CHAPTER-1

Number Systems

(1) Every rational number is
(a) a natural number (b) an integer
(c) a real number (d) a whole number

(2) Between two rational numbers, there is/are
(a) no rational number
(b) exactly one rational number
(c) infinitely many rational numbers.
(d) only rational numbers and no irrational numbers.

(3) Decimal representation of a rational number cannot be
(a) terminating (b) non-terminating
(c) non-terminating repeating
(d) non-terminating non-repeating

(4) Decimal representation of an irrational number is always
(a) terminating (b) terminating repeating
(c) non-terminating repeating
(d) non-terminating non-repeating

(5) The product of any two irrational numbers is
(a) always an irrational number
(b) always a rational number
(c) always an integer
(d) sometimes rational, sometimes irrational

(6) The difference of a rational number and an irrational number is
(a) an integer
(b) may be rational number
(c) always a rational number
(d) always an irrational number

(7) The square of an irrational number is
(a) always an integer
(b) always a rational number
(c) always an irrational number
(d) sometimes rational, sometimes irrational.

(8) The decimal expansion of the number $\sqrt{2}$ is
(a) a finite decimal.
(b) 1.41421
(c) non-terminating recurring

(d) non-terminating non-recurring

(9) The number of rational numbers between 10 and 15 is

(a) 4 (b) 6 (c) finite (d) infinite

(10) Which of the following is irrational?

(a) $\sqrt{\frac{4}{9}}$ (b) $\sqrt{\frac{12}{13}}$ (c) $\sqrt{7}$ (d) $\sqrt{81}$

(11) Every point on a number line represents one and only one _____number.

(12) The decimal expansion of a _____number is either terminating or non-terminating recurring.

(13) The decimal expansion of an irrational number is _____and _____.

(14) All the rational and irrational numbers taken together make up the collection of _____numbers.

(15) A number is called _____ number, if it cannot be written in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

(16) Rational number × Irrational number = _____number.

(17) Between two distance rational numbers, these exist _____ rational numbers.

(18) $(125)^{-1/3}$= _____.

(19) Two numbers are said to be _____ if they have no common factor other than 1.

(20) The number e(=2.7182818……) is _____ number.

(21) Find the value of $\sqrt{12}\times\sqrt{8}$.

(22) Which numbers have their decimal expansions non-terminating and non-repeating?

(23) What is the simplified value of $(81)^{-\frac{1}{4}} \div (81)^{\frac{1}{4}}$?

(24) Simplify :$\frac{2\sqrt{3}}{3} - \frac{\sqrt{3}}{6}$.

(25) If x =3 +$2\sqrt{2}$, then find whether x + $\frac{1}{x}$ is rational or irrational.

(26) Find the value of $\sqrt{\frac{2+\sqrt{3}}{2-\sqrt{3}}}$, if $\sqrt{3}$ =1.73.

(27) Represent the following numbers on the number line: 7, 7.2, $-\frac{3}{2}$, $-\frac{12}{25}$.

(28) Find three rational numbers between $\frac{5}{7}$and $\frac{9}{11}$.

(29) Represent $3+\sqrt{5}$ on the number line.

(30) Find the value of $\sqrt{18}\times\sqrt{6}$.

(31) What is the simplified value of $(81)^{-\frac{1}{4}} \div (81)^{\frac{1}{4}}$?

(32) Express $0.\overline{3}$in the form of $\frac{p}{q}$, where p and q are integers and $q\neq 0$.

(33) Represent $\sqrt{10.5}$ on the number line.

(34) If x =2 + $\sqrt{3}$, find the value of $x^2 + \frac{1}{x^2}$.

(35) Express $\frac{1}{1+\sqrt{2}-\sqrt{3}}$ with rational denominator.

(36) Simplify :$\frac{\sqrt{7}+\sqrt{2}}{1+\sqrt{2}-\sqrt{3}}$ with rational denominator.

(37) Evaluate: $[8]^{1/2}(64^{1/3} + 125^{1/3})^3]^{1\backslash 4}$

(38) Simplify :$\frac{7}{2\sqrt{3}-\sqrt{5}} - \frac{2}{\sqrt{3}+\sqrt{2}} - \frac{3}{\sqrt{5}-\sqrt{2}}$.

(39) Express $\frac{1}{1+\sqrt{2}-\sqrt{3}}$ with rational denominator.

(40) Simplify :$\frac{\sqrt{7}+\sqrt{2}}{1+\sqrt{2}-\sqrt{3}}$ with rational denominator.

(41) Evaluate: $[8]^{1/2}(64^{1/3} + 125^{1/3})^3]^{1\backslash 4}$

(42) Simplify :$\frac{2\sqrt{3}}{3} - \frac{\sqrt{3}}{6}$.

(43) If x =3 +$2\sqrt{2}$, then find whether x + $\frac{1}{x}$ is rational or irrational.

(44) Find the value of $\sqrt{\frac{2+\sqrt{3}}{2-\sqrt{3}}}$, if $\sqrt{3}$ =1.73.

(45) Is zero a rational number? Can you write it in the form $\frac{p}{q}$, where p and q are integers and q ≠ 0?

(46) Find six rational numbers between 3 and 4.

(47) Find three rational numbers between $\frac{1}{3}$and $\frac{1}{2}$.

(48) Find five rational numbers between $\frac{3}{5}$and $\frac{4}{5}$.

(49) Find eight rational numbers between $\frac{2}{7}$and $\frac{3}{5}$.

(50) Insert nine rational numbers between 0 and 0.1.

(51) Find ten rational numbers between - $\frac{2}{3}$and $\frac{1}{4}$.

(52) Find three rational numbers $\frac{1}{5}$and $\frac{1}{3}$.

(53) Find three rational numbers between $\frac{3}{7}$and $-\frac{3}{5}$.

(54) Find eight rational numbers between 2 and 3.

(55) Find ten rational numbers between $-\frac{1}{9}$and $\frac{4}{9}$.

(56) Find the decimal expansions of $\frac{5}{8}$, $\frac{1}{3}$ and $\frac{1}{7}$.

(57) What can be the maximum number if digits be in the repeating block of digits in the decimal expansion of $\frac{1}{17}$? Perform the division to check your answer.

(58) Express each of the following numbers in the form $\frac{p}{q}$, where p and q are integers and q ≠ 0.

(i) 0.575 (ii) 3.125 (iii) –0.052

(59) Express the following in the $\frac{p}{q}$, where p and q are integers and q ≠ 0.

(i) $0.\overline{6}$ (ii) $1.\overline{27}$ (iii) $0.\overline{001}$

(60) Express $23.\overline{43}$ in the form $\frac{p}{q}$, where p and q are integers and q ≠ 0.

(61) Show that 0.142857142857....= $\frac{1}{7}$.

(62) Simplify : $0.\overline{87} + 0.\overline{6}$

(63) Simplify: $0.39\overline{285714} \times 0.15\overline{90}$.

(64) Write three numbers whose decimal expansions are non-terminating non-recurring.

(65) Classify the following numbers as rational or irrational:

(i) $\sqrt{23}$ (ii) $\sqrt{225}$ (iii) 0.3796 (iv) 7.478478

(v) 1.101001000100001.....

(66) Find an irrational number between $\frac{1}{7}$ and $\frac{2}{7}$.

(67) Find the three different irrational numbers between the rational numbers $\frac{5}{7}$ and $\frac{9}{11}$.

(68) Classify the following numbers as rational or irrational with justification.

(i) $\sqrt{\frac{9}{27}}$ (ii) $\sqrt{\frac{28}{343}}$

(69) Represent $\sqrt{9.3}$ on the number line.

(70) If a = $\frac{2+\sqrt{5}}{2-\sqrt{5}}$ and b = $\frac{2-\sqrt{5}}{2+\sqrt{5}}$, then find the value of $a^2 - b^2$.

(71) Represent $(1 + \sqrt{9.5})$ on the number line.

(72) Simplify: $\frac{\sqrt{a^2-b^2}+a}{\sqrt{a^2-b^2}+b} \div \frac{\sqrt{a^2-b^2}-b}{a-\sqrt{a^2-b^2}}$

(73) Find the product of $(x + \sqrt{2})$ and $(\sqrt{2}x + 1)$

(74) Evaluate : (i) $\sqrt{2 + 2\sqrt{6}}$ (ii) $\sqrt{8 - 2\sqrt{15}}$

(75) If $a = 2+ \sqrt{3}$, then find the value of $a - \frac{1}{a}$.

(76) If $a = 8 + 3\sqrt{7}$, $b = \frac{1}{a}$, then find the value of $a^2 + b^2$.

(77) If $a = 7 - 4\sqrt{3}$, then find the value of $\sqrt{a} + \frac{1}{\sqrt{a}}$.

(78) If $a = 1-\sqrt{2}$, find the value of $\left(a - \frac{1}{a}\right)^3$.

(79) If a = $\frac{2-\sqrt{5}}{2+\sqrt{5}}$ and b = $\frac{2+\sqrt{5}}{2-\sqrt{5}}$, then find $(a + b)^3$.

(80) If x = $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$ and y = $\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$, then find the value of $x^2 + y^2$.

(81) If x = $\frac{\sqrt{2}+1}{\sqrt{2}-1}$ and y = $\frac{\sqrt{2}-1}{\sqrt{2}+1}$, find the value of $x^2 + y^2 + xy$.

(82) If a = $\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ and b = $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$, find the value of $a^2 + b^2 - 5ab$.

(83) If $x = 3 - 2\sqrt{2}$, find the value of $x^4 + \frac{1}{x^4}$.

(84) If $x = \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ and $y = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$, find the $x^3 + y^3$.

(85) If $x = \left(2+\sqrt{5}\right)^{1/2} + \left(2-\sqrt{5}\right)^{1/2}$ and $y = \left(2+\sqrt{5}\right)^{1/2} - \left(2-\sqrt{5}\right)^{1/2}$

(86) If $x = \frac{\sqrt{a+2b}-\sqrt{a-2b}}{\sqrt{a+2b}-\sqrt{a-2b}}$, show that $bx^2 - ax + b = 0$.

(87) If $a = \frac{\sqrt{5}+1}{\sqrt{5}-1}$ and $b = \frac{\sqrt{5}-1}{\sqrt{5}+1}$, find the value of $\frac{a^2+ab+b^2}{a^2-ab+b^2}$.

(88) Simplify : $\frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}} - \frac{2\sqrt{5}}{\sqrt{6}+\sqrt{5}} - \frac{3\sqrt{2}}{\sqrt{15}+3\sqrt{2}}$

(89) Simplify : $\frac{\sqrt{5}+\sqrt{3}}{\sqrt{80}+\sqrt{48}-\sqrt{45}-\sqrt{27}}$

(90) If $x = 3 + 2\sqrt{2}$, find the value of $x^4 + \frac{1}{x^4}$.

(91) If $x = 7 + 4\sqrt{3}$, find the value of $x^2 - \frac{1}{x^2}$.

(92) If $\sqrt{2} = 1.4142$ and $\sqrt{6} = 2.4495$, then evaluate upto three places of decimal, $\frac{1}{\sqrt{3}-\sqrt{2}-1}$.

(93) $x^2 = 5 \Rightarrow x = \pm\sqrt{5}$ = an irrational number.

(94) $\omega^3 = 27 \Rightarrow \omega = \sqrt[3]{3\times 3\times 3} = 3$ = a rational number.

(95) Find $64^{\frac{1}{2}}$.

(96) Simplify : $\frac{11^{\frac{1}{2}}}{14^{\frac{1}{4}}}$

(97) Simplify : $\left[\left(625^{-\frac{1}{2}}\right)^{-\frac{1}{4}}\right]^2$

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

(99) Express the following radical as powers:

(i) $\sqrt[4]{a}$ (ii) $\sqrt[5]{a^3}$ (iii) $\sqrt[7]{a^{-14}}$

(100) Arrange the following in ascending order of their magnitudes: $\sqrt{3}$, $\sqrt[3]{4}$, $\sqrt[4]{6}$

(101) Arrange the following in descending order of their magnitudes: $\sqrt[3]{18}$, $\sqrt[6]{144}$, $\sqrt{6}$.

(102) Prove that : $\left(\frac{x^a}{x^b}\right)^{a+b} . \left(\frac{x^b}{x^a}\right)^{b+c} . \left(\frac{x^c}{x^a}\right)^{c+a} = 1$.

(103) Prove that : $\left(\frac{x^a}{x^b}\right)^{a^2+ab+b^2} . \left(\frac{x^b}{x^c}\right)^{b^2+bc+b^2} . \left(\frac{x^c}{x^a}\right)^{c^2+ca+a^2} = 1$.

(104) Prove that : $\sqrt{x^{-1}y} . \sqrt{y^{-1}z} . \sqrt{z^{-1}x} = 1$

(105) Solve the equation : $2^{2x+1} = 2^{3x-1}$

(106) If $\sqrt[5]{\sqrt[4]{x^{20}}} = x^p$ find 'p'.

(107) If $a^x = b^y = c^z$ and $b^2=ac$, prove that $\frac{1}{x} + \frac{1}{z} = \frac{2}{y}$

(108) A rational number between $\sqrt{2}$ and $\sqrt{3}$.

(109) If $a = 7 - 4\sqrt{3}$, then find the value of $\sqrt{a} + \frac{1}{\sqrt{a}}$.

(110) If $a = 1 - \sqrt{2}$, find the value of $\left(a - \frac{1}{a}\right)^3$.

(111) Express the following radicals as powers : $\sqrt[7]{a^{-14}}$.

(112) Simplify: $0.\overline{6} \times 0.00\overline{27}$

(113) If $\sqrt{2} = 1.4142$ and $\sqrt{6} = 2.4495$, then evaluate upto three places of decimal, $\frac{1}{\sqrt{3}-\sqrt{2}-1}$.

(114) If $x = 7+4\sqrt{3}$, find the value of $x^2 - \frac{1}{x^2}$.

(115) Show that $\frac{1}{2+\sqrt{3}} + \frac{2}{\sqrt{5}-\sqrt{3}} - \frac{1}{2-\sqrt{5}} = 0$.

(116) Simplify : $\frac{\sqrt{a+x}+\sqrt{a-x}}{\sqrt{a+x}-\sqrt{a-x}}$ and find its value when $x = \frac{2ab}{1+b^2}$.

(117) If $x = \frac{5-\sqrt{21}}{2}$, prove that $\left(x^3 + \frac{1}{x^3}\right) - 5\left(x^2 + \frac{1}{x^2}\right) + \left(x + \frac{1}{x}\right) = 0$.

(118) If $x = \frac{1}{2-\sqrt{3}}$, find the value of $x^3 - 2x^2 - 7x + 5$.

(119) Show that $\frac{1}{\sqrt{2}-\sqrt{3}-\sqrt{5}} + \frac{1}{\sqrt{2}+\sqrt{3}-\sqrt{5}} = \frac{1}{\sqrt{2}}$

(120) Find a and b from the following:

$$\frac{1+\sqrt{48}}{5\sqrt{3}+4\sqrt{2}-\sqrt{72}-\sqrt{108}+\sqrt{8}+2} = a + b\sqrt{3}$$

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