

**TASK 2.8.5: REFLECTIONS SUMMARY****Solutions**

**V:** Using the information that you gained from the previous graphs or other problem solving strategies, answer the following questions.

**1. Reflections about the  $y$ -axis:** Let PQ be a line in the plane and let P'Q' be the line that results from reflecting PQ about the  $y$ -axis.

- If line PQ has slope  $p/q$ , then what slope will line P'Q' have? Explain.  
 $-p/q$ . A reflection about the  $y$ -axis takes a line with positive slope to a line with negative slope and vice versa.
- If line PQ is horizontal, will P'Q' be horizontal? Explain.  
 It will stay horizontal. A horizontal line reflected about the vertical line  $x=0$  will stay horizontal. Only the positions of the  $x$ -values change, not the  $y$ -values.
- If line PQ is vertical, will P'Q' be vertical? Explain.  
 It will stay vertical. Only the positions of the  $x$ -values change.

**2. Reflections about the  $x$ -axis:** Let PQ be a line in the plane and let P''Q'' be the line that results from reflecting PQ about the  $x$ -axis.

- If line PQ has slope  $p/q$ , then what slope will line P''Q'' have? Explain.  
 $-p/q$ . A reflection about the  $y$ -axis takes a line with positive slope to a line with negative slope and vice versa.
- If line PQ is horizontal, will P''Q'' be horizontal? Explain.  
 It will stay horizontal. A horizontal line reflected about the vertical line  $x=0$  will stay horizontal. Only the position of the  $x$ -values change, not the  $y$ 's.
- If line PQ is vertical, will P''Q'' be vertical? Explain.  
 It will stay vertical. Only the positions of the  $x$ -values change.

**3. Reflections about the line  $y=x$ :** Let PQ be a line in the plane and let P'''Q''' be the line that results from reflecting PQ about the line  $y=x$ .

- If line PQ has slope  $p/q$ , then what slope will line P'''Q''' have? Explain.  
 $q/p$ . Both  $x$ -values and  $y$ -values are changed. A point  $(a,b)$  becomes  $(b,a)$ . The sign doesn't change.
- If line PQ is horizontal, will P'''Q''' be horizontal? Explain.  
 No. Horizontal lines become vertical.
- If line PQ is vertical, will P'''Q''' be vertical? Explain.  
 No. Vertical lines become horizontal.

**Teaching Notes**

Encourage students to use problem solving techniques to find answers to these generalizations; for example they could create a specific example and sketch a graph. They could also visualize the situation; we want students to develop the ability to reflect images mentally.

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If line  $PQ$  has slope  $p/q$ , then what slope will line  $P'Q'$  have? Explain.

If line  $PQ$  is horizontal, will  $P'Q'$  be horizontal? Explain.

If line  $PQ$  is vertical, will  $P'Q'$  be vertical? Explain.

**2. Reflections about the  $x$ -axis:** Let  $PQ$  be a line in the plane and let  $P''Q''$  be the line that results from reflecting  $PQ$  about the  $x$ -axis.

If line  $PQ$  has slope  $p/q$ , then what slope will line  $P''Q''$  have? Explain.

If line  $PQ$  is horizontal, will  $P''Q''$  be horizontal? Explain.

If line  $PQ$  is vertical, will  $P''Q''$  be vertical? Explain.

**3. Reflections about the line  $y=x$ :** Let  $PQ$  be a line in the plane and let  $P'''Q'''$  be the line that results from reflecting  $PQ$  about the line  $y=x$ .

If line  $PQ$  has slope  $p/q$ , then what slope will line  $P'''Q'''$  have? Explain.

If line  $PQ$  is horizontal, will  $P'''Q'''$  be horizontal? Explain.

If line  $PQ$  is vertical, will  $P'''Q'''$  be vertical? Explain.