GCSE – Mathematics only Topic: Direct and inverse proportion	Tier: Higher	Grade: A/A*

Starter:

1) Jim walks 3 miles in 51 minutes. How long would it take him to walk 2 miles ?

2) What assumption have you made to answer Q1?

Top Tips!

Look out for key words 'inverse' or 'direct'.
If y is **directly** proportional to x say, then y = something **times** x
If y is **inversely** proportional to x say, then y = something **divided** by x.

Common examples (using k to represent that 'something')
If y is directly proportional to x^2, then $y = kx^2$.
If m is directly proportional to n^3, then $m = kn^3$.
If y is inversely proportional to x^2, then $y = \frac{k}{x^2}$

Finding the value of 'k'
You will be given extra information for this.
Ie Given that *x* is directly proportional to the cube of *y*, and that *x* = 16 when *y* = 2, find an expression for *x* in terms of *y*.
The words 'directly proportional' means $x = ky^3$.
Now sub in x = 16 and y = 2, $16=k(2)^3$, $16 = 8k$, $k=2$
Therefore $x = 2y^3$.

Skills:

1) Given that y is inversely proportional to x, and that y = 4 when x = 6,
(a) Find an expression for y in terms of x,

(b) Complete the following table for values of x and y.

x	$\frac{1}{2}$	6	
y		4	3

2. Given that g is directly proportional to h^2, and that g = 1 when h = 3,
(a) Find an expression for g in terms of h,

(b) Find g when h = 2.

Examination Question:

2012 Summer Link Applications U1 Higher Q13

A production line making chocolates sometimes develops a fault and shuts down.
The distance the chocolates travel towards the next process before shut down is *d* metres.
The speed of the production line is *v* m/s.
When the fault occurs, it is noticed that the distance the chocolates travel towards the next process is inversely proportional to the square of the speed of the production line.
The fault last occurred when the distance the chocolates moved on towards the next process was 8m and the speed of the production line was 4 m/s.

a) Find an expression for *d* in terms of *v*. (3)

b) Calculate *d* when *v* = 6 m/s. (2)

c) Calculate *v* when *d* is 25cm. (3)

Assessment for Learning

Video / QR code

GCSE – Mathematics only Topic: Direct and inverse proportion	Tier: Higher	Grade: A/A*

Starter:

1) Jim walks 3 miles in 51 minutes. How long would it take him to walk 2 miles ?

1 mile = 51÷3 = 17 minutes

2 miles = 17 x 2 = 34 minutes

2) What assumption have you made to answer Q1?

That he always walks at the same constant speed

Skills:

1. Given that y is inversely proportional to x, and that y = 4 when x = 6,

(a) Find an expression for y in terms of x,

$y = \frac{k}{x}$, $4 = \frac{k}{6}$, $k = 24$, $y = \frac{24}{x}$

(b) Complete the following table for values of x and y.

$x = \frac{1}{2}$ $3 = \frac{24}{x}$

$y = \frac{24}{\frac{1}{2}} = 48$ $x = 8$

x	$\frac{1}{2}$	6	8
y	48	4	3

2) Given that g is directly proportional to h^2, and that g = 1 when h = 3,

(a) Find an expression for g in terms of h,

$g = kh^2$

$1 = k \times 3^2$

$k = \frac{1}{9}$ $g = \frac{1}{9}h^2$

(b) Find g when h = 2. $g = \frac{1}{9} \times 2^2 = \frac{4}{9}$

Top Tips!

Look out for key words 'inverse' or 'direct'.

If y is **directly** proportional to x say, then y = something **times** x

If y is **inversely** proportional to x say, then y = something **divided** by x.

Common examples (using k to represent that 'something')

If y is directly proportional to x^2, then $y = kx^2$.

If m is directly proportional to n^3, then $m = kn^3$.

If y is inversely proportional to x^2, then $y = \frac{k}{x^2}$

Finding the value of 'k'

You will be given extra information for this.

Ie Given that *x* is directly proportional to the cube of *y*, and that *x* = 16 when *y* = 2, find an expression for *x* in terms of *y*.

The words 'directly proportional' means $x = ky^3$.

Now sub in x = 16 and y = 2, $16=k(2)^3$, $16 = 8k$, $k=2$

Therefore $x = 2y^3$.

Examination Question:

2012 Summer Link Applications U1 Higher Q13

A production line making chocolates sometimes develops a fault and shuts down.

The distance the chocolate travel towards the next process before shut down is *d* metres.

The speed of the production line is *v* m/s.

When the fault occurs, it is noticed that the distance the chocolates travel towards the next process, is inversely proportional to the square of the speed of the production line.

The fault last occurred when the distance the chocolates moved on towards the next process was 8m and the speed of the production line was 4 m/s.

a) Find an expression for *d* in terms of *v*. (3)

$d = \frac{k}{v^2}$, $8 = \frac{k}{4^2}$, $8 = \frac{k}{16}$, $k = 16 \times 8 = 128$, $d = \frac{128}{v^2}$

b) Calculate *d* when *v* = 6 m/s. (2)

$d = \frac{128}{6^2} = 3.555555 = 3.6m$

c) Calculate *v* when *d* is 25cm. (d=0.25m) (3)

$0.25 = \frac{128}{v^2}$, $v^2 = \frac{128}{0.25}$, $v^2 = 512$, $v = \sqrt{512}$, $v = 22.6m/s$