# Warmup $2 /\left(1 \times 10^{1}\right)+\left(3 \times 10^{0}\right)$ 

GET FROMTHE SUPPLY TABLE:

- A ruler or protractor (either one)
- One piece of patty paper INSIDE YOUR DESK SHOULD BE:
- Graphing Sheet
- Marker/Eraser

।. Which axis is the $x$-axis and which is the $y$-axis? Describe the difference on your warmup page. (This is easy but SUPER important for today)
2. The preimage points are $(-2,3)$ and $(1,3)$ and the image points are $(-6,6)$ and $(-3,6)$. Describe the translation in words. (You can use your graphing sheet to help, but if you can figure it out without it, go for it)
3. Write the translation from \#2 in coordinate notation.

## What was the translation?



- What was the translation? Write it in coordinate notation.
$\cdot(x, y+4)$


## Going over the quizzes...

## Remember:

- Do not slap things with your ruler. I will take it away and you will have to use the edge of a piece of paper.
- DO NOT BEND THEM.


## p. $457(I-7,9)$

$11 \triangle A B C$ with vertices $A(1,2), B(3,1)$, and $C(3,4)$ translated 2 units left and 1 unit up $A^{\prime}(-1,3), B^{\prime}(1,2), C^{\prime}(1,5)$
2. rectangle $J K L M$ with vertices $J(-3,2)$, $K(3,5), L(4,3)$, and $M(-2,0)$ translated 1 unit right and 4 units down

$$
J^{\prime}(-2,-2), K^{\prime}(4,1), L^{\prime}(5,-1), M^{\prime}(-1,-4)
$$

Triangle $P Q R$ has vertices $P(0,0), Q(5,-2)$, and $R(-3,6)$. Find the vertices of $P^{\prime} Q^{\prime} R^{\prime}$ after each translation. (Example 2)
3. 6 units right and 5 units up $P^{\prime}(6,5), Q^{\prime}(11,3), R^{\prime}(3,11)$
4. 8 units left and 1 unit down $P^{\prime}(-8,-1), Q^{\prime}(-3,-3), R^{\prime}(-11,5)$

Use the image of the race car at the right. (Example 3)
5. Use translation notation to describe the translation from
point $A$ to point $B . \quad(x-3, y-3)$
6. Use translation notation to describe the translation from point $B$ to point $C .(x-2, y-4)$


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Use the image of the race car at the right. (Example 3)
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6. Use translation notation to describe the translation from
point $B$ to point $C$. $(x-2, y-4)$


17 Quadrilateral $K L M N$ has vertices $K(-2,-2), L(1,1), M(0,4)$, and $N(-3,5)$.
It is first translated by $(x+2, y-1)$ and then translated by $(x-3, y+4)$. When a figure is translated twice, a double prime symbol is used. Find the coordinates of quadrilateral $K^{\prime \prime} L^{\prime \prime} M^{\prime \prime} N^{\prime \prime}$ after both translations.
$K^{\prime \prime}(-3,1), L^{\prime \prime}(0,4), M^{\prime \prime}(-1,7), N^{\prime \prime}(-4,8)$
9. (MP) Reason Inductively A figure is translated by $(x-5, y+7)$, then by $(x+5, y-7)$. Without graphing, what is the final position of the figure? Explain your reasoning to a classmate. the same as the original position of the figure; Sample answer: Since $\mathbf{- 5}$ and 5 are opposites, and
-7 and 7 are opposites, the translations cancel each other out.

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> Yesterday this was listed as page IO...that was incorrect! Please fix this.

## Transformations

## Today's Objectives:

- Use patty paper to reflect a shape across a line
- Reflect figures across the $x$ - and $y$-axis on a coordinate plane


## Reflecting a figure using patty paper

## Document camera demonstration

I. Using your ruler, draw a diagonal line from corner to corner.
2. On one side of the line, draw a shape. (not too big) Use your ruler to make sure the sides are straight.
3. Fold the paper along the line of reflection.
4. Turn the patty paper over and trace your shape onto the back.
5. Unfold. You have just reflected your shape across the line!

## What do you notice?

- Are the angle measures of the preimage and image equal?
- Are the sides of the preimage and image congruent?
- What is different?


## On your patty paper...

I. Position your paper like this: (ignore your first shape)

2. Draw a capital "L" on the paper like so:

3. WITHOUT FOLDING ITYET, draw another capital "L" where you think it will end up.
4. Fold the paper now and trace the " L " onto the back to see how close you were.

## How can we draw a reflection?

- VOLUNTEER to come up to the board and draw the image of the triangle? You may use any tools you would like to help you be as exact as you can.



## Reflections on the Coordinate Plane

- Draw a triangle with vertices $F(4, I), B(4,5)$, and I $(6, I)$.
- REFLECT $\Delta F B I$ over the x-axis.
- You may use patty paper to trace the triangle and fold along the $x$-axis, but if you know where the image will be without it, do it without.
- YOUR NEW COORDINATES SHOULD BE: F'(4, - I); B'(4, -5); I'(6, - I )



## Reflections on the Coordinate Plane

- Erase your image, but keep the original triangle: F (4, I), B (4, 5), and I $(6, I)$.
- Now reflect $\Delta F B I$ over the $y$-axis.
- YOUR NEW COORDINATES SHOULD BE: F'(-4, I); B'(-4, 5); I'(-6, I )



## Reflection Strategy

- Count spaces from each vertex to the line of reflection, then count the same number of spaces on the other side


# Do not reflect over the wrong axis. (This is a VERY common mistake) 

One helpful strategy is to trace a line over the axis. This will be a visual reminder of which axis to use.

## Reflections on the Coordinate Plane

- Draw parallelogram MATH: M(-5, 5);A(-6, 7); T(-I, 5); H(-2, 7)
- First reflect the parallelogram over the $x$ axis, then reflect the image of that over the $y$-axis.
- YOUR NEW COORDINATES SHOULD BE: M"(5, -5); A"(6, -7); T"( $1,-5$ ); H"(2, -7)



## Reflections on the Coordinate Plane

- Draw $\boldsymbol{\Delta F U N}: \mathbf{F}(\mathbf{3}, 4) ; \mathbf{U}(5,-2) ; \mathbf{N}(\mathbf{7}, 4)$
- Reflect the triangle over the x -axis.
- YOUR NEW COORDINATES SHOULD BE: F'(3, -4); ' ${ }^{\prime}(5,2) ; \mathbf{N}^{\prime}(7,-4)$



## What happens to the coordinates?

- When you reflect a figure across the $\mathbf{x}$ axis, what happens to the coordinates?
- Can you predict where the triangle with vertices $\mathbf{A}(1,2)$; $\mathbf{B}(2,4) ; \mathbf{C}(3,2)$ would end up? (If not, then draw it and then do the reflection!)

$$
A^{\prime}(1,-2) ; B^{\prime}(2,-4) ; C^{\prime}(3,-2)
$$

- Where would the triangle with vertices

$$
\begin{gathered}
\mathbf{D ( - 8 , - 2 ) ; E ( - 5 , - 2 ) ; F ( - 6 , - 4 )} \text { end up? } \\
D^{\prime}(-8,2) ; E^{\prime}(-5,2) ; F^{\prime}(-6,4)
\end{gathered}
$$

## Reflecting Across the $x$-axis:

- $x$ stays the same, $y$ becomes the opposite


## Coordinate notation is $(x,-y)$

## What happens to the coordinates?

- When you reflect a figure across the $\mathbf{y}$ axis, what happens to the coordinates?
- Can you predict where the triangle with vertices $\mathbf{A}(1,2)$; $\mathbf{B}(2,4) ; \mathbf{C}(3,2)$ would end up? (If not, then draw it and then do the reflection!)

$$
A^{\prime}(-I, 2) ; B^{\prime}(-2,4) ; C^{\prime}(-3,2)
$$

- Where would the triangle with vertices

$$
\begin{gathered}
\mathbf{D ( - 8 , - 2 ) ;} \mathbf{E ( - 5 , - 2 ) ; F ( - 6 , - 4 )} \text { end up? } \\
D^{\prime}(8,-2) ; E^{\prime}(5,-2) ; F^{\prime}(6,-4)
\end{gathered}
$$

## Reflecting Across the $x$-axis:

- $x$ stays the same, $y$ becomes the opposite


## Reflecting Across the $y$-axis:

- $x$ becomes the opposite, $y$ stays the same

Coordinate notation is $(-x, y)$

## Which axis was it reflected over?

- $A(4,-7) \rightarrow A^{\prime}(4,7) \quad x$-axis
- $\mathrm{B}(-8,9) \rightarrow(-8,-9) \quad x$-axis
- $\mathrm{C}(3,2) \rightarrow(-3,2)$
$y$-axis


## Homework

- p. 465 (I - 7), p. $468(20,2$ I)

