

1-1 Rise Over Run Notes Key

You may have heard the words pitch, slant, or steepness. What do these terms mean? They are words to describe **slope**.

Slope is a ratio that compares the change in a **vertical** distance to the change in a **horizontal** distance. It is a ratio between these two numbers.

slope: a ratio of rise to run which indicates how steeply something is slanted

Slope can be expressed as follows.

$$\text{slope} = \frac{\Delta \text{ vertical distance}}{\Delta \text{ horizontal distance}}$$

The symbol Δ is the Greek letter delta, and it means "change" or "difference."

The variable m is used to represent slope. The change in vertical distance is also called the rise, and the change in horizontal distance is also called the run. Slope can therefore be expressed as follows.

$$m = \frac{\text{rise}}{\text{run}}$$

Example 1) Calculate the slope of a line that has a rise of 12 cm for a run of 8 cm.

SOLUTION

Use the formula for slope.

$$m = \frac{\text{rise}}{\text{run}}$$

$$m = \frac{12}{8} \quad \text{Substitute in the known values.}$$

$$m = \frac{12 \div 4}{8 \div 4} \quad \text{Divide by a common factor.}$$

$$m = \frac{3}{2}$$

The slope is $\frac{3}{2}$.

ALTERNATIVE SOLUTION

The slope can also be expressed as a decimal.

$$\frac{3}{2} = 1.5$$

The slope is 1.5.

Slope does not have units because it is a ratio, not a measurement.

Example 2) The slope of a line is $\frac{7}{20}$. What is the rise if the run is 100 metres?

SOLUTION

Use the formula for slope.

$$m = \frac{\text{rise}}{\text{run}}$$

$$\frac{7}{20} = \frac{\text{rise}}{100} \quad \text{Substitute in the known values.}$$

$$100 \times \frac{7}{20} = \frac{\text{rise}}{\text{run}} \times 100 \quad \text{Multiply to isolate the rise.}$$

$$100 \times \frac{7}{20} = \text{rise} \quad \text{Simplify.}$$

$$35 = \text{rise}$$

The rise is 35 m.

Example 3) Harbinder is building a ramp in two sections, both with the same slope. If one section rises 2 m for a run of 6.5 m, how much will it have to rise for the remaining run of 9.8 m?

SOLUTION

Calculate the slope of the first section.

$$m = \frac{\text{rise}}{\text{run}}$$

$$m = \frac{2}{6.5}$$

The slope of the second section is also $\frac{2}{6.5}$. Set up a proportion to solve for x , the rise of the second section.

$$\frac{2}{6.5} = \frac{x}{9.8}$$

$$9.8 \times \frac{2}{6.5} = \frac{x}{9.8} \times 9.8 \quad \text{Multiply to isolate } x.$$

$$\frac{9.8 \times 2}{6.5} = x$$

$$\frac{19.6}{6.5} = x$$

$$3.02 = x$$

The rise of the remaining section is approximately 3.02 m.