➤ **Choose the right answer from the given options. [1 Marks Each]** **[10]**

1. Which one of the following is not equal to $\left(\frac{100}{9}\right)^{-\frac{3}{2}}$?

(A) $\left(\frac{9}{100}\right)^{\frac{3}{2}}$

(B) $\left(\frac{1}{\frac{100}{9}}\right)^{\frac{3}{2}}$

(C) $\frac{3}{10}\times\frac{3}{10}\times\frac{3}{10}$

(D) $\sqrt{\frac{100}{9}}\times\sqrt{\frac{100}{9}}\times\sqrt{\frac{100}{9}}$

Ans. :

d. $\sqrt{\frac{100}{9}}\times\sqrt{\frac{100}{9}}\times\sqrt{\frac{100}{9}}$

Solution:

We have to find the value of $\left(\frac{100}{9}\right)^{-\frac{3}{2}}$

So,

$\left(\frac{100}{9}\right)^{-\frac{3}{2}}=\left(\frac{10^2}{3^2}\right)^{-\frac{3}{2}}$

$=\frac{10^{2\times\frac{3}{2}}}{3^{2\times\frac{3}{2}}}$

$=\frac{10^{-3}}{3^{-3}}$

$\left(\frac{100}{9}\right)^{-\frac{3}{2}}=\frac{\frac{1}{10^3}}{\frac{1}{3^3}}$

$=\frac{1}{10\times10\times10}\times\frac{3\times3\times3}{1}$

$=\frac{3\times3\times3}{10\times10\times10}$

Since, $\left(\frac{100}{9}\right)^{-\frac{3}{2}}$ is equal to $\left(\frac{100}{9}\right)^{\frac{3}{2}}$, $\frac{1}{\left(\frac{100}{9}\right)^{\frac{3}{2}}}$, $\frac{3\times3\times3}{10\times10\times10}$.

Hence the correct choice is d.

2. If $x=\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ and $y=\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$, then $x^2+xy+y^2=$

(A) 101 (B) 99 (C) 98 (D) 102

Ans. :

b. 99

Solution:

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

$\therefore x=\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}\times\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}$

$=\frac{\left(\sqrt{3}-\sqrt{2}\right)^2}{3-2}=5-2\sqrt{6}$

$y=\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$,

$\therefore y=\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}\times\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}}$

$=\frac{\left(\sqrt{3}+\sqrt{2}\right)^2}{3-2}=5+2\sqrt{6}$

Now, x^2+xy+y^2

$=\left(5-2\sqrt{6}\right)^2+\left(5-2\sqrt{6}\right)\left(5+2\sqrt{6}\right)+\left(5+2\sqrt{6}\right)^2$

$=\left(25+24-20\sqrt{6}\right)+(25-24)+\left(25+24+20\sqrt{6}\right)$

$=49-20\sqrt{6}+1+49+20\sqrt{6}$

$= 99$
Hence, correct option is (b).

3. If $\left(\frac{2}{3}\right)^{x}\left(\frac{3}{2}\right)^{2x} = \frac{81}{16}$ then x = ?

(A) 1 (B) 2 (C) 3 (D) 4

Ans. :

d. 4

Solution:

$\left(\frac{2}{3}\right)^{x}\left(\frac{3}{2}\right)^{2x} = \frac{81}{16}$

$\Rightarrow \left(\frac{3}{2}\right)^{-x}\left(\frac{3}{2}\right)^{2x} = \frac{3^4}{2^4}$

$\Rightarrow \left(\frac{3}{2}\right)^{-x+2x} = \left(\frac{3}{2}\right)^{4}$

$\Rightarrow \left(\frac{3}{2}\right)^{x} = \left(\frac{3}{2}\right)^{4}$

$\Rightarrow x = 4$

Hence, the correct option is (d).

4. Value of $\sqrt[4]{(81)^{-2}}$ is:

(A) $\frac{1}{81}$ (B) $\frac{1}{3}$ (C) $\frac{1}{9}$ (D) 9

Ans. :

c. $\frac{1}{9}$

Solution:

$\sqrt[4]{(81)^{-2}}$

$= \sqrt[4]{\frac{1}{(81)^2}}$

$= \sqrt[4]{\frac{1}{(9^2)^2}}$

$= \sqrt[4]{\frac{1}{9^4}}$

$= \left(\frac{1}{9}\right)^{4\times\frac{1}{4}}$

$= \frac{1}{9}$

5. If $\frac{3-\sqrt{5}}{3+2\sqrt{5}} = a\sqrt{5} - \frac{19}{11}b,$ than the value of 'b' is:

(A) -1 (B) 2 (C) 1 (D) 3

Ans. :

c. 1

Solution:

$\frac{3-\sqrt{5}}{3+2\sqrt{5}} = a\sqrt{5} - \frac{19}{11}b,$

Taking LHS,

$\Rightarrow \frac{3-\sqrt{5}}{3+2\sqrt{5}} \times \frac{3-2\sqrt{5}}{3-2\sqrt{5}}$

$\Rightarrow \frac{3(3-2\sqrt{5})-\sqrt{5}(3-2\sqrt{5})}{9-20}$

$\Rightarrow \frac{9-6\sqrt{5}-3\sqrt{5}+10}{-11}$

$\Rightarrow \frac{19-9\sqrt{5}}{-11}$

$\Rightarrow \frac{-19}{11} + \frac{9\sqrt{5}}{11}$

Equating this with RHS,
We get,

$= \frac{-19}{11}b = -\frac{19}{11}$

$\Rightarrow b = 1$

6. Which of the following statements is true?

(A) Product of two irrational numbers is always irrational.

(B) Product of a rational and an irrational number is always irrational.

(C) Sum of two irrational numbers can never be irrational.

(D) Sum of an integer and a rational number can never be an integer.

Ans. :

b. Product of a rational and an irrational number is always irrational.

Solution:

a. Is incorrect, Product of two irrational numbers is not always irrational, it can be also rational sometimes.

when an irrational number is multiplied to itself, or multiplied by another irrational, that product becomes a perfect square.

Example:

$\sqrt{2}\times\sqrt{2}=2$ (Rational)

$\sqrt{2}\times\sqrt{8}=\sqrt{16}=\pm4$ (Rational)

b. Is correct, because when a rational number is multiplied to an irrational number, it can not make an irrational number terminating or Non-terminating Repeating. Product again becomes a Non-terminating Non-Repeating number.

as: $2\times\sqrt{3}=2\sqrt{3}$

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

So, product of a rational number and an irrational number is always an irrational, because irrational number is just changed in magnitude not in properties.

c. Is incorrect, Sum of two irrational numbers can be an irrational number. i.e. if we add $\sqrt{2}$ and $\sqrt{3}$, we will get $\sqrt{2}+\sqrt{3}$ which is also an irrational.

d. Is incorrect, Sum of an integer and a rational number can be a integer. Because all integers are rational numbers and also we can say some rational numbers are integers. So their sum with integer would be a integer

i.e. 2 + 3 = 5

Hence, correct option is (b).

7. When simplified $\left(x^{-1}+y^{-1}\right)^{-1}$ is equal to:

(A) xy

(B) $x+y$

(C) $\frac{xy}{x+y}$

(D) $\frac{x+y}{xy}$

Ans. :

c. $\frac{xy}{x+y}$

Solution:

We have to simplify $\left(x^{-1}+y^{-1}\right)^{-1}$

So,

$\left(x^{-1}+y^{-1}\right)^{-1}=\left(\frac{1}{x}+\frac{1}{y}\right)^{-1}$

$=\frac{1}{\frac{1}{x}+\frac{1}{y}}$

$=\frac{1}{\frac{1\times y}{x\times y}+\frac{1\times x}{y\times x}}$

$=\frac{1}{\frac{y}{xy}+\frac{x}{xy}}$

$\left(x^{-1}+y^{-1}\right)^{-1}=\frac{1}{\frac{y+x}{xy}}$

$=\frac{xy}{y+x}$

The value of $\left(x^{-1}+y^{-1}\right)^{-1}$ is $\frac{xy}{y+x}$

Hence the correct choice is c.

8. If $x=\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$ and $y=\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$, then $x+y+xy=$

(A) 9

(B) 5

(C) 17

(D) 7

Ans. :

a. 9

Solution:

$x=\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$

$\therefore x=\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}\times\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}}$

$=\frac{\left(\sqrt{5}+\sqrt{3}\right)^2}{\left(\sqrt{5}\right)^2-\left(\sqrt{3}\right)^2}=\frac{8+2\sqrt{15}}{2}=4+\sqrt{15}$

$y=\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$

$\therefore y=\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}\times\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}-\sqrt{3}}$

$=\frac{\left(\sqrt{5}-\sqrt{3}\right)^2}{\left(\sqrt{5}\right)^2-\left(\sqrt{3}\right)^2}=\frac{8-2\sqrt{15}}{2}=4-\sqrt{15}$

$xy=\left(4+\sqrt{15}\right)\left(4-\sqrt{15}\right)=16-15=1$

Now, $x+y+xy=4+\sqrt{15}+4-\sqrt{15}+1$

$=4+4+1=9$

Hence, correct option is (a).

9. Write the correct answer in the following:

Value of $\sqrt[4]{(81)^{-2}}$ is.

(A) $\frac{1}{9}$ (B) $\frac{1}{3}$ (C) 9 (D) $\frac{1}{81}$

Ans. :

a. $\frac{1}{9}$

Solution:

$\sqrt[4]{(81)^{-2}}=\sqrt[4]{\left(\frac{1}{81}\right)^2}=\sqrt[4]{\left\{\left(\frac{1}{9}\right)^2\right\}^2}=\sqrt[4]{\left(\frac{1}{9}\right)^4}=\left(\frac{1}{9}\right)^{4\times\frac{1}{4}}=\frac{1}{9}$

Hence, (a) is the correct answer.

10. The sum of $0.\bar{3}$ and $0.\bar{4}$ is:

(A) $\frac{7}{9}$ (B) $\frac{7}{11}$ (C) $\frac{7}{99}$ (D) $\frac{7}{10}$

Ans. :

a. $\frac{7}{9}$

Solution:

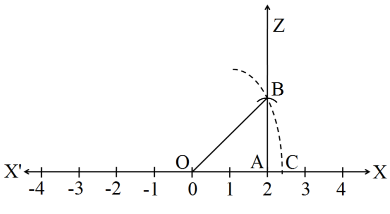
$0.\bar{3}+0.\bar{4}$

$=0.\bar{7}=\frac{7}{9}$

➤ **Answer the following short questions. [2 Marks Each]** **[8]**

11. Represent $\sqrt{5}$ on the number line.

Ans. : Draw a number line as shown. On the number line, take point O corresponding to zero. Now take point A on number line such that OA = 2 units. Draw perpendicular AZ at A on the number line and cut-off arc AB = 1 unit. By Pythagoras Theorem, $OB^2 = OA^2 + AB^2 = 2^2 + 1^2 = 4 + 1 = 5 \Rightarrow OB=\sqrt{5}$ Taking O as centre and $OB=\sqrt{5}$ as radius draw an arc cutting real line at C. Clearly, $OC=OB=\sqrt{5}$



Hence, C represents $\sqrt{5}$ on the number line.

12. Find rational numbers a and b such that:

$\frac{5+2\sqrt{3}}{7+4\sqrt{3}}=a+b\sqrt{3}$

Ans. : $\frac{5+2\sqrt{3}}{7+4\sqrt{3}}=\mathrm{a}+\mathrm{b}\sqrt{3}$ we have, $\frac{5+2\sqrt{3}}{7+4\sqrt{3}}=\frac{5+2\sqrt{3}}{7+4\sqrt{3}}\times\frac{7-4\sqrt{3}}{7-4\sqrt{3}}=\frac{5\times7-5\times4\sqrt{3}+2\sqrt{3}\times7-2\sqrt{3}\times4\sqrt{3}}{(7)^2-\left(4\sqrt{3}\right)^2}=\frac{35-20\sqrt{3}+14\sqrt{3}-8\times3}{49-16\times3}$

$=\frac{35-6\sqrt{3}-24}{49-48}=\frac{11-6\sqrt{3}}{1}=11-6\sqrt{3}$ Now, $\frac{5+2\sqrt{3}}{7+4\sqrt{3}}=\mathrm{a}+\mathrm{b}\sqrt{3}\Rightarrow\mathrm{a}=11$ and $\mathrm{b}=-6$

13. It being given that $\sqrt{3}=1.732,\sqrt{5}=2.236,\sqrt{6}=2.449$ and $\sqrt{10}=3.162,$ find to three places of decimal, the value of the following:

$\frac{3+\sqrt{5}}{3-\sqrt{5}}$

Ans. : $\frac{3+\sqrt{5}}{3-\sqrt{5}}=\frac{3+\sqrt{5}}{3-\sqrt{5}}\times\frac{3+\sqrt{5}}{3+\sqrt{5}}=\frac{\left(3+\sqrt{5}\right)^2}{(3)^2-\left(\sqrt{5}\right)^2}=\frac{(3)^2+2\times3\sqrt{5}+\left(\sqrt{5}\right)^2}{9-5}=\frac{9+6\sqrt{5}+5}{4}=\frac{14+6\sqrt{5}}{4}=\frac{7+3\sqrt{5}}{2}=\frac{7+3\times2.236}{2}$

$=\frac{7+6.708}{2}=\frac{13.708}{2}=6.854$

14. Simplify by rationalising the denominator:

$\frac{7\sqrt{3}-5\sqrt{2}}{\sqrt{48}+\sqrt{18}}$

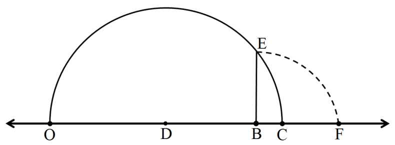
Ans. : $\frac{7\sqrt{3}-5\sqrt{2}}{\sqrt{48}+\sqrt{18}}=\frac{7\sqrt{3}-5\sqrt{2}}{\sqrt{16\times3}+\sqrt{9\times2}}=\frac{7\sqrt{3}-5\sqrt{2}}{4\sqrt{3}+3\sqrt{2}}=\frac{7\sqrt{3}-5\sqrt{2}}{4\sqrt{3}+3\sqrt{2}}\times\frac{4\sqrt{3}-3\sqrt{2}}{4\sqrt{3}-3\sqrt{2}}=\frac{7\sqrt{3}\times4\sqrt{3}-7\sqrt{3}\times3\sqrt{2}-5\sqrt{2}\times4\sqrt{3}+5\sqrt{2}\times3\sqrt{2}}{\left(4\sqrt{3}\right)^2-\left(3\sqrt{2}\right)^2}$

$=\frac{28\times3-21\sqrt{6}-20\sqrt{6}+15\times2}{16\times3-9\times2}=\frac{84-41\sqrt{6}+30}{48-18}=\frac{114-41\sqrt{6}}{30}$

➤ **Answer the following questions. [3 Marks Each]** **[12]**

15. Represent $\sqrt{10.5}$ on the number line.

Ans. : Draw a line segment OB = 10.5 units and extend it to C such that BC = 1 unit. Find the midpoint D of OC. With D as centre and DO as radius, draw a semicircle. Now, draw $\mathrm{BE}\perp\mathrm{AC},$ intersecting the semicircle at E. Then, $\mathrm{BE}=\sqrt{10.5}\,\mathrm{units}.$ With B as centre and BE as radius, draw an arc, meeting AC produced at F.



Then, $\mathrm{BF}=\mathrm{BE}=\sqrt{10.5}\mathrm{units}.$

16. Simplify:

$\frac{2\sqrt{6}}{\sqrt{2}+\sqrt{3}}+\frac{6\sqrt{2}}{\sqrt{6}+\sqrt{3}}-\frac{8\sqrt{3}}{\sqrt{6}+\sqrt{2}}$

Ans. : $\frac{2\sqrt{6}}{\sqrt{2}+\sqrt{3}}+\frac{6\sqrt{2}}{\sqrt{6}+\sqrt{3}}-\frac{8\sqrt{3}}{\sqrt{6}+\sqrt{2}}=\frac{2\sqrt{6}}{\sqrt{2}+\sqrt{3}}\times\frac{\sqrt{2}-\sqrt{3}}{\sqrt{2}-\sqrt{3}}+\frac{6\sqrt{2}}{\sqrt{6}+\sqrt{3}}\times\frac{\sqrt{6}-\sqrt{3}}{\sqrt{6}-\sqrt{3}}-\frac{8\sqrt{3}}{\sqrt{6}+\sqrt{2}}\times\frac{\sqrt{6}-\sqrt{2}}{\sqrt{6}-\sqrt{2}}$

$=\frac{2\sqrt{6}\times\sqrt{3}-2\sqrt{6}\times\sqrt{2}}{\left(\sqrt{3}\right)^2-\left(\sqrt{2}\right)^2}+\frac{6\sqrt{2}\times\sqrt{6}-6\sqrt{2}\times\sqrt{3}}{\left(\sqrt{6}\right)^2-\left(\sqrt{3}\right)^2}-\frac{8\sqrt{3}\times\sqrt{6}-8\sqrt{3}\times\sqrt{2}}{\left(\sqrt{6}\right)^2-\left(\sqrt{2}\right)^2}=\frac{2\sqrt{18}-2\sqrt{12}}{3-2}+\frac{6\sqrt{12}-6\sqrt{6}}{6-3}-\frac{8\sqrt{18}-8\sqrt{6}}{6-2}$

$=2\sqrt{18}-2\sqrt{12}+\frac{6\sqrt{12}-6\sqrt{6}}{3}-\frac{8\sqrt{18}-8\sqrt{6}}{4}=2\sqrt{18}-2\sqrt{12}+2\sqrt{12}-2\sqrt{6}-2\sqrt{18}+2\sqrt{6}=0$

17. Find rational numbers a and b such that:

$\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}=\mathrm{a}+\mathrm{b}\sqrt{6}$

Ans. : $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}=\mathrm{a}+\mathrm{b}\sqrt{6}$ we have, $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}=\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}\times\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}}=\frac{\left(\sqrt{3}+\sqrt{2}\right)^2}{\left(\sqrt{3}\right)^2-\left(\sqrt{2}\right)^2}=\frac{\left(\sqrt{3}\right)^2+2\times\sqrt{2}\times\sqrt{3}+\left(\sqrt{2}\right)^2}{3-2}$

$=\frac{3+2\sqrt{6}+2}{1}=5+2\sqrt{6}$ Now, $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}=\mathrm{a}+\mathrm{b}\sqrt{6}\Rightarrow\mathrm{a}=5$ and $\mathrm{b}=2$

18. Simplify $\frac{\sqrt{13}-\sqrt{11}}{\sqrt{13}+\sqrt{11}}+\frac{\sqrt{13}+\sqrt{11}}{\sqrt{13}-\sqrt{11}}$

Ans. : $\frac{\sqrt{13}-\sqrt{11}}{\sqrt{13}+\sqrt{11}}+\frac{\sqrt{13}+\sqrt{11}}{\sqrt{13}-\sqrt{11}}$ $=\frac{\sqrt{13}-\sqrt{11}}{\sqrt{13}+\sqrt{11}}\times\frac{\sqrt{13}-\sqrt{11}}{\sqrt{13}-\sqrt{11}}+\frac{\sqrt{13}+\sqrt{11}}{\sqrt{13}-\sqrt{11}}\times\frac{\sqrt{13}+\sqrt{11}}{\sqrt{13}+\sqrt{11}}$ $=\frac{\left(\sqrt{13}-\sqrt{11}\right)^2}{\left(\sqrt{13}\right)^2-\left(\sqrt{11}\right)^2}+\frac{\left(\sqrt{13}+\sqrt{11}\right)^2}{\left(\sqrt{13}\right)^2-\left(\sqrt{11}\right)^2}$

$=\frac{13+11-2\times\sqrt{13}\times\sqrt{11}}{13-11}+\frac{13+11+2\times\sqrt{13}\times\sqrt{11}}{13-11}$ $=\frac{24-2\sqrt{143}}{2}+\frac{24+2\sqrt{143}}{2}$ $=\frac{24-2\sqrt{143}+24+2\sqrt{143}}{2}$ $=\frac{48}{2}$ $=24$

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