3.1-3.5 Guided Notes

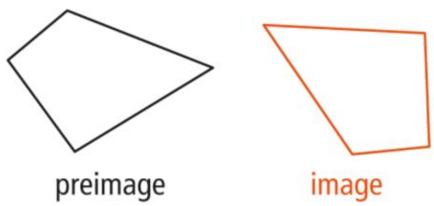
3.1 Reflections

Transformation: an operation that changes an original object, called a ____________________, into a resulting object, called an ________________________.

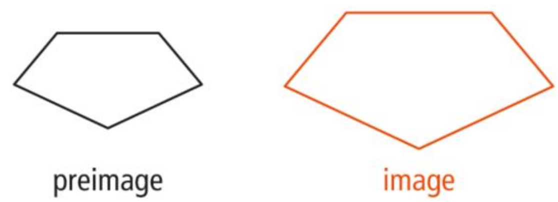
We can transform points, shapes, and even functions!

Rigid Motion: a transformation that preserves ____.

1. a. Is the transformation a rigid motion? Explain.



1. b. Is the transformation a rigid motion? Explain.

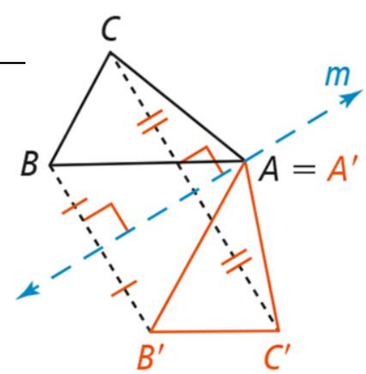


Reflection: ____

____

A reflection has these properties:

- If a point A is on line m, then the point and its image are the same point (that is, $A' = A$).
- If a point B is not on line m, line m is the perpendicular bisector of $\overline{BB'}$.

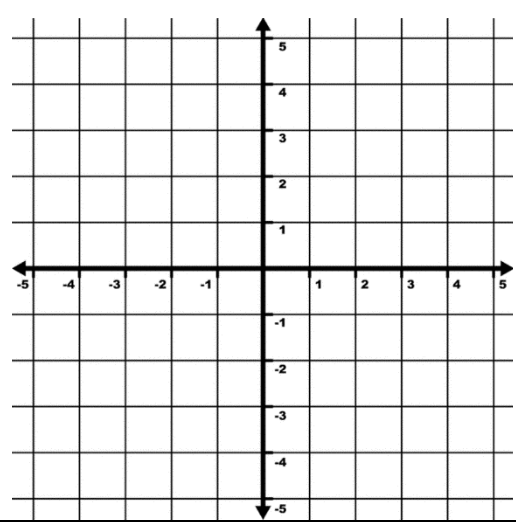


The reflection of $\triangle ABC$ across line m can be written as $R_m(\triangle ABC) = \triangle A'B'C'$.

Example: Quadrilateral $\boldsymbol{FGHJ}$ has coordinates $\boldsymbol{F(0,3), G(2,4), H(4,2), J(-2,0)}$.

A. Graph and label $\boldsymbol{FGHJ}$ and $_{x\text{-axis}}(\boldsymbol{FGHJ})$. What is a general rule for reflecting a point across the x-axis?

B. What do you think is a general rule for reflecting a point across the y-axis?



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3.2 Translations

Translation: ____

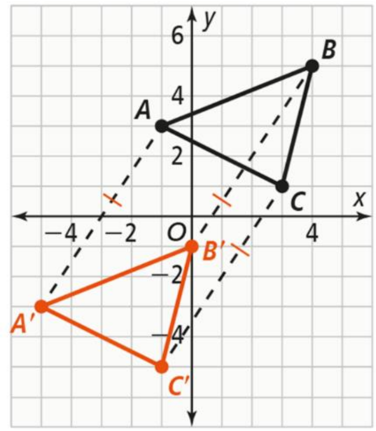
____

The translation of $\triangle ABC$ by x units along the x-axis and by y units along the y-axis can be written as $T_{\langle x,\, y\rangle}(\triangle ABC) = \triangle A'B'C'$.

A translation has the following properties:

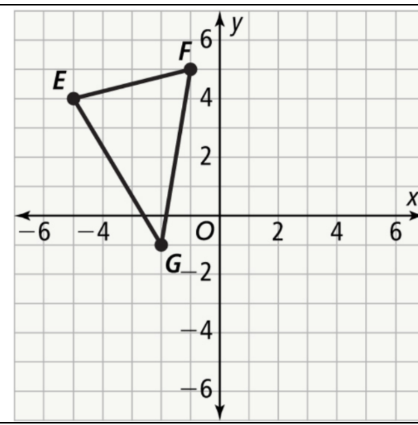
If $T_{\langle x,\, y\rangle}(\triangle ABC) = \triangle A'B'C'$, then

- $\overline{AA'} \parallel \overline{BB'} \parallel \overline{CC'}$.
- $\overline{AA'} \cong \overline{BB'} \cong \overline{CC'}$.
- $\triangle ABC$ and $\triangle A'B'C'$ have the same orientation.



Example 1: **What is the graph of $T_{\langle 7,\, -4\rangle}(\triangle EFG) = \triangle E'F'G'$?**

Notation:

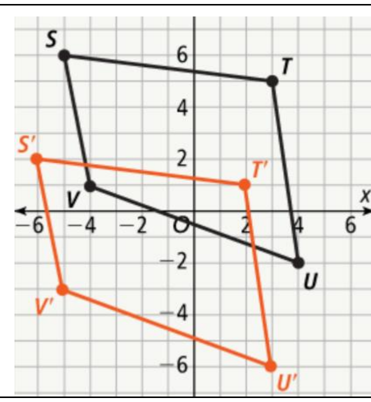


You Try! Using the graph in Example 1, what are the vertices of $\Delta E'F'G'$ if the following translations happen?

A. $T_{\langle 6,\, -7\rangle}(\triangle EFG) = \triangle E'F'G'$

B. $T_{\langle 11,\, 2\rangle}(\triangle EFG) = \triangle E'F'G'$

Example 2: What translation rule maps *STUV* onto *S'T'U'V'*?



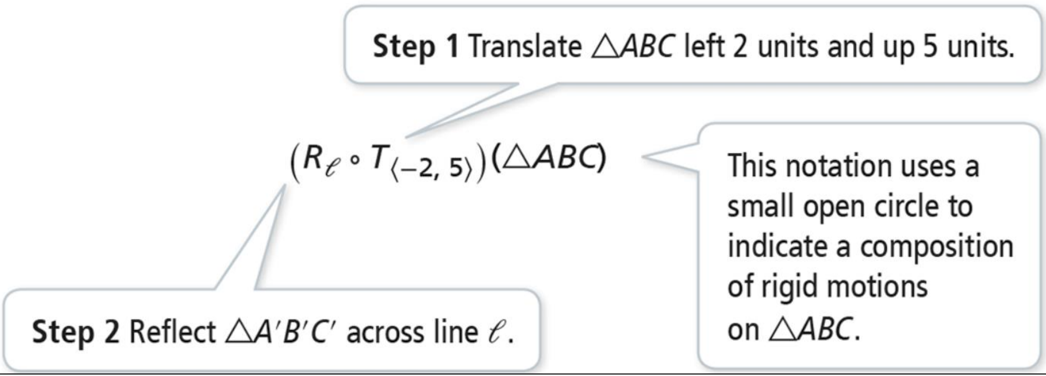
3.1-3.5 Guided Notes

Composition of Rigid Motions: ____

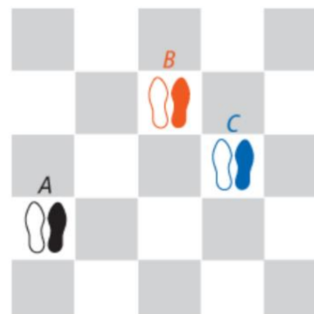
____

____

Notation:



Example 3: In learning a new dance, Kyle moves from position A to position B and then to position C. What single transformation describes Kyle's move from position A to position C?



You Try! What is the composition of the transformations written as one transformation?

$T_{\langle 3, -2\rangle} \circ T_{\langle 1, -1\rangle}$

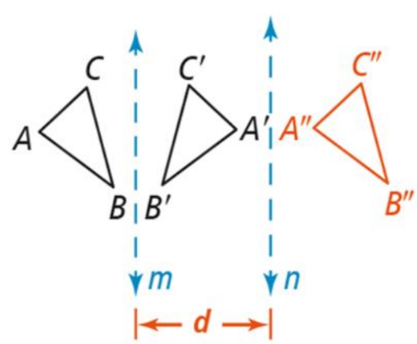
Theorem 3-1:

A translation is a composition of reflections across two parallel lines.

- Both reflection lines are perpendicular to the line containing a preimage point and its corresponding image point.
- The distance between the preimage and the image is twice the distance between the two reflection lines.

If... $T(ABC) = A''B''C''$

$AA'' = BB'' = CC'' = 2d$



Then... $(R_n \circ R_m)(ABC) = A''B''C''$

3.1-3.5 Guided Notes

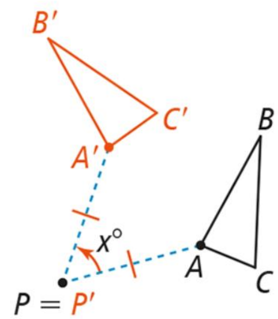
3.3 Rotations

Rotation:

A rotation $r_{(x°,\ P)}$ is a transformation that rotates each point in the preimage about a point P, called the center of rotation, by an angle measure of $x°$, called the angle of rotation. A rotation has these properties:

- The image of P is P' (that is, $P' = P$).
- For a preimage point A, $PA = PA'$ and $m\angle APA' = x°$.

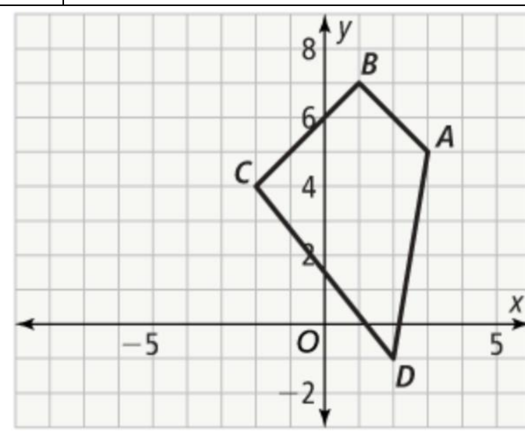
A rotation is a rigid motion, so length and angle measure are preserved. Note that a rotation is counterclockwise for a positive angle measure.



Ordered Pair Rules: Rotations in the Coordinate Plane

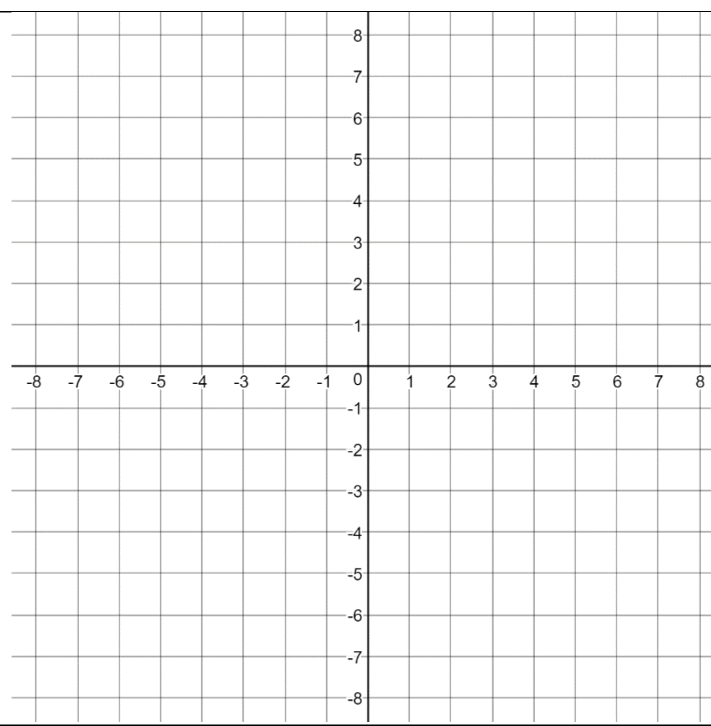
90° rotation counterclockwise.	180° rotation counterclockwise.	270° rotation counterclockwise.
$(x, y) \rightarrow (\quad ,\quad)$	$(x, y) \rightarrow (\quad ,\quad)$	$(x, y) \rightarrow (\quad ,\quad)$

Example: What is $r_{(90°,\ O)}$ $ABCD$?



Try It! The vertices of $\triangle XYZ$ $X(-4,7)$, $Y(0,8)$, and $Z(2,-1)$.

What are the vertices of $r_{(180°,O)}(\triangle XYZ)$?



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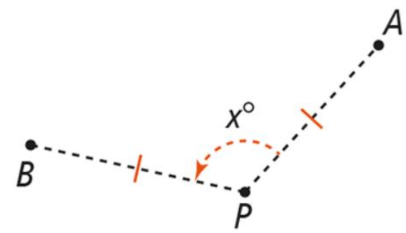
Theorem 3-2

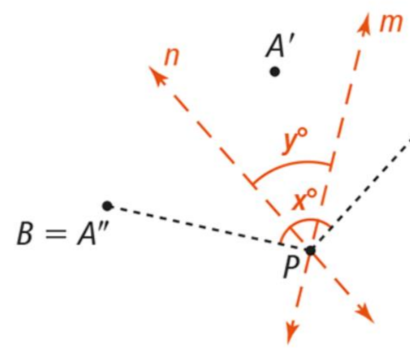
Any rotation is a composition of reflections across two lines that intersect at the center of rotation.

The angle of rotation is twice the angle formed by the lines of reflection.

If...

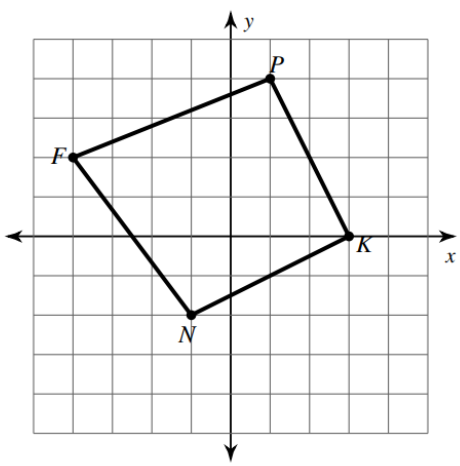


Then...

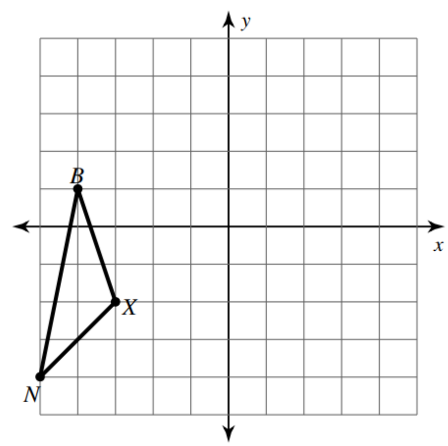


Additional Practice with Rotations

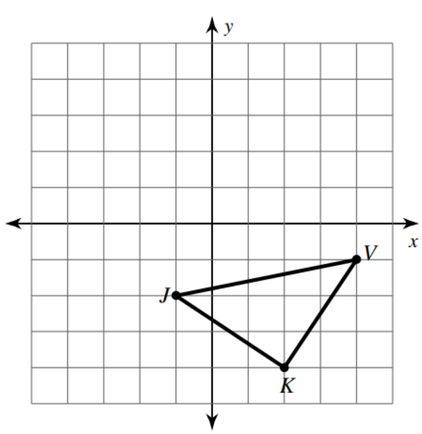
1) rotation 180° about the origin



3) rotation 90° counterclockwise about the origin

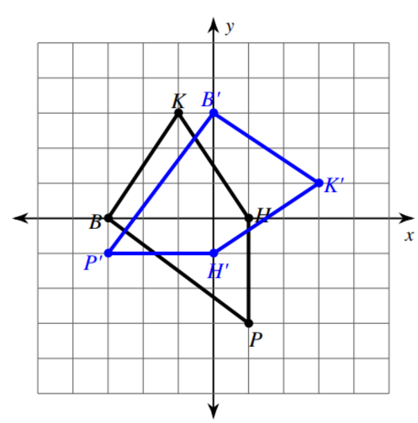


5) rotation 90° clockwise about the origin



Write a rule to describe each transformation.

7)



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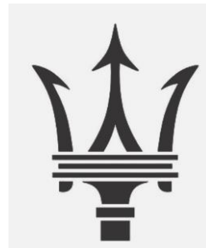
3.5 Symmetry

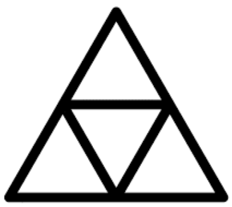
Reflectional Symmetry: A type of symmetry that maps the figure onto itself. The line of reflection is called the ___________________________________.

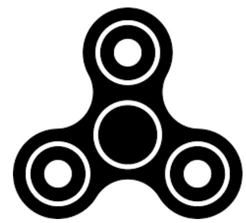
Examples:



Rotational Symmetry: A type of symmetry that maps an image onto its preimage after a rotation of less than 360°.

Examples:





Point Symmetry: A type of symmetry where an object has rotational symmetry of 180°.

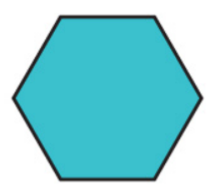
Can you think of capitalized block letters from the alphabet that have point symmetry?

Example 1: What transformation(s) will map the image onti itself?

A.

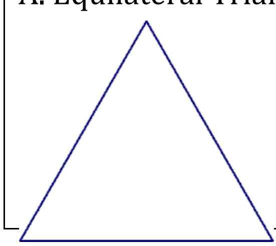
B.

Example 2: How many lines of symmetry does a regular hexagon have?

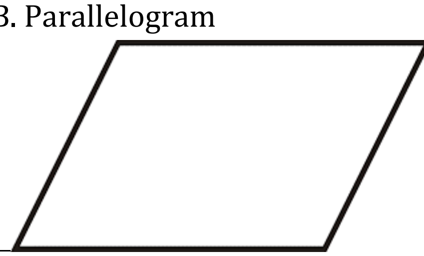


Example 3: For what angles of rotation will the figure be mapped onto itself?

A. Equilateral Triangle



B. Parallelogram



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