Mathematics 10C

Unit RF: Relations and functions

Representing linear relations

A taxi fare in two lines

- The flag drop is $4.
- Each kilometre adds $2.
- At 0 km the fare is $4, and at 1 km it is $6.

Five versions of one fare

- The equation is $C = 2d + 4$.
- The graph through $(0, 4)$ and $(1, 6)$ is a straight line.

Key terms

linear relation

A relation whose rate of change is constant and whose graph is a straight line.
(y = 2x + 4)

independent variable

The input you choose, written in the first coordinate or on the horizontal axis. (x or d)

dependent variable

The output that responds to the input, written in the second coordinate or on the vertical axis. (y or C)

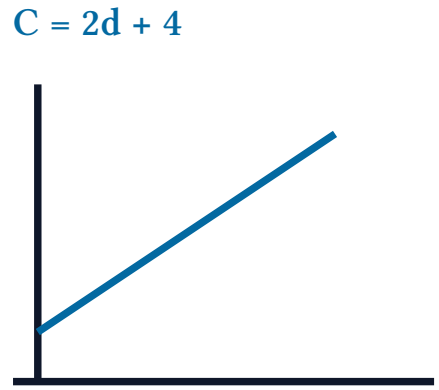
first difference

The change in consecutive outputs when the inputs increase by the same step. (Δy)

Three representations

- The fares 4, 6, 8, 10 rise by 2 each kilometre.
- Those equal jumps make a straight line.
- The equation is C = 2d + 4.

km	cost
0	$4
1	$6
2	$8



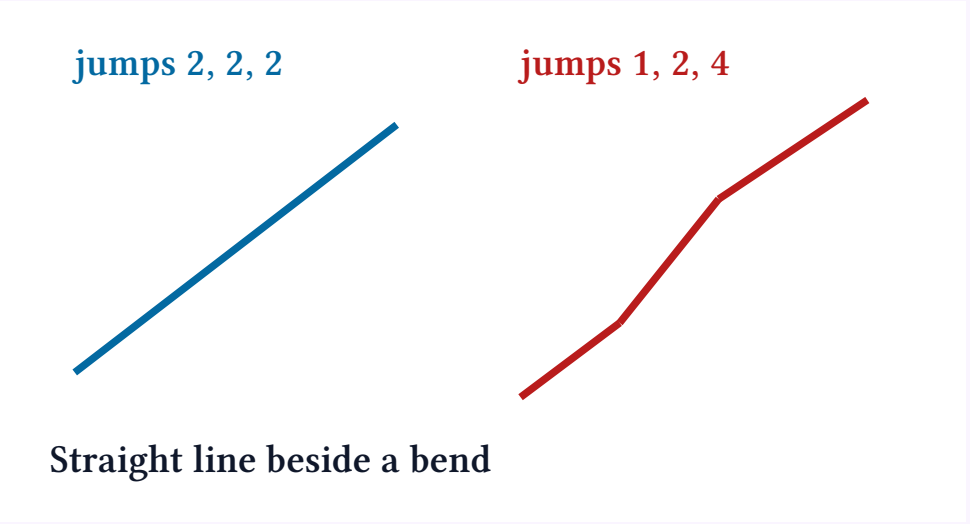
Table, line, and equation agree

Testing the point (3, 10)

- In the story, 3 km costs $4 + 2 \times 3 = 10$ dollars.
- The pair (3, 10) is on the line.
- The equation $C = 2(3) + 4$ also gives 10.

Equal jumps or changing jumps

- The outputs 1, 3, 5, 7 have differences 2, 2, and 2, so the relation is linear.
- The outputs 1, 2, 4, 8 have differences 1, then 2, then 4, so the relation is nonlinear.



Four representations

- A curve is nonlinear.
- The equation $y = -x + 6$ is linear.
- Outputs 10, 7, 4, 1 have differences −3, −3, and −3, so that table is linear.
- The area of a square as the side grows is nonlinear.

Quick check

- The pair (2, 8) fits C = 2d + 4, because 2(2) + 4 = 8.
- Outputs 2, 5, 10 are nonlinear because the jumps are 3 and 5.

Displays that agree

- The fare $C = 2d + 4$ matches the points $(0, 4)$ and $(1, 6)$.
- A changing jump means the graph bends.