Name Key

MCC8.G.3 Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates.

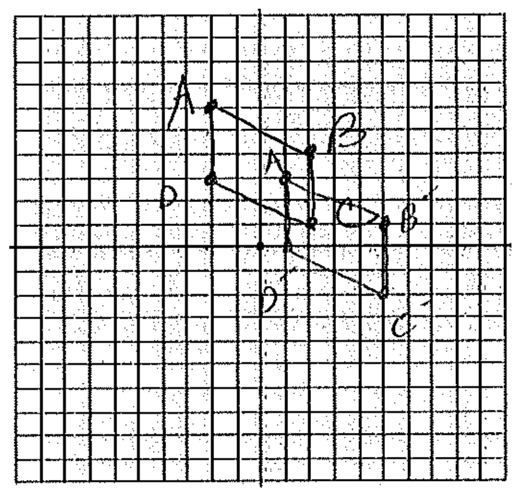
Image – The new figure produced from a transformation

Preimage – The original figure in the transformation

Isometry – A transformation that preserves length and angle measure

Example 1: Translations

Graph quadrilateral ABCD with vertices A(-2, 6), B(2, 4), C(2, 1), and D(-2, 3). Find the image of each vertex after the translation $(x, y) \rightarrow (x + 3, y - 3)$. Then graph the image using prime notation.



$(-2, 6) \rightarrow (1, 3)$

$(2, 4) \rightarrow (5, 1)$

$(2, 1) \rightarrow (5, -2)$

$(-2, 3) \rightarrow (1, 0)$

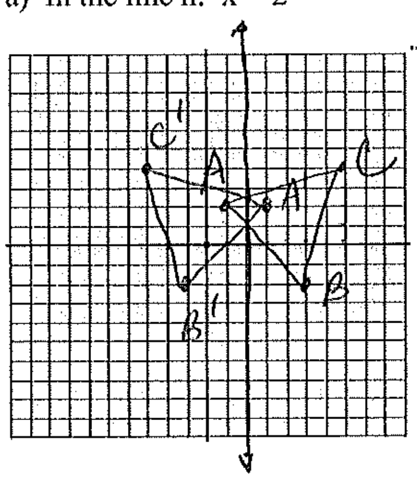
A translation is an isometry

Line of reflection – The mirror line is called the line of reflection

Example 2: Reflections

The vertices of Δ ABC are A(1, 2), B(5, -2), and C(7, 4). Graph the reflection of Δ ABC described.

a) In the line n: $x = 2$

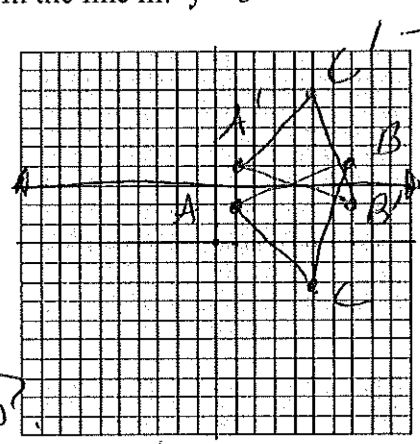


x	y
1	2
5	-2
7	4

x	y
3	2
-1	-2
-3	4

What happens?
x_1, x_2 are average of 2 y stays

b) In the line m: $y = 3$

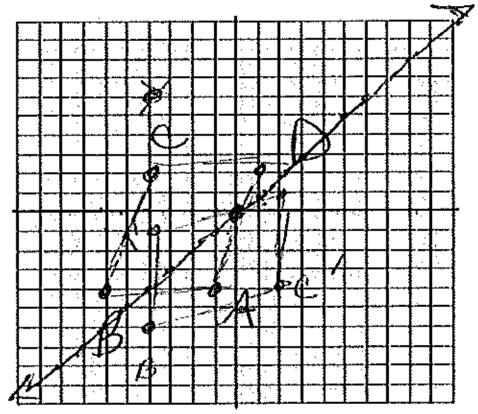


1	2
5	-2
7	4

1	4
5	8
7	2

What happens

Example 3
The vertices of quadrilateral ABCD are A(-1,-4) B (-6,-4) C(-4, 2) and D(1, 2).
Reflect the segment in the line y = x. Graph the segment and its image.

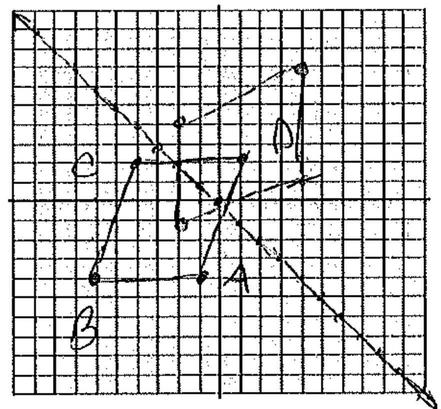


	x	y
A	-1	-4
B	-6	-4
C	-4	2
D	1	2

	x	y
A'	-4	-1
B'	-4	-6
C'	2	-4
D'	2	1

What happens?
x and y switch

Example 4
Reflect ABCD from Example 3 in the line y = -x.
Graph ABCD and its image.



What happens?

-1	-4
-6	-4
-4	2
1	2

x	y
4	1
4	6
-2	4
-2	-1

~~Thereom 9.2:~~ **Reflection Theorem - A reflection is an isometry**

Rotations

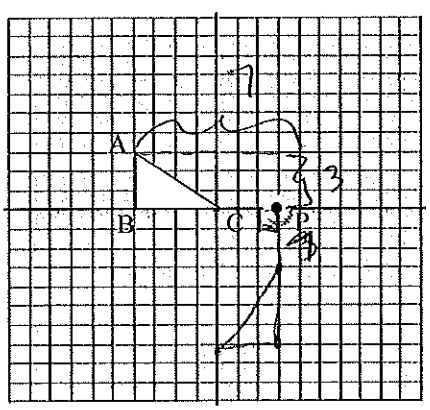
Center of rotation – The fixed point a preimage is rotated around

Angle of rotation – The amount of rotation from preimage to image

Example 5 counter clockwise
Draw a 90° rotation of Δ ABC about point ~~P~~ the origin

changed

(b, -a)



~~A' (0, -3)~~
~~B' (0, -7)~~
~~C' (-3, -7)~~

A (-7, 3)
B (-7, 0)
C (-3, 0)

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

Coordinate Rules for rotations about the origin

When a point (a, b) is rotated counterclockwise about the origin, the following are true:

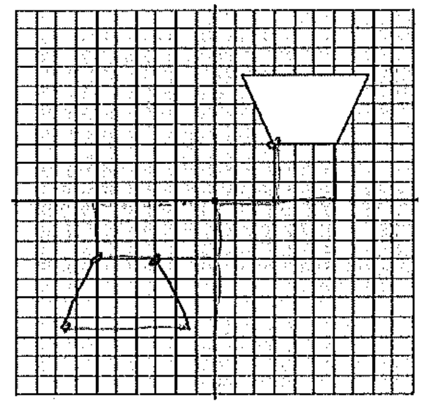
1. For a rotation of 90° $(a,b) \rightarrow (-b, a)$ or clockwise 90°
2. For a rotation of 180° $(a,b) \rightarrow (-a, -b)$ or clockwise 180°
3. For a rotation of 270° $(a,b) \rightarrow (b, -a)$ or clockwise 90°

Example 6

Rotate the quadrilateral ~~270°~~ 180° about the origin.

x	y
3	3
6	3
$7\frac{1}{2}$	$6\frac{1}{2}$
$1\frac{1}{2}$	$6\frac{1}{2}$

-3	-3
-6	-3
$-7\frac{1}{2}$	$-6\frac{1}{2}$
$-1\frac{1}{2}$	$-6\frac{1}{2}$



Theorem 9.3: Rotation Theorem - A rotation is an isometry

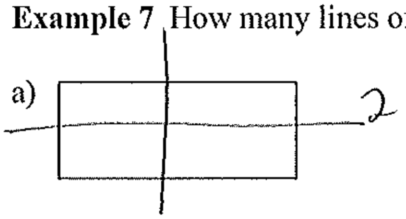
Line of Symmetry - The line of reflection

Rotational Symmetry- A that that can be mapped onto itself by a rotation of 180° or less

Center of Symmetry - Center of figure

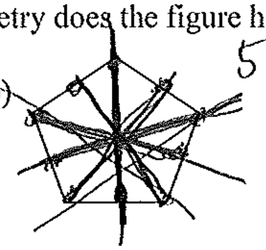
Example 7 How many lines of symmetry does the figure have?

a)



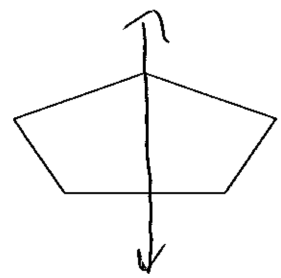
2

b)



5

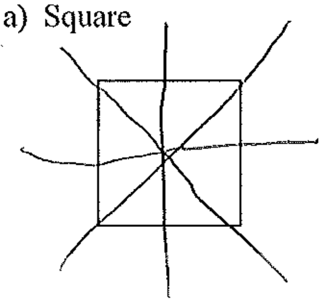
c)



1

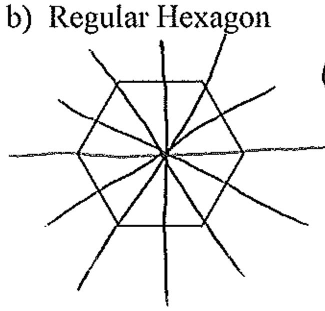
Example 8 Does the figure have rotational symmetry?

a) Square



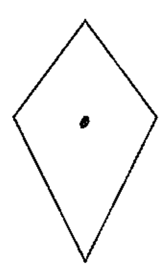
yes

b) Regular Hexagon



6

c) Kite



no