The slope of a line is the ratio of the change in \( y \) to the change in \( x \) between any two points on a line. Slope indicates the steepness (or flatness) of a line, as well as its direction (up or down) left to right.

Slope is determined by the ratio \( \frac{\text{vertical change}}{\text{horizontal change}} \) between any two points on a line.

For lines that go up (from left to right), the sign of the slope is positive (the change in \( y \) is positive). For lines that go down (left to right), the sign of the slope is negative (the change is \( y \) is negative). A horizontal line has zero slope while the slope of a vertical line is undefined.

For additional information see the Math Notes box in Lesson 7.2.4 of the Core Connections, Course 3 text.

**Example 1**

Write the slope of the line containing the points \((-1, 3)\) and \((4, 5)\).

First graph the two points and draw the line through them.

Look for and draw a slope triangle using the two given points.

Write the ratio \( \frac{\text{vertical change in } y}{\text{horizontal change in } x} \) using the legs of the right triangle: \( \frac{2}{5} \).

Assign a positive or negative value to the slope (this one is positive) depending on whether the line goes up (+) or down (−) from left to right.

**Example 2**

If the points are inconvenient to graph, use a “generic slope triangle,” visualizing where the points lie with respect to each other. For example, to find the slope of the line that contains the points \((-21, 12)\) and \((17, -4)\), sketch the graph at right to approximate the position of the two points, draw a slope triangle, find the length of the leg of each triangle, and write the ratio \( \frac{5}{2} \), then simplify. The slope is \( \frac{-8}{19} \) since the change in \( y \) is negative (decreasing).
Problems

Write the slope of the line containing each pair of points.

1. (3, 4) and (5, 7)  
2. (5, 2) and (9, 4)  
3. (1, −3) and (−4, 7)  
4. (−2, 1) and (2, −2)  
5. (−2, 3) and (4, 3)  
6. (32, 12) and (12, 20)

Determine the slope of each line using the highlighted points.

7.  
8.  
9.  

Answers

1. \(\frac{3}{2}\)  
2. \(\frac{1}{2}\)  
3. −2  
4. −\(\frac{3}{4}\)  
5. 0  
6. −\(\frac{2}{5}\)  
7. −\(\frac{1}{2}\)  
8. \(\frac{3}{4}\)  
9. −2