

## Common Types of Surd Questions

Hello!

Congratulations on taking the first step towards mastery of **Surds**!

This resource was created to help you save time and effort when doing your A.Math revision, so you are clear on the different types of surd questions that commonly appear!

Our teachers have taken time and effort to curate questions and we are certain this valuable resource will help you in your revision so please make sure you use it!

Should you still require some help after going through these questions, do feel free to drop us a WhatsApp! Our friendly centre manager will always be ready to help!

Here's wishing you all the very best for your O Level A.Math tests and exams.

Teachers of The Classroom

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**Skills required to solve surd questions**

- A Form, simplify and rationalise surds
- B Find the value of unknown constants given a surd equation
- C Solve surdic equations

**Rationalising the Denominator**

- $\frac{\sqrt{a}}{\sqrt{b}} = \frac{\sqrt{a}}{\sqrt{b}} \times \frac{\sqrt{b}}{\sqrt{b}} = \frac{\sqrt{ab}}{b}$
- $\frac{1}{\sqrt{a} + \sqrt{b}} = \frac{1}{\sqrt{a} + \sqrt{b}} \times \frac{\sqrt{a} - \sqrt{b}}{\sqrt{a} - \sqrt{b}} = \frac{\sqrt{a} - \sqrt{b}}{a - b}$
- $\frac{1}{\sqrt{a} - \sqrt{b}} = \frac{1}{\sqrt{a} - \sqrt{b}} \times \frac{\sqrt{a} + \sqrt{b}}{\sqrt{a} + \sqrt{b}} = \frac{\sqrt{a} + \sqrt{b}}{a - b}$

**Questions**

1. A cone has curved surface area  $\pi(17 - \sqrt{3}) \text{ cm}^2$  and slant height  $(7 - 3\sqrt{3}) \text{ cm}$ .  
**Without using a calculator**, find the diameter of the base of the cone, in cm, in the form  $a + b\sqrt{3}$ , where  $a$  and  $b$  are integers. [4]
2. Show that  $(2 + \sqrt{7})^2 - \frac{18}{3 - \sqrt{7}} = c + d\sqrt{7}$  where  $c$  and  $d$  are integers. [2]
3. Without using a calculator, find the integer value of  $a$  and  $b$  for which the solution of the equation  $2x\sqrt{5} = x\sqrt{2} + \sqrt{18}$  is  $\frac{\sqrt{a+b}}{3}$ . [4]
4. Solve the equation  $\sqrt{4 + \frac{3}{x}} = \frac{1}{\sqrt{x}} + 2$ . [5]

Suggested Solutions

Surds

<p><b>1.</b></p> $\pi rl = \pi(17 - \sqrt{3})$ $r = \frac{(17 - \sqrt{3})}{7 - 3\sqrt{3}}$ $= \frac{(17 - \sqrt{3})}{7 - 3\sqrt{3}} \times \frac{7 + 3\sqrt{3}}{7 + 3\sqrt{3}}$ $= \frac{110 + 44\sqrt{3}}{22}$ $= 5 + 2\sqrt{3}$ <p>Diameter = <math>10 + 4\sqrt{3}</math></p>	<p><b>3.</b></p> $x(2\sqrt{5} - \sqrt{2}) = \sqrt{18}$ $x = \frac{\sqrt{18}}{2\sqrt{5} - \sqrt{2}}$ $= \frac{\sqrt{18}}{2\sqrt{5} - \sqrt{2}} \times \frac{2\sqrt{5} + \sqrt{2}}{2\sqrt{5} + \sqrt{2}}$ $= \frac{2\sqrt{90} + 6}{18}$ $= \frac{\sqrt{10} + 1}{3}$ <p><math>a = 10, b = 1.</math></p>
<p><b>2.</b></p> $(2 + \sqrt{7})^2 - \frac{18}{3 - \sqrt{7}}$ $= 4 + 4\sqrt{7} + 7 - \frac{18}{3 - \sqrt{7}} \times \frac{3 + \sqrt{7}}{3 + \sqrt{7}}$ $= 11 + 4\sqrt{7} - \frac{18(3 + \sqrt{7})}{9 - 7}$ $= 11 + 4\sqrt{7} - 9(3 + \sqrt{7})$ $= 11 - 27 + 4\sqrt{7} - 9\sqrt{7}$ $= -16 - 5\sqrt{7}$	<p><b>4.</b></p> $4 + \frac{3}{x} = \left(\frac{1}{\sqrt{x}} + 2\right)^2$ $4 + \frac{3}{x} = \frac{1}{x} + \frac{4}{\sqrt{x}} + 4$ $\frac{2}{x} = \frac{4}{\sqrt{x}}$ $2\sqrt{x} = 4x$ $4x = 16x^2$ $16x^2 - 4x = 0$ $4x(4x - 1) = 0$ <p><math>x = 0</math> (rej) or <math>x = \frac{1}{4}</math></p>