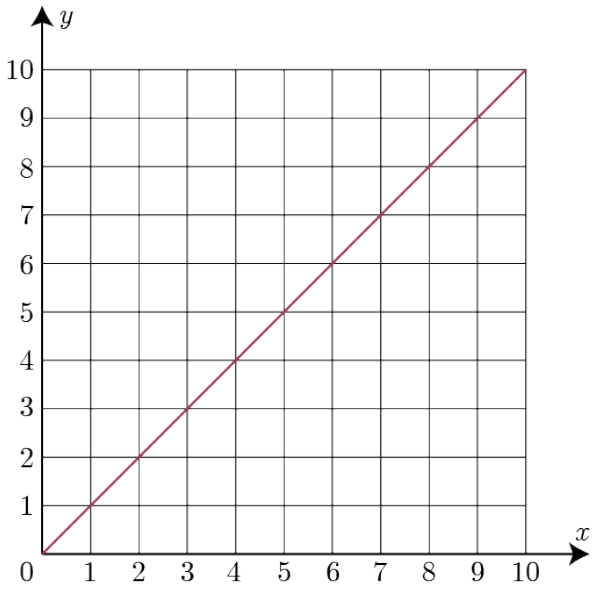
Problem of the Week
Problem B and Solution
A Capital Transformation

Problem

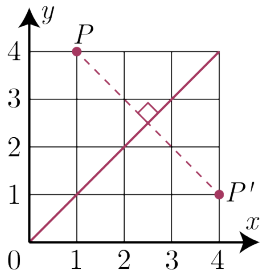
(a) Plot the given points on the grid, then connect the points in the order they appear in the table. Finish by connecting the last point with the first.

x	y
1	10
6	10
6	9
4	9
4	5
3	5
3	9
1	9



(b) Reflect each of the points you plotted in part (a) across the diagonal line in the grid above, then connect the reflected points like you did in part (a).

Tip: When you reflect a point across a line, the reflected point lies on the opposite side of the line, the same perpendicular distance away as the original point. This is shown in the diagram where P is the original point and P' is its reflection across the diagonal line.

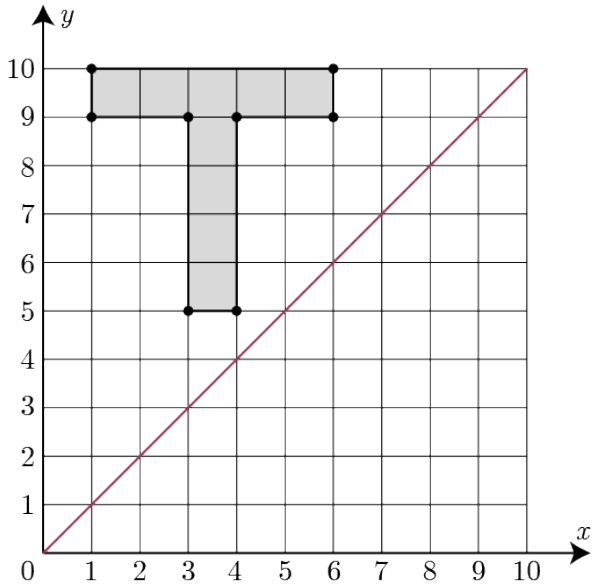


(c) How do the coordinates of each reflected point from part (b) compare with the coordinates of their original point?

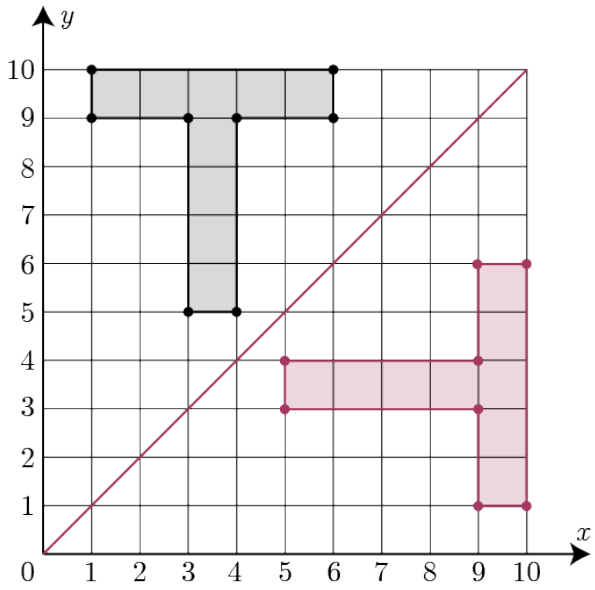
(d) Starting with the original points, can you use 2 or 3 different transformations in a row to get the same final image you drew in part (b)? If so, explain the transformations you used.

Solution

(a) The plotted points are shown on the grid. When joined in order, they form the letter T.



(b) The reflected points are shown on the grid. When joined in order, they form a sideways letter T.



(c) The coordinates for each point are reversed in its reflected point. For example, the reflection of the point $(1, 10)$ is $(10, 1)$.

(d) There are several different ways to get the same final image using multiple transformations. One way is as follows:

Step 1: Rotate each point 90° clockwise about the point $(3, 5)$, which is the bottom-left corner of the T.

Step 2: Translate each point 2 units to the right.

Step 3: Translate each point 1 unit down.