



5. If  $a = \sqrt{3} + \sqrt{2}$  and  $b = \sqrt{3} - \sqrt{2}$ , calculate  $a^2 - b^2$ .

6. Prove that  $3 + 2\sqrt{7}$  is irrational.

7. Express  $\frac{1}{\sqrt{7}-\sqrt{3}}$  in the form  $a + b\sqrt{3}$ , where  $a, b$  are rational.

8. Simplify  $\sqrt{50} + \sqrt{72} - \sqrt{32}$ .

9. If  $x = \sqrt{2} + 1$ , find the value of  $x^3 - 3x$ .

10. Prove that  $\sqrt{2} + \sqrt{3}$  cannot be expressed as a rational number.

## 2. Properties of Real Numbers

11. Prove that the sum of two irrational numbers may be rational, with an example.

12. Verify the associative property of multiplication for  $\frac{1}{2}, \frac{3}{4}, \frac{5}{6}$ .

13. If  $a = 2 + \sqrt{3}$ , find  $a^2 + 2a - 3$ .

14. Simplify  $(\sqrt{3} + \sqrt{2})^3 - (\sqrt{3} - \sqrt{2})^3$ .

15. Prove that  $(\sqrt{5} + \sqrt{3})(\sqrt{5} - \sqrt{3}) = 2$ .

16. If  $a = \sqrt{3} - 1$ , find the value of  $a^4 + 4a^2 + 1$ .

17. Simplify  $\frac{1}{\sqrt{3}+\sqrt{2}} + \frac{1}{\sqrt{3}-\sqrt{2}}$ .

18. Prove that  $\sqrt{7} - \sqrt{5}$  is irrational.

19. Verify the distributive property of multiplication over addition for  $\sqrt{3}, 2, \sqrt{2}$ .

20. If  $x = \sqrt{5}$ , evaluate  $x^3 - 3x^2 + 3x - 1$ .

### 3. Decimal Representation of Real Numbers

21. Write  $\frac{7}{8}$  as a terminating decimal.

22. Express  $\frac{1}{11}$  as a repeating decimal.

23. If  $x = 0.\overline{142857}$ , prove that  $x = \frac{1}{7}$ .

24. Convert  $0.333\dots$  into a fraction.

25. Show that  $0.\overline{1234}$  is rational.
26. Write  $\frac{23}{40}$  as a decimal and state whether it is terminating or repeating.
27. Express  $\frac{25}{99}$  as a repeating decimal.
28. Prove that  $\pi$  is non-terminating and non-repeating.
29. If  $x = 0.\overline{36}$ , express  $x$  as a fraction.
30. Show that  $1.1010010001\dots$  is neither rational nor terminating.

#### 4. Prime Factorization and LCM/HCF

31. Find the LCM and HCF of 72 and 120 using prime factorization.

32. Verify that  $\text{LCM} \cdot \text{HCF} = \text{Product of Numbers}$  for 45 and 60.

33. Find the smallest number divisible by 6, 8, and 12.

34. Determine the greatest number that divides 84, 108, and 144.

35. Write 126 as a product of its prime factors.

36. Find the HCF of 168 and 180 using Euclid's algorithm.

37. Determine the smallest number divisible by 9, 15, and 21.

38. Prove that  $\text{HCF}(a, b) \times \text{LCM}(a, b) = ab$  for  $a = 20, b = 30$ .

39. Find the HCF of 175 and 105 using the division method.

40. Calculate the LCM of 24, 36, and 54 using prime factorization.

## 5. Rationalization

41. Rationalize  $\frac{1}{\sqrt{5}}$ .

42. Simplify  $\frac{3}{\sqrt{7}+\sqrt{5}}$ .

43. Rationalize  $\frac{\sqrt{3}}{\sqrt{5}-\sqrt{3}}$ .

44. Simplify  $\frac{1}{\sqrt{2}+1} + \frac{1}{\sqrt{2}-1}$ .

45. Rationalize  $\frac{\sqrt{5}+1}{\sqrt{5}-1}$ .

46. If  $x = \frac{1}{\sqrt{3}+1}$ , find  $x^2$ .

47. Simplify  $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$ .

48. Rationalize  $\frac{1}{\sqrt{11+2\sqrt{3}}}$ .

49. Simplify  $\frac{\sqrt{7}-2}{\sqrt{7}+2}$ .

50. Rationalize  $\frac{1}{\sqrt{10}-3}$ .