



GCSE MATHS

DIRECT AND INVERSE
PROPORTIONS

Direct Proportion

Inverse Proportion

Proportions Word Problems

www.expertguidance.co.uk
mahima.laroyia@expertguidance.co.uk
+447448352272
#mahimalaroyia
@expertguidance

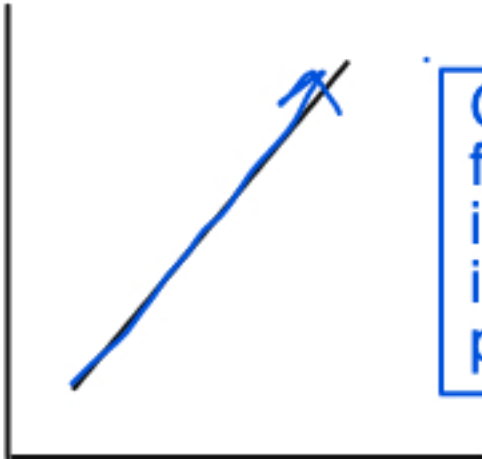


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**DIRECT AND
INVERSE PROPORTION**

DIRECT PROPORTION

When one value increases the other increases as well



Greater the force greater is the extension in the spring produced.

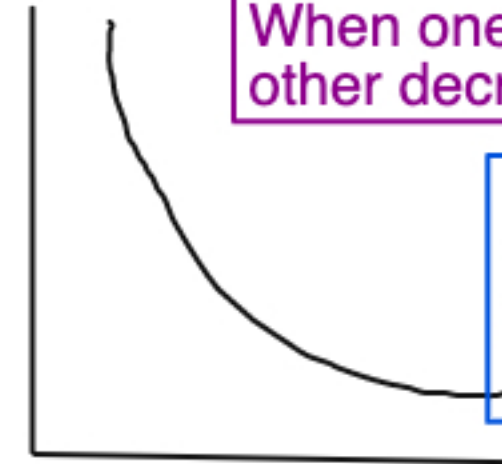
$$y \propto x$$

$$y = kx$$

$k = \text{constant}$

INVERSE PROPORTION

When one value increases other decreases



If pressure increases volume decreases

$$y \propto \frac{1}{x}$$

$k = \text{constant}$

$$y = \frac{k}{x}$$

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#mahimalaroyia
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DIRECT PROPORTION

- Write the proportional relation
- Convert it into equation using a constant k
- Substitute the values to work out k
- Complete the equation
- Use the equation to find unknown values.

x is directly proportional to the square of y .
If x is 1000 y is 20.

- Write the proportionality equation
- Work out the value of x when y is 5

a is directly proportional to b . If a is 7 b is 35.
a) Write the proportionality equation
b) Work out the value of b when a is 21

a) $a \propto b$ \rightarrow $a = \frac{1}{5}b$

$a = kb$

$7 = k \cdot 35$

$\frac{7}{35} = k$

$\frac{1}{5} = k$

b) $21 = \frac{1}{5}b$

$105 = b$

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#mahimalaroyia
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DIRECT PROPORTION

- Write the proportional relation
- Convert it into equation using a constant k
- Substitute the values to work out k
- Complete the equation
- Use the equation to find unknown values.

x is directly proportional to the square of y.
If x is 1000 y is 20.

- Write the proportionality equation
- Work out the value of x when y is 5

$$\begin{aligned} x &= 2.5 \times 5^2 \\ &= 2.5 \times 25 \\ &= 62.5 \end{aligned}$$

$$\begin{aligned} \text{a) } x &\propto y^2 \\ x &= ky^2 \\ 1000 &= k \times (20)^2 \\ k &= \frac{1000}{400} = \\ &= 2.5 \end{aligned}$$

$$x = 2.5y^2$$

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+447448352272
#mahimalaroyia
@expertguidance



INVERSE PROPORTION

a) Write the proportional relation

b) Convert it into equation using a constant k

c) Substitute the values to work out k

d) Complete the equation

e) Use the equation to find unknown values.

y is inversely proportional to the cube of x

When $y = 125$, $b = 0.1$

Find the value of y when x is 0.25

a is inversely proportional to b.
If a is 10 b is 0.1.

a) Work out the proportionality equation

b) Work out b when a is 100

$$a \propto \frac{1}{b} \quad a = \frac{k}{b} \quad 10 = \frac{k}{0.1}$$

$$k = 1$$

$$a) \quad a = \frac{1}{b} \quad b) \quad 100 = \frac{1}{b}$$

$$b = \frac{1}{100}$$

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mahima.laroyia@expertguidance.co.uk
+447448352272
#mahimalaroyia
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INVERSE PROPORTION

- Write the proportional relation
- Convert it into equation using a constant k
- Substitute the values to work out k
- Complete the equation
- Use the equation to find unknown values.

y is inversely proportional to the cube of x

When y = 125, x = 0.1

Find the value of y when x is 0.25

$$y = \frac{0.125}{x^3}$$

$$y = \frac{0.125}{0.25^3} = 8$$

$$y \propto \frac{1}{x^3}$$

$$y = \frac{k}{x^3}$$

$$125 = \frac{k}{(0.1)^3}$$

$$k = 125 \times 0.1^3 = 0.125$$

www.expertguidance.co.uk
mahima.laroyia@expertguidance.co.uk
+447448352272
#mahimalaroyia
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PROPORTION WORD PROBLEMS

Q1 To make 20 Flapjacks, 200 g of Flour is required.
How much flour is needed to make 30 Flapjacks.

Q3 To make a red cookie
you require 20 g of flour and 60 of sugar.
If you have 360 g of sugar how much flour
will you need.

Q2 If 20 m wire cost \$30 how much will 25 m
wire cost ?

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#mahimalaroyia
@expertguidance



PROPORTION WORD PROBLEMS

Q1 To make 20 Flapjacks, 200 g of Flour is required. How much flour is needed to make 30 Flapjacks.

$$\begin{array}{l}
 \text{Flapjacks} = \text{Flour} \\
 \begin{array}{l}
 \times 1.5 \left\{ \begin{array}{l} 20 = 200 \\ 30 = 300\text{g} \end{array} \right. \times 1.5
 \end{array}
 \end{array}$$

Q2 If 20 m wire cost \$30 how much will 25 m wire cost ?

$$\begin{array}{l}
 \text{Wire} = \text{Price} \\
 \begin{array}{l}
 \div 20 \left\{ \begin{array}{l} 20\text{m} \rightarrow \$30 \\ 1\text{m} \rightarrow \frac{30}{20} \end{array} \right. \\
 \times 25 \left\{ \begin{array}{l} 25\text{m} \rightarrow \frac{30}{20} \times 25 = \frac{75}{2} = 37.50
 \end{array} \right.
 \end{array}
 \end{array}$$

Q3 To make a red cookie you require 20 g of flour and 60 of sugar. If you have 360 g of sugar how much flour will you need.

$$\begin{array}{l}
 \text{Sugar} = \text{Flour} \\
 \begin{array}{l}
 \div 60 \left\{ \begin{array}{l} 60 \quad 20 \\ 1 \quad - \frac{20}{60} \end{array} \right. \\
 \times 6 \left\{ \begin{array}{l} 360\text{g} \rightarrow \frac{20}{60} \times 360 \\ \rightarrow 120 \text{ flour}
 \end{array} \right.
 \end{array}
 \end{array}$$

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+447448352272
#mahimalaroyia
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NEXT STEP

★ CHECK SPECIFICATION

★ EXAM QUESTIONS ON THE TOPIC



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