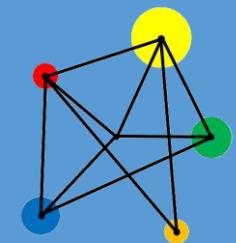


Proportion



Understand direct proportion

Vocabulary

Proportional

Two quantities are proportional if when one quantity is doubled, the other doubles also.

Starter

Copy these tables.

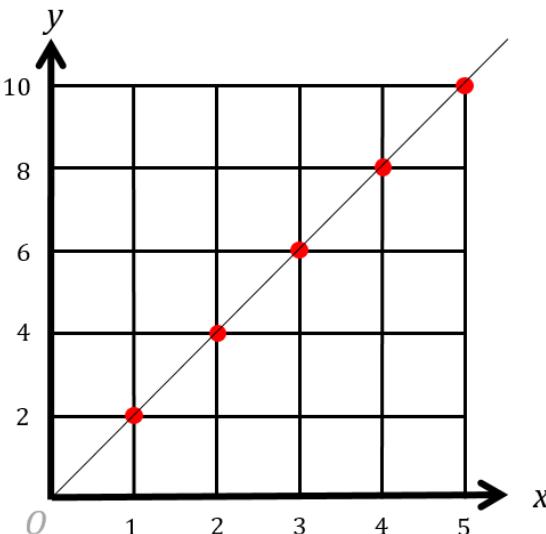
Can you find a link between x and y and fill in the missing rows?

x	y
1	2
2	4
3	
4	8
-----	-----
100	

x	y
2	7
4	14
6	
8	28
-----	-----
100	

Solutions

x	y
1	2
2	4
3	6
4	8
---	---
100	200



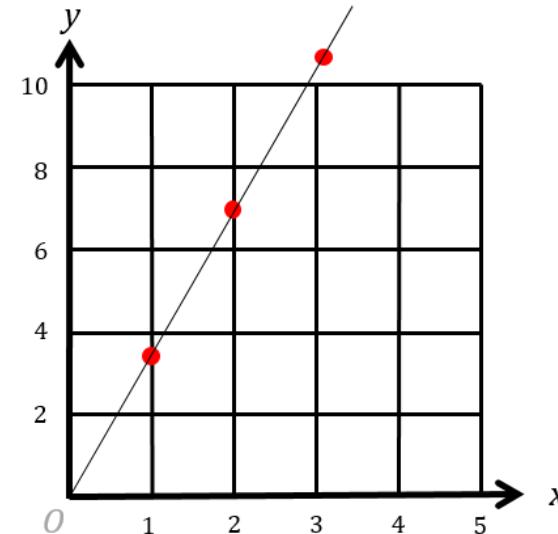
y is twice as big as x.

$$y = 2x$$

x	y
2	7
4	14
6	21
8	28
---	---
100	350

y is 3.5 times as big as x.

$$y = 3.5x$$



Exercise

Copy these tables.

Find a link between x and y and fill in the missing rows.

Sketch a graph of the relationship between x and y for each table.

x	y
1	3
2	6
3	
4	12
100	?

x	y
1	10
2	20
3	30
4	
100	?

x	y
1	0.5
2	
3	1.5
4	2
100	?

Solutions

Copy these tables.

Find a link between x and y and fill in the missing row.

Sketch a graph of the relationship between x and y for each table.

$$y = 3x$$

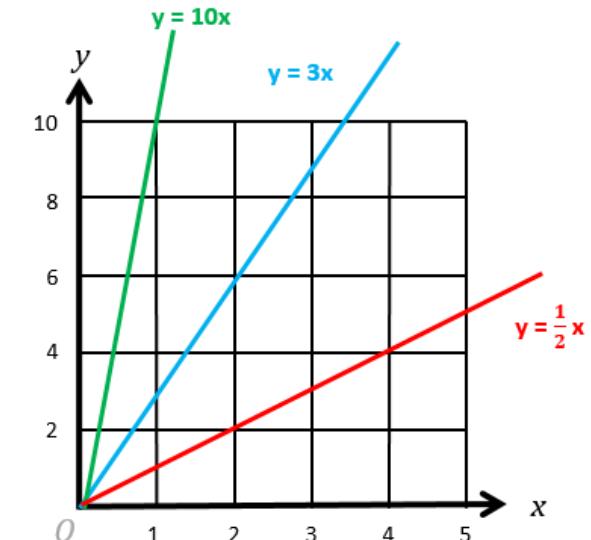
x	y
1	3
2	6
3	9
4	12
---	---
100	300

$$y = 10x$$

x	y
1	10
2	20
3	30
4	40
---	---
100	1000

$$y = \frac{1}{2}x$$

x	y
1	0.5
2	1
3	1.5
4	2
---	---
100	50



Exercise

In each table, y is proportional to x .
Find a formula linking y and x

x	1	2	3	4
y	5	10	15	20

x	1	2	3	4
y	32	64	96	128

x	2	4	6	8
y	3	6	9	12

In each table, y is proportional to x .
Fill in the gaps in each table

x	1	2		9
y	6		36	

x	12	24		54
y	9		30	

Are x and y proportional?

x	y
0	0
3	2
9	6
18	12
36	24
45	30
198	132

Solutions

In each table, y is proportional to x .

Find a formula linking y and x

$$y = 5x$$

x	1	2	3	4
y	5	10	15	20

$$y = 32x$$

x	1	2	3	4
y	32	64	96	128

$$y = 1.5x$$

x	2	4	6	8
y	3	6	9	12

In each table, y is proportional to x .
Fill in the gaps in each table

x	1	2	6	9
y	6	12	36	54

x	12	24	22.5	54
y	9	18	30	40.5

Are x and y proportional?

x	y
0	0
3	2
9	6
18	12
36	24
45	30
198	132

Yes. $x = 1.5y$

Example

5 bananas cost £1.40.

How much would 8 bananas cost?

Solution

5 bananas cost £1.40.

How much would 8 bananas cost?

$$1 \text{ banana} : \text{ £1.40} \div 5 = 28p$$

$$8 \text{ bananas} : 28p \times 8 = \text{ £2.24}$$

You try ...

7 apples cost £2.45.

How much would 6 apples cost?

Solution

7 apples cost £2.45.

How much would 6 apples cost?

$$1 \text{ apple} : \text{ £2.45} \div 7 = 35p$$

$$6 \text{ apples} : 35p \times 6 = \text{ £2.10}$$

Exercise

1. 7 pens cost £1.75.
How much would 4 pens cost?
2. Hanna earns £106 for 8 hours work.
How much will she earn for 5 hours work?
3. A recipe for 6 people uses 3 eggs.
How many eggs would a recipe for 10 people use?
4. It takes 3 hours to mark 4 exam papers.
How long would it take to mark 7 exam papers?
5. A computer can perform 5 billion calculations per second.
How many calculations can it perform in one hour?

6. £1 = \$1.25
 - a) £10 = \$_____
 - b) £_____ = \$10
7. An office holds enough paper for 70 people for 30 days.

5 new employees join the office.

How many days will the paper now last?

Exercise

1. 7 pens cost £1.75.

How much would 4 pens cost? **£1**

2. Hanna earns £106 for 8 hours work.

How much will she earn for 5 hours work? **£66.25**

3. A recipe for 6 people uses 3 eggs.

How many eggs would a recipe for 10 people use? **5 eggs**

4. It takes 3 hours to mark 4 exam papers.

How long would it take to mark 7 exam papers?

5 hours and 15 minutes

5. A computer can perform 5 billion calculations per second.

How many calculations can it perform in one hour?

18 000 000 000 000

18 trillion

6. £1 = \$1.25

a) £10 = \$ **12.50**

b) £ **8** = \$10

7. An office holds enough paper for 70 people for 30 days.

5 new employees join the office.

How many days will the paper now last? **28 days**

Recipes

Here is a list of ingredients for making 8 biscuits:

60g oats

40g butter

30ml golden syrup

28g sugar

- a) How many g of oats would be needed for 16 biscuits?
- b) How many g of butter would be needed for 40 biscuits?
- c) How many ml of syrup would be needed for 4 biscuits?
- d) How many g of sugar would be needed for 12 biscuits?
- e) How many g of oats would be needed for 10 biscuits?

Challenge

If you had 70g of butter and plenty of the other ingredients, how many biscuits could you make?

Solutions

Here is a list of ingredients for making 8 biscuits:

60g oats

40g butter

30ml golden syrup

28g sugar

- a) How many g of oats would be needed for 16 biscuits? **120g**
- b) How many g of butter would be needed for 40 biscuits? **200g**
- c) How many ml of syrup would be needed for 4 biscuits? **15ml**
- d) How many g of sugar would be needed for 12 biscuits? **42g**
- e) How many g of oats would be needed for 10 biscuits? **75g**

Challenge

If you had 70g of butter and plenty of the other ingredients, how many biscuits could you make?

14 biscuits

Here is a list of Ingredients for making 'Toad in the Hole'.

Serves 4 people

6 sausages

140g plain flour

180ml skimmed milk

2 eggs

(a) Complete this list of ingredients for making a larger 'Toad in the Hole'.

Serves 6 people

..... sausages

210g plain flour

..... ml skimmed milk

..... eggs

(b) Complete this list of ingredients for making an even larger 'Toad in the Hole'.

Serves people

..... sausages

..... plain flour

405ml skimmed milk

..... eggs

What problems might occur when following the recipe above

Here is a list of Ingredients for making 'Toad in the Hole'.

Serves 4 people

6 sausages

140g plain flour

180ml skimmed milk

2 eggs

(a) Complete this list of ingredients for making a larger 'Toad in the Hole'.

Serves 6 people

9 sausages

210g plain flour

270 ml skimmed milk

3 eggs

(b) Complete this list of ingredients for making an even larger 'Toad in the Hole'.

Serves **9** ... people

13.5 sausages

315 plain flour

405ml skimmed milk

4.5 eggs

What problems might occur when following the recipe above

Part of a sausage and egg.

Extension

5 apples cost 'x' pence.

Write down the cost of:

a) 10 apples

b) 3 apples

c) 1 apple

d) 'x' apples

Solutions

5 apples cost 'x' pence.

Write down the cost of:

a) 10 apples $2x$

b) 1 apple $\frac{x}{5}$

c) 3 apples $\frac{3x}{5}$

d) 'x' apples x^2

Exam Style Question

There are 57 calories in 100g of blueberries.

There are 92 calories in 100g of yogurt.

Maisie has 40g of blueberries and 120g of yogurt for breakfast.

Work out the total number of calories in Maisie's breakfast.

Solution

There are 57 calories in 100g of blueberries.

There are 92 calories in 100g of yogurt.

Maisie has 40g of blueberries and 120g of yogurt for breakfast.

Work out the total number of calories in Maisie's breakfast.

10g of blueberries contain 5.7 calories.

10g of yogurt contains 9.2 calories.

40g of blueberries contain:

$$4 \times 5.7$$

$$= 22.8 \text{ calories}$$

120g of yogurt contains:

$$12 \times 9.2$$

$$= 110.4 \text{ calories}$$

Maisie's breakfast contains:

$$22.8 + 110.4$$

$$= \underline{\text{133.2 calories}}$$