Chapter 1 — Number Systems

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1. Find the six rational number between 3 and 4.
2. Find five rational numbers between $\frac{3}{5}$ and $\frac{4}{5}$.
3. Show how $\sqrt{5}$ can be represented on the number line.
4. Find the three rational number between 2 and 3.
5. Find two rational numbers between $\frac{1}{2}$ and $\frac{1}{3}$.
6. Find three rational numbers between $\frac{5}{6}$ and $\frac{6}{7}$.
7. Show that $\sqrt{6}$ can be represented on a number line.
8. Express (a) 0.33……. (b) 0.234234….. in $\frac{p}{q}$ form.
9. Express the following in the form $\frac{p}{q}$ where p and q are integers and q≠0.
   (a) $0.\overline{7}$ (b) $0.\overline{68}$ (c) $0.\overline{002}$ (d) $0.\overline{67}$
10. Express the following in the form $\frac{p}{q}$ where p and q are integers and q≠0.
    (a) $0.\overline{6}$ (b) $0.\overline{47}$ (c) $0.\overline{001}$ (d) $0.\overline{27}$
11. Classify the following numbers as rational or irrational :
    (a) $3 - \sqrt{7}$ (b) $(5 + 2\sqrt{11} - \sqrt{11})$ (c) 7π.
12. Simplify each of the following expressions : -
    (a) $(5 + \sqrt{7})(3 + \sqrt{3})$ (b) $(5 + \sqrt{11})(5 - \sqrt{11})$
    (c) $(\sqrt{6} + \sqrt{3})^2$ (d) $(\sqrt{13} + \sqrt{7}) (\sqrt{13} - \sqrt{7})$.
13. Rationalise the denominator of the following :
    (a) $\frac{1}{\sqrt{5}}$ (b) $\frac{1}{\sqrt{10}-\sqrt{8}}$
    (c) $\frac{1}{\sqrt{5}+\sqrt{3}}$ (d) $\frac{1}{\sqrt{6}-\sqrt{5}}$.
14. Rationalise the denominator of $\frac{1}{\sqrt{2}}$.
15. Rationalise the denominator of $\frac{1}{2+\sqrt{3}}$.
16. Rationalise the denominator of $\frac{1}{\sqrt{3}-\sqrt{2}}$.
17. Rationalise the denominator of $\frac{1}{\sqrt{7}+\sqrt{2}}$.

18. *Simplify each of the following by rationalising the denominator :*

(a) $\frac{\sqrt{3}-1}{\sqrt{3}+1}$ (b) $\frac{5+\sqrt{6}}{5-\sqrt{6}}$ (c) $\frac{\sqrt{7}-\sqrt{5}}{\sqrt{7}+\sqrt{5}}$ (d) $\frac{7+3\sqrt{5}}{7-3\sqrt{5}}$

(e) $\frac{2\sqrt{3}-\sqrt{5}}{2\sqrt{2}+3\sqrt{3}}$ (f) $\frac{2\sqrt{6}-\sqrt{5}}{3\sqrt{5}+2\sqrt{6}}$ (g) $\frac{7\sqrt{3}-5\sqrt{2}}{\sqrt{48}+\sqrt{18}}$ (h) $\frac{1}{1+\sqrt{2}-\sqrt{3}}$

(i) $\frac{1}{3+\sqrt{5}-2\sqrt{2}}$ (j) $\frac{1}{\sqrt{6}+\sqrt{5}-\sqrt{11}}$

19. *Find the value of each of the following :*

(a) $16^{\frac{1}{2}}$ (b) $243^{\frac{1}{5}}$ (c) $15625^{\frac{1}{6}}$ (d) $8^{\frac{5}{3}}$

20. *Find the value of :*

(a) $\left(\frac{81}{16}\right)^{\frac{3}{4}}$ (b) $\left(\frac{625}{81}\right)^{\frac{1}{4}}$ (c) $\left(\frac{343}{1331}\right)^{\frac{1}{3}}$ (d) $\left(\frac{256}{6561}\right)^{-\frac{5}{8}}$

21. *Simplify each of the following :*

(a) $23^{\frac{1}{2}} \times 23^{\frac{1}{2}}$ (b) $11^{-\frac{4}{3}} \times 11^{-\frac{5}{3}}$ (c) $3 \times 9^{\frac{3}{2}} \times 9^{-\frac{1}{2}}$ (d) $27^{\frac{1}{3}} \times 27^{\frac{2}{3}} \times 27^{-\frac{4}{3}}$

22. *Evaluate each of the following :*

(a) $(3^2 + 4^2)^{-\frac{1}{2}}$ (b) $(5^2 + 12^2)^{\frac{3}{2}}$ (c) $(17^2 - 8^2)^{\frac{1}{2}}$ (d) $(1^3 + 2^3 + 3^3)^{-\frac{5}{2}}$

23. *Simplify :* $\sqrt{8} + \sqrt{32} - \sqrt{2}$.

24. *Write two rational number between* $\frac{2}{3}$ *and* $\frac{2}{5}$.

25. *Find the value of x if (a)* $5^{x-1} = 125$ *(b)* $2^{x+2} = 128$