MATHEMATICS
WORKSHEET_150323
CHAPTER 01 NUMBER SYSTEM
(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. On simplifying $(\sqrt{3}-\sqrt{7})^2$, we get
(a) $2-\sqrt{21}$ (b) $5-\sqrt{21}$ (c) $2(5-\sqrt{21})$ (d) $10-\sqrt{21}$
Ans: (c) $2(5-\sqrt{21})$
$(\sqrt{3}-\sqrt{7})^2 = (\sqrt{3})^2 + (\sqrt{7})^2 - 2\times\sqrt{3}\times\sqrt{7}$
$= 3+7-2\sqrt{21} = 10-2\sqrt{21} = 2(5-\sqrt{21})$

2. The value of $\dfrac{\sqrt{32}+\sqrt{48}}{\sqrt{8}+\sqrt{12}}$ 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).

3. 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).

4. On dividing $6\sqrt{27}$ by $2\sqrt{3}$, we get
(a) $3\sqrt{9}$ (b) 6 (c) 9 (d) none of these
Ans: (c) 9
$$\frac{6\sqrt{27}}{2\sqrt{3}} = \frac{3\times 3\sqrt{3}}{\sqrt{3}} = 9$$

5. The value of √10 times √15 is equal to

(a) $5\sqrt{6}$ (b) $\sqrt{25}$ (c) $10\sqrt{5}$ (d) $\sqrt{5}$

Ans: (a) $5\sqrt{6}$

$\sqrt{10}\times\sqrt{15} = (\sqrt{2}.\sqrt{5})\times(\sqrt{3}.\ \sqrt{5}) = (\sqrt{5}\times\sqrt{5})(\sqrt{2}\times\sqrt{3}) = 5\sqrt{6}$.

6. 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).**

7. $\left(-\frac{1}{27}\right)^{\frac{-2}{3}}$ 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

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

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

$\therefore$ **Correct option is (b).**

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

(a) $\frac{1}{9}$ (b) $\frac{1}{3}$ (c) 9 (d) $\frac{1}{81}$

Ans: (a) $\frac{1}{9}$

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

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): $2+\sqrt{3}$ is an irrational number.

Reason (R): Sum of a rational number and an irrational numbers is always an irrational number.

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. Find the value of x for which $\left(\frac{3}{4}\right)^6 \times \left(\frac{16}{9}\right)^5 = \left(\frac{4}{3}\right)^{x+2}$.

Ans:

Given $\left(\frac{3}{4}\right)^6 \times \left(\frac{16}{9}\right)^5 = \left(\frac{4}{3}\right)^{x+2}$

$\Rightarrow \left(\frac{4}{3}\right)^{-6} \times \left[\left(\frac{4}{3}\right)^2\right]^5 = \left(\frac{4}{3}\right)^{x+2}$

$\Rightarrow \left(\frac{4}{3}\right)^{-6} \times \left(\frac{4}{3}\right)^{10} = \left(\frac{4}{3}\right)^{x+2}$

$\Rightarrow \left(\frac{4}{3}\right)^{10-6} = \left(\frac{4}{3}\right)^{x+2}$

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

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. Simplify $\frac{6-4\sqrt{3}}{6+4\sqrt{3}}$ by rationalising the denominator.

Ans:

$$\frac{6-4\sqrt{3}}{6+4\sqrt{3}} = \left(\frac{6-4\sqrt{3}}{6+4\sqrt{3}}\right) \times \left(\frac{6-4\sqrt{3}}{6-4\sqrt{3}}\right) = \frac{(6-4\sqrt{3})^2}{(6)^2-(4\sqrt{3})^2}$$

$$= \frac{36-48\sqrt{3}+48}{36-48} \qquad [(a-b)^2 = a^2 - 2ab + b^2]$$

$$= \frac{84-48\sqrt{3}}{-12} = \frac{12(7-4\sqrt{3})}{-12} = 4\sqrt{3} - 7$$

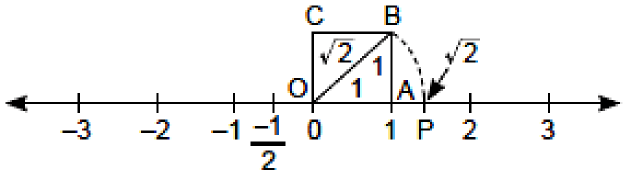
14. Represent $\sqrt{2}$ on the real number line.

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 = $\sqrt{2}$



SECTION – C

Questions 15 to 17 carry 3 marks each.

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

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 $\dfrac{\sqrt{3}-1}{\sqrt{3}+1}=a+b\sqrt{3}$

Ans:

$$\frac{\sqrt{3}-1}{\sqrt{3}+1}=\left(\frac{\sqrt{3}-1}{\sqrt{3}+1}\right)\times\left(\frac{\sqrt{3}-1}{\sqrt{3}-1}\right)$$

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

$$\Rightarrow 2-\sqrt{3}=a+b\sqrt{3}$$

Hence, on equating rational and irrational part both sides, we get $a = 2$, $b = -1$.

17. Simplify $\dfrac{4+\sqrt{5}}{4-\sqrt{5}}+\dfrac{4-\sqrt{5}}{4+\sqrt{5}}$ by using rationalizing the denominator

Ans:

$$\frac{4+\sqrt{5}}{4-\sqrt{5}}+\frac{4-\sqrt{5}}{4+\sqrt{5}}=\left(\frac{4+\sqrt{5}}{4-\sqrt{5}}\right)\times\left(\frac{4+\sqrt{5}}{4+\sqrt{5}}\right)+\left(\frac{4-\sqrt{5}}{4+\sqrt{5}}\right)\times\left(\frac{4-\sqrt{5}}{4-\sqrt{5}}\right)$$

(Rationalising both denominators)

$$=\frac{(4+\sqrt{5})^2}{(4)^2-(\sqrt{5})^2}+\frac{(4-\sqrt{5})^2}{(4)^2-(\sqrt{5})^2}=\frac{16+5+8\sqrt{5}}{16-5}+\frac{16+5-8\sqrt{5}}{16-5}$$

$$=\frac{1}{11}[21+8\sqrt{5}+21-8\sqrt{5}]=\frac{42}{11}$$

SECTION – D

Questions 18 carry 5 marks each.

18. Prove that $\dfrac{1}{3-\sqrt{8}}-\dfrac{1}{\sqrt{8}-\sqrt{7}}+\dfrac{1}{\sqrt{7}-\sqrt{6}}-\dfrac{1}{\sqrt{6}-\sqrt{5}}+\dfrac{1}{\sqrt{5}-2}=5.$

Ans:

$$\frac{1}{3-\sqrt{8}}-\frac{1}{\sqrt{8}-\sqrt{7}}+\frac{1}{\sqrt{7}-\sqrt{6}}-\frac{1}{\sqrt{6}-\sqrt{5}}+\frac{1}{\sqrt{5}-2}$$

$$=\left[\frac{1}{3-\sqrt{8}}\times\frac{3+\sqrt{8}}{3+\sqrt{8}}\right]-\left[\frac{1}{\sqrt{8}-\sqrt{7}}\times\frac{\sqrt{8}+\sqrt{7}}{\sqrt{8}+\sqrt{7}}\right]+\left[\frac{1}{\sqrt{7}-\sqrt{6}}\times\frac{\sqrt{7}+\sqrt{6}}{\sqrt{7}+\sqrt{6}}\right]$$

$$-\left[\frac{1}{\sqrt{6}-\sqrt{5}}\times\frac{\sqrt{6}+\sqrt{5}}{\sqrt{6}+\sqrt{5}}\right]+\left[\frac{1}{\sqrt{5}-2}\times\frac{\sqrt{5}+2}{\sqrt{5}+2}\right]$$

$$=\left[\frac{3+\sqrt{8}}{9-8}\right]-\left[\frac{\sqrt{8}+\sqrt{7}}{8-7}\right]+\left[\frac{\sqrt{7}+\sqrt{6}}{7-6}\right]-\left[\frac{\sqrt{6}+\sqrt{5}}{6-5}\right]+\left[\frac{\sqrt{5}+2}{5-4}\right]$$

$$=[3+\sqrt{8}]-[\sqrt{8}+\sqrt{7}]+[\sqrt{7}+\sqrt{6}]-[\sqrt{6}+\sqrt{5}]+[\sqrt{5}+2]$$

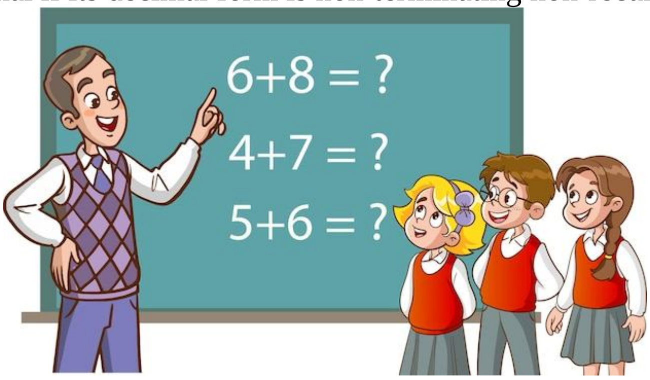
$$=3+\sqrt{8}-\sqrt{8}-\sqrt{7}+\sqrt{7}+\sqrt{6}-\sqrt{6}-\sqrt{5}+\sqrt{5}+2=5$$

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 January 2021, the vaccination drive for COVID -19 started in 7 states of a country. More than 60% of the people were vaccinated in 4 states out of 7 states, In one of the state vaccination drive has not been started due to flood although vaccine dose was supplied to that state in advance. In February 2021, 4 more states were included in this drive and 2 states have got remarkable response from the people and more than 80% of the population got vaccinated there. Using this information answer the following questions:

(a) In January 2021, more than 60% of people were vaccinated in 4 states out of 7 states. Find the decimal representation of $\frac{4}{7}$ (2)

(b) In 2 states out of 11 states, more than 80% of people participated in vaccination drive in two months. Find the decimal form of $\frac{2}{11}$ (2)

OR

(b) The fraction for state where vaccination not started in January 2021 is $\frac{1}{7}$ and its decimal form is $0.\overline{142857}$. Find the decimal form of $\frac{6}{7}$. (2)

Ans:

(a) Dividing 4 by 7 as:

$$
\begin{array}{l}
7\overline{)4.0000000}(0.571428 \\
\underline{-35} \\
\quad 50 \\
\underline{-49} \\
\quad 10 \\
\underline{-7} \\
\quad 30 \\
\underline{-28} \\
\quad 20 \\
\underline{-14} \\
\quad 60 \\
\underline{-56} \\
\quad 40
\end{array}
$$

Ans. $= 0.\overline{571428}$

(b) Decimal form of

$\frac{2}{11} = 0.181818 = 0.\overline{18}$

$$
\begin{array}{l}
11\overline{)2.0000000}(0.181818 \\
\underline{-11} \\
\quad 90 \\
\underline{-88} \\
\quad 20 \\
\underline{-11} \\
\quad 90 \\
\underline{-88} \\
\quad 20 \\
\underline{-11} \\
\quad 90 \\
\underline{-88} \\
\quad 20
\end{array}
$$

OR

If $\frac{1}{7}$ is $0.\overline{142857}$

then $\frac{6}{7}$ is

$6 \times \frac{1}{7} = 0.\overline{857142}$