Important Formulas and Questions: Square Root and Cube Root

In order to score well in aptitude tests, we need to memorize squares till 35 and cubes till 21.

SQUARES:

$1^2 = 1$	$2^2 = 4$	$3^2 = 9$	$4^2 = 16$	$5^2 = 25$	$6^2 = 36$
$7^2 = 49$	$8^2 = 64$	$9^2 = 81$	$10^2 = 100$	$11^2 = 121$	$12^2 = 144$
$13^2 = 169$	$14^2 = 196$	$15^2 = 225$	$16^2 = 256$	$17^2 = 289$	$18^2 = 324$
$19^2 = 361$	$20^2 = 400$	$21^2 = 441$	$22^2 = 484$	$23^2 = 529$	$24^2 = 576$
$25^2 = 625$	$26^2 = 676$	$27^2 = 729$	$28^2 = 784$	$29^2 = 841$	$30^2 = 900$
$31^2 = 961$	$32^2 = 1024$	$33^2 = 1089$	$34^2 = 1156$	$35^2 = 1225$	

CUBES:

$1^3 = 1$	$2^3 = 8$	$3^3 = 27$	$4^3 = 64$	$5^3 = 125$	$6^3 = 216$
$7^3 = 343$	$8^3 = 512$	$9^3 = 729$	$10^3 = 1000$	$11^3 = 1331$	$12^3 = 1728$
$13^3 = 2197$	$14^3 = 2744$	$15^3 = 3375$	$16^3 = 4096$	$17^3 = 4913$	$18^3 = 5832$
$19^3 = 6859$	$20^3 = 8000$	$21^3 = 9261$			

Important Formulas:

1) $\sqrt{xy} = \sqrt{x} \times \sqrt{y}$
2) $\sqrt{\frac{x}{y}} = \frac{\sqrt{x}}{\sqrt{y}} = \frac{\sqrt{x}}{\sqrt{y}} \times \frac{\sqrt{y}}{\sqrt{y}} = \frac{\sqrt{xy}}{\sqrt{y}}$
3) $\sqrt[3]{xy} = \sqrt[3]{x} \times \sqrt[3]{y}$
4) $\sqrt[3]{\frac{x}{y}} = \frac{\sqrt[3]{x}}{\sqrt[3]{y}} = \frac{\sqrt[3]{x}}{\sqrt[3]{y}} \times \frac{\sqrt[3]{y^2}}{\sqrt[3]{y^2}} = \frac{\sqrt[3]{xy^2}}{y}$

Q1) Evaluate $\frac{\sqrt{729}}{\sqrt{81}} + \frac{3}{\sqrt{36}}$

Solution: $\frac{27}{9} + \frac{3}{6} = 3 + \frac{1}{2} = \frac{7}{2}$

Q2) Evaluate $\sqrt{29 + \sqrt{38 + \sqrt{107 + \sqrt{196}}}}$

Solution: $\sqrt{29 + \sqrt{38 + \sqrt{107 + 14}}} = \sqrt{29 + \sqrt{38 + \sqrt{121}}} = \sqrt{29 + \sqrt{38 + 11}}$

$$= \sqrt{29 + \sqrt{49}} = \sqrt{29 + 7} = \sqrt{36} = 6$$

Q3) Find the square root of $(\mathbf{104^2 - 40^2})$

Solution: $\sqrt{104^2 - 40^2} = \sqrt{(104 - 40)(104 + 40)}$

$$= \sqrt{64 \times 144} = \sqrt{64} \times \sqrt{144} = 8 \times 12 = 96$$

Q4) Find the value of $\sqrt{\mathbf{90\frac{1}{4}}}$

Solution: $\sqrt{90\frac{1}{4}} = \sqrt{\frac{361}{4}} = \frac{\sqrt{361}}{\sqrt{4}} = \frac{19}{2} = 9\frac{1}{2}$

Q5) What will come in place of x: $\sqrt{\mathbf{86.49}} + \sqrt{\mathbf{5 + x^2}} = \mathbf{12.3}$

Solution: $\sqrt{86.49} + \sqrt{5 + x^2} = 12.3$

$$9.3 + \sqrt{5 + x^2} = 12.3$$

$$\sqrt{5 + x^2} = 3$$

$$x^2 = 9 - 5 = 4$$

$$x = \sqrt{4} = 2$$

Q6) Find the least number by which 324 should be multiplied so that the net result is a perfect cube?

Solution: $324 = 2^2 \times 3^4$

To make 324 a perfect cube we have to multiply it by $2^1 \times 3^2 = 18$

NOTE: A number is a perfect cube of powers of prime factors are divisible by 3 i.e. of the form $3k$

Q7) $\frac{\sqrt{484}}{\sqrt{81} - \sqrt{36}} - \frac{22}{\sqrt{36}}$

1) $-\frac{3}{11}$ **2) 3** **3)** $\frac{11}{3}$ **4) 4**

Solution: $\frac{\sqrt{484}}{\sqrt{81} - \sqrt{36}} - \frac{22}{\sqrt{36}} = \frac{22}{9-6} - \frac{22}{6} = \frac{22}{3} - \frac{22}{6} = \frac{11}{3}$

Q8) If $x = 5$, then what is the value of $4x\sqrt{x^2 - x}$

1) $40\sqrt{5}$ **2)** $80\sqrt{5}$ **3)** $32\sqrt{3}$ **4)** $40\sqrt{3}$

Solution: Put $x = 5$ in the given expression.

Q9) $\sqrt{72 - 64\frac{8}{9}}$ =?

1) $4\frac{1}{3}$ **2)** $8\frac{2}{3}$ **3)** $2\frac{1}{3}$ **4)** $2\frac{2}{3}$

Solution: $\sqrt{72 - 64\frac{8}{9}} = \sqrt{72 - \frac{584}{9}} = \sqrt{\frac{64}{9}} = \frac{\sqrt{64}}{\sqrt{9}} = \frac{8}{3} = 2\frac{2}{3}$

Q10) Which number can replace x in the equation $\frac{4}{x} = \frac{x}{8}$

1) $2\sqrt{2}$ **2)** $3\sqrt{2}$ **3)** $4\sqrt{2}$ **4)** $5\sqrt{2}$

Solution: $\frac{4}{x} = \frac{x}{8}$

$$x^2 = 32 \; i.e. x = 4\sqrt{2}$$

Q11) If $\sqrt{4^n} = 256$ **, then the value of** n **is**

1) 4 **2)** 12 **3)** 16 **4)** 8

Solution: $\sqrt{4^n} = 256$; $\sqrt{2^{2n}} = 256$; $2^n = 2^8$; $n = 8$

Q12) If $3a = 4b = 6c$ **and** $a + b + c = 27\sqrt{11}$ **then** $\sqrt{a^2 + \frac{4}{3}b^2 + 2c^2}$ **is:**

1) $18\sqrt{11}$ **2)** $9\sqrt{11}$ **3)** $3\sqrt{11}$ **4) None of these**

Solution: As $3a = 4b$ and $4b = 6c$ so $a = \frac{4b}{3}, c = \frac{2b}{3}$

$$a + b + c = 27\sqrt{11}$$

$$\frac{4b}{3} + b + \frac{2b}{3} = 27\sqrt{11}, \qquad b = 9\sqrt{11}$$

$$\sqrt{a^2 + \frac{4}{3}b^2 + 2c^2} = \sqrt{\left(\frac{4b}{3}\right)^2 + \frac{4}{3}b^2 + 2 \times \left(\frac{2b}{3}\right)^2} = \sqrt{\frac{16}{9}b^2 + \frac{4}{3}b^2 + 2 \times \frac{4}{9}b^2} = \sqrt{4b^2}$$

$$= 2b = 18\sqrt{11}$$

Q13) Given that $\sqrt{172} = 13.11$ ***and*** $\sqrt[3]{172} = 5.56$

then find the value of $\left(\sqrt[5]{172}\right)^6 + \sqrt[3]{\frac{27}{8}}$.

1) 76.89 **2)** 71.39 **3)** 74.39 **4)** 69.89

Solution: $\left(\sqrt[5]{172}\right)^6 + \sqrt[3]{\frac{27}{8}} = (172)^{5/6} + \frac{\sqrt[3]{27}}{\sqrt[3]{8}} = (172)^{1/2} \times (172)^{1/3} + \frac{\sqrt[3]{27}}{\sqrt[3]{8}}$

$$= 13.11 \times 5.56 + \frac{3}{2} = 74.39$$