The slope of a line is similar to the slope in roofs or roads. Slopes will be counted or calculated exactly from graphs of lines. Slopes can also be found in the equations that represent lines. The definition of the slope of a line needs to be memorized in whatever version makes the most sense to you.

A line's slope is the same everywhere along the line. If the coordinates of any 2 points on the line are known, the slope can be calculated using algebra. If the coordinates are integers, the slope can be counted off the graph of the line. Counting up or right gives positive numbers and counting down or left gives negative numbers. The signed number rules learned in algebra still apply here. With any 2 points, there are 4 paths to choose from in counting the slope and all 4 give the same answer.

p. 420 Definition of Slope - Ratio (fraction) of the vertical change to the horizontal change between any 2 points on the line.

Slope = \( \frac{\text{vertical change}}{\text{horizontal change}} \)

Not in the book.

\[
\begin{align*}
\text{Slope} &= \frac{9}{6} = \frac{3}{2} \\
\text{The fraction is reduced.}
\end{align*}
\]
To count off the slope of a line from a graph, there are 4 different ways to do it. Start at either of the 2 points and count up or down or left or right along a line of the graph until reaching another graph line that goes through the other point. Up or right are positive (+). Down or left are negative (-). Continue at a right angle (90° angle) counting in a different direction to the second point. This process is very visual and easier to understand seeing it rather than describing it in words.

In this example, start at the lower left point and count up 6 (+6) and then count right 3 (+3). The coordinates of the graph are not important so are not shown.

\[
\text{slope} = \frac{\text{vert change}}{\text{hor change}} = \frac{+6}{+3} = +2 \quad \text{The slope is 2.}
\]

Another way to count is to start at the upper right point and count down 6 (-6) and then count left 3 (-3). The slope will be exactly the same.

\[
\text{slope} = \frac{\text{vert change}}{\text{hor change}} = \frac{-6}{-3} = +2 \quad \text{The slope is 2.}
\]
You must remember one of these definitions of slope:

\[
\frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{\text{change in } y}{\text{change in } x} = \text{vertical change} / \text{horizontal change} = \frac{y}{x}
\]

(rise over run) \( \Delta \) is Greek letter Delta used to mean "change"

The small letter \( m \) is used to represent slope in all algebra books. Slope can be defined with following algebra equation:

If you have 2 points, \((x_1, y_1)\) (read it, "x sub one, y sub one") and \((x_2, y_2)\) (read it, "x sub two, y sub two")

The small numbers are labels or names and do not have any mathematical meaning.

the slope \( m \) is defined as

\[
\frac{y_2 - y_1}{x_2 - x_1} \quad \text{Notice that the } y \text{ values are on top.}
\]

\[
\frac{y_1 - y_2}{x_1 - x_2} \quad \text{Notice that the } x \text{ values are on the bottom.}
\]

These values come from the same point.

These values come from the same point.

It can also be written like this. It doesn't matter which point is used first.

\[
\frac{y_1 - y_2}{x_1 - x_2}
\]

An easier way (Lindlo's way) is to think of a capital \( N \).

p. 421 Ex 1

Find the slope of the line through the points \((-6, +1)\) and \((3, 5)\).

\((x_1, y_1) \quad (x_2, y_2)\)

Book method: \( m = \frac{y_2 - y_1}{x_2 - x_1} \)

\[
m = \frac{5 - (+1)}{3 - (-6)}
\]

Lindlo's method: Get the fraction and subtraction signs ready

\[
m = \frac{5 - (+1)}{3 - (-6)}
\]

Put the numbers into the fraction in the same order a capital \( N \) would be written without lifting the pencil.

\[
m = \frac{4}{9}
\]
If the 2 points were chosen in the opposite order, the slope equation would have looked like this:

\[ m = \frac{S(3) - S(-6)}{3 + (6)} \]

This would have resulted in:

\[ m = \frac{(-6) - 1}{-6 + 6} \]

\[ m = \frac{-7}{0} \]

Odd

Simplifying signs

Change subtraction to addition

Now all the numbers are in use parentheses.

If any numbers are negative, they go in as negative numbers. If they go behind the subtraction sign that is part of the equation (formula)

\[ \frac{-7}{0} \]

Think of a cancel

\[ \frac{(-6) + 1}{3} \]

Start here

Put in the first number

Put in the second number

Subtract

Use parenthesis

End

1st

3rd
Recognize Positive and Negative Slopes

p. 422 The drawings in the book show positive and negative slopes, but it's also helpful to know the number values of slopes. \( m \) represents slope.

These slopes are all negative: \( m = -\frac{3}{2} \)  
\( m = -\frac{1}{2} \)  
\( m = 1 \)  
\( m = -1 \)

These slopes are all positive: \( m = 1 \)  
\( m = \frac{2}{3} \)  
\( m = \frac{1}{3} \)  
\( m = \frac{1}{7} \)

Notice that the slopes \( m = 1 \) and \( m = -1 \) that form 45° angles with the axes are "dividing" lines. Fractional slopes less than 1 are on one side and slopes larger than 1 are on the other side.

These slopes can be related to skiing. Slopes with slopes greater than 1 are fairly "steep" and could be skied, but not by beginners. Slopes that are less than 1 are fractional and not steep, but gentle and would be appropriate for beginning skiers.

p. 422 Examine the Slopes of Horizontal and Vertical Lines

The demonstration of why a horizontal line has a slope of 0 in the book is good. We can relate this to skiing as well. Flat ground can be skied on- it is cross-country skiing. Vertical lines have an undefined slope. A vertical line is like a cliff. Skiing is not possible, is "undefined" with a cliff.