

Inverse Proportion

Starter

- (Review of last lesson)** Given that 1 foot = 12 inches and 1 inch = 2.54 cm, convert:

(a) 4 feet to cm and (b) 500 cm to feet.
- (Review of last lesson)** Wendy is going on holiday and wants to take \$1500 with her. She has the choice between two currency exchange companies.

X-change: No fee, the exchange rate is £1 = \$1.35
 UR Money: £6 fee, the exchange rate is £1 = \$1.37

Which one should she choose?
- Peter goes for a cycle ride. If he increases his speed, how would that affect:

(a) the distance travelled
 (b) the time taken.

Discuss with a partner.

Notes

Inverse proportion is when an increase in one quantity causes a decrease in another quantity.

Examples of inverse proportion

- Building a wall (workers and time): if you increase the workers, you (should) need less time.
- Speed and time: if you increase the speed, you need less time to cover the same distance
- Density and volume: if you increase the density, you need less volume to weigh the same

E.g. Eleven taps fill a tank in three hours. How long would it take 6 taps?

Unitary method

	Taps	≡	Hours	
	11		3	
÷ 11	↓		↓	× 11 because less taps will mean more time
	1		33	
× 6	↓		↓	÷ 6 because more taps means less time
	6		$\frac{33}{6} = 5.5$ hours	

N.B. Notice that we *do the opposite on each side* — if we multiply on one side, we divide on the other and vice versa.

E.g. 1 A field of grass feeds 24 cows for 6 days. How long would the same field feed 18 cows?

E.g. 2 The length of an essay is 174 lines with an average of 14 words per line. How many lines would it be if it was 12 words per line?

Ratios involving three quantities

E.g. 3* Eighty machines can produce 4800 identical pens in 5 hours. At this rate how many pens would:

- (a) one machine produce in one hour?
- (b) 25 machines produce in 7 hours.

Hint: set up a table like the one below.

Machines	Pens	Hours
80	4800	5

Working: (a) Starting with 80 machines, 4800 pens, 5 hours we need to get to 1 machine, ?? pens, 1 hour.
 With fewer machines (from 80 to 1), fewer pens would be produced so divide 4800 by 80 — hence 1 machine, 60 pens, 5 hours.
 With fewer hours (from 5 to 1), fewer pens would be produced so divide 60 by 5 — hence 1 machine, 12 pens, 1 hour.

Machines	Pens	Hours
80	4800	5
1	$4800 \div 80 = 60$	5
1	$60 \div 5 = 12$	1

So 12 pens could be produced by 1 machine in 1 hour.

(b) Starting with 1 machine, 12 pens, 1 hour we need to get to 25 machines, ?? pens, 7 hour.
 With more machines (from 1 to 25), more pens would be produced so multiply 12 by 25 — hence 25 machines, 300 pens, 1 hour.
 With more hours (from 1 to 7), more pens would be produced so multiply 300 by 7 — hence 25 machines, 2100 pens, 7 hours.

Machines	Pens	Hours
1	12	1
25	$12 \times 25 = 300$	1
25	$300 \times 7 = 2100$	7

So 2100 pens could be produced by 25 machines in 7 hours.

E.g. 4* Twenty typists work for 8 hours a day and complete 3000 pages. How long would 15 typists need to work to produce 200 pages? Give your answer in terms of days, minutes and seconds.

Video: <https://www.drfrostmaths.com/videos.php?skid=397>

[Solutions to Starter and E.g.s](#)

Exercise

p125 Ex 7.5 Qu 1-10

Summary

Inverse proportion — when one quantity increases, the other one decreases by the same ratio.
Find out how much 1 item is worth.

[Textbook answers \(only available during a lockdown\)](#)

