



| KGS

KHAN SIR

Surds and Indices



By: P.K Sir

01.

Find the value of $\sqrt{30 + \sqrt{30 + \sqrt{30 + \dots}}}$

$\sqrt{30 + \sqrt{30 + \sqrt{30 + \dots}}}$ कका मान ज्ञात कीजिए ?

(a) 5

(b) $3\sqrt{10}$

~~(c) 6~~

(d) 7

02.

Let $x = \sqrt{272 + \sqrt{272 + \sqrt{272 + \sqrt{272 + \dots}}}}$ to infinity ;

then x equals

$$\downarrow$$

$$16 \times 17$$

(a) 16

(b) $4\sqrt{13}$

(c) 17

(d) 4.35

$$\textcircled{i} x = \sqrt{a + \sqrt{a + \sqrt{a + \dots}}} \Rightarrow x = \frac{\sqrt{4a+1} + 1}{2}$$

$$\textcircled{ii} y = \sqrt{a - \sqrt{a - \sqrt{a - \dots}}} \Rightarrow y = \frac{\sqrt{4a+1} - 1}{2}$$

03.

Let $x = \sqrt{\underbrace{42}_{6 \times 7} - \sqrt{42 - \sqrt{42 - \sqrt{42 - \dots \text{to infinity}}}}} ;$
then x equals

~~(a) 6~~

(b) 7

(c) Between 6 and 7 (d) Greater than 7

04.

What is the value of $2 + \sqrt{2 + \sqrt{2 + \sqrt{2 + \dots}}}$?

$2 + \sqrt{2 + \sqrt{2 + \sqrt{2 + \dots}}}$ का मान क्या है ?

(a) 1 (b) 2

(c) 3 ~~(d) 4~~

$$2 + 2 = 4$$

05.

$$\sqrt{31 + \sqrt{31 + \sqrt{31 + \sqrt{31 \dots \infty}}}} = ?$$

~~(a)~~ $5\sqrt{5} - 1.5$

~~(b)~~ $2.5\sqrt{5} + 0.5$

~~(c)~~ $\frac{5\sqrt{5} - 1}{2}$

(d) $\frac{2\sqrt{31} + 1}{2}$

$$\frac{\sqrt{4a+1} + 1}{2} = \frac{\sqrt{4 \times 31 + 1} + 1}{2} = \frac{\sqrt{125+1}}{2} = \frac{\sqrt{126}}{2} = \frac{\sqrt{2 \times 63}}{2} = \frac{\sqrt{2 \times 9 \times 7}}{2} = \frac{3\sqrt{14}}{2}$$

$$\sqrt{125} = 5\sqrt{5}$$

$$2.5\sqrt{5} + 0.5$$

$$\frac{\sqrt{2 \times 63}}{2} = \frac{\sqrt{126}}{2}$$

06.

$\sqrt{14 + \sqrt{14 + \sqrt{14 + \sqrt{14 + \dots \infty}}}}$ lies between x

~~(a)~~ 4 and 4.5

(b) 4.5 and 5

(c) 3 and 4

(d) none

$$x = \frac{\sqrt{4a+1} + 1}{2} = \frac{\sqrt{57+1}}{2}$$

$$\frac{\sqrt{49} + 1}{2} < x < \frac{\sqrt{64} + 1}{2}$$

$$\frac{7+1}{2} < x < \frac{8+1}{2}$$

$$4 < x < 4.5$$

$$\# x = \sqrt{7 + \sqrt{7 + \sqrt{7} \dots \infty}} \quad x = \frac{\sqrt{4a+1} + 1}{2} = \frac{\sqrt{29+1}}{2}$$

$\sqrt{25} \leftarrow \rightarrow \sqrt{36}$

x 的 Range

$$\frac{\sqrt{25+1}}{2} < x < \frac{\sqrt{36+1}}{2}$$

$$2 < x < 3.5$$

$$\# x = \sqrt{11 - \sqrt{11 - \sqrt{11 - \sqrt{11} \dots \infty}}}$$

$36 \leftarrow \rightarrow 49$

x 的 Range $x = \frac{\sqrt{4a+1}-1}{2} = \frac{\sqrt{45-1}}{2}$

$$\frac{\sqrt{36-1}}{2} < x < \frac{\sqrt{49-1}}{2}$$

$$2.5 < x < 3$$

07.

If $a = \sqrt{13 + \sqrt{13 + \sqrt{13 + \sqrt{13 \dots \infty}}}}$ and

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

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

$b = \sqrt{13 - \sqrt{13 - \sqrt{13 - \sqrt{13 \dots \infty}}}}$, then which option

is true ?

① $a + b = \sqrt{4 \times 13 + 1}$ ③ $a \times b = 13$
 ② $a - b = 1$ $= \sqrt{53}$

① $x + y = \sqrt{4a + 1}$
 ② $x - y = 1$
 ③ $x \times y = a$

(a) $a + b + 1 = 0$ ~~(b) $a - b - 1 = 0$~~

(c) $a - b + 1 = 0$ (d) $a - b + 1 = 0$

$a - b = 1$
 $a - b - 1 = 0$

08.

Find $\sqrt{19 - \sqrt{19 - \sqrt{19 - \sqrt{19 \dots \infty}}}} = ?$ $\frac{\sqrt{4a+1}-1}{2} = \frac{\sqrt{77}-1}{2}$

~~(a)~~ $\frac{\sqrt{77}-1}{2}$

(b) $\frac{\sqrt{19}+3}{2}$

(c) $\frac{\sqrt{77}+1}{2}$

(d) Between 4 and 5

09.

Find $\sqrt{35 \oplus 2\sqrt{35 + 2\sqrt{35 + 2\sqrt{35 + \dots \infty}}} = ?$

(a) 6

(c) 5

~~(b) 7~~

(d) 6.4

$\sqrt{5 \times 7}$
✓
✓

10.

Find $\sqrt{154 + 3\sqrt{154 + 3\sqrt{154 + 3\sqrt{154 + \dots\infty}}} = ?$

(a) 13

 11×14

(b) 14

(c) 11

(d)

$$\frac{\sqrt{613} + 9}{2}$$

$$\textcircled{I} x = \sqrt{a + b\sqrt{a + b\sqrt{a + \dots\infty}}}$$

$$x = \frac{\sqrt{4a + b^2} + b}{2}$$

$$\textcircled{II} y = \sqrt{a - b\sqrt{a - b\sqrt{a - \dots\infty}}}$$

$$y = \frac{\sqrt{4a + b^2} - b}{2}$$

11.

Find $\sqrt{3 + 4\sqrt{3 + 4\sqrt{3 + 4\sqrt{3 + \dots\infty}}} = ?$

$$x = \frac{\sqrt{4a + b^2} + b}{2}$$

(a) $\sqrt{7} + 2$

(b) $2\sqrt{7} - 3$

(c) $2\sqrt{7}$

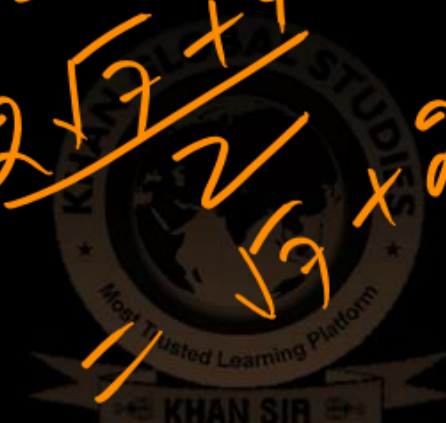
(d) $4 + \sqrt{7}$

$$= \frac{\sqrt{4 \times 3 + 4^2} + 4}{2}$$

$$= \frac{\sqrt{28 + 16}}{2}$$

$$= \frac{2\sqrt{7} + 4}{2}$$

$$= \sqrt{7} + 2$$



12.

Let $x = \sqrt{6 - \sqrt{6 + \sqrt{6 - \sqrt{6 + \dots}}}}$ to infinity ; then x

equals

(a) 3

(b) $\sqrt{21}$

(c) $\frac{\sqrt{21} - 1}{2}$

(d) $\frac{\sqrt{21} + 1}{2}$

① $x = \sqrt{a + \sqrt{a - \sqrt{a + \sqrt{a - \dots}}}}$

$x = \frac{\sqrt{4a-3} + 1}{2}$

② $y = \sqrt{a - \sqrt{a + \sqrt{a - \sqrt{a + \dots}}}}$

$y = \frac{\sqrt{4a-3} - 1}{2}$ ✓

$\frac{\sqrt{4a-3} - 1}{2} = \frac{\sqrt{4 \times 6 - 3} - 1}{2} = \frac{\sqrt{21} - 1}{2}$

13.

Let $x = \sqrt{4 + \sqrt{4 - \sqrt{4 + \sqrt{4 - \dots}}}}$ to infinity; then x

equals $x = \frac{\sqrt{4x-3} + 1}{2} = \frac{\sqrt{4 \times 4 - 3} + 1}{2} = \frac{\sqrt{13} + 1}{2}$

(a) 3

(b) $\sqrt{13}$

(c) $\frac{\sqrt{13} - 1}{2}$

(d) $\frac{\sqrt{13} + 1}{2}$

14.

Let $x = \sqrt{3 + 2\sqrt{3 - 2\sqrt{3 + 2\sqrt{3 - \dots}}}}$; then x equals

(a) 1

(b) $\sqrt{2}$

(c) 2

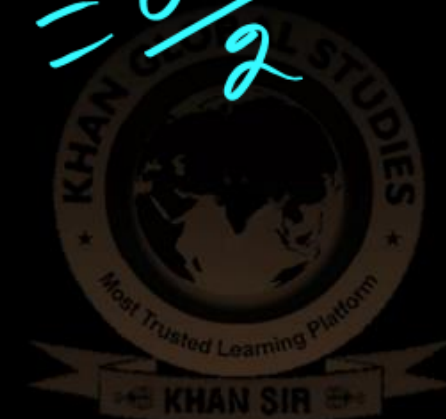
(d) none

$$\textcircled{i} \quad x = \sqrt{a+b} \sqrt{a-b} \sqrt{a+b} \sqrt{a-b} \dots \infty \quad x = \frac{\sqrt{4a-3b^2} + b}{2} = \frac{\sqrt{4 \times 3 - 3 \times 2^2} + 2}{2}$$

$$= \frac{\sqrt{0} + 2}{2}$$

$$= \frac{0 + 2}{2} = 1$$

$$\textcircled{ii} \quad y = \sqrt{a-b} \sqrt{a+b} \sqrt{a-b} \sqrt{a+b} \dots \infty \quad y = \frac{\sqrt{4a-3b^2} - b}{2}$$



15.

Let $x = \sqrt{7 - 2\sqrt{7 + 2\sqrt{7 - 2\sqrt{7 + \dots}}}}$; then x equals

~~(a)~~ 1

(b) $\sqrt{2}$

(c) 2

(d) none

$$y = \frac{\sqrt{4a - 3b^2} - b}{2} = \frac{\sqrt{4 \times 7 - 3 \times 2^2} - 2}{2} = \frac{\sqrt{16 - 2}}{2} = \frac{4 - 2}{2} = \frac{2}{2} = 1$$

16.

$$\sqrt{12\sqrt{12\sqrt{12\sqrt{12\dots\infty}}}} = ?$$

(a) 8

~~(b) 12~~

(c) 36

(d) 6

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

$$x = a$$

17.

$$\sqrt{7\sqrt{7\sqrt{7\sqrt{7}\dots\infty}}} = 343^{y-1} \text{ then } y = ?$$

$$7 = (343)^{y-1}$$

$$343 = 7^3$$

~~(a)~~ $\frac{4}{3}$

(b) $\frac{3}{2}$

(c) $\frac{5}{4}$

(d) 1

$$y = \frac{4}{3}$$

$$7^1 = 7^{3(y-1)}$$

$$7^1 = 7^{3y-3}$$

$$1 = 3y-3$$

$$4 = 3y$$

(i) $a^m \times a^n = a^{m+n}$

(ii) $\frac{a^m}{a^n} = a^{m-n}$

(iii) $a^x = a^y$
 $x = y$

(iv) $a^x = b^x$
 $a = b$



$$\overset{24}{(12)} = \overset{24}{(3x)}$$

$$x =$$

$$12 = 3x$$
$$x = 4$$

$$x = \sqrt[n]{a \times \sqrt[n]{a \times \sqrt[n]{a} \dots \infty}}$$

$$\sqrt[16]{16 \times \sqrt[16]{16} \dots \infty}$$

(16)

$$x = (a)^{\frac{1}{n-1}}$$

$$\textcircled{4} \sqrt[4]{27 \sqrt[4]{27 \sqrt[4]{27} \dots \infty}}$$

$$x = \sqrt[n-1]{a}$$

$$\sqrt[3]{27} = 3$$

18.

$$\sqrt[3]{64\sqrt[3]{64\sqrt[3]{64\dots\dots}}} = ? \quad \sqrt{64} = 8$$

(a) 4

(b) 8

(c) 16

(d) $4\sqrt{2}$

$$\sqrt[4]{81} = 3$$

$$\# x = \sqrt[5]{81\sqrt[5]{81\sqrt[5]{81\sqrt[5]{81\dots\dots}}}} \quad \infty$$

18.

$$\sqrt[3]{64 \sqrt[3]{64 \sqrt[3]{64 \dots}}} = ?$$

$$\sqrt[3]{64} = 8$$

(a) 4

~~(b) 8~~

(c) 16

(d) $4\sqrt{2}$

$$\sqrt{7 \sqrt{7 \sqrt{7 \dots}}} = 7$$

$$\sqrt[3]{16 \sqrt[3]{16 \sqrt[3]{16 \dots}}} = \sqrt[2]{16} = 4$$

$$\sqrt[4]{8 \sqrt[4]{8 \sqrt[4]{8 \dots}}} = \sqrt[3]{8} = 2$$

19.

$$\sqrt[2]{27 \div \sqrt{27 \div \sqrt{27 \div \sqrt{27 \dots \dots \infty}}} = ?$$

$\sqrt[3]{27}$
 $= 3$

(a) 3

(b) $3\sqrt{3}$

(c) $\sqrt{3}$

(d) 9

$$x = \sqrt[n]{a \div \sqrt[n]{a \div \sqrt[n]{a \dots \dots \infty}}}$$

$$x = \sqrt[n+1]{a}$$

$x = \sqrt[2]{8 \div \sqrt[3]{8 \div \sqrt[3]{8 \div \sqrt[3]{8 \dots \dots \infty}}}}$

$\sqrt[2]{81} = 9$

$y = \sqrt[3]{8 \div \sqrt[4]{8 \div \sqrt[4]{8 \dots \dots \infty}}}$

$\sqrt[3]{81} = 3$

20.

If $\sqrt{x} \sqrt{x} \sqrt{x} \sqrt{x} \dots \sqrt{x} \dots \infty = \frac{1}{2}$ then $x = ?$

(a) $\frac{1}{8}$

(b) $\frac{1}{4}$

(c) $\frac{1}{16}$

(d) $\frac{1}{32}$

$$(x^3)^4 = x^{12}$$

Handwritten solution:

$$\sqrt{x} \sqrt{x} \sqrt{x} \sqrt{x} \dots \sqrt{x} \dots \infty = \frac{1}{2}$$

$$\left(\sqrt{x} \right)^{\frac{1}{2}} = \frac{1}{2}$$

$$\left(x^{\frac{1}{2}} \right)^{\frac{1}{2}} = \frac{1}{2}$$

$$x^{\frac{1}{4}} = \frac{1}{2}$$

$$x = \left(\frac{1}{2} \right)^4 = \frac{1}{16}$$

20.

If $\sqrt{x} \sqrt{x} \sqrt{x} \sqrt{x} \dots \infty = \frac{1}{2}$ then $x = ?$

(a) $\frac{1}{8}$

(b) $\frac{1}{4}$

~~(c) $\frac{1}{16}$~~

(d) $\frac{1}{32}$

$$\left(x^{\frac{1}{2}}\right)^{\frac{1}{2}} = \frac{1}{2}$$

$$x^{\frac{1}{4}} = \frac{1}{2}$$

$$x = \left(\frac{1}{2}\right)^4 = \frac{1}{16}$$

$$\sqrt{x} \sqrt{x} \sqrt{x} \sqrt{x} \dots \infty = \frac{1}{2}$$

$$\left(\sqrt{x}\right)^{\frac{1}{2}} = \frac{1}{2}$$

$$\left(\sqrt{x}\right)^{\frac{1}{2}} = \frac{1}{2}$$

21.

If $\sqrt{x} \sqrt{x} \sqrt{x} \dots \infty = \frac{1}{6}$ then $x = ?$

$$\frac{1}{x} = x^{-1} \quad \left(\frac{a}{b}\right)^n = \left(\frac{b}{a}\right)^{-n}$$

$$\sqrt{x} \sqrt{x} \sqrt{x} \dots \infty = \frac{1}{6}$$

~~(a) 6^{-12}~~

(b) 6^{-18}

$$(\sqrt{x}) \sqrt{x} \sqrt{x} \dots \infty = \frac{1}{6}$$

(c) 6^{-8}

(d) 6^{-16}

$$(\sqrt{x})^{\frac{1}{6}} = \frac{1}{6}$$

$$x = \left(\frac{1}{6}\right)^{12}$$

$$\left(x^{\frac{1}{2}}\right)^{\frac{1}{6}} = \frac{1}{6}$$

$$x = \left(\frac{1}{6}\right)^{-12} = 6^{12}$$

$$x^{\frac{1}{12}} = \frac{1}{6}$$

$$\sqrt{a} \sqrt{a} \sqrt{a} \sqrt{a} \dots \infty = \frac{1}{5}$$

$$\left(\sqrt{a} \sqrt{a} \sqrt{a} \sqrt{a} \dots \infty \right)^2 = \frac{1}{5}$$

$$\left(\sqrt{a} \right)^{\frac{1}{5}} = \frac{1}{5}$$

$$\left(a^{\frac{1}{2}} \right)^{\frac{1}{5}} = \frac{1}{5}$$

$$a^{\frac{1}{10}} = \frac{1}{5}$$

$$a = \left(\frac{1}{5} \right)^{10} = 5^{-10}$$

$a = ?$

$$\begin{aligned} \sqrt[2]{x} &= x^{\frac{1}{2}} \\ \sqrt[3]{x} &= x^{\frac{1}{3}} \\ \sqrt[4]{x} &= x^{\frac{1}{4}} \\ \sqrt[5]{x} &= x^{\frac{1}{5}} \end{aligned}$$

$$\left(x \right)^m = \left(\sqrt[m]{a} \sqrt[n]{b} \sqrt[m]{a} \sqrt[n]{b} \dots \right)^m$$

$\frac{a^m}{a^n} = a^{m-n}$

$$x^m = a \times \sqrt[n]{b} \sqrt[m]{a} \sqrt[n]{b} \sqrt[m]{a} \sqrt[n]{b} \dots$$

$$\left(x^m \right)^n = \left(a \times \sqrt[n]{b} \right)^n$$

$$x^{mn} = a^n \times b$$

$$\frac{x^{mn}}{x^n} = a^n \times b \Rightarrow x^{mn-n} = a^n \times b \Rightarrow x = \sqrt[mn-n]{a^n \times b}$$

22.

$$\sqrt[m]{a \sqrt[n]{b^m a^n b^m a^n b \dots \infty}} = ?$$

(a) $mn-1 \sqrt{a^n b}$

(b) $mn \sqrt{ab}$

(c) $mn-1 \sqrt{b^n a}$

(d) $mn+1 \sqrt{a^n b}$

$$mn-1 \sqrt{a^n \times b}$$

23.

$$\sqrt{2 \times \sqrt[3]{4 \times \sqrt{2 \times \sqrt[3]{4 \times \sqrt{2 \times \sqrt[3]{4 \times \dots \infty}}}}}} = ?$$

(a) $\sqrt{2}$

(b) 2

(c) 4

(d) $4\sqrt{2}$

$$\sqrt[4]{2 \sqrt[3]{5 \sqrt{2 \sqrt[3]{5 \dots \infty}}}}$$

$$\sqrt[5]{2^3 \times 4} = \sqrt[5]{32} = \sqrt[5]{2^5} = 2$$

$$\sqrt[5]{2^3 \times 5} = \sqrt[5]{40} = (40)^{\frac{1}{5}}$$



24.

The greatest number among 2^{72} , 5^{36} , 11^{24} and 3^{60} is

- (a) 2^{72} → सबसे छोटा माना
 (b) 5^{36}
 (c) 11^{24}
 (d) 3^{60} ⇒ बड़ा मान

6	3	2	5
72	36	24	60
2	5	11	3
2^6	5^3	11^2	3^5
64	125	121	243

3^{60}

$10^{11}, 11^{10}$
 $14^{13}, 13^{14}$

25.

The smallest among the number 7^{200} , 9^{150} , 6^{250} and 5^{300} is

7^{200} , 9^{150} , 6^{250} और 5^{300} निम्नलिखित में से कौन-सी संख्या सबसे छोटी है ?

(a) 7^{200}

(b) 5^{300}

(c) 9^{150}

(d) 6^{250}

Handwritten calculations in green:

$$7^4 = 2401$$

$$9^3 = 729$$

$$6^5$$

$$5^6$$

- # (i) $1^2 < 2^1$
- (ii) $2^3 < 3^2$

(iii) $3^4 > 4^3$

(iv) $4^5 > 5^4$

1024 625

power वसा की value वसा होना है।

$10^{11} > 11^{10}$

$13^{14} > 14^{13}$

$2^3 < 3^2$

26.

Which among $2^{1/2}$, $3^{1/3}$, $4^{1/4}$, $6^{1/6}$ and $12^{1/12}$ is the largest?

(a) $2^{1/12}$

~~(b) $3^{1/3}$~~

(c) $4^{1/4}$

~~(d) $6^{1/6}$~~

(e) $12^{1/12}$

Handwritten work showing the conversion of all terms to a common denominator of 12:

$$2^{1/2} = 2^{6/12} = 2^6 = 64$$

$$3^{1/3} = 3^{4/12} = 3^4 = 81$$

$$4^{1/4} = 4^{3/12} = 4^3 = 64$$

$$6^{1/6} = 6^{2/12} = 6^2 = 36$$

$$12^{1/12} = 12^1 = 12$$

The values are compared: $64 < 81 > 64 > 36 > 12$. Therefore, $3^{1/3}$ is the largest.

27.

Which is the greatest among $(\sqrt{17} - \sqrt{14})$,
 $(\sqrt{19} - 4)$, $(\sqrt{22} - \sqrt{19})$, $(\sqrt{13} - \sqrt{10})$?

$(\sqrt{17} - \sqrt{14})$, $(\sqrt{19} - 4)$, $(\sqrt{22} - \sqrt{19})$,
 $(\sqrt{13} - \sqrt{10})$ निम्नलिखित में से कौन-सी संख्या सबसे बड़ी
 है ?

- (a) $(\sqrt{17} - \sqrt{14})$ (b) $(\sqrt{19} - 4)$
 (c) $(\sqrt{22} - \sqrt{19})$ (d) $(\sqrt{13} - \sqrt{10})$



28.

Which one among the following is the smallest ?

निम्नलिखित में से कौन-सी संख्या सबसे छोटी है ?

(a) $\sqrt{201} - \sqrt{199}$

(b) $\sqrt{101} - \sqrt{99}$

(c) $\sqrt{301} - \sqrt{299}$

(d) $\sqrt{401} - \sqrt{399}$



29.

The smallest of $(\sqrt{8} + \sqrt{5})$, $(\sqrt{7} + \sqrt{6})$, $(\sqrt{10} + \sqrt{3})$

and $(\sqrt{11} + \sqrt{2})$ is:

(a) $(\sqrt{8} + \sqrt{5})$

(b) $(\sqrt{7} + \sqrt{6})$

(c) $(\sqrt{10} + \sqrt{3})$

(d) $(\sqrt{11} + \sqrt{2})$



30.

The smallest of, $(\sqrt{23} + 2\sqrt{3})$, $(\sqrt{31} + 2)$,

$(\sqrt{29} + \sqrt{6})$ and $(\sqrt{24} + \sqrt{11})$ is :

$(\sqrt{23} + 2\sqrt{3})$, $(\sqrt{31} + 2)$, $(\sqrt{29} + \sqrt{6})$ और

$(\sqrt{24} + \sqrt{11})$ में से कौन-सी संख्या सबसे छोटी है ?



31.

Which is the greatest among $(\sqrt{15} - \sqrt{10})$,
 $(\sqrt{19} - \sqrt{6})$, $(\sqrt{18} - \sqrt{7})$, $(\sqrt{17} - \sqrt{8})$?

$(\sqrt{15} - \sqrt{10})$, $(\sqrt{19} - \sqrt{6})$, $(\sqrt{18} - \sqrt{7})$,

$(\sqrt{17} - \sqrt{8})$ निम्नलिखित में से कौन-सी संख्या सबसे बड़ी है ?

(a) $(\sqrt{15} - \sqrt{10})$ (b) $(\sqrt{19} - \sqrt{6})$

(c) $(\sqrt{18} - \sqrt{7})$ (d) $(\sqrt{17} - \sqrt{8})$



32.

Which is the greatest among $(\sqrt{24} + \sqrt{10})$,
 $(\sqrt{30} + \sqrt{8})$, $(\sqrt{15} + 4)$, $(\sqrt{12} + \sqrt{20})$?

$(\sqrt{24} + \sqrt{10})$, $(\sqrt{30} + \sqrt{8})$, $(\sqrt{15} + 4)$,

$(\sqrt{12} + \sqrt{20})$ निम्नलिखित में से कौन-सी संख्या सबसे बड़ी है ?

(a) $(\sqrt{24} + \sqrt{10})$ (b) $(\sqrt{30} + \sqrt{8})$

(c) $(\sqrt{15} + 4)$ (d) $(\sqrt{12} + \sqrt{20})$



33.

Which of the following statement(s) is / are TRUE ?

निम्नलिखित में से कौन-सा है/से कथन सत्य है ?

I. $\sqrt{11} + \sqrt{7} < \sqrt{10} + \sqrt{8}$

II. $\sqrt{17} + \sqrt{11} > \sqrt{15} + \sqrt{13}$

- (a) Only I / केवल I
(b) Only II / केवल II
(c) Both I and II / I तथा II दोनों
(d) Neither I nor II / न तो I न ही II



34.

Which of the following statement(s) is/are TRUE

निम्नलिखित में से कौन-सा से कथन सत्य है/हैं ?

I. $\sqrt{121} + \sqrt{12321} + \sqrt{1234321} = 1233$

II. $\sqrt{0.64} + \sqrt{64} + \sqrt{36} + \sqrt{0.36} > 15$

- (a) Only I / केवल I
(b) Only II / केवल II
(c) Neither I or II / न तो I न ही II
(d) Both I and II / I तथा II दोनों



35.

While multiplying three real numbers, Ashok took one of the numbers as 73 instead of 37. As a result, the product went up by 720. Then, the minimum possible value of the sum of square of the other two numbers is –

तीन वास्तविक संख्याओं को गुणा करते हुए, अशोक ने 37 के बजाय 73 एक संख्या ली। नतीजतन, गुणनफल 720 अधिक आया। फिर, अन्य दो संख्याओं के वर्गों के योग का न्यूनतम संभव मान है—

- | | |
|---------|--------|
| (a) 41 | (b) 40 |
| (c) 104 | (d) 36 |



36.

If $3^{8^{2x}} = 81^{2^{5x}}$ then $x = ?$

$$3 \times 3 \times 3 \times 3 = 3^4 = 81$$

$$3^{8^{2x}} = (81)^{2^{5x}}$$

$$3^{2^{6x}} = (3^4)^{2^{5x}}$$

$$6x = 5x + 2$$

$$x = 2$$

$$(12 + 6\sqrt{3})^2$$

$$3^{2^{6x}} = 3^{2^{5x+2}}$$

$$2^{6x} = 2^{5x+2}$$

$$8^{2x} = (2^3)^{2x} = 2^{6x}$$

$$(3^4)^{2^{5x}} = 3^{4 \times 2^{5x}}$$

$$(3)^{2^{5x+2}} = 3^{2^{5x} \times 2^2}$$

37.

If $3^{x+y} = 81$ and $81^{x-y} = 3$ then $x * y = ?$

(a) $\frac{255}{64}$

(b) $\frac{125}{32}$

(c) $\frac{240}{64}$

(d) None

$$3^{x+y} = 3^4$$

$$x+y=4$$

$$(-2, -3, 4, 5, 6)$$

$$3^{4(x-y)} = 3^1$$

$$4(x-y) = 1$$

$$x-y = \frac{1}{4}$$

$$x * y = \frac{17}{8} * \frac{15}{8} = \frac{255}{64}$$

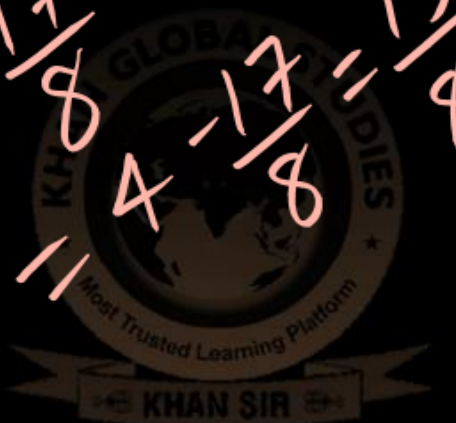
$$x+y=4$$

$$x-y = \frac{1}{4}$$

$$2x = 4 + \frac{1}{4} = \frac{17}{4}$$

$$x = \frac{17}{8}$$

$$y = 4 - \frac{17}{8} = \frac{15}{8}$$



38.

If $8^{3x-5} = \frac{1}{32^{7-4x}}$ then $x = ?$

(a) $\frac{16}{9}$

(c) $\frac{25}{13}$

(b) $\frac{20}{11}$

(d) 2

$$\frac{1}{32^{7-4x}} = 32^{-(7-4x)}$$

$$= 32^{4x-7}$$

$$32^{4x-7}$$

$$(2^5)^{4x-7}$$

$$(2)^{20x-35}$$

$$(2^3)^{3x-5} = 2^{9x-15}$$

$$\frac{1}{x} = x^{-1}$$

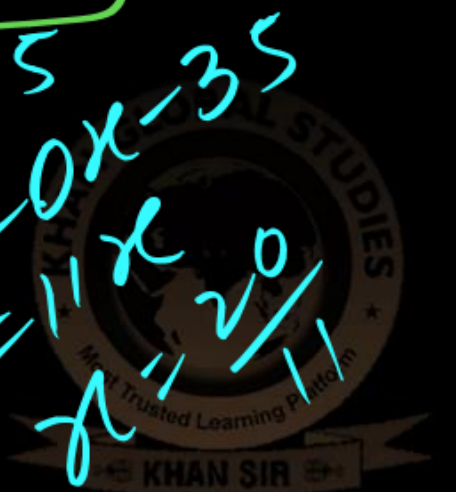
$$\frac{1}{x^n} = x^{-n}$$

$$2^{9x-15} = 2^{20x-35}$$

$$9x-15 = 20x-35$$

$$20 = 11x$$

$$x = \frac{20}{11}$$



38.

If $8^{3x-5} = \frac{1}{32^{7-4x}}$ then $x = ?$

$$\begin{aligned} (2^3)^{3x-5} &= 32^{-7+4x} \\ 2^{9x-15} &= 32^{4x-7} \\ &= (2^5)^{4x-7} \\ &= 2^{20x-35} \end{aligned} \quad \begin{aligned} (a) \quad &\frac{16}{9} \\ (b) \quad &\frac{20}{11} \end{aligned}$$

$$\begin{aligned} (c) \quad &\frac{25}{13} \\ (d) \quad &2 \end{aligned}$$

$$\begin{aligned} 2^{9x-15} &= 2^{20x-35} \\ 9x-15 &= 20x-35 \\ -15+35 &= 20x-9x \\ 20 &= 11x \\ x &= \frac{20}{11} \end{aligned}$$

39.

If $(x^{x^x})^{\frac{5}{4}} = x^{x^{\frac{5}{4}}}$ then $x = ?$

$$x^{\frac{5x}{4}} = (x)^{x^{\frac{5}{4}}}$$

$$\frac{5x}{4} = x^{\frac{5}{4}}$$

$$\frac{5}{4} = \frac{x^{\frac{5}{4}}}{x^1} = x^{\frac{5}{4}-1} = x^{\frac{1}{4}}$$

$$\textcircled{1} \frac{a^m}{a^n} = a^{m-n}$$

$$\textcircled{2} a^m \times a^n = a^{m+n}$$

$$\left(x^{\frac{1}{4}}\right)^4 = \left(\frac{5}{4}\right)^4$$

$$x = \frac{5^4}{4^4} = \frac{625}{256}$$

40.

If $\sqrt{15} + \sqrt{60} + \sqrt{84} + \sqrt{140} = \sqrt{a} + \sqrt{b} + \sqrt{c}$, then
the value of $a + b + c$?

(a) 5 $a^2 + b^2 + c^2$

(b) 20

(c) 10

(d) 15

$\rightarrow 3 + 5 + 7 = 15$

$$\sqrt{15 + 2\sqrt{15} + 2\sqrt{21} + 2\sqrt{35}} = \sqrt{a} + \sqrt{b} + \sqrt{c}$$

$2 \times \sqrt{3} \times \sqrt{5}$ $2 \times \sqrt{3} \times \sqrt{7}$ $2 \times \sqrt{5} \times \sqrt{7}$
 $2 \times a \times b$ $2 \times a \times c$ $2 \times b \times c$

$$(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$$

$$\sqrt{3} + \sqrt{5} + \sqrt{7} = \sqrt{a} + \sqrt{b} + \sqrt{c}$$

$a=3$
 $b=5$
 $c=7$



41.

The expression $\sqrt{10 + 2(\sqrt{6} - \sqrt{15} - \sqrt{10})}$ is equal to :

$\sqrt{10 + 2(\sqrt{6} - \sqrt{15} - \sqrt{10})}$ का मान है—

~~(a) $\sqrt{3} - \sqrt{2} - \sqrt{5}$~~

~~(b) $\sqrt{3} - \sqrt{2} + \sqrt{5}$~~

~~(c) $\sqrt{2} - \sqrt{3} - \sqrt{5}$~~

~~(d) $\sqrt{3} + \sqrt{2} - \sqrt{5}$~~

42.

What is the square root of $23 + 4\sqrt{10} - 10\sqrt{2} - 8\sqrt{5}$?

(a) ~~$\sqrt{5} + \sqrt{10} - 2\sqrt{2}$~~ (b) ~~$\sqrt{5} + 2\sqrt{2} + \sqrt{10}$~~

(c) $\sqrt{5} - \sqrt{10} + 2\sqrt{2}$ (d) ~~$2\sqrt{2} - \sqrt{5} + \sqrt{10}$~~

By option

$$23 + 2 \left[2\sqrt{10} - 5\sqrt{2} - 4\sqrt{5} \right]$$

$+4\sqrt{5}$

$$\begin{aligned} & -2\sqrt{20} \\ & -4\sqrt{5} \end{aligned}$$

$$\begin{aligned} & -\sqrt{50} \\ & = -5\sqrt{2} \end{aligned}$$

$$\textcircled{i} (a+b)^2 = a^2 + b^2 + 2ab$$

$$\textcircled{ii} (a-b)^2 = a^2 + b^2 - 2ab$$

$7 + 4\sqrt{3}$ का वर्गमूल निकालें।

$$\sqrt{7 + 4\sqrt{3}} = a + b$$

$a^2 + b^2 = 7$
 $4 + 3$

$2ab = 2 \times 2 \times \sqrt{3}$

$$\# \sqrt{(a+b)^2} = a+b$$

$$\textcircled{i} a-b$$

$a > b$

$$\# \sqrt{(a-b)^2}$$

$\textcircled{ii} b-a$
 $b > a$

$$\sqrt{(\sqrt{3}-2)^2} \rightarrow \sqrt{3}-2 \Rightarrow \sqrt{3}-\sqrt{4} \quad \times$$
$$\rightarrow 2-\sqrt{3} \quad \checkmark$$

$7 + 4\sqrt{3}$ का वर्गमूल निकालें।

$$\sqrt{7 + 4\sqrt{3}} = a + b$$
$$= 2 + \sqrt{3}$$

Diagram illustrating the decomposition of $7 + 4\sqrt{3}$ into a perfect square form:

$7 + 4\sqrt{3}$ is decomposed into $4a^2 + 3b^2 + 2 \times 2 \times \sqrt{3}$ and $2 \times a \times b$.

From the diagram, we identify $4a^2 = 4$ and $3b^2 = 3$, leading to $a = 2$ and $b = \sqrt{3}$.

$\sqrt{14 + 6\sqrt{5}} = 3 + \sqrt{5}$

Diagram illustrating the decomposition of $14 + 6\sqrt{5}$ into a perfect square form:

$14 + 6\sqrt{5}$ is decomposed into $2 \times 3 \times \sqrt{5}$ and $2 \times a \times b$.

From the diagram, we identify $2 \times 3 \times \sqrt{5} = 6\sqrt{5}$ and $2 \times a \times b = 14$, leading to $a = 3$ and $b = \sqrt{5}$.

$\sqrt{13 + 4\sqrt{3}} = a + b$

Diagram illustrating the decomposition of $13 + 4\sqrt{3}$ into a perfect square form:

$13 + 4\sqrt{3}$ is decomposed into $2 \times 2 \times \sqrt{3}$ and $2 \times a \times b$.

From the diagram, we identify $2 \times 2 \times \sqrt{3} = 4\sqrt{3}$ and $2 \times a \times b = 13$, leading to $a = 2$ and $b = \sqrt{3}$.

Verification: $a^2 + b^2 = 12 + 3 = 15$.

43.

Find the square root of

~~(a) $7 + 4\sqrt{3}$~~

(b) $4 + \sqrt{15}$

(c) $61 + 28\sqrt{3}$

(d) $139 - 80\sqrt{3}$

(e) $74 - 12\sqrt{30}$

$$\sqrt{61 + 28\sqrt{3}} = a + b$$

$$2 \times 14 \times \sqrt{3} = 7 + 2\sqrt{3}$$

$$2 \times 7 \times 2\sqrt{3}$$

$$2 \times a \times b$$

$$7 + 12 = 61$$

43.

Find the square root of

~~(a)~~ $7 + 4\sqrt{3}$

(b) $4 + \sqrt{15}$

(c) $61 + 28\sqrt{3}$

(d) $139 - 80\sqrt{3}$

(e) $74 - 12\sqrt{30}$

$$\begin{matrix} a & - & b \\ b & - & a \end{matrix}$$

$$\begin{matrix} \sqrt{64} & - & \sqrt{75} \\ 8 & - & 5\sqrt{3} \end{matrix}$$

$$5\sqrt{3} - 8$$

$$\sqrt{139 - 80\sqrt{3}}$$

\Downarrow
 $2 \times 40 \times \sqrt{3}$
 $2 \times 8 \times 5\sqrt{3}$
 $2 \times a \times b$

$64 + 75 = 139$



43.

Find the square root of

~~(a) $7 + 4\sqrt{3}$~~

(b) $4 + \sqrt{15}$ ✓✓

(c) $61 + 28\sqrt{3}$

(d) $139 - 80\sqrt{3}$

(e) $\sqrt{74 - 12\sqrt{30}}$

$\sqrt{20} - \sqrt{54}$
 $2\sqrt{5} - 3\sqrt{6}$ X

$3\sqrt{6} - 2\sqrt{5}$ ✓✓

$$a^2 + b^2 = 74 + 54 = 128$$

$$\begin{aligned} & \downarrow \\ & 2 \times 6 \times \sqrt{30} \\ & 2 \times 6 \times \sqrt{5} \times \sqrt{6} \\ & 2 \times 3 \times 2 \times \sqrt{5} \times \sqrt{6} \\ & 2 \times 2\sqrt{5} \times 3\sqrt{6} \\ & 2 \times a \times b \end{aligned}$$

$$\sqrt{4 + \sqrt{15}} \Rightarrow \sqrt{\frac{8 + 2\sqrt{15}}{2}} = \frac{\sqrt{8 + 2\sqrt{15}}}{\sqrt{2}} = \frac{\sqrt{5} + \sqrt{3}}{\sqrt{2}}$$

$$\sqrt{7 + 3\sqrt{5}} = \sqrt{\frac{14 + 6\sqrt{5}}{2}}$$

$$\sqrt{8 + 2\sqrt{15}} = \sqrt{5} + \sqrt{3}$$

$$\Downarrow$$

$$2 \times \sqrt{5} \times \sqrt{3}$$

$$2 \times a \times b$$

$$\sqrt{14 + 6\sqrt{5}} = 3 + \sqrt{5}$$

$$\Downarrow$$

$$2 \times 3 \times \sqrt{5}$$

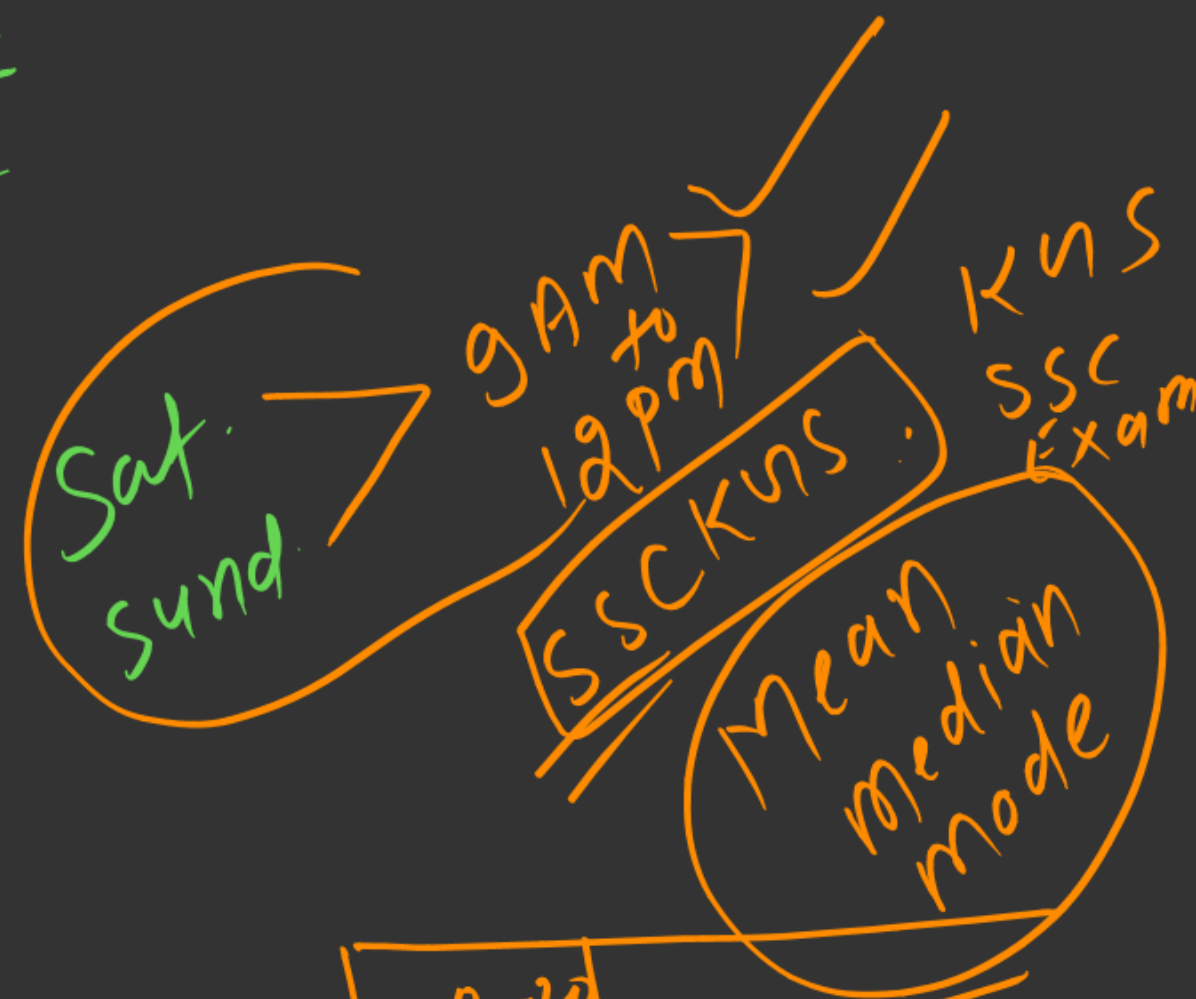
$$2 \times a \times b$$

$$= \frac{\sqrt{14 + 6\sqrt{5}}}{\sqrt{2}}$$

$$= \frac{3 + \sqrt{5}}{\sqrt{2}}$$

$$\sqrt{6 - 3\sqrt{3}} = \sqrt{\frac{12 - 6\sqrt{3}}{2}} = \frac{3 - \sqrt{3}}{\sqrt{2}}$$

$\nearrow 2 \times 3 \times \sqrt{3}$



10-20	
20-30	