Direct & Inverse Variations

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A P1 Topic : All cases & PP question types included

CASE | =>

Y varies as x ... y varies directly as x ...

These terms indicate $y \propto x \rightarrow y = kx$

Now lets do some examples

Q) y varies directly as square of x, given that $x = 3, y = 45$

i) Express y in terms of x

$y \propto x^2 \rightarrow y = kx^2$

$45 = k(3)^2 \rightarrow \frac{45}{9} \rightarrow k = 5$

$$y = 5x^2$$

ii) Find y, when $x = 2$

$y = 5(2)^2 \rightarrow y = 20$

iii) Find x, when $y = 125$

$125 = 5x^2$

$\frac{125}{5} = x^2 \rightarrow \sqrt{x^2} = \sqrt{25} \rightarrow x = \pm 5$

want another question? Here you go!

Q) y is directly proportional to square root of x, when $y = 20, x = 4$

i) express y in terms of x

$y \propto \sqrt{x} \rightarrow y = k\sqrt{x} \rightarrow 20 = k\sqrt{4} \rightarrow k = \frac{20}{2} = 10$

$$\boxed{y = 10\sqrt{x}}$$

ii) Find y when $x = 25$

$y = 10\sqrt{25} \rightarrow 10 \times 5 \rightarrow \boxed{y = 50}$

iii) Find x when $y = 52$

$52 = 10\sqrt{x} \rightarrow \frac{52}{10} = \sqrt{x} \rightarrow (\sqrt{x})^2 = (5.2)^2$ ($(5.2)^2$ ↓)

$\boxed{x = 27.04}$

Q) y varies directly to cube root of x when $x = 27, y = 6$

i) Express y in terms of x

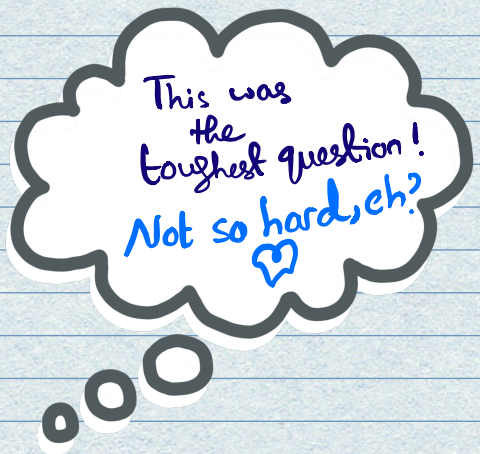
$y \propto \sqrt[3]{x} \rightarrow y = k\sqrt[3]{x}$

$\boxed{y = 2\sqrt[3]{x}}$

$6 = k\sqrt[3]{27} \rightarrow 6/3 = \boxed{k = 2}$

ii) Find y when $x = 216$

$y = 2\sqrt[3]{216} \rightarrow y = 2 \times 6 = \boxed{12}$



iii) Find x when $y = 3$

$3 = 2\sqrt[3]{x} \rightarrow \left(\frac{3}{2}\right)^3 = \left(\sqrt[3]{x}\right)^3 \rightarrow \boxed{x = \frac{27}{8}}$

CASE #2 :- Lets not be Friends ☹

Ok, so x & y were friends. They are not friends anymore

Now y is not compatible with x, hence they are now

Indirectly Proportional!

Q) y varies inversely as root of x if $y = 20, x = 16$

i) Express y in terms of x

$y \propto \frac{1}{x} \rightarrow y = \frac{k}{x}$

$20 = \frac{k}{\sqrt{16}} \rightarrow 20 = \frac{k}{4}$

$k = 80$

$$y = \frac{80}{\sqrt{x}}$$

ii) Find y when $x = 144$

$y = \frac{80}{\sqrt{x}} = y = \frac{80}{\sqrt{144}} \rightarrow \frac{80}{12} = \frac{20}{3} = y$

iii) x when $y = 40$

$40 = \frac{80}{\sqrt{x}} \rightarrow (\sqrt{x}) = \left(\frac{80}{40}\right)^2 = 2^2 = x = 4$

Thank you so much for going through these notes. Hope they helped you out. Have an Amazing day. Best of Luck!