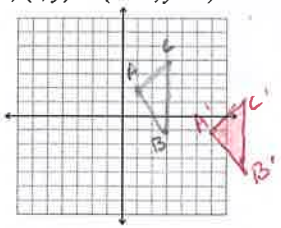
Chapter 4 Study Guide

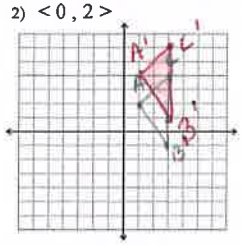
4.1 Translations

Graph ΔABC with vertices $A(1, 2)$, $B(3, -1)$, and $C(3, 4)$ and its image after the translation.

1) $(x, y) \rightarrow (x + 5, y - 3)$

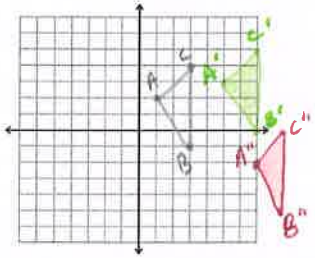


2) $< 0 , 2 >$



Graph ΔABC and its image after the composition.

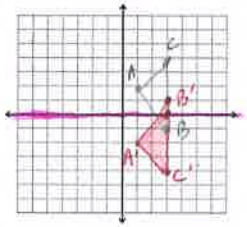
3) Translation: $(x, y) \rightarrow (x + 4, y + 1)$
Translation: $(x, y) \rightarrow (x + 2, y - 5)$



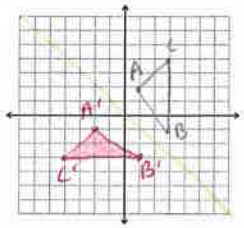
4.2 Reflections

Graph ΔABC with vertices $A(1, 2)$, $B(3, -1)$, and $C(3, 4)$ and its image after the reflection over the given line.

1) in the x-axis

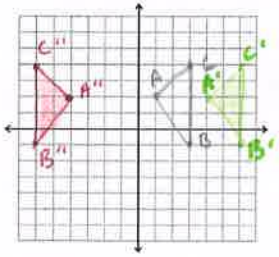


2) $y = -x$



Graph ΔABC and its image after the composition.

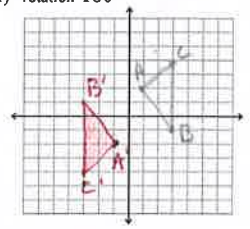
3. Translation: $(x, y) \rightarrow (x + 3, y)$
Reflection: in y-axis



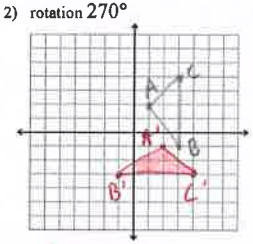
4.3 Rotations

Graph ΔABC with vertices $A(1, 2)$, $B(3, -1)$, and $C(3, 4)$ and its image after the rotation.

1) rotation $180°$

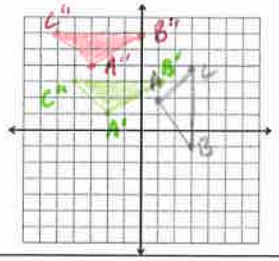


2) rotation $270°$



Graph ΔABC and its image after the composition.

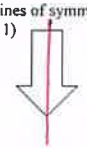
3) Rotate: $90°$ about the origin
Translation: $(x, y) \rightarrow (x - 1, y + 3)$



4.2 & 4.3 Symmetry

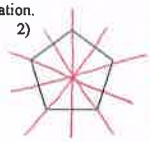
Determine whether the object has reflectional symmetry and whether it has rotational symmetry. Identify all lines of symmetry and angles of rotation.

1)



1 line
no rotational

2)



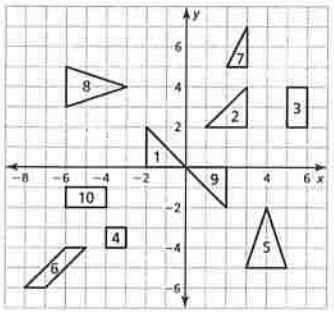
5 lines
72° (4+4) rotational

3)

no lines
180° rotational

4.4 Congruence & Transformations

1) Identify all congruent figures in the coordinate plane.
Use transformations to explain your reasoning.



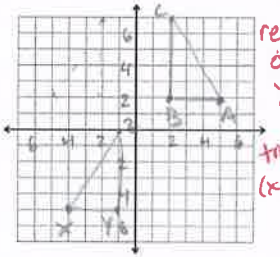
$\Delta 3 \rightarrow \Delta 10$
rotation 90°
translate $(x, y) \rightarrow (x - 1, y - 4)$

$\Delta 1 \rightarrow \Delta 2$
reflection y-axis
translate $(x, y) \rightarrow (x + 2, y + 2)$

$\Delta 5 \rightarrow \Delta 8$
rotate 90°
reflect y-axis
translation $(x, y) \rightarrow (x - 1, y)$

$\Delta 1 \rightarrow \Delta 9$
rotation of 180°

2) Describe a congruence transformation that maps ΔABC to ΔXYZ.
$A(5, 2)$, $B(2, 2)$, $C(2, 7)$ and $X(-4, -5)$, $Y(-1, -5)$, $Z(-1, 0)$



reflect on y-axis
translate $(x, y) \rightarrow (x + 1, y - 7)$

3) If you perform two reflections over intersecting lines that are 36° apart, what is the angle of rotation for the figure?

72°

Chapter 4 Study Guide

Geometry

4.1 Translations

"sliding" or "moving" the figure

(right or left, up or down)

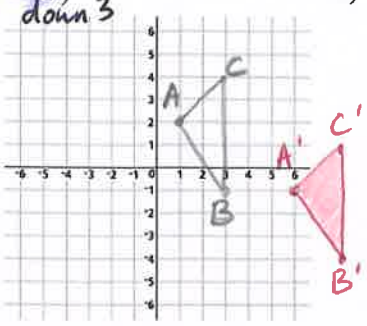
Graph ΔABC with vertices $A(1, 2)$, $B(3, -1)$, and $C(3,4)$ and its image after the translation.

1) $(x, y) \rightarrow (x + 5, y - 3)$ right 5, down 3

$A'(6, -1)$

$B'(8, -4)$

$C'(8, 1)$

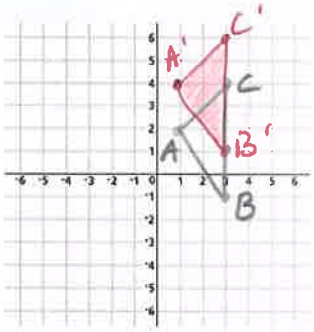


2) $\langle 0, 2 \rangle$ up 2

$A'(1, 4)$

$B'(3, 1)$

$C'(3, 6)$



A = original / pre-image

Graph ΔABC and its image after the composition.

3) Translation: $(x, y) \rightarrow (x + 4, y + 1)$ right 4, up 1

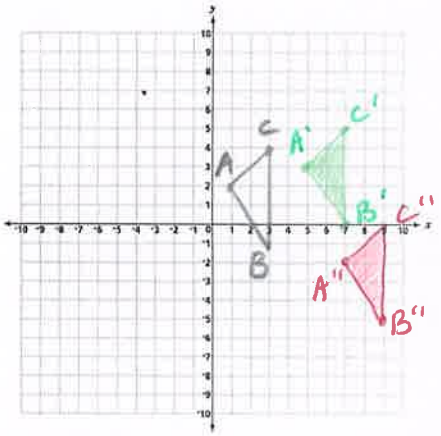
A' = first transformation

$A'(5, 3)$ $B'(7, 0)$ $C'(7, 5)$

Translation: $(x, y) \rightarrow (x + 2, y - 5)$ right 2, down 5

A'' = second transformation

$A''(7, -2)$ $B''(9, -5)$ $C''(9, 0)$



4.2 Reflections

"flip" or "mirror" the figure

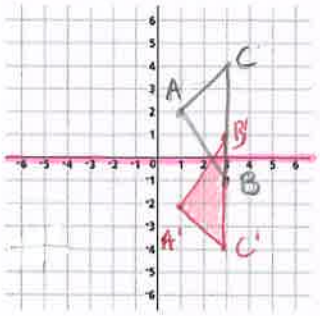
Graph ΔABC with vertices $A(1, 2)$, $B(3, -1)$, and $C(3,4)$ and its image after the reflection in the given line.

1) x-axis

$A'(1, -2)$

$B'(3, 1)$

$C'(3, -4)$

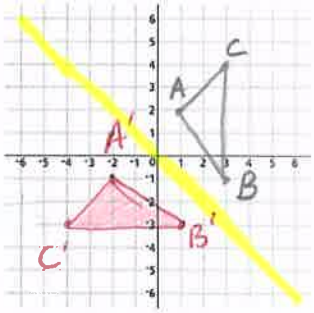


2) $y = -x$

$A'(-2, -1)$

$B'(1, -3)$

$C'(-4, -3)$



Rules for (a, b)

x-axis → $(a, -b)$

y-axis → $(-a, b)$

$y = x$ → (b, a)

$y = -x$ → $(-b, -a)$

Graph ΔABC and its image after the composition.

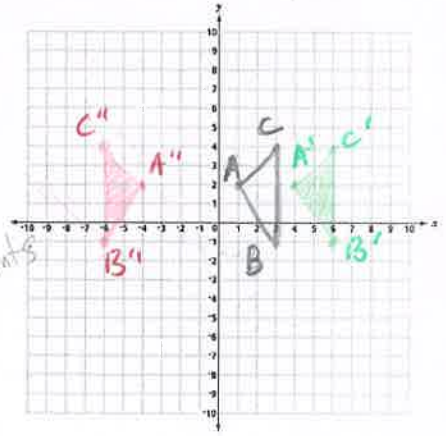
3) Translation: $(x, y) \rightarrow (x + 3, y)$ right 3

$A'(4, 2)$ $B'(6, -1)$ $C'(6, 4)$

Reflection: in y-axis

$A'(-4, 2)$ $B'(-6, -1)$ $C'(-6, 4)$

always off the last points



4.3 Rotations

"turn" the figure around a point...
- usually the origin
- in a counter-clockwise direction.

Rules for (a, b)

90° → $(-b, a)$

180° → $(-a, -b)$

270° → $(b, -a)$

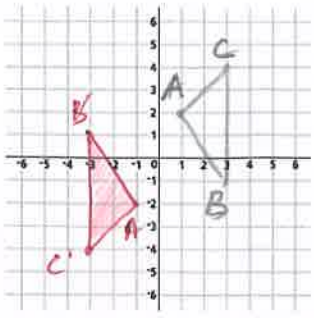
Graph ΔABC with vertices $A(1, 2)$, $B(3, -1)$, and $C(3,4)$ and its image after the a rotation of the given number of degrees about the origin.

1) 180°

$A'(-1, -2)$

$B'(-3, 1)$

$C'(-3, -4)$

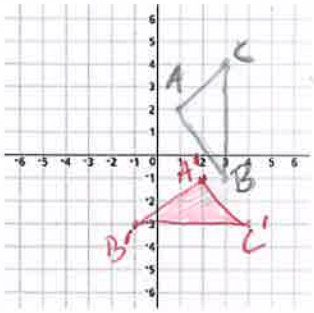


2) 270°

$A'(2, -1)$

$B'(-1, -3)$

$C'(4, -3)$



Graph ΔABC and its image after the composition.

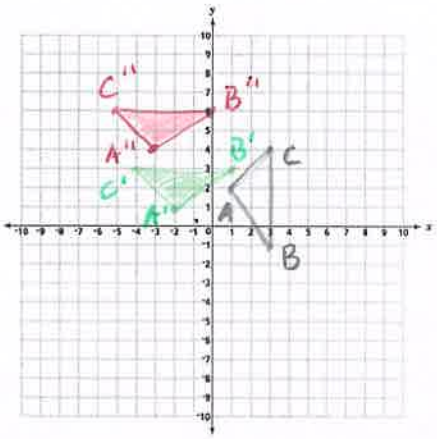
7) Rotate: 90°

$A'(-2, 1)$ $B'(1, 3)$ $C'(-4, 3)$

Translation: $(x, y) \rightarrow (x - 1, y + 3)$

left 1 up 3

$A''(-3, 4)$ $B''(0, 6)$ $C''(-5, 6)$



4.2 & 4.3 Symmetry

Line Symmetry

divides objects into two identical parts

Rotational Symmetry

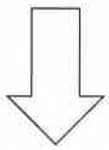
when you can spin an object at the center and get the same thing

* 180° or less

Determine whether the object has reflectional symmetry and whether it has rotational symmetry. Identify all lines of symmetry and angles of rotation.

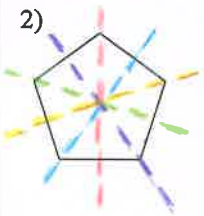
1)

1 line of symmetry

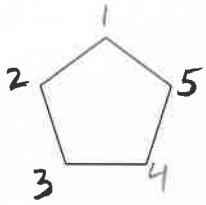


no rotational symmetry

2)



5 lines of symmetry

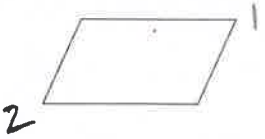


rotational symmetry at 72°, 144°, 216°, 288°, 360°

$\frac{360}{5} =$ every 72

3)

No lines of symmetry



rotational symmetry at 180°

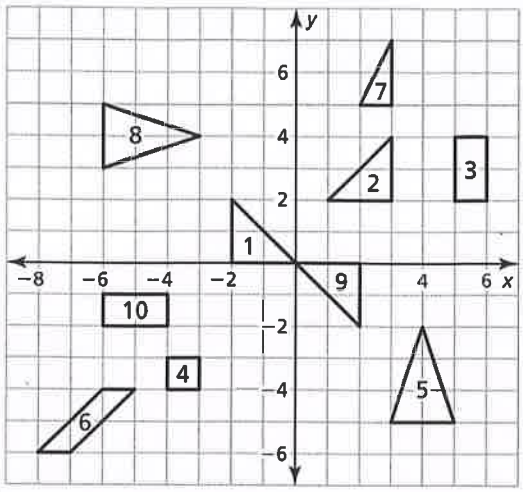
$\frac{360}{2} =$ every 180

4.4 Congruence & Transformations

Congruent

when two objects are the same
- shape
- size/length
- angles

1) Identify all congruent figures in the coordinate plane. Use transformations to explain your reasoning.



Δ1 → Δ2
Reflection on y-axis
Translate $(x, y) \rightarrow (x+2, y+2)$

Δ1 → Δ9
Rotation of 180°

□3 → □10
Rotation of 90°
Translation $(x, y) \rightarrow (x-1, y-4)$

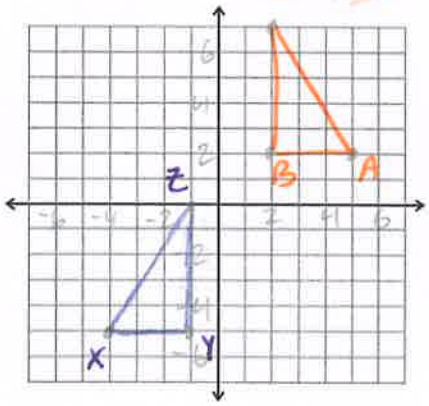
Δ5 → Δ8
Rotation of 90°
Reflect on y-axis
Translation $(x, y) \rightarrow (x-1, y)$

Two Intersecting Lines

If lines are x° apart,
Then the image is 2x° apart

2) Describe a congruence transformation that maps ΔABC to ΔXYZ.

$A(5, 2), B(2, 2), C(2, 7)$ and $X(-4, -5), Y(-1, -5), Z(-1, 0)$



Reflect on y-axis
Translate $(x, y) \rightarrow (x+1, y-7)$
or
Translate $(x, y) \rightarrow (x, y-7)$
Reflect on $x = .5$

Two Parallel Lines

If the lines are x units away
Then the image is 2x units appart.

3) If you perform two reflections over intersecting lines that are 36° apart, what is the angle of rotation for the figure?

figure is 72° rotated