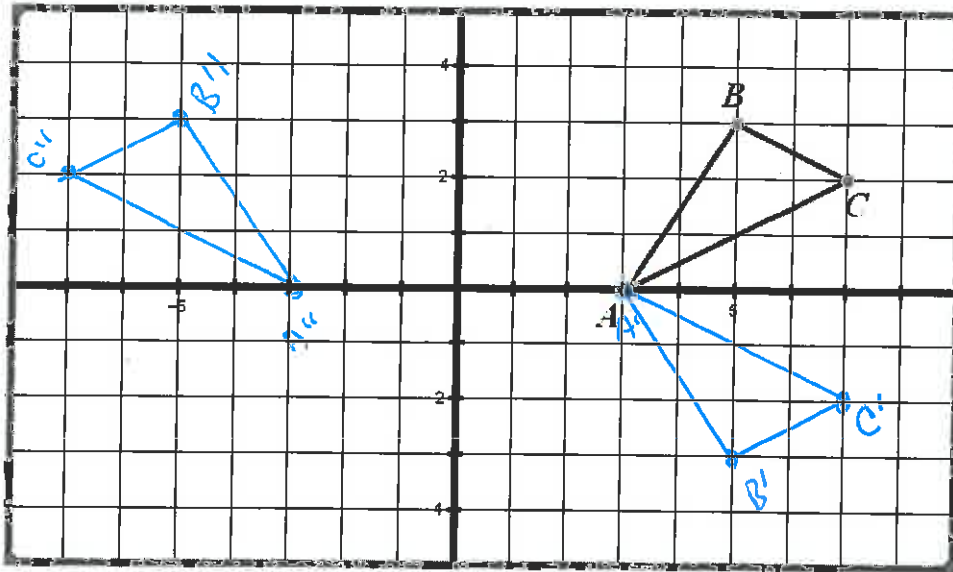


Reflection, Rotation, Symmetry

Reflection: Flip

Example:



1. Reflect $\triangle ABC$ over the x-axis to find the coordinates of the image $\triangle A'B'C'$.

$A(3,0) \rightarrow A'(3,0)$
 $B(5,3) \rightarrow B'(5,-3)$
 $C(7,2) \rightarrow C'(7,-2)$

Describe the Reflection using:

Notation: $r_{x\text{-axis}}$

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

2. Reflect $\triangle ABC$ over the y-axis to find the coordinates of the image $\triangle A''B''C''$.

$A(3,0) \rightarrow A''(-3,0)$
 $B(5,3) \rightarrow B''(-5,3)$
 $C(7,2) \rightarrow C''(-7,2)$

Describe the Reflection using:

Notation: $r_{y\text{-axis}}$

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

Examples:

1. The point $P(-9,2)$ is reflected over the y-axis. What are the coordinates of the image P' ?

$P'(9,2)$

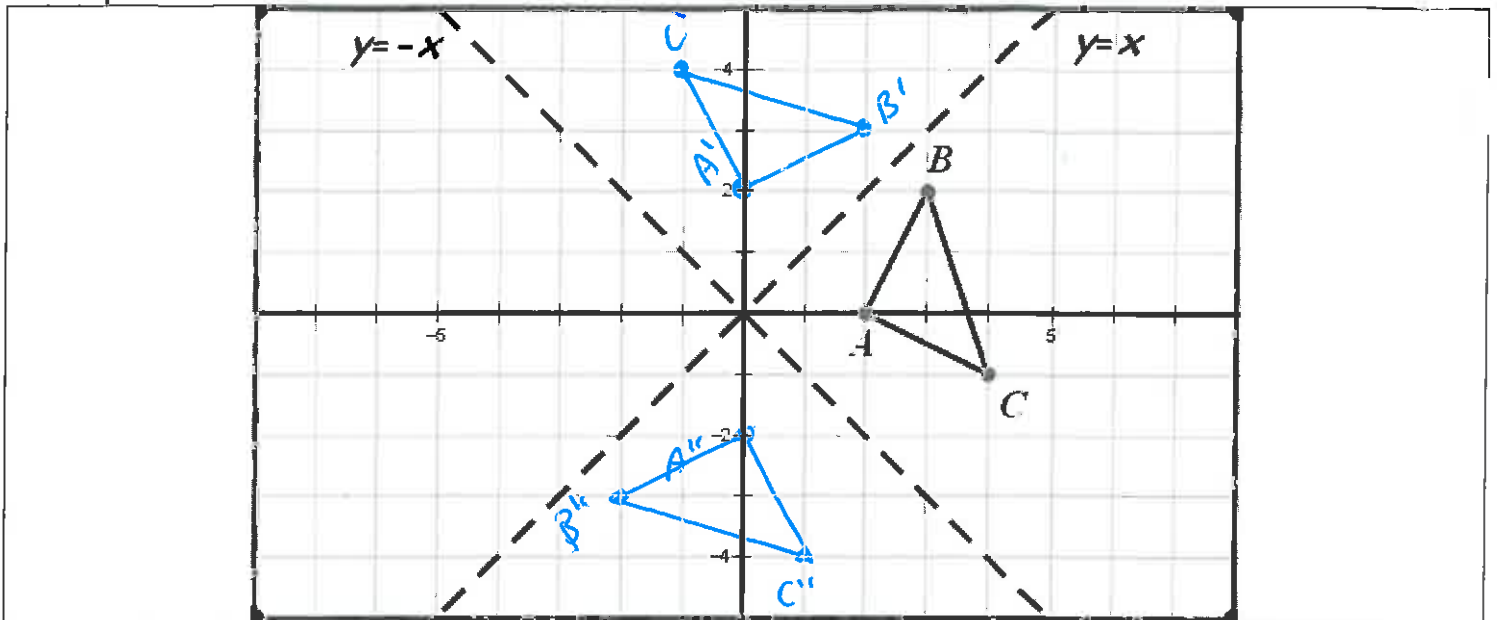
2. The point $H'(-4,-5)$ is the image of H under the transformation $r_{x\text{-axis}}$. What are the coordinates of H ?

$H(-4,5)$

3. True or False: A line reflection is an example of an *Opposite Isometry*.

True

Example:



1. Reflect $\triangle ABC$ over the line $y=x$ to find the coordinates of the image $\triangle A'B'C'$.

$$\begin{aligned} A(2,0) &\rightarrow A'(0,2) \\ B(3,2) &\rightarrow B'(2,3) \\ C(4,-1) &\rightarrow C'(-1,4) \end{aligned}$$

Describe the Reflection using:

Notation: $r_{y=x}$

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

2. Reflect $\triangle ABC$ over the line $y=-x$ to find the coordinates of the image $\triangle A''B''C''$.

$$\begin{aligned} A(2,0) &\rightarrow A''(0,-2) \\ B(3,2) &\rightarrow B''(-2,-3) \\ C(4,-1) &\rightarrow C''(1,-4) \end{aligned}$$

Describe the Reflection using:

Notation: $r_{y=-x}$

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

Examples:

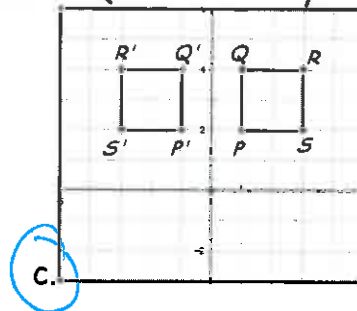
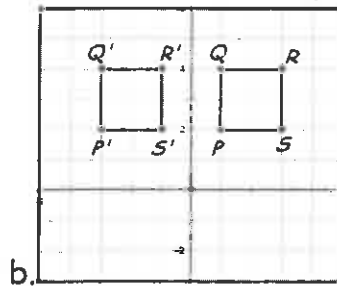
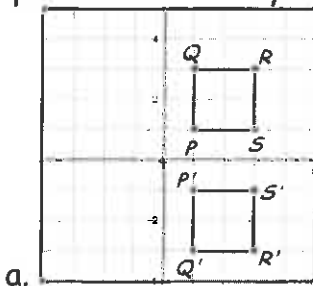
1. The point $M(2,-9)$ is reflected over the line $y=x$. What are the coordinates of M' , the image of M ?

$$M'(-9,2)$$

2. What is the pre-image of point $F'(-7,-3)$ under the transformation $r_{y=-x}$?

$$F(3,7)$$

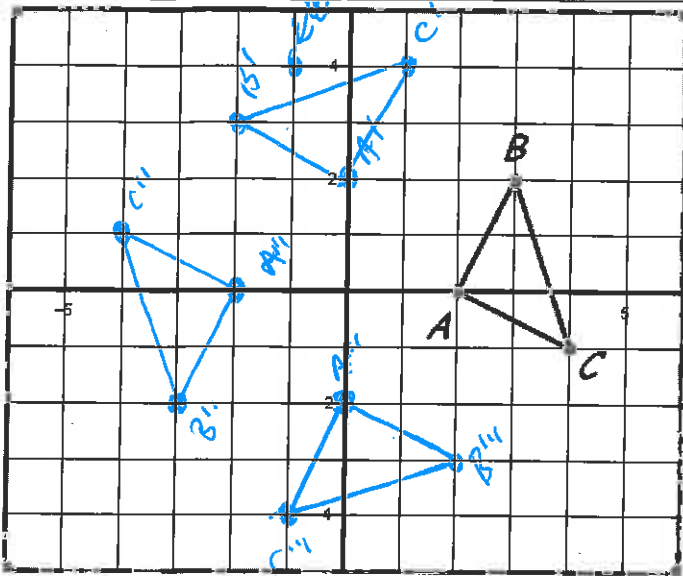
3. Which picture accurately represents the reflection of square PQRS over the y-axis?



Rotation: Spin - turn

(Direction of Rotation: CC-clockwise)

Example:



1. Rotate $\triangle ABC$ 90° to find the coordinates of the image $\triangle A'B'C'$.

$$\begin{aligned} A(2,0) &\rightarrow A'(0,2) \\ B(3,2) &\rightarrow B'(-2,3) \\ C(4,-1) &\rightarrow C'(1,4) \end{aligned}$$

Describe the Rotation using:

Notation: R_{90}

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

2. Rotate $\triangle ABC$ 180° to find the coordinates of the image $\triangle A''B''C''$.

$$\begin{aligned} A(2,0) &\rightarrow A''(-2,0) \\ B(3,2) &\rightarrow B''(-3,-2) \\ C(4,-1) &\rightarrow C''(-4,1) \end{aligned}$$

Describe the Rotation using:

Notation: R_{180}

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

3. Rotate $\triangle ABC$ 270° to find the coordinates of the image $\triangle A'''B'''C'''$.

$$\begin{aligned} A(2,0) &\rightarrow A'''(0,-2) \\ B(3,2) &\rightarrow B'''(2,3) \\ C(4,-1) &\rightarrow C'''(-1,4) \end{aligned}$$

Describe the Rotation using:

Notation: R_{270}

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

Examples:

1. Find the image of point $P(2,3)$ under: R_{90} , R_{180} , and R_{270} . $(-3,2)$, $(-2,-3)$, $(-3,2)$

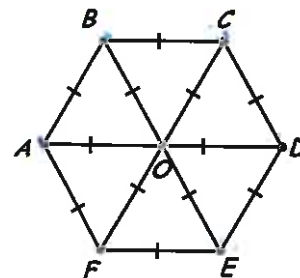
2. $N'(-3,4)$ is the image of point N under the Rotation R_{180} . Find the coordinates of point N .

3. True or False: A rotation of 180° is a *Direct Isometry*. True

4. Find the image of A under the following rotations:

- a) $R_{0,60^\circ}$ b) $R_{0,120^\circ}$ c) $R_{0,-240^\circ}$ d) $R_{0,-300^\circ}$

F E E F

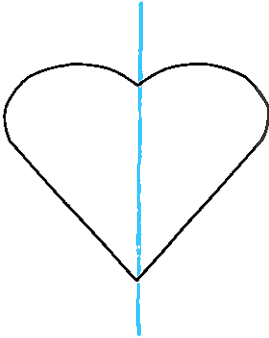


Symmetry

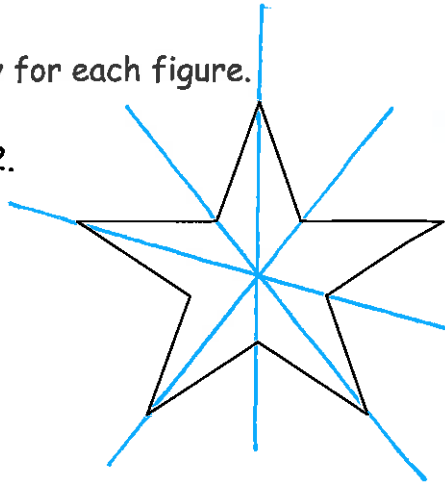
Line Symmetry:

Example: Draw the lines of symmetry for each figure.

1.



2.



Point Symmetry:

Examples:

1. Which of the following letters has point symmetry?

A H I M

2. Which of the following words has point symmetry?

MOM

MOW

chump

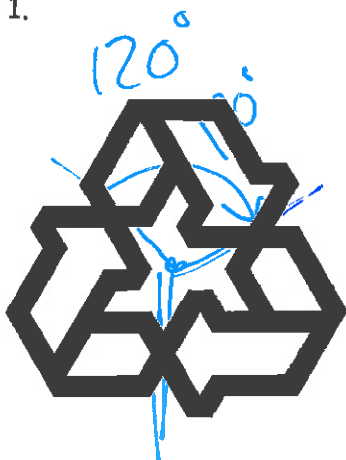
Symmetry

Rotational Symmetry:

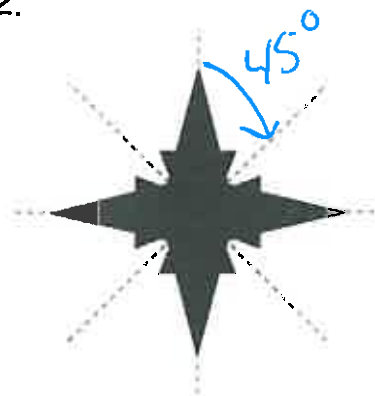
Example: Which of the following pictures has rotational symmetry?

For those that do, what is the angle of rotation?

1.



2.



3.

