# Guide to: Powers and roots

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**Explanation:**

A **square number** ($n^2$) is the result of multiplying an integer by itself (first ten: **1, 4, 9, 16, 25, 36, 49, 64, 81, 100**). A **cube number** ($n^3$) comes from multiplying an integer by itself three times: $n \times n \times n$ (first five: **1, 8, 27, 64, 125**). Never multiply the base by the power ($4^3 \neq 12$).

Roots are the inverse of powers: the **square root** ($\sqrt{x}$) asks what positive number squared gives $x$, and the **cube root** ($\sqrt[3]{x}$) asks what number cubed gives $x$. Also remember that any non-zero number to the power of 0 equals 1 ($x^0 = 1$).

**Example 1:** Work out the value of $\mathbf{7^2 + \sqrt{81} - 2^3}$

**Solution:**

Evaluate each power or root separately first:

- $\mathbf{7^2} = 7 \times 7 = \mathbf{49}$
- $\mathbf{\sqrt{81}} = \mathbf{9}$ (since $9 \times 9 = 81$)
- $\mathbf{2^3} = 2 \times 2 \times 2 = \mathbf{8}$

Combine: $49 + 9 - 8 =$ **Answer: 50**

**Example 2:** Work out the value of $\mathbf{4^3 - \sqrt[3]{64} + 10^3}$

**Solution:**

Evaluate each term carefully:

- $\mathbf{4^3} = 4 \times 4 \times 4 = \mathbf{64}$
- $\mathbf{\sqrt[3]{64}} = \mathbf{4}$ (since $4 \times 4 \times 4 = 64$)
- $\mathbf{10^3} = 10 \times 10 \times 10 = \mathbf{1000}$

Combine: $64 - 4 + 1000 =$ **Answer: 1060**

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