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 $= 1500 \div 1.35 = £1111.11$
   UR Money: Cost to exchange $1500 = 1500 \div 1.37 + 6 = £1108.96$
   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

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

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

18 cows $\equiv \dfrac{174 \times 14}{12} = 203$ 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 ÷ 80 = 60	5
1	60 ÷ 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 × 25 = 300	1
25	300 × 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 ÷ 20 = 1	8 × 20 = 160	3000
1 × 15 = 15	160 ÷ 15 = 32/3	3000
15	32/3 ÷ 3 = 32/9	3000 ÷ 3 = 1000
15	32/9 × 2 = 64/9	1000 × 2 = 2000

$\frac{64}{9}$ days ≡ 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)