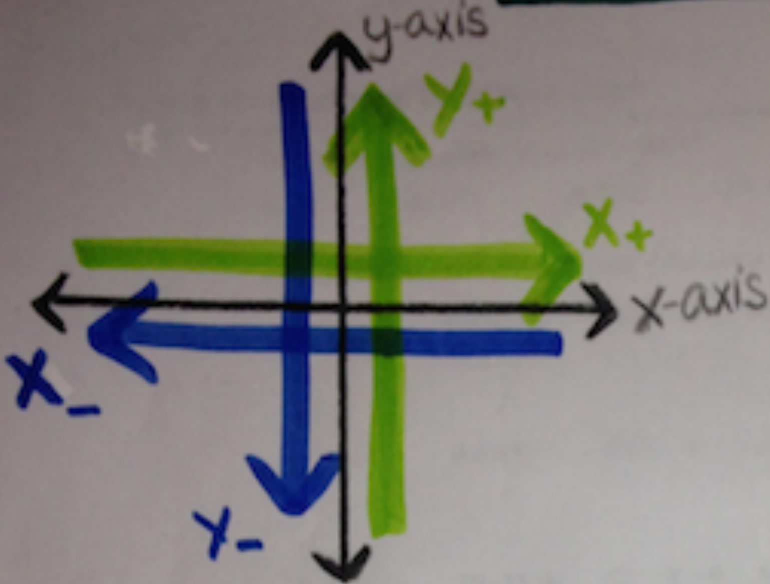
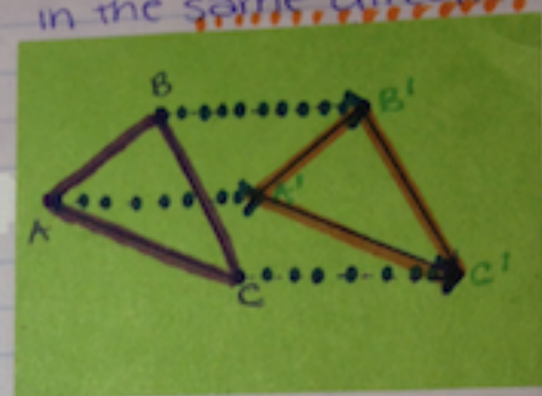
7.1

Translations



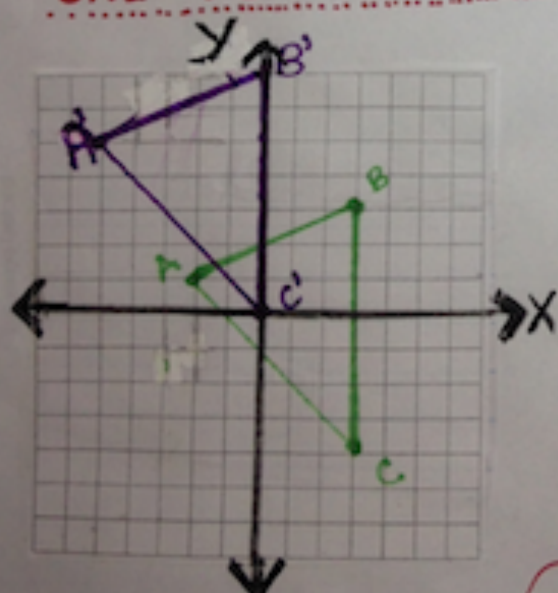
A translation moves all points of a figure the same distance in the same direction



*Example 1

Translate the original figure ΔABC to the left 3 units & up 4 units. ΔA'B'C' is the image → *new* translated image ... the *pre-image* is the original figure.

ONE POINT AT A TIME



Rule:

coordinate notation → coordinate in terms of changes made to x+y

$(x,y) \rightarrow (x-3, y+4)$

$A(-2,1) \rightarrow (-2-3, 1+4) \rightarrow A'(-5,5)$

$B(3,3) \rightarrow (3-3, 3+4) \rightarrow B'(0,7)$

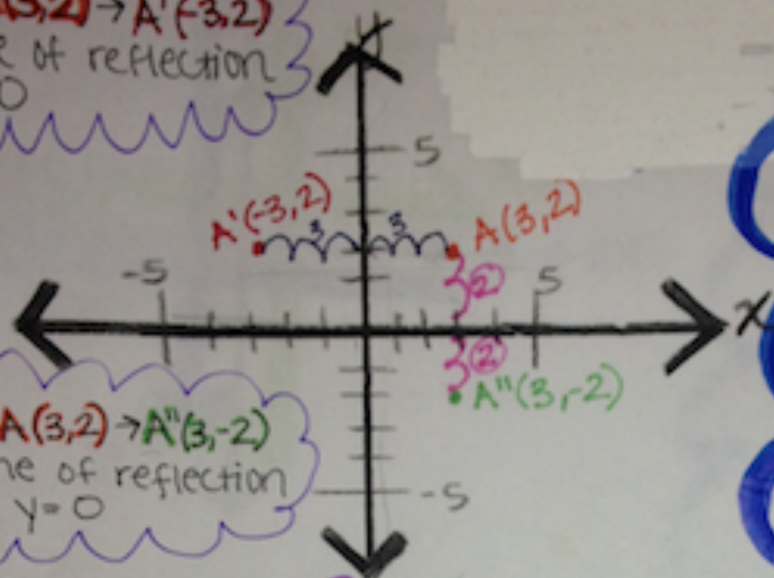
$C(3,-4) \rightarrow (3-3, -4+4) \rightarrow C'(0,0)$

Representing translation in coordinate plane

pre-image	image
(x,y)	$(x+a, y+b)$ Translation a units horizontally & b units vertically.

Reflections

From A(3,2) → A'(-3,2)
the line of reflection
is x=0



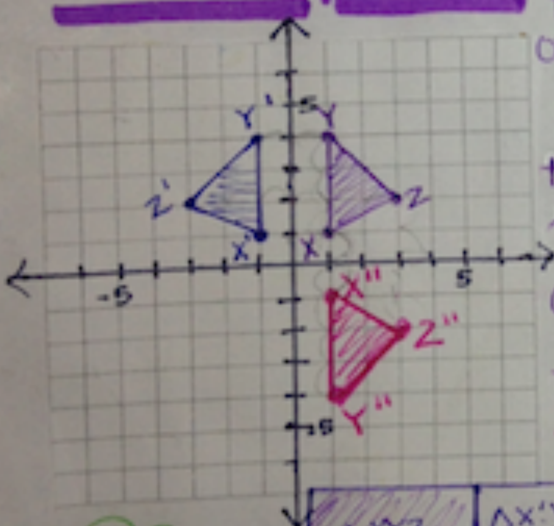
From A(3,2) → A''(3,-2)
the line of reflection
is y=0

A reflection flips a figure over a given line of reflection so that all of the corresponding points are the same distance from the line of reflection.

EQUAL DISTANCES

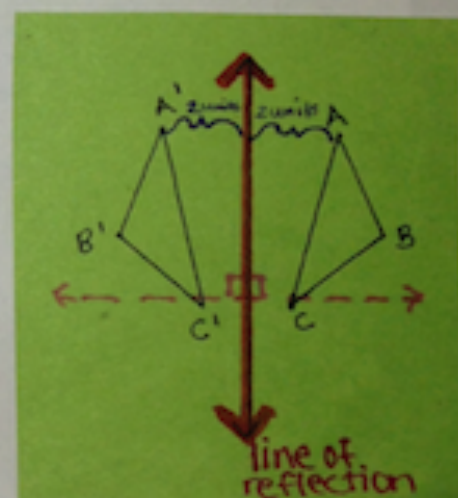
* perpendicular ⊥ distances* 90°

*Example 2



Reflect the original figure ΔXYZ over y-axis or x=0, name the new figure ΔX'Y'Z'.

Reflect ΔXYZ over the x-axis or y=0, name the new figure ΔX''Y''Z''



What do you notice?

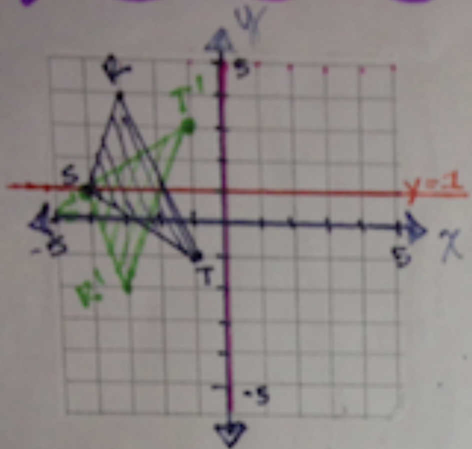
ΔXYZ original	ΔX'Y'Z' reflected over x=0	ΔX''Y''Z'' reflected over y=0
X(1,1)	X'(-1,1)	X''(1,-1)
Y(1,4)	Y'(-1,4)	Y''(1,-4)
Z(3,2)	Z'(-3,2)	Z''(3,-2)

Looking only at point X,
what do you notice about the coordinates X→X'?

what do you notice about the coordinates X→X''?

Reflections cont.

EXAMPLE 3



Reflect $\triangle RST$ over the line $y=1$

Preimage $\triangle RST$ (x,y)	IMAGE $\triangle R'S'T'$ (x,y)
R(-3,4)	R'(-3,-2)
S(-4,1)	S'(-4,1)
T(-1,-1)	T'(-1,3)

What do you notice?

Example 4:

Triangle KED has coordinates K(-3,3), E(3,-2) & D(-1,4). If $\triangle KED$ is reflected across the y-axis, what are the coordinates of $\triangle K'E'D'$?
FIND WITHOUT GRAPHING!!

Answer...

Rules:

X-axis (y=0)	$(x,y) \rightarrow (x,-y)$
y-axis (x=0)	$(x,y) \rightarrow (-x,y)$
Any horizontal line of reflection (y=n)	$(x,y) \rightarrow (x,2n-y)$
Any vertical line of reflection (x=n)	$(x,y) \rightarrow (2n-x,y)$

Generalizing Patterns

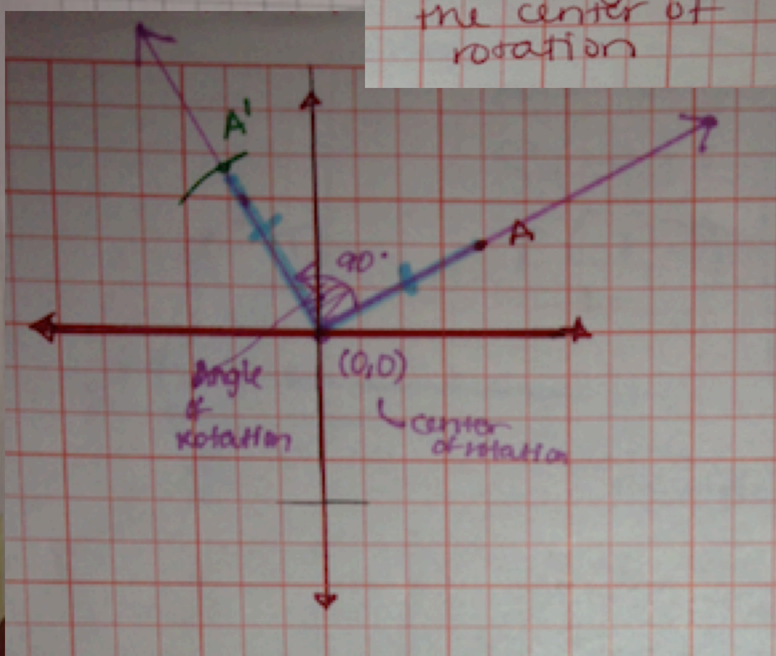
When reflecting across a vertical line ↕, only change the x-value to preserve the distance from each point to the line of symmetry... y stays the same.

When reflecting across a horizontal line ↔, only change the y-value to preserve the distance from each point to the line of symmetry. x-value stays the same.

7.1 ROTATIONS

Example 4:

Rotate A counterclockwise 90° using the origin as the center of rotation



A rotation is a transformation where a figure is rotated about a fixed point, called the center of rotation.

Rays drawn from the center of rotation to a point on the figure & the corresponding point on the image form the angle of rotation.

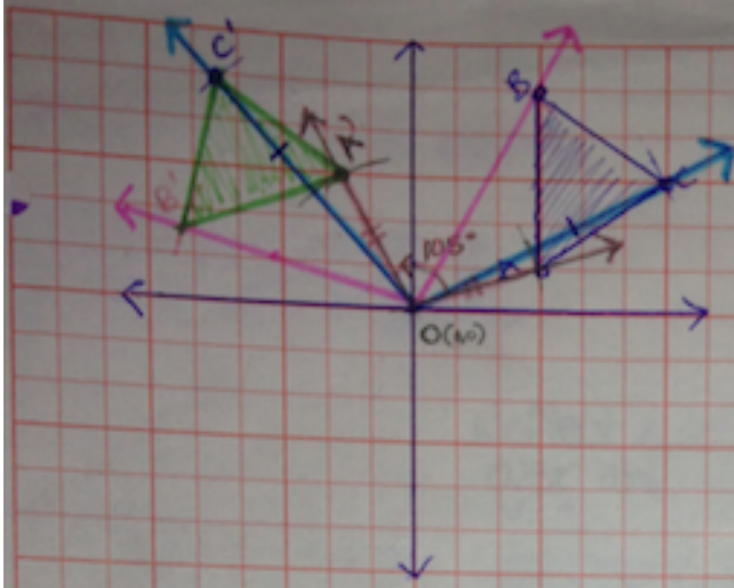
A figure can be rotated in the clockwise or counterclockwise direction.

Generalizing Patterns

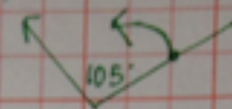
original point	coordinates after a 90° counterclockwise rotation about the origin (0,0)	coordinates after a 180° counterclockwise rotation about the origin (0,0)	coordinates after a 270° counterclockwise rotation about the origin (0,0)	coordinates after a 360° counterclockwise rotation about the origin (0,0)
(x,y)	(-y,x)	(-x,-y)	(y,-x)	(x,y)
original point	coordinates after a 90° clockwise rotation about the origin (0,0)	coordinates after a 180° clockwise rotation about the origin (0,0)	coordinates after a 270° clockwise rotation about the origin	coordinates after a 360° clockwise rotation about the origin (0,0)
(x,y)	(y,-x)	(-x,-y)	(-y,x)	(x,y)

STEPS FOR PERFORMING ROTATION USING A COMPASS

...counterclockwise about the 2) translation: 4 units right and 1 unit down



Rotate △ABC
105° counterclockwise



using the origin (0,0) as your center of rotation.

△ABC
A(3,1)
B(3,5)
C(6,3)

1) Draw a ray from the origin through point A (3,1)

2) Place protractor on the ray w/ the center @ the origin & measure a 105° angle in the counter-clockwise direction

Make a tic mark @ the 105° mark & connect a ray from the origin through this point.

3) Place compass on the ray you made $\overrightarrow{OA}$ w/ the center on the origin. Use the slider to measure open to point A.

4) w/o moving slider, or the center of the compass, swing compass so it intersects the ray measuring the 105° angle & make an arc. Label the intersection A'.

5) Repeat steps #1-4 for B→B' & C→C'

Homework: Skills Practice Lesson 7.1 (all)

Warm-up
coordinate $\cong \Delta$s
7.2

Check for Students' Understanding

The coordinates of a pre-image are as follows.

$A(0, 0)$ $B(13, 0)$ $C(13, 4)$ $D(4, 4)$

Consider the coordinates of each image listed below and describe the transformation.

1. $A'(0, -7)$ $B'(13, -7)$ $C'(13, -3)$ $D'(4, -3)$

2. $A'(0, 0)$ $B'(13, 0)$ $C'(13, -4)$ $D'(4, -4)$

3. $A'(0, 0)$ $B'(-13, 0)$ $C'(-13, -4)$ $D'(-4, -4)$

4. Did you have to graph the pre-image and image to describe the transformation? Explain your reasoning.