

## Inverse Proportion

### Starter

1. **(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.

**Working:** (a) 121.92 cm (b) 16.4 feet

- 2.\* **(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?

**Working:** X-change: Cost to exchange \$1500 =  $1500 \div 1.35 = \text{£}1111.11$   
 UR Money: Cost to exchange \$1500 =  $1500 \div 1.37 + 6 = \text{£}1108.96$   
 So UR Money is cheaper.

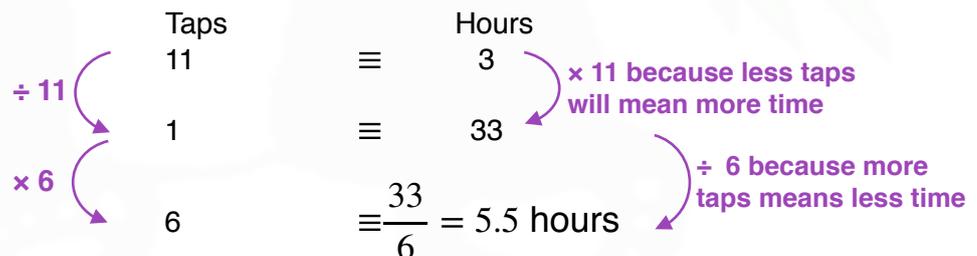
3. Peter goes for a cycle ride. If he increases his speed, how would that affect:  
 (a) the distance travelled  
 (b) the time taken.

Discuss with a partner.

**Working:** (a) Distance travelled would also increase (speed is proportional to distance)  
 (b) Time taken to cover the same distance would decrease (speed is inversely proportional to time)

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

### Unitary method



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

**Working:** 24 cows ≡ 6 days  
 1 cow ≡  $24 \times 6$  days the field lasts longer for 1 cow  
 18 cows ≡  $\frac{24 \times 6}{18} = 8$  days the field lasts longer for 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?

**Working:** 14 words per line  $\equiv$  174 lines  
 1 word per line  $\equiv$   $174 \times 14$  lines *1 word per line requires more lines*  
 12 words per line  $\equiv$   $\frac{174 \times 14}{12} = 203$  lines *12 words per line requires less lines*

**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.

**Working:** From 20 typist, 8 hours, 3000 pages to 15 typists, ??hours, 200 pages.

Typists	Hours	Pages
20	8	3000
$20 \div 20 = 1$	$8 \times 20 = 160$	3000
$1 \times 15 = 15$	$160 \div 15 = 32/3$	3000
15	$32/3 \div 3 = 32/9$	$3000 \div 3 = 1000$
15	$32/9 \times 2 = 64/9$	$1000 \times 2 = 2000$

$\frac{64}{9}$  days  $\equiv$  7 days 6 minutes 40 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

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