

# Geometry Unit 7: Congruence transformations

Bronx Early College Academy

Christopher J. Huson PhD

17 January 2023 - 10 February 2023

7.1 Translation	17 January
7.2 Reflection	18 January
7.3 Rotation	20 January
7.4 Composition	23 January
7.5 Composition review	1 February
7.6 Using technology for transformations	3 February
7.7 Transformations “onto,” symmetry	6 February
7.8 Line of symmetry	7 February

# Learning Target: I can slide a figure

HSG.CO.A.5 Congruence transformations

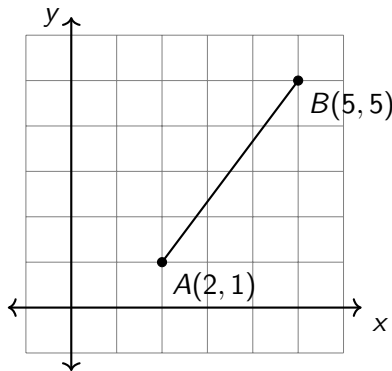
7.1 Tuesday 17 January

Do Now

1. Review your Jump rope grades
2. Find the rise and run of the line segment  $\overline{AB}$ .

Lesson: Translation, classwork practice

Homework: Complete the classwork practice



# Translation

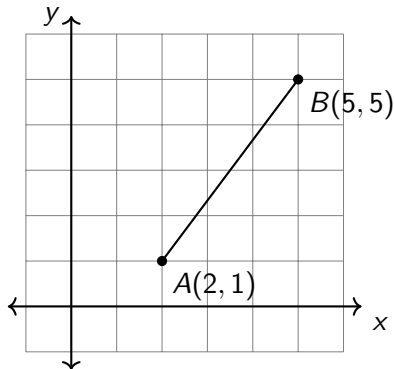
Rise is plus 4, run is plus 3.

$$A(2, 1) \rightarrow B(5, 5)$$

**Translate** Move a figure horizontally and vertically (slide)

**Vector** A quantity with both magnitude and direction

$$\overrightarrow{AB} = (3, 4)$$



## Example: Translate point $A$ up two units and right four units

Notation for translation:

$$\overrightarrow{AA'} = (+4, +2)$$

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

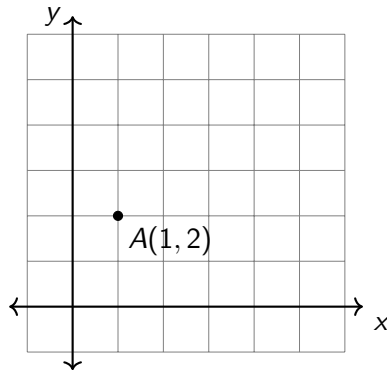
$$T_{+4, +2}$$

**Pre-image** The original figure

**Image** The result of a transformation

→ We say the  $A$  is *mapped* to  $A'$ .

**Prime** The prime symbol is used to denote the image ( $A'$ )



Translate  $\triangle ABC$  right one unit and up three units  $T_{+1,+3}$

$$(x, y) \rightarrow (x + 1, y + 3)$$

$$A(1, 1) \rightarrow$$

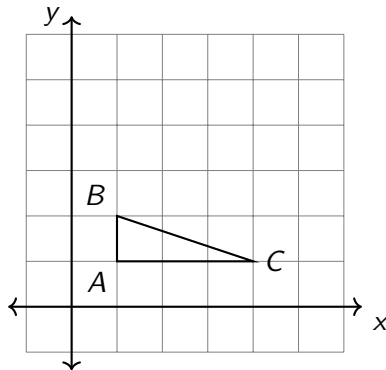
$$B(1, 2) \rightarrow$$

$$C(4, 1) \rightarrow$$

**Rigid motion** Move without changing the shape or size (isometry)

**Congruent** Figures with the same size and shape

**Invariant** Does not change (lengths, angles, area, perimeter)



# Learning Target: I can reflect a figure

HSG.CO.A.5 Congruence transformations

7.2 Wednesday 18 January

Do Now: Find the lengths of the sides of  $\triangle ABC$ .

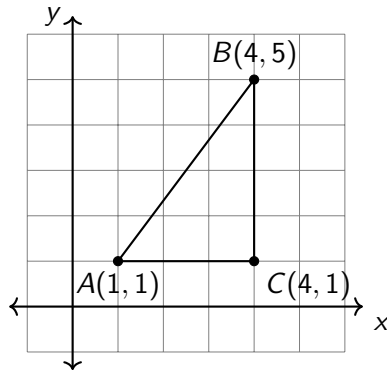
$AC =$

$BC =$

$AB =$

Lesson: Reflection, classwork practice

Homework: Complete classwork, Deltamath assignment



# Reflect or flip an object across the $y$ -axis

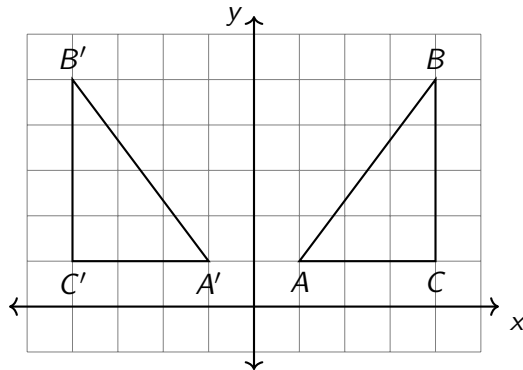
Reflection is a rigid motion.

$$\triangle ABC \rightarrow \triangle A'B'C'$$

**Reflection** A transformation that flips an object across a line

**Line of reflection** The line across which the object is flipped

**Correspond** Parts that map to each other  
 $A$  corresponds to  $A'$ .





# Learning Target: I can rotate a figure

HSG.CO.A.5 Congruence transformations

7.3 Friday 20 January

Do Now: Find the angle measures of right  $\triangle ABC$ .

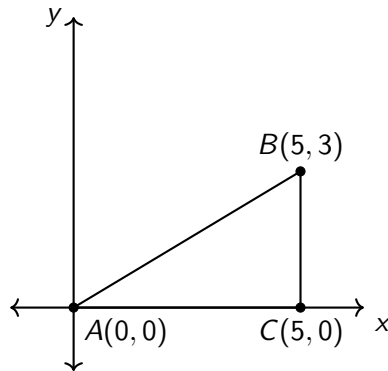
$$m\angle A = 30^\circ$$

$$m\angle B =$$

$$m\angle C =$$

Lesson: Rotation, classwork practice

Homework: Complete classwork, Deltamath assignment



# Learning Target: I can employ multiple rigid motions

HSG.CO.A.5 Congruence transformations

7.4 Monday 23 January

Do Now: Rotate  $\triangle ABC$  counterclockwise  $90^\circ$  around the origin.

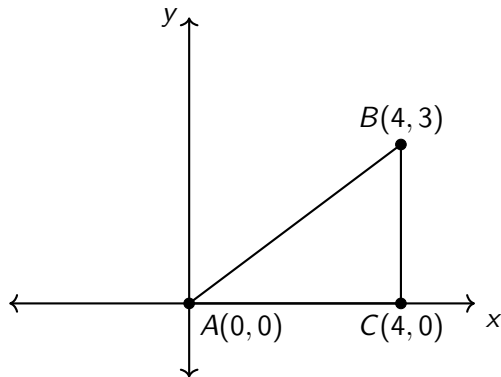
$A(0, 0) \rightarrow$

$B(4, 3) \rightarrow$

$C(4, 0) \rightarrow$

Lesson: Composition of transformations,  
mixed practice

Homework: Complete classwork, Deltamath  
assignment



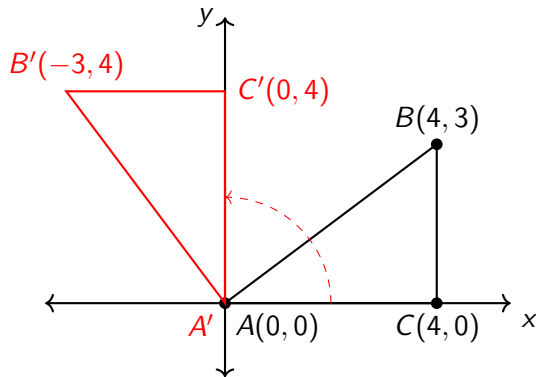
Solution: Rotate  $\triangle ABC$  counterclockwise  $90^\circ$  around the origin.

$$A(0,0) \rightarrow A'(0,0)$$

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

$$C(4,0) \rightarrow C'(0,4)$$

Check for understanding: What is the measure of angle  $\angle CAC'$ ?



## A *composition* is multiple transformations, one after the other

Example: Translate  $\triangle ABC$  to the right 5 units then reflect it over the  $x$ -axis.

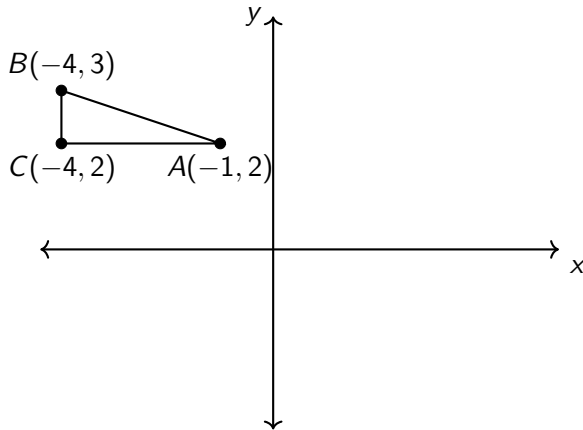
$$T_{+5,0}$$

*reflect<sub>x-axis</sub>*

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

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

$$C(-4, 2) \rightarrow$$



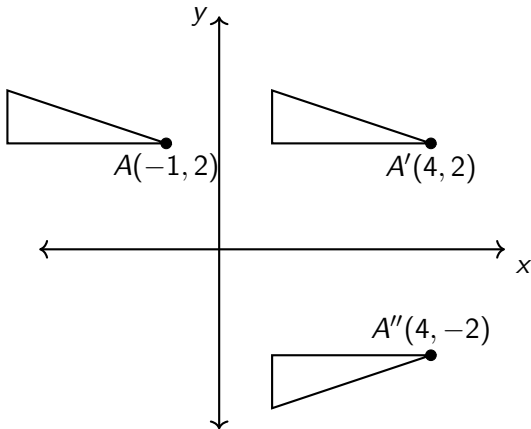
Translate  $\triangle ABC$  to the right 5 units then reflect it over the  $x$ -axis.

$T_{+5,0}$        $reflect_{x-axis}$

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

$$B(-4, 3) \rightarrow B'(1, 3) \rightarrow B''(1, -3)$$

$$C(-4, 2) \rightarrow C'(1, 2) \rightarrow C''(1, -2)$$



# Learning Target: I can employ multiple rigid motions

HSG.CO.A.5 Congruence transformations

7.5 Wednesday 1 February

Do Now: Slide  $\triangle ABC$  to the left three and up two.

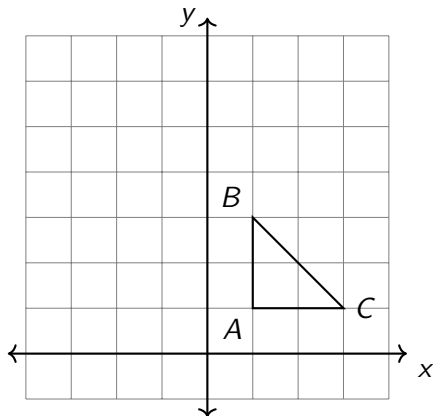
$$A(1, 1) \rightarrow$$

$$B(1, 3) \rightarrow$$

$$C(3, 1) \rightarrow$$

Lesson: Composition of transformations,  
mixed practice

Homework: Complete classwork, Deltamath  
assignment



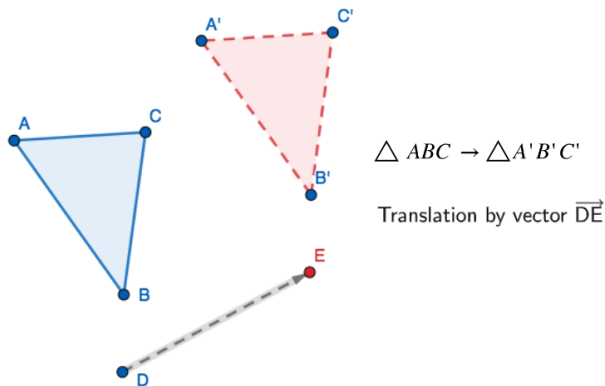
# Learning Target: I can record a transformation using geogebra

HSG.CO.A.5 Congruence transformations

7.6 Friday 3 February

Do Now: Open the attached slide document and edit your name

Lesson: Use geogebra to perform a translation, reflection, and rotation



# Learning Target: I can recognize symmetry

HSG.CO.A.5 Congruence transformations

7.7 Monday 6 February

Do Now: Reflect the  $\triangle$  across the  $y$ -axis.

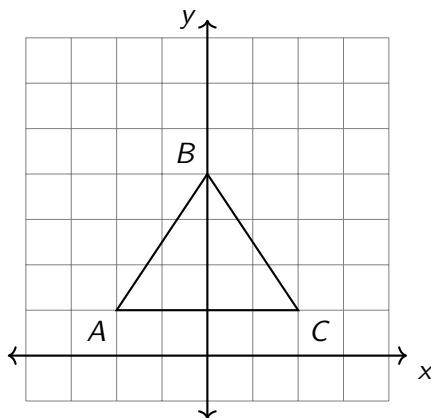
$$A(-2, 1) \rightarrow$$

$$B(0, 4) \rightarrow$$

$$C(2, 1) \rightarrow$$

Lesson: Transformations "onto," symmetry

Homework: Complete classwork, Deltamath assignment





## Learning Target: I can recognize symmetry

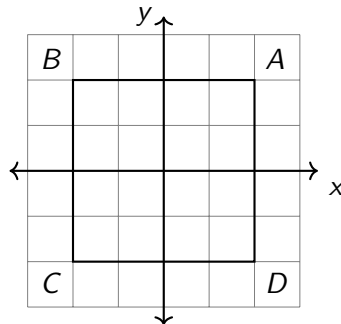
Rotate the square  $90^\circ$  counterclockwise around its center.

**onto** When the image of a figure is congruent to the original figure

**symmetry** When a figure is invariant under a transformation

**bilateral symmetry** When a figure is the same after a reflection across its mid-line

**radial symmetry** A shape is the same after a rotation around its center



# Learning Target: I can construct a line of symmetry using Geogebra

HSG.CO.A.5 Congruence transformations

7.8 Tuesday 7 February

Do Now Pre-Quiz: Deltamath practice test  
(20 minutes max).

Folder check: 7.7 Problem set complete?

Lesson: Geogebra line of symmetry

Homework: Complete transformations slides

*line of symmetry*

