#10 270° counter clockwise rotation about the origin followed by a translation along ⟨2, −2⟩

2,0 ?,-2 0,-1

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

(x+2, y-2)

Step 1 Switch

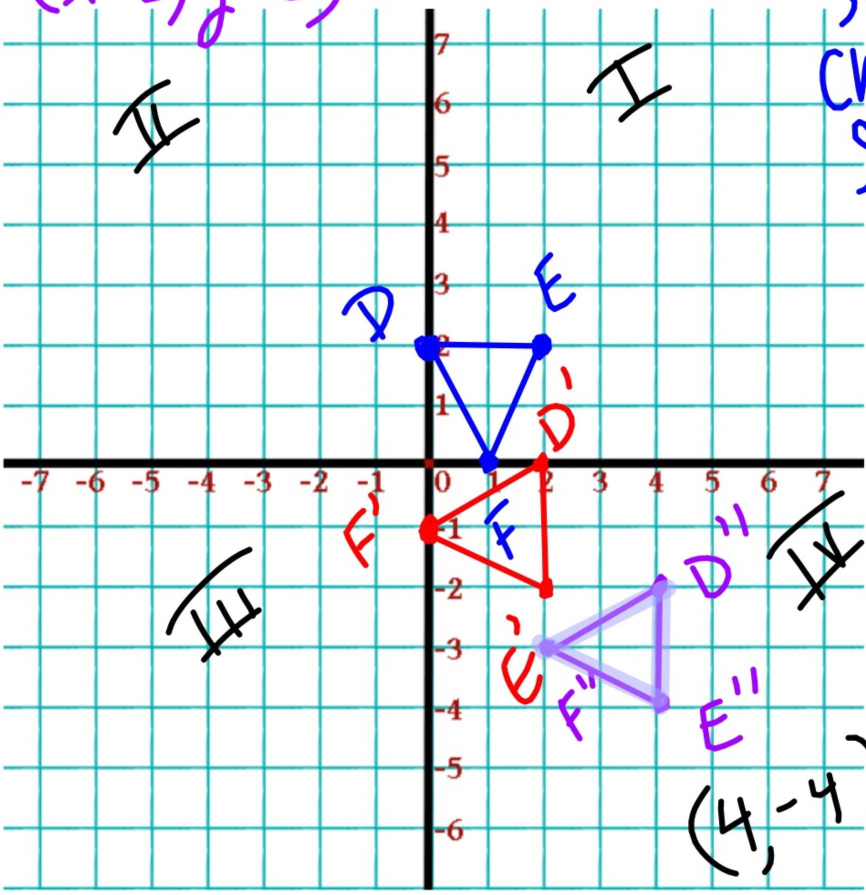
Step Change Sign

CCW

90 -y, x

180 -x, -y

270 y, -x



(4,-4)

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

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

Reflection: in $y = 1x + 0$

$y = mx + b$

slide

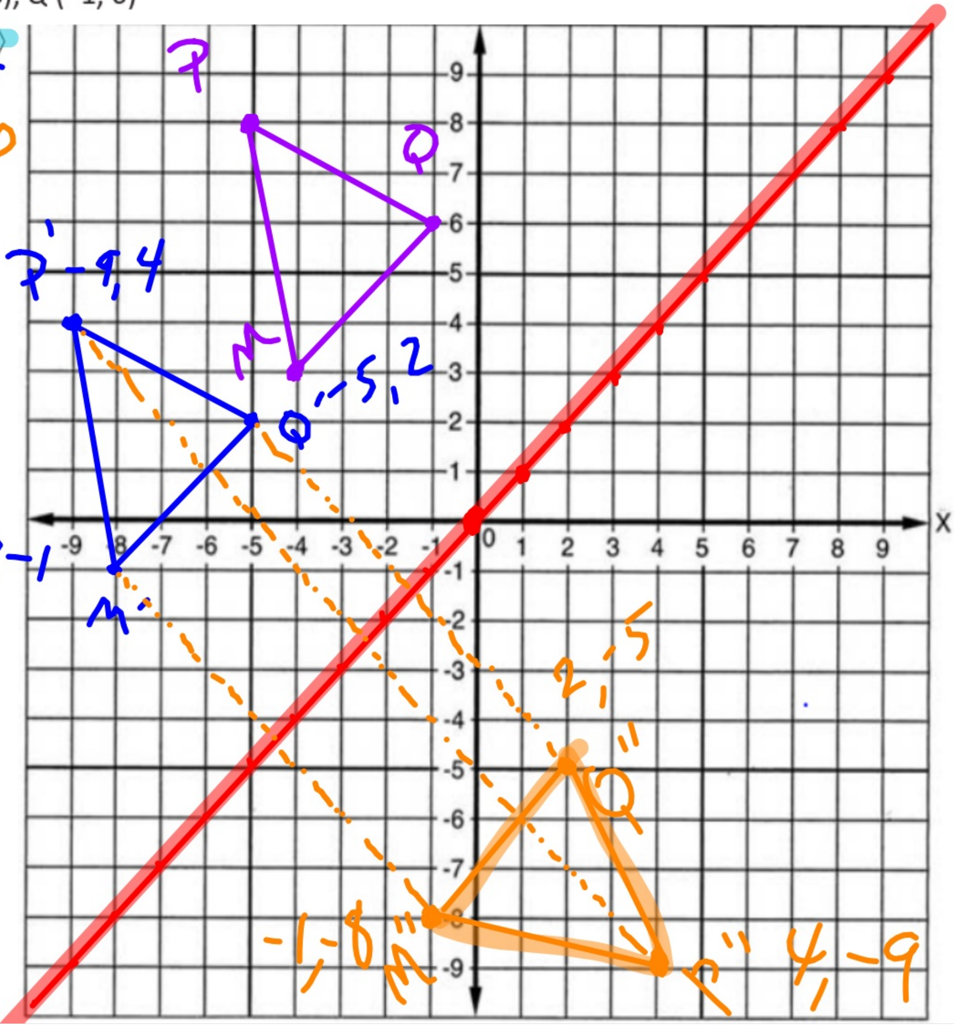
$(x-4, y-4)$

Slope

1

y-int

0



❶

Reflections

$r_{x\text{-axis}}(x,y) = (x,-y)$

$r_{y\text{-axis}}(x,y) = (-x,y)$

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

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

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)

❷

Rotations

$R_{90cw}(x,y) = (y,-x)$

$R_{90ccw}(x,y) = (-y,x)$

$R_{180}(x,y) = (-x,-y)$

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)

❸

Translations

$T_{a,b}(x,y) = (x+a,y+b)$

"a" moves left or right and "b" moves up or down

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)

❹

Dilations

$D_k(x,y) = (kx,ky)$

Scale factor = k

Example:

Determine the 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' = $(1, \frac{1}{3})$