7.2 Transformations in Coordinate Plane

Standards:

G.CO.2

G.CO.3

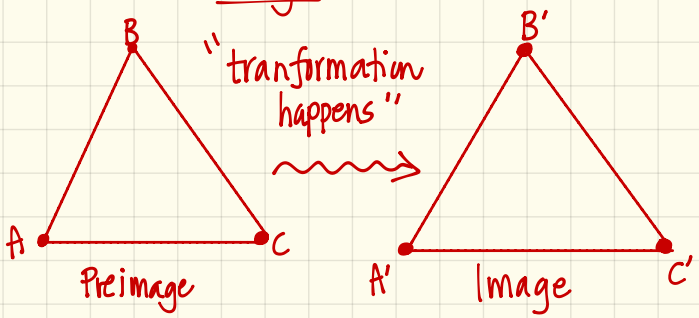
Old Exponential Transformations

Warm up:

parent function → $f(x) = a(b)^{x \pm k} \pm h$ ← left or right shift; ← up or down shift

New Transformations in Cartesian Plane

- Transformation – means to change the position, shape, or size of a figure in a coordinate plane.
- The original figure is called the preimage & the "change" or "moved" image is called the image.



- Isometry – is a transformation in which the preimage & the image are congruent.
- There are 3 types of isometric transformations:
  1. Translations (sliding)
  2. Reflections (flipping)
  3. Rotations (turning)

1 Translations (slide)

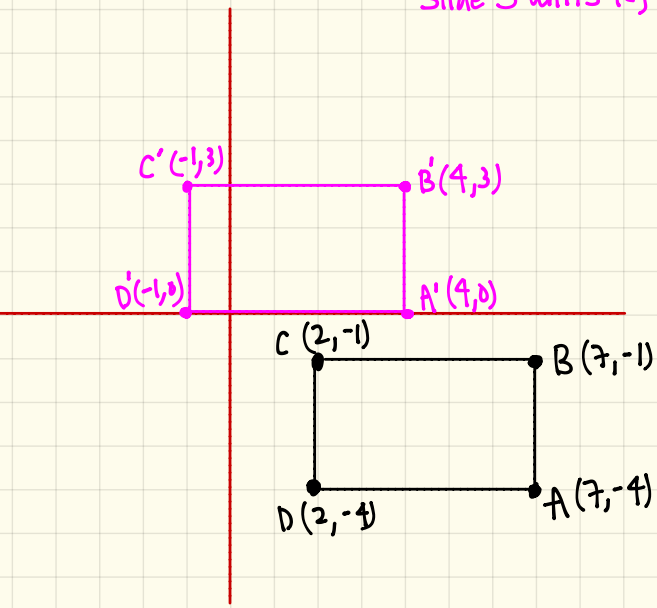
Transformation that "slides" the figure a certain distance either up, down, left or right on a coordinate plane.

notation

preimage	⟶	image
(x, y)	⟶	$(x+h, y+k)$ (right, up)
(x, y)	⟶	$(x-h, y-k)$ (left, down)

[Example 1] Translate $(x,y) \to (x-3, y+4)$

slide 3 units left & slide 4 units up

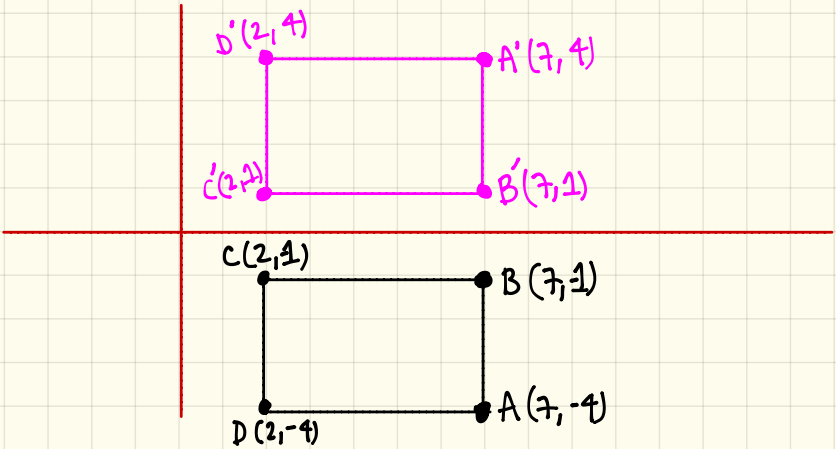


2 Reflections (flips)

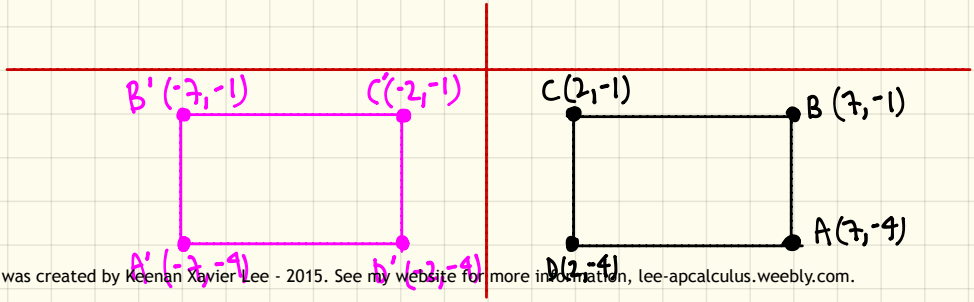
Transformation where a mirror image is created

notation	preimage		image
Reflection across x-axis	(x, y)	$\rightarrow$	$(x, -y)$
Reflection across y-axis	(x, y)	$\rightarrow$	$(-x, y)$

[Example 2] Reflect figure across the x-axis $(x, y) \rightarrow (x, -y)$



[Example 3] Reflect figure across y-axis $(x, y) \rightarrow (-x, y)$

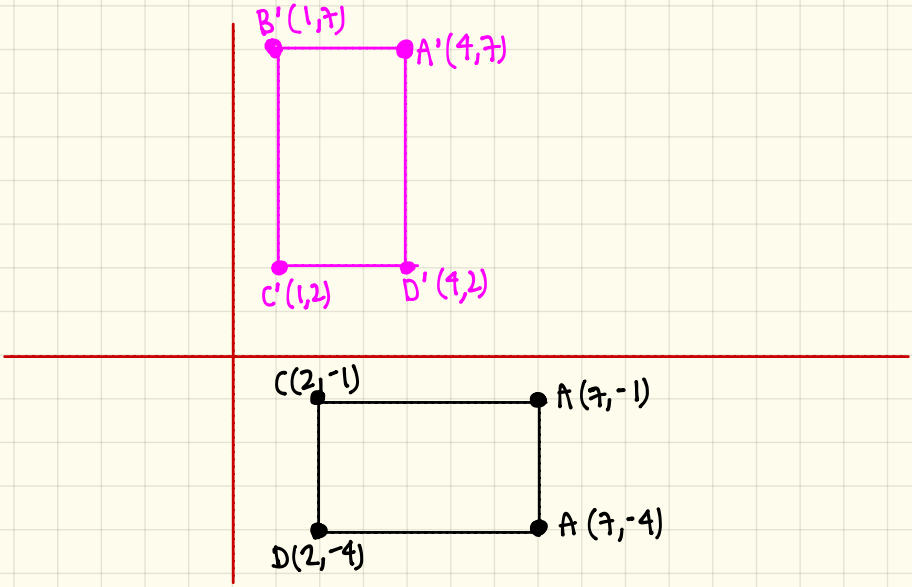


[3] Rotation (turn)

Transformation that "turns" a figure around a point of degrees.

notation	pre-image ⇝	image
90° Rotation counterclockwise about the origin	(x, y) ⟶	$(-y, x)$
180° Rotation counterclockwise about the origin.	(x, y) ⟶	$(-x, -y)$
270° Rotation counterclockwise about the origin.	(x, y) ⟶	$(y, -x)$

[Example 3] 90° Rotation of figure about the origin



Isometric Transformation Rules — Memorize

Translations "slides" —
- $(x,y) \rightarrow (x+h, y+k)$ right, up
- $(x,y) \rightarrow (x-h, y-k)$ left, down

Reflections "flips" —
- $(x,y) \rightarrow (x,-y)$ Reflection across x-axis
- $(x,y) \rightarrow (-x,y)$ Reflection across y-axis

Rotations "turns" —
- $(x,y) \rightarrow (-y,x)$ 90° rotation
- $(x,y) \rightarrow (-x,-y)$ 180° Rotation
- $(x,y) \rightarrow (y,-x)$ 270° Rotation