DIRECT AND INVERSE PROPORTION

Task 1

1) The cost of 6 pencils is £3. Work out the cost of 4 pencils.
£3 ÷ 6 = £0.50 each
4 × £0.50 = **£2**

2) 5 apples cost £2.50. How much do 8 apples cost?
£2.50 ÷ 5 = £0.50 each
8 × £0.50 = **£4**

3) A car travels 120 km in 2 hours. How far does the car travel in 5 hours at the same speed?
120 ÷ 2 = 60 km/h
60 × 5 = **300 km**

4) 3 hours of TV takes 12 hours of battery life. How much battery life does 7 hours of TV take?
12 ÷ 3 = 4 hours
7 × 4 = **28 hours**

5) A machine produces 240 bottles in 4 hours. How many bottles can it produce in 7 hours?
240 ÷ 4 = 60 per hour
60 × 7 = **420 bottles**

6) 10 pens cost £15. How much do 3 pens cost, after they are marked down 20% in a sale?
£15 ÷ 10 = £1.50 each
3 × £1.50 = £4.50
£4.50 × 0.8 = **£3.60**

7) A train travels 75 km in 1.5 hours. How far does the train travel in 4 hours?
75 ÷ 1.5 = 50 km/h
50 × 4 = **200 km**

8) 4 miles of driving in a ride share app cost £10. Work out the cost of 9 miles of driving in the ride share app. State one assumption you've made.
£10 ÷ 4 = £2.50 each mile
9 × £2.50 = **£22.50**
The same amount is charged per mile.

9) A car uses 8 litres of petrol to travel 120 km. How much petrol is needed for 210 km?
120 ÷ 8 = 15 km per litre
210 ÷ 15 = **14 litres**

10) 1 pencil and 5 pens cost £4.20. 12 pencils cost £5.40. Work out the cost of 2 pens.
Pencil = £5.40 ÷ 12 = £0.45

£0.45 + 5p = £4.20
5p = £3.75
p =£0.75

Pen = £0.75
2 pens = £1.50

11) Sketch a graph on the axes below to show that y is directly proportional to x.
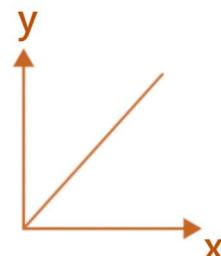
12) m is directly proportional to n.
m is given by the formula:
$$m = 3.2n$$
a. Find the value of m when n = 15.
$m = 3.2(15) = $ **48**
b. Find the value of n when m = 16.
$16 = 3.2n$
$n = 16 ÷ 3.2 = $ **5**

Task 2

13) 8 workers take 12 hours to complete a job. How long will 4 workers take to complete the same job?
8 workers → 12 hours
× 2
4 workers → 24 hours
24 hours

14) 5 painters take 15 days to paint a house. How long will 10 painters take to complete the same job? State one assumption you've made.

5 painters → 15 days
÷ 2
10 painters → 7.5 days

7.5 days

We have assumed all painters, paint at the same rate.

15) 6 taps fill a tank in 20 minutes. How long will it take 4 taps to fill the tank?

6 taps → 20 minutes
× 6
1 tap → 120 minutes
÷ 4
4 taps → 30 minutes

30 minutes

16) 12 workers build an extension in 18 days. How long will 9 workers take to build the extension? State one assumption you've made.

12 workers → 18 days
× 4
3 workers → 72 days
÷ 3
9 workers → 24 days

24 days

We have assumed all builders work at the same rate.

17) A machine takes 8 hours to produce 240 items. If the machine produced 360 items, how long did it take?

8 × 1.5 = **12 hours**

18) Sketch a graph on the axes below to show that y is inversely proportional to x.
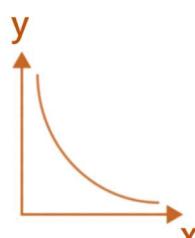
19) a is inversely proportional to b.

a is given by the formula:
$$a = \frac{80}{b}$$

a. Find the value of a when b = 40.
$$a = \frac{80}{40} = 2$$

b. Find the value of b when a = 160.
$$160 = \frac{80}{b}$$
$$160b = 80$$
$$b = 0.5$$

Challenge

20) 12 students must each work 2 hours a day to complete 180 research assignments.

If only 9 students are available, each working 4 hours a day, how many assignments can they complete?

12 students → 2 hours → 180 assignments
× $\frac{4}{3}$ (adjust for 9 students)
9 students → $2\frac{2}{3}$ hours → 180 assignments
× $\frac{3}{2}$ (adjust for 4 hours)
9 students → 4 hours → 270 assignments

270 assignments

21) It takes 6 bakers, working 5 hours a day, 4 days to bake 360 cupcakes for a wedding.

How long would it take 8 bakers, working 6 hours a day, to bake 540 cupcakes?

6 bakers → 5 hours → 4 days → 360 cupcakes
÷ $\frac{4}{3}$ (adjust to 8 bakers)
8 bakers → 5 hours → 3 days → 360 cupcakes
× $\frac{3}{2}$ (adjust to 540 cupcakes)
8 bakers → 5 hours → 4.5 days → 540 cupcakes
÷ $\frac{6}{5}$ (adjust to 6 hours)
8 bakers → 6 hours → 3.75 days → 540 cupcakes

3.75 days or 3 days 18 hours