Direct & Inverse Proportion

คิดถึงครูอ้น(C9)
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Direct Proportion

TOP Maths IGCSE

Speed (s)	Distance Covered (d)
8 m/s	**240m**
16 m/s	**480m**
4 m/s	**120m**
24 m/s	**720m**

Where one quantity directly scales with another (e.g. as one doubles, the other doubles) we say they are **directly proportional.**

$$d \quad \square \quad s$$

Based on our discussion that there's a 'constant scale factor' between the two, we can also write:

Worked Examples

y is directly proportional to x. When $x = 3$, $y = 7.5$.
Find a formula for y in terms of x and hence find the value of y when $x = 4.4$.

Worked Examples

A r is directly proportional to q. When $q = 12, r = 9$.

a) Find a formula for r in terms of q.

b) Find the value of r when $q = 17$.

B b is directly proportional to the square root of a.

When $a = 9, b = 15$.

Find the value of b when $a = 25$.

Exercise

A b is directly proportional to the square of a. When $a = 6, b = 18$. Find a when $b = 32$.

B b is directly proportional to the cube root of a. When $a = 27, b = 4.5$. Find a when $b = 7.5$.

C $y \propto x^2$

Write a formula for y in terms of x

x	5	6
y	400	576

Inverse Proportion

Speed (s)	Time (t)
6.47 m/s	773s (his PB)
5 m/s	1000s
10 m/s	500s

We say they are **indirectly or inversely proportional.**

$$s \propto \frac{1}{t}$$

$$s = \frac{k}{t}$$

First Step

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Question…	First thing you'd write…
y is directly proportional to x.	
y is inversely proportional to x.	
y is directly proportional to the square of x.	
y is inversely proportional to the square root of x.	
y is inversely proportional to the cube of x.	
y is proportional to the cube root of x.	
$y \propto \frac{1}{x^3}$	

Reminder:

- For "(directly) proportional to", use "$= k\times$"
- For "inversely proportional to", use " $= k \div$"

Worked Examples

y is inversely proportional to x.
When $x = 6, y = 8$.
Find y when $x = 9$.

b is inversely proportional to the square root of a.
When $a = 4, b = 10$.
Find b when $a = 25$.

U y is inversely proportional to x.
$y = 3$ when $x = 15$. Find a formula for y in terms of x.

V A, r and T are three variables. A is proportional to T^2. A is also proportional to r^3. $T = 47$ when $r = 0.25$.
Find r when $T = 365$. Give your answer correct to 3sf.

Proportion and their Graphs

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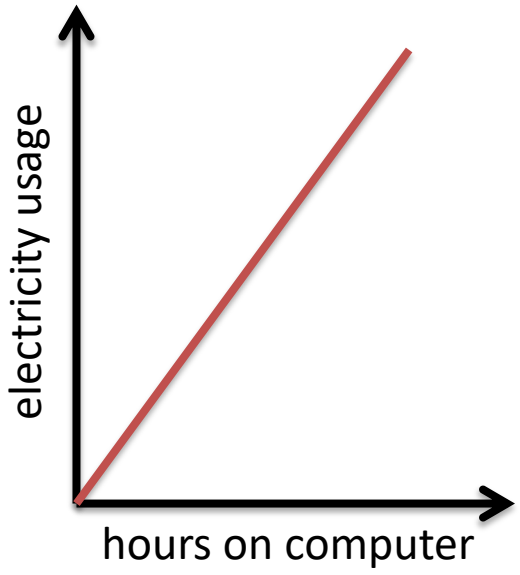
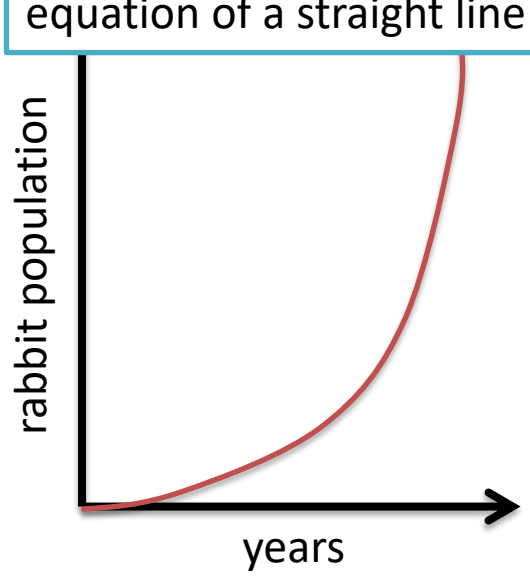
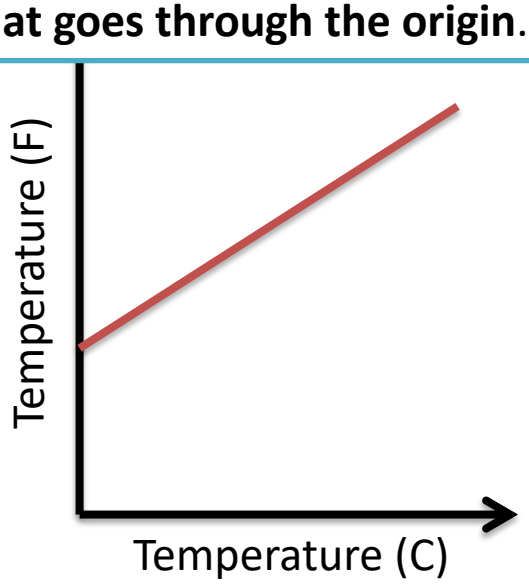
Which of these graphs represent variables which are directly proportional to each other?

For proportional variables y and x, $y = kx$. This is the equation of a straight line **that goes through the origin**.

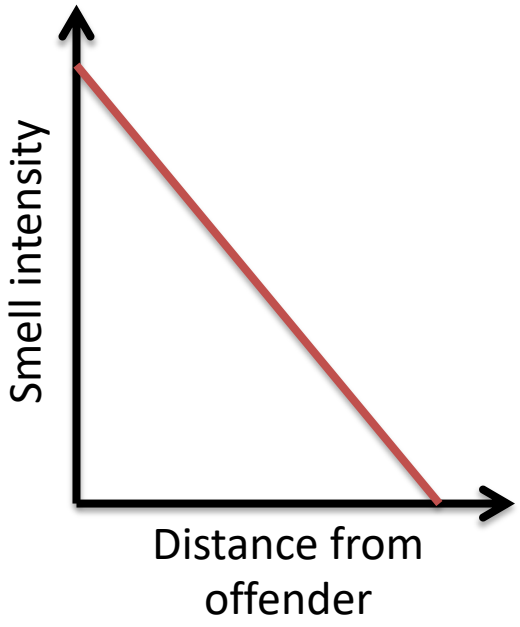


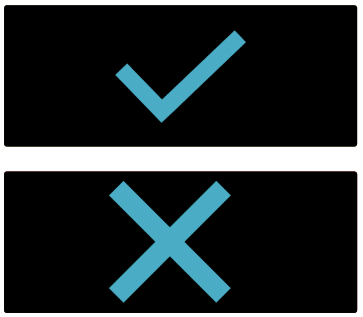


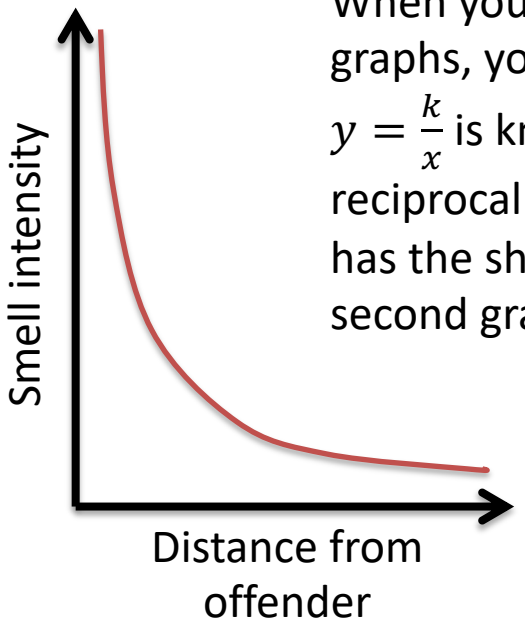


Proportion and their Graphs

Which of these graphs represent variables which are <u>inversely</u> proportional to each other?







When you do curved graphs, you'll see that $y = \frac{k}{x}$ is known as a reciprocal graph, which has the shape of the second graph.