Module 4: Transformations

Sunday, December 11, 2022 4:28 PM

Module 4 Notes

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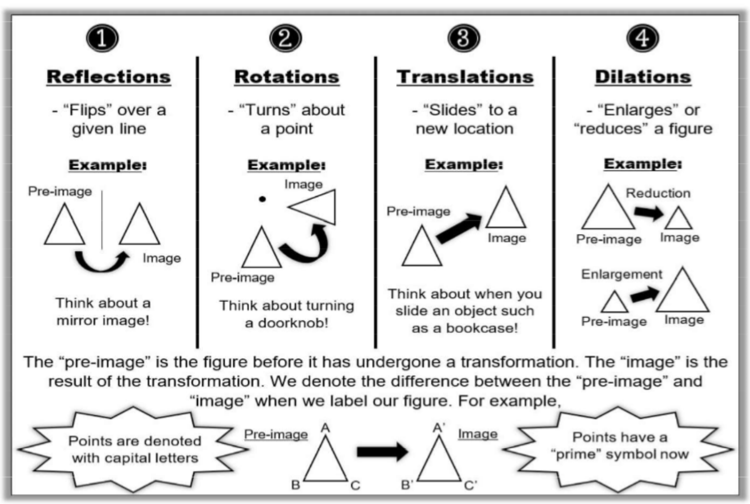
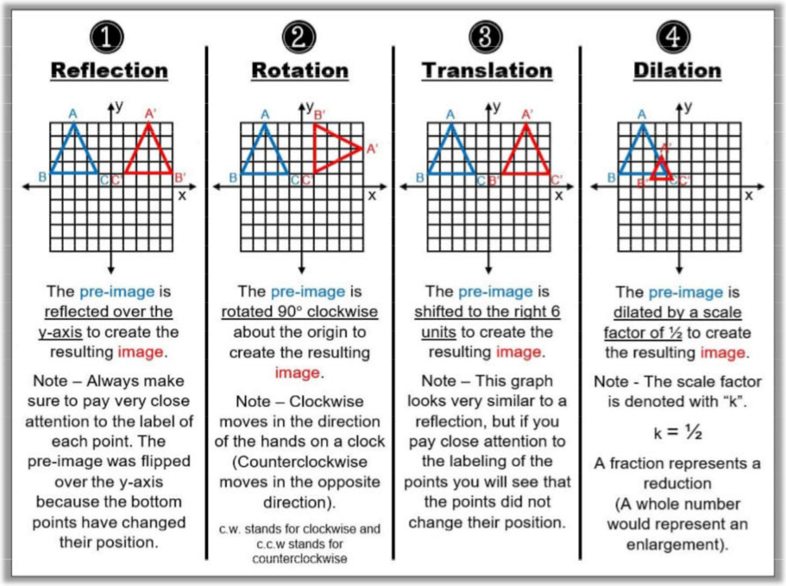




1

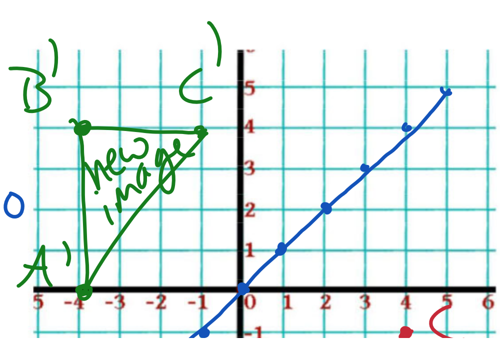
Reflection

Draw the pre-image then reflect ΔABC over the line y = x.

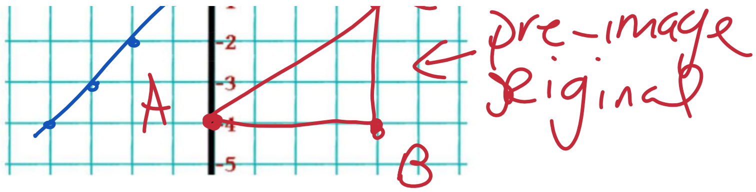
y=1x+0

Pre-Image Coordinates:

A(0,-4)



B(4,-4)
C(4,-1)



❷ Rotation

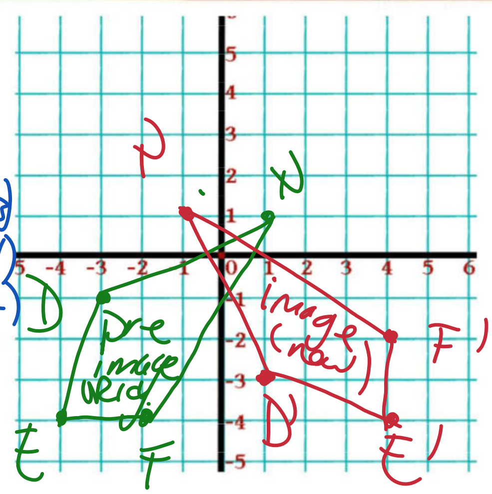
Draw the pre-image then rotate ΔDEF 90° c.c.w.

$-y, x$

Counterclockwise Rotation	Clockwise Rotation	Coordinate Rule
90° counterclockwise	270° clockwise	$(x, y) \rightarrow (-y, x)$
180° counterclockwise	180° clockwise	$(x, y) \rightarrow (-x, -y)$
270° counterclockwise	90° clockwise	$(x, y) \rightarrow (y, -x)$

Pre-Image Coordinates:

D(-3,-1) (+1, -3)
E(-4,-4) (+4, -4)
F(-2,-4) (+4, -2)
N(1,1) (-1, 1)



❸

Translation

Draw the pre-image then translate KLMN 3 units to the left and 5 units down.

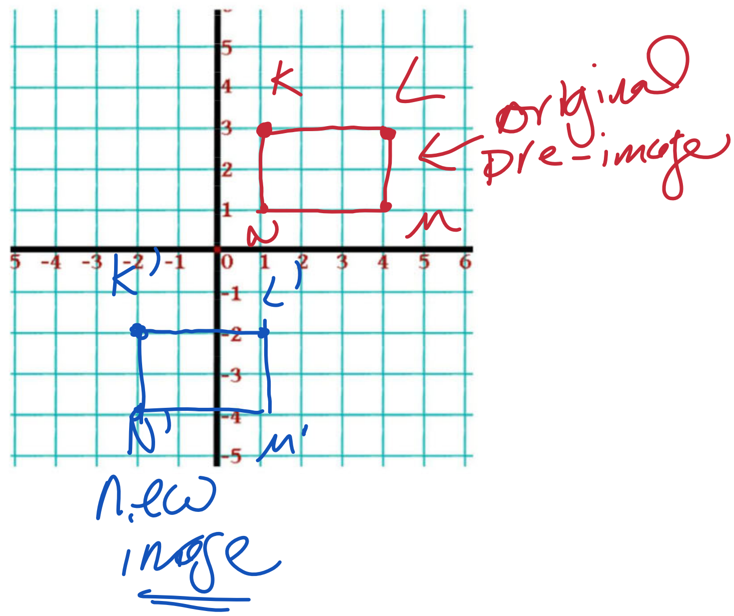
Pre-Image Coordinates:

K(1,3)

L(4,3)

M(4,1)

N(1,1)



4

Dilation

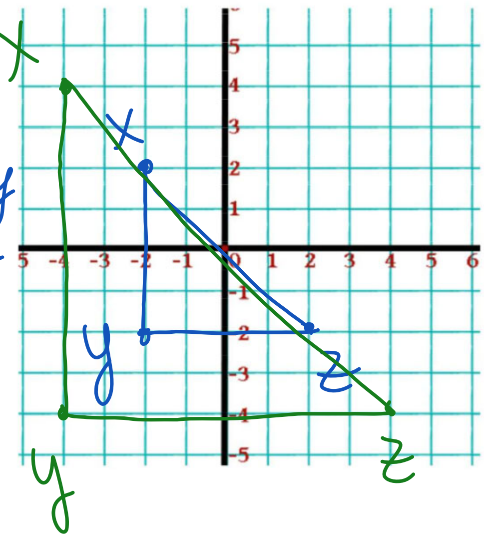
Draw the pre-image then dilate ΔXYZ by a scale factor of 2.

multiply by 2

Pre-Image Coordinates:

X(-2,2)
Y(-2,-2)
Z(2,-2)

(-4,4)
(-4,-4)
(4,-4)



#5 **Graph each figure with the given vertices and its image after the indicated glide reflection.**

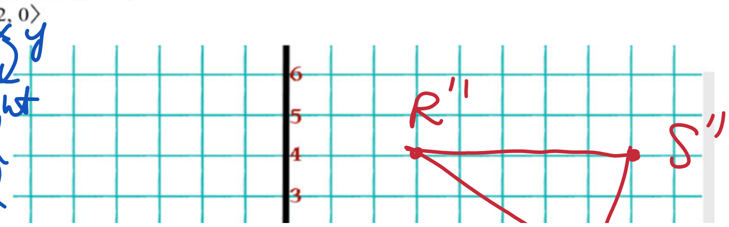
$\triangle RST$: $R(1, -4)$, $S(6, -4)$, $T(5, -1)$

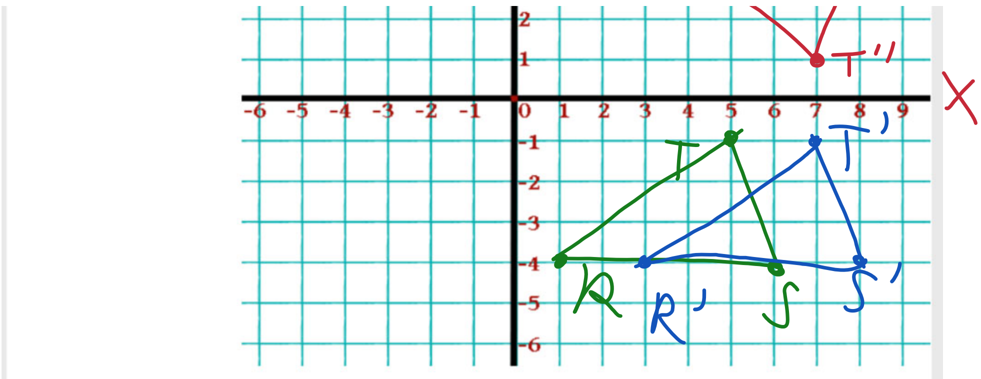
Translation: along $\langle 2, 0\rangle$

Reflection: in x-axis

x y

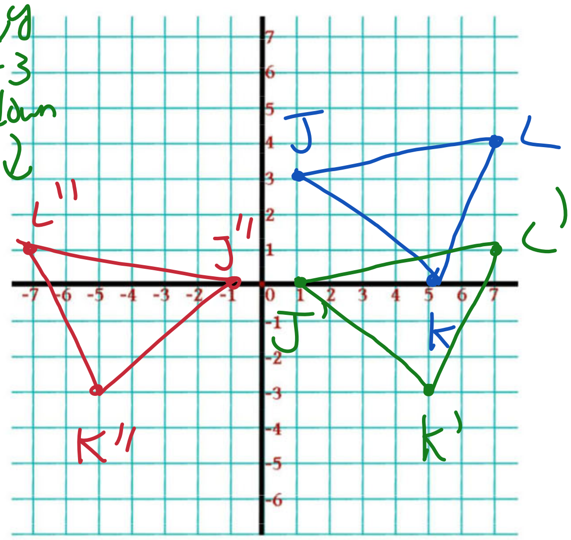
Right 2





#6 $\triangle JKL$: $J(1, 3)$, $K(5, 0)$, $L(7, 4)$
Translation: along $\langle 0, -3 \rangle$
Reflection: in y-axis

y
−3
down
x
no



#7 $\overline{WX}$: $W(-4, 6)$ and $X(-4, 1)$
Reflection: in x-axis
Rotation: 90° about origin

$(-y, x)$

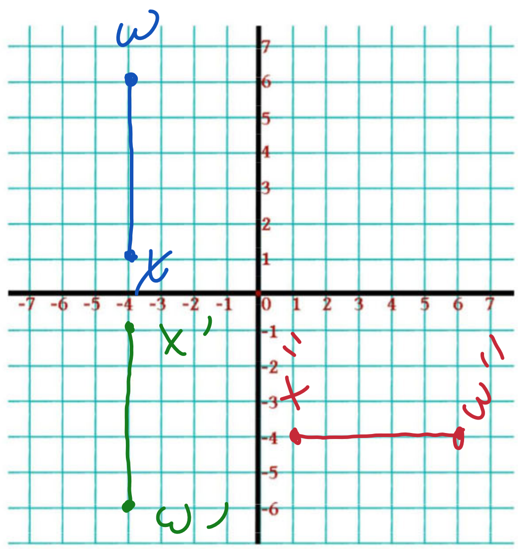
$X'(-4, -1)$

$X''(+1, -4)$

$W'(-4, -6)$

$W''(+6, -4)$

X



#8 $\overline{FG}$: $F(1, 1)$ and $G(6, 7)$
Reflection: in x-axis
Rotation: 180° about origin

G''

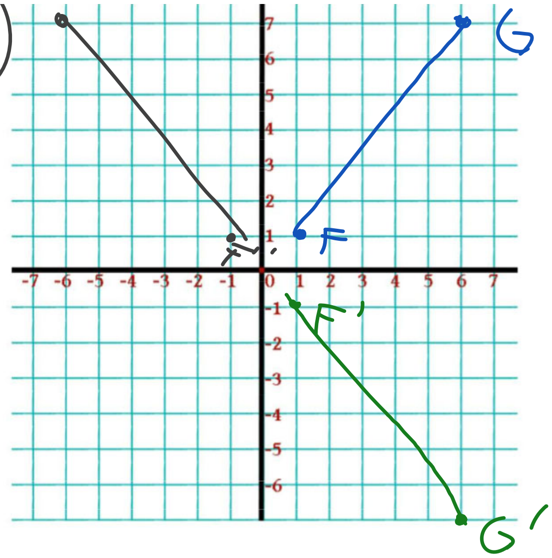
$(-x, -y)$

$F'(1, -1)$

$F''(-1, 1)$ X

$G'(6, -7)$

$G''(-6, 7)$



#9

$\overline{RS}$: $R(2, -1)$ and $S(6, -5)$

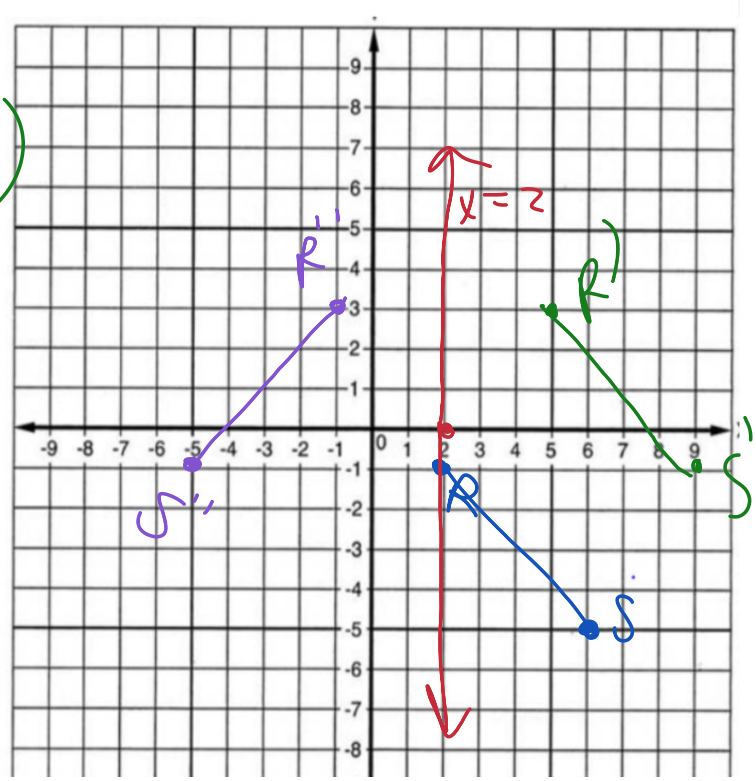
Translation: along $\langle 3, 4 \rangle$

Reflection: in $x = 2$

$(x+3, y+4)$

$\langle 3, 4 \rangle$

$\rightarrow 3 \quad \uparrow 4$



#10 270° counter clockwise rotation about the origin followed by a translation along $\langle 2, -2 \rangle$

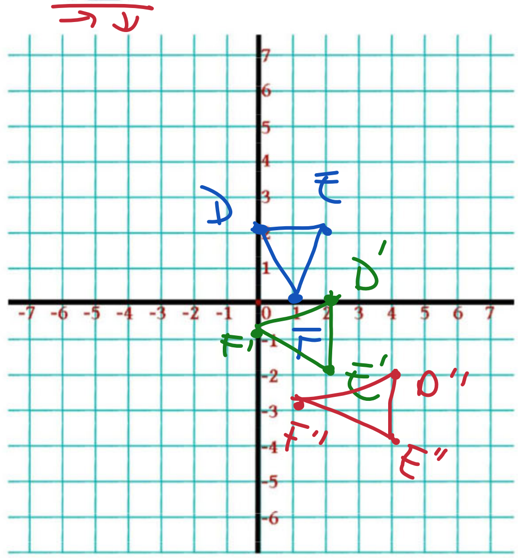
D: (0,2), E: (2,2), F (1,0)

$y, -x$

$D'(2,0)$

$E'(2,-2)$

$F'(0,-1)$



#11 $\triangle MPQ$: $M(-4, 3)$, $P(-5, 8)$, $Q(-1, 6)$

Translation: along $\langle -4, -4 \rangle$

Reflection: in $y = x$

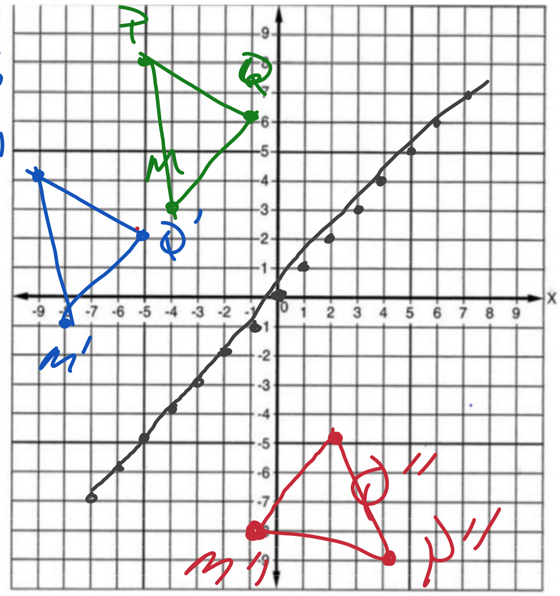
L D

← ↓

4 4

$y = mx + b$

$y = 1x + 0$



❶ **Reflections**	❷ **Rotations**	❸ **Translations**	❹ **Dilations**
$r_{x\text{-axis}}(x,y) = (x,-y)$	$R_{90cw}(x,y) = (y,-x)$	$T_{a,b}(x,y) = (x+a, y+b)$	$D_k(x,y) = (kx, ky)$
$r_{y\text{-axis}}(x,y) = (-x,y)$	$R_{90ccw}(x,y) = (-y,x)$	"a" moves left or right and "b" moves up or down	Scale factor = k
$r_{y=x}(x,y) = (y,x)$	$R_{180}(x,y) = (-x,-y)$		**Example:**
	Example:	**Example:**	Determine the

$r_{y=-x}(x,y) = (-y,-x)$

Example:

Determine the coordinates of ΔA'B'C' given that ΔABC is reflected over the y-axis:
A = (2,3), B = (-1,4), C = (3,-5)

Solution:

The rule needed is:
$r_{y\text{-axis}}(x,y) = (-x,y)$
I will take the "opposite" of the x-coordinate and keep the y-coordinate the same. Hence,
A = (2,3) → A' = (-2,3)
B = (-1,4) → B' = (1,4)
C = (3,-5) → C' = (-3,-5)

Example:

Determine the coordinates of ΔF'G'H' given that ΔFGH is rotated 90° c.c.w:
F = (4,-2), G = (-7,1), H = (1,0)

Solution:

The rule needed is:
$R_{90ccw}(x,y) = (-y,x)$
I will take the "opposite" of the y-coordinate and keep the x-coordinate the same, then SWITCH the position of the coordinates. Hence,
F = (4,-2) → F' = (2,4)
G = (-7,1) → G' = (-1,-7)
H = (1,0) → H' = (0,1)

Example:

Determine the coordinates of ΔX'Y'Z' given that ΔXYZ is shifted left 5 units and up 3 units:
X = (-4,-6), Y = (1,8), Z = (0,1)

Solution:

The rule is:
$T_{a,b}(x,y) = (x+a,y+b)$
$T_{-5,3}(x,y) = (x-5,y+3)$
I will subtract 5 from the x-coordinate and add 3 to the y-coordinate. Hence,
X = (-4,-6) → X' = (-9,-3)
Y = (1,8) → Y' = (-4,11)
Z = (0,1) → Z' = (-5,4)

coordinates of ΔM'N'O' given that ΔMNO is dilated by a scale factor of $k = \frac{1}{3}$:
M = (-3,0), N = (6,-6), O = (3,1)

Solution:

The rule is:
$D_k(x,y) = (kx,ky)$
$D_{1/3}(x,y) = (\frac{1}{3}x, \frac{1}{3}y)$
I will multiply both the x- and y-coordinate by a factor of $\frac{1}{3}$ (Divide each coordinate by 3). Hence,
M = (-3,0) → M' = (-1,0)
N = (6,-6) → N' = (2,-2)
O = (3,1) → O' = $(1, \frac{1}{3})$