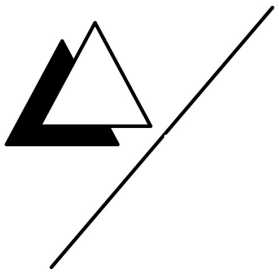
Launch: Copy each figure and line of reflection, then draw the reflection image. (Imagine the line is a mirror)

1.

2.

3.



Transformations

The word transform means "to change."

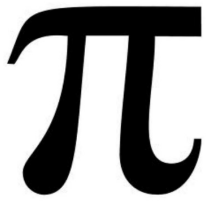
In geometry, a transformation changes the position of a shape on a coordinate plane.

There are three basic transformations:

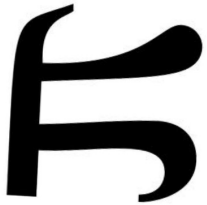
1. Flip (Reflection)
2. Slide (Translation)
3. Turn (Rotation)

The original figure is called the preimage. The resulting figure is an image.

preimage



image



7.2 Reflections

Objectives:

To model the composition of reflections over intersecting lines and classify the resulting transformation as a rotation.

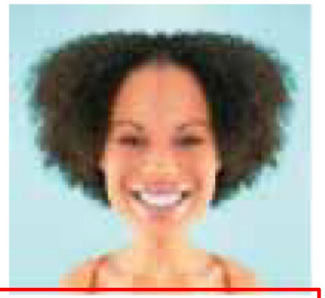
To understand properties of reflection in the plane.

To identify fixed points for a given reflection or composition of reflections.

Definition

A point that is its own image after a transformation is a **fixed point.**

You have seen what happens when you reflect a point over one line. What happens when you reflect a point over one line and then reflect the image of that point over a second line?



A figure that reflects onto itself over a line has line symmetry.

In-Class Experiment: In your notes

1. Draw 2 parallel lines and label them r and s. Also, draw the letter F. This is the preimage.

2. Reflect F over r. Refer to this image of F as F'

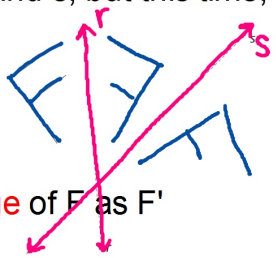
3. Reflect F' over s. Refer to this image of F' as F"

4. Are there any fixed points? No

5. Is there a transformation (not necessarily a reflection) that describes the change from F to F"?

Translation (Slide)

6. Draw another letter F and lines r and s, but this time, r and s should intersect.



7. Reflect F over r. Refer to this image of F as F'

8. Reflect F' over s. Refer to this image of F' as F"

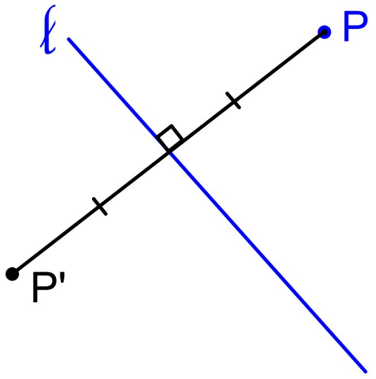
9. Are there any fixed points?

10. Is there a transformation (not necessarily a reflection) that describes the change from F to F"?

Rotation (Turn)

Definition

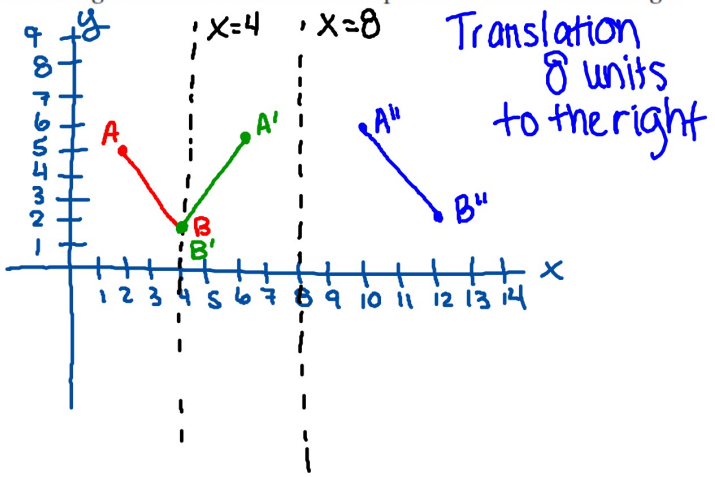
Suppose P is a point and ℓ is a line not containing P. A **reflection** over ℓ maps the point to P' such that ℓ is the perpendicular bisector of $\overline{PP'}$. If ℓ contains P, P is its own reflection image.



2. **a.** Reflect $\overline{AB}$ with endpoints $A(2, 5)$ and $B(4, 2)$ over the line with equation $x = 4$. Write the coordinates of the image. A'(6,5) B'(4,2)

b. Now reflect the image of $\overline{AB}$ over the line with equation $x = 8$. Write the coordinates of this new image. A''(10,5) B''(12,2)

c. Describe a single transformation that maps $\overline{AB}$ onto the final image.



Translation 8 units to the right

7. **a.** Reflect $\overline{AB}$ with endpoints $A(1, 2)$ and $B(3, 3)$ over the line $y = \frac{1}{2}$. Write the coordinates of the endpoints of the image.

b. Now reflect the image of $\overline{AB}$ over the line $y = -1$. Write the coordinates of the endpoints of this new image.

c. Describe a single transformation that maps $\overline{AB}$ onto the final image.

On Your Own

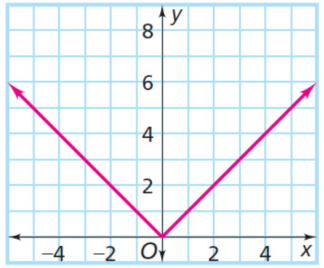
Page 543: 7, 10-12

10. **Standardized Test Prep** Reflect point $R(2, -3)$ over the line $y = x$. What are the coordinates of the reflection image of point R?

A. $(-2, -3)$ **B.** $(-2, 3)$ **C.** $(-3, 2)$ **D.** $(2, 3)$

In Exercises 11–14, you are given an equation and its graph. Decide whether each graph has any lines of symmetry. Prove your conjecture.

11. $y = |x|$



12. $y = x^2$