CBSE Test Paper 01

CH-1 Number Systems

1. $\sqrt{12} \times \sqrt{15}$ =
   a. 5
   b. $5\sqrt{6}$
   c. $6\sqrt{5}$
   d. 6
2. Which of the following is equal to 'x'?
   a. $\sqrt[12]{(x^4)^{\frac{1}{3}}}$
   b. $x^{\frac{12}{7}} \times x^{\frac{7}{12}}$
   c. $\left(\sqrt{x^3}\right)^{\frac{2}{3}}$
   d. $x^{\frac{12}{7}} - x^{\frac{5}{7}}$
3. An irrational number between 5 and 6 is
   a. none of these
   b. $\sqrt{5+6}$
   c. $\sqrt{5-6}$
   d. $\sqrt{5\times 6}$
4. $2\sqrt{3}+\sqrt{3}$ is equal to
   a. $2\sqrt{6}$
   b. $3\sqrt{6}$

c. 3

d. $3\sqrt{3}$

5. If $x = 3 + \sqrt{8}$, then the value of $\left(x^2 + \frac{1}{x^2}\right)$ is

a. 32

b. 34

c. 6

d. 12

6. Fill in the blanks:

The two rational number which are their own multiplicative inverses are________.

7. Fill in the blanks:

The value of $\frac{2}{\sqrt{5}-\sqrt{3}}$ is________.

8. Find:$125^{\frac{-1}{3}}$

9. Identify whether $\sqrt{45}$ is rational number or irrational number.

10. Write the decimal form and state its kind of decimal expansion. $\frac{36}{100}$

11. Simplify the expression: $(\sqrt{5} - \sqrt{2})(\sqrt{5} + \sqrt{2})$

12. Recall, π is defined as the ratio of the circumference (say c) of a circle to its diameter (say d). That is, $\pi = \frac{c}{d}$ This seems to contradict the fact that is irrational. How will you resolve this contradiction?

13. Find three different irrational numbers between the rational numbers $\frac{5}{9}$ and $\frac{9}{11}$.

14. Rationalize a denominator of the following: $\frac{\sqrt{3}-1}{\sqrt{3}+1}$

15. Prove that: $\frac{3^{-3}\times 6^2\times\sqrt{98}}{5^2\times\sqrt[3]{1/25}\times(15)^{-4/3}\times 3^{1/3}}$ = $28\sqrt{2}$

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Solution

1. (c) $6\sqrt{5}$

   Explanation:

   $\sqrt{12} = \sqrt{3 \times 2^2} = 2\sqrt{3}$ and $\sqrt{15} = \sqrt{5} \times \sqrt{3}$

   so, $\sqrt{12} \times \sqrt{15} = 2\sqrt{3} \times \sqrt{3} \times \sqrt{5}$

   $= 2 \times 3\sqrt{5} = 6\sqrt{5}$

2. (c) $\left(\sqrt{x^3}\right)^{\frac{2}{3}}$

   Explanation:

   $(\sqrt{x^3})^{\frac{2}{3}}$

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

   =x

3. (d) $\sqrt{5 \times 6}$

   Explanation:

   We know that,

   If a and b are two distinct positive rational numbers such that ab is not a perfect square of a rational number,then

   $\sqrt{ab}$ is an irrational number lying between a and b,

   Here also we have 5 and 6 two distinct rational numbers and 5×6=30 is not a perfect square,

   So irrational number between 5 and 6 =$\sqrt{5 \times 6}$

4. (d) $3\sqrt{3}$

   Explanation:

   $2\sqrt{3} + \sqrt{3}$

   $= \sqrt{3}(2 + 1)$

   $= 3\sqrt{3}$

5. (b) 34

   Explanation:

given $x = (3 + \sqrt{8})$

$\frac{1}{x} = \frac{1}{(3+\sqrt{8})} = \frac{1}{(3+\sqrt{8})} \times \frac{(3-\sqrt{8})}{(3-\sqrt{8})}$

$= \frac{(3-\sqrt{8})}{\left(3^2-(\sqrt{8})^2\right)} = \frac{(3+\sqrt{8})}{(9-8)} = (3 - \sqrt{8})$

$\left(x + \frac{1}{x}\right) = (3 + \sqrt{8}) + (3 - \sqrt{8}) = 6$

$\Rightarrow \left(x + \frac{1}{x}\right)^2 = 6^2 = 36$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right) + 2 \times x \times \frac{1}{x} = 36$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right) + 2 = 36$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right) = 36 - 2 = 34$

6. 1, -1

7. $\sqrt{5} + \sqrt{3}$

8. $125^{\frac{-1}{3}}$

We know that $a^{-n} = \frac{1}{a^n}$

We conclude that $125^{\frac{-1}{3}}$ can also be written as $\frac{1}{125^{\frac{1}{3}}}$,or $\left(\frac{1}{125}\right)^{\frac{1}{3}}$

We know that $a^{\frac{1}{n}} = \sqrt[n]{a}$, where $a > 0$.

We know that $\left(\frac{1}{125}\right)^{\frac{1}{3}}$ can also be written as

$\$\sqrt[3]{\left(\frac{1}{125}\right)} = \sqrt[3]{\left(\frac{1}{5} \times \frac{1}{5} \times \frac{1}{5}\right)} = \frac{1}{5}.$

Therefore, the value of $125^{\frac{-1}{3}}$ will be $\frac{1}{5}$.

9. We have,

$\sqrt{45} = \sqrt{9 \times 5} = 3\sqrt{5}$

Since 3 is a rational number and $\sqrt{5}$ is an irrational number. Therefore, the product 3 $\sqrt{5} = \sqrt{45}$ is an irrational number.

10. $\frac{36}{100} = 0.36$

The decimal expansion is terminating.

11. $(\sqrt{5} - \sqrt{2})(\sqrt{5} \quad \sqrt{2}) = (\sqrt{5})^2 - (\sqrt{2})^2 +$ ṇ = 5 - 2 = 3

12. We know that when we measure the length of a line or a figure by using a scale or any device, we do not get an exact measurement. In fact, we get an approximate rational value. So, we are not able to realize that either circumference (c) or diameter(d) of a circle is irrational. Therefore, we can conclude that as such there is not any contradiction regarding the value π of and we realize that the value of π is irrational.

13.
```
7 ) 5.000000 ( 0.714285....
    49
    --
     10
      7
     --
     30
     28
     --
      20
      14
      --
       60
       56
       --
        40
        35
        --
         5
```
Thus, $\frac{5}{7}$ = 0.714285 ... = $0.\overline{714285}$

```
11 ) 9.0000 ( 0.8181....
     88
     --
      20
      11
      --
       90
       88
       --
        20
        11
        --
         9
```
Thus, $\frac{9}{11}$ = 0.8181 ... = $0.\overline{81}$

Three different irrational numbers between the rational $\frac{5}{9}$ and $\frac{9}{11}$ can be taken as

0.75 075007500075000075 ...

0.7670767000767 ...,

0.808008000800008 ...,

14. $\frac{\sqrt{3}-1}{\sqrt{3}+1}$

$\frac{\sqrt{3}-1}{\sqrt{3}+1} = \frac{\sqrt{3}-1}{\sqrt{3}+1} \times \frac{\sqrt{3}-1}{\sqrt{3}-1}$

(Multiplying the numerator and denominator by $\sqrt{3}$ - 1)

$$= \frac{(\sqrt{3}-1)^2}{(\sqrt{3})^2-(1)^2}$$

$$= \frac{(\sqrt{3})^2-2(\sqrt{3})(1)+(1)^2}{3-1}$$

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

15. We have,

$$\frac{3^{-3}\times 6^2\times\sqrt{98}}{5^2\times\sqrt[3]{\frac{1}{25}}\times(15)^{-\frac{4}{3}}\times 3^{\frac{1}{3}}}$$

$$= \frac{3^{-3}\times 36\times\sqrt{7\times 7\times 2}}{5^2\times\left(\frac{1}{25}\right)^{\frac{1}{3}}\times(15)^{-\frac{4}{3}}\times 3^{\frac{1}{3}}}$$

$$= \frac{3^{-3}\times 36\times 7\sqrt{2}}{5^2\times\left(\frac{1}{5^{2\times\frac{1}{3}}}\right)\times\frac{1}{(15)^{\frac{4}{3}}}\times 3^{\frac{1}{3}}}$$

$$= \frac{3^{-3}\times 36\times 7\sqrt{2}}{5^2\times 5^{-\frac{2}{3}}\times\frac{1}{(5\times 3)^{\frac{4}{3}}}\times 3^{\frac{1}{3}}}$$

$$= \frac{3^{-3}\times 36\times 7\sqrt{2}}{\left(5^2\times 5^{-\frac{2}{3}}\times 5^{-\frac{4}{3}}\right)\times 3^{-\frac{4}{3}}\times 3^{\frac{1}{3}}}$$

$$= \frac{3^{-3}\times 36\times 7\sqrt{2}\times 3^{\frac{4}{3}}\times 3^{-\frac{1}{3}}}{(5)^{2-\frac{2}{3}-\frac{4}{3}}}$$

$$= \frac{3^{-3}\times 36\times 7\sqrt{2}\times 3^{\frac{4}{3}}\times 3^{-\frac{1}{3}}}{(5)^{\frac{6-2-4}{3}}}$$

$$= \frac{3^{-3+\frac{4}{3}-\frac{1}{3}}\times 36\times 7\sqrt{2}}{5^0}$$

$$= 3^{-3+\left(\frac{4-1}{3}\right)}\times 36\times 7\sqrt{2}$$

$$= 3^{-3+\frac{3}{3}}\times 36\times 7\sqrt{2}$$

$$= 3^{-3+1}\times 36\times 7\sqrt{2}$$

$$= 3^{-2}\times 36\times 7\sqrt{2}$$

$$= \frac{1}{9}\times 36\times 7\sqrt{2}$$

$$= 4\times 7\sqrt{2}$$

$$= 28\sqrt{2}$$