Exercise 2.1

Q1. Identify which of the following are rational and irrational numbers.

(1) $\sqrt{3}$ **(2)** $\frac{1}{5}$ **(3)** π **(4)** $\frac{25}{2}$ **(5) 7.25** **(6)** $\sqrt{79}$

Solution:

Rational Numbers

All numbers of the form $\frac{p}{q}$ (where p, q are integers and q is not zero) are called rational numbers. The set of rational numbers is denoted by Q.

i.e., $Q^{+} = \left\{ \frac{p}{q} = \frac{p}{q} \in Z, q \neq Z, q \neq 0 \right\}$

Irrational Numbers

The numbers which cannot be expressed as quotient of integers are called irrational number

The set of irrational numbers is denoted by Q'

i.e., $Q' = \left\{ \frac{p}{q} \neq \frac{p}{q}, p \in Z, q \neq 0 \right\}$

For example, the numbers $\sqrt{2}, \sqrt{5}, \sqrt{3}$ are all irrational numbers. The union of the set of rational numbers and irrational numbers is known as the set of real numbers. It is denoted by R.

i.e., $R = Q \cup Q'$

here Q and Q' are both subset of R and $Q \cap Q' = \phi$

Rational Number	**2,4,5**
Irrational Numbers	**1,3,6**

Q2. Convert the following fraction into decimal fraction.

(1) $\frac{17}{25}$

Solution:

$$\begin{array}{r|l} & \underline{0.68} \\ 25 & 170 \\ & \underline{150} \\ & 200 \\ & \underline{200} \\ & 0 \end{array}$$

So. $\frac{17}{25} = 0.68$ **Answer**

(2) $\frac{19}{4}$

Solution:

$$\begin{array}{r|l} & \underline{4.75} \\ 4 & 19 \\ & \underline{16} \\ & 30 \\ & \underline{28} \\ & 20 \\ & \underline{20} \\ & 0 \end{array}$$

So. $\frac{19}{4} = 4.75$ **Answer**

(3) $\frac{57}{8}$

Solution:

$$\begin{array}{r|l} & \underline{7.125} \\ 8 & 57 \\ & \underline{56} \\ & 10 \\ & \underline{08} \\ & 20 \\ & \underline{16} \\ & 40 \\ & \underline{40} \\ & 0 \end{array}$$

So. $\frac{57}{8} = 7.125$ **Answer**

(4) $\frac{260}{18}$

Solution:

$$\begin{array}{r|l} & \underline{11.3889} \\ 18 & 205 \\ & \underline{198} \\ & 70 \\ & \underline{54} \\ & 160 \\ & \underline{144} \\ & 160 \\ & \underline{144} \\ & 160 \end{array}$$

So. $\frac{260}{18} = 11.3889$ **Answer**

(5) $\frac{5}{8}$

Solution:

$$\begin{array}{r|l} & \underline{0.625} \\ 8 & 50 \\ & \underline{48} \\ & 20 \\ & \underline{16} \\ & 40 \\ & \underline{40} \\ & 0 \end{array}$$

So. $\frac{5}{8} = 0.625$ **Answer**

(6) $\frac{23}{38}$

Solution:

$$\begin{array}{r|l} & \underline{0.61789} \\ 38 & 230 \\ & \underline{228} \\ & 220 \\ & \underline{190} \\ & 300 \\ & \underline{304} \\ & 340 \\ & \underline{304} \\ & 360 \\ & \underline{342} \\ & 18 \end{array}$$

So. $\frac{23}{38} = 0.61789$

Q3. Which of the following statements are true and which are false?

(i) $\frac{1}{5}$ **is an irrational number.**

(ii) π **is an irrational number.**

(iii) $\frac{5}{8}$ **is a terminating fraction.**

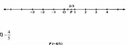
(iv) $\frac{1}{3}$ **is a terminating fraction.**

(v) $\frac{1}{3}$ **is recurring fraction.**

Solution:
(i) False (ii) True (iii) False (iv) True (v) False

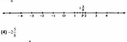
Q4. Represent the following numbers on the number line.

(1) $\frac{3}{5}$



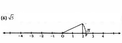
(2) $-\frac{4}{5}$

(3) $\frac{1}{4}$

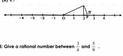


(4) $-\frac{7}{2}$

(5) $\frac{9}{2}$



(6) $\sqrt{5}$



Q5. Give a rational number between $\frac{3}{4}$ **and** $\frac{5}{6}$ **.**

Solution:

Sum of numbers $= \frac{3}{4}$ and $\frac{5}{6}$ $\Rightarrow \frac{3}{4} + \frac{5}{6} = \frac{3(9) + 5(6)}{4(9) + 6(4)} = \frac{27 + 20}{36} = \frac{47}{36}$

If we divide the above number by 2, it will be the number between $\frac{3}{4}$ and $\frac{5}{6}$

$= \left(\frac{\frac{47}{36}}{2} \right) = \frac{\frac{47}{36}}{2} = \frac{47}{72}$ **Answer**

Q6. Express the following recurring decimals as the rational number $\frac{p}{q}$ **where p, q are integers and** $q \neq 0$

(1) $0.\overline{5}$ **(2)** $0.\overline{13}$ **(3)** $0.\overline{67}$

Solution:
(1) $0.\overline{5}$

Let $x = 0.\overline{5}$

Or $x = 0.5555.....$ ..... (1)

Since we have only one digit i.e., 5 repeating indefinitely therefore multiplying both sides by 10

$10x = 5.555.....$ ..... (2)

Subtracting (1) from (2), we get

$10x - x = (5.555.....) - (0.555.....)$

$9x = 5.00000$

Hence $x = \frac{5}{9}$

(2) $0.\overline{13}$

Let $x = 0.\overline{13}$

Or $x = 0.13131313131313.....$ ..... (1)

Since we have only two digits i.e., 13 repeating indefinitely therefore multiplying both sides by 100

$100x = 13.13131313131313.....$ ..... (2)

Subtracting (1) from (2), we get

$100x - x = (13.1313.....) - (0.1313.....)$

$99x = 13.00000$

Hence $x = \frac{13}{99}$

(3) $0.\overline{67}$

Let $x = 0.\overline{67}$

$x = 0.6767676767.....$ ..... (1)

Since we have only two digits i.e., 67 repeating indefinitely therefore multiplying both sides by 100

$100x = 67.6767676767.....$ ..... (2)

Subtracting (1) from (2), we get

$100x - x = (67.6767676767.....) - (0.6767676767.....)$

$99x = 67.00000$

Hence $x = \frac{67}{99}$

Exercise 2.2

Q1. identify the property used in the following

i. $a+b=b+a$

ii. $a(bc)-(ab)c$

iii. $7\times 1=7$

iv. $x>y, x=y, x<y$

v. $ab=ba$

vi. $a+c=b+c \Rightarrow a=b$

vii. $5+(-5)=0$

viii. $7\times\frac{1}{7}=1$

ix. $a>b \Rightarrow ac>bc \quad (c>0)$

Solution:

i. Commutative property w.r t. addition
ii. Associative property w.r.t multiplication
iii. Multiplicative identity
iv. Trichotomy property
v. Commutative property w.r.t. multiplication
vi. Cancellation property
vii. Additive inverse
viii. Multiplicative inverse
ix. Multiplicative property

Q2. Fill in the following blanks by stating the properties of real numbers used.

3x+ 3(y-x)

= 3x + 3y - 3x, ...

= 3x - 3x + 3y, ...

= 0 + 3y, ...

= 3y, ...

Solution:

3x + 3(y-x)

Step 1:

= 3x + 3y -3x Distributive property w.r.t. multiplication

Step 2:

=3x - 3x +3y, Commutative property

Step 3:

= 0+ 3y, Additive Inverse

Step 4:

= 3y, Additive identity

Q3. Give the name of property used in the following.

1. $\sqrt{24}+0=\sqrt{24}$
2. $-\frac{2}{3}\left(5+\frac{7}{2}\right)=\left(-\frac{2}{3}\right)(5)+\left(-\frac{2}{3}\right)\left(\frac{7}{2}\right)$
3. $\pi+(-\pi)=0$
4. $\sqrt{3}.\sqrt{3}$ **is a real number**
5. $\left(-\frac{5}{8}\right)\left(-\frac{8}{5}\right)=1$

Solution:

1. Additive identity
2. Distributive property w.r.t. multiplication
3. Additive inverse
4. Closure property
5. Multiplication inverse

Exercise 2.3

Q1. Write each radical expression in exponential notation and each exponential expression in notation and each exponential expression in radical notation. Do not simplify.

Solution:

(1) $\sqrt{64} = 64^{\frac{1}{2}}$

(2) $2^{\frac{3}{5}} = (2^3)^{\frac{1}{5}} = \sqrt[5]{2^3}$

(3) $-7^{\frac{1}{3}} = \sqrt[3]{-7} = -\sqrt[3]{7}$

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

Q2. Tell whether the following statements are true or false?

(1) $5^{\frac{1}{2}} = \sqrt{5}$

(2) $2^{\frac{2}{3}} = \sqrt[3]{4}$

(3) $\sqrt{49} = \sqrt{7}$

(4) $\sqrt[3]{x^{27}} = x^3$

Solution:
(1) False
(2) True
(3) False
(4) False

Q3. Simplify the following radical expression.

(1) $\sqrt[3]{-125}$

Solution:

$= \sqrt[3]{-125}$

$= \sqrt[3]{(-5)^3}$

$= (-5)^{3\times\frac{1}{3}}$

$= -5$

(2) $\sqrt[4]{32}$

Solution:

$= \sqrt[4]{2^5}$

$= \sqrt[4]{2.2^4}$

$= \sqrt[4]{2}.\sqrt[4]{2^4}$

$= \sqrt[4]{2}.2^{4\times\frac{1}{4}}$

$= \sqrt[4]{2}.2$

$= 2\sqrt[4]{2}$

(3) $\sqrt[5]{\frac{3}{32}}$

Solution:

$= \sqrt[5]{\frac{3}{32}}$

$= \frac{\sqrt[5]{3}}{\sqrt[5]{32}}$

$= \frac{\sqrt[5]{3}}{\sqrt[5]{2^5}}$

$= \frac{\sqrt[5]{3}}{2^{5\times\frac{1}{5}}}$

$= \frac{\sqrt[5]{3}}{2}$

(4) $\sqrt[3]{-\frac{8}{27}}$

Solution:

$= \sqrt[3]{-\frac{8}{27}}$

$= \sqrt[3]{\left(-\frac{2}{3}\right)^3}$

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

$= -\frac{2}{3}$

Exercise 2.4

Q1. Use laws of exponents to simplify:

(1) $\dfrac{(243)^{\frac{3}{5}}(32)^{\frac{-2}{5}}}{\sqrt{(196)^{-3}}}$

Solution:

$$=\frac{(243)^{\frac{3}{5}}(32)^{\frac{-2}{5}}}{(196)^{\frac{-3}{2}}}$$

$$=\left(\frac{1}{243}\right)^{\frac{3}{5}}\times\left(\frac{1}{32}\right)^{\frac{2}{5}}\times(196)^{\frac{3}{2}}$$

$$=\left(\frac{1}{3^5}\right)^{\frac{3}{5}}\times\left(\frac{1}{2^5}\right)^{\frac{2}{5}}\times(4\times 49)^{\frac{3}{2}}$$

$$=\frac{1}{3^3}\times\frac{1}{2^2}\times(2^2)^{\frac{3}{2}}\times(7^2)^{\frac{3}{2}}$$

$$=\frac{1}{3^3\times 3^1}\times\frac{1}{2}\times 2\times 7$$

$$=\frac{1}{3^3\times 3^1}\times\frac{2}{2}\times 7$$

$$=\frac{7}{3^4\times\sqrt{3}}$$

$$=\frac{7}{27(\sqrt{3})}$$

(2) $(2x^2y^{-4}(-8x^{-3}y^2)$

Solution:

$$=2\times(-8)\times x^2.x^{-3}.y^{-4}.y^2$$

$$=-16\times x^{2-3}\times y^{-4+2}$$

$$=-16x^2y^{-2}$$

$$=\frac{-16x^2}{y^2}$$

(3) $\left(\dfrac{x^{-2}y^{-2}z^{-4}}{x^4y^{-2}z^{-2}}\right)^{-9}$

Solution:

$$=\left(\frac{x^4y^{-2}z^4}{x^{-2}y^{-2}z^{-2}}\right)^9$$

$$=\left(\frac{x^{4-(-2)}z^{4+2}}{y^{-2+2}}\right)^9$$

$$=\left(\frac{x^6z^6}{y^0}\right)^9$$

$$=\frac{x^{6\times 9}z^{6\times 9}}{y^{0\times 9}}$$

$$=\frac{x^{54}z^{54}}{y^0}$$

(4) $\dfrac{(81)^n.3^1-(3)^{n-1}.(243)}{(9^{n-1})(3^3)}$

Solution:

$$=\frac{(3^4)^n.3^1-(3)^{n-1}.3^5}{(3^2)^{n-1}(3^3)}$$

$$=\frac{3^{4n}.3^1-3^{n-1}.3^5}{3^{2n-2}.3^3}$$

$$=\frac{3^{4n}.3^1-3^{n-1+5}}{3^{2n-2}.3^3}$$

$$=\frac{3^{4n}.3^1-3^{n-4}}{3^{2n-2}.3^3}$$

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

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

$$=(3)\times(2)$$

$$=6$$

Q2: Show that $\left(\dfrac{x^a}{x^b}\right)^{a+b}\times\left(\dfrac{x^b}{x^c}\right)^{b+c}\times\left(\dfrac{x^c}{x^a}\right)^{c+a}=1$

Solution:

$$=\left(\frac{x^a}{x^b}\right)^{a+b}\times\left(\frac{x^b}{x^c}\right)^{b+c}\times\left(\frac{x^c}{x^a}\right)^{c+a}$$

$$=(x^{a-b})^{a+b}\times(x^{b-c})^{b+c}\times(x^{c-a})^{c+a}$$

$$=x^{a^2-b^2}\times x^{b^2-c^2}\times x^{c^2-a^2}$$

$$=x^{a^2-b^2+b^2-c^2+c^2-a^2}$$

$$=x^0$$

$$=1$$

Q3: Simplify.

(1) $\dfrac{2^{\frac{1}{2}}\times(27)^{\frac{1}{2}}\times 60^{\frac{1}{2}}}{(180)^{\frac{1}{2}}\times 4^{\frac{1}{2}}\times 9^{\frac{1}{2}}}$

Solution:

$$=\frac{2^{\frac{1}{2}}\times(3^3)^{\frac{1}{2}}\times(3\times 5\times 2^2)^{\frac{1}{2}}}{(2\times 2\times 3\times 3\times 5)^{\frac{1}{2}}\times(2^2)^{\frac{1}{2}}\times(3^2)^{\frac{1}{2}}}$$

$$=\frac{2^{\frac{1}{2}}\times 3^{\frac{3}{2}}\times(3^{\frac{1}{2}}\times 5^{\frac{1}{2}}\times 2^{\frac{2}{2}})}{(2^2\times 3^2\times 5)^{\frac{1}{2}}\times 2^{\frac{2}{2}}\times 3^{\frac{2}{2}}}$$

$$=\frac{}{(2^{\frac{2}{2}}\times 3^{\frac{2}{2}}\times 5^{\frac{1}{2}})\times 2^{\frac{2}{2}}\times 3^{\frac{2}{2}}}$$

$$=\frac{2^{\frac{1}{2}}\times 3^{\frac{3}{2}}\times 5^{\frac{1}{2}}\times 3\times 2}{(2\times 3\times 5^{\frac{1}{2}})\times 2^{\frac{2}{2}}\times 3^{\frac{2}{2}}}$$

$$=\frac{2^{\frac{1-2}{2}}\times 3^{\frac{3}{2}}\times 5^{\frac{1}{2}}\times 3\times 2}{5^{\frac{1}{2}}\times 3^{\frac{2}{2}}\times 2\times 3}$$

$$=2^1$$

$$=2$$

(2) $\sqrt{\dfrac{216^{\frac{1}{2}}\times 25^{\frac{1}{2}}}{(0.04)^{\frac{1}{2}}}}$

Solution:

$$=\sqrt{\frac{(2\times 2\times 2\times 3\times 3)^{\frac{1}{2}}\times(5^2)^{\frac{1}{2}}}{\left(\frac{4}{100}\right)^{\frac{1}{2}}}}$$

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

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

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

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

$$=2\times 3$$

$$=6$$

(3) $5^3\div(5^2)^3$

Solution:

$$=5^3\div 5^6$$

$$=5^{3-6}$$

$$=5^3$$

$$=25$$

(4) $=(x^3)^2\div x^{-2}$, where $x\neq 0$

Solution:

$$=x^{3\times 2}\div x^{-2}$$

$$=x^6\div x^{-2}$$

$$=x^{6-(-2)}$$

$$=x^{-5}$$

$$=\frac{1}{x^5}$$

Exercise 2.5

Q1. Evaluate.

(1) i^7

Solution:

$= i^6 \times i$

$= (i^2)^3 \times i$

$= (-1)^3 \times i$

$= (-1) \times -i$

$= -i$

(2) i^{50}

Solution:

$= (i^2)^{25}$

$= (-1)^{25}$

$= -1$

(3) i^{12}

Solution:

$= (i^2)^6$

$= (-1)^6$

$= 1$

(4) $(-i)^8$

Solution:

$= i^8$

$= (i^2)^4$

$= (-1)^4$

$= 1$

(5) $(-i)^5$

Solution:

$= -i^4 \times i$

$= -(i^2)^2 \times i$

$= -(-1)^2 \times i$

$= -i$

(6) i^{27}

Solution:

$= i^{26} \times i$

$= (i^2)^{13} \times i$

$= (-1)^{13} \times i$

$= (-1) \times i$

$= -i$

Q2. Write the conjugate of the following numbers.

(1) $2+3i$

Solution:

$z = 2+3i$

$\bar{z} = 2-3i$

(2) $3-5i$

Solution:

$z = 3-5i$

$\bar{z} = 3+5i$

(3) $-i$

Solution:

$z = -i$

$\bar{z} = i$

(4) $-3+4i$

Solution:

$z = -3+4i$

$\bar{z} = -3-4i$

(5) $-4-i$

Solution:

$z = -4-i$

$\bar{z} = -4+i$

(6) $i-3$

Solution:

$z = i-3$

$\bar{z} = -i-3$

Q3: Write the real and imaginary parts of the following number.

Solution:

(1) $1+i$ → $\mathrm{Re}(z) = 1$ $\mathrm{Im}(z) = 1$

(2) $-1+2i$ → $\mathrm{Re}(z) = -1$ $\mathrm{Im}(z) = 2$

(3) $-3i+2$ → $\mathrm{Re}(z) = 2$ $\mathrm{Im}(z) = -3$

(4) $-2-2i$ → $\mathrm{Re}(z) = -2$ $\mathrm{Im}(z) = -2$

(5) $-3i$ → $\mathrm{Re}(z) = 0$ $\mathrm{Im}(z) = -3$

(6) $2+0i$ → $\mathrm{Re}(z) = 2$ $\mathrm{Im}(z) = 0$

Q4. Find the value of x and y if $x+iy+1 = 4-3i$ **.**

Solution:

$x+iy+1 = 4-3i$

$(x+1)+iy = 4-3i$

By comparing real and imaginary part we get

x+1=4 and y=-3

x=4-1 and y=-3

x=3 and y=-3

Exercise 2.6

Q1 Identify the following statements as true or false.

(a) $\sqrt{(x^2)} = x$

(b) $\sqrt{(x^2)} = |x|$

(c) $\sqrt{x} = x$

(d) Conjugate complex of z is z^2 for z is z is real.

(e) Conjugate complex of z is z if z is real. Conjugate complex is real number

(f) $|z_1 + z_2| = |z_1| + |z_2|$. Then z_1 and z_2 are real

(g) Product of a complex number and its conjugate is always a non-negative real number

Solution

(a) False

(b) True

(c) False

(d) False

(e) True

(f) False

(g) True

Q2 Express each complex number in the standard form $a+ib$, where a and b are real numbers.

Solution

$(5)(3i) + (7)(-4i)$

$= 15i + (-28i)$

$= 15i - 28i$

(a)

$(2 + 3i)^2 + (2^2 + 3i^2)$

$= (2 + 3i)(2 + 3i) + (4 + 3i^2)$

$= (2 \times 2 + 2 \times 3i + 3i \times 2 + 3i \times 3i) + (4 + 3i^2)$

$= (4 + 6i + 6i + 9i^2) + (4 + 3i^2)$

$= (4 + 12i + 9i^2) + (4 + 3i^2)$

$= (4 + 12i + 9(-1)) + (4 + 3(-1))$

$= (4 + 12i - 9) + (4 - 3)$

$= (-5 + 12i) + (1)$

$= -5 + 12i + 1$

$= -4 + 12i$

Q3 Simplify and write your answer in the form $a+ib$.

$(3 + i)(4 + 5i)$

Solution

$= (3 \times 4) + (3 \times 5i) + (i \times 4) + (i \times 5i)$

$= 12 + 15i + 4i + 5i^2$

$= 12 + 19i + 5i^2$

$= 12 + 19i + 5$

$= 17 + 19i$

$(2 + i)^3$

Solution

$(2 + i)^3 = (2 + i)(2 + i)^2$

$= (2 + i)(2^2 + i^2 + 2i)$

$= (2 + i)(4 + 1 + 4i)$

$= (2 + i)(5 + 4i)$

$= (2 \times 5) + (2 \times 4i) + (i \times 5) + (i \times 4i)$

$= 10 + 8i + 5i + 4i^2$

$= 10 + 13i + 4i^2$

$= 10 + 13i + 4(-1)$

$= 10 + 13i - 4$

$= 6 + 13i$

$\frac{1}{i}$

Solution

$\frac{1}{i} \times \frac{i}{i}$

$= \frac{1 \times i}{i \times i}$

$= \frac{i}{i^2}$

$= \frac{i}{-1}$

$= -i$

$\frac{1}{2+i}$

Solution

$\frac{1}{2+i} \times \frac{2-i}{2-i}$

$= \frac{1 \times (2-i)}{(2+i)(2-i)}$

$= \frac{2-i}{(2 \times 2) + (2 \times -i) + (i \times 2) + (i \times -i)}$

$= \frac{2-i}{4 - 2i + 2i - i^2}$

$= \frac{2-i}{4 - i^2}$

$= \frac{2-i}{4 - (-1)}$

$= \frac{2-i}{4+1}$

$= \frac{2-i}{5}$

$\frac{1}{1+i+i^2}$

Solution

$\frac{1}{1+i+i^2} \times \frac{1-i-i^2}{1-i-i^2}$

$= \frac{1 \times (1-i-i^2)}{(1+i+i^2)(1-i-i^2)}$

$= \frac{1-i-i^2}{(1 \times 1) + (1 \times -i) + (1 \times -i^2) + (i \times 1) + (i \times -i) + (i \times -i^2) + (i^2 \times 1) + (i^2 \times -i) + (i^2 \times -i^2)}$

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

Review Exercise

Q1. Multiple Choice Questions. Choose the correct answer.

(i) $\left(27x^{-3}\right)^{\frac{1}{3}}$ .....

(a) $\frac{3x^2}{1}$ **(b)** $\frac{3x^3}{1}$

(c) $\frac{3x^2}{3}$ **(d)** $\frac{3x^3}{3}$

(ii) Write $\sqrt[5]{x}$ in exponential form.....

(a) x **(b)** x^5

(c) $x^{\frac{1}{5}}$ **(d)** $x^{\frac{1}{2}}$

(iii) Write $x^{\frac{1}{3}}$ with radical signs.....

(a) $\sqrt[3]{x}$ **(b)** $\sqrt[4]{x}$

(c) $\sqrt[5]{x}$ **(d)** $\sqrt[6]{x}$

(iv) In $\sqrt[3]{27}$ the radicand is.....

(a) 1 **(b)** $\frac{1}{3}$

(c) 27 **(d)** none of these

(v) $\left(\frac{27}{64}\right)^{-\frac{2}{3}}$ = ...

(a) $\frac{9}{16}$ **(b)** $\frac{4}{9}$

(c) $\frac{9}{4}$ **(d)** $-\frac{4}{9}$

(vi) The conjugate of $7-4i$ is.....

(a) $-7+4i$ **(b)** $-7-4i$

(c) $7+4i$ **(d)** $7-4i$

(vii) The value of i^7 is.....

(a) 1 **(b)** -1

(c) i **(d)** 0

(viii) Every real number is.....

(b) a positive integer **(b)** a rational number

(c) a negative number **(d)** a complex number

(ix) Real part of $3ab(i+i^2)a$ .....

(a) $3ab$ **(b)** $(-3ab)$

(c) $3ab\,i$ **(d)** $-3ab\,i$

(x) **Imaginary part of** $-i(3i-2)$ **is** .....

(a) 2 **(b)** 3

(c) 3 **(d)** -3

(xi) **Which of the following sets have the colure property w.r.t addition.....**

(a){1} **(b)** {0, -1}

(c) {0, 1} **(d)** $\left\{\sqrt{2}, \frac{1}{\sqrt{2}}\right\}$

(xii) **Name the property of real number used in** $\left(-\frac{3}{5}\right)\times 1=-\frac{3}{5}$ .....

(a)additive identity **(b)** additive inverse

(c) multiplicative identity **(d)** multiplicative inverse

(xiii) If $a, b, c \in R$, $c \neq 0$ then $a \neq b \Rightarrow ac \neq bc$ .....

(a) $ac > bc$ **(b)** $ac \geq bc$

(c) $ac < bc$ **(d)** none of these

(xiv) **If** $a, b \in R$, **then only one of** $a = b$ **or** $a > b$ **or** $a < b$ **holds is called.....**

(a) trichotomy property **(b)** transitive property

(c) additive property **(d)** multiplicative property

(xv) **A non- terminating, non- recurring decimal represents:**

(a) a natural number **(b)** a rational number

(c) an irrational number **(d)** a prime number

ANSWERS:

i. B	ii. C	iii. A	iv. A	v. B	vi. A
vii. d	viii. a	ix. b	x. d	xi. b	xii. d
xiii. b	xiv. a	xv. c			

Q2. True or false? Identify.

i. Division is not an associative operation.
ii. Every whole number is a natural number.
iii. Multiplicative inverse of $\frac{2}{3}$ is $\frac{3}{2}$
iv. π is a rational number.
v. Every integer is a rational number
vi. Subtraction is a commutative property.
vii. Every real number is a irrational number.
viii. Decimal representation of a rational number is either terminating or recurring.
ix. $1.\overline{5} = 1 + \frac{5}{9}$

Answers:

(i) True **(ii)** False **(iii)** True **(iv)** False **(v)** True
(vi) False **(vii)** False **(viii)** True **(ix)** True

Q3. Simplify the followings.

(i) $\sqrt[3]{8a^{-3}b^{-6}}$ **(ii)** $\sqrt[3]{216a^{-6}b^{-9}}$

(iii) $\left(\frac{x^{\frac{1}{2}}y^{-\frac{1}{3}}}{x^{-\frac{1}{3}}y^{\frac{1}{2}}}\right)^{-1}$ **(iv)** $\left(\frac{125x^{-3}y^{-3}}{512x^{-9}y^{-6}}\right)^{\frac{1}{3}}$

(i) $\sqrt[3]{8a^{-3}b^{-6}}$

Solution:

$$=(8)^{\frac{1}{3}}a^{-3\frac{1}{3}}b^{-6\frac{1}{3}}$$
$$=(2^3)^{\frac{1}{3}}a^{-\frac{3}{3}}b^{-\frac{6}{3}}$$
$$=2^{3\times\frac{1}{3}}a^{-1}b^{-2}$$
$$=2a^{-1}b^{-2}$$
$$=\frac{2}{a^1b^2}$$

(ii) $\sqrt[3]{216a^{-6}b^{-9}}$

Solution:

$$=\left(216a^{-6}b^{-9}\right)^{\frac{1}{3}}$$
$$=\left(6^3(a)^{-6}b^{-9}\right)^{\frac{1}{3}}$$
$$=6^{3\times\frac{1}{3}}a^{-6\times\frac{1}{3}}b^{-9\times\frac{1}{3}}$$
$$=6a^{-2}b^{-3}$$
$$=\frac{6}{a^2b^3}$$

(iii) $\left(\frac{x^{\frac{1}{2}}y^{-\frac{1}{3}}}{x^{-\frac{1}{3}}y^{\frac{1}{2}}}\right)^{-1}$

Solution:

$$=\left(\frac{x^{\frac{1}{2}}y^{-\frac{1}{3}}}{x^{-\frac{1}{3}}y^{\frac{1}{2}}}\right)^{-1}$$
$$=\left(\frac{x^{\frac{1}{2}}y^{-\frac{1}{3}}}{x^{-\frac{1}{3}}y^{\frac{1}{2}}}\right)^{-1}$$
$$=\frac{x^{\frac{1}{2}}y^{-\frac{1}{3}}}{x^{-\frac{1}{3}}y^{-\frac{1}{2}}}$$
$$=\frac{x^{\frac{1}{2}}y^{-\frac{1}{3}}}{x^{-\frac{1}{3}}y^{-\frac{1}{2}}}$$
$$=\frac{x^{\frac{1}{2}}y^{-\frac{1}{3}}}{x^{-\frac{1}{3}}y^{-\frac{1}{2}}}$$

(iv) $\left(\frac{125x^{-3}y^{-3}}{512x^{-9}y^{-6}}\right)^{\frac{1}{3}}$

Solution:

$$=\left(\frac{5^3x^{-3}y^{-3}}{8^3x^{-9}y^{-6}}\right)^{\frac{1}{3}}$$
$$=\left(\frac{5^3x^{-3}y^{-3}}{8^3x^{-9}y^{-6}}\right)^{\frac{1}{3}}$$
$$=\frac{5^{3\times\frac{1}{3}}x^{-3\times\frac{1}{3}}y^{-3\times\frac{1}{3}}}{8^{3\times\frac{1}{3}}x^{-9\times\frac{1}{3}}y^{-6\times\frac{1}{3}}}$$
$$=\frac{5^1x^{-1}y^{-1}}{8^1x^{-3}y^{-2}}$$
$$=\frac{5^1x^{-1}y^{-1}}{8^1x^{-3}y^{-2}}$$

$$=(x^{-1})^{-1}x^{-(-3)}$$
$$=(y^{-1})^{-1}y^{-(-2)}$$
$$=x^{-1\times-1}x^{-(-3)}$$
$$=x^{1}$$

(v) $\left(\frac{16\times(x^2)^3}{625(x^3)^2}\right)^{\frac{1}{4}}$

Solution:

$$=\left(\frac{2^4\times(x^2)^3}{5^4(x^3)^2}\right)^{\frac{1}{4}}$$
$$=\left(\frac{2^4\times(x^2)^3}{5^4(x^3)^2}\right)^{\frac{1}{4}}$$
$$=\left(\frac{2^4\times x^{2\times3}}{5^4\times x^{3\times2}}\right)^{\frac{1}{4}}$$
$$=\left(\frac{2^4\times x^{6}}{5^4\times x^{6}}\right)^{\frac{1}{4}}$$
$$=\left(\frac{2^4\times x^{6}}{5^4\times x^{6}}\right)^{\frac{1}{4}}$$
$$=\left(\frac{2^4}{5^4}\right)^{\frac{1}{4}}$$
$$=\left(\frac{2^4}{5^4}\right)^{\frac{1}{4}}$$
$$=\frac{2^{4\times\frac{1}{4}}}{5^{4\times\frac{1}{4}}}$$
$$=\frac{2^1}{5^1}$$
$$=\frac{2\times1}{5\times1}$$
$$=\frac{2}{5}$$

Q4. Simplify: $\sqrt[3]{\frac{1024+1296}{20.48}}$

Solution:

$$=\sqrt[3]{\frac{2^{10}+3^{4}}{\left(\frac{2}{100}\right)}}$$
$$=\sqrt[3]{\frac{2^{10}+3^{4}}{\left(\frac{2}{100}\right)}}$$
$$=\sqrt[3]{2^{10}+\left(\frac{2}{100}\right)}$$
$$=\sqrt[3]{2^{10}+\left(\frac{1}{50}\right)}$$
$$=\sqrt[3]{2^{10}+\left(\frac{1}{50}\right)}$$
$$=\sqrt[3]{2^{10}+\frac{1}{50}}$$
$$=\sqrt[3]{2^{10}+\frac{1}{50}}$$
$$=\sqrt[3]{\frac{2^{10}\times50+1}{50}}$$
$$=\sqrt[3]{\frac{2^{10}\times50+1}{50}}$$
$$=\sqrt[3]{\frac{2^{10}\times50+1}{50}}$$
$$=\sqrt[3]{\frac{2^{10}\times50+1}{50}}$$
$$=\frac{2^{10}\times50+1}{50}$$
$$=\frac{2^{10}\times50+1}{50}$$
$$=\frac{2^{10}\times50+1}{50