Mathematics 10C

Unit RF: Relations and functions

Slope of a line

A ramp and a staircase

- The ramp rises 1 m over a 4 m run.
- The staircase rises 1 m over a 1 m run.
- The staircase is steeper.

Rise over run

- Slope is rise divided by run.
- A line through (1, 2) and (4, 8) has slope 2.

Key terms

slope

The ratio of vertical change to horizontal change along a line. (m = rise/run)

rise

The vertical change between two points, positive when the line goes up. (change in y)

run

The horizontal change between two points, positive when moving to the right. (change in x)

rate of change

A slope that tells how much one quantity changes for each unit of another. (dollars per kilometre)

Key terms

parallel lines

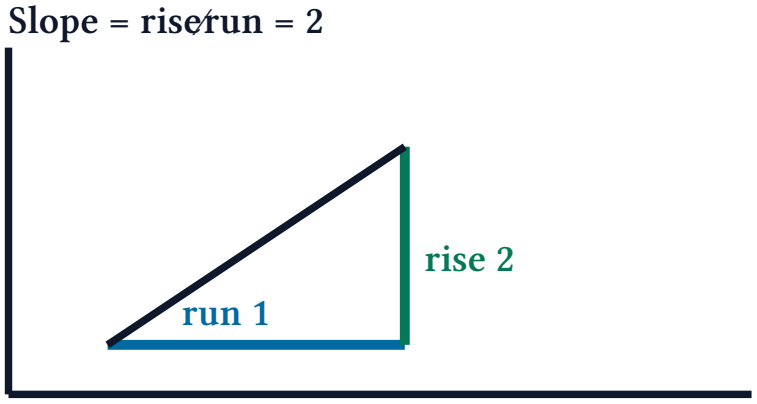
Lines that share one slope and stay the same distance apart forever. (equal slopes)

perpendicular lines

Lines that meet at a right angle. For two sloping lines, the product of the slopes is −1. (slopes multiply to −1)

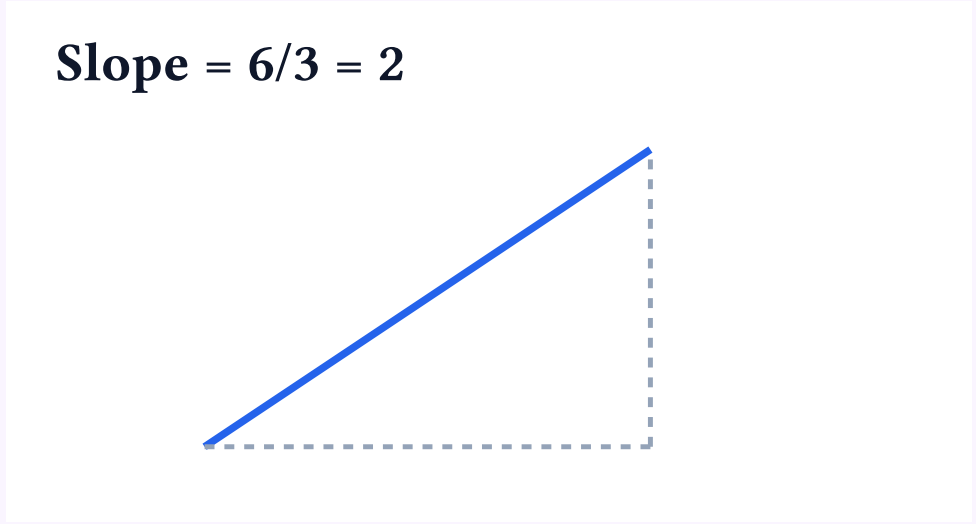
Slope from (1, 2) to (4, 8)

- The rise is $8 - 2 = 6$.
- The run is $4 - 1 = 3$.
- The slope is $\frac{6}{3} = 2$.



The same slope farther along

- From (4, 8) to (7, 14), the rise is 6.
- The run is 3.
- The slope is again 2.

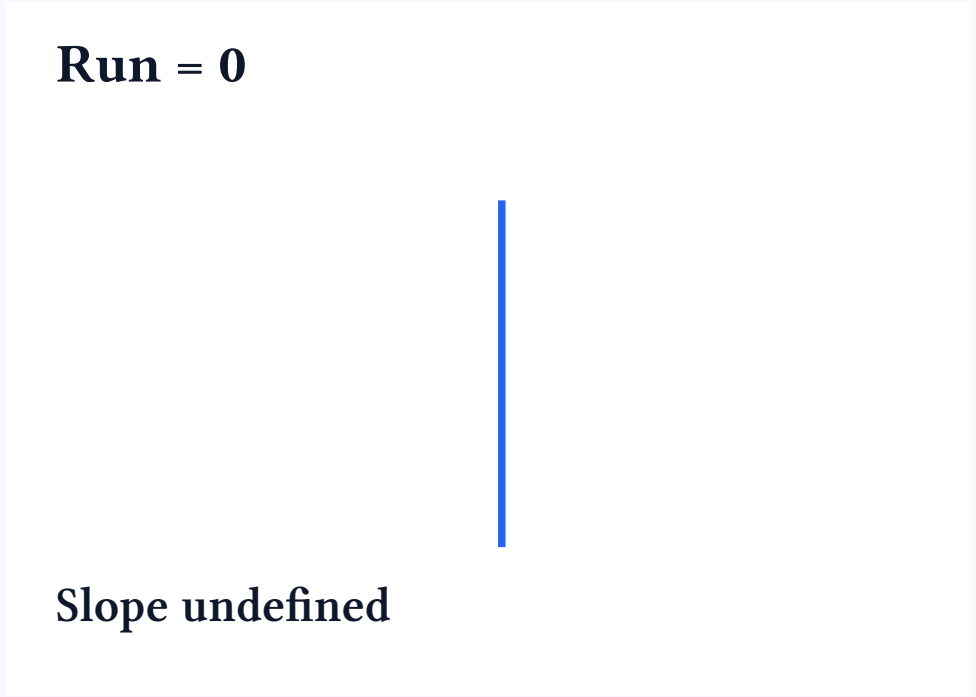


A falling line and a flat line

- From $(0, 5)$ to $(2, 1)$, the rise is $1 - 5 = -4$.
- The run is 2, so the slope is -2.
- A horizontal line from $(0, 2)$ to $(6, 2)$ has rise 0 and slope 0.

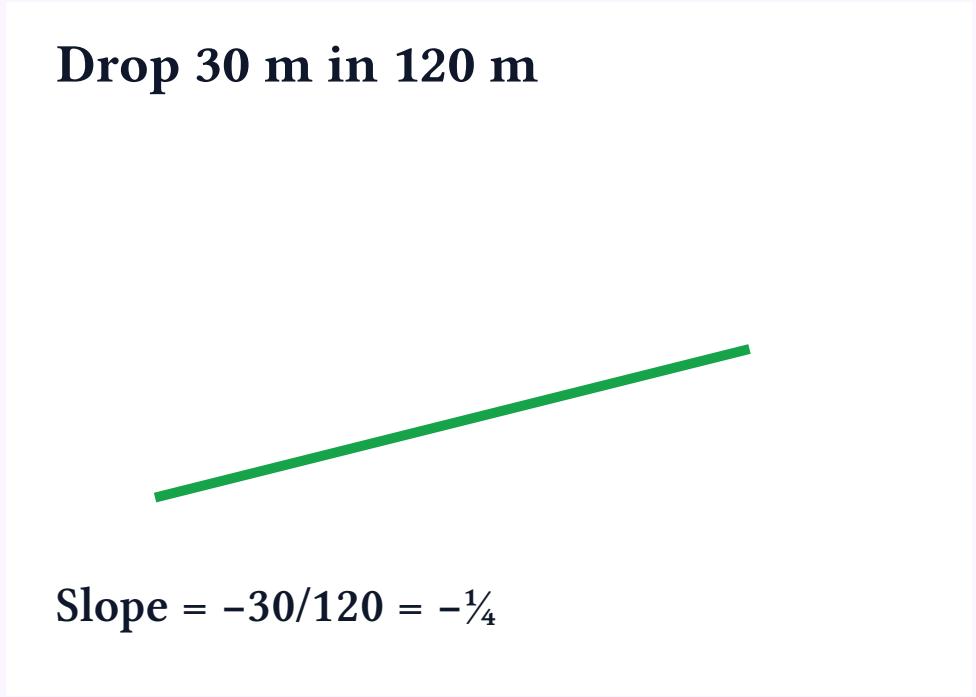
A vertical line

- The points (3, 4) and (3, 9) share an x-coordinate.
- The run is $3 - 3 = 0$.
- The slope is undefined, and the line is vertical.



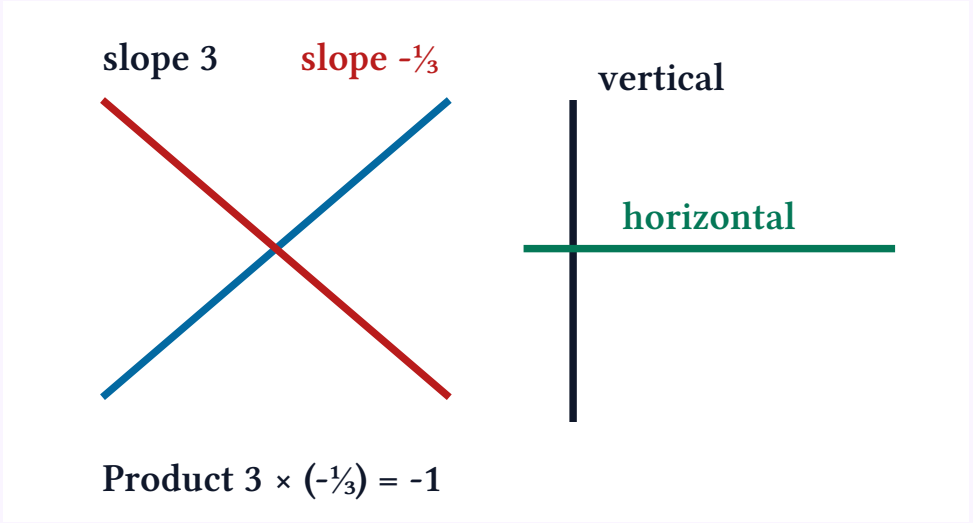
A trail as a rate

- The trail drops 30 m over a run of 120 m.
- The slope is $-\frac{30}{120} = -\frac{1}{4}$.
- That rate is 1 m of drop for every 4 m of run.



A new point and a right angle

- From (2, 1) with slope 3, one run and three rises land on (3, 4).
- A parallel line also has slope 3.
- A perpendicular slope is $-\frac{1}{3}$, because $3 \times (-\frac{1}{3}) = -1$.



A hill of rise 15

- The rise is 15 m and the run is 45 m.
- The slope is $^{15}\!/_{45} = \frac{1}{3}$.

Quick check

- A drop of 8 m over a run of 24 m has slope $-\frac{8}{24} = -\frac{1}{3}$.
- The slope perpendicular to 2 is $-\frac{1}{2}$, because $2 \times \left(-\frac{1}{2}\right) = -1$.

Slope as a ratio

- Slope 2 means rise 2 for run 1.
- A run of 0 leaves the slope undefined.