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PRACTICE PAPER - CHAPTER 01 and 02 (2023-24)

(ANSWERS)

SUBJECT: MATHEMATICS **MAX. MARKS : 40**

CLASS : IX **DURATION : 1½ hrs**

General Instructions:

(i). **All** questions are compulsory.

(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.

(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.

(iv). There is no overall choice.

(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. The value of $\frac{\sqrt{32}+\sqrt{48}}{\sqrt{8}+\sqrt{12}}$ is equal to

(a) $\sqrt{2}$ (b) 2 (c) 4 (d) 8

Ans: (b) 2

$$\frac{\sqrt{32}+\sqrt{48}}{\sqrt{8}+\sqrt{12}}=\frac{4\sqrt{2}+4\sqrt{3}}{2\sqrt{2}+2\sqrt{3}}=\frac{4(\sqrt{2}+\sqrt{3})}{2(\sqrt{2}+\sqrt{3})}=\frac{4}{2}=2$$

$\therefore$ Correct option is (b).

2. The simplified form of $13^{\frac{1}{5}} \div 13^{\frac{1}{3}}$ is

(a) $13^{\frac{2}{15}}$ (b) $13^{\frac{8}{15}}$ (c) $13^{\frac{-1}{15}}$ (d) $13^{\frac{-2}{15}}$

Ans: (d) $13^{\frac{-2}{15}}$

$$\frac{13^{\frac{1}{5}}}{13^{\frac{1}{3}}}=13^{\frac{1}{5}}.13^{-\frac{1}{3}}=13^{\frac{1}{5}-\frac{1}{3}}=13^{-\frac{2}{15}}$$

$\therefore$ Correct option is (d).

3. Value of $(256)^{0.16} \times (256)^{0.09}$ is

(a) 4 (b) 16 (c) 64 (d) 256.25

Ans: (a) 4

$$(256)^{0.16} \times (256)^{0.09} = (256)^{0.16+0.09} = (256)^{0.25}$$

$$= (256)^{\frac{25}{100}} = (4^4)^{\frac{1}{4}}$$

$$= 4^{4\times\frac{1}{4}} = 4$$

$\therefore$ Correct option is (a).

4. $\left(-\frac{1}{27}\right)^{\frac{-2}{3}}$ is equal to

(a) $8\left(\frac{1}{27}\right)^{\frac{-2}{3}}$ (b) 9 (c) $\frac{1}{9}$ (d) $27\sqrt{27}$

Ans: (b) 9

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

$$= \{(-1)^2\}^{\frac{-1}{3}} \times 3^2 = 1 \times 9 = 9$$

$\therefore$ Correct option is (b).

5. If $(2x + 5)$ is a factor of $2x^2 - k$, then value of k is

(a) 2 (b) – 1 (c) 25 (d) $\frac{25}{2}$

Ans: (d) $\frac{25}{2}$

6. Factors of $x^2 + 11x + 18$ are

(a) $(x + 9)(x - 2)$ (b) $(x - 9)(x - 2)$
(c) $(x - 9)(x + 2)$ (d) $(x + 9)(x + 2)$
Ans: (d) $(x + 9)(x + 2)$

7. Zeros of the polynomial $p(x) = (x - 2)^2 - (x + 2)^2$ are

(a) 2, – 2 (b) 2x (c) 0, – 2 (d) 0
Ans: $p(x) = (x - 2)^2 - (x + 2)^2 = x^2 + 4 - 4x - (x^2 + 4 + 4x)$
$= x^2 + 4 - 4x - x^2 - 4 - 4x = -8x$
Now, $p(x) = 0 \Rightarrow -8x = 0 \Rightarrow x = 0$
Correct option is (d).

8. Volume of a cuboid is $3x^2 - 27$. Then possible dimensions are

(a) 3, 3, 3 (b) 3, (x – 3), (x + 3) (c) 3, x^2, 27x (d) 3, x^2, – 27x
Ans: $3x^2 - 27 = 3(x^2 - 9) = 3(x2 - 3^2) = 3(x - 3)(x + 3)$
Correct option is (b).

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

9. **Assertion (A):** Rational number lying between two rational numbers x and y is $\frac{1}{2}(x + y)$.

Reason (R): There is one rational number lying between any two rational numbers.
Ans: (c) Assertion (A) is true but reason (R) is false.

10. **Assertion (A):** $3x + 5$ is the linear polynomial.
Reason (R): A polynomial of degree 1 is called linear polynomial.
Ans: (a) Both A and R are true and R is the correct explanation of A.

SECTION – B

Questions 11 to 14 carry 2 marks each.

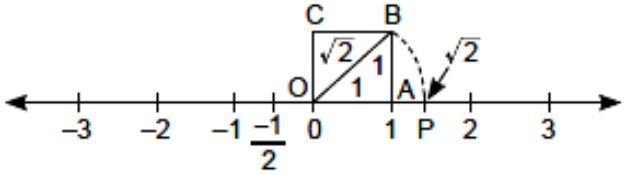
11. Represent $\sqrt{2}$ on the real number line.

Ans: Using Pythagoras theorem, $\sqrt{2} = \sqrt{1^2 + 1^2}$

$\Rightarrow$ OB = $\sqrt{OA^2 + AB^2} = \sqrt{2}$

Hence, take OA = 1 unit on the number line and AB = 1 unit, which is perpendicular to OA. With O as centre and OB as radius, we draw an arc to intersect the number line at P. Then P corresponds to $\sqrt{2}$ on the number line as shown in figure.

Clearly, OP = OB = $\sqrt{2}$



12. Simplify $\sqrt[4]{81} - 8(\sqrt[3]{216}) + 15(\sqrt[5]{32}) + \sqrt{225}$.

Ans:

$\sqrt[4]{81} = (81)^{\frac{1}{4}} = (3^4)^{\frac{1}{4}} = 3^{4\times\frac{1}{4}} = 3$

$\sqrt[3]{216} = (216)^{\frac{1}{3}} = (6^3)^{\frac{1}{3}} = 6^{3\times\frac{1}{3}} = 6$

$\sqrt[5]{32} = (32)^{\frac{1}{5}} = (2^5)^{\frac{1}{5}} = 2^{5\times\frac{1}{5}} = 2$

$\sqrt{225} = (225)^{\frac{1}{2}} = (15^2)^{\frac{1}{2}} = 15^{2\times\frac{1}{2}} = 15$

Hence, $\sqrt[4]{81} - 8(\sqrt[3]{216}) + 15(\sqrt[5]{32}) + \sqrt{225}$

= 3 – 8 × 6 + 15 × 2 + 15 = 3 – 48 + 30 + 15 = 48 – 48 = 0

13. If $f(x) = x^2 - 4x + 6$, find $f(1) - f(-1)$

Ans: $f(1) = (1)^2 - 4 \times 1 + 6 = 1 - 4 + 6 = 3$

$f(-1) = (-1)^2 - 4(-1) + 6 = 1 + 4 + 6 = 11$

$\therefore$ $f(1) - f(-1) = 3 - 11 = -8$

14. Using suitable identity, evaluate $(-32)^3 + (18)^3 + (14)^3$

Ans: Here, we find that

$a + b + c = -32 + 18 + 14 = -32 + 32 = 0$

Thus, if $a + b + c = 0$, then $a^3 + b^3 + c^3 = 3abc$

$\therefore$ $(-32)^3 + (18)^3 + (14)^3 = 3 \times (-32) \times 18 \times 14 = -24192$

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Find the value of $\frac{4}{(216)^{-\frac{2}{3}}} + \frac{1}{(256)^{-\frac{3}{4}}} + \frac{2}{(243)^{-\frac{1}{5}}}$

Ans:

$$\frac{4}{(216)^{-\frac{2}{3}}} + \frac{1}{(256)^{-\frac{3}{4}}} + \frac{2}{(243)^{-\frac{1}{5}}} = \frac{4}{(6^3)^{\frac{-2}{3}}} + \frac{1}{(2^8)^{-\frac{3}{4}}} + \frac{2}{(3^5)^{-\frac{1}{5}}}$$

$$= \frac{4}{6^{-3\times\frac{2}{3}}} + \frac{1}{2^{-8\times\frac{3}{4}}} + \frac{2}{3^{-5\times\frac{1}{5}}} = \frac{4}{6^{-2}} + \frac{1}{2^{-6}} + \frac{2}{3^{-1}}$$

$$= 4 \times 6^2 + 2^6 + 2 \times 3 = 4 \times 36 + 64 + 6$$

$$= 144 + 70 = 214$$

16. Find the value of a and b, if $\frac{7+\sqrt{5}}{7-\sqrt{5}}-\frac{7-\sqrt{5}}{7+\sqrt{5}}=a+\frac{7}{11}\sqrt{5}b$

Ans:

Given $\frac{7+\sqrt{5}}{7-\sqrt{5}}-\frac{7-\sqrt{5}}{7+\sqrt{5}}=a+\frac{7}{11}\sqrt{5}b$

$\text{L.H.S}=\frac{7+\sqrt{5}}{7-\sqrt{5}}-\frac{7-\sqrt{5}}{7+\sqrt{5}}$

$=\left(\frac{7+\sqrt{5}}{7-\sqrt{5}}\right)\times\left(\frac{7+\sqrt{5}}{7+\sqrt{5}}\right)-\left(\frac{7-\sqrt{5}}{7+\sqrt{5}}\right)\times\left(\frac{7-\sqrt{5}}{7-\sqrt{5}}\right)$

$=\frac{(7+\sqrt{5})^2}{(7)^2-(\sqrt{5})^2}-\frac{(7-\sqrt{5})^2}{(7)^2-(\sqrt{5})^2}$

$=\frac{49+5+14\sqrt{5}}{49-5}-\frac{49+5-14\sqrt{5}}{49-5}$

$=\frac{54+14\sqrt{5}}{44}-\frac{54-14\sqrt{5}}{44}$

$=\frac{1}{44}[54+14\sqrt{5}-54+14\sqrt{5}]$

$=\frac{1}{44}(2\times 14\sqrt{5})=\frac{7\sqrt{5}}{11}$

So, $0+\frac{7\sqrt{5}}{11}=a+\frac{7}{11}\sqrt{5}b$

$\Rightarrow \quad a=0 \text{ and } b=1$

OR

Find the value of x, if $5^{x-3}\times 3^{2x-8}=225$.

Ans:

Given $5^{x-3}\times 3^{2x-8}=225$

$\Rightarrow \quad 5^x\cdot 5^{-3}\times 3^{2x}\times 3^{-8}=5^2\times 3^2$

$\Rightarrow \quad 5^x\cdot 3^{2x}=\frac{5^2\times 3^2}{5^{-3}\times 3^{-8}}$

$\Rightarrow \quad 5^x\cdot 3^{2x}=5^2\cdot 5^3\cdot 3^2\cdot 3^8 \quad \left[a^{+m}=\frac{1}{a^{-m}}\right]$

$\Rightarrow \quad 5^x\cdot 3^{2x}=5^5\cdot 3^{10} \quad [a^m\cdot a^n=a^{m+n}]$

$\Rightarrow \quad 5^x\cdot 3^{2x}=5^5\cdot 3^{2\times 5}$

On comparing the exponents both sides, we get

$x=5$

17. If $2x + 3y = 12$ and $xy = 6$, find the value of $8x^3 + 27y^3$.

Ans: We know that

$(x + y)^3 = x^3 + y^3 + 3xy(x + y)$

$\Rightarrow x^3 + y^3 = (x + y)^3 - 3xy(x + y)$

Now, $8x^3 + 27y^3 = (2x)^3 + (3y)^3 = (2x + 3y)^3 - 3(2x)(3y)(2x + 3y)$

$= 12^3 - 18 \times 6 \times 12$ [Given $2x + 3y = 12$ and $xy = 6$]

$= 1728 - 1296 = 432$

Hence, $8x^3 + 27y^3 = 432$

SECTION – D

Questions 18 carry 5 marks each.

18. Find the value of m and n so that the polynomial $f(x) = x^3 - 6x^2 + mx - n$ is exactly divisible by $(x-1)$ as well as $(x-2)$.

Ans: If $f(x)$ is exactly divisible by $(x-1)$ and $(x-2)$, then $(x-1)$ and $(x-2)$ are factors of $p(x)$.

By the given condition, we have

$f(1) = 0$ and $f(2) = 0$

When $f(1) = 0$,

$\Rightarrow 1^3 - 6(1)^2 + m(1) - n = 0$

$\Rightarrow 1 - 6 + m - n = 0$

$\Rightarrow m - n = 5$ ...(i)

When $f(2) = 0$,

$\Rightarrow 2^3 - 6(2)^2 + m(2) - n = 0$

$\Rightarrow 8 - 24 + 2m - n = 0$

$\Rightarrow 2m - n = 16$ ...(ii)

Subtracting (i) from (ii), we get

$m = 11$

and substitute in (i), we get $n = 6$

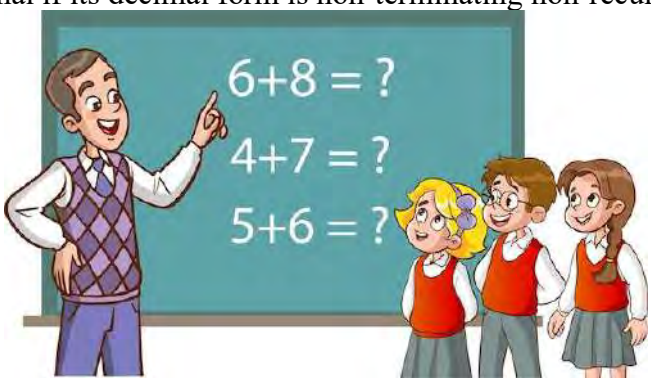
Hence, $m = 11$ and $n = 6$

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. Mr. Kumar, a Mathematics teacher explained some key points of unit 1 of class IX to his students. Some are given here.

- There are infinite rational numbers between any two rational numbers.
- Rationalisation of a denominator means to change the irrational denominator to rational form.
- A number is irrational if its decimal form is non-terminating non-recurring



On the basis of these key points, Answer the following questions

(a) What is the reciprocal of $2 + \sqrt{3}$?

(b) Find a rational number between $\sqrt{2}$ and $\sqrt{3}$

(c) Simplify $(\sqrt{3} - \sqrt{7})^3$

OR

(c) Express $\frac{4}{7}$ in decimal form and state the kind of decimal expansion.

Ans:

(a) Reciprocal of $2 + \sqrt{3}$ is $\frac{1}{2+\sqrt{3}}$

By Rationalisation,

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

(*b*) $\sqrt{2} = 1.414$ and $\sqrt{3} = 1.732$

Ans. = 1.5

(c) $(\sqrt{3}-\sqrt{7})^3 = = (\sqrt{3})^3 - (\sqrt{7})^3 - 3(\sqrt{3})^2\sqrt{7} + 3(\sqrt{3})(\sqrt{7})^2$

$= 3\sqrt{3} - 7\sqrt{7} - 9\sqrt{7} + 21\sqrt{3}$

$= 24\sqrt{3} - 16\sqrt{7}$

OR

(c) $\frac{4}{7} = 0.571428571428... = 0.\overline{571428}$

Therefore, the decimal expansion of the given rational number is non-terminating recurring (repeating).

20. In a restaurant at the time of payment, the owner says that you divide $x^3 - 3x^2 - x + 6$ by $x - 3$ and pay that money.

(a) If the owner returns the balance, then find the amount paid and the remaining balance.

(b) Verify whether the following are zeroes of the polynomial, indicated against them. $p(x) = x^3 - 3x^2 + 4x - 12$, $x = 3$

OR

(b) Find the value of each of the following polynomials at the indicated value of variable: $p(y) = 5y^2 - 3y + 7$ at $y = 1, -1$

Ans: (a) Let $p(x) = x^3 - 3x^2 - x + 6$

and $g(x) = x - 3$

If $(x - 3)$ is factor $p(x)$, then $p(3)$ must be zero, otherwise not. So,

$p(3) = 3^3 - 3 \cdot (3)^2 - 3 + 6 = 27 - 27 - 3 + 6 = 3 \neq 0$

Therefore, if the amount paid is $x^3 - 3x^2 - x + 6$, then owner must return ₹ 3 to the payee.

(b) $p(x) = x^3 - 3x^2 + 4x - 12$

$\therefore\ p(3) = 3^3 - 3(3)^2 + 4(3) - 12 = 27 - 27 + 12 - 12 = 0$

So, $x = 3$ is a zero of the polynomial $p(x) = x^3 - 3x^2 + 4x - 12$

OR

(b) $p(y) = 5y^2 - 3y + 7$

$\therefore$ At $y = 1$, $p(1) = 5(1)^2 - 3(1) + 7 = 5 - 3 + 7 = 9$

and at $y = -1$, $p(-1) = 5(-1)^2 - 3(-1) + 7 = 5 + 3 + 7 = 15$