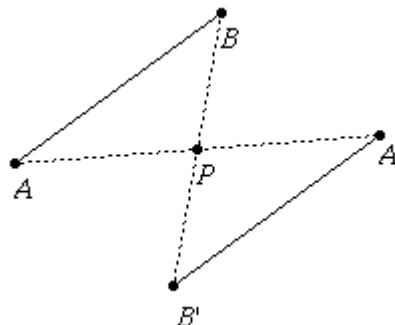


6-4: Point Reflections in the Coordinate Plane

Definition: A **point reflection in P** is a transformation in the plane such that:

1. If a point A is not point P , then the image of A is A' where P is the midpoint of $\overline{AA'}$.
2. The point P is its own image.



- Under a point reflection, the size and shape of the image is the same size and shape of the preimage:

Theorem and Corollaries: Under a point reflection distance, angle measure, collinearity, and midpoint are preserved.

- The proof is left to the student.
- **Notation:**
 - $r_p(A) = B$ means
"The image of A under a reflection in the point P is B ."
 - $r_p(\triangle ABC) = \triangle A'B'C'$ means
"The image of $\triangle ABC$ under a reflection in point P is $\triangle A'B'C'$."

Definition: A figure has **point symmetry** when the figure is its own image under a point reflection.

Point Reflection in the Coordinate Plane

- In the coordinate plane, the origin is the most common point that is used to define a point reflection.

In the figure, $\triangle ABC$ is reflected in the origin.

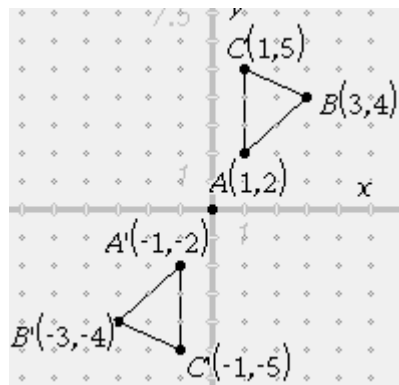
Its image under the reflection is $\triangle A'B'C'$.

From the figure we see that

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

$$B(3,4) \rightarrow B'(-3,-4)$$

$$C(1,5) \rightarrow C'(-1,-5)$$

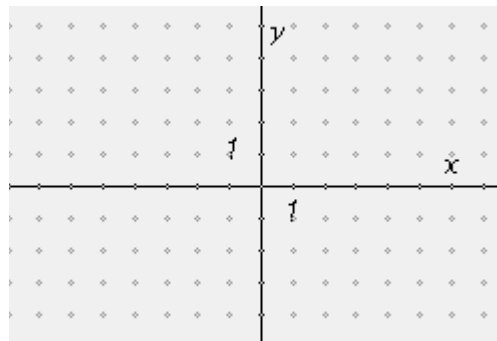


Theorem: Under a reflection in the origin, the image of $P(a, b)$ is $P'(-a, -b)$.

- We write: $r_{(0,0)}(a,b) = (-a,-b)$

Example:

- What are the coordinates of B , the image of $A(-3, 2)$ under a reflection in the origin?
- What are the coordinates of C , the image of $A(-3, 2)$ under a reflection in the x -axis?
- What are the coordinates of D , the image of $A(-3, 2)$ under a reflection in the y -axis?
- Does a reflection in the origin give the same result as a reflection in the x -axis followed by a reflection in the y -axis? Justify your answer.



Homework: