Review Exercise 1

Q.1 Choose the correct option.

i. $\sqrt{7}$ is:
(a) Integer
(b) Rational number
(c) Irrational number
(d) Natural number

ii. π and e are:
(a) Natural number
(b) Integers
(c) Rational number
(d) Irrational number

iii. If n is not a perfect square then $\sqrt{n}$ is:
(a) Rational number
(b) Natural number
(c) Integer
(d) Irrational number

iv. $\sqrt{3}+\sqrt{5}$ is:
(a) Whole number
(b) Integer
(c) Rational number
(d) Irrational number

v. For all $x \in R$, $x = x$ is called:
(a) Reflexive property
(b) Transitive number
(c) Symmetric property
(d) Trichotomy property

vi. Let $a, b, c \in R$ then $a > b$ and $b > c$ $\Rightarrow a > c$ is called _____property.

(a) Trichotomy (b) Transitive
(c) Additive (d) Multiplicative

vii. $2^x \times 8^x = 64$ then $x =$

(a) $\frac{3}{2}$ (b) $\frac{3}{4}$
(c) $\frac{5}{6}$ (d) $\frac{2}{3}$

viii. Let $a, b, \in R$ then $a = b$ and $b = a$ is called _____property.

(a) Reflexive (b) Symmetric
(c) Transitive (d) Additive

ix. $\sqrt{75} + \sqrt{27} =$

(a) $\sqrt{102}$ (b) $9\sqrt{3}$
(c) $5\sqrt{3}$ (d) $8\sqrt{3}$

x. The product of $(3+\sqrt{5})(3-\sqrt{5})$ is:

(a) Prime number
(b) odd number
(c) Irrational number
(d) Rational number

Answer Key

i	**c**	ii	**d**	iii	**d**	iv	**d**	v	**a**
vi	**b**	vii	**a**	viii	**b**	ix	**d**	x	**d**

Multiple Choice Questions (Additional)

History of Real numbers

1. Which number system was used by the Sumerians?
   (a) Decimal (b) hexadecimal
   (c) Sexagesimal (d) Binary
2. The sexagesimal system is a number system with the base:
   (a) 2 (b) 10
   (c) 16 (d) 60
3. Which number system was used by the Egyptians?
   (a) Decimal (b) hexadecimal
   (c) Sexagesimal (d) Binary
4. How many letters are used in Roman numeral system?
   (a) 3 (b) 5
   (c) 7 (d) 10
5. In Roman counting the letter "L" represents the number:
   (a) 10 (b) 50
   (c) 100 (d) 500
6. The invention of zero is attributed to:
   (a) Arabs (b) Egyptians
   (c) Sumerians (d) Indians
7. Which number system is known as Indo-Arabic numerals?
   (a) Decimal (b) hexadecimal
   (c) Sexagesimal (d) Binary
8. Who did introduce the numerals (0-9) to Europe?
   (a) Arabs (b) Egyptians
   (c) Sumerians (d) Indian
9. Which of the following is one of the modern number systems?
   (a) Roman Numerals
   (b) Egyptians numerals
   (c) Sexagesimal system
   (d) hexadecimal system

Real numbers

10. $Q \cup Q' =$ ____
    (a) Q' (b) Q
    (c) R (d) ϕ
11. $Q \cap Q' =$ ____
    (a) Q' (b) Q
    (c) R (d) ϕ
12. Q and Q' are _____sets.
    (a) disjoint (b) over lapping
    (c) intersecting (d) supper
13. For each prime number P, $\sqrt{P}$ is an:
    (a) Irrational (b) Rational
    (c) Real (d) Whole

Properties of real numbers

14. Name the property of real numbers used in $\pi + (-\pi) = 0$.
    (a) Additive inverse
    (b) Multiplicative inverse
    (c) Additive identity
    (d) Multiplicative identity
15. Name the property of real numbers used in $\frac{1}{2} \times 1 = \frac{1}{2}$.
    (a) Additive identity
    (b) Additive Inverse
    (c) Multiplicative identity
    (d) Multiplicative Inverse
16. If $x < y$ and $z < 0$ then:
    (a) $x z < y z$ (b) $x z > y z$
    (c) $x z = y z$ (d) $\ddot{x} > y$
17. If a, b$\in$ R then only one of a = b or a < b or a > b holds is called --- property.
    (a) Trichotomy (b) Transitive
    (c) Additive (d) Multiplicative

Radical Expressions

18. In $\sqrt[r]{a}$, the symbol $\sqrt{}$ is called:
    (a) radical sign (b) index
    (c) exponent (d) base
19. In $\sqrt[n]{a^m}$ 'n' is called:
    (a) base (b) radical sign
    (c) index (d) radical
20. $(27x)^{\frac{2}{3}} =$ _____
    (a) $\frac{\sqrt[3]{x^2}}{9}$ (b) $\frac{\sqrt{x^3}}{9}$
    (c) $\frac{\sqrt[3]{x^2}}{8}$ (d) $9\sqrt[3]{x^2}$
21. Write $\sqrt[5]{x}$ in exponential form
    (a) x (b) x^5
    (c) $x^{\frac{1}{5}}$ (d) $x^{\frac{5}{2}}$
22. Writing $m^{\frac{2}{3}}$ with radical sign we get:
    (a) $\sqrt[3]{m^2}$ (b) $\sqrt{m^3}$
    (c) $\sqrt[2]{m^3}$ (d) $\sqrt{m^6}$
23. In $\sqrt[3]{5}$, the radicand is:
    (a) 3 (b) $\frac{1}{3}$
    (c) 5 (d) 35

Surds

24. Which of the following is a Surd?
    (a) $\sqrt{7}$ (b) $\sqrt{9}$
    (c) $\sqrt{\pi}$ (d) $\sqrt{e}$
25. Which of the following is a binomial Surd?
    (a) $4\sqrt{3}$ (b) $\sqrt{16}$
    (c) $7+\sqrt{\pi}$ (d) $2-\sqrt{3}$
26. A surd which contains a single term is called surd.
    (a) Monomial (b) Binomial
    (c) Trinomial (d) None
27. Conjugate factor of the Surd $a+b\sqrt{x}$ is:
    (a) $a+b\sqrt{x}$ (b) $a-b\sqrt{x}$
    (c) $-a-b\sqrt{x}$ (d) $-a+b\sqrt{x}$
28. $(4+\sqrt{2})(4-\sqrt{2})$ is equal to:
    (a) 14 (b) –14
    (c) 12 (d) 8
29. $(\sqrt{x}+\sqrt{y})(\sqrt{x}-\sqrt{y})(x+y) = ...$
    (a) $(x+y)$ (b) $(x-y)$
    (c) (x^2+y^2) (d) (x^2-y^2)
30. $\frac{1}{2-\sqrt{3}} =$ _____
    (a) $2+\sqrt{3}$ (b) $2-\sqrt{3}$
    (c) $-2+\sqrt{3}$ (d) $-2-\sqrt{3}$

Answer Key

1	**c**	2	**d**	3	**a**	4	**c**	5	**b**	6	**d**	7	**a**	8	**a**	9	**d**	10	**c**
11	**d**	12	**a**	13	**a**	14	**a**	15	**c**	16	**b**	17	**a**	18	**a**	19	**c**	20	**d**
21	**c**	22	**a**	23	**c**	24	**a**	25	**d**	26	**a**	27	**b**	28	**a**	29	**d**	30	**a**

Q.2 If $a=\frac{3}{2}, b=\frac{5}{3}$ and $c=\frac{7}{5}$ then verify that

(i) $a(b+c)=ab+ac$

Solution:

$a(b+c)=ab+ac$

L.H.S $=a(b+c)$

$=\frac{3}{2}\left(\frac{5}{3}+\frac{7}{5}\right)$

$=\frac{3}{2}\left(\frac{25+21}{15}\right)$

$=\frac{3}{2}\left(\frac{46}{15}\right)$

$=\frac{23}{5}$ _____ (i)

Now, R.H.S $=ab+ac$

$=\frac{3}{2}\times\frac{5}{3}+\frac{3}{2}\times\frac{7}{5}$

$=\frac{5}{2}+\frac{21}{10}$

$=\frac{25+21}{10}$

$=\frac{46}{10}$

$=\frac{23}{5}$ _____ (ii)

From (i) and (ii), L.H.S = R.H.S

Hence $a(b+c)=ab+ac$

(ii) $(a+b)c=ac+bc$

Solution

$(a+b)c=ac+bc$

L.H.S $=(a+b)c$

$=\left(\frac{3}{2}+\frac{5}{3}\right)\times\frac{7}{5}$

$=\left(\frac{9+10}{6}\right)\times\frac{7}{5}$

$=\frac{19}{6}\times\frac{7}{5}$

$=\frac{133}{30}$ _____ (i)

Now, R.H.S $=ac+bc$

$=\frac{3}{2}\times\frac{7}{5}+\frac{5}{3}\times\frac{7}{5}$

$=\frac{21}{10}+\frac{7}{3}$

$=\frac{63+70}{30}$

$=\frac{133}{30}$ _____ (ii)

From (i) and (ii), L.H.S = R.H.S

Hence $(a+b)c=ac+bc$ is proved

Q.3 If $a=\frac{4}{3}, b=\frac{5}{2}, c=\frac{7}{4}$, then verify the associative property of real numbers w.r.t addition and multiplication.

Solution:

(i) Associative property w.r.t addition.

$(a+b)+c=a+(b+c)$

L.H.S $=(a+b)+c$

$=\left(\frac{4}{3}+\frac{5}{2}\right)+\frac{7}{4}$

$=\left(\frac{8+15}{6}\right)+\frac{7}{4}$

$=\frac{23}{6}+\frac{7}{4}$

$=\frac{46+21}{12}$

$=\frac{67}{12}$ _____ (i)

2	6 –4
2	3–2
3	3–1
	1–1

R.H.S. $=a+(b+c)$

Now, $=\frac{4}{3}+\left(\frac{5}{2}+\frac{7}{4}\right)$

$=\frac{4}{3}+\left(\frac{10+7}{4}\right)$

$=\frac{4}{3}+\frac{17}{4}$

$=\frac{16+51}{12}$

$=\frac{67}{12}$ _____ (ii)

From(i) and (ii) L.H.S = R.H.S.

Hence $a+(b+c)=(a+b)+c$

(ii) Associative property w.r.t multiplication. $(a\times b)\times c = a\times(b\times c)$

Solution:

L.H.S $= (a\times b)\times c$

$$= \left(\frac{4}{3}\times\frac{5}{2}\right)\times\frac{7}{4}$$

$$= \frac{20}{6}\times\frac{7}{4}$$

$$= \frac{10}{3}\times\frac{7}{4}$$

$$= \frac{70}{12}$$

$$= \frac{35}{6} \quad \text{(i)}$$

Now, R.H.S $= a\times(b\times c)$

$$= \frac{4}{3}\times\left(\frac{5}{2}\times\frac{7}{4}\right)$$

$$= \frac{4}{3}\times\left(\frac{35}{8}\right)$$

$$= \frac{{}^{1}\cancel{4}}{3}\times\left(\frac{35}{\cancel{8}_{2}}\right)$$

$$= \frac{35}{6} \quad \text{(ii)}$$

From (i) and (ii) L.H.S = R.H.S

Hence, $(a\times b)\times c = a\times(b\times c)$

Q.4 Is 0 a rational number? Explain.

Solution:

Yes, 0 is a rational number.

Explanation

A number in the form $\frac{p}{q}$, p where p, $q \in z$ and $q \neq 0$ is a rational number. The number 0 can be written as $\frac{0}{1}, \frac{0}{2}, \frac{0}{3}, \ldots\ldots$ Here $0 \in z$ and 1,2,3, $\in z$ so we can say that 0 is a rational number.

Q.5 State trichotomy property of real numbers.

Solution:

For all values of $a, b \in R$

Either $a > b$ or $a = b$ or $a < b$

This property is called trichotomy property.

Q.6 Find two rational numbers between 4 and 5.

Solution:

Average of 4 and 5 $= \frac{4+5}{2} = \frac{9}{2}$

Now we find,

Average of $\frac{9}{2}$ and 5 $= \left(\frac{9}{2}+5\right)\div 2$

$$= \left(\frac{9+10}{2}\right)\times\frac{1}{2}$$

$$= \frac{19}{2}\times\frac{1}{2}$$

$$= \frac{19}{4}$$

Thus two rational number between 4 and 5 are $\frac{9}{2}$ and $\frac{19}{4}$.

Q.7 Simplify the following:

(i) $\sqrt[5]{\frac{x^{15}y^{35}}{z^{20}}}$

Solution:

$$\sqrt[5]{\frac{x^{15}y^{35}}{z^{20}}} = \left(\frac{x^{15}y^{35}}{z^{20}}\right)^{\frac{1}{5}}$$

$$= \frac{x^{15\times\frac{1}{5}}y^{35\times\frac{1}{5}}}{z^{20\times\frac{1}{5}}}$$

$$= \frac{x^3.y^7}{z^4}$$

(ii) $\sqrt[3]{(27)^{2x}}$

Solution:

$$\sqrt[3]{(27)^{2x}}$$

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

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

$= 3^{2x} \qquad \because \sqrt[3]{a^3} = a$

(iii) $\dfrac{6(3)^{n+2}}{3^{n+1}-3^n}$

Solution:

$$\frac{6(3)^{n+2}}{3^{n+1}-3^n}$$

$$= \frac{6\left(3^n \times 3^2\right)}{3^n 3^1 - 3^n \times 1} \qquad \left(\because a^{m+n} = a^m \times a^n\right)$$

$$= \frac{3^n \times 6 \times 3^2}{3^n\left[3^1 - 1\right]}$$

$$= \frac{3^n \times 3^{-n} \times 6 \times 9}{2}$$

$$= \frac{3^{n-n} \times 6 \times 9}{2}$$

$$= \frac{3^0 \times 54}{2} \qquad (\because 3^0 = 1)$$

$= 1 \times 27$

$= 27$

Q.8 The sum of three consecutive odd integers is 51. Find the three integers.

Solution:

Sum = 51

Let x, $x+2$, $x+4$ be three consecutive odd numbers.

By condition:

$(x) + (x+2) + (x+4) = 51$

$x + x + 2 + x + 4 = 51$

$3x + 6 = 51$

$3x = 51 - 6$

$3x = 45$

$x = \dfrac{45}{3}$

$x = 15$

1^{st} odd number $= x = 15$

2^{nd} odd number $= x+2$

$= 15+2 = 17$

3^{rd} odd number $= x+4$

$= 15+4 = 19$

Thus, 15, 17 and 19 are required three consecutive odd numbers.

Q.9 Abdullah picked up 96 balls and placed them into two buckets. One bucket has twenty-eight more balls than the other bucket. How many balls were in each bucket?

Solution

Total balls = 96

Let balls in 1^{st} and 2^{nd} bucket be x and y respectively.

By 1^{st} condition:

$x + y = 96$ ---------- (i)

By 2^{nd} condition:

$x = 28 + y$

$x - y = 28$ ..... (ii)

Adding eq.(i) and (ii)

$$x + y = 96$$
$$x - y = 28$$
$$2x = 124$$

$$x = \frac{124}{2} = 62$$

$$\boxed{x = 62}$$

Put it in eq. (i)

$62 + y = 96$

$y = 96 - 62$

$$\boxed{y = 34}$$

Thus 1^{st} bucket has 62 balls and 2^{nd} bucket has 34 balls.

Q.10 Salma invested Rs. 350,000 in a bank, which paid simple profit at a rate

$7\frac{1}{4}\%$ **per annum. After 2 years, the rate was increased to 8% per annum. Find the amount she had at the end of 7 years.**

Solution:

Time period = 7 years.

We divide the period of 7 years into two parts 2 years and 5 years.

Finding profit for 2 years

Principal amount = P = Rs.350,000/-

Profit rate = R = $7\frac{1}{4}\%$ or 7.25%

Time = t = 2 years

We know that

Profit = P×T×R

= 350,000×2×7.25%

$= 700{,}000 \times \frac{7.25}{100}$

$= 700{,}000 \times \frac{725}{100\times 100}$

= 70 × 725

= Rs.50, 750

Finding the profit for 5 years

Principal amount = P = Rs.350,000/-

Profit rate = R = 8%

Time period = T = 5 years

We know that

Profit = P×T×R

= 350,000×5×8%

$= 1{,}750{,}0\cancel{0}\cancel{0}\frac{8}{1\cancel{00}}$

= Rs. 140,000/-

Finding the total profit:

Total profit = Rs. (50,750+140,000)

= Rs. 190,750

Finding the total amount:

Total amount at the end of 7 years

= Rs. (350,000 + 190,750)

= Rs. 540,750/-