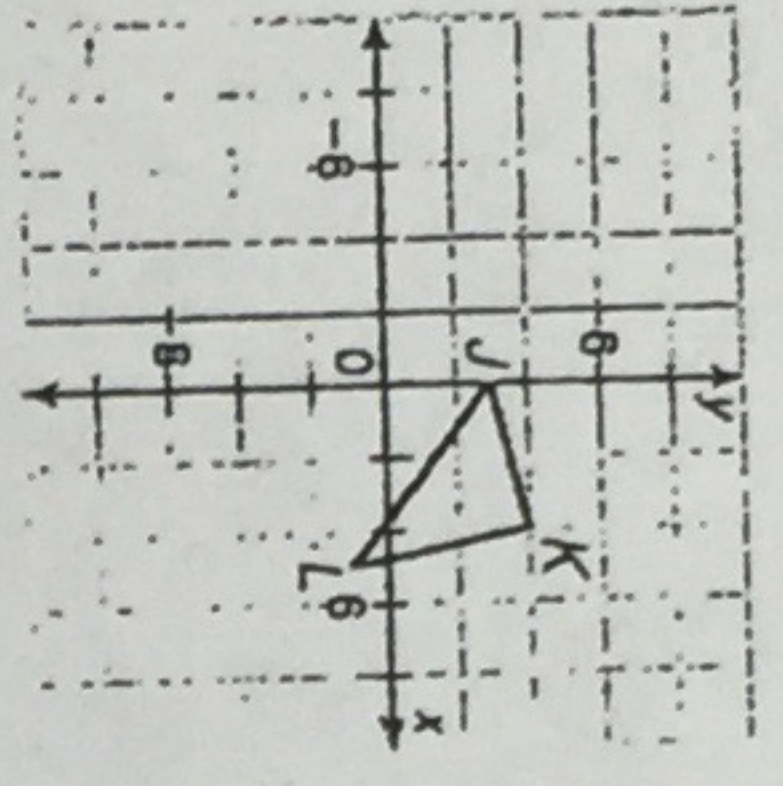
6. The point  $(90, 0)$  is rotated  $150^\circ$  about the origin. What are the coordinates of its image?

- F  $(90, 150)$
- G  $(90, 45)$
- H  $(-45\sqrt{3}, 45)$
- J  $(-45, 45\sqrt{3})$

7. Which shows the image of  $\angle$  after a  $180^\circ$  rotation about the endpoint of the ray?

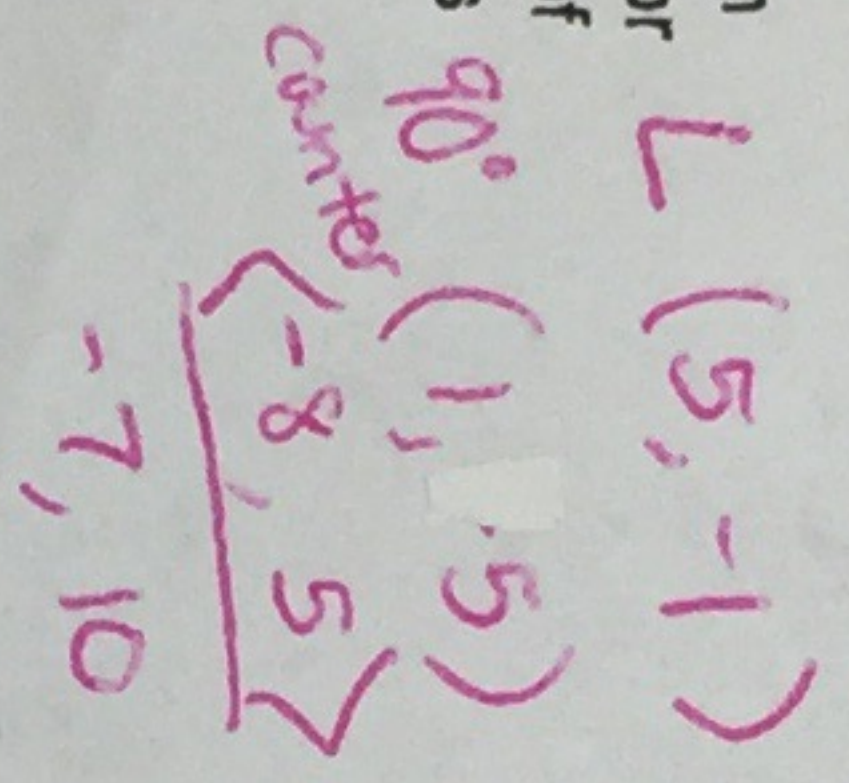
- A  $\uparrow$
- B  $\swarrow$
- C  $\searrow$
- D  $\downarrow$

Use the figure for Exercises 8 and 9. The coordinates of the vertices are integers.



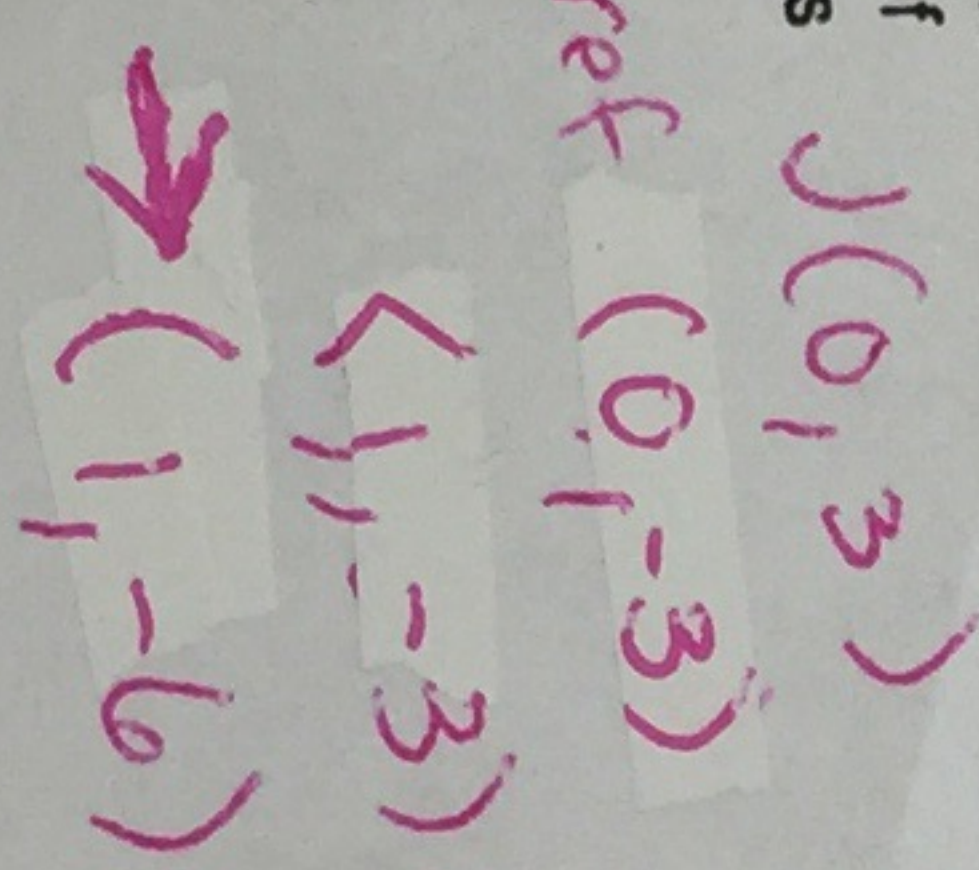
8.  $\triangle JKL$  is rotated  $90^\circ$  about the origin and then translated along the vector  $\langle -8, 5 \rangle$ . What are the coordinates of the final image of point L under this composition of transformations?

- F  $(-7, 10)$
- H  $(-9, 10)$
- G  $(-7, 0)$
- J  $(-9, 0)$



9.  $\triangle JKL$  is translated along the vector  $\langle 1, -3 \rangle$  after it is reflected across the x-axis. What are the coordinates of the final image of point J under this composition of transformations?

- A  $(6, -1)$
- B  $(-6, 1)$
- C  $(1, -6)$
- D  $(-1, 6)$



10.  $\triangle JKL$  is translated so that the image of vertex K is  $K'(4, -12)$ . A composition of reflections across the lines of which equations creates the same image?

- F first  $y = -5$ , then  $y = -9$
- G first  $y = -5$ , then  $y = -1$
- H first  $y = -9$ , then  $y = -1$
- J first  $y = -1$ , then  $y = -9$

11. The composition of two reflections across two intersecting lines is equivalent to which isometry?

- A rotation
- C translation
- B glide rotation
- D reflection

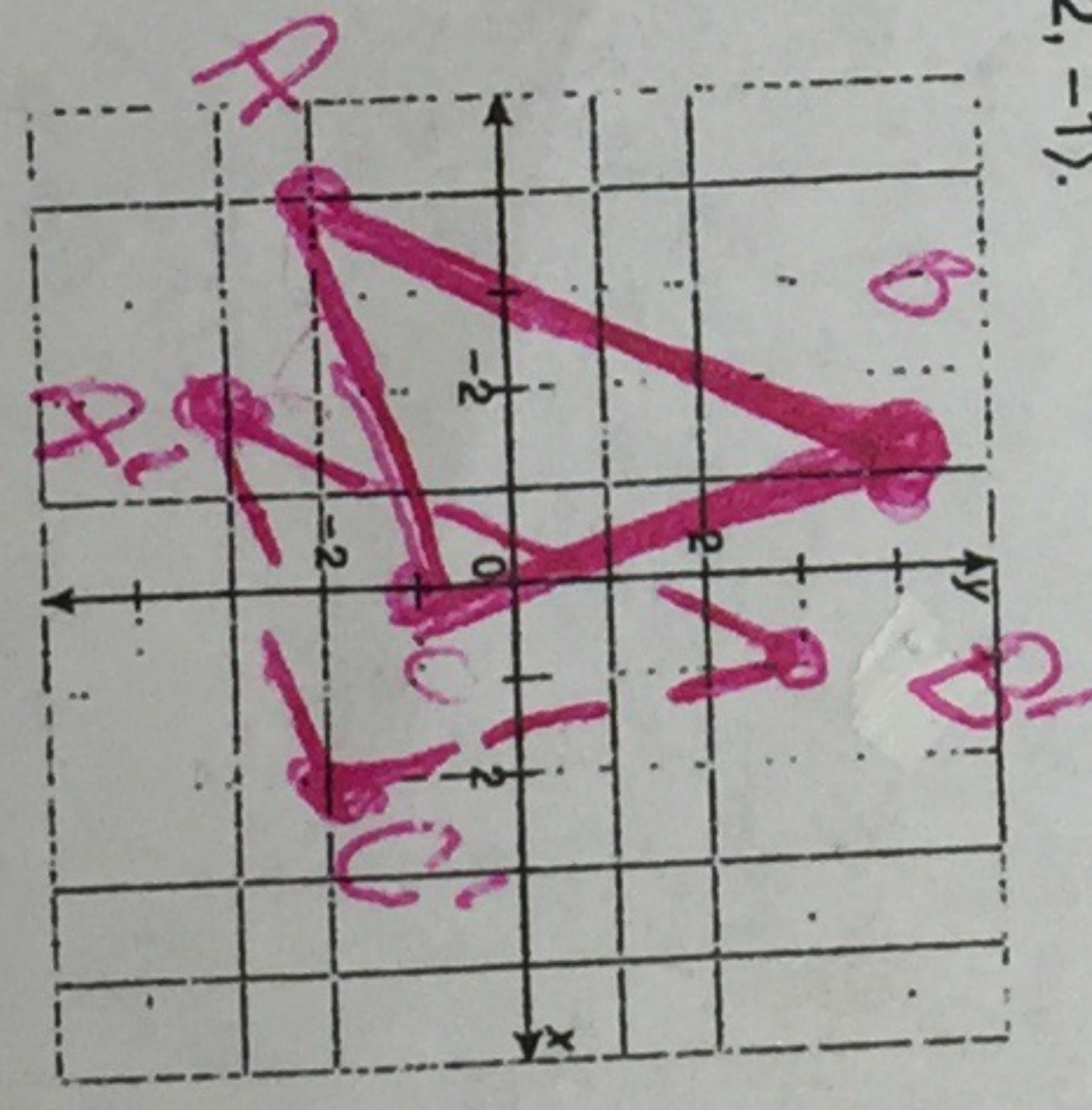
12. A triangle has vertices at  $A(-2, 3)$ ,  $B(2, 1)$ , and  $C(1, 0)$ . After a transformation, the image of the triangle has vertices at  $A'(-2, -3)$ ,  $B'(2, -5)$ , and  $C'(1, -6)$ . Identify the transformation.

$(x, y) \rightarrow (x, y-6)$   
translation

13. Identify the image of the point  $A(-6, -9)$  when A is reflected across the line  $y = x$ .

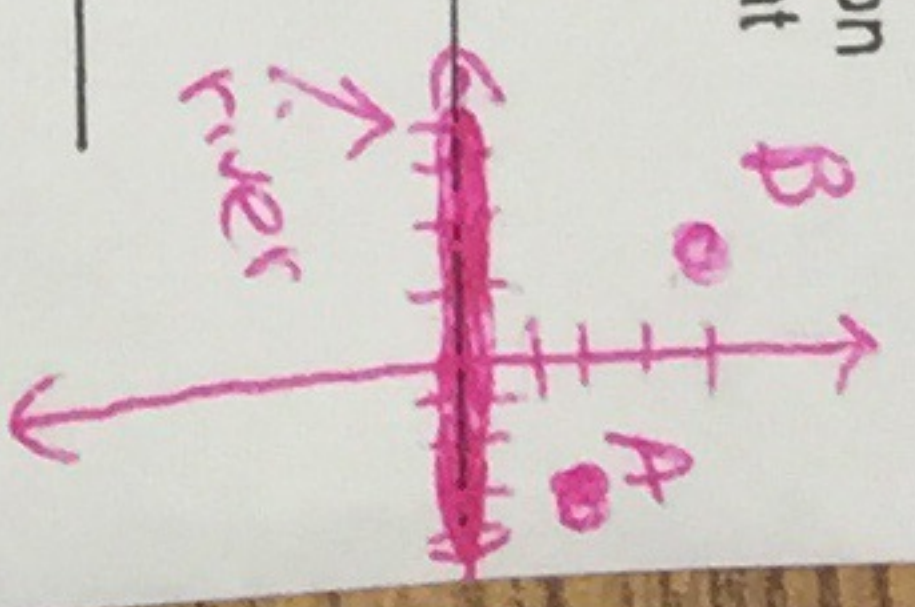
$A'(-9, -6)$

14.  $\triangle ABC$  has vertices  $A(-4, -2)$ ,  $B(-1, 4)$ , and  $C(0, -1)$ . Draw  $\triangle ABC$  and its image  $\triangle A'B'C'$  for translation along the vector  $\langle 2, -1 \rangle$ .



15. Two cabins are on the same side of a river. Two trails are planned to connect the campsites to a planned boat dock on the river. On a grid, cabin A would be at  $(4, 2)$ , cabin B would be at  $(-2, 4)$ , and the river would be located along the x-axis. Where should the dock be located to make the combined length of the trails as short as possible?

$(2, 0)$



16. The point  $R(2, -3)$  is translated along a vector that is parallel to the line  $y = 2x + 1$ . The translation vector has a magnitude of  $2\sqrt{5}$ . What are the coordinates of a possible image of point R?

don't do

17. Given the function  $y = x^2$ , write a function that reflects the graph across the x-axis.

$y = -x^2$   
ref.

18. Use mapping notation to represent a  $90^\circ$  clockwise rotation about the origin of the point  $(x, y)$ .

$(x, y) \rightarrow (y, -x)$   
ex plain  
trans form

# Combined Transformations and Symmetry

## Study Guide

Select the best answer.

1. How many lines of symmetry does a regular hexagon have?  
 A 3  
 B 4  
 C 6  
 D 8

2. What is the order and angle of rotational symmetry of a regular octagon?  
 F 8; 45°  
 G 16; 45°  
 H 4; 90°  
 J 8; 90°

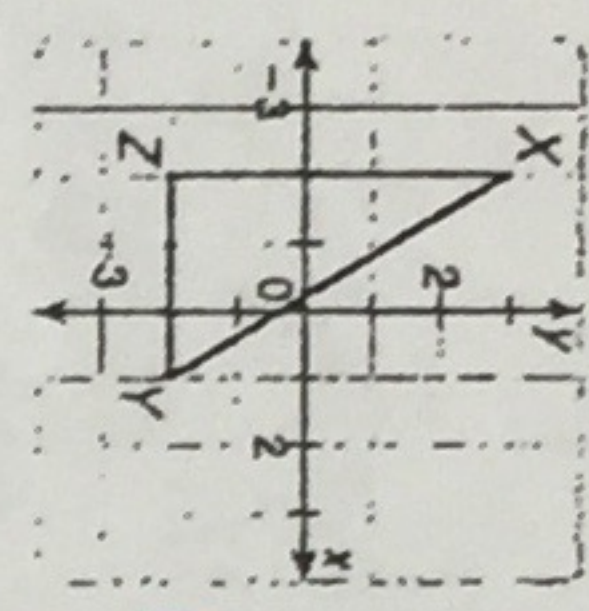
3. Which capital letter has exactly one line of symmetry?  
 A O  
 B P  
 C S  
 D T

4. Which shape CANNOT be used to make a regular tessellation?  
 F isosceles right triangle  
 G rhombus  
 H trapezoid  
 J regular pentagon

5. Which pair of regular polygons can be used to make a semiregular tessellation?  
 A octagon and triangle  
 B octagon and square  
 C pentagon and triangle  
 D pentagon and square

6. Using only glide reflections, which of the following can tessellate the plane?  
 F regular octagon  
 G isosceles trapezoid  
 H circle segment  
 J circle

7.  $\triangle XYZ$  is reflected across the  $y$ -axis. Then its image is rotated  $90^\circ$  about the origin. What are the coordinates of the final image of point  $X$  under the composition of transformations?



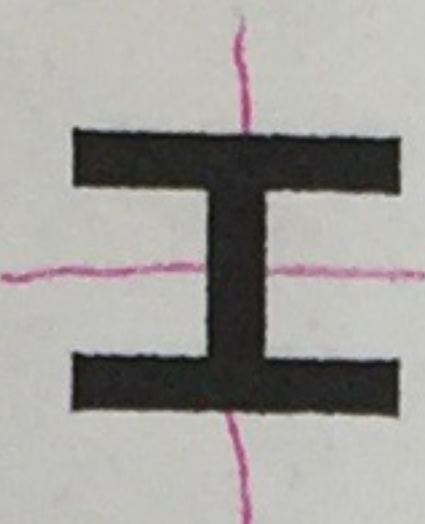
$X(-2, 3)$   
 Ref  $(2, 3)$   
 $90^\circ (-3, 2)$

- A  $(-3, 2)$   
 B  $(3, 2)$   
 C  $(2, -1)$   
 D  $(-2, -3)$

8. Which are equivalent to a composition of two reflections?  
 I. reflection  
 II. rotation  
 III. translation  
 IV. glide reflection

- F I and II  
 G II and III  
 H I and IV  
 J I, II, and III

9. Which are the angle of rotation and the order of rotational symmetry for the figure?



- A  $90^\circ; 2$   
 B  $180^\circ; 2$   
 C  $90^\circ; 4$   
 D  $180^\circ; 4$

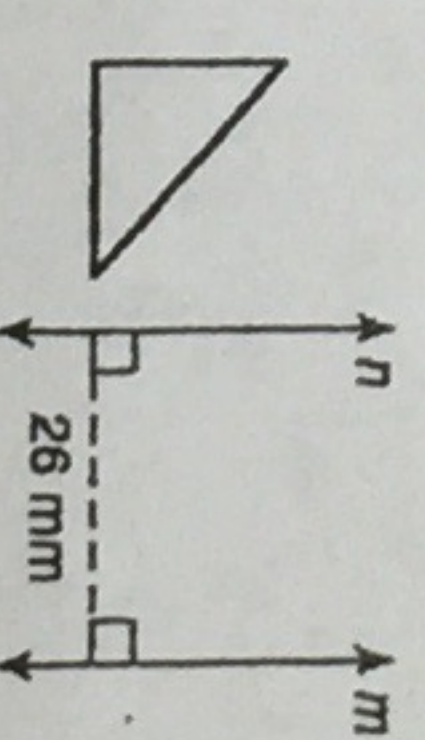
# Combined Transformations and Symmetry

10. Which type of polygon can always be used to tessellate a plane?  
 F heptagon  
 G octagon  
 H pentagon  
 J trapezoid

11. The point  $(2, -3)$  is reflected across the line  $y = 1$  and then rotated  $90^\circ$  about the origin. Determine the final coordinates of the image after the composition of transformations.  
 don't do

12. A figure above the line  $y = -1$  is reflected across the line  $y = -1$  and then reflected across the line  $y = -5$ . Determine the slope and magnitude of the equivalent translation vector.  
 don't do

13. Suppose the triangle shown is reflected across line  $n$  and then across line  $m$ . Describe a single transformation that is equivalent to this composition of transformations.  
 translation



14. Describe the line of symmetry for the function  $y = (x - 4)^2$ .

15. Draw a figure with rotational symmetry but not line symmetry.

16. Write True or False. A cross section of a right cylinder may tessellate a plane. Explain your reasoning.

17. Identify a regular polygon that can be used with a regular hexagon to create a semiregular tessellation of the plane. Indicate the number of each type of polygon that must meet at each vertex.