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Objective Questions
CLASS : 9 th
SUB : Maths
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CHAPTER 1

Number Systems

1. OBJECTIVE QUESTIONS

1. The value of x, when $(2)^{x+4} \cdot (3)^{x+1} = 288$ is
(a) 1 (b) -1
(c) 0 (d) None

Ans : (a) 1

$$2^{x+4} \cdot 3^{x+1} = 2^5 \cdot 3^2$$
$$x = 1$$

2. The rational number between 1/2 and 1/3 is
(a) 2/5 (b) 1/5
(c) 3/5 (d) 4/5

Ans : (a) 2/5

Since, $\frac{1}{2} = 0.5$,

$\frac{1}{3} = 0.\bar{3}$

Rational number lies between $0.\bar{3}$ and 0.5 is

$$0.4 = \frac{4}{10} = \frac{2}{5}$$

3. Set of natural numbers is a subset of
(a) Set of even numbers
(b) Set of odd numbers
(c) Set of composite numbers
(d) Set of real numbers

Ans : (d) Set of real numbers

Since, set of real numbers contains all natural numbers, integers, rational and irrational numbers.

4. $0.12\bar{3}$ can be expressed in rational form as
(a) $\frac{900}{111}$ (b) $\frac{111}{900}$
(c) $\frac{123}{10}$ (d) $\frac{121}{900}$

Ans : (b) $\frac{111}{900}$

Let, $x = 0.12333.....$ ...(1)
Multiply (1) by 10 on both sides, we get
$10x = 1.2333.....$ ...(2)
Subtracting (1) from (2), we get
$9x = 1.11$
$x = 111/900$

5. The fraction $\frac{2(\sqrt{2}+\sqrt{6})}{3(\sqrt{2}+\sqrt{3})}$ is equal to
(a) $\frac{2\sqrt{2}}{3}$ (b) 1
(c) $\frac{2\sqrt{3}}{3}$ (d) $\frac{4}{3}$

Ans : (d) $\frac{4}{3}$

Let, $y = \frac{2(\sqrt{2}+\sqrt{6})}{3(\sqrt{2}+\sqrt{3})}$

Squaring (1) both sides, we get

$$y^2 = \left(\frac{2(\sqrt{2}+\sqrt{6})}{3(\sqrt{2}+\sqrt{3})}\right)^2 = \frac{4}{9}\left(\frac{(\sqrt{2}+\sqrt{6})^2}{2+\sqrt{3}}\right)$$
$$= \frac{4}{9}\left(\frac{(2+6+2\sqrt{12})}{2+\sqrt{3}}\right)$$
$$= \frac{4}{9}\left(\frac{(8+2\sqrt{4\times 3})}{2+\sqrt{3}}\right)$$
$$= \frac{16}{9}\left(\frac{2+\sqrt{3}}{2+\sqrt{3}}\right) = \frac{16}{9}$$

Taking square root, we get
$y = 4/3$

6. If $x \geq 0$, then $\sqrt{x\sqrt{x\sqrt{x}}} =$
(a) $x\sqrt{x}$ (b) $x\sqrt[4]{x}$
(c) $\sqrt[8]{x}$ (d) $\sqrt[8]{x^7}$

Ans : (d) $\sqrt[8]{x^7}$

$$\sqrt{x\sqrt{x\sqrt{x}}} = \sqrt{x(x^{3/2})^{1/2}} = \sqrt{x.(x)^{3/4}}$$
$$= \sqrt{x^{7/4}} = x^{7/8} = \sqrt[8]{x^7}$$

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7. $\frac{7\sqrt{3}}{(\sqrt{10}+\sqrt{3})} - \frac{2\sqrt{5}}{(\sqrt{6}+\sqrt{5})} - \frac{3\sqrt{2}}{(\sqrt{15}+3\sqrt{2})} =$
(a) 1 (b) 2
(c) 1/2 (d) 3

Ans : (a) 1

$$\frac{7\sqrt{3}}{(\sqrt{10}+\sqrt{3})} - \frac{2\sqrt{5}}{(\sqrt{6}+\sqrt{5})} - \frac{3\sqrt{2}}{(\sqrt{15}+3\sqrt{2})}$$
$$= \frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}} \times \frac{\sqrt{10}-\sqrt{3}}{\sqrt{10}-\sqrt{3}} - \frac{2\sqrt{5}}{\sqrt{6}+\sqrt{5}}$$
$$\times \frac{\sqrt{6}-\sqrt{5}}{\sqrt{6}-\sqrt{5}} - \frac{3\sqrt{2}}{\sqrt{15}+3\sqrt{2}} \times \frac{\sqrt{15}-3\sqrt{2}}{\sqrt{15}-3\sqrt{2}}$$
$$= \frac{7\sqrt{3}(\sqrt{10}-\sqrt{3})}{7} - 2\sqrt{5}(\sqrt{6}-\sqrt{5})$$
$$- \frac{3\sqrt{2}(\sqrt{15}-3\sqrt{2})}{-3}$$

$= \sqrt{30} - 3 - 2\sqrt{30} + 10 + \sqrt{30} - 6 = 1$

8. The rationalising factor of $\sqrt[5]{a^2b^3c^4}$ is

(a) $\sqrt[5]{a^3b^2c}$ (b) $\sqrt[4]{a^3b^2c}$

(c) $\sqrt[3]{a^3b^2c}$ (d) $\sqrt{a^3b^2c}$

Ans : (a) $\sqrt[5]{a^3b^2c}$

Since, multiplication of $\sqrt[5]{a^2b^3c^4}$ by $\sqrt[5]{a^3b^2c}$ gives rational number.

R.F. of $\sqrt[5]{a^2b^3c^4} = \sqrt[5]{a^3b^2c}$

9. Four rational numbers between 3 and 4 are:

(a) $\frac{3}{5}, \frac{4}{5}, 1, \frac{6}{5}$ (b) $\frac{13}{5}, \frac{14}{5}, \frac{16}{5}, \frac{17}{5}$

(c) 3.1, 3.2, 4.1, 4.2 (d) 3.1, 3.2, 3.8, 3.9

Ans : (d) 3.1, 3.2, 3.8, 3.9

To find four rational numbers between 3 and 4.

$\frac{3 \times 5}{5}$ and $\frac{4 \times 5}{5}$

$\frac{15}{5}$ and $\frac{20}{5}$

Between $\frac{15}{5}$ and $\frac{20}{5}$ lies $\frac{16}{5}, \frac{17}{5}, \frac{18}{5}, \frac{19}{5}$

Now, from the given options (a) and (b) does not contain rational number between 3 and 5.
(c) has 4.1 and 4.2 that does not lie between 3 and 4.

10. Value of x satisfying $\sqrt{x+3} + \sqrt{x-2} = 5$, is

(a) 6 (b) 7

(c) 8 (d) 9

Ans : (a) 6

$x = 6$ satisfies the given equation

11. If both 'a' and 'b' are rational numbers, then 'a' and 'b' from $\frac{3-\sqrt{5}}{3+2\sqrt{5}} = a\sqrt{5} - b$, respectively are

(a) $\frac{9}{11}, \frac{19}{11}$ (b) $\frac{19}{11}, \frac{9}{11}$

(c) $\frac{2}{11}, \frac{8}{11}$ (d) $\frac{10}{11}, \frac{21}{11}$

(a) $\frac{9}{11}, \frac{19}{11}$

We have, $\frac{3-\sqrt{5}}{3+2\sqrt{5}} = a\sqrt{5} - b$

$$\frac{3-\sqrt{5}}{3+2\sqrt{5}} \times \frac{3-2\sqrt{5}}{3-2\sqrt{5}} = a\sqrt{5} - b$$

$$a\sqrt{5} - b = \frac{(3-\sqrt{5})(3-2\sqrt{5})}{(3)^2 - (2\sqrt{5})^2}$$

or

$$= \frac{(3-\sqrt{5})(3-2\sqrt{5})}{-11}$$

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

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

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

On comparing, we get $a = \frac{9}{11}$, $b = \frac{19}{11}$.

12. Simplify : $\frac{2^{n+4} - 2(2^n)}{2(2^{n+3})}$

(a) $2^{n+1} - \frac{1}{8}$ (b) -2^{n+1}

(c) $1 - 2^n$ (d) 7/8

Ans : (d) 7/8

$$\frac{2^{n+4} - 2(2^n)}{2(2^{n+3})} = \frac{2^{n+4} - 2^{n+1}}{2^{n+4}} = 1 - \frac{2^{n+1}}{2^{n+4}}$$

$$= 1 - 2^{n+1-n-4} = 1 - 2^{-3}$$

$$= 1 - \frac{1}{8} = \frac{7}{8}$$

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13. A rational number equivalent to a rational number $\frac{7}{19}$ is

(a) $\frac{17}{119}$ (b) $\frac{14}{57}$

(c) $\frac{21}{38}$ (d) $\frac{21}{57}$

Ans : (d) $\frac{21}{57}$

Simplest form of $\frac{17}{119} = \frac{17}{119}$

Simplest form of $\frac{14}{57} = \frac{14}{57}$

Simplest form of $\frac{21}{38} = \frac{21}{38}$

Simplest form of $\frac{21}{57} = \frac{7}{19}$

14. The numerator of $\frac{a+\sqrt{a^2-b^2}}{a-\sqrt{a^2-b^2}} + \frac{a-\sqrt{a^2-b^2}}{a+\sqrt{a^2-b^2}}$ is

(a) a^2 (b) b^2

(c) $a^2 - b^2$ (d) $4a^2 - 2b^2$

Ans : (d) $4a^2 - 2b^2$

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

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

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

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

15. The ascending order of the surds $\sqrt[3]{2}, \sqrt[6]{3}, \sqrt[9]{4}$ is

(a) $\sqrt[9]{4}, \sqrt[6]{3}, \sqrt[3]{2}$ (b) $\sqrt[9]{4}, \sqrt[3]{2}, \sqrt[6]{3}$

(c) $\sqrt[3]{2}, \sqrt[6]{3}, \sqrt[9]{4}$ (d) $\sqrt[6]{3}, \sqrt[9]{4}, \sqrt[3]{2}$

Ans : (a) $\sqrt[9]{4}, \sqrt[6]{3}, \sqrt[3]{2}$

Surds are $(2)^{\frac{1}{3}}, (3)^{\frac{1}{6}}, (4)^{\frac{1}{9}}$

L.C.M. of 3, 6, 9 is 18

$$= (2)^{\frac{1}{3} \times \frac{6}{6}}, (3)^{\frac{1}{6} \times \frac{3}{3}}, (4)^{\frac{1}{9} \times \frac{2}{2}}$$

$$= (2^6)^{\frac{1}{18}}, (3^3)^{\frac{1}{18}}, (4^2)^{\frac{1}{18}} = (64)^{\frac{1}{18}}, (27)^{\frac{1}{18}}, (16)^{\frac{1}{18}}$$

$$= (2)^{\frac{1}{3}} > (3)^{\frac{1}{6}} > (4)^{\frac{1}{9}}$$

16. The value of 0.423 is

(a) $\frac{423}{1000}$ (b) $\frac{423}{100}$

(c) $\frac{423}{990}$ (d) $\frac{419}{990}$

Ans : (a) $\frac{423}{1000}$

17. Which of the following statement is not true?

(a) Between two integers, there exist infinite number of rational numbers.

(b) Between two rational numbers, there exist infinite number of integers

(c) Between two rational numbers, there exist infinite number of rational numbers.

(d) Between two real numbers, there exists infinite number of real numbers.

Ans : (b) Between two rational numbers, there exist infinite number of integers

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18. Rationalizing factor of $(2+\sqrt{3})$ =

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

(c) $2+\sqrt{3}$ (d) $3+\sqrt{3}$

Ans : (a) $2-\sqrt{3}$

19. Which of the following expressions is same as $\frac{1}{(\sqrt[3]{2}-1)}$?

(a) $\sqrt[3]{2}+1$ (b) $\sqrt[3]{4}+1$

(c) $\sqrt[3]{4}+\sqrt[3]{2}+1$ (d) $\sqrt[3]{4}+2\sqrt[3]{2}+1$

Ans : (c) $\sqrt[3]{4}+\sqrt[3]{2}+1$

Let, $y = \frac{1}{(2)^{1/3}-1}$

Since, $a^3-b^3 = (a-b)(a^2+b^2+ab)$

Taking $a = (2)^{1/3}$, $b = 1$, we get

$$y = \frac{1(2^{2/3}+1+2^{1/3})}{((2)^{1/3}-1)(2^{2/3}+1+2^{1/3})} = \frac{\sqrt[3]{4}+\sqrt[3]{2}+1}{((2)^{1/3})^3-(1)^3}$$

20. If $m=\frac{cab}{a-b}$, then b equals

(a) $\frac{m(a-b)}{ca}$ (b) $\frac{cab-ma}{-m}$

(c) $\frac{1}{1+c}$ (d) $\frac{ma}{m+ca}$

Ans : (d) $\frac{ma}{m+ca}$

$m = \frac{cab}{a-b}$ (given)$= ma-mb = cab$

$m(a-b) = cab$

$ma-mb = cab$

$cab+mb = ma$

$b(m+ca) = ma$

$b = ma/(m+ca)$

21. Rational number between $\sqrt{2}$ and $\sqrt{3}$ is

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

(c) 1.5 (d) 1.8

Ans : (c) 1.5

Since, $\sqrt{2}$ = 1.414.....,

$\sqrt{3}$ = 1.732.....

Rational number between $\sqrt{2}$ and $\sqrt{3}$ is 1.5.

22. The greater between $\sqrt{17}-\sqrt{12}$ and $\sqrt{11}-\sqrt{6}$ is.

(a) $\sqrt{17}-\sqrt{12}$ (b) $\sqrt{11}-\sqrt{6}$

(c) Both are equal (d) Cannot compare

Ans : (b) $\sqrt{11}-\sqrt{6}$

Since, difference of smaller surds is greater than difference of bigger surds.

23. Rationalizing factor of $1+\sqrt{2}+\sqrt{3}$

(a) $1+\sqrt{2}-\sqrt{3}$ (b) 2

(c) 4 (d) $1+\sqrt{2}+\sqrt{3}$

Ans : (a) $1+\sqrt{2}-\sqrt{3}$

24. $1/(\sqrt{3}-\sqrt{2})$ is not equal to

(a) $\sqrt{3}+\sqrt{2}$ (b) $\sqrt{2}/(\sqrt{6}-2)$

(c) $(\sqrt{3}-\sqrt{2})/(5-2\sqrt{6})$ (d) $\sqrt{3}/(9-\sqrt{6})$

Ans : (d) $\sqrt{3}/(9-\sqrt{6})$

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

$$\frac{\sqrt{2}}{\sqrt{6}-2} = \frac{\sqrt{2}}{\sqrt{2}(\sqrt{3}-\sqrt{2})} = \frac{1}{\sqrt{3}-\sqrt{2}}$$

$$\frac{\sqrt{3}-\sqrt{2}}{5-2\sqrt{6}}\times\frac{5+2\sqrt{6}}{5+2\sqrt{6}}$$

$$= 5\sqrt{3}+6\sqrt{2}-5\sqrt{2}-4\sqrt{3}$$

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

$$\frac{\sqrt{3}}{9-\sqrt{6}} = \frac{\sqrt{3}}{\sqrt{3}(3\sqrt{3}-\sqrt{2})} = \frac{1}{3\sqrt{3}-\sqrt{2}}$$

25. The value of $\left(\frac{x^q}{x^r}\right)^{\frac{1}{qr}}\times\left(\frac{x^r}{x^p}\right)^{\frac{1}{rp}}\times\left(\frac{x^p}{x^q}\right)^{\frac{1}{pq}}$ is equal to

(a) $x^{\frac{1}{p}+\frac{1}{q}+\frac{1}{r}}$ (b) 0

(c) $x^{pq+qr+rp}$ (d) 1

Ans : (d) 1

$$\left(\frac{x^q}{x^r}\right)^{\frac{1}{qr}}\times\left(\frac{x^r}{x^p}\right)^{\frac{1}{rp}}\times\left(\frac{x^p}{x^q}\right)^{\frac{1}{pq}}$$

$$= \frac{x^{\frac{1}{r}}}{x^{\frac{1}{q}}}\times\frac{x^{\frac{1}{p}}}{x^{\frac{1}{r}}}\times\frac{x^{\frac{1}{q}}}{x^{\frac{1}{p}}} = 1$$

26. The value of $\left(\sqrt[6]{27}-\sqrt{6\frac{3}{4}}\right)^2$ equals

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

(c) $\frac{\sqrt{3}}{4}$ (d) $\frac{3}{4}$

Ans : (d) $\frac{3}{4}$

Let, $y = \left(\sqrt[6]{27} - \sqrt{6\frac{3}{4}}\right)^2 = \left((3^3)^{1/6} - \left(\frac{27}{4}\right)^{1/2}\right)^2$

$= \left((3)^{1/2} - \left(\frac{27}{4}\right)^{1/2}\right)^2$

$= 3 + \frac{27}{4} - 2 \times (3)^{1/2} \times \frac{(3)^{3/2}}{2}$

$= \frac{39}{4} - 3^2 = \frac{39}{4} - 9 = \frac{3}{4}$

27. If $\left(a + \frac{1}{a}\right)^2 = 9$, then $a^3 + \frac{1}{a^3}$ equals

(a) $\frac{10\sqrt{3}}{3}$ (b) $3\sqrt{3}$

(c) 18 (d) $7\sqrt{7}$

Ans : (c) 18

Given, $\left(a + \frac{1}{a}\right)^2 = 9$

$a + \frac{1}{a} = 3$ ...(1)

Cubing (1) both sides, we get

$a^3 + \frac{1}{a^3} + 3\left(a + \frac{1}{a}\right) = 27$

$a^3 + \frac{1}{a^3} = 27 - 9 = 18$

28. $\frac{2\sqrt{6}}{\sqrt{2} + \sqrt{3} + \sqrt{5}}$ equals

(a) $\sqrt{2} + \sqrt{3} - \sqrt{5}$ (b) $4 - \sqrt{2} - \sqrt{3}$

(c) $\sqrt{2} + \sqrt{3} + \sqrt{6} - 5$ (d) $\frac{1}{2}(\sqrt{2} + \sqrt{5} - \sqrt{3})$

Ans : (a) $\sqrt{2} + \sqrt{3} - \sqrt{5}$

Let, $y = \frac{2\sqrt{6}}{\sqrt{2} + \sqrt{3} + \sqrt{5}}$ ...(1)

On rationalising (1), we get

$y = \frac{2\sqrt{6}}{\sqrt{2} + \sqrt{3} + \sqrt{5}} \times \frac{(\sqrt{2} + \sqrt{3} - \sqrt{5})}{(\sqrt{2} + \sqrt{3} - \sqrt{5})}$

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

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

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

29. If $25^{x-1} = 5^{2x-1} - 100$, then the value of x is.

(a) 3 (b) 2

(c) 4 (d) 1

Ans : (b) 2

$25^{x-1} = 5^{2x-1} - 100$ (given)

or, $5^{2(x-1)} = 5^{2x-1} - 100$

or, $5^{2x-1} - 5^{2x-2} = 100$

Only $x = 2$, satisfy above equation.

30. If $x = 2 - \sqrt{3}$, then the values of $x^2 + \frac{1}{x^2}$ and $x^2 - \frac{1}{x^2}$ respectively are.

(a) $14, 8\sqrt{3}$ (b) $-14, -8\sqrt{3}$

(c) $14, -8\sqrt{3}$ (d) $-14, 8\sqrt{3}$

Ans : (c) $14, -8\sqrt{3}$

$x = 2 - \sqrt{3}$

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

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

$= 2(4 + 3) = 14$

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

$= -4\sqrt{3} - 4\sqrt{3} = -8\sqrt{3}$

31. If $4^{44} + 4^{44} + 4^{44} + 4^{44} = 4^x$, than x is

(a) 45 (b) 44

(c) 176 (d) 11

Ans : (a) 45

$4^{44} + 4^{44} + 4^{44} + 4^{44} = 4(4)^{44} = 4^x$

$4^{44+1} = 4^x$

$4^{45} = 4^x$

$x = 45$

32. The 100^{th} root of $10^{(10^{10})}$ is

(a) $10^{8^{10}}$ (b) 10^{10^8}

(c) $(\sqrt{10})^{(\sqrt{10})^{10}}$ (d) $10(\sqrt{10})^{\sqrt{10}}$

Ans : (b) 10^{10^8}

Taking, $10^{(10^{10})} = 10^{10^8 \cdot 10^2}(10^{10^8})^{100}$

100^{th} root of $10^{(10^{10})}$ is 10^{10^8}.

33. Which of the following numbers has the terminating decimal representation?

(a) 1/7 (b) 1/3

(c) 3/5 (d) 17/3

Ans : (c) 3/5

Since, $\frac{3}{5} = 0.6$

Option (c) is true. (all other numbers has non-terminating decimal representation).

2. FILL IN THE BLANK

DIRECTION : Complete the following statements with an appropriate word/term to be filled in the blank space(s).

1. Between two real numbers, there exists infinite number of ..... numbers.

Ans : real

2. Between two rational numbers, there exist .....

number of rational numbers.
Ans : infinite

3. Two mixed quadratic surds, $a+\sqrt{b}$ and $a-\sqrt{b}$, whose sum and product are rational, are called .....
Ans : conjugate

4. An irrational number between $\frac{2}{5}$ and $\frac{3}{7}$ is
Ans : $\sqrt{\frac{6}{35}}$

5. 0.72737475 is ..... number. (rational/irrational)
Ans : irrational

6. 0.578 is ..... number. (rational/irrational)
Ans : rational

7. If $x+\sqrt{5}=4+\sqrt{y}$, then $x+y=$ ..... . (where x and y are rational)
Ans : 9

8. The sum/difference of a rational and an irrational number is ..... .
Ans : irrational

9. Value of a is ..... of $\frac{\sqrt{3}-1}{\sqrt{3}+1}=a+b\sqrt{3}$
Ans : 2

10. $\sqrt[4]{\frac{1008}{63}}$ is equal to .....
Ans : $\left(\frac{1008}{63}\right)^{1/4}=(16)^{1/4}=(2^4)^{1/4}=2$

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3. TRUE/FALSE

DIRECTION : Read the following statements and write your answer as true or false.

1. Every integer is a whole number.
Ans : False

2. All rational numbers when expressed in decimal form are either terminating decimals or repeating decimals.
Ans : True

3. Every rational number is an integer.
Ans : False

4. The sum or difference of a rational number and an irrational number is an irrational.
Ans : True

5. Every natural number is a whole number.
Ans : True

6. Every rational number is a whole number.
Ans : False

7. Product of a rational and an irrational number is always irrational.
Ans : True

8. Every whole number is a natural number.
Ans : False

9. A real number is either rational or irrational.
Ans : True

10. All rational numbers can be represented by some point on the number line.
Ans : True

4. MATCHING QUESTIONS

DIRECTION : In the section, each question has two matching lists. Choices for the correct combination of elements from Column-I and Column-II are given as options (a), (b), (c) and (d) out of which one is correct.

1. Match the following :

	Column-I		**Column-II**
(P)	Decimal expansion of an irrational number is non-terminating and	(1)	irrational
(Q)	The sum of two ..... numbers may be a rational number or an irrational number.	(2)	$\sqrt{5}$
(R)	A number x is called a ..... number, if it can be written in the form $\frac{m}{n}$, where m and n are integers, $n\neq 0$	(3)	rational
(S)	An irrational number between 2 and 2.5 is	(4)	non-repeating
(T)	The value of $0.\overline{23}+0.\overline{22}$ is	(5)	$0.\overline{45}$

Ans : P − 4, Q − 1, R − 3, S − 2, T − 5

2. Match the following :

Column-I		Column-II	
(P)	$\left(\frac{81}{16}\right)^{-\frac{3}{4}} \times \left\{\left(\frac{25}{9}\right)^{-\frac{3}{2}} \div \left(\frac{5}{2}\right)^{-3}\right\}$	(1)	$\frac{3}{80}$
(Q)	$\frac{\sqrt[3]{0.125} \times \sqrt[5]{(0.00032)^{-2}}}{\sqrt[5]{(0.00243)^{-3} \times (27)^{2/3}}}$	(2)	$\frac{39+8\sqrt{30}}{21}$
(R)	$\sqrt[4]{(81)^{-2}}$	(3)	$\frac{1}{9}$
(S)	$\frac{2\sqrt{6}+\sqrt{5}}{3\sqrt{5}-2\sqrt{6}}$	(4)	1

	P	Q	R	S
(a)	1	2	4	3
(b)	3	2	1	4
(c)	2	3	4	1
(d)	4	1	3	2

Ans : P − 4, Q − 1, R − 3, S − 2

(P) $\left(\frac{81}{16}\right)^{-\frac{3}{4}} \times \left\{\left(\frac{25}{9}\right)^{-\frac{3}{2}} \div \left(\frac{5}{2}\right)^{-3}\right\}$

$= \left(\frac{3^4}{2^4}\right)^{-\frac{3}{4}} \times \left\{\left(\frac{(5)^2}{(3)^2}\right)^{-\frac{3}{2}} \div \left(\frac{5}{2}\right)^{-3}\right\}$

$= \left(\frac{3}{2}\right)^{4\times-\frac{3}{4}} \times \left\{\left(\frac{5}{3}\right)^{2\times-\frac{3}{2}} \div \left(\frac{5}{2}\right)^{-3}\right\}$

$= \left(\frac{2}{3}\right)^{3} \times \left\{\left(\frac{3}{5}\right)^{3} \div \left(\frac{2}{5}\right)^{3}\right\}$

$= \frac{8}{27} \times \left(\frac{27}{125} \times \frac{125}{8}\right) = 1$

(Q) $\frac{\sqrt[3]{0.125} \times \sqrt[5]{(0.00032)^{-2}}}{\sqrt[5]{(0.00243)^{-3} \times (27)^{2/3}}}$

$= \frac{\left(\frac{25}{1000}\right)^{1/3} \times \left(\frac{32}{100000}\right)^{-2/5}}{\left(\frac{243}{100000}\right)^{-3/5} \times (3^3)^{2/3}}$

$= \frac{\left(\frac{5}{10}\right)^{3\times\frac{1}{3}} \times \left(\left(\frac{2}{10}\right)^{5\times-2/5}\right)}{\left(\frac{3}{10}\right)^{5\times\left(-\frac{3}{5}\right)} \times 3^2} = \frac{\frac{5}{10} \times \left(\frac{2}{10}\right)^{-2}}{\left(\frac{3}{10}\right)^{-3} \times 3^2}$

$= \frac{\frac{5}{10} \times \left(\frac{10}{2}\right)^{2}}{\left(\frac{10}{3}\right)^{3} \times 3^2} = \frac{\frac{5}{10} \times \frac{100}{4}}{\frac{1000}{27} \times 9}$

$= \frac{5 \times 10 \times 3}{4 \times 1000} = \frac{3}{80}$

(R) $(81^{-2})^{1/4} = \left((9)^{-4}\right)^{1/4} = 1/9$

(S) $\frac{2\sqrt{6}+\sqrt{5}}{3\sqrt{5}-2\sqrt{6}} \times \frac{3\sqrt{5}+2\sqrt{6}}{3\sqrt{5}+2\sqrt{6}}$

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

$= \frac{2\sqrt{6}(3\sqrt{5}+2\sqrt{6})+\sqrt{5}(3\sqrt{5}+2\sqrt{6})}{45-24}$

$= \frac{6\sqrt{30}+24+15+2\sqrt{30}}{21} = \frac{39+8\sqrt{30}}{21}$

3. Match the following :

	Column-I		Column-II
(P)	$\frac{1}{2+\sqrt{3}}$	(1)	Irrational
(Q)	$64^{1/2}$	(2)	$\sqrt{56}$
(R)	$16^{3/4}$	(3)	8
(S)	$7^{1/2}8^{1/2}$	(4)	$2-\sqrt{3}$

Ans : P − (1, 4), Q − 3, R − 3, S − 2

4. Match the following :

	Column-I		Column-II
(P)	12 is a	(1)	prime number
(Q)	2, 7 are	(2)	not a rational number
(R)	2 is a	(3)	composite number
(S)	$\sqrt{2}$	(4)	co-prime numbers

Ans : P − 3, Q − 4, R − 1, S − 2

(P) $12 = 3 \times 4$ is a composite no.
(Q) 2 is a prince number,
(R) g.c.d. $(2, 7) = 1$
(S) $\sqrt{2}$ is not a rational no.

5. Match the following, if $\sqrt{2} = 1.414$, $\sqrt{3} = 1.732$, $\sqrt{5} = 2.236$ and $\pi = 3.141$.

Column-I		Column-II	
(P)	$\frac{2}{\sqrt{5}-\sqrt{3}}$	(1)	4.357
(Q)	$\frac{\pi}{2}+\frac{3}{\sqrt{5}}$	(2)	3.968
(R)	$\frac{1}{2\sqrt{5}-3\sqrt{2}}$	(3)	2.912
(S)	$\pi + 1/\sqrt{2}$	(4)	3.848

	P	Q	R	S
(a)	2	3	1	4
(b)	1	2	3	4
(c)	4	1	2	3
(d)	3	1	2	4

Ans : P − 2, Q − 3, R − 1, S − 4

(P) $\frac{2}{\sqrt{5}-\sqrt{3}} \times \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}}$

$= \frac{2(\sqrt{5}+\sqrt{3})}{5-3}$

$= \sqrt{5}+\sqrt{3} = 2.236 + 1.732 = 3.968$

(Q) $\frac{\pi}{2}+\frac{3}{\sqrt{5}} = \frac{\pi}{2}+\frac{3\sqrt{5}}{5} = \frac{5\pi+6\sqrt{5}}{10}$

$= \frac{5\times 3.141+6\times 2.236}{10}$

$= \frac{15.705+13.416}{10} = \frac{29.121}{10} = 2.912$

(R) $\frac{1}{2\sqrt{5}-3\sqrt{2}}\times\frac{2\sqrt{5}+3\sqrt{2}}{2\sqrt{5}+3\sqrt{2}}$

$= \frac{2\sqrt{5}+3\sqrt{2}}{20-18} = \frac{2\sqrt{5}+3\sqrt{2}}{2}$

$= \frac{2\times 2.236+3\times 1.414}{2}$

$= \frac{4.472+4.242}{2} = 4.357$

(S) $\pi+\frac{1}{\sqrt{2}} = \pi+\frac{\sqrt{2}}{2} = \frac{2\pi+\sqrt{2}}{2}$

$= \frac{2\times 3.141+1.414}{2}$

$= \frac{6.282+1.414}{2}$

$= \frac{7.696}{2} = 3.848$

6. Match the following :

Column-I		**Column-II**	
(P)	If $x=\frac{\sqrt{7}}{5}$ and $\frac{5}{x}=p\sqrt{7}$, then $p=$	(1)	7
(Q)	If $x=\sqrt{5}-2$, then $\left(x^2+\frac{1}{x^2}\right)=$	(2)	0
(R)	If $5^{x-3}.3^{2x-8}=455625$, then $x=$	(3)	18
(S)	If $2^x=3^y=6^{-z}$, then $1/x+1/y+1/z=$	(4)	25/7

	P	**Q**	**R**	**S**
(a)	1	2	3	4
(b)	4	3	1	2
(c)	3	2	4	1
(d)	4	3	2	1

Ans : P − 4, Q − 3, R − 1, S − 2

(P) $x = \frac{\sqrt{7}}{5}$ (Given)

$\frac{5}{\frac{\sqrt{7}}{5}} = p\sqrt{7}$

$\frac{25}{\sqrt{7}} = p\sqrt{7}$

$\frac{25}{7} = p$

(Q) $x = \sqrt{5}-2$

$x^2 = \left(\sqrt{5}-2\right)^2 = 5+4-4\sqrt{5} = 9-4\sqrt{5}$

$\frac{1}{x} = \frac{1}{\sqrt{5}-2}\times\frac{\sqrt{5}+2}{\sqrt{5}+2}$

$= \frac{\sqrt{5}+2}{5-4} = \sqrt{5}+2$

$\frac{1}{x^2} = \left(\sqrt{5}+2\right)^2 = 5+4+4\sqrt{5} = 9+4\sqrt{5}$

$x^2+\frac{1}{x^2} = 18$

(R) $5^{x-3}\cdot 3^{2x-8} = 455625$

$5^{x-3}\cdot 3^{2x-8} = 5^4\cdot 3^6$

Comparing like terms, we get

$x-3 = 4$

and $2x-8 = 6$

$x = 3+4$

and $2x = 14$

$x = 7$

(S) $2^x = 3^y = 6^{-z}$

$2^x = 3^y = \left(\frac{1}{6}\right)^z = k$ (say)

$2 = (k)^{1/x}$, $3 = (k)^{1/y}$ and $\frac{1}{6} = (k)^{1/z}$

Now, $2\times 3 = (k)^{1/x}\times(k)^{1/y}$

$6 = (k)^{\frac{1}{x}+\frac{1}{y}}$ ...(1)

and $\left(\frac{1}{6}\right) = (k)^{1/z}$

$6 = (k)^{-1/z}$ ...(2)

From (1) and (2), we get

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

$\frac{1}{x}+\frac{1}{y}+\frac{1}{z} = 0$

5. ASSERTION AND REASON

DIRECTION : In each of the following questions, a statement of Assertion is given followed by a corresponding statement of Reason just below it. Of the statements, mark the correct answer as

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

(b) Both assertion and reason are true but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Assertion is false but reason is true.

1. **Assertion :** 0.271 is a terminating decimal and we can express this number as 271/1000 which is of the form p/q, where p and q are integers and $q\neq 0$.
Reason : A terminating or non-terminating decimal expansion can be expressed as rational number.

Ans : (c) Assertion is true but reason is false.

2. **Assertion :** Every integer is a rational number.
Reason : Every integer 'm' can be expressed in the form $\frac{m}{1}$.

Ans : (a) Both Assertion and Reason are correct and

Reason is the correct explanation of Assertion.

3. **Assertion :** Rational number lying between two rational numbers a and b is $a + b/2$.
Reason : There is one rational number lying between any two rational numbers.
Ans : (c) Assertion is true but reason is false.

There are infinitely many rational numbers between any two given rational numbers.

4. **Assertion :** If $\sqrt{2} = 1.414$, $\sqrt{3} = 1.732$, then $\sqrt{5} = \sqrt{2} + \sqrt{3}$.
Reason : Square root of a positive real number always exists.
Ans : (d) Assertion is false but reason is true.

$\sqrt{2} + \sqrt{3} \neq 5$
$\sqrt{3} + \sqrt{2} = 1.732 + 1.414 = 3.146 \neq \sqrt{5}$ as
$\sqrt{5} = 2.236$

5. **Assertion :** $2 + \sqrt{6}$ is an irrational number.
Reason : Sum of a rational number and an irrational number is always an irrational number.
Ans : (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

6. **Assertion :** $\sqrt{2}$ is an irrational number.
Reason : A number is called irrational, if it cannot be written in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.
Ans : (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

7. **Assertion :** $\sqrt{2}, \sqrt{3}$ are examples of irrational numbers.
Reason : An irrational number can be expressed in the form p/q.
Ans : (c) Assertion is true but reason is false.

Irrational number cannot be expressed in the form p/q, where p and q are integers, $q \neq 0$.

8. **Assertion :** $17^2 \cdot 17^5 = 17^3$
Reason : If $a > 0$ be a real number and p and q be rational numbers. Then $a^p \cdot a^q = a^{p+q}$.
Ans : (d) Assertion is incorrect but Reason is correct.

$$17^2 \cdot 17^5 = 17^{2+5} = 17^7$$

9. **Assertion :** $5 - \sqrt{2} = 5 - 1.414 = 3.586$ is an irrational number.
Reason : The difference of a rational number and an irrational number is an irrational number.
Ans : (a) Both assertion and reason are true and reason is the correct explanation of assertion.

10. **Assertion :** A rational number between $\frac{1}{3}$ and $\frac{1}{2}$ is $\frac{5}{12}$.
Reason : Rational number between two numbers a and b is $\sqrt{ab}$.
Ans : (c) Assertion is correct but Reason is incorrect.

$$\frac{1}{2}\left(\frac{1}{3} + \frac{1}{2}\right) = \frac{5}{12}$$

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