

PRACTICE SHEET- CLASS IX (2020 -21)

NUMBER SYSTEM

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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
(A) There is no rational number (B) there is exactly one rational number (C) there are infinitely many rational numbers (D) there are 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. 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
5. 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
6. Which of the following is irrational?
(A) 0.14 (B) $0.14\overline{16}$ (C) $0.\overline{1416}$ (D) 0.4014001400014.....
7. Identify the following as rational or irrational numbers:
 - i) $\sqrt{16}$ ANS: $\sqrt{16} = 4$ (Rational)
 - ii) $\sqrt{\frac{4}{25}}$ ANS: $\sqrt{\frac{4}{25}} = \frac{2}{5}$ (Rational)
 - iii) 0.5918 ANS: $0.5918 = \frac{5918}{10000}$ (Rational)
 - iv) $5 + \sqrt{2} - (3 + \sqrt{2})$ ANS: $5 + \sqrt{2} - (3 + \sqrt{2}) = 2$ (Rational)
 - v) $\sqrt{20}$ ANS: $\sqrt{20} = \sqrt{4 \times 5} = 2\sqrt{5}$ (Irrational)
 - vi) $\sqrt{1.69}$ ANS: $\sqrt{1.69} = \sqrt{1.3 \times 1.3} = 1.3$ (Rational)
8. Are there two irrational numbers whose sum and product both are rationals ? Justify.
9. Find three rational numbers between $\frac{1}{5}$ and $\frac{1}{3}$.
10. Find three rational numbers between $-\frac{2}{5}$ and $-\frac{1}{5}$.
11. Find 4 rational numbers between $\frac{1}{2}$ and $\frac{3}{4}$

ANS: $\frac{11}{20}, \frac{12}{20}, \frac{13}{20}, \frac{14}{20}$

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12. Find 3 rational numbers between $\frac{1}{7}$ and $\frac{1}{3}$

ANS: $\frac{4}{21}, \frac{5}{21}, \frac{6}{21}$

13. Find 5 rational numbers between $\frac{1}{8}$ and $\frac{1}{5}$

ANS: $\frac{11}{80}, \frac{12}{80}, \frac{13}{80}, \frac{14}{80}, \frac{15}{80}$

14. Find 3 rational numbers between $\frac{2}{5}$ and $\frac{2}{3}$.

ANS: $\frac{7}{15}, \frac{8}{15}, \frac{9}{15}$

15. Express each of the following numbers as a decimal fraction.

i) $\frac{5}{8}$ ii) $\frac{12}{125}$ iii) $\frac{13}{625}$ iv) $\frac{7}{64}$ v) $\frac{3}{40}$ vi) $\frac{2}{3}$ vii) $\frac{7}{15}$ viii) $\frac{7}{6}$ ix) $\frac{13}{44}$ x) $\frac{437}{999}$.

16. Find one irrational number between 0 .01 and 0.13.

17. Represent the following decimals in the form of repeating decimals as a quotient of integers.

i) $0.2\overline{341}$ ii) $0.\overline{052}$ iii) $15.7\overline{12}$ iv) $0.\overline{47}$ v) $0.2\overline{45}$ vi) $1.21212121 \dots$
vii) $0.353535\dots$ viii) $0.\overline{6}$ ix) $0.12\overline{7}$ x) $2.\overline{124}$ xi) $0.1\overline{37}$

18. Express $0.8 + 0.\overline{7} + 0.4\overline{3}$ in the $\frac{p}{q}$ form, where p and q are integers $q \neq 0$ ANS: $\frac{181}{90}$

19. Give an example of each, of two different irrational numbers whose:

- i) Difference is a rational number ii) sum is a rational number
- iii) Product is rational number iv) quotient is rational number.

20. Give an example of two different irrational numbers whose difference is a rational number

21. Are there two irrational numbers whose sum and product both are rationals? Justify.

22. Insert two irrational numbers between i) 2 and 2.5 ii) 0.5 and 0.6 iii) 1 and 2

23. Simplify : $(\sqrt{11} - \sqrt{7})(\sqrt{11} + \sqrt{7})$ ANS: 4

24. Simplify : $(\sqrt{3} + \sqrt{5})^2$ ANS: $8 + 2\sqrt{15}$

25. Simplify : $\frac{\sqrt{10}}{\sqrt{5}}$ ANS: $\sqrt{2}$

26. If $x = \sqrt{7} + \sqrt{5}$ and $y = \sqrt{7} - \sqrt{5}$
find i) xy ii) $x^2 + y^2$ iii) $x^2 - y^2$

27. . If $x = 1 - \sqrt{2}$, find the value of

i) $x + \frac{1}{x}$ ii) $x - \frac{1}{x}$ iii) $x^2 + \frac{1}{x^2}$ iv) $x^2 - \frac{1}{x^2}$

28. Simplify by rationalising the denominator:

i. $\frac{5}{\sqrt{3}-\sqrt{5}}$ ANS: $-\left(\frac{5\sqrt{5}+5\sqrt{3}}{2}\right)$

ii. $\frac{1}{3+\sqrt{3}}$ ANS: $\frac{3-\sqrt{3}}{6}$

iii. $\frac{2+\sqrt{3}}{2-\sqrt{3}}$ ANS: $7 + 4\sqrt{3}$

$$\text{iv. } \frac{5+\sqrt{6}}{5-\sqrt{6}} \quad \text{ANS: } \frac{31+10\sqrt{6}}{19}$$

$$\text{v. } \frac{3\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}} \quad \text{ANS: } 9 + 2\sqrt{15}$$

$$29. \text{ Rationalise the denominator } \frac{30}{5\sqrt{3}-3\sqrt{5}} \quad \text{ANS: } 5\sqrt{3} + 3\sqrt{5}$$

$$30. \text{ Simplify: } \frac{(2+\sqrt{7})(2-\sqrt{7})}{(3+\sqrt{5})(3-\sqrt{5})}$$

31. Find the rational numbers a and b, such that

$$\text{i) } \frac{4+3\sqrt{5}}{4-3\sqrt{5}} = a + b\sqrt{5}. \quad \text{ii) } \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}} = a + b\sqrt{15}. \quad \text{iii) } \frac{(\sqrt{2}+1)^2}{3-\sqrt{2}} = a + b\sqrt{2}.$$

$$\text{iv) } \frac{\sqrt{2}+\sqrt{3}}{3\sqrt{2}-2\sqrt{3}} = a - b\sqrt{6} \quad \text{v) } \frac{5+2\sqrt{3}}{7+4\sqrt{3}} = a + b\sqrt{3}$$

$$32. \text{ What are the values of a and b if } \frac{\sqrt{5}-1}{\sqrt{5}+1} + \frac{\sqrt{5}+1}{\sqrt{5}-1} = a + b\sqrt{5}.$$

33. Simplify each of the following by rationalising the denominator.

$$\text{i) } \frac{5+\sqrt{6}}{5-\sqrt{6}} \quad \text{ii) } \frac{\sqrt{7}-\sqrt{5}}{\sqrt{7}+\sqrt{5}} \quad \text{iii) } \frac{2\sqrt{6}-\sqrt{5}}{3\sqrt{5}-2\sqrt{3}} \quad \text{iv) } \frac{\sqrt{5}-2}{\sqrt{5}+2} - \frac{\sqrt{5}+2}{\sqrt{5}-2}$$

34. Simplify :

$$\text{i) } \frac{\sqrt{6}}{\sqrt{2}+\sqrt{3}} + \frac{3\sqrt{2}}{\sqrt{6}+\sqrt{3}} - \frac{4\sqrt{3}}{\sqrt{6}+\sqrt{2}} \quad \text{ii) } \frac{2+\sqrt{3}}{2-\sqrt{3}} + \frac{2-\sqrt{3}}{2+\sqrt{3}} + \frac{\sqrt{3}-1}{\sqrt{3}+1}$$

$$\text{iii) } \frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}} - \frac{2\sqrt{5}}{\sqrt{6}+\sqrt{5}} - \frac{3\sqrt{2}}{\sqrt{15}+3\sqrt{2}}$$

$$35. \quad \text{If } a = \sqrt{2} + 1, \text{ find the value of } \left(a - \frac{1}{a}\right)^2 \quad \text{ANS: } 4$$

$$36. \quad \text{Prove that: } \frac{1}{1+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} \dots \dots \dots \frac{1}{\sqrt{8}+\sqrt{9}} = 2$$

$$37. \quad \text{Show that: } \frac{1}{3-\sqrt{8}} - \frac{1}{\sqrt{8}-\sqrt{7}} + \frac{1}{\sqrt{7}-\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{5}} + \frac{1}{\sqrt{5}-2} = 5.$$

$$38. \quad \text{Prove that: } \frac{1}{3+\sqrt{7}} + \frac{1}{\sqrt{7}+\sqrt{5}} + \frac{1}{\sqrt{5}+\sqrt{3}} + \frac{1}{\sqrt{3}+1} = 1$$

$$39. \text{ If } a = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}, \quad b = \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}} \text{ find } a^2 + b^2.$$

$$40. \text{ If } x = \sqrt{\frac{5+2\sqrt{6}}{5-2\sqrt{6}}}, \text{ show that } x^2(x-10)^2 = 1.$$

$$41. x = \frac{\sqrt{2}+1}{\sqrt{2}-1} \text{ and } y = \frac{\sqrt{2}-1}{\sqrt{2}+1} \text{ show that } x^2 + xy + y^2 = 35.$$

$$42. \text{ Taking } \sqrt{2} = 1.414, \quad \sqrt{3} = 1.732 \quad \sqrt{5} = 2.236, \quad \sqrt{6} = 2.449 \text{ find :}$$

$$\text{i) } \frac{4}{3\sqrt{3}-2\sqrt{2}} + \frac{3}{3\sqrt{3}+2\sqrt{2}} \quad \text{ii) } \frac{1+\sqrt{2}}{\sqrt{5}+\sqrt{3}} + \frac{1-\sqrt{2}}{\sqrt{5}-\sqrt{3}}.$$

43. Simplify:

$$\text{i) } (9)^{\frac{3}{2}} \quad \text{ANS: } 27$$

ii) $(16)^{\frac{-3}{2}}$

ANS: $\frac{1}{64}$

iii) $(64)^{\frac{1}{3}}$

ANS: 4

iv) $(32)^{\frac{3}{5}}$

ANS: 8

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

ANS: 2

vi) $\frac{(7)^{\frac{1}{5}}}{(7)^{\frac{1}{3}}}$

ANS: $(7)^{\frac{-2}{15}}$

44. $\sqrt{\frac{q}{p}} = \left(\frac{p}{q}\right)^{1-2x}$ then the value of $x =$ ____.

45. If $3^x - 3^{x-1} = 18$ then the value of $x^x =$ ____.

ANS: 27

46. Solve for x : $\left(\frac{8}{3}\right)^{3-x} = \left(\frac{3}{8}\right)^{2x-1}$.

47. Simplify: $\left[5\left(8^{\frac{1}{3}} + 27^{\frac{1}{3}}\right)^3\right]^{\frac{1}{4}}$

ANS: 5

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

49. If $\left(\frac{a}{b}\right)^{x-1} = \left(\frac{b}{a}\right)^{x-3}$, find x .

ANS: 2

50. Find the value of $\frac{(27)^{2/3} \times 8^{2/3}}{(9)^{\frac{3}{2}}}$

ANS: 4/3

51. $\sqrt{2^{(x+3)}} = 16$ then the value of $x =$?

ANS: 5

52. $2^{x-1} + 2^{x+1} = 320$, then the value of x

ANS: 7

53. Simplify : $(1^3 + 2^3 + 3^3)^{1/2}$

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

55. Show that : $\left(\frac{x^p}{x^q}\right)^{p+q} \left(\frac{x^r}{x^p}\right)^{r+p} \left(\frac{x^q}{x^r}\right)^{q+r} = 1$

56. If $17^{\frac{x}{5}} = 289$ find x .

57. Simplify : $8^{\frac{3}{2}} - \sqrt{9}(10)^0 + \left(\frac{1}{144}\right)^{-\frac{1}{2}}$.

58. $\frac{5}{3+\sqrt{n}}$ when rationalised becomes $3 - \sqrt{n}$ find n .

59. Give an example of two different irrational numbers whose quotient is a rational number.

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

61. Simplify: $16^{-\frac{1}{4}} \times \sqrt[4]{16}$