

Surds & Indices

(करणी एवं घात)

01. Laws of Indices (घातांक के नियम)

$$\begin{array}{ll} (i). a^0 = 1 & (vii). a^{-m} = \frac{1}{a^m} \\ (ii). (a^m)^n = a^{m \times n} & (viii). \left(\frac{a}{b}\right)^{-1} = \frac{1}{\frac{a}{b}} = \frac{b}{a} \\ (iii). a^{m \times n} \neq (a^m)^n & \\ (iv). a^m \times a^n = a^{m+n} & \\ (v). a^m \div a^n = a^{m-n} & (ix). a^m \times b^m = (ab)^m \\ (vi). a^m \div a^n \times a^p \times a^q \div a^k & (x). \frac{a^m}{b^m} = \left(\frac{a}{b}\right)^m \\ & = a^{m-n+p+q-k} \end{array}$$

02. Laws of Surds (करणियों के नियम)

$$\begin{array}{ll} (i). n\sqrt{a} = a^{\frac{1}{n}} & \\ (ii). m\sqrt{n\sqrt{p\sqrt{a}}} = m \times n \times p\sqrt{a} & \\ (iii). m\sqrt{a} \times m\sqrt{b} \times m\sqrt{c} = m\sqrt{a \times b \times c} & \\ (iv). \frac{m\sqrt{a}}{m\sqrt{b}} = m\sqrt{\frac{a}{b}} & (vi). a\sqrt{2} + b\sqrt{3} = 5\sqrt{2} + 6\sqrt{3} \\ (v). \left(m\sqrt{n\sqrt{a}}\right)^0 = 1 & (vii). m\sqrt{a} = n\sqrt{a} \\ (viii). m\sqrt{(a^p)^q} = a^{\frac{pq}{m}} & \end{array}$$

03. Some special rules (कुछ विशेष नियम)

Concept: 1

$$\sqrt{a \sqrt{a \sqrt{a \sqrt{a}} \dots \dots \dots n \text{ times}}} = a^{\frac{2n-1}{2n}}$$

Concept: 2

$$\sqrt{a \sqrt{a \sqrt{a \sqrt{a}} \dots \dots \dots \infty}} = a$$

Concept: 3

$$\sqrt[n]{a \sqrt[n]{a \sqrt[n]{a \sqrt[n]{a}} \dots \dots \dots \infty}} = a^{\left(\frac{1}{n-1}\right)}$$

Concept: 4

$$\sqrt[m]{a \sqrt[n]{b \sqrt[m]{a \sqrt[n]{b}} \dots \dots \dots \infty}} = \sqrt{(mn-1)}{a^n b}$$

Concept: 5

$$\sqrt{a + \sqrt{a + \sqrt{a + \sqrt{a}} \dots \dots \dots \infty}} = \frac{\sqrt{4a + 1} + 1}{2}$$

Concept: 6

$$\sqrt{a - \sqrt{a - \sqrt{a - \sqrt{a - \dots \dots \dots \infty}}} = \frac{\sqrt{4a + 1} - 1}{2}$$

Concept: 7

$$x = \sqrt{a + \sqrt{a + \sqrt{a + \sqrt{a + \dots \dots \dots \infty}}}$$

$$y = \sqrt{a - \sqrt{a - \sqrt{a - \sqrt{a - \dots \dots \dots \infty}}}$$

- (i) $x + y = \sqrt{4a + 1}$
- (ii) $x - y = 1$
- (iii) $xy = a$

INDIA

Concept: 8 & 9

$$p = \sqrt{a + \sqrt{a - \sqrt{a + \sqrt{a - \dots \dots \dots \infty}}}$$

$$q = \sqrt{a - \sqrt{a + \sqrt{a - \sqrt{a + \dots \dots \dots \infty}}}$$

- (i) $p = \frac{\sqrt{4a-3}+1}{2}$
- (ii) $q = \frac{\sqrt{4a-3}-1}{2}$

$$(iii) p + q = \sqrt{4a - 3}$$

$$(iv) p - q = 1$$

$$(v) pq = a - 1$$

Concept: 10

$$\sqrt{a \div \sqrt{a \div \sqrt{a \div \sqrt{a \div \dots \dots \dots \infty}}} = a^{1/3}$$

Concept: 11

$$\begin{aligned} & \sqrt{a + b \times \sqrt{a + b \times \sqrt{a + b \times \sqrt{a + \dots \dots \dots \infty}}}} \\ &= \frac{\sqrt{4a + b^2} + b}{2} \end{aligned}$$

Concept: 12

$$\begin{aligned} & \sqrt{a - b \times \sqrt{a - b \times \sqrt{a - b \times \sqrt{a - \dots \dots \dots \infty}}}} \\ &= \frac{\sqrt{4a + b^2} - b}{2} \end{aligned}$$

Concept: 13

$$m = \sqrt{a + b \times \sqrt{a + b \times \sqrt{a - \dots \dots \dots \infty}}}$$

$$n = \sqrt{a - b \times \sqrt{a - b \times \sqrt{a - \dots \dots \dots \infty}}}$$

(i) $m + n = \sqrt{4a + b^2}$

(ii) $m - n = b$

(v) $mn = a$

Concept: 14

1+ Consecutive Series

$$\sqrt{1 + 2 \sqrt{1 + 3 \sqrt{1 + 4 \sqrt{1 + 5 \sqrt{1 + 6 \dots \dots \infty}}}}}$$

3 - Ans

Concept: 15 (Power Concept)

$$\sqrt{a} \sqrt{a} \sqrt{a} \sqrt{a} \dots \dots \infty = \frac{1}{8}$$

$$(\sqrt{a})^{\frac{1}{8}} = \frac{1}{8}$$

$$\left(a^{\frac{1}{16}}\right)^{\frac{1}{16}} = \left(\frac{1}{8}\right)^{\frac{1}{16}} \Rightarrow a = \left(\frac{1}{8}\right)^{16}$$

$$\Rightarrow a = \frac{1}{8^{16}}$$

Concept: 16 (Fix Value Series)

$$10 + \sqrt{25} + \sqrt{108} + \sqrt{154} + \sqrt{225} = ?$$

Diagram illustrating the breakdown of the expression into its components:

- $\sqrt{16} = 4$ (boxed)
- $\sqrt{36} = 6$
- $\sqrt{121} = 11$
- $\sqrt{169} = 13$
- 15

The diagram shows arrows connecting the numbers 10, 25, 108, 154, and 225 in the expression to their respective square roots (16, 36, 121, 169, 225) and then to their integer values (4, 6, 11, 13, 15). The value 4 is highlighted in a box.

