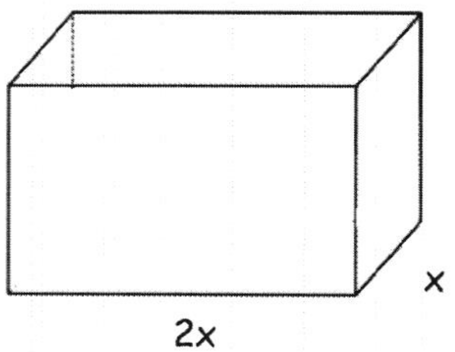
19th July

Corbettmaths

Use factor theorem to show that $(x-1)$ is a factor of $x^3 - 3x^2 - 13x + 15 = f(x)$	$f(1) = 1 - 3 - 13 + 15 = 0$ $\Rightarrow$ $\underline{x - 1 \text{ factor}}$
Expand and simplify $(2\sqrt{3} - 1)^3$	$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ $(2\sqrt{3}-1)^3 = (2\sqrt{3})^3 + 3(2\sqrt{3})^2(-1) + 3(2\sqrt{3})(-1)^2 + (-1)^3$ $= 24\sqrt{3} - 36 + 6\sqrt{3} - 1$ $\underline{= -37 + 30\sqrt{3}}$

An open-topped tank in the shape of a cuboid is shown below.



The surface area of the cuboid is 300cm²

The volume of the cuboid is V

Show that $y = \dfrac{50}{x} - \dfrac{x}{3}$

$SA = 2(2xy) + 2(xy) + x(2x)$
$= 6xy + 2x^2 = 300$
$\Rightarrow 6xy = 300 - 2x^2$
$\Rightarrow \underline{y = \frac{50}{x} - \frac{x}{3}}$

Show that the volume of the tank is $V = 100x - \dfrac{2}{3}x^3$

$V = 2x^2y = 2x^2\left(\frac{50}{x} - \frac{x}{3}\right)$
$\underline{= 100x - \frac{2}{3}x^3}$

Use differentiation to find the value of x for which V is a maximum

$\frac{dV}{dx} = 100 - 2x^2$ $\left[\frac{d^2V}{dx^2} = -4x < 0 \Rightarrow \text{max}\right]$
At max $100 - 2x^2 = 0$
$\Rightarrow x^2 = 50$
$\Rightarrow \underline{x = \sqrt{50} \ (7.07\text{cm})}$