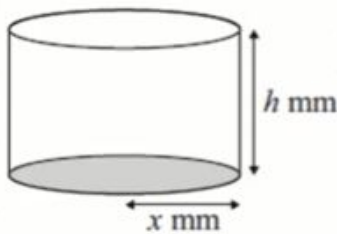




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## Calculus - Max & Min | Past Paper Question | C2 Edexcel June 2012 Q8(c)



A manufacturer produces pain relieving tablets. Each tablet is in the shape of a solid circular cylinder with base radius  $x$  mm and height  $h$  mm, as shown.

Given that the volume of each tablet has to be  $60 \text{ mm}^3$ ,

(b) show that the surface area,  $A \text{ mm}^2$ , of a tablet is given by

$$A = 2\pi x^2 + \frac{120}{x} \quad \textcircled{1}$$

The manufacturer needs to minimise the surface area  $A \text{ mm}^2$ , of a tablet.

(c) Use calculus to find the value of  $x$  for which  $A$  is a minimum. (5)

$A = 2\pi x^2 + 120x^{-1}$	At a min: $\frac{dA}{dx} = 0$	$\therefore 4\pi x^2 = 120$
$\therefore \frac{dA}{dx} = 4\pi x - 120x^{-2}$	$\therefore 4\pi x - \frac{120}{x^2} = 0$	$\therefore x^2 = \frac{120}{4\pi}$
$\therefore \frac{dA}{dx} = 4\pi x - \frac{120}{x^2}$	$\therefore 4\pi x^3 - 120 = 0$	$\therefore x = \sqrt[3]{\frac{30}{\pi}} = 2.1215$
		$\therefore x = 2.12 \text{ (3sf)}$

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