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.

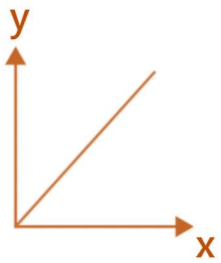
9) A car uses 8 litres of petrol to travel 120 km. How much petrol is needed for 210 km?
   120 ÷ 8 = 15 km per litre
   210 ÷ 15 = **14 litres**

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.

$$m = 3.2(15) = \mathbf{48}$$

   b. Find the value of n when m = 16.

$$16 = 3.2n$$
$$n = 16 \div 3.2 = \mathbf{5}$$

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

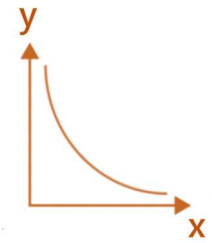
24 days

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.

$$a = \frac{80}{40} = \mathbf{2}$$

b. Find the value of b when a = 160.

$$160 = \frac{80}{b}$$

$$160b = 80$$

$$\boldsymbol{b = 0.5}$$

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