

Spotting Proportional Relationships in Tables and Graphs

Grade 7 math · Lesson · Standards: 7.RP.A.2a, 7.RP.A.2b, 7.RP.A.2d

Quick answer: A proportional relationship is one where two quantities always have the same ratio. In a table, $y \div x$ is the same for every pair; on a graph, the points lie on a straight line through (0, 0). That constant ratio is the constant of proportionality, also called the unit rate.

Standards: 7.RP.A.2a, 7.RP.A.2b, 7.RP.A.2d · **Level:** Grade 7

What makes a relationship proportional?

Two quantities are in a proportional relationship when one is always the same number of times the other. Peaches sold at \$2.50 per pound are a good model: 2 pounds cost \$5, 4 pounds cost \$10, and every cost is exactly 2.5 times the weight.

Constant of proportionality

In a proportional relationship, the ratio $\frac{y}{x}$ is the same for every pair. This constant is called the constant of proportionality, written k . It equals the unit rate: the amount of y for 1 unit of x .

How can you test a table?

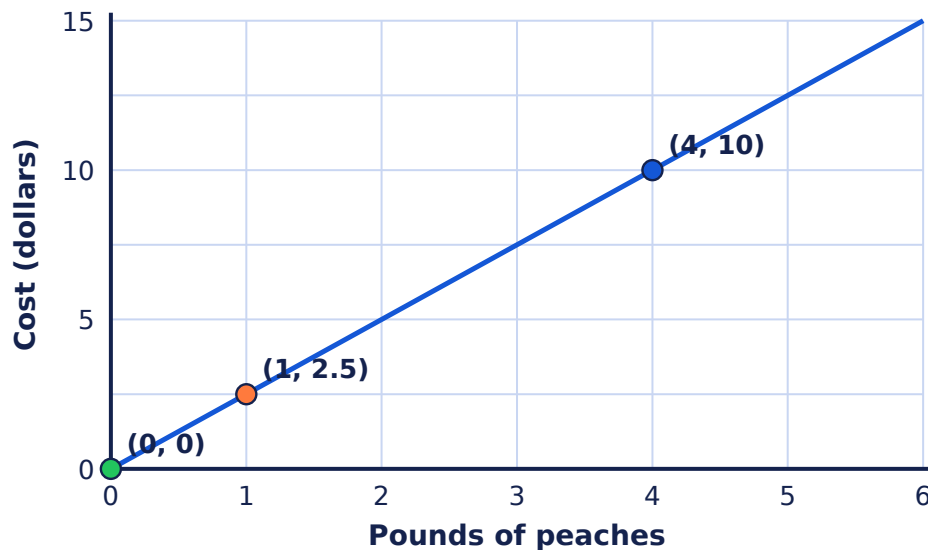
Divide each y -value by its x -value. If every quotient is equal, the table is proportional. If even one differs, it is not.

Pounds (x)	2	4	6
Cost in \$ (y)	5	10	15
$y \div x$	2.5	2.5	2.5

Equal ratios in the last row show that the table is proportional.

How can you test a graph?

A graph is proportional only when it passes both tests: its points lie on one straight line, and that line goes through the origin (0, 0). A line that is straight but starts higher or lower is not proportional.



Peach cost: a straight line through the origin. The point $(1, 2.5)$ shows the unit rate.

What the key points mean

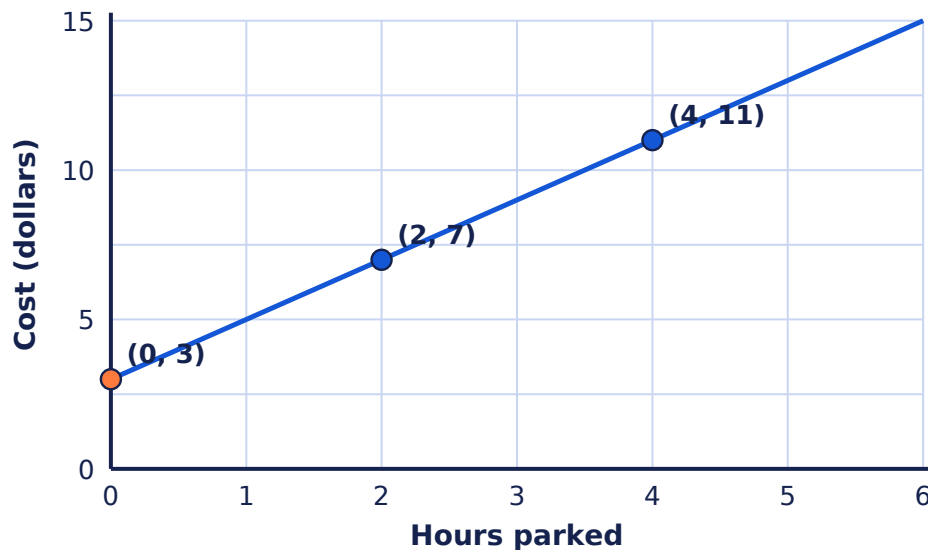
Point	Meaning
$(0, 0)$	Zero of one quantity matches zero of the other: 0 pounds cost \$0.
$(1, r)$	r is the constant of proportionality: the cost of 1 pound.

Method: is it proportional?

1. Table: compute $y \div x$ for every pair.
2. Check that all the quotients match.
3. Graph: check for a straight line that contains $(0, 0)$.
4. If it passes, name k and say what it means in the story.

Worked example

A parking garage charges \$3 to enter plus \$2 per hour. At 2 hours the cost is \$7, at 4 hours it is \$11. Ratios: $7 \div 2 = 3.5$ and $11 \div 4 = 2.75$. They differ, so the relationship is **not proportional**.



Parking: a straight line, but it misses $(0, 0)$, so the relationship is not proportional.

Common mistake

Thinking every straight line is proportional. A flat entry fee moves the line up, so it misses $(0, 0)$. Also, adding the same amount each step (like $+2$) is not the same as multiplying by a constant.

Mathbot's tip

Look for the origin first. If a straight graph hits $(0, 0)$, find one point with $x = 1$ and read k straight from it.

Key points to remember

- Proportional means $y \div x$ gives the same number for every pair.
- The constant of proportionality k is the unit rate: y for 1 unit of x .
- The graph is a straight line that passes through the origin $(0, 0)$.
- The point $(1, r)$ on the graph shows the constant of proportionality r .
- A straight line that misses $(0, 0)$ is not proportional.

Spotting Proportional Relationships in Tables and Graphs: frequently asked questions

How do you know if a table is proportional?

Divide each y -value by the matching x -value. If all the quotients are the same, the table is proportional. A single different quotient means it is not.

What is the constant of proportionality?

It is the fixed ratio $y \div x$ in a proportional relationship. It is the same as the unit rate, such as

dollars per pound or miles per hour.

Why must the graph go through (0, 0)?

With none of one quantity you have none of the other, so the point (0, 0) must belong to the graph. A line that crosses the y-axis elsewhere has a starting amount, which breaks proportionality.

What does the point (1, r) mean on a proportional graph?

It says that 1 unit of x goes with r units of y. So r is the unit rate and the constant of proportionality.

Can a proportional relationship have fractions or decimals?

Yes. Values such as $\frac{3}{4}$ or 2.5 work the same way. Compare the ratios $y \div x$; converting fractions to decimals can make the comparison easier.