Terms to Know

<table>
<thead>
<tr>
<th>Image</th>
<th>Prime notation</th>
<th>Coordinates</th>
<th>Arrow notation</th>
<th>Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>The translated figure</td>
<td>Used to name the new image</td>
<td>The x and y values of a point. The ordered pair.</td>
<td>Describes the translation.</td>
<td>Describes the translation</td>
</tr>
<tr>
<td>Image of point A = A’</td>
<td>Original J(0,2)</td>
<td>Image J’(4,-1)</td>
<td>(x, y) → (x + 4, y - 3)</td>
<td>4 units right and 3 units down</td>
</tr>
</tbody>
</table>

Example: If \(\triangle PQR\) below is translated 6 units to the right and 3 units down, what are the coordinates of point \(P’\)? Draw and label the translated image.

Name the coordinates:

\[
\begin{array}{|c|c|}
\hline
\Delta PQR & \Delta P’Q’R’ \\
\hline
\end{array}
\]

Did the size or shape of the figure change? What did change?

Translations on the Web!
Practice:

1. \( \triangle JKL \) has vertices \( J(0,2), K(3,4), \) and \( L(5,1) \). Translate \( \triangle JKL \) 4 units to the left and 5 units up. What are the coordinates of the new image?

\[
\begin{align*}
J(0,2) & \rightarrow J'( \quad , \quad ) \\
K(3,4) & \rightarrow K'( \quad , \quad ) \\
L(5,1) & \rightarrow L'( \quad , \quad )
\end{align*}
\]

2. Graph the image after the given translation. Name the coordinates of the image.

3. Use arrow notation to write a rule that describes the translation shown on the graph.

4. Use arrow notation to write a rule that describes the translation shown on the graph.

5. Match the rule with the correct translation.

   i. \( (x, y) \rightarrow (x - 1, y - 5) \) \hspace{1cm} A. \( P(4,-1) \rightarrow P'(3,-6) \)
   
   ii. \( (x, y) \rightarrow (x + 3, y) \) \hspace{1cm} B. \( Q(3,0) \rightarrow Q'(-3,2) \)
   
   iii. \( (x, y) \rightarrow (x - 1, y - 5) \) \hspace{1cm} C. \( R(-2,4) \rightarrow R'(1,4) \)

6. Point \( A(2,3) \) is translated 2 units to the right and 4 units down. What are the coordinates of point \( A' \)?
"FLIPS" a figure over a line. That line is called the line of reflection.

The reflection of an object over a line of reflection gives us a ________________ image.

a. What is the line of reflection?

b. What observations do you notice about the points on either side of the line of reflection?

Example: If \( \triangle PQR \) below is reflected over the \( x \)-axis, what are the coordinates of point \( P' \)? Draw and label the reflected image.

Name the coordinates:

<table>
<thead>
<tr>
<th>( \triangle PQR )</th>
<th>( \triangle P'Q'R' )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Did the size or shape of the figure change?

What did change
Practice:
1. \(\triangle EFG\) has vertices \(E(4,3), F(3,1),\) and \(G(1,2)\).
   Graph \(\triangle EFG\) and its new images after it is reflected over the \(y\)-axis and the \(x\)-axis. Name the coordinates of the vertices of \(\triangle E'F'G'\).

<table>
<thead>
<tr>
<th>Over the (x)-axis</th>
<th>Over the (y)-axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>(E(4,3))</td>
<td>(E'(4,-3))</td>
</tr>
<tr>
<td>(F(3,1))</td>
<td>(F'(3,-1))</td>
</tr>
<tr>
<td>(G(1,2))</td>
<td>(G'(1,-2))</td>
</tr>
</tbody>
</table>

2. Use the graph below. Match each point with its image after a reflection over the given axis.

   - a. \(A\), \(y\)-axis
   - b. \(B\), \(x\)-axis
   - c. \(H\), \(y\)-axis
   - d. \(F\), \(y\)-axis
   - e. \(E\), \(x\)-axis
   - f. \(C\), \(x\)-axis

3. Graph the given point and its image after each reflection over the given axis. Name the coordinates of the reflected point.

   - a. \(H(-3,2)\), \(x\)-axis
   - b. \(G(2,4)\), \(y\)-axis
   - c. \(B(-3,-4)\), \(y\)-axis
   - d. \(M(5,0)\), \(y\)-axis
   - e. \(D(0,-2)\), \(x\)-axis
   - e. \(C(4,-3)\), \(x\)-axis

4. **Reflectional symmetry** exists when a figure can be folded over onto itself along a line. The line that divides the figure into a mirror image is called a **line of symmetry**.

   Many of the letters in our alphabet have symmetry.

   **Identify the capital letters that have reflectional symmetry. Some have more than one line of symmetry.**

   - A
   - B
   - C
   - D
   - E
   - F
   - G
   - H
   - I
   - J
   - K
   - L
   - M
   - N
   - O
   - P
   - Q
   - R
   - S
   - T
   - U
   - V
   - W
   - X
   - Y
   - Z

   **Answer:**
   - A
   - B
   - C
   - D
   - E
   - H
   - I
   - K
   - M
   - O
   - T
   - U
   - V
   - W
   - X
   - Y

   What state has reflectional symmetry when written horizontally?
   - Answer: **Arizona**

   What four state names have reflectional symmetry when written vertically in capital letters?
   - Answer: **Arizona**, **California**, **Kansas**, **Washington**
These letters have rotational symmetry:
(Just turn them 180°.)