Artifact 14 – Proportional and Nonproportional Relationships

Driving Question: Two relationships can both graph as straight lines. How can a table, a graph, or an equation tell you whether one of them is proportional?

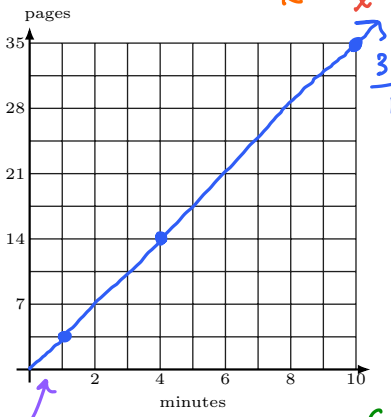
Example 1

A printer prints 7 pages every 2 minutes.

$y = 7$ $x = 2$ $y = kx \rightarrow$ Proportional

$k = \frac{y}{x} = \frac{7}{2} = 3.5$ pgs/min.

x	y
Minutes	Pages
1 ×3.5	3.5
4 ×3.5	14
10 ×3.5	35



$y \div x$ in each row

$\frac{3.5}{1} = 3.5$ $\frac{14}{4} = 3.5$ $\frac{35}{10} = 3.5$

Equation $y = 3.5x$ (constant of proportionality)

Proportional? Name two things that tell you. Yes – we have a constant of proportionality ($k = 3.5$ for every $\frac{y}{x}$)

–AND– the graph shows a straight line that passes through the origin (0,0).

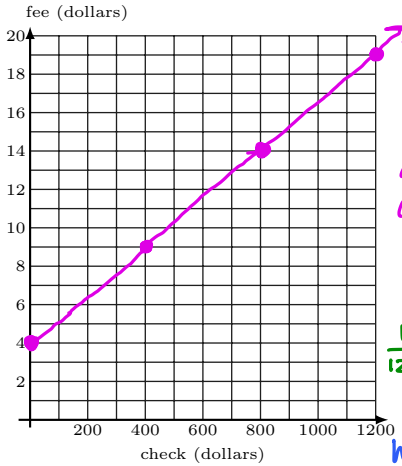
Example 2

Doesn't start at (0,0)

Store A from your board: 4 dollars plus $1\frac{1}{4}$ percent of the check. Fill the table, plot the points, draw the line.

$1\frac{1}{4} = 1.25\% = 0.0125$

Check	Fee
0	4
400 · 0.0125 + 4 = 9	
800	14
1,200	19



Where the line meets the fee axis, as a point, and what it means (0,4) → pay a $4 fee even for a $0 check

Fee ÷ check for two rows $\frac{14}{800} = 0.0175$ $\frac{19}{1200} = 0.016$ not the same

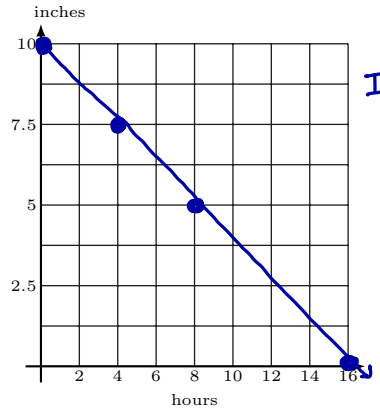
Proportional? Justify two ways. No – we don't have a constant of proportionality.

–AND– the graph doesn't pass through the origin (starts y-intercept at (0,4)).

Example 3

A candle is 10 inches tall when it is lit. It burns $\frac{5}{8}$ inch every hour.

Hours	Inches
0	10
4 · $-\frac{5}{8}$ + 10 = 7.5	
8 · $-\frac{5}{8}$ + 10 = 5	
16 · $-\frac{5}{8}$ + 10 = 0	



Initial value and rate of change (y-intercept)

Initial value = 10

ROC = $-\frac{5}{8}$ in./hr

Equation (nonproportional) $y = -\frac{5}{8}x + 10$

Proportional? Justify. No – y-int. is (0,10) & we don't have a $y = kx$ proportional equation.

Notes to Forgetful Self

Proportional, in my own words. In a table, a graph and an equation it shows as

Table:

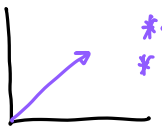
x	y
0	0
3 ×3	9
4 ×3	12

We have a constant of proportionality

$k = 3$

$\frac{y}{x} = \frac{9}{3} = \frac{12}{4} = 3$

Graph:



* straight line
* passes through (0,0)

Equation: $y = kx$ $y = 3x$ * just multiplication

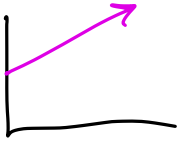
Nonproportional, in my own words. In a table, a graph and an equation it shows as

Table could still have a constant rate →

x	y
0	2 ← y-int. not (0,0)
1	4
2	6

$\frac{4}{1} \neq \frac{6}{2}$

Graph:



Equation: $y = -\frac{5}{8}x + 10$ $y = 6x - 2$