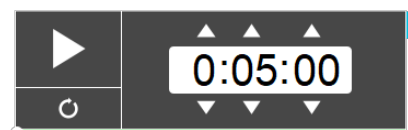# Compositions of Translations

<u>Mental Floss</u>: Thursday Nov 4th

Without graphing, determine the coordinates for both the first and second translations of the triangle below.

0:05:00

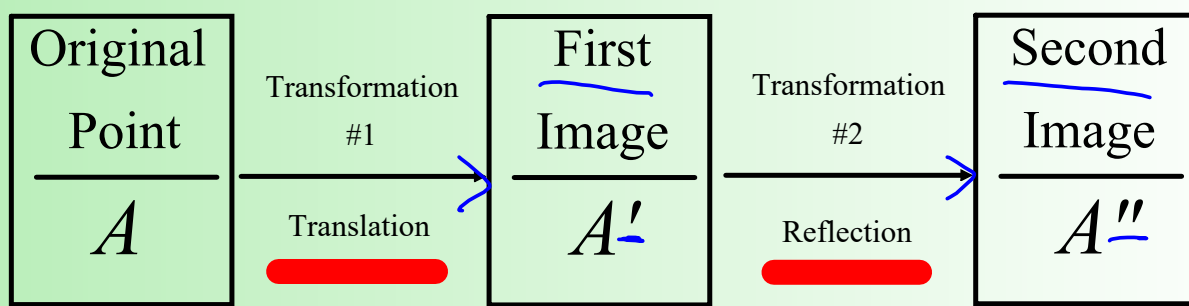ΔXYZ with vertices $X(2,4)$, $Y(6,0)$, and $Z(7,2)$

Translation: $(x,y) \rightarrow (x+\underline{12}, y+\underline{4})$

Translation: $\langle -5, -9 \rangle$

$X'\overset{2+12 \ \ 4+4}{(14 \ , \ 8)}$　　$X''\overset{14-5 \ \ 8-9}{(9 \ , \ -1)}$

$Y'\overset{6+12 \ \ 0+4}{(18 \ , \ 4)}$　　$Y''\overset{18-5 \ \ 4-9}{(13 \ , -5)}$

$Z'\overset{7+2 \ \ 2+4}{(19 \ , \ 6)}$　　$Z''\overset{19-5 \ \ 6-9}{(14 \ , -3)}$

Glide Reflection
A translation followed by a reflection.

Original Point A	Transformation #1 Translation	First Image A'	Transformation #2 Reflection	Second Image A''

$(x+a, y+b)$

$(-x, y)$ A double prime
$(x, -y)$
(y, x)
$(-x, -y)$

1.) Write the component form of a vector that translates $P(5,-1)$ to $P'(-3,4)$.

$\langle \cancel{x-8}, \cancel{y+5} \rangle$ $\langle -8, 5 \rangle$

$x-8$ $y+5$

2.) Write the vector from part (1) as a translation rule.

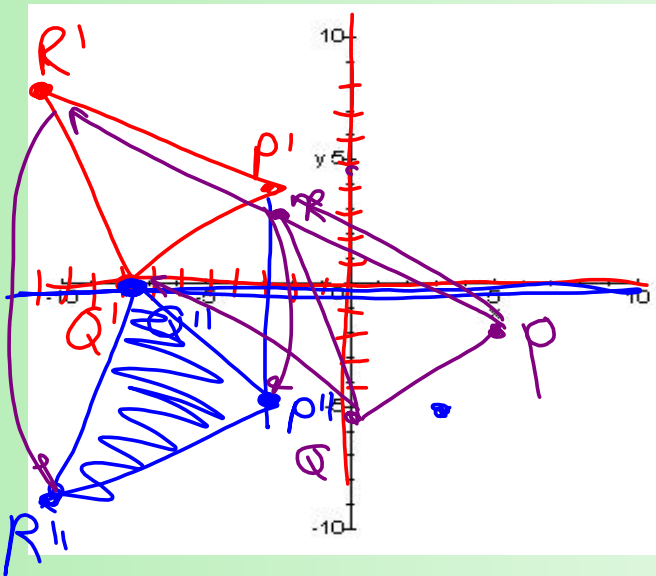$(x,y) \rightarrow (x-8, y+5)$

3.) Apply this same translation to $Q(0,-5)$ and $R(-3,3)$.

$Q(0,-5) \rightarrow Q'(-8,0)$

$R(-3,3) \rightarrow R'(-11,8)$

4.) Graph the vertices of triangle $P'Q'R'$. Then, list the coordinates $(P'', Q'', \text{and } R'')$ when this triangle is reflected over the ~~y~~-axis.

x axis
Reflection

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

$Q'(-8,0) \rightarrow Q''(-8,0)$

$R'(-11,8) \rightarrow R''(-11,-8)$

$(x,-y)$

<u>4.2 p.186</u>
Part 1 #3-6 (Mon 11/8)
Part 2 #8,14,16,17,20 (Tues 11/9)
Part 3 #21-24,28,30 (Wed 11/10)

<u>Mental Floss</u>: Wednesday Dec 9th

Given the segment AB with endpoints at:

$$A(3,-4) \quad \text{and} \quad B(5,1)$$

List the coordinates when segment AB is transformed according to the rules (in order):

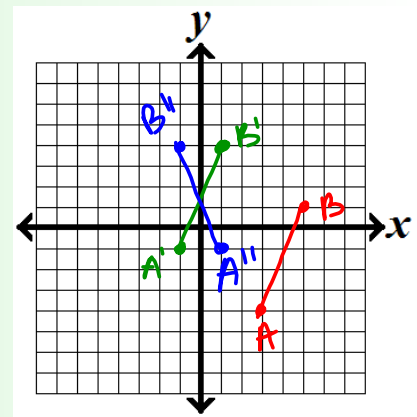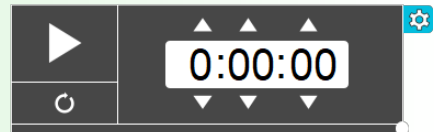1.) $(x,y) \rightarrow (x-4, y+3)$

       left 4   U.P 3

2.) Reflected over the y-axis

$(x-4,y+3)$

$A (3,-4) \Rightarrow A'(-1,-1)$

$B (5,1) \Rightarrow B'(1,4)$

     y axis

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

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

Geometry   Name: _____

Translations and Reflections Practice   Period: _____

Graph 1:

$A(-10,3)$

$(-3,4)$ B'

$(-10,3)$ A

$(-6,0)$ C

$C(-6,3)$ C' 10 A'

y axis   **Vertical line**
x = a number
x = 0
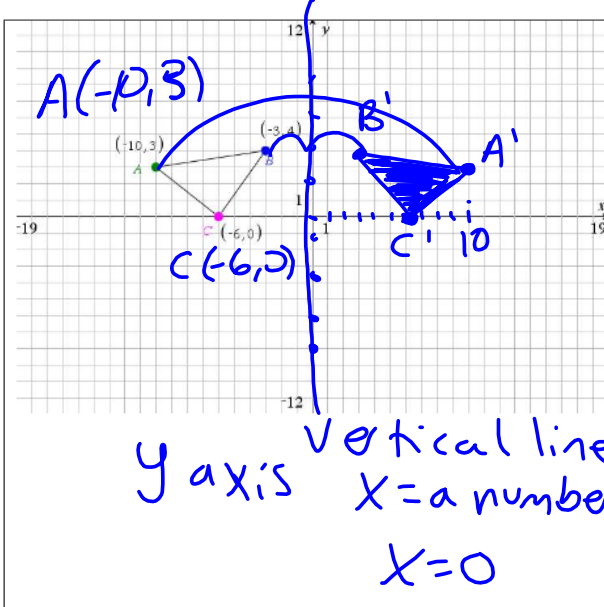
1.) Write the coordinates for triangle ABC under the rule:

$$(x, y) \to (-x, y)$$

A'(10, 3)   B'(3, 4)   C'(6, 0)

This rule represents which of the following
(mark as many as apply)

A. ~~Translation~~
B. ~~Vertical reflection over a vertical line~~
C. ~~Horizontal reflection over a horizontal line~~
D. ~~Vertical reflection over a horizontal line~~
(E.) Horizontal reflection over a vertical line
F. NONE of these

If a reflection, then state the equation of the line of reflection: $X = 0$

If a translation, then state the translation rule in vector form:

Graph 2:

$A(-10,3)$ $(-3,4)$

$(-10,3)$ A   B

$(-6,0)$ C

C' B'

A'
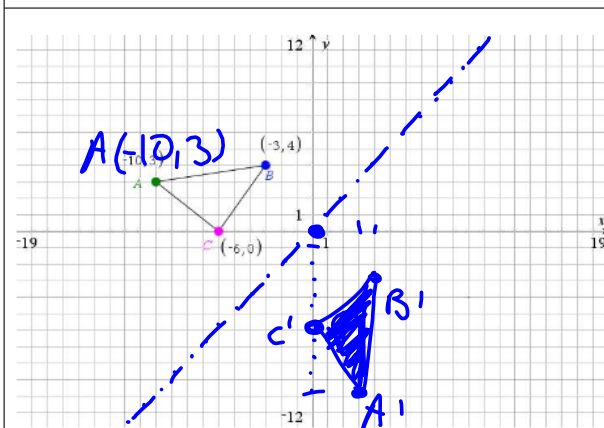
2.) Reflect $\triangle ABC$ over the line $y = x$. $y = 1x + 0$

Draw the line $y = x$ on the graph
(the y intercept is 0 and the slope is up 1 right 1)

If we reflect over the line $y = x$, then the transformation rule can be written as:

$$(x, y) \to (\underline{\ y\ }, \underline{\ x\ })$$

x and y switch

Determine the location of the points:

A'(3, -10)   B'(4, -3)   C'(0, -6)

Graph 3:

A'

C'

$A(-10,3)$

A   B'

$(-6,0)$ C

3.) Reflect $\triangle ABC$ over the line $y = -x$. $y = -1x + 0$

Draw the line $y = -x$ on the graph
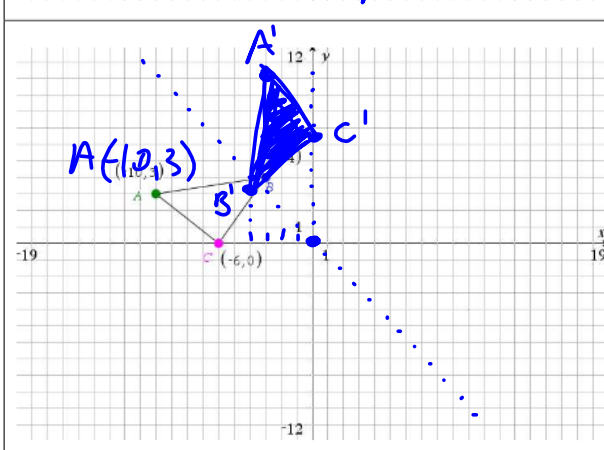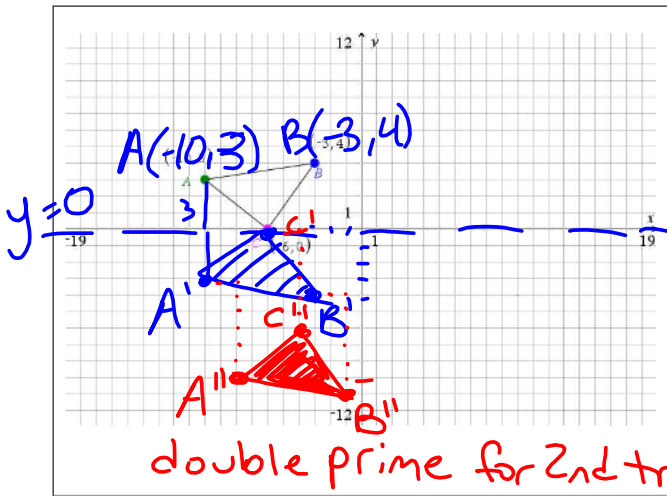(the y intercept is 0 and the slope is up 1 left 1)

If we reflect over the line $y = -x$, then the transformation rule can be written as:

$$(x, y) \to (\underline{-y}, \underline{-x})$$

Switch sign
Switch x and y

Determine the location of the points:

A'(-3, 10)   B'(-4, 3)   C'(0, 6)

Panel 1 (top)

4.) Reflect $\triangle ABC$ over the line y = 0 this is the x axis, then apply the vector translation

$< 2, -6 >$ to $\triangle A'B'C'$.

X component   Y component

List the coordinates after each of the transformations.
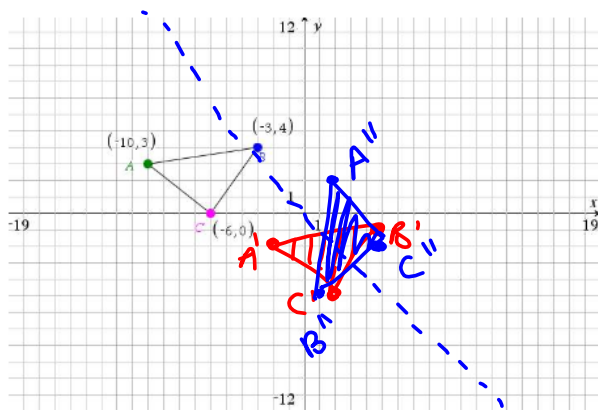
$(x, y) \rightarrow (x, -y)$

After the x-axis Reflection, the First Image Triangle is:

A' $(10, -3)$ B' $(-3, -4)$ C' $(6, 0)$

After the shift right 2 and down 6 Translation, the Second Image Triangle is:

$-6+2, 0-6$

$-10+2, -3-6$

A'' $(-8, -9)$ B'' $(-1, -10)$ C'' $(-4, -6)$

Draw the First Image and Second Image triangles using your points above

double prime for 2nd transformation

Graph annotations: $A(-10, 3)$ $B(-3, 4)$ $y=0$

Panel 2 (middle)

5.) Apply the vector: $< 8, -5 >$ to $\triangle ABC$, then reflect $\triangle A'B'C'$ about the line y = -x.

$(x+8, y-5)$
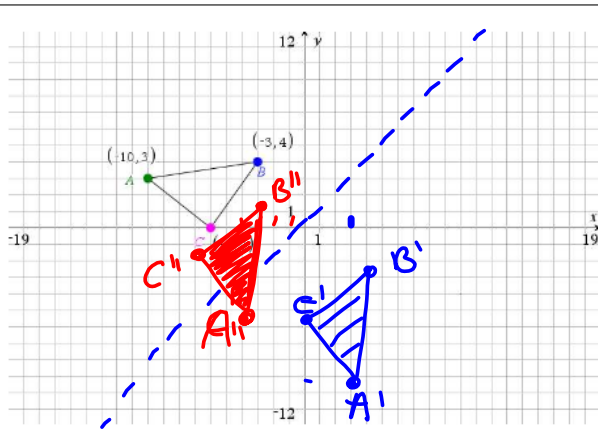
List the coordinates after each of the transformations.

After the Translation, the First Image Triangle is:

$(-10+8, 3-5)$

A' $(-2, -2)$ B' $(5, -1)$ C' $(2, -5)$

After the Reflection the Second Image Triangle is:

A'' $(2, 2)$ B'' $(1, -5)$ C'' $(5, -2)$

Draw the First Image and Second Image triangles using your points above

Graph labels: $(-10, 3)$ $(-3, 4)$ $(-6, 0)$
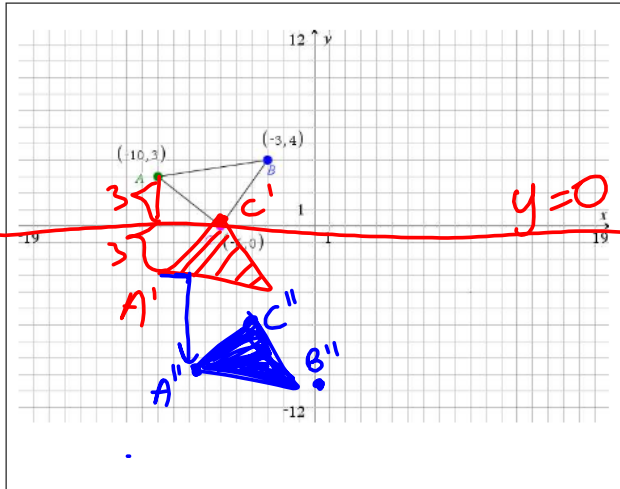
Panel 3 (bottom)

6.) Reflect $\triangle ABC$ about the line y = x, then translate it under the rule $(x, y) \rightarrow (x - 7, y + 4)$.
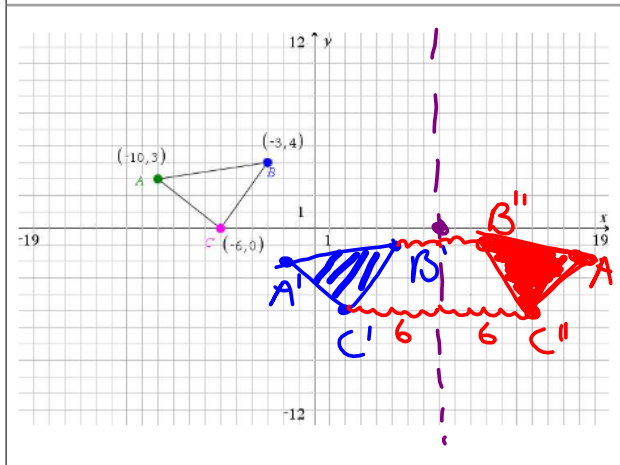
List the coordinates after each of the transformations.

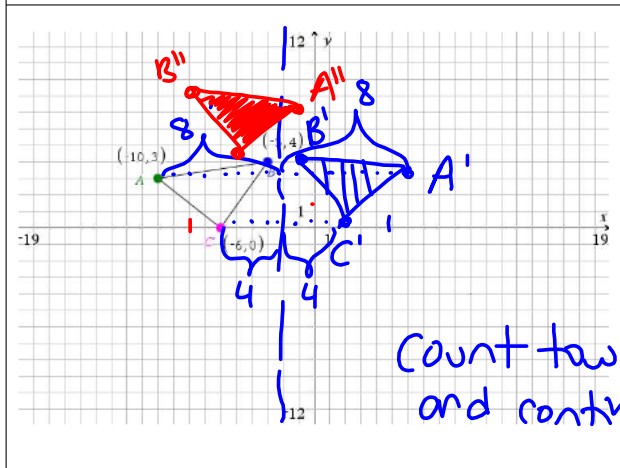| Original Pre-Image Points	First Image Points $(x,y) \rightarrow (y,x)$	Second Image Points $(x,y) \rightarrow (x-7, y+4)$
A $(-10, 3)$	A' $(3, -10)$	A'' $(-4, -6)$
B $(-3, 4)$	B' $(4, -3)$	B'' $(-3, 1)$
C $(-6, 0)$	C' $(0, -6)$	C'' $(-7, -2)$

Graph labels: $(-3, 4)$ $(-10, 3)$

Enriched

4.) Reflect $\triangle ABC$ over the line *y = 0 this is the x axis*, [x axis] then apply the vector translation
$$< 2, -6 >$$ to $\triangle A'B'C'$.

right 2 down 6

List the coordinates after each of the transformations.

After the x-axis Reflection, the First Image Triangle is:

A'(-10, -3) B'(-3, -4) C'(-6, 0)

After the shift right 2 and down 6 Translation, the Second Image Triangle is:

A''(-8, -3) B''(-1, -2) C''(-4, -6)

Draw the First Image and Second Image triangles using your points above

---

5.) Apply the vector: $< 8, -5 >$ to $\triangle ABC$, then reflect $\triangle A'B'C'$ about the line $x = 8$

List the coordinates after each of the transformations.

After the Translation, the First Image Triangle is:

8 right   5 down

A'(-2, -2) B'(5, -1) C'(2, -5)

After the Reflection the Second Image Triangle is:

A''(18, -2) B''(11, -1) C''(14, -5)

Draw the First Image and Second Image triangles using your points above

---

6.) Reflect $\triangle ABC$ about the line $y = -2$
then translate it under the rule $(x, y) \to (x - 7, y + 4)$.

List the coordinates after each of the transformations.

Original Pre-Image Points	First Image Points (x,y)-->(y,x)	Second Image Points (x,y)→(x-7,y+4)
A(-10, 3)	A'(6, 3)	A''(-1, 7)
B(-3, 4)	B'(-1, 4)	B''(-8, 8)
C(-6, 0)	C'(2, 0)	C''(-5, 4)

Count towards mirror and continue passed the same distance