بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

Quran Education Point

QuranEducationPoint.Com

Class	9th	Chapter	01
Subject	Mathematics	Board	Punjab

Chapter 1: Real Numbers

Exercise 1.1

Q1. Identify each of the following as a rational or irrational number:

- **(i)** 2.353535 →**Rational** (It is a terminating decimal number).
- **(ii)** $0.\bar{6}$ →**Rational** (It is a non-terminating and recurring decimal number).
- **(iii)** $2.236067\ldots$ →**Irrational** (It is a non-terminating and non-recurring decimal number).
- **(iv)** $\sqrt{7}$ →**Irrational** (Square root of a non-perfect square).
- **(v)** e →**Irrational** (Euler's constant $\approx 2.71828\ldots$).
- **(vi)** π →**Irrational** (Pi $\approx 3.14159\ldots$).
- **(vii)** $5+\sqrt{11}$ →**Irrational** (Sum of a rational and an irrational number).
- **(viii)** $\sqrt{3}+\sqrt{13}$ →**Irrational** (Sum of two irrational numbers).
- **(ix)** $\frac{15}{4}$ →**Rational** (Expressed as a quotient of integers where denominator $\neq 0$).
- **(x)** $(2-\sqrt{2})(2+\sqrt{2})$ →**Rational**
    - *Step:* Using $(a-b)(a+b)=a^2-b^2$, we get $2^2-(\sqrt{2})^2=4-2=2=\frac{2}{1}$, which is rational.

Q2. Represent the following numbers on number line:

- **(i)** $\sqrt{2}$
    - *Step:* Construct a right-angled triangle with base 1unit and perpendicular 1unit. The hypotenuse is $\sqrt{1^2+1^2}=\sqrt{2}$. Draw an arc with radius equal to the hypotenuse from the origin on the number line to mark $\sqrt{2}$.
- **(ii)** $\sqrt{3}$

نوٹس حاصل کرنے کے لیے QuranEducationPoint.com لکھ کر سرچ کریں۔

- *Step:* Construct $\sqrt{2}$first. Then construct a perpendicular of 1unit at the tip of $\sqrt{2}$. The hypotenuse becomes $\sqrt{(\sqrt{2})^2 + 1^2} = \sqrt{3}$. Draw an arc to locate it on the number line.

- **(iii)** $4\frac{1}{3} = \frac{13}{3} \approx 4.33$
  - *Step:* Locate integer 4on the number line. Divide the segment between 4and 5into 3equal parts and select the first division mark to the right of 4.
- **(iv)** $-2\frac{1}{7} = -\frac{15}{7} \approx -2.14$
  - *Step:* Locate -2on the number line. Divide the segment between $-2$and -3into 7equal parts to the left, and choose the first division mark.
- **(v)** $\frac{5}{8} = 0.625$
  - *Step:* Divide the segment between 0and 1into 8equal parts and take the 5th part.
- **(vi)** $2\frac{3}{4} = 2.75$
  - *Step:* Locate integer 2on the number line. Divide the segment between 2and 3into 4equal parts, and choose the 3rd division mark.

Q3. Express the following as a rational number $\frac{p}{q}$where $p$and $q$are integers and $q \neq 0$:

- **(i)** $0.\overline{4}$
  - Let $x = 0.\overline{4} = 0.4444..$— (1)
  - Multiply both sides by 10: $10x = 4.4444..$— (2)
  - Subtract (1) from (2): $10x - x = 4.4444\ldots - 0.4444\ldots \Longrightarrow 9x = 4 \Longrightarrow x = \frac{4}{9}$.
- **(ii)** $0.\overline{37}$
  - Let $x = 0.\overline{37} = 0.373737..$— (1)
  - Multiply both sides by 100: $100x = 37.373737..$— (2)
  - Subtract (1) from (2): $100x - x = 37.3737\ldots - 0.3737\ldots \Longrightarrow 99x = 37 \Longrightarrow x = \frac{37}{99}$.
- **(iii)** $0.\overline{21}$
  - Let $x = 0.\overline{21} = 0.212121..$— (1)
  - Multiply both sides by 100: $100x = 21.212121..$— (2)
  - Subtract (1) from (2): $99x = 21 \Longrightarrow x = \frac{21}{99} = \frac{7}{33}$(simplifying by dividing by 3).

Q4. Name the property used in the following:

- (i) $(a + 4) + b = a + (4 + b)$ →**Associative property w.r.t. addition**
- (ii) $\sqrt{2} + \sqrt{3} = \sqrt{3} + \sqrt{2}$ →**Commutative property w.r.t. addition**
- (iii) $x - x = 0$ →**Additive inverse property**
- (iv) $a(b + c) = ab + ac$ →**Left distributive property of multiplication over addition**
- (v) $16 + 0 = 16$ →**Additive identity property**

نوٹس حاصل کرنے کے لیے QuranEducationPoint.com لکھ کر سرچ کریں۔

- (vi) $100 \times 1 = 100$ →**Multiplicative identity property**
- (vii) $4 \times (5 \times 8) = (4 \times 5) \times 8$ →**Associative property w.r.t. multiplication**
- (viii) $ab = ba$ →**Commutative property w.r.t. multiplication**

Q5. Name the property used in the following:

- (i) $-3 < -1 \Rightarrow 0 < 2$ →**Additive property of order** (adding 3to both sides)
- (ii) If $a < b$then $\frac{1}{a} > \frac{1}{b}$ →**Reciprocal property of order**
- (iii) If $a < b$then $a + c < b + c$ →**Additive property of order**
- (iv) If $ac < bc$and $c > 0$then $a < b$ →**Multiplicative property of order**
- (v) If $ac < bc$and $c < 0$then $a > b$ →**Multiplicative property of order** (reverses inequality when multiplying by a negative number)
- (vi) Either $a > b$or $a = b$or $a < b$ →**Trichotomy property**

Q6. Insert two rational numbers between:

- **(i)** $\frac{1}{3}$**and** $\frac{1}{4}$
  - *Step 1:* Find the average of $\frac{1}{3}$and $\frac{1}{4}$: $\frac{\frac{1}{3}+\frac{1}{4}}{2} = \frac{\frac{7}{12}}{2} = \frac{7}{24}$.
  - *Step 2:* Find the average of $\frac{1}{4}$and $\frac{7}{24}$: $\frac{\frac{1}{4}+\frac{7}{24}}{2} = \frac{\frac{13}{24}}{2} = \frac{13}{48}$.
  - *Result:* $\mathbf{\frac{13}{48}}$and $\mathbf{\frac{7}{24}}$.
- **(ii)** 3**and** 4
  - *Step 1:* Average $= \frac{3+4}{2} = \frac{7}{2}$.
  - *Step 2:* Average of 3and $\frac{7}{2} = \frac{3+\frac{7}{2}}{2} = \frac{13}{4}$.
  - *Result:* $\mathbf{\frac{13}{4}}$and $\mathbf{\frac{7}{2}}$.
- **(iii)** $\frac{3}{5}$**and** $\frac{4}{5}$
  - *Step:* Convert denominators to a larger common base by multiplying numerator and denominator by 10: $\frac{30}{50}$and $\frac{40}{50}$.
  - *Result:* $\mathbf{\frac{31}{50}}$and $\mathbf{\frac{32}{50}}$(or any other values in between).

QuranEducationPoint.Com

بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

Exercise 1.2

Q1. Rationalize the denominator of following:

- **(i)** $\frac{13}{4+\sqrt{5}}$
  - *Step:* Multiply numerator and denominator by conjugate $(4-\sqrt{5})$:

$$\frac{13(4-\sqrt{5})}{(4+\sqrt{5})(4-\sqrt{5})} = \frac{13(4-\sqrt{5})}{4^2-(\sqrt{5})^2} = \frac{13(4-\sqrt{5})}{16-5} = \frac{13(4-\sqrt{5})}{11} = \frac{52-13\sqrt{5}}{11}$$

$$\frac{13(4-\sqrt{5})}{(4+\sqrt{5})(4-\sqrt{5})} = \frac{13(4-\sqrt{5})}{4^2-(\sqrt{5})^2} = \frac{13(4-\sqrt{5})}{16-5} = \frac{13(4-\sqrt{5})}{11} = \mathbf{\frac{52-13\sqrt{5}}{11}}$$

- **(ii)** $\frac{\sqrt{2}+\sqrt{5}}{\sqrt{3}}$
  - *Step:* Multiply numerator and denominator by $\sqrt{3}$:

$$\frac{(\sqrt{2}+\sqrt{5})\sqrt{3}}{\sqrt{3}\cdot\sqrt{3}} = \frac{\sqrt{6}+\sqrt{15}}{3}$$

$$\frac{(\sqrt{2}+\sqrt{5})\sqrt{3}}{\sqrt{3}\cdot\sqrt{3}} = \mathbf{\frac{\sqrt{6}+\sqrt{15}}{3}}$$

- **(iii)** $\frac{\sqrt{2}-1}{\sqrt{5}}$
  - *Step:* Multiply numerator and denominator by $\sqrt{5}$:

$$\frac{(\sqrt{2}-1)\sqrt{5}}{\sqrt{5}\cdot\sqrt{5}} = \frac{\sqrt{10}-\sqrt{5}}{5}$$

$$\frac{(\sqrt{2}-1)\sqrt{5}}{\sqrt{5}\cdot\sqrt{5}} = \mathbf{\frac{\sqrt{10}-\sqrt{5}}{5}}$$

- **(iv)** $\frac{6-4\sqrt{2}}{6+4\sqrt{2}}$
  - *Step:* Multiply numerator and denominator by conjugate $(6-4\sqrt{2})$:

$$\frac{(6-4\sqrt{2})^2}{6^2-(4\sqrt{2})^2} = \frac{36-48\sqrt{2}+32}{36-32} = \frac{68-48\sqrt{2}}{4} = 17-12\sqrt{2}$$

$$\frac{(6-4\sqrt{2})^2}{6^2-(4\sqrt{2})^2} = \frac{36-48\sqrt{2}+32}{36-32} = \frac{68-48\sqrt{2}}{4} = \mathbf{17-12\sqrt{2}}$$

نوٹس حاصل کرنے کے لیے QuranEducationPoint.com لکھ کر سرچ کریں۔

- **(v)** $\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$
  - *Step:* Multiply numerator and denominator by $(\sqrt{3}-\sqrt{2})$:

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

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

- **(vi)** $\frac{4\sqrt{3}}{\sqrt{7}+\sqrt{5}}$
  - *Step:* Multiply numerator and denominator by $(\sqrt{7}-\sqrt{5})$:

$$\frac{4\sqrt{3}(\sqrt{7}-\sqrt{5})}{7-5}=\frac{4(\sqrt{21}-\sqrt{15})}{2}=2\sqrt{21}-2\sqrt{15}$$

$$\frac{4\sqrt{3}(\sqrt{7}-\sqrt{5})}{7-5}=\frac{4(\sqrt{21}-\sqrt{15})}{2}=\mathbf{2\sqrt{21}-2\sqrt{15}}$$

Q2. Simplify the following:

- **(i)** $\left(\frac{81}{16}\right)^{-\frac{3}{4}}$
  - *Step:* Invert fraction to make exponent positive: $\left(\frac{16}{81}\right)^{\frac{3}{4}}=\left(\left(\frac{2}{3}\right)^4\right)^{\frac{3}{4}}=\left(\frac{2}{3}\right)^3=\mathbf{\frac{8}{27}}$.
- **(ii)** $\left(\frac{3}{4}\right)^{-2}\div\left(\frac{4}{9}\right)^3\times\frac{16}{27}$
  - *Step:* Convert negative exponent and powers: $\frac{16}{9}\div\frac{64}{729}\times\frac{16}{27}=\frac{16}{9}\times\frac{729}{64}\times\frac{16}{27}=\mathbf{12}$.
- **(iii)** $(0.027)^{-\frac{1}{3}}$
  - *Step:* Convert decimal to fraction: $\left(\frac{27}{1000}\right)^{-\frac{1}{3}}=\left(\left(\frac{3}{10}\right)^3\right)^{-\frac{1}{3}}=\left(\frac{3}{10}\right)^{-1}=\mathbf{\frac{10}{3}}$.
- **(iv)** $\sqrt[4]{\frac{x^{14}\times y^{21}\times z^{35}}{y^{14}\times z^7}}$
  - *Step:* Simplify inside radical: $\sqrt[4]{x^{14}y^7z^{28}}=(x^{14}y^7z^{28})^{\frac{1}{4}}=\mathbf{x^{\frac{7}{2}}y^{\frac{7}{4}}z^7}$.
- **(v)** $\frac{5\cdot(25)^{n+1}-25\cdot(5)^{2n}}{5\cdot(5)^{2n+3}-(25)^{n+1}}$
  - *Step:* Express terms in base 5:

$$\frac{5\cdot5^{2n+2}-5^{2n+2}}{5\cdot5^{2n+3}-5^{2n+2}}=\frac{4\cdot5^{2n+2}}{24\cdot5^{2n+2}}=\frac{1}{6}$$

نوٹس حاصل کرنے کے لیے QuranEducationPoint.com لکھ کر سرچ کریں۔

$$\frac{5\cdot 5^{2n+2}-5^{2n+2}}{5\cdot 5^{2n+3}-5^{2n+2}}=\frac{4\cdot 5^{2n+2}}{24\cdot 5^{2n+2}}=\mathbf{\frac{1}{6}}$$

- **(vi)** $\frac{(16)^{n+1}+20(4^{2n})}{2^3\times 8^{n-1}}$
  - *Step:* Express terms in base 2:

$$\frac{2^{4n+4}+20(2^{4n})}{2^3\times 2^{3n-3}}=\frac{36\cdot 2^{4n}}{2^{3n}}=36\cdot 2^n$$

$$\frac{2^{4n+4}+20(2^{4n})}{2^3\times 2^{3n-3}}=\frac{36\cdot 2^{4n}}{2^{3n}}=\mathbf{36\cdot 2^n}$$

- **(vii)** $(64)^{-\frac{2}{3}}\div(9)^{-\frac{3}{2}}$
  - *Step:* $(4^3)^{-\frac{2}{3}}\div(3^2)^{-\frac{3}{2}}=4^{-2}\div 3^{-3}=\frac{1}{16}\times 27=\mathbf{\frac{27}{16}}$.
- **(viii)** $\frac{3^n\times 9^{n+1}}{3^{n-1}\times 9^{n-1}}$
  - *Step:* Convert to base 3: $\frac{3^n\times 3^{2n+2}}{3^{n-1}\times 3^{2n-2}}=\frac{3^{3n+2}}{3^{3n-3}}=3^5=\mathbf{243}$.
- **(ix)** $\frac{5^{n+3}-6\cdot 5^{n+1}}{9\times 5^n-2^n\times 5^n}$
  - *Step:* Factor out common terms: $\frac{5^{n+1}(5^2-6)}{5^n(9-2^n)}=\frac{5\cdot 19}{9-2^n}=\mathbf{\frac{95}{9-2^n}}$.

Q3. If $x=3+\sqrt{8}$, find the value of:

- Given $x=3+\sqrt{8}$, then $\frac{1}{x}=\frac{1}{3+\sqrt{8}}=3-\sqrt{8}$.
- **(i)** $x+\frac{1}{x}=(3+\sqrt{8})+(3-\sqrt{8})=\mathbf{6}$
- **(ii)** $x-\frac{1}{x}=(3+\sqrt{8})-(3-\sqrt{8})=\mathbf{2\sqrt{8}=4\sqrt{2}}$
- **(iii)** $x^2+\frac{1}{x^2}=\left(x+\frac{1}{x}\right)^2-2=6^2-2=36-2=\mathbf{34}$
- **(iv)** $x^2-\frac{1}{x^2}=\left(x+\frac{1}{x}\right)\left(x-\frac{1}{x}\right)=6\times 4\sqrt{2}=\mathbf{24\sqrt{2}}$
- **(v)** $x^4+\frac{1}{x^4}=\left(x^2+\frac{1}{x^2}\right)^2-2=34^2-2=1156-2=\mathbf{1154}$
- **(vi)** $\left(x-\frac{1}{x}\right)^2=\left(4\sqrt{2}\right)^2=16\times 2=\mathbf{32}$

Q4. Find rational numbers $p$and $q$such that $\frac{8-3\sqrt{2}}{4+3\sqrt{2}}=p+q\sqrt{2}$

- *Step:* Rationalize the LHS denominator:

$$\frac{(8-3\sqrt{2})(4-3\sqrt{2})}{(4+3\sqrt{2})(4-3\sqrt{2})}=\frac{32-24\sqrt{2}-12\sqrt{2}+18}{4^2-(3\sqrt{2})^2}=\frac{50-36\sqrt{2}}{16-18}=\frac{50-36\sqrt{2}}{-2}$$

$$=-25+18\sqrt{2}$$

نوٹس حاصل کرنے کے لیے QuranEducationPoint.com لکھ کر سرچ کریں۔

$$\frac{(8-3\sqrt{2})(4-3\sqrt{2})}{(4+3\sqrt{2})(4-3\sqrt{2})} = \frac{32-24\sqrt{2}-12\sqrt{2}+18}{4^2-(3\sqrt{2})^2} = \frac{50-36\sqrt{2}}{16-18} = \frac{50-36\sqrt{2}}{-2}$$

$$= -25+18\sqrt{2}$$

- *Result:* $\mathbf{p = -25}$and $\mathbf{q = 18}$.

Q5. Simplify the following:

- **(i)** $\sqrt{\frac{(25)^2\times(243)^{\frac{3}{5}}}{(16)^4\times(8)^{\frac{4}{3}}}}$
  - *Step:* Evaluate components: $25^2 = 625$, $243^{\frac{3}{5}} = 3^3 = 27$, $16^4 = 2^{16}$, $8^{\frac{4}{3}} = 2^4 = 16$.
  - Substitute into expression: $\sqrt{\frac{16875}{2^{20}}} = \mathbf{\frac{75\sqrt{3}}{1024}}$.
- **(ii)** $\frac{54\times\sqrt[3]{(27)^{2x}}}{9^{x+1}+216(3^{2x-1})}$
  - *Step:* Express terms in base 3: $\frac{2\cdot3^3\cdot3^{2x}}{3^{2x+2}+2^3\cdot3^3\cdot3^{2x-1}} = \frac{2\cdot3^{2x+3}}{3^{2x+4}} = \mathbf{\frac{2}{3}}$.
- **(iii)** $\sqrt{\frac{(216)^{\frac{2}{3}}\times(25)^{\frac{1}{2}}}{(0.04)^{-\frac{3}{2}}}}$
  - *Step:* Evaluate components: $(6^3)^{\frac{2}{3}} = 36$, $(5^2)^{\frac{1}{2}} = 5$, $\left(\frac{1}{25}\right)^{-\frac{3}{2}} = 125$.
  - Substitute: $\sqrt{\frac{36\times5}{125}} = \sqrt{\frac{36}{25}} = \mathbf{\frac{6}{5}}$.
- **(iv)** $\left(a^{\frac{1}{3}}+b^{\frac{1}{3}}\right)\times\left(a^{\frac{2}{3}}-a^{\frac{1}{3}}b^{\frac{1}{3}}+b^{\frac{2}{3}}\right)$
  - *Step:* Using the sum of cubes formula $(x+y)(x^2-xy+y^2) = x^3+y^3$:

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

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

QuranEducationPoint.Com

بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

Exercise 1.3

Q1. The sum of three consecutive integers is forty-two, find the three integers.

- *Step:* Let integers be $x, x+1, x+2$.
- $x + (x+1) + (x+2) = 42 \Longrightarrow 3x + 3 = 42 \Longrightarrow 3x = 39 \Longrightarrow x = 13$.
- *Result:* The integers are $\mathbf{13, 14, 15}$.

Q2. The diagram shows right-angled $\triangle ABC$ where length of $AC = \left(\sqrt{3} + \sqrt{5}\right)$ cm and area $= \left(1 + \sqrt{15}\right)$ cm^2. Find length AB in the form $\left(a\sqrt{3} + b\sqrt{5}\right)$ cm.

- *Step:* Area $= \frac{1}{2} \times$ base $\times$ height $= \frac{1}{2} \times AB \times \left(\sqrt{3} + \sqrt{5}\right) = 1 + \sqrt{15}$.
- $AB = \frac{2\left(1+\sqrt{15}\right)}{\sqrt{3}+\sqrt{5}} = \frac{2\left(1+\sqrt{15}\right)\left(\sqrt{5}-\sqrt{3}\right)}{2} = \left(1 + \sqrt{15}\right)\left(\sqrt{5} - \sqrt{3}\right) = \mathbf{4\sqrt{3} - 2\sqrt{5}}$ cm.

Q3. A rectangle has sides of length $2 + \sqrt{18}$ m and $\left(5 - \frac{4}{\sqrt{2}}\right)$ m. Express the area in the form $a + b\sqrt{2}$.

- *Step 1:* Simplify sides: Side $1 = 2 + 3\sqrt{2}$, Side $2 = 5 - 2\sqrt{2}$.
- *Step 2:* Area $= \left(2 + 3\sqrt{2}\right)\left(5 - 2\sqrt{2}\right) = 10 - 4\sqrt{2} + 15\sqrt{2} - 12 = \mathbf{-2 + 11\sqrt{2}}$ m^2.

Q4. Find two numbers whose sum is 68 and difference is 22.

- *Step:* Let numbers be x and y.
  - $x + y = 68$
  - $x - y = 22$
- Adding both equations: $2x = 90 \Longrightarrow x = 45$. Substituting gives $y = 23$.
- *Result:* The numbers are $\mathbf{45}$ and $\mathbf{23}$.

Q5. Convert 48°C to Fahrenheit using $\left(^\circ\text{F} = \frac{9^\circ}{5}\text{C} + 32\right)$.

- *Step:* $^\circ$F $= \frac{9}{5}(48) + 32 = 86.4 + 32 = \mathbf{118.4}^\circ$F.

Q6. The sum of the ages of the father and son is 72 years. Six years ago, the father's age was 2 times the son's age. What was the son's age six years ago?

- *Step:* $F + S = 72 \Longrightarrow F = 72 - S$.
- Six years ago: $(F - 6) = 2(S - 6) \Longrightarrow (66 - S) = 2S - 12 \Longrightarrow 3S = 78 \Longrightarrow S = 26$.
- Son's age six years ago $= 26 - 6 = \mathbf{20}$ years.

Q7. Mirha sells a toy for Rs. 1520. What will the selling price be to get a 15% profit? ***(Assuming CP = Rs. 1520)***

- *Step:* Profit $= 15\%$ of $1520 = 0.15 \times 1520 =$ Rs. 228.
- Selling Price $= 1520 + 228 =$ Rs. $\mathbf{1748}$.

Q8. Annual income of Tayyab is Rs. 9,60,000 with an exempted amount of Rs. 1,30,000. Find tax at 0.75%.

- *Step:* Taxable income $= 9{,}60{,}000 - 1{,}30{,}000 =$ Rs. 8,30,000.
- Tax $= \frac{0.75}{100} \times 8{,}30{,}000 =$ Rs. $\mathbf{6{,}225}$.

نوٹس حاصل کرنے کے لیے QuranEducationPoint.com لکھ کر سرچ کریں۔

بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

Q9. Find the compound markup on Rs. $3,75,000$ for one year at 14% compounded annually.

- *Step:* For 1 year, compound markup equals simple profit: $\frac{3,75,000\times14\times1}{100} =$ Rs. $\mathbf{52,500}$.

Review Exercise 1

Q1. Multiple Choice Questions:

- (i) $\sqrt{7}$is: **(c) irrational number**
- (ii) $\pi$and $e$are: **(d) irrational numbers**
- (iii) If $n$is not a perfect square, then $\sqrt{n}$is: **(d) irrational number**
- (iv) $\sqrt{3}+\sqrt{5}$is: **(d) irrational number**
- (v) For all $x \in R, x = x$is called: **(a) reflexive property**
- (vi) Let $a, b, c \in R$, then $a > b$and $b > c \Longrightarrow a > c$is called: **(b) transitive property**
- (vii) $2^x \times 8^x = 64$then $x =$: **(a)** $\frac{3}{2}$
- (viii) Let $a, b \in R$, then $a = b$and $b = a$is called: **(b) symmetric property**
- (ix) $\sqrt{75}+\sqrt{27} =$: **(d)** $8\sqrt{3}$
- (x) The product of $(3+\sqrt{5})(3-\sqrt{5})$is: **(d) rational number**

Q2. If $a = \frac{3}{2}, b = \frac{5}{3}, c = \frac{7}{5}$, verify:

- **(i)** $a(b+c) = ab + ac$
  - *LHS:* $\frac{3}{2}\left(\frac{5}{3}+\frac{7}{5}\right) = \frac{3}{2}\left(\frac{46}{15}\right) = \frac{23}{5}$.
  - *RHS:* $\left(\frac{3}{2}\times\frac{5}{3}\right)+\left(\frac{3}{2}\times\frac{7}{5}\right) = \frac{5}{2}+\frac{21}{10} = \frac{23}{5}$. **(LHS = RHS, Verified)**
- **(ii)** $(a+b)c = ac + bc$
  - *LHS:* $\left(\frac{3}{2}+\frac{5}{3}\right)\frac{7}{5} = \left(\frac{19}{6}\right)\frac{7}{5} = \frac{133}{30}$.
  - *RHS:* $\frac{21}{10}+\frac{7}{3} = \frac{133}{30}$. **(LHS = RHS, Verified)**

Q3. If $a = \frac{4}{3}, b = \frac{5}{2}, c = \frac{7}{4}$, verify associative property w.r.t addition and multiplication.

نوٹس حاصل کرنے کے لیے QuranEducationPoint.com لکھ کر سرچ کریں۔

- **Addition $a + (b + c) = (a + b) + c$:**
  - *LHS:* $\frac{4}{3} + \left(\frac{5}{2} + \frac{7}{4}\right) = \frac{4}{3} + \frac{17}{4} = \mathbf{\frac{67}{12}}$.
  - *RHS:* $\left(\frac{4}{3} + \frac{5}{2}\right) + \frac{7}{4} = \frac{23}{6} + \frac{7}{4} = \mathbf{\frac{67}{12}}$. **(Verified)**
- **Multiplication $a(bc) = (ab)c$:**
  - *LHS:* $\frac{4}{3}\left(\frac{5}{2} \times \frac{7}{4}\right) = \mathbf{\frac{35}{6}}$.
  - *RHS:* $\left(\frac{4}{3} \times \frac{5}{2}\right)\frac{7}{4} = \mathbf{\frac{35}{6}}$. **(Verified)**

Q4. Is 0a rational number? Explain.

- **Answer: Yes**, because 0can be written in the form $\frac{p}{q}$where $p$and $q$are integers and $q \neq 0$(e.g., $\frac{0}{1}$).

Q5. State trichotomy property of real numbers.

- **Answer:** For any real numbers $a$and b, exactly one of the following relations holds: $a < b$, $a = b$, or $a > b$.

Q6. Find two rational numbers between 4and 5.

- *Step:* First average $= \frac{4+5}{2} = \frac{9}{2}$. Second average $= \frac{4+\frac{9}{2}}{2} = \frac{17}{4}$.
- *Result:* $\mathbf{\frac{17}{4}}$and $\mathbf{\frac{9}{2}}$.

Q7. Simplify the following:

- **(i)** $\sqrt{\frac{x^{15}y^{35}}{z^{20}}} = \mathbf{\frac{x^{\frac{15}{2}}y^{\frac{35}{2}}}{z^{10}}}$
- **(ii)** $\sqrt[3]{(27)^{2x}} = ((3^3)^{2x})^{\frac{1}{3}} = \mathbf{3^{2x}}$
- **(iii)** $\frac{6(3)^{n+2}}{3^{n+1}-3^n} = \frac{6 \cdot 3^n \cdot 9}{3^n(3-1)} = \frac{54}{2} = \mathbf{27}$

Q8. The sum of three consecutive odd integers is 51. Find the integers.

- *Step:* $x + (x + 2) + (x + 4) = 51 \Longrightarrow 3x + 6 = 51 \Longrightarrow 3x = 45 \Longrightarrow x = 15$.
- *Result:* The integers are $\mathbf{15, 17, 19}$.

Q9. Abdullah picked up 96balls into two buckets. One bucket has 28more balls than the other. Find the number of balls in each bucket.

- *Step:* $x + (x + 28) = 96 \Longrightarrow 2x = 68 \Longrightarrow x = 34$.
- *Result:* **34**balls and **62**balls.

Q10. Salma invested Rs. $3,50,000$at $7\frac{1}{4}$%per annum simple profit for 2years, then at 8%per annum for the remaining years. Find the amount at the end of 7years.

- *Step 1:* Interest for first 2years ($r_1 = 7.25\%$):

$$I_1 = \frac{3{,}50{,}000 \times 7.25 \times 2}{100} = \text{Rs. } 50{,}750$$

$$I_1 = \frac{3{,}50{,}000 \times 7.25 \times 2}{100} = \text{Rs. } 50{,}750$$

- *Step 2:* Interest for next 5years ($r_2 = 8\%$):

$$I_2 = \frac{3{,}50{,}000 \times 8 \times 5}{100} = \text{Rs. } 1{,}40{,}000$$

$$I_2 = \frac{3{,}50{,}000 \times 8 \times 5}{100} = \text{Rs. } 1{,}40{,}000$$

- *Step 3:* Total Interest $= 50{,}750 + 1{,}40{,}000 = \text{Rs. } 1{,}90{,}750$.
- *Step 4:* Total Amount $=$ Principal $+$ Total Interest $= 3{,}50{,}000 + 1{,}90{,}750 =$ Rs. $\mathbf{5,40,750}$.

QuranEducationPoint.Com