VIDYA
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ADVANCE
MATHEMATICS

Teacher's
Resource Book

Class 8

2. (i) $\dfrac{48}{72} = \dfrac{4}{6} = \dfrac{\mathbf{2}}{\mathbf{3}}$ (ii) $\dfrac{-65}{91} = \dfrac{\mathbf{-5}}{\mathbf{7}}$ (iii) $\dfrac{-125}{-175} = \dfrac{125}{175} = \dfrac{\mathbf{5}}{\mathbf{7}}$

    (iv) $\dfrac{-63}{135} = \dfrac{\mathbf{-7}}{\mathbf{15}}$ (v) $\dfrac{231}{-1001} = \dfrac{\mathbf{-3}}{\mathbf{13}}$

5. $\dfrac{10}{16}, \dfrac{35}{56}, \dfrac{80}{128}, \dfrac{1200}{1920}, \dfrac{5000}{8000}$

6. (i) $\dfrac{2}{3} + \dfrac{7}{6} + \dfrac{1}{12}$

    The L.C.M. of 3, 6, 12 is 24.

$$= \dfrac{8 \times 2 + 4 \times 7 + 2 \times 1}{24} = \dfrac{16 + 28 + 2}{24} = \dfrac{46}{24} = \dfrac{\mathbf{23}}{\mathbf{12}}$$

    (ii) Do yourself.

    (iii) $\dfrac{7}{5} + \dfrac{11}{15} + \dfrac{13}{20}$

    The L.C.M of, 5, 15, 20 is 60.

$$= \dfrac{7 \times 12 + 11 \times 4 + 13 \times 3}{60} = \dfrac{84 + 44 + 39}{60} = \dfrac{\mathbf{167}}{\mathbf{60}}$$

    (iv) $\dfrac{4}{7} + \dfrac{21}{70} + \dfrac{3}{5}$

    The L.C.M. of 5, 7 and 70 is 70.

$$= \dfrac{4 \times 10 + 21 \times 1 + 14 \times 3}{70} = \dfrac{40 + 21 + 42}{70} = \dfrac{\mathbf{103}}{\mathbf{70}}$$

7. (i) $\dfrac{4}{5} - \dfrac{2}{5} = \dfrac{2}{5}$ (ii) $\dfrac{4}{5} - \dfrac{2}{3} = \dfrac{12 - 10}{15} = \dfrac{\mathbf{2}}{\mathbf{15}}$

    (iii) $\dfrac{1}{6} - \dfrac{4}{5} = \dfrac{5 \times 1 - 6 \times 4}{30} = \dfrac{5 - 24}{30} = \dfrac{\mathbf{-19}}{\mathbf{30}}$

    (iv) Do yourself.   (v) Do yourself.

    (vi) $0 - \dfrac{7}{9} = \dfrac{\mathbf{-7}}{\mathbf{9}}$

8. (i) $\dfrac{2}{3} + \dfrac{4}{5} - \dfrac{1}{6}$

    The L.C.M. of 3, 5 and 6 is 30.

$$= \dfrac{2 \times 10 + 4 \times 6 + (-1 \times 5)}{30} = \dfrac{20 + 24 - 5}{30} = \dfrac{44 - 5}{30} = \dfrac{39}{30} = \dfrac{\mathbf{13}}{\mathbf{10}}$$

    (ii), (iii) Do yourself.

    (iv) $3 + \dfrac{1}{2} - 6\dfrac{1}{4} = \dfrac{3}{1} + \dfrac{1}{2} - \dfrac{25}{4}$ The L.C.M. of 1, 2 and 4 is 4.

$$\Rightarrow \quad \dfrac{3 \times 4 + 1 \times 2 - 25 \times 1}{4} = \dfrac{12 + 2 - 25}{4} = \dfrac{14 - 25}{4} = \dfrac{\mathbf{-11}}{\mathbf{4}}$$

9. (i) $\dfrac{4}{5} \times \dfrac{7}{8} = \dfrac{\mathbf{7}}{\mathbf{10}}$ (ii) $\dfrac{2}{3} \times \dfrac{6}{11} = \dfrac{\mathbf{4}}{\mathbf{11}}$

(iii) Do yourself. (iv) $\dfrac{4}{11} \times \left(\dfrac{-1}{6}\right) = \dfrac{-4}{66} = \dfrac{\mathbf{-2}}{\mathbf{33}}$

11. $x + \dfrac{5}{11} = \dfrac{-26}{33} \Rightarrow x = \dfrac{-26}{33} - \dfrac{5}{11} = \dfrac{-26 \times 1 - 3 \times (5)}{33}$

$$= \dfrac{-26 - 15}{33} = \dfrac{\mathbf{-41}}{\mathbf{33}}$$

12. Let the one number be x.

$x + \dfrac{-15}{4} = \dfrac{3}{2} \Rightarrow x = \dfrac{3}{2} + \dfrac{15}{4} = \dfrac{3 \times 2 + 15 \times 1}{4} = \dfrac{6 + 15}{4} = \dfrac{\mathbf{21}}{\mathbf{4}}$

14. Let the other number be x ; $\Rightarrow -5 \times x = -9$; $x = \dfrac{9}{5} = \mathbf{1}\dfrac{\mathbf{4}}{\mathbf{5}}$

15. $\dfrac{-5}{6} \times x = \dfrac{\mathbf{-25}}{\mathbf{18}}$ $x = \dfrac{25 \times 6}{5 \times 18} = \dfrac{5}{3} = \mathbf{1}\dfrac{\mathbf{2}}{\mathbf{3}}$

16. Sum $= \dfrac{-3}{2} + \dfrac{-9}{4} = \dfrac{-6 - 9}{4} = \dfrac{-15}{4}$

Difference $= \dfrac{-3}{2} + \dfrac{9}{4} = \dfrac{-6 + 9}{4} = \dfrac{3}{4}$

Divide $= \dfrac{-15 \times 4}{4 \times 3} = \mathbf{-5}$

17. (i) $\dfrac{27}{64} = \dfrac{3^3}{4^3} = \left(\dfrac{3}{4}\right)^3$

3	27
3	9
3	3
	1

4	64
4	16
4	4
	1

(ii), (iii), (iv) Do yourself.

18. $\left(\dfrac{6}{7}\right)^4 \times \left(\dfrac{6}{7}\right)^{-9} = \left(\dfrac{6}{7}\right)^{2m-1}$ $\Rightarrow$ $\left(\dfrac{6}{7}\right)^{4-9} = \left(\dfrac{6}{7}\right)^{2m-1}$

$-5 = 2m - 1 \Rightarrow 2m = -4 \Rightarrow m = \mathbf{-2}$

19. $\left(\dfrac{3}{4}\right)^{-3} \div \left(\dfrac{4}{5}\right)^{-2} = \left(\dfrac{4}{3}\right)^3 \div \left(\dfrac{5}{4}\right)^2 = \dfrac{4 \times 4 \times 4}{3 \times 3 \times 3} \div \dfrac{5 \times 5}{4 \times 4}$

$$= \dfrac{4 \times 4 \times 4}{3 \times 3 \times 3} \times \dfrac{4 \times 4}{5 \times 5} = \dfrac{4^5}{3^3 \times 5^2}$$

Reciprocal $= \dfrac{\mathbf{3^3 \times 5^2}}{\mathbf{4^5}}$

20. $\dfrac{p}{q} = \left(\dfrac{16}{11}\right)^0 \div \left(\dfrac{32}{33}\right)^{-1} = \dfrac{p}{q} = 1 \div \left(\dfrac{33}{32}\right)^1 = 1 \times \dfrac{32}{33} = \dfrac{32}{33}$

$$\left(\dfrac{p}{q}\right)^{-2} = \left(\dfrac{32}{33}\right)^{-2} = \left(\dfrac{1024}{1089}\right)^{-1} = \mathbf{\dfrac{1089}{1024}}$$

21. (i) $\dfrac{1}{4} = \mathbf{0.25}$ \qquad\qquad\qquad (ii), (iii), (iv) Do yourself.

22. Do yourself.

23. (i) $\dfrac{2}{3} \times \dfrac{2}{3} = \left(\dfrac{\mathbf{2}}{\mathbf{3}}\right)^{\mathbf{2}}$ \qquad\qquad (ii), (iii), (iv) Do yourself.

24. (i) $123.456 = 1.23456 \times 10^2$ \qquad (ii) $2345.678 = 2.345678 \times 10^3$
(iii) $0.45678 = 4.5678 \times 10^{-1}$ \qquad (iv) $0.0076543 = 7.6543 \times 10^{-3}$

25. (i) $1.311 \times 10^{-2} = 131.1$ \qquad\qquad (ii), (iii) (iv) Do yourself.

26.
Days	Work
20	1
15	x

$$\dfrac{15}{20} = \dfrac{x}{1} \quad \Rightarrow \quad x = \dfrac{\mathbf{3}}{\mathbf{4}} \textbf{ part}$$

27.
Labours	Days
10	15
8	x

$$\dfrac{x}{15} = \dfrac{10}{8} \Rightarrow 8 \times x = 10 \times 15$$

$$x = \dfrac{10 \times 15}{8} = \mathbf{18\dfrac{3}{4}} \textbf{ days}$$

28. $\text{Speed} = \dfrac{\text{Distance}}{\text{Time}} \Rightarrow 4 = \dfrac{18}{t}$

$\Rightarrow \quad t = \dfrac{18}{4} = \dfrac{9}{2} \quad \Rightarrow \quad t = \mathbf{4\dfrac{1}{2}} \textbf{ hours}$

29. Do yourself.

30. Total Alloy $= 20 + 100 = 120$

$$\% \text{ of tin} = \dfrac{20 \times 100}{120} = \dfrac{50}{3} = \mathbf{16\dfrac{2}{3}} \mathbf{\%}$$

31., 32. Do yourself.

33. $\text{S.I.} = \dfrac{P \times R \times T}{100} = \dfrac{500 \times 12 \times 3}{100} = ₹\, 180$ \quad S.I. $= ₹\, \mathbf{180}$

Amount $= ₹\,(500 + 180) = ₹\,\mathbf{680}$

34., 35. Do yourself.

36. $\text{S.I.} = \dfrac{P \times R \times T}{100} \Rightarrow 227.50 = \dfrac{728 \times x \times 5}{100}$

$\Rightarrow x = \dfrac{22750}{5 \times 728}; \ x = \mathbf{6\dfrac{1}{4}\%}$

37. Do yourself.

38. (i) $x^4 - 81 = (x^2)^2 - (9)^2 = (x^2 + 9)(x^2 - 9)$
$= (x^2 + 9)[(x)^2 - (3)^2] = \mathbf{(x^2 + 9)(x + 3)(x - 3)}$

(ii) $12x^3 - 12x = 12x(x^2 - 1) = \mathbf{12x(x + 1)(x - 1)}$

(iii) $6(a - 3b)^2 - 4(a - 3b) = 2$
$(a - 3b) = \{3(a - 3b) - 2\}$
$= \mathbf{2(a - 3b)(3a - 9b - 2)}$

(iv) Do yourself.

39. Let the number be $2x$, x and $\dfrac{2x}{3}$

$$2x + x + \dfrac{2x}{3} = 132, \ \ 3x + \dfrac{2x}{3}$$
$$= 132, \ 9x + 2x = 132 \times 3,$$
$$11x = 132 \times 3 \Rightarrow x = \dfrac{132 \times 3}{11}, \ x = \mathbf{36}$$

The numbers be **72**, **36** and **24**.

40. Do yourself.

41. Let the breadth $= x$ and length $= 11 + x$
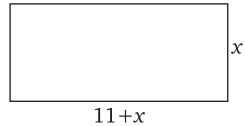Perimeter of rectangle $= 2 \times (l + b)$
$$126 = 2 \times (11 + x + x)$$
or $\qquad 63 = 11 + 2x$
$$63 - 11 = 2x \ \text{ or } \ 52 = 2x$$
$\Rightarrow \qquad\qquad x = \mathbf{26}$
Length $= 11 + 26 = \mathbf{37}$ cm, Breadth $= \mathbf{26\ cm}$

42. (i) $5a^2 - 6a(a - 2) + a\,(3 + 5a) = 5a^2 - 6a^2 + 12a + 3a + 5a^2$
$$= \mathbf{4a^2 + 15a}$$

(ii) $y(y^3 - 1) - y^2(y^2 - 1) - y^3(y - 1)$
$$= y^4 - y - y^4 + y^2 - y^4 + y^3$$
$$= \mathbf{-y^4 + y^3 + y^2 - y}$$

43. $(536)^2 - (136)^2 = 25x$
or $\quad (536 + 136)(536 - 136) = 25x$
or $\qquad\qquad 672 \times 400 = 25x$
or $\qquad\qquad x = \dfrac{400 \times 672}{25}$
$$= \mathbf{10752}$$

44. (i) $\dfrac{5.68 \times 5.68 - 2.68 \times 2.68}{5.68 + 2.68}$ Let $a = 5.68, \ b = 2.68$

$$= \frac{a \times a - b \times b}{a+b} = \frac{a^2 - b^2}{a+b} = \frac{(a+b)(a-b)}{(a+b)}$$

$$= a - b = 5.68 - 2.68 = \mathbf{3}$$

(ii) Do yourself.

49. $105° + 30° + x = 180°$, $x = 180° - (105° + 30°) = 180° - 135° = \mathbf{45°}$

50. $x + x + 2x = 180°$, $4x = 180° \Rightarrow x = 45°$,

$$\mathbf{45°, 45°} \text{ and } \mathbf{90°}$$
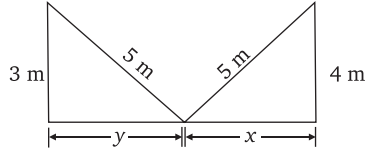
52. $5^2 = 3^2 + y^2$

$25 = 9 + y^2 \Rightarrow y^2 = 16$

$\Rightarrow \qquad\qquad y = 4$

$5^2 = 4^2 + x^2$,

$25 = 16 + x^2 \Rightarrow x^2 = 9 \Rightarrow x = 3$

Width of the road $= x + y = 3 + 4 = \mathbf{7\ m}$

54. Let the angles be $x, 3x, 7x, 9x$

$$x + 3x + 7x + 9x = 360; 20x = 360 \Rightarrow x = 18°,$$

$$\mathbf{18°, 54°, 126°, 162°}$$

55. $6a^2 = 1176 \Rightarrow a^2 = \dfrac{1176}{6} \Rightarrow a^2 = 196 \Rightarrow a = 14\,\text{cm}$,

Volume of cube $= a^3 = (14)^3 = \mathbf{2744\ cm^3}$

Unit-I : Number System

1.   Rational Numbers

EXERCISE 1.4

7.

$$\text{Speed} = 65\frac{1}{3}\,\text{km/h.}$$

$$\text{or} = \frac{196}{3}\,\text{km/h.}$$

$$\text{Time} = 6\frac{1}{2}\,\text{hours}$$

$$= \frac{13}{2}\,\text{hours.}$$

$$\text{Distance} = \text{Speed} \times \text{Time} = \frac{196}{3} \times \frac{13}{2}$$

$$= \frac{98}{3} \times 13 = \frac{1274}{3} = \mathbf{424\frac{2}{3}\ km}$$

8.   Cost of 1 litre milk $= ₹\ 16\frac{1}{2}$

$$\text{Cost of } 3\frac{5}{7} \text{ litre milk} = ₹\ 16\frac{1}{2} \times 3\frac{5}{7}$$

$$= ₹\ \frac{33}{2} \times \frac{26}{7} = \frac{429}{7} = ₹\ \mathbf{61\frac{2}{7}}$$

EXERCISE 1.9

1. Quantity of paint that Ravi had $= \dfrac{3}{4}$ L

Quantity of paint used by Ravi for a room $= \dfrac{1}{2}$ L

Quantity of paint Ravi left $= \dfrac{3}{4}$ L $- \dfrac{1}{2}$ L

$$= \frac{3\,L - 2\,L}{4} = \mathbf{\frac{1}{4}\,L}$$

Let A L paint need to made it $= \dfrac{4}{5}$ L

Then $\dfrac{1}{4} + A = \dfrac{4}{5}$

$$A = \frac{4}{5} - \frac{1}{4}$$

$$= \frac{16 - 5}{20} = \mathbf{\frac{11}{20}\,L}$$

2. Total quantity of sugar with Kavita $= \dfrac{7}{9}$ cup

(a) Quantity of sugar that she used altogether $= \dfrac{1}{2} + \dfrac{1}{4}$

$$= \frac{2 + 1}{4} = \mathbf{\frac{3}{4}\ cup}$$

(b) Quantity of sugar she had left $= \dfrac{7}{9} - \dfrac{3}{4}$

$$= \frac{28 - 27}{36} = \mathbf{\frac{1}{36}\ cup}$$

3. (a)   Their total height $= 1\dfrac{7}{10}$ m $+ 1\dfrac{5}{8}$ m

$$= \frac{17}{10}\,m + \frac{13}{8}\,m$$

$$= \frac{68\,m + 65\,m}{40} = \mathbf{\frac{133}{40}\,m}$$

(b) Difference between their heights $= 1\dfrac{7}{10}$ m $- 1\dfrac{5}{8}$ m

$$= \frac{17}{10} \, m - \frac{13}{8} \, m$$

$$= \frac{68 \, m - 65 \, m}{40} = \frac{\mathbf{3}}{\mathbf{40}} \, \mathbf{m}$$

6. (a) Total time spent by pulkit $= \dfrac{1}{4} \, \text{hrs} + \dfrac{2}{5} \, \text{hrs}$

$$= \frac{5 \, \text{hrs} + 8 \, \text{hrs}}{20}$$

$$= \frac{\mathbf{13}}{\mathbf{20}} \, \mathbf{hrs}$$

(b) Time spent in cleaning the second classroom $= \dfrac{2}{5} \, \text{hrs} - \dfrac{1}{4} \, \text{hrs}$

$$= \frac{8 \, \text{hrs} - 5 \, \text{hrs}}{20} = \frac{\mathbf{3}}{\mathbf{20}} \, \mathbf{hrs}$$

7. Do yourself.

8. Fraction of money that eldest received $= \dfrac{7}{13}$

Fraction of remaining money $= 1 - \dfrac{7}{13} = \dfrac{6}{13}$

Fraction of money that next received $= \dfrac{6}{13} \times \dfrac{2}{3} = \dfrac{4}{13}$

Fraction of money that their third brother received $= \dfrac{6}{13} - \dfrac{4}{13}$

$$= \frac{6 - 4}{13} = \frac{\mathbf{2}}{\mathbf{13}}$$

9. Cost of 1 litre of milk $= ₹ \, \dfrac{4}{5}$

Cost of $\dfrac{15}{28}$ litre of milk $= ₹ \, \dfrac{4}{5} \times \dfrac{15}{28} = ₹ \, \dfrac{\mathbf{3}}{\mathbf{7}}$

10. Fraction of plank that is sawn off $= \dfrac{1}{5}$

Remaining part of plank $= 1 - \dfrac{1}{5} = \dfrac{4}{5}$

Fraction of plank that thrown away $= \dfrac{4}{5} \times \dfrac{3}{8} = \dfrac{3}{10}$

Fraction of the original plank remained $= \dfrac{4}{5} - \dfrac{3}{10}$

$$= \frac{8 - 3}{10} = \frac{5}{10} = \frac{\mathbf{1}}{\mathbf{2}}$$

11. Let two numbers are x and y

According to question $\quad x \times y = \dfrac{6}{5}$

Given, $\qquad\qquad\qquad\qquad x = \dfrac{1}{5}$

So, $\qquad\qquad\qquad\quad \dfrac{1}{5} \times y = \dfrac{6}{5}$

$$y = \dfrac{6}{5} \times \dfrac{5}{1}$$

$$y = 6$$

(a) Sum of two numbers $= x + y$

$$= \dfrac{1}{5} + \dfrac{6}{1} = \dfrac{1 + 30}{5} = \dfrac{\mathbf{31}}{\mathbf{5}}$$

(b) Difference of two numbers $= 6 - \dfrac{1}{5} = \dfrac{30 - 1}{5} = \dfrac{\mathbf{29}}{\mathbf{5}}$

14. Fraction of chocolate taken to $A = \dfrac{1}{4}$

Fraction of remaining part of chocolate $= 1 - \dfrac{1}{4} = \dfrac{3}{4}$

Fraction of chocolate taken to $B = \dfrac{3}{4} \times \dfrac{3}{8} = \dfrac{9}{32}$

Fraction of remaining part of chocolate $= \dfrac{3}{4} - \dfrac{9}{32}$

$$= \dfrac{24 - 9}{32} = \dfrac{15}{32}$$

Fraction of chocolate taken to $C = \dfrac{15}{32} \times \dfrac{5}{9} = \dfrac{25}{96}$

Fraction of chocolate taken to $D = \dfrac{15}{32} - \dfrac{25}{96}$

$$= \dfrac{45 - 25}{96} = \dfrac{20}{96} = \dfrac{\mathbf{5}}{\mathbf{24}}$$
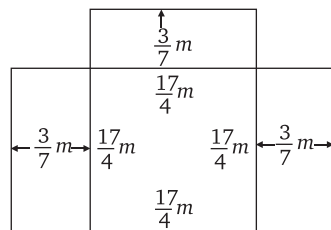
15. Do yourself.

16. From the figure

Area of the border

$$= \left(\dfrac{17}{4} \times \dfrac{3}{7}\right) + \left(\dfrac{17}{4} \times \dfrac{3}{7}\right) + \left(\dfrac{17}{4} \times \dfrac{3}{7}\right)$$

$$= \dfrac{51}{28} + \dfrac{51}{28} + \dfrac{51}{28}$$

$$= \dfrac{51 + 51 + 51}{28} = \dfrac{\mathbf{153}}{\mathbf{28}} \ \mathbf{m^2}$$

17. Length of paper box $l = \dfrac{25}{100}$ m

$$= \dfrac{25}{100} \times 100 \text{ cm} = 25 \text{ cm}$$

Breadth of paper box $b = \dfrac{16}{100}$ m

$$= \dfrac{16}{100} \times 100 \text{ cm} = 16 \text{ cm}$$

Height of paper box $h = \dfrac{5}{100}$ m

$$= \dfrac{5}{100} \times 100 \text{ cm} = 5 \text{ cm}$$

Required paper used to make the box $= 2 \, [l \times b + b \times h + h \times l]$

$$= 2\,[25\,\text{cm} \times 16\,\text{cm} + 16\,\text{cm} \times 5\,\text{cm} + 5\,\text{cm} \times 25\,\text{cm}]$$
$$= 2\,[400\,\text{cm}^2 + 80\,\text{cm}^2 + 125\,\text{cm}^2]$$
$$= 2\,[605\,\text{cm}^2]$$
$$= 1210\,\text{cm}^2$$

But surface area of lid will be subtract from total surface area then total paper used

$$= 1210 - 25 \times 16$$
$$= 1210 - 400$$
$$= \textbf{810 cm}^{\textbf{2}}$$

18. Area of hall $= 8\,\text{m} \times \dfrac{11}{2}\,\text{m} = 44\,\text{m}^2$

Per m^2 carpeting cost $= ₹\,\dfrac{21}{4}$

Required carpeting cost of hall $= ₹\,\dfrac{21}{4} \times 44$

$$= 21 \times 11 = ₹\,\textbf{2.31}$$

19. Radius of bucket $= \dfrac{22}{100}$ m

$$= \dfrac{22}{100} \times 100\,\text{cm}$$
$$= \dfrac{22}{2}\,\text{cm} = 11\,\text{cm}$$

Circumference of bucket $= 2\pi r = 2 \times \dfrac{22}{7} \times 11$

Depth $= 9.68\,\text{m}$

$$= \dfrac{968}{100} \times 100\,\text{cm} = 968\,\text{cm}$$

$$\text{Number of turns} = \frac{968}{2 \times \dfrac{22}{7} \times 11}$$

$$= \frac{968 \times 7}{2 \times 22 \times 11} = \mathbf{14}.$$

2. Exponents and Radicals

EXERCISE 2.1

1. (i) $(16)^{\frac{1}{2}} = \sqrt{\mathbf{16}}$ (ii) $(125)^{\frac{1}{3}} = \sqrt[3]{\mathbf{125}}$

(iii) $\left(\dfrac{6}{17}\right)^{\frac{1}{9}} = \sqrt[9]{\dfrac{\mathbf{6}}{\mathbf{17}}}$ (iv) $\left(\dfrac{11}{17}\right)^{\frac{1}{11}} = \sqrt[11]{\dfrac{\mathbf{11}}{\mathbf{17}}}$

(v) $\left(\dfrac{61}{325}\right)^{\frac{1}{17}} = \sqrt[17]{\dfrac{\mathbf{61}}{\mathbf{325}}}$

2. (i) $\sqrt{5} = \mathbf{(5)}^{\frac{\mathbf{1}}{\mathbf{2}}}$ (ii) Do yourself

(iii) $\sqrt[9]{1100} = \mathbf{(1100)}^{\frac{\mathbf{1}}{\mathbf{9}}}$ (iv) $\sqrt[4]{\dfrac{3}{4}} = \left(\dfrac{\mathbf{3}}{\mathbf{4}}\right)^{\frac{\mathbf{1}}{\mathbf{4}}}$

(v) $\sqrt[8]{\dfrac{61}{1123}} = \left(\dfrac{\mathbf{61}}{\mathbf{1123}}\right)^{\frac{\mathbf{1}}{\mathbf{8}}}$

EXERCISE 2.2

1. (i) $(8)^{\frac{1}{3}} = (2^3)^{\frac{1}{3}} = 2^{3 \times \frac{1}{3}} = \mathbf{2}$

(ii) $(27)^{\frac{2}{3}} = (3^3)^{\frac{2}{3}} = 3^{3 \times \frac{2}{3}} = 3^2 = \mathbf{9}$

(iii) Do yourself.

(iv) $(16)^{-\frac{3}{4}} = (2^4)^{\frac{-3}{4}} = 2^{4 \times \frac{-3}{4}} = 2^{-3} = \dfrac{\mathbf{1}}{\mathbf{8}}$

(v) Do yourself.

(vi) $(4)^{\frac{-5}{2}} = (2)^{2 \times \left(\frac{-5}{2}\right)} = 2^{-5} = \dfrac{1}{2^5} = \dfrac{\mathbf{1}}{\mathbf{32}}$

(vii), (viii) Do yourself.

(ix) $(243)^{\frac{2}{5}} = (3^5)^{\frac{2}{5}} = 3^{5 \times \frac{2}{5}} = 3^2 = \mathbf{9}$

3	243
3	81
3	27
3	9
3	3
	1

(x) $(512)^{\frac{-2}{9}} = (2^9)^{\frac{-2}{9}}$

$= 2^{9 \times \frac{-2}{9}}$

$= 2^{-2}$

$= \dfrac{1}{2^2}$

$= \mathbf{\dfrac{1}{4}}$

2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

EXERCISE 2.3

2. (i) $(5)^{\frac{1}{4}} = \sqrt[4]{\mathbf{5}}$

(iii) Do yourself.

(v) Do yourself.

(ii) $21^{\frac{2}{3}} = \sqrt[3]{\mathbf{21^2}}$

(iv) $\left(\dfrac{5}{17}\right)^{\frac{1}{9}} = \sqrt[9]{\dfrac{\mathbf{5}}{\mathbf{17}}}$

(vi) $(-215)^{\frac{1}{7}} = \sqrt[7]{\mathbf{-215}}$

3. (i) $\sqrt[4]{37} = \mathbf{(37)^{\frac{1}{4}}}$

(iii) $\sqrt[7]{29^2} = \mathbf{(29)^{\frac{2}{7}}}$

(vi) $\sqrt[3]{2^{-6}} = (2)^{\frac{-6}{3}} = \mathbf{2^{-2}}$

(ii) Do yourself.

(iv), (v) Do yourself.

4. (i) $(32)^{\frac{1}{5}} = 2^{5 \times \frac{1}{5}} = \mathbf{2}$

2	32
2	16
2	8
2	4
2	2
	1

(ii) $\dfrac{4}{36^{\frac{-1}{2}}} = \dfrac{4}{(2^2)^{\frac{-1}{2}}(3^2)^{\frac{-1}{2}}}$

$= \dfrac{4}{(2)^{2\times\frac{-1}{2}}(3)^{2\times\frac{-1}{2}}}$

$= \dfrac{4}{(2)^{-1}(3)^{-1}} = \dfrac{4\times 2\times 3}{1}$

$= \mathbf{24}$

2	36
2	18
3	9
3	3
	1

(iii) $(16)^{\frac{-3}{4}} = \dfrac{1}{(16)^{\frac{3}{4}}} = \dfrac{1}{2^{4\times\frac{3}{4}}} = \dfrac{1}{2^3} = \mathbf{\dfrac{1}{8}}$

5. (i) $13^{\frac{4}{3}} \div 13^{\frac{1}{3}} = 13^{\frac{4}{3}-\frac{1}{3}} = 13^{\frac{3}{3}} = \mathbf{13}$ (ii) Do yourself.

(iii) $(110)^{\frac{1}{2}\times 4} = (110)^2 = \mathbf{12100}$ (iv) $(5^{10})^0 = \mathbf{1}$

6. (i) $7^{\frac{1}{2}} \times 7^{\frac{3}{2}} = 7^{\frac{1}{2}+\frac{3}{2}} = 7^{\frac{4}{2}} = 7^2 = \mathbf{49}$

(ii) Do yourself.

(iii) $2 \times 9^{\frac{3}{2}} \times 9^{\frac{-1}{2}} = 2 \times 9^{\frac{3}{2}-\frac{1}{2}} = 2 \times 9^{\frac{3-1}{2}} = 2 \times 9 = \mathbf{18}$

(iv) Do yourself.

7. (i) $3 \times 16^{\frac{3}{4}} = 3 \times 2^{4\times\frac{3}{4}} = 3 \times 2^3 = 3 \times 8 = \mathbf{24}$

(ii), (iii) Do yourself.

(iv) $\left[(8)^{\frac{2}{3}}\right]^{\frac{-3}{2}} = 8^{\frac{2}{3}\times\frac{-3}{2}} = 8^{-1} = \mathbf{\dfrac{1}{8}}$

8. (i) $(0.04)^{\frac{3}{2}} = \left(\dfrac{4}{100}\right)^{\frac{3}{2}} = \left(\dfrac{2}{10}\right)^{2\times\frac{3}{2}} = \dfrac{8}{1000} = \mathbf{0.008}$

(ii) Do yourself.

(iii) $(0.000064)^{\frac{5}{6}} = \left(\dfrac{64}{1000000}\right)^{\frac{5}{6}} = \left(\dfrac{2}{10}\right)^{6\times\frac{5}{6}} = \left(\dfrac{2}{10}\right)^5$

$= \dfrac{32}{100000} = \mathbf{0.00032}$

(iv) $(6.25)^{\frac{3}{2}} = \left(\dfrac{625}{100}\right)^{\frac{3}{2}} = \left(\dfrac{25}{10}\right)^{2\times\frac{3}{2}}$

$= \left(\dfrac{25}{10}\right)^3 = \dfrac{25\times 25\times 25}{10\times 10\times 10} = \dfrac{15625}{1000} = \mathbf{15.625}$

9. (i) $64^{\frac{1}{2}} \times \left(64^{\frac{1}{2}} + 1\right) = 8^{2\times\frac{1}{2}} \times \left(8^{2\times\frac{1}{2}} + 1\right)$

$$= 8 \times (8+1) = 8 \times 9 = \mathbf{72}$$

(ii) $27^{\frac{-1}{3}} \times \left(27^{\frac{1}{3}} - 27^{\frac{2}{3}}\right) = 27^{\frac{-1}{3}} \times \left(3^{3\times\frac{1}{3}} - 3^{3\times\frac{-1}{3}}\right)$

$$= 3^{3\times\frac{-1}{3}} \times \left(3^{3\times\frac{1}{3}} - 3^{3\times\frac{2}{3}}\right)$$

$$= 3^{-1} \times (3 - 3^2)$$

$$= \frac{1}{3} \times (3 - 9) = \frac{-6}{3} = \mathbf{-2}$$

(iii) Do yourself.

(iv) $\dfrac{(36)^{\frac{7}{2}} - (36)^{\frac{9}{2}}}{(36)^{\frac{5}{2}}} = \dfrac{(6^2)^{\frac{7}{2}} - (6^2)^{\frac{9}{2}}}{(6^2)^{\frac{5}{2}}} = \dfrac{6^7 - 6^9}{6^5} = \dfrac{6^7}{6^5} - \dfrac{6^9}{6^5}$

$$= 6^{7-5} - 6^{9-5} = 6^2 - 6^4$$

$$= 36 - 1296 = \mathbf{-1260}$$

10. (i) $(x^{-4})^3 = x^{-4\times3} = x^{-12} = \dfrac{\mathbf{1}}{\boldsymbol{x^{12}}}$

(ii) $2x^{\frac{1}{6}} \times 2x^{\frac{-7}{6}} = 4x^{\frac{1}{6}-\frac{7}{6}} = 4x^{-1} = \dfrac{\mathbf{4}}{\boldsymbol{x}}$

(iii) $x^{-7} \times y^{-7} = (xy)^{-7} = \dfrac{1}{(xy)^7} = \dfrac{\mathbf{1}}{\boldsymbol{x^7 y^7}}$

(iv) $x^{\frac{5}{7}} \div x^{\frac{12}{7}} = x^{\frac{5}{7}-\frac{12}{7}} = x^{\frac{-7}{7}} = x^{-1} = \dfrac{\mathbf{1}}{\boldsymbol{x}}$

11. (i) $(3^2 + 4^2)^{\frac{1}{2}} = (9 + 16)^{\frac{1}{2}} = (25)^{\frac{1}{2}} = 5^{2\times\frac{1}{2}} = \mathbf{5}$

(ii), (iii) Do yourself.

(iv) $(1^3 + 2^3 + 3^3)^{\frac{1}{2}} = (1 + 8 + 27)^{\frac{1}{2}} = (36)^{\frac{1}{2}} = 6^{2\times\frac{1}{2}} = \mathbf{6}$

3. Squares and Square Roots

EXERCISE 3.1

5. (i) $65^2 = 65 \times 65 = \mathbf{4225}$ (ii) $75^2 = 75 \times 75 = \mathbf{5625}$

6. (i) $23^2 - 22^2 = (23 + 22)(23 - 22) = 45 \times 1 = \mathbf{45}$

(ii) $101^2 - 100^2 = (101 + 100)(101 - 100) = 201 \times 1 = \mathbf{201}$

(iii) Do yourself.
7. Do yourself.
8. (iv) $4^2 + 5^2 + 20^2 = 21^2$ (v) $5^2 + 6^2 + 30^2 = 31^2$
    (vi) $6^2 + 7^2 + 42^2 = 43^2$

EXERCISE 3.2

1. (i) 25
   Now $25 - 1 = 24, 24 - 3 = 21, 21 - 5 = 16, 16 - 7 = 9, 9 - 9 = 0,$
   Since, we had to subtract 5 times. $\therefore \sqrt{\mathbf{25}} = \mathbf{5}$
   (ii) 64
   Now $64 - 1 = 63, 63 - 3 = 60, 60 - 5 = 55, 55 - 7 = 48,$
        $48 - 9 = 39, 39 - 11 = 28, 28 - 13 = 15, 15 - 15 = 0$
   Since, we had to subtract 8 times $\therefore \sqrt{\mathbf{64}} = \mathbf{8}$
   (iii), (iv), (v) Do yourself.
   (vi) 225
   Now $225 - 1 = 224, 224 - 3 = 221, 221 - 5 = 216,$
   $216 - 7 = 209, 209 - 9 = 200, 200 - 11 = 189, 189 - 13 = 176,$
   $176 - 15 = 161, 161 - 17 = 144, 144 - 19 = 125, 125 - 21 = 104,$
   $104 - 23 = 81, 81 - 25 = 56, 56 - 27 = 29, 29 - 29 = 0$
   Since, we had to subtract 15 times. $\therefore \sqrt{\mathbf{225}} = \mathbf{15}$
   (vii) Do yourself.
   (viii) $4900 = 49 \times 100$
   Now $49 - 1 = 48, 48 - 3 = 45, 45 - 5 = 40, 40 - 7 = 33,$
   $33 - 9 = 24, 24 - 11 = 13, 13 - 13 = 0$
   Since, we had to subtract 7 times and
   Now $100 - 1 = 99, 99 - 3 = 96, 96 - 5 = 91, 91 - 7 = 84,$
   $84 - 9 = 75, 75 - 11 = 64, 64 - 13 = 51, 51 - 15 = 36,$
   $36 - 17 = 19, 19 - 19 = 0$
   Since, we had to sabtract 10 times.
   $\sqrt{49} = 7$ and $\sqrt{100} = 10, \sqrt{4900} = 7 \times 10 = \mathbf{70}$
   (ix) and (x) Do yourself.
2. (i) Factorizing 16 by the division method
   $$16 = 2 \times 2 \times 2 \times 2$$
   $\Rightarrow$ $\sqrt{16} = 2 \times 2$
   $$= \mathbf{4}$$

2	16
2	8
2	4
2	2
	1

(ii) Do yourself.

(iii) Factorizing 529 by the division method.

$$529 = 23 \times 23$$
$$\sqrt{529} = \mathbf{23}$$

23	529
23	23
	1

(iv) Do yourself.

(v) Factorizing 1764 by the division method

$$1764 = 2 \times 2 \times 3 \times 3 \times 7 \times 7$$
$$\sqrt{1764} = 2 \times 3 \times 7$$
$$= \mathbf{42}$$

2	1764
2	882
3	441
3	147
7	49
7	7
	1

(vi) Do yourself.

(vii) Factorizing 7744 by the division method.

$$7744 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 11 \times 11$$
$$\sqrt{7744} = 2 \times 2 \times 2 \times 11$$
$$= \mathbf{88}$$

2	7744
2	3872
2	1936
2	968
2	484
2	242
11	121
11	11
	1

(viii), (ix) Do yourself.

(x) Factorizing 298116 by the division method

$$298116 = 2 \times 2 \times 3 \times 3 \times 7 \times 7 \times 13 \times 13$$
$$\sqrt{298116} = 2 \times 3 \times 7 \times 13$$
$$= \mathbf{546}$$

2	298116
2	149058
3	74529
3	24843
7	8281
7	1183
13	169
13	13
	1

3. By prime factorization, we get

$$9408 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 7 \times 7$$

To be a perfect square, it should be having pairs of prime factors therefore, division by 3 is necessary.

Thus, $\dfrac{9408}{3} = \dfrac{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 7 \times 7}{3}$

$= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 7 \times 7$

$= 2 \times 2 \times 2 \times 7$

$= \mathbf{56}$

2	9408
2	4704
2	2352
2	1176
2	588
2	294
3	147
7	49
7	7
	1

4. Proceed as question 2.

5. Let there be x students in the school

$\therefore$ Number of student in the school $= x$

Fee paid by the x student $= x \times x = x^2$

The total collection of fee $= 2304$

$\therefore \qquad x^2 = 2304$

$x = \sqrt{2304}$

$x = \sqrt{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3}$

$x = 2 \times 2 \times 2 \times 2 \times 3 = \mathbf{48}$

2	2304
2	1152
2	576
2	288
2	144
2	72
2	36
2	18
3	9
3	3
	1

6. Do yourself.

EXERCISE 3.3

1. (i) $\sqrt{\dfrac{625}{1296}} = \sqrt{\dfrac{5 \times 5 \times 5 \times 5}{6 \times 6 \times 6 \times 6}} = \dfrac{5 \times 5}{6 \times 6} = \dfrac{\mathbf{25}}{\mathbf{36}}$

(ii) $\sqrt{4\dfrac{29}{49}} = \sqrt{\dfrac{225}{49}} = \sqrt{\dfrac{3 \times 3 \times 5 \times 5}{7 \times 7}} = \dfrac{3 \times 5}{7} = \dfrac{15}{7} = \mathbf{2}\dfrac{\mathbf{1}}{\mathbf{7}}$

(iii), (iv), (v), (vi) Do yourself.

(vii) $\sqrt{5.774409} = \sqrt{\dfrac{5774409}{1000000}}$

$$= \sqrt{\dfrac{3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 89 \times 89}{10 \times 10 \times 10 \times 10 \times 10 \times 10}}$$

$$= \dfrac{3 \times 3 \times 3 \times 89}{10 \times 10 \times 10}$$

$$= \dfrac{2403}{1000} = \textbf{2.403}$$

(viii), (ix), (x), (xi) Do yourself.

(xii) $\sqrt{0.09} = \sqrt{\dfrac{9}{100}} = \sqrt{\dfrac{3 \times 3}{10 \times 10}} = \dfrac{3}{10} = \textbf{0.3}$

(xiii), (xiv) Do yourself.

(xv) $\sqrt{\dfrac{121}{1000}} = \sqrt{\dfrac{11 \times 11}{10 \times 10 \times 10 \times 10}} = \dfrac{11}{10 \times 10} = \dfrac{11}{100}$

(xvi), (xvii) Do yourself.

2. Area of a square field $= 101\dfrac{1}{400}\,\text{m}^2$

$$= (\text{Arm})^2$$

Then $\quad (\text{Arm})^2 = 101\dfrac{1}{400}$

$$\text{Arm} = \sqrt{101\dfrac{1}{400}}$$

$$= \sqrt{\dfrac{40401}{400}}$$

$$= \sqrt{\dfrac{201}{20}} = \textbf{10}\dfrac{\textbf{1}}{\textbf{20}}$$

EXERCISE 3.4

1. $\sqrt{2304} = \textbf{48}$

	4 8
4	23 04
	16
88	704
	704
	0

2., **3.**, **4.**, **5.**, **6.**, **7.** and **8.** Do yourself.

9. $\sqrt{99856} = \mathbf{316}$

	3 1 6
3	$\overline{9}\,\overline{98}\,\overline{56}$
	9
61	98
	61
626	3756
	3756
	0

10., **11.**, **12.**, **13.** Do yourself.

14. $\sqrt{4937284} = \mathbf{2222}$

	2 2 2 2
2	$\overline{4}\,\overline{93}\,\overline{72}\,\overline{84}$
	4
42	93
	84
442	972
	884
4442	8884
	8884
	0

15., **16.**, **17.**, **18.**, **19.**, **20.** Do yourself.

20. $\sqrt{3226694416} = \mathbf{56804}$

	5 6 8 0 4
5	$\overline{32}\,\overline{26}\,\overline{69}\,\overline{44}\,\overline{16}$
	25
106	726
	636
1128	9069
	9024
113604	454416
	454416
	0

21., **22.**, **23.**, **24.**, **25.** Do yourself.

26. The greatest number of six digits is 999999.

```
                    9 9 9
          9 | 99 99 99
            | 81
        ─────────────
        189 | 1899
            | 1701
        ─────────────
       1989 |  19899
            |  17901
        ─────────────
            |   1998
```

We subtract 1998 from 999999 to make it a perfect square.

∴   Required number $= 999999 - 1998 = $ **998001**

27. Total soldiers $= 8160$

Remaining soldiers $= 60$

Soldiers which are perfect square $= 8160 - 60 = 8100$

Let the x soldiers in one row and x rows in a field then,

$$x^2 = 8100$$
$$x = \sqrt{8100} = \sqrt{9 \times 9 \times 10 \times 10} = \textbf{90 soldiers}$$

EXERCISE 3.5

1. $\sqrt{\dfrac{361}{625}} = \sqrt{\dfrac{361}{625}} = \dfrac{\sqrt{19 \times 19}}{\sqrt{25 \times 25}} = \dfrac{19}{25}$

2. $\sqrt{5\dfrac{19}{25}} = \sqrt{\dfrac{144}{25}} = \dfrac{\sqrt{2 \times 2 \times 2 \times 2 \times 3 \times 3}}{\sqrt{5 \times 5}} = \dfrac{12}{5} = 2\dfrac{2}{5}$

3., **4.**, **5.**, **6.**, **7.** Do yourself.

8. $\sqrt{332\dfrac{61}{169}} = \dfrac{\sqrt{56169}}{\sqrt{169}} = \dfrac{237}{13} = 18\dfrac{3}{13}$

```
                    2 3 7
          2 | 5 61 69
            | 4
        ─────────────
         43 | 161
            | 129
        ─────────────
        467 |  3269
            |  3269
        ─────────────
            |    ×
```

9. $\sqrt{7.29} = \dfrac{\sqrt{729}}{\sqrt{100}}$

$\qquad = \dfrac{27}{10}$

$\qquad = \mathbf{2.7}$

```
                    2 7
            ┌─────────────
          2 │  7 29
            │  4
        ────┼─────────────
         47 │   329
            │   329
            ├─────────────
            │     ×
```

10., **11.**, **12.**, **13.**, **14.**, **15.** Do yourself.

16. $\sqrt{0.00008281} = \dfrac{\sqrt{8281}}{\sqrt{100000000}}$

$\qquad\qquad = \dfrac{91}{10000}$

$\qquad\qquad = \mathbf{0.0091}$

```
                    9 1
            ┌─────────────
          9 │  82 81
            │  81
        ────┼─────────────
        181 │   181
            │   181
            ├─────────────
            │     ×
```

17. Let the number be x

$\qquad x \times x = 251953.8025$

$\qquad x^2 = 251953.8025$

$\qquad x = \dfrac{\sqrt{2519538025}}{\sqrt{10000}}$

$\qquad x = \dfrac{50195}{100}$

$\qquad = \mathbf{501.95}$

```
                    5 0 1 9 5
            ┌───────────────────────
          5 │ 25 19 53 80 25
            │ 25
       ─────┼───────────────────────
       1001 │    1953
            │    1001
      ──────┼───────────────────────
      10029 │   95280
            │   90261
     ───────┼───────────────────────
     100385 │    501925
            │    501925
            ├───────────────────────
            │       ×
```

18. Do yourself.

19. Area of playground = $(\text{side})^2$

$\qquad 256.6404 = a^2$

$\qquad\qquad a = \sqrt{256.6404}$

$\qquad\qquad a = \dfrac{\sqrt{2566404}}{\sqrt{10000}} = \dfrac{1602}{100}$

$\qquad\qquad = \mathbf{16.02\ m}$

```
                  1 6 0 2
          ┌──────────────────
        1 │ 2 56 64 04
          │ 1
      ────┼──────────────────
       26 │  156
          │  156
      ────┼──────────────────
     3202 │     6404
          │     6404
          ├──────────────────
          │       ×
```

EXERCISE 3.6

1. $\sqrt{1.7} = 1.3038$ up to four places of decimal
= 1.304 Correct upto three places of decimal.

```
              1.3 0 3 8
        1 | 1.70 00 00 00
          | 1
     ─────────────────────
       23 | 70
          | 69
     ─────────────────────
     2603 | 10000
          |  7809
     ─────────────────────
    26068 | 219100
          | 208544
     ─────────────────────
          |  10556
```

2., **3.** Do yourself.

4.
$$\sqrt{237.615} = \frac{\sqrt{2376150}}{\sqrt{10000}}$$
$$= \frac{1541.47}{100}$$
$$= 15.4147$$
$$= \mathbf{15.415}$$

Correct upto three places of decimal.

```
                  1 5 4 1.4 7
          1 | 2 37 61 50
            | 1
     ─────────────────────────
         25 | 137
            | 125
     ─────────────────────────
        304 | 1261
            | 1216
     ─────────────────────────
       3081 | 4550
            | 3081
     ─────────────────────────
      30824 | 146900
            | 123296
     ─────────────────────────
     308287 | 2360400
            | 2158009
     ─────────────────────────
            | 202391
```

5., **6.**, **7.**, **8.**, **9.**, **10.** Do yourself.

11. $\sqrt{\dfrac{7}{8}} = \sqrt{0.875}$

$= \dfrac{\sqrt{8750}}{\sqrt{10000}} = \dfrac{93.54}{100}$

$= 0.935$

Correct upto three places of decimal.

	9 3.54
9	$\overline{87}\,\overline{50}$
	81
183	650
	549
1865	10100
	9325
18704	77500
	74816
	2684

12., **13.**, **14.**, **15.**, **16.** Do yourself.

17.

	3. 3 1 6 6 2
3	$\overline{11.}\,\overline{00}\,\overline{00}\,\overline{00}\,\overline{00}$
	9
63	200
	189
661	1100
	661
6626	43900
	39756
66326	414400
	397956
663322	1644400
	1326644
	317756

$= 3.31662$

Let's Recall

2. (b) $\sqrt{2401} = \sqrt{7^x}$

$\sqrt{7^4} = \sqrt{7^x}$

$(7^4)^{\frac{1}{2}} = (7^x)^{\frac{1}{2}}$

$7^4 = 7^x$ Comparing of power

$x = 4$.

So, option (b) is right.

4.   Cubes and Cube Roots

1. (i) $7^3 = 7 \times 7 \times 7$
$= \mathbf{343}$
(ii) $12^3 = 12 \times 12 \times 12$
$= \mathbf{1728}$
(iii) $21^3 = 21 \times 21 \times 21$
$= \mathbf{9261}$
(iv) $100^3 = 100 \times 100 \times 100$
$= \mathbf{1000000}$
(v) $(302)^3 = 302 \times 302 \times 302$
$= \mathbf{27543608}$

2.
$1^3 = 1 \times 1 \times 1 = 1$
$2^3 = 2 \times 2 \times 2 = 8$
$3^3 = 3 \times 3 \times 3 = 27$
$4^3 = 4 \times 4 \times 4 = 64$
$5^3 = 5 \times 5 \times 5 = 125$
$6^3 = 6 \times 6 \times 6 = 216$
$7^3 = 7 \times 7 \times 7 = 343$
$8^3 = 8 \times 8 \times 8 = 512$
$9^3 = 9 \times 9 \times 9 = 729$
$10^3 = 10 \times 10 \times 10 = 1000$
$11^3 = 11 \times 11 \times 11 = 1331$
$12^3 = 12 \times 12 \times 12 = 1728$
....
$19^3 = 19 \times 19 \times 19 = 6859$

Here, odd numbers are 1, 3, 5, 7, 9, 11, ... 19 and their cubes are 1, 27, 125, 343, 729, 1331, ... 6859 which are also odd numbers. And, even numbers are 2, 4, 6, 8, 10, 12, ... and their cubes are 8, 64, 216, 512, 1000, 1728, ... which are also even numbers.

3. Do yourself.

4. $3^3 = 3 \times 3 \times 3 = 27,$
$6^3 = 6 \times 6 \times 6 = 216,$
$9^3 = 9 \times 9 \times 9 = 729,$
$12^3 = 12 \times 12 \times 12 = 1728,$
$15^3 = 15 \times 15 \times 15 = 3375.$

27, 216, 729, 1728 and 3375 are the multiples of 27.

5. Do yourself.

6.

2	64
2	32
2	16
2	8
2	4
2	2
	1

2	216
2	108
2	54
3	27
3	9
3	3
	1

3	243
3	81
3	27
3	9
3	3
	1

$\sqrt[3]{64} = 2 \times 2 = 4, \sqrt[3]{216} = 2 \times 3 = 6, \sqrt[3]{1728} = 2 \times 2 \times 3 = 12^3$ are perfect cubes.

243, 106480 are not perfect cubes.

7. Resolving 392 in to prime factors, we have

$392 = 2 \times 2 \times 2 \times 7 \times 7$

Grouping the factors in triplets of equal factors we get

$392 = \underline{2 \times 2 \times 2} \times 7 \times 7$

Clearly, to make it a perfect cube, it must be multiplied by 7.

2	392
2	196
2	98
7	49
7	7
	1

8. Volume of cube $= (\text{side})^3 = 13^3 = 13 \times 13 \times 13 = \mathbf{2197\ m^3}$

9. Do yourself.

EXERCISE 4.2

1. (i)

7	343
7	49
7	7
	1

$\sqrt[3]{343} = \mathbf{7}$

(ii) Do yourself.

(iii)

2	2744
2	1372
2	686
7	343
7	49
7	7
	1

$\sqrt[3]{2744} = 2 \times 7 = \mathbf{14}$

(iv) and (v) Do yourself.

(vi)

2	134217728
2	67108864
2	33554432
2	16777216
2	8388608
2	4194304
2	2097152
2	1048576
2	524288
2	262144
2	131072
2	65536
2	32768
2	16384
2	8192
2	4096
2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

$$\sqrt[3]{134217728} = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = \mathbf{512}$$

(vii), (viii) Do yourself.

2. Do yourself.

3. $137592 = \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3} \times \underline{7} \times 7 \times 13$

To make it a perfect cube it must be multiplied by

$$13 \times 13 \times 7 = \mathbf{1183}$$

The cube root of product $= 2 \times 3 \times 7 \times 13 = \textbf{546}$

2	137592
2	68796
2	34398
3	17199
3	5733
3	1911
7	637
7	91
13	13
	1

4. $26244 = 2 \times 2 \times 3 \times 3 \times 9 \times 9 \times 9$

To make it a perfect cube it must be divided by $2 \times 2 \times 3 \times 3$
$= \textbf{36}$

The cube root of product $= \textbf{9}$

2	26244
2	13122
3	6561
3	2187
9	729
9	81
9	9
	1

5. Volume of cube $= (\text{side})^3$

$$\sqrt[3]{512} = \text{side}$$

$$\text{Side} = \textbf{8 m}$$

2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

1. (i) $\sqrt[3]{-125} = -\sqrt[3]{125} = -\sqrt[3]{5\times5\times5} = $ **−5,**

(ii) and (iii) Do yourself.

(iv) $\sqrt[3]{-2744000} = -\sqrt[3]{2744000}$

$= -\sqrt[3]{2\times2\times2\times7\times7\times7\times10\times10\times10}$

$= -2\times7\times10 = $ **−140**

2	2744000
2	1372000
2	686000
7	343000
7	49000
7	7000
10	1000
10	100
10	10
	1

EXERCISE 4.4

1. $\sqrt[3]{8\times64} = \sqrt[3]{2\times2\times2\times2\times2\times2\times2\times2\times2} = 2\times2\times2 = $ **8**

2	64		2	8
2	32		2	4
2	16		2	2
2	8			1
2	4			
2	2			
	1			

2. $\sqrt[3]{(-216)\times1728}$

$= -\sqrt[3]{2\times2\times2\times3\times3\times3\times2\times2\times2\times2\times2\times2\times3\times3\times3}$

$= -2\times3\times2\times2\times3 = -8\times9 = $ **−72**

2	216		2	1728
2	108		2	864
2	54		2	432
3	27		2	216
3	9		2	108
3	3		2	54
	1		3	27

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3	9
3	3
	1

3. Do yourself.

4. $\sqrt[3]{(-125) \times (-3375)} = -\sqrt[3]{5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 3 \times 3 \times 3}$

$\qquad = 5 \times 5 \times 3 = \mathbf{75}$

5	125
5	25
5	5
	1

3	3375
3	1125
3	375
5	125
5	25
5	5
	1

5., **6.**, **7.** Do yourself.

8. $\sqrt[3]{-5832000} = \sqrt[3]{5832000}$

$\qquad = -\sqrt[3]{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 5 \times 5 \times 5}$

$\qquad = -2 \times 2 \times 3 \times 3 \times 5$

$\qquad = -4 \times 9 \times 5 = \mathbf{-180}$

2	5832000
2	2916000
2	1458000
2	729000
2	364500
2	182250
3	91125
3	30375
3	10125
3	3375
3	1125
3	375
5	125
5	25
5	5
	1

EXERCISE 4.5

1. (i) $(0.3)^3 = 0.3 = \dfrac{3 \times 3 \times 3}{1000} = \dfrac{27}{1000} = 0.027$

(ii) Do yourself.

(iii) $(0.08)^3 = 0.08 \times 0.08 \times 0.08 = \dfrac{8 \times 8 \times 8}{100 \times 100 \times 100}$

$= \dfrac{512}{1000000} = \mathbf{0.000512}$

(iv) Do yourself.

2. (i) $\left(\dfrac{7}{9}\right)^3 = \dfrac{7 \times 7 \times 7}{9 \times 9 \times 9} = \dfrac{\mathbf{343}}{\mathbf{729}}$

(ii) $\left(\dfrac{-8}{11}\right)^3 = \dfrac{-8 \times -8 \times -8}{11 \times 11 \times 11} = \dfrac{\mathbf{-512}}{\mathbf{1331}}$

(iii) and (iv) Do yourself.

(v) $\left(2\dfrac{3}{5}\right)^3 = \left(\dfrac{13}{5}\right)^3 = \dfrac{13 \times 13 \times 13}{5 \times 5 \times 5} = \dfrac{\mathbf{2197}}{\mathbf{125}}$

(vi) Do yourself.

3. (i) $\sqrt[3]{\dfrac{27}{64}} = \sqrt[3]{\dfrac{3 \times 3 \times 3}{4 \times 4 \times 4}} = \dfrac{\mathbf{3}}{\mathbf{4}}$

(ii) $\sqrt[3]{\dfrac{125}{128}} = \sqrt[3]{\dfrac{5 \times 5 \times 5}{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2}}$

128 is not a perfect cube.

2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

(iii), (iv) Do yourself.

4. Volume of box $= (\text{Side})^3$

$$32.768 = (\text{side})^3$$
$$\sqrt[3]{32.768} = \text{Side}$$
$$\sqrt[3]{\dfrac{32768}{1000}} = \text{Side}$$

$$\text{Side} = \frac{2 \times 2 \times 2 \times 2 \times 2}{10}$$

$$= \frac{32}{10} = \mathbf{3.2\ m}$$

2	32768
2	16384
2	8192
2	4096
2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

5. (i) $\sqrt[3]{\dfrac{8}{125}} = \sqrt[3]{\dfrac{2 \times 2 \times 2}{5 \times 5 \times 5}} = \mathbf{\dfrac{2}{5}}$

(ii) $\sqrt[3]{\dfrac{-64}{1331}} = -\sqrt[3]{\dfrac{4 \times 4 \times 4}{11 \times 11 \times 11}} = -\mathbf{\dfrac{4}{11}}$

(iii) Do yourself.

(iv) $\sqrt[3]{\dfrac{-2197}{-9261}} = \sqrt[3]{\dfrac{2197}{9261}} = \sqrt[3]{\dfrac{13 \times 13 \times 13}{21 \times 21 \times 21}} = \mathbf{\dfrac{13}{21}}$

5.   Playing with Numbers

EXERCISE 5.1

1. Let the number be, $10a + b$

Where, a is the tens digit and b is the units digit

Now, according to question,

Units digit = 5

and $\qquad\qquad\qquad$ $b = 5$

$$a + b = (10a + b) \times \frac{1}{5}$$
$$5a + 5b = 10a + b$$
$$10a + b - 5a - 5b = 0$$
$$5a - 4b = 0$$
$$5a = 4b \text{ Putting the value of } b$$
$$5a = 4 \times 5$$
$$5a = 20$$
$$a = 4$$

[Putting the values of a and b]

Hence, the number is $10a + b = 10 \times 4 + 5 = 40 + 5 = \textbf{45}$

2. Let the number be $10a + b$

Where, a is the tens digit and b is the units digit.

Now, According to question,

$$(10a + b) - (10b + a) = 72$$
$$10a + b - 10b - a = 72$$
$$10a - 10b - a + b = 72$$
$$(a - b)[10 - 1] = 72$$
$$(a - b) \times 9 = 72$$
$$a - b = \frac{72}{9}$$
$$a - b = \textbf{8}$$

Thus, difference between the two digit number is **8**.

3. Let the number be $10a + b$

Where, a is the tens digit and b is the units digit

Now, According to question,

$$10a + b = (a + b) + 27$$
$$10a + b - a - b = 27$$
$$9a = 27$$
$$a = 3$$

But $\qquad\qquad\qquad\qquad b = 2a$

Given in question

Then, $\qquad\qquad\qquad\qquad b = 2 \times 3$
$$b = 6$$

Hence, the number is, $10a + b$

$$= 10 \times 3 + 6$$
$$= 30 + 6$$
$$= \textbf{36}$$

4. Do yourself.
5. Now, According to question,

$$10b + a = (10a + b) \times \frac{4}{7}$$
$$70b + 7a = 40a + 4b$$
$$70b - 4b = 40a - 7a$$
$$66b = 33a$$
$$b = \frac{33}{66}a$$
$$b = \frac{1}{2}a$$
$$\Rightarrow \qquad a = 2b$$

But $a - b = 3$, Given in question $b = 3$

Then, $\qquad a - \dfrac{a}{2} = 3$

$$\frac{2a - a}{2} = 3$$

$\Rightarrow \qquad \dfrac{a}{2} = 3$

$\Rightarrow \qquad a = 6$

Hence, the number is

$\Rightarrow \qquad 10a + b = 10 \times 6 + 3$
$$= 60 + 3 = \mathbf{63}$$

Unit-II : Algebra

6. Algebraic Expression and Their Factorization

EXERCISE 6.1

1. (i) $(x + 8)(x - 2) = x(x + 8) - 2(x + 8) = x^2 + 8x - 2x - 16$
$$= \boldsymbol{x^2 + 6x - 16}$$

(ii), (iii), (iv) Do yourself.

(v) $(y - 9)(y - 2) = y(y - 9) - 2(y - 9) = y^2 - 9y - 2y + 18$
$$= \boldsymbol{y^2 - 11y + 18}$$

(vi) $(z^2 + 2)(z^2 - 3) = (z^2 + 2)z^2 + (z^2 + 2)(-3)$
$$= \boldsymbol{z^4 + 2z^2 - 3z^2 - 6}$$
$$= z^4 - z^2 - 6$$

2. (i) $102 \times 106 = (100 + 2) \times (100 + 6)$
$$= (100 + 2) \times 100 + (100 + 2) \times 6$$
$$= 10000 + 200 + 600 + 12 = \mathbf{10812}$$

(ii) $103 \times 96 = (100 + 3) \times (100 - 4)$
$\qquad = (100 + 3) \times 100 + (100 + 3) \times (-4)$
$\qquad = 10000 + 300 - 400 - 12$
$\qquad = 10300 - 412 = \mathbf{9888}$
(iii) $95 \times 97 = (100 - 5)(100 - 3)$
$\qquad = (100 - 5) \times 100 + (100 - 5) \times (-3) = \mathbf{9215}$
(iv) Do yourself.
(v) $34 \times 36 = (30 + 4) \times (30 + 6) = (30 + 4) \times 30 + (30 + 4) \times 6$
$\qquad = 900 + 120 + 180 + 24 = \mathbf{1224}$
(vi) Do yourself.

EXERCISE 6.2

1. (i) $(x + 2y + 3z)^2$
$\qquad = (x)^2 + (2y)^2 + (3z)^2 + 2(x \times 2y + 2y \times 3z + 3z \times x)$
$\qquad = \mathbf{x^2 + 4y^2 + 9z^2 + 4xy + 12yz + 6zx}$
(ii) $(x + y - 2z)^2$
$\qquad = (x)^2 + (y)^2 + (-2z)^2 + 2\{x \times y + y \times (-2z) + (-2z) \times x\}$
$\qquad = \mathbf{x^2 + y^2 + 4z^2 + 2xy - 4yz - 4zx}$

(iii) Do yourself.

(iv) $(p - 3q - 2z)^2$
$\qquad = (p)^2 + (-3q)^2 + (-2z)^2 + 2\{p \times (-3q) + (-3q)$
$\qquad\qquad\qquad\qquad\qquad\qquad \times(-2z) + (-2z) \times p\}$
$\qquad = \mathbf{p^2 + 9q^2 + 4z^2 - 6pq + 12qz - 4pz}$
(v), (vi), (vii) Do yourself.
(viii) $\left(3x - \dfrac{1}{2}p + 2q\right)^2$

$\qquad = (3x)^2 + \left(-\dfrac{1}{2}p\right)^2 + (2q)^2 + 2\left\{3x \times \left(\dfrac{-1}{2}p\right)\right.$

$\qquad\qquad\qquad\qquad\qquad\qquad \left. + \left(\dfrac{-p}{2}\right) \times (2q) + 3x \times 2q\right\}$

$\qquad = \mathbf{9x^2 + \dfrac{p^2}{4} + 4q^2 - 3px - 2pq + 12xq}$

(ix) $(5x^2 + y + z)^2$
$\qquad = (5x^2)^2 + (y)^2 + (z)^2 + 2\{5x^2 \times y + y \times z + z \times 5x^2\}$
$\qquad = \mathbf{25x^4 + y^2 + z^2 + 10x^2y + 2yz + 10zx^2}$

2. Do yourself.

3. (i) $(x + y + z)^2 + (x + y - z)^2$

$= (x)^2 + (y)^2 + (z)^2 + 2xy + 2yz + 2zx + (x)^2 + (y)^2 + (-z)^2$
$\qquad\qquad\qquad\qquad + 2xy + 2y(-z) + 2(-z) \times (x)$
$= x^2 + y^2 + z^2 + 2xy + 2yz + 2zx + x^2 + y^2 + z^2$
$\qquad\qquad\qquad\qquad\qquad\qquad + 2xy - 2yz - 2zx$
$= \boldsymbol{2x^2 + 2y^2 + 2z^2 + 4xy}$

(ii) $(2x + p - c)^2 - (2x - p + c)^2 \quad \because \ (a)^2 - (b)^2 = (a+b)(a-b)$
$\qquad = (2x + p - c + 2x - p + c)(2x + p - c - 2x + p - c)$
$\qquad = (4x)(2p - 2c) = \boldsymbol{8px - 8cx}$

EXERCISE 6.3

1. (i) $(3x - 2y)^3 = (3x)^3 - (2y)^3 - 3 \times 3x \times 2y(3x - 2y)$
$\qquad\qquad = \boldsymbol{27x^3 - 8y^3 - 54x^2y + 36xy^2}$

(ii) $(x + 3y)^3 = (x)^3 + (3y)^3 + 3 \times x \times (3y)\{x + 3y\}$
$\qquad\qquad = x^3 + 27y^3 + 9xy(x + 3y)$
$\qquad\qquad = \boldsymbol{x^3 + 27y^3 + 9x^2y + 27xy^2}$

(iii), (iv), (v), (vi) Do yourself.

(vii) $\left(\dfrac{2}{3}x - \dfrac{5}{3}z\right)^3 = \left(\dfrac{2}{3}x\right)^3 - \left(\dfrac{5}{3}z\right)^3 - 3 \times \dfrac{2}{3}x \times \dfrac{5}{3}z\left(\dfrac{2}{3}x - \dfrac{5}{3}z\right)$

$\qquad\qquad = \dfrac{8}{27}x^3 - \dfrac{125}{27}z^3 - \dfrac{10xz}{3}\left(\dfrac{2}{3}x - \dfrac{5}{3}z\right)$

$\qquad\qquad = \boldsymbol{\dfrac{8}{27}x^3 - \dfrac{125}{27}z^3 - \dfrac{20}{9}x^2z + \dfrac{50}{9}xz^2}$

(viii) Do yourself.

2. (i) $3x + 2y = 14$ and $xy = 8$

$\quad 27x^3 + 8y^3 = (3x)^3 + (2y)^3$
$\qquad\qquad = (3x + 2y)^3 - 3 \times 3x \times 2y(3x + 2y)$
$\qquad\qquad = (14)^3 - 18xy \times 14 = (14)^3 - 18 \times 8 \times 14$
$\qquad\qquad = 14\{14^2 - 18 \times 8\}$
$\qquad\qquad = 14\{196 - 144\} = 14 \times 52 = \boldsymbol{728}$

(ii) Do yourself.

3. (i) $p^3 - q^3$, $p - q = -8$ and $pq = -12$

$\qquad\qquad p^3 - q^3 = (p - q)^3 + 3pq(p - q)$
$\qquad\qquad\qquad = (-8)^3 + 3 \times (-12) \times (-8)$
$\qquad\qquad\qquad = -512 + 288 = \boldsymbol{-224}$

(ii) Do yourself.

Advance Mathematics-8

4. (i) $64x^3 - 125z^3$, $4x - 5z = 16$, and $xz = 12$

$$64x^3 - 125z^3 = (4x - 5z)^3 + 3 \times 4x \times 5z \times (4x - 5z)$$
$$= (16)^3 + 60xz \times 16 = (16)^3 + 60 \times 12 \times 16$$
$$= 16\{(16)^2 + 60 \times 12\} = 16\{256 + 720\}$$
$$= 16 \times 976 = \mathbf{15616}$$

(ii) $64x^3 - 125z^3$, $4x = 5z = 16$

and $xz = 6 = (4x - 5z)^3 + 3 \times 4x \times 5z \times (4x - 5z)$

$$= \left(\frac{3}{5}\right)^3 + 60 \times 6 \times \frac{3}{5}$$
$$= \frac{3}{5}\left\{\left(\frac{3}{5}\right)^2 + 60 \times 6\right\} = \frac{3}{5}\left\{\frac{9}{25} + 360\right\}$$
$$= \frac{3 \times 9009}{25 \times 5} = \frac{\mathbf{27027}}{\mathbf{125}}$$

5. (i) $(105)^3 = (100 + 5)^3 = (100)^3 + (5)^3 + 3 \times 100 \times 5(100 + 5)$
$$= 1000000 + 125 + 1500 \times 105$$
$$= \mathbf{1157625}$$

(ii) $(99)^3 = (100 - 1)^3 = (100)^3 - (1)^3 - 3 \times 100 \times 1(100 - 1)$
$$= 1000000 - 1 - 300 \times 99$$
$$= 1000000 - 1 - 29700 = \mathbf{970299}$$

(iii), (iv), (v) Do yourself.

(vi) $(601)^3 = (600 + 1)^3$
$$= (600)^3 + (1)^3 + 3 \times 600 \times 1 \times (600 + 1)$$
$$= 216000000 + 1 + 1800 \times 601$$
$$= 216000000 + 1 + 1081800 = \mathbf{217081801}$$

(vii), (viii), (ix) Do yourself.

(x) $(9.9)^3 = (10 - 0.1)^3$
$$= (10)^3 - (0.1)^3 - 3 \times 10 \times 0.1(10 - 0.1)$$
$$= 1000 - \frac{1}{1000} - 3 \times 9.9 = 1000 - \frac{1}{1000} - \frac{297}{10}$$
$$= \frac{1000000 - 1 - 29700}{1000} = \frac{970299}{1000} = \mathbf{970.299}$$

6. (i) $(2x + 3p)^3 + (2x - 3p)^3$
$$= (2x + 3p + 2x - 3p)^3 - 3(2x + 3p)(2x - 3p)$$
$$(2x + 3p + 2x - 3p)$$
$$= (4x)^3 - 3(4x^2 - 9p^2) \times (4x)$$
$$= 64x^3 - 12x(4x^2 - 9p^2) = 64x^3 - 48x^3 + 108p^2x$$
$$= \mathbf{16x^3 + 108p^2x}$$

(ii) $(x+2p)^3 - (x-2p)^3$

$\quad = (x+2p-x+2p)^3 + 3(x+2p)(x-2p)(x+2p-x+2p)$

$\quad = (4p)^3 + 3(x^2-4p^2)\times 4p = 4p\{(4p)^2 + 3(x^2-4p^2)\}$

$\quad = 4p\{16p^2 + 3x^2 - 12p^2\} = 4p\{4p^2 + 3x^2\}$

$\quad = \mathbf{16p^3 + 12px^2}$

(iii), (iv) Do yourself.

(v) $\left(\dfrac{x}{3} + \dfrac{y}{5}\right)^3 - \left(\dfrac{x}{3} - \dfrac{y}{5}\right)^3 = \left(\dfrac{x}{3} + \dfrac{y}{5} - \dfrac{x}{3} + \dfrac{y}{5}\right)^3$

$\qquad\qquad + 3\left(\dfrac{x}{3} + \dfrac{y}{5}\right)\left(\dfrac{x}{3} - \dfrac{y}{5}\right)\left(\dfrac{x}{3} + \dfrac{y}{5} - \dfrac{x}{3} + \dfrac{y}{5}\right)$

$\qquad = \left(\dfrac{2y}{5}\right)^3 + 3\left(\dfrac{x^2}{9} - \dfrac{y^2}{25}\right)\times \dfrac{2y}{5}$

$\qquad = \left(\dfrac{2y}{5}\right)\left\{\left(\dfrac{2y}{5}\right)^2 + 3\left(\dfrac{x^2}{9} - \dfrac{y^2}{25}\right)\right\}$

$\qquad = \dfrac{2y}{5}\left\{\dfrac{4y^2}{25} + \dfrac{x^2}{3} - \dfrac{3y^2}{25}\right\}$

$\qquad = \dfrac{8y^3}{125} + \dfrac{2x^2y}{15} - \dfrac{6y^3}{125} = \dfrac{\mathbf{2y^3}}{\mathbf{125}} + \dfrac{\mathbf{2x^2y}}{\mathbf{15}}$

7. Do yourself.

EXERCISE 6.4

1. (i) $(1-x)(1+x+x^2) = (1)^3 - (x)^3 = \mathbf{1 - x^3}$

(ii) $(x+2)(x^2-2x+4) = (x)^3 + (2)^3 = \mathbf{x^3 + 8}$

(iii), (iv) Do yourself.

(v) $(0.9x + 0.7y)(0.81x^2 - 0.63xy + 0.49y^2)$

$\qquad\qquad = (0.9x)^3 + (0.7y)^3$

$\qquad\qquad = \mathbf{0.729x^3 + 0.343y^3}$

(vi) $\left(\dfrac{2x}{5} - \dfrac{3y}{7}\right)\left(\dfrac{4x^2}{25} + \dfrac{9y^2}{49} + \dfrac{6xy}{35}\right) = \left(\dfrac{2x}{5}\right)^3 - \left(\dfrac{3y}{7}\right)^3$

$\qquad\qquad\qquad = \dfrac{\mathbf{8x^3}}{\mathbf{125}} - \dfrac{\mathbf{27y^3}}{\mathbf{343}}$

2. Do yourself.

EXERCISE 6.5

1. (i) $x^2 + 9x + 20 = x^2 + (5+4)x + 20 = x^2 + 5x + 4x + 20$

$\qquad\qquad = x(x+5) + 4(x+5) = \mathbf{(x+4)(x+5)}$

(ii) $x^2 - 6x + 8 = x^2 - (4+2)x + 8 = x^2 - 4x - 2x + 8$

$\qquad\qquad = x(x-4) - 2(x-4) = \boldsymbol{(x-4)(x-2)}$

(iii) Do yourself.

(iv) $p^2 + 5pq - 36q^2$

$\qquad\qquad = p^2 + (9-4)pq - 36q^2 = p^2 + 9pq - 4pq - 36q^2$

$\qquad\qquad = p(p+9q) - 4q(p+9q) = \boldsymbol{(p+9q)(p-4q)}$

(v) Do yourself.

(vi) $m^2 + 11mn + 18n^2 = m^2 + (9+2)mn + 18n^2$

$\qquad\qquad\qquad = m^2 + 9mn + 2mn + 18n^2$

$\qquad\qquad\qquad = m(m+9n) + 2n(m+9n)$

$\qquad\qquad\qquad = \boldsymbol{(m+9n)(m+2n)}$

2. (i) $x^2 + 4y^2 + z^2 + 4xy - 2xz - 4yz$

$\qquad\qquad = (x)^2 + (2y)^2 + (-z)^2 + 2 \times x \times 2y + 2 \times 2y$

$\qquad\qquad\qquad\qquad\qquad \times(-z) + 2 \times (-z) \times (x)$

$\qquad\qquad = \boldsymbol{(x + 2y - z)^2}$

(ii) $4p^2 + 9q^2 + 4r^2 + 12pq + 12qr + 8pr$

$\qquad\qquad = (2p)^2 + (3q)^2 + (2r)^2 + 2 \times 2p \times 3q + 2 \times 3q$

$\qquad\qquad\qquad\qquad\qquad\qquad \times 2r + 2 \times 2p \times 2r$

$\qquad = \boldsymbol{(2p + 3q + 2r)^2}$

(iii), (iv) Do yourself.

3. (i) $27x^3 - 8y^3 - 54x^2y + 36xy^2$

$\qquad\qquad = (3x)^3 - (2y)^3 - 18xy(3x - 2y)$

$\qquad\qquad = (3x - 2y)(9x^2 + 4y^2 + 6xy) - 18xy(3x - 2y)$

$\qquad\qquad = (3x - 2y)(9x^2 + 4y^2 + 6xy - 18xy)$

$\qquad\qquad = (3x - 2y)(9x^2 + 4y^2 - 12xy) = \boldsymbol{(3x - 2y)^3}$

(ii) Do yourself.

(iii) $8y^3 - 125z^3 - 60y^2z + 150yz^2$

$\qquad\qquad = (2y)^3 - (5z)^3 - 30yz(2y - 5z)$

$\qquad\qquad = (2y - 5z)\{4y^2 + 25z^2 + 10yz\} - 30yz(2y - 5z)$

$\qquad\qquad = (2y - 5z)(4y^2 + 25z^2 + 10yz - 30zy)$

$\qquad\qquad = (2y - 5z)(4y^2 + 25z^2 - 20yz) = \boldsymbol{(2y - 5z)^3}$

(iv) Do yourself.

4. (i) $p^3 + 27 = (p)^3 + (3)^3 = \boldsymbol{(p + 3)(p^2 + 9 - 3p)}$

(ii) Do yourself.

(iii) $1 - 27z^3 = (1)^3 - (3z)^3 = \boldsymbol{(1 - 3z)(1 + 9z^2 + 3z)}$

(iv) Do yourself.

(v) $64x^3 - y^3 = (4x)^3 - (y)^3 = \mathbf{(4x - y)(16x^2 + y^2 + 4xy)}$

(vi) Do yourself.

(vii)$\dfrac{1}{216}p^3 - 8q^3 = \left(\dfrac{p}{6}\right)^3 - (2q)^3 = \mathbf{\left(\dfrac{p}{6} - 2q\right)\left(\dfrac{p^2}{36} + 4q^2 + \dfrac{pq}{3}\right)}$

5. (i) $10xy^4 - 10x^4y = 10xy(y^3 - x^3)$

$\qquad\qquad = \mathbf{10xy(y - x)(y^2 + x^2 + xy)}$

(ii) $54x^6y + 2x^3y^4 = 2x^3y\{27x^3 + y^3\} = 2x^3y\{(3x)^3 + (y)^3\}$

$\qquad\qquad = \mathbf{2x^3y(3x + y)(9x^2 + y^2 - 3xy)}$

(iii) $(p - 2q)^3 - (8q)^3$

$\qquad\qquad = (p - 2q - 8q)\{(p - 2q)^2 + (8q)^2 + (p - 2q)8q\}$

$\qquad\qquad = (p - 10q)\{p^2 - 4q^2 - 4pq + 64q^2 + 8pq - 16q^2\}$

$\qquad\qquad = \mathbf{(p - 10q)\{p^2 + 52q^2 + 4pq\}}$

(iv) Do yourself.

EXERCISE 6.6

1. (i) $p^3 + 8q^3 + 64r^3 - 24pqr$

$\qquad = (p)^3 + (2q)^3 + (4r)^3 - 3 \times p \times 2q \times 4r$

$\qquad = \mathbf{(p + 2q + 4r)\{p^2 + 4q^2 + 16r^2 - 2pq - 8qr - 4pr\}}$

(ii) Do yourself.

(iii) $l^3 + m^3 - n^3 + 3lmn$

$\qquad\qquad = (l)^3 + (m)^3 + (-n)^3 - 3 \times l \times (m) \times (-n)$

$\qquad\qquad = \mathbf{(l + m - n)\{l^2 + m^2 + n^2 - lm + mn + nl\}}$

(iv), (v) Do yourself.

(vi) $\dfrac{1}{27}x^3 - y^3 + 125z^3 + 5xyz$

$\qquad = \left(\dfrac{x}{3}\right)^3 + (-y)^3 + (5z)^3 - 3 \times \dfrac{x}{3} \times (-y) \times 5z$

$\qquad = \mathbf{\left(\dfrac{x}{3} - y + 5z\right)\left\{\dfrac{x^2}{9} + y^2 + 25z^2 + \dfrac{xy}{3} + 5yz - \dfrac{5}{3}zx\right\}}$

2. (i) $(3x - 5y)^3 + (5y - 9z)^3 + (9z - 3x)^3$

Let $\quad 3x - 5y = A,\ 5y - 9z = B,\ 9z - 3x = C$

Then, $3x - 5y + 5y - 9z + 9z - 3x = A + B + C$

$\therefore \qquad\qquad A + B + C = 0$

$\therefore \qquad\qquad A^3 + B^3 + C^3 = 3ABC$

$\Rightarrow \quad (3x - 5y)^3 + (5y - 9z)^3 + (9z - 3x)^3$

$\qquad\qquad = \mathbf{3(3x - 5y)(5y - 9z)(9z - 3x)}$

(ii), (iii), (iv) Do yourself.

3. (i) $55^3 - 25^3 - 30^3$

$(55)^3 - (25)^3 - (30)^3$

Let $a = 55, b = -25, c = -30$

Then, $\qquad\qquad a + b + c = 0$

$\therefore \qquad\qquad a^3 + b^3 + c^3 = 3abc$

$(55)^3 + (-25)^3 + (-30)^3 = 3 \times 55 \times (-25) \times (-30)$

$\qquad\qquad\qquad = 90 \times 55 \times 25 = \mathbf{123750}$

(ii) Do yourself.

(iii) $(9.8)^3 - (11.3)^3 + (1.5)^3$

Let $a = 9.8, b = -11.3, c = 1.5$

Then, $\qquad\qquad a + b + c = 0$

$\therefore \qquad\qquad a^3 + b^3 + c^3 = 3abc$

$(9.8)^3 + (-11.3)^3 + (1.5)^3 = 3 \times 9.8 \times (-11.3) \times (1.5)$

$\qquad\qquad\qquad = \mathbf{-498.33}$

(iv) Do yourself.

Let's Recall

1. (a) $x + y + z = 10$ and $x^2 + y^2 + z^2 = 40$

$\qquad\qquad xy + yz + zx = ?$

$\qquad\qquad (x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$

$\qquad\qquad (10)^2 = 40 + 2(xy + yz + zx)$

$\qquad\qquad 100 - 40 = 2(xy + yz + zx)$

$\qquad\qquad xy + yz + zx = \dfrac{60}{2} = 30$ or $\mathbf{xy + yz + zx = 30}$

2. (b) $x + y = 5$ and $xy = 4$

$\qquad\qquad x^3 + y^3 = ?$

$\qquad\qquad (x + y)^3 = x^3 + y^3 + 3xy(x + y)$

$\qquad\qquad (5)^3 = x^3 + y^3 + 3 \times 4(5)$

$\qquad\qquad 125 = x^3 + y^3 + 60$

$\qquad\qquad 125 - 60 = x^3 + y^3 \Rightarrow 65 = x^3 + y^3$

$\qquad\qquad \mathbf{x^3 + y^3 = 65}$

3. (c) $(x - y)^3 + (y - z)^3 + (z - x)^3 = \mathbf{3(x - y)(y - z)(z - x)}$

4. (b) Let the two numbers are x and y

Now,

According to question,

$\qquad\qquad x + y = 15$

and $\qquad\qquad x^2 - y^2 = 15$

$$(x + y)(x - y) = 15$$

Putting the value of $(x + y)$

$$15(x - y) = 15$$

$$x - y = \frac{15}{15}$$

$$x - y = 1$$

Hence,

The difference of the numbers is 1.

5. (c) $a^3 + b^3 + c^3 - 3abc$ divided by $(a + b + c)$

Then, $= (a^2 + b^2 + c^2 - ab - bc - ca)$

7. Division of Algebraic Expressions

EXERCISE 7.1

1. (i) $6x^2yz \div 3xy$, $\dfrac{6x^2yz}{3xy} = 2xz$

(ii) $15m^2n^3 \div 5m^2n^2$, $\dfrac{15m^2n^3}{5m^2n^2} = 3n$

(iii) Do yourself.

2. (i) $\dfrac{16m^3y^2}{4m^2y} = \mathbf{4my}$

(ii) $\dfrac{x^2 + 4x + 4}{x + 2} = \dfrac{(x + 2)^2}{(x + 2)} = \mathbf{x + 2}$

(iii) $\dfrac{16m^2 - 9n^2}{4m - 3n} = \dfrac{(4m)^2 - (3n)^2}{4m - 3n}$

$$= \dfrac{(4m + 3n)(4m - 3n)}{(4m - 3n)} = \mathbf{4m + 3n}$$

(iv) $\dfrac{125x^3 + 64}{25x^2 - 20x + 16} = \dfrac{(5x)^3 + (4)^3}{25x^2 - 20x + 16}$

$$= \dfrac{(5x + 4)(25x^2 - 20x + 16)}{(25x^2 - 20x + 16)} = \mathbf{5x + 4}$$

(v) $\dfrac{9x^2 - 24xy + 16y^2}{3x - 4y} = \dfrac{(3x - 4y)^2}{(3x - 4y)} = \mathbf{3x - 4y}$

(vi) $\dfrac{216z^3 - 343p^3}{6z - 7p} = \dfrac{(6z)^3 - (7p)^3}{(6z - 7p)}$

$$= \frac{(6z - 7p)(36z^2 + 49p^2 + 42pz)}{(6z - 7p)}$$
$$= \mathbf{36z^2 + 49p^2 + 42pz}$$

EXERCISE 7.2

1. (i) $(9m^5 + 12m^4 - 6m^2) \div 3m^2 = \dfrac{9m^5}{3m^2} + \dfrac{12m^4}{3m^2} - \dfrac{6m^2}{3m^2}$

$$= \mathbf{3m^3 + 4m^2 - 2}$$

(ii) $(x^2 + 7x + 12) \div (x + 3) = \dfrac{x^2 + 7x + 12}{x + 3}$

$$= \frac{x^2 + 4x + 3x + 12}{x + 3}$$

$$= \frac{x(x + 4) + 3(x + 4)}{x + 3}$$

$$= \frac{(x + 3)(x + 4)}{x + 3} = \mathbf{x + 4}$$

(iii), (iv) Do yourself.

(v) $(3m^3 + 4m^2 + 5m + 18) \div (m + 2)$

```
                3m² − 2m + 9
       m+2 ) 3m³ + 4m² + 5m + 18
              3m³ + 6m²
            −      −
            ─────────────────
                  −2m²+5m
                  −2m² − 4m
                +       +
                ─────────────────
                        9m + 18
                        9m + 18
                      −       −
                      ─────────
                           ×
                      ─────────
```

(vi) $3y^4 - 3y^3 - 4y^2 4y \div y^2 - 2y$

```
                  3y² + 3y + 2
       y² − 2y ) 3y⁴ − 3y³ − 4y² + 4y
                 3y⁴ − 6y³
               −     +
               ──────────────────
                    −3y³ − 4y²
                    −3y³ − 6y²
                  −       +
                  ──────────────────
                        2y² − 4y
                        2y² − 4y
                      −     +
                      ─────────
                           ×
                      ─────────
```

2. (i) $14x^2 + 13x - 15 \div 7x - 4$

$$
\begin{array}{r}
2x + 3 \\
7x - 4\,\overline{)\,14x^2 + 13x - 15} \\
\underline{14x^2 - 8x} \\
\underset{-+}{} \\
21x - 15 \\
21x - 12 \\
\underset{-+}{} \\
-\,3
\end{array}
$$

$2x + 3$, Remainder $= -3$

Now, Dividend $=$ Divisor $\times$ Quotient $+$ Remainder

$\qquad$ RHS $=$ Divisor $\times$ Quotient $+$ Remainder

$\qquad\qquad = (7x - 4) \times (2x + 3) + (-3)$

$\qquad\qquad = 7x \times 2x - 4 \times 2x + 3 \times 7x - 4 \times 3 + (-3)$

$\qquad\qquad = 14x^2 - 8x + 21x - 12 - 3 = 14x^2 + 13x - 15$

$\qquad$ LHS $=$ Dividend

$\qquad\qquad = 14x^2 + 13x - 15$

Thus, $\qquad$ LHS $=$ RHS

(ii), (iii) Do yourself.

(iv) $(34x - 22x^3 - 12x^4 - 10x^2 - 75) \div (3x + 7)$

$$
\begin{array}{r}
-4x^3 + 2x^2 - 8x + 30 \\
3x + 7\,\overline{)\,-12x^4 - 22x^3 - 10x^2 + 34x - 75} \\
\underline{-12x^4 - 28x^3} \\
\underset{++}{} \\
6x^3 - 10x^2 \\
6x^3 + 14x^2 \\
\underset{--}{} \\
-24x^2 + 34x \\
-24x^2 - 56x \\
\underset{++}{} \\
90x - 75 \\
90x + 210 \\
\underset{--}{} \\
-285
\end{array}
$$

$\Rightarrow -4x^3 + 2x^2 - 8x + 30$, Remainder $= -285$

Now, Dividend $=$ Divisor $\times$ Quotient $+$ Remainder

$\qquad$ RHS $=$ Divisor $\times$ Quotient $+$ Remainder

$\qquad\qquad = (3x + 7) \times (-4x^3 + 2x^2 - 8x + 30) + (-285)$

$\qquad\qquad = (-4x^3 + 2x^2 - 8x + 30) \times 3x + (-4x^3 + 2x^2$

$\qquad\qquad\qquad\qquad\qquad -8x + 30) \times 7 - 285$

$$= -12x^4 + 6x^3 - 24x^2 + 90x - 28x^3 + 14x^2$$
$$-56x + 210 - 285$$
$$= -12x^4 - 22x^3 - 10x^2 + 34x - 75$$

LHS = Dividend
$$= 12x^4 - 22x^3 - 10x^2 + 34x - 75$$

Thus, LHS = RHS

3. (i) $(x^2 - x - 42), (x + 6)$

$$
\begin{array}{r}
x - 7 \\
x + 6 \overline{)\, x^2 - x - 42} \\
x^2 + 6x \\
\underline{-\quad -\quad\;\;} \\
-7x - 42 \\
-7x - 42 \\
\underline{+\quad +\quad\;} \\
\times
\end{array}
$$

Yes, $(x + 6)$ is a factor of $(x^2 - x - 42)$

(ii) $(4z^2 - 13z - 12), (4z - 3)$

$$
\begin{array}{r}
z - \dfrac{5}{2} \\
4z - 3 \overline{)\, 4z^2 - 13z - 12} \\
4z^2 - 3z \\
\underline{-\quad +\quad\quad} \\
-10z - 12 \\
-10z + \dfrac{15}{2} \\
\underline{+\quad\quad -\quad} \\
-\dfrac{39}{2}
\end{array}
$$

No, $(4z - 3)$ is not a factor of $(4z^2 - 13z - 12)$

(iii), (iv) Do yourself.

(v) $(z^5 - 9z) \div (z^2 + 3)$

$$
\begin{array}{r}
z^3 - 3z \\
z^2 + 3 \overline{)\, z^5 - 9z} \\
z^5 + 3z^3 \\
\underline{-\quad -\quad\;} \\
-3z^3 - 9z \\
-3z^3 - 9z \\
\underline{+\quad\quad +\quad} \\
\times
\end{array}
$$

= Yes, $(z^2 + 3)$ is a factor of $(z^2 - 9z)$

8. Linear Equations in One Variable

1. $\dfrac{2y+6}{y+4} = 1$

$$2y + 6 = y + 4$$
$$2y - y = 4 - 6$$
$$y = -2$$

Check :

$$\text{LHS } \frac{2\,(-2)+6}{(-2)+4} = \frac{-4+6}{-2+4} = \frac{2}{2} = 1 \text{ RHS}$$

$$\textbf{LHS} = \textbf{RHS}$$

2. $\dfrac{3x+5}{2x+7} = \dfrac{4}{1}$

$$3x + 5 = 4\,(2x + 7)$$
$$3x + 5 = 8x + 28$$
$$5 - 28 = 8x - 3x$$

$$\Rightarrow \qquad -23 = 5x,\ x = -\frac{23}{5}$$

Check :

$$\text{L.H.S.} \qquad = \frac{3x+5}{2x+7} = \frac{3 \times \left(\dfrac{-23}{5}\right) + 5}{2 \times \left(\dfrac{-23}{5}\right) + 7}$$

$$= \frac{\dfrac{-69+25}{5}}{\dfrac{-46+35}{5}}$$

$$= \frac{-44}{-11} = \frac{4}{1}$$

$$\text{RHS} = \frac{4}{1}$$

$$\textbf{LHS} = \textbf{RHS}$$

3. $\dfrac{2x+1}{3x-2} = \dfrac{5}{9} \Rightarrow 18x + 9 = 15x - 10,\ 18x - 15x = -10 - 9,$

$$3x = -19,\ x = \frac{-19}{3}$$

Check :
$$\text{LHS} = \frac{2x+1}{3x-2} = \frac{2 \times \left(-\frac{19}{3}\right)+1}{3 \times \left(-\frac{19}{3}\right)-2}$$

$$= \frac{\frac{-38+3}{3}}{-19-2} = \frac{-35}{3 \times (-21)}$$

$$= \frac{-35}{-63} = \frac{5}{9}$$

$$\text{LHS} = \frac{5}{9}$$

LHS = RHS

4. Do yourself.

5. $\dfrac{1-9y}{19-3y} = \dfrac{5}{8}$, $8 - 72y = 95 - 15y$ $\Rightarrow 8 - 95 = -15y + 72y$

$$-87 = 57y, \, y = \frac{-87}{57} = \frac{-29}{19}$$

Check :
$$\text{LHS} = \frac{1-9y}{19-3y} = \frac{1 - 9 \times \left(\frac{-29}{19}\right)}{19 - 3 \times \left(\frac{-29}{19}\right)}$$

$$= \frac{\frac{19+261}{19}}{\frac{361+87}{19}} = \frac{280}{448} = \frac{5}{8}$$

$$\text{RHS} = \frac{5}{8}$$

LHS = RHS

6. Do yourself.

7. $\dfrac{0.4z-3}{1.5z+9} = \dfrac{-7}{5}$ $\Rightarrow$ $2z - 15 = -10.5z - 63,$

$12.5z = -63 + 15,$ $\Rightarrow$ $12.5z = -48, z = \dfrac{-48}{12.5} = \mathbf{\dfrac{-96}{25}}$

8. Do yourself.

9. $\dfrac{2x}{3x+1} = \dfrac{-3}{1}, 2x = -9x - 3, \, 2x + 9x = -3, 11x = -3, x = \mathbf{\dfrac{-3}{11}}$

10. $\dfrac{17(2-x) - 5(x+12)}{1-7x} = \dfrac{8}{1}, \dfrac{34 - 17x - 5x - 60}{1-7x} = \dfrac{8}{1},$

$\dfrac{-22x - 26}{1-7x} = \dfrac{8}{1}, 8 - 56x = -22x - 26, 8 + 26 = -22x + 56x,$

$34 = 34x \Rightarrow x = \mathbf{1}$

Advance Mathematics-8   **161**

11. $\dfrac{y - (7 - 8y)}{9y - (3 + 4y)} = \dfrac{2}{3}, \ 3y - 3(7 - 8y) = 18y - 2(3 + 4y),$

$3y - 21 + 24y = 18y - 6 - 8y, 27y - 21 = 10y - 6,$

$27y - 10y = -6 + 21, 17y = 15 \Rightarrow y = \dfrac{\mathbf{15}}{\mathbf{17}}$

EXERCISE 8.2

1. Let the unit place be x, then the digit in the tens place $= 12 - x$
The original number $= 10 \times (12 - x) + x = 120 - 9x$
Reversing the digits the new number $= 10x + (12 - x)$
$$= 10x + 12 - x = 9x + 12$$
Now, $120 - 9x + 18 = 9x + 12, \ 138 - 12 = 9x + 9x, \ 126 = 18x$
$\Rightarrow x = 7$
The digit in the unit place $= 7$
The digit in the tens place $= 12 - 7 = 5$
The original number $= 57$
Check :
The original number $= 120 - 9x = 120 - 9 \times 7 = 120 - 63 = \mathbf{57}$

2. Let the numbers be $7x$ and $8x$

$7x + 8x = 45, \qquad 15x = 45 \Rightarrow x = \dfrac{45}{15} = 3$

First number $= 7x = 7 \times 3 = 21,$
Second number $= 8x = 8 \times 3 = \mathbf{24}$

3., **4.**, **5.** Do yourself.

6. Let the Meera's present age $= x$, Mother's age $= 4x$
After five year, \quad Meera's age $= x + 5$ and Mother's age $= 4x + 5$
According to the question
$3(x + 5) = 4x + 5, \ 3x + 15 = 4x + 5, \ 15 - 5 = 4x - 3x, \ 10 = x$
$\therefore$ Meera's age $= 10$ years and Mother's age $= \mathbf{40 \ years.}$

7. Let the unit place be x and tens place be $3x$
The original number $= 3x \times 10 + x$
Reversing the digits the new number $= 10x + 3x$
According to the question, we have, $30x + x + 10x + 3x = 88,$
$44x = 88, \ x = 2$
Unit place $= 2$ and tens place $= 3 \times 2 = 6$
The number $= \mathbf{62}$

8. Let the base of triangle be x and altitude $= \dfrac{5x}{3}$
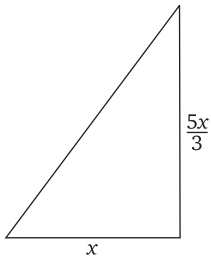
Case I   Case II
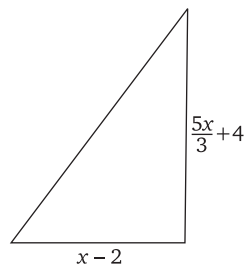
$$\text{Area of triangle} = \frac{1}{2} \times \text{base} \times \text{altitude}$$

$$\frac{5x \times x}{3 \times 2} = \frac{1}{2} \times (x-2)\left(\frac{5x}{3} + 4\right)$$

$$\frac{5x^2}{6} = \frac{1}{2}\left\{\frac{5x^2}{3} + 4x - \frac{10x}{3} - 8\right\}$$

$$\frac{5x^2}{6} = \frac{5x^2}{6} + 2x - \frac{5x}{3} - 4$$

$$\frac{6x - 5x}{3} - 4 = 0$$

$$\frac{x}{3} = 4 \Rightarrow x = 12$$

Base = **12 cm** and Altitude = **20 cm**.

9. Let the breadth $= x$,   length $= 4 + x$

Case I   Case II

Area of rectangle   Area of rectangle

$= l \times b$ $= (x+7)(x+3)$

$= (\boldsymbol{x+4}) \times \boldsymbol{x}$
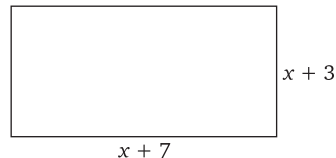
Now according to the question, we have

$x(x+4) + 81 = (x+7)(x+3)$ $x^2 + 4x + 81 = x^2 + 7x + 3x + 21$

$x^2 + 4x + 81 = x^2 + 10x + 21$ $81 - 21 = 10x - 4x$

$60 = 6x \Rightarrow x = 10$

Breadth = **10 cm** and Length $= 10 + 4 =$ **14 cm**

Check :

$x(x+4)+81=(x+7)(x+3),\ \ 10(10+4)+81=(10+7)(10+3)$

$10\times 14+81=17\times 13,\ \ 140+81=17\times 13$

$$221=221$$

10. Let the volume of iron piece be x and copper piece be $2x$.

$$x\times 7.8+2x\times 8.9\ =1280,\ \ \frac{78x}{10}+\frac{178}{10}x=1280,\ \ \frac{256x}{10}=1280$$

$$256x=12800,\ x=\frac{12800}{256}=50$$

Volume of iron $=50\,\text{cm}^3$

Volume of copper $=100\,\text{cm}^3$

11. Let the land which can be ploughed in one day be x.

$$14\times x=(x+20)\times 10,\ \ 14x=10x+200$$

$$14x-10x=200\Rightarrow 4x=200\Rightarrow x=\mathbf{50}$$

$$\text{Area of field}=50\times 14=\mathbf{700}$$

50 hectares and **700 hectares**.

12. Let the first prize be x.

Second prize be $\dfrac{5x}{6}$, Third prize be $\dfrac{5x\times 4}{6\times 5}=\dfrac{2x}{3}$

$$x+\frac{5x}{6}+\frac{2x}{3}=150$$

$$x\left\{1+\frac{5}{6}+\frac{2}{3}\right\}=150$$

$$\frac{15}{6}\times x=150,\ x=\frac{150\times 6}{15}=60$$

First prize $=$ ₹ **60**,   Second prize $=$ ₹ **50**, Third prize $=$ ₹ **40**

13., **14.** Do yourself.

Let's Recall

1. (d) $\sqrt{2+\sqrt{x}}=3$

Squaring both side,

$$2+\sqrt{x}=9$$

$$\sqrt{x}=9-2$$

$$\sqrt{x}=7$$

Again squaring both side,

$$(\sqrt{x})^2=(7)^2$$

$$x=\mathbf{49}$$

2. (d) $\dfrac{2x-3}{3x+2}=-\dfrac{2}{3}$

$$6x-9=-6x-4$$

$$6x + 6x = -4 + 9$$
$$12x = 5$$
$$x = \frac{\mathbf{5}}{\mathbf{12}}$$

3. **(b)** Let two numbers are x and y
Now,
According to question
$$x + y = 15$$
And $\qquad x^2 - y^2 = 15$
$$(x + y)(x - y) = 15$$
Putting the value of $(x + y)$
$$15(x - y) = 15$$
$$x - y = \frac{15}{15}$$
$$x - y = \mathbf{1}$$
Hence, The difference of the numbers is 1.

4. **(c)** Let man's age $= x$
His wife's age $= y$
Now, According to question
$$x + y = 99$$
$$\text{and } x = y + 9$$
$$y + 9 + y = 99,$$
$$y + y = 99 - 9, \, 2y = 90, \, y = 45 \text{ years}$$
Then, man's age $x = y + 9$, $x = 45 + 9$, $x = 54$
Hence, man's age is **54**.

5. **(c)** No unique solution.

Unit-III : Commercial Mathematics

9. Ratios and Percentage

EXERCISE 9.1

9. Number of defective tyres $= 28000 \, \text{of} \, 4\dfrac{1}{4}\,\%$
$$= 28000 \times \frac{17}{4 \times 100}$$
$$= \frac{280 \times 17}{4}$$
$$= 70 \times 17 = 1190$$
Hence, the number of defective tyres in company is **1190**.

EXERCISE 9.2

1. Decrease 216 by $37\frac{1}{2}\%$

$$= 216 \times 37\frac{1}{2}\%$$
$$= 216 \times \frac{75}{2}\%$$
$$= 216 \times \frac{75}{2 \times 100}$$
$$= 81$$

Decreased value $= 216 - 81 = \textbf{135}$.

2. Increase 28 by 125%

$$= 28 \times 125\%$$
$$= 28 \times \frac{125}{100}$$
$$= 35$$

Increased value $= 28 + 35$
$$= \textbf{63}$$

3. Let the number be x.

When, increased by $15\% = x \times 15\%$
$$= x \times \frac{15}{100}$$
$$= \frac{3x}{20}$$

According to question, $x + \frac{3x}{20} = 161$

$$\frac{20x + 3x}{20} = 161$$
$$23x = 161 \times 20$$
$$x = \frac{161 \times 20}{23}$$
$$x = 140$$

Hence, the number is **140**.

4. Do yourself.

5. The cost of flat after $36\% = 100\% + 36\%$

$$= 136\% \text{ of } 1900000$$

Then,
$$= \frac{136}{100} \times 1900000$$
$$= 136 \times 19000$$
$$= ₹\, 2584000$$

Hence, the cost of flat today is ₹ **2584000**.

6. Amount spent by a man in a month = ₹ 880

$$\text{Amount for rent} = 26\%$$

$$\text{Amount of that his rent} = 26\% \text{ of } ₹ \, 880$$

$$= 880 \times \frac{26}{100}$$

$$= \frac{88 \times 26}{10} = ₹ \, \mathbf{228.80}$$

7. After spending of 88%, 12% of his income remains

Use Proportion Method

His income : ₹ 2160 : : 100 : 12

$$\text{His income} = \frac{100 \times ₹ \, 2160}{12} = ₹ \, \mathbf{18000}$$

8. Do yourself.

9. New height of the tree after increased by 12.5%

$$= 4.8 \, \text{m} + 4.8 \, \text{m} \times 12.5\%$$

$$= 4.8 \, \text{m} + 4.8 \, \text{m} \times \frac{12.5}{100}$$

$$= 4.8 \, \text{m} + 0.6 \, \text{m}$$

$$= 5.4 \, \text{m}$$

Thus, the new height of tree is **5.4 m**.

10. Number of the house to be sold in 2006

$$= 4260 + 20\% \text{ of } 4260$$

$$= 4260 + 4260 \times \frac{20}{100}$$

$$= 4260 + 852$$

$$= 5112$$

Hence, the number of house in 2006 is **5112**.

11. Do yourself.

12. Let the number of passengers carried a train in 2004 be x.

Number of passengers carried by a train in 2005 $= x + x \times 8\%$

$$= x + x \times \frac{8}{100}$$

$$= x + \frac{2x}{25}$$

$$= \frac{27x}{25}$$

Number of passengers carried by a train in 2006

$$= \frac{27x}{25} + \frac{27x}{25} \times 8\%$$

$$= \frac{27}{25}x + \frac{27}{25}x \times \frac{8}{100}$$

$$= \frac{27}{25}x + \frac{27}{25}x \times \frac{2}{25}$$

$$= \frac{27}{25}x\left[1 + \frac{2}{25}\right]$$

$$= \frac{27}{25}x \times \frac{27}{25}$$

$$= \left(\frac{27}{25}\right)^2 x$$

Increase in 2004 to 2006 $= \left(\frac{27}{25}\right)^2 x - x$

$$= \frac{729}{625}x - x$$

$$= \frac{729x - 625x}{625}$$

$$= \frac{104}{625}x$$

In Percentage $= \frac{104x \times 100}{625 \times x}$

$$= \frac{104 \times 100}{625}$$

$$= \mathbf{16.64\%}$$

13. Method-I

Mohan is taller than Ram $= 108\%$

Ankur is shorter than Ram $= 90\%$

Percentage of Mohan taller than Ankur $= \left[\frac{108\% - 90\%}{90\%} \times 100\right]\%$

$$= \left[\frac{18\%}{90\%} \times 100\right]\%$$

$$= \left[\frac{1}{5} \times 100\right]\%$$

$$= \mathbf{20\%}$$

Method-II

Let the Ram tall be x.

Then,

Mohan is taller than Ram $= x + x$ of 8%

$$= x + x \times \frac{8}{100}$$

$$= x + \frac{2x}{25} = \frac{27x}{25}$$

Ankur is shorter than Ram $= x - x \times 10\%$

$$= x - x \times \frac{10}{100}$$

$$= x - \frac{x}{10} = \frac{9x}{10}$$

Percentage of Mohan taller than Ankur $\left[\dfrac{\frac{27}{25}x - \frac{9x}{10}}{\frac{9x}{10}} \times 100 \right]\%$

$$\left[\frac{54x - 45x}{50} \times \frac{10}{9x} \times 100 \right]\%$$

$$\left[\frac{9x}{50} \times \frac{10}{9x} \times 100 \right]\%$$

$$= \left[\frac{10 \times 100}{50} \right]\% = \mathbf{20\%}$$

10.   Profit and Loss

EXERCISE 10.1

1. SP = ₹ 3240, gain = 8%, CP = ?

$$CP = \frac{100}{100 + 8} \times 3240$$

$$= ₹ 3000$$

2. CP of Pens = ₹ 200, CP of Pencils = ₹ 50

$$SP \text{ of Pens} = \frac{100 + 10}{100} \times 200$$

$$= \frac{110 \times 200}{100} = ₹ 220$$

$$SP \text{ of Pencils} = \frac{100 - 20}{100} \times 50 = \frac{80 \times 50}{100} = ₹ 40$$

Total CP = ₹ (200 + 50) = ₹ 250

Total SP = ₹ (220 + 40) = ₹ 260,   SP > CP

Profit = SP – CP = ₹ (260 – 250) = ₹ 10

$$Profit\% = \frac{Profit \% \times 100}{CP} = \frac{10 \times 100}{250} = 4\%$$

Profit = 4%

3.
$$CP = \frac{100}{100 - \text{Loss}\%} \times SP$$
$$= \frac{100}{100 - 12} \times 1320$$
$$= ₹ \frac{100 \times 1320}{88}$$
$$= ₹ \textbf{1500}$$

4. CP = ₹ 1200, Profit of Sonu = 10%, SP = ?
$$SP = \frac{100 + \text{Gain}\%}{100} \times CP$$
$$= \frac{100 + 10}{100} \times 1200$$
$$= ₹ \frac{110 \times 1200}{100} = ₹ 1320,$$

CP of John's cycle = ₹ 1320

Profit of Salim = 12%, SP = ?
$$SP = \frac{100 + 12}{100} \times 1320$$
$$= ₹ \frac{112 \times 1320}{100}$$
$$= ₹ \textbf{1478.40}$$

5. Cost of 20 quires = 250, Cost of 1 quires = $\frac{250}{20}$ = ₹ 12.50,

Gain% = 20%, CP = ₹ 12.50
$$SP = \frac{100 + \text{Gain}\%}{100} \times CP$$
$$SP = \frac{100 + 20}{100} \times 12.50$$
$$SP = ₹ \frac{120 \times 1250}{100 \times 100} = ₹ \textbf{15}$$

6., **7.** Do yourself.

8. SP = ₹ 360, Loss% = 10, CP = ?
$$CP = \frac{100}{100 - 10} \times 360$$
$$= \frac{100 \times 360}{90} = ₹ 400$$

In other case CP = ₹ 400
$$SP = ₹ 460, \ SP > CP$$
$$\text{Profit} = ₹ (460 - 400) = ₹ 60$$
$$\text{Profit}\% = \frac{\text{Profit}\% \times 100}{CP} = \frac{60 \times 100}{400} = 15\%$$
$$\textbf{Profit} = \textbf{15\%}$$

9., **10.**, **11.** Do yourself.

12. S.P. = ₹ 360, Loss per cent = 25%, CP = $\dfrac{100}{100-25} \times$ SP

$$= \dfrac{100 \times 360}{75} = ₹\ 480$$

Now the CP = ₹ 480 and Gain = 25%,

$$\text{SP} = \dfrac{100+25}{100} \times 480$$

$$= ₹\ \dfrac{125 \times 480}{100}$$

$$= ₹\ \mathbf{600}$$

13. Do yourself.

14. Let the CP of 1 fan be ₹ x, CP of 4 fans = ₹ $4x$

SP of 4 fans = CP of 5 fans = ₹ $5x$, SP > CP

Profit = ₹ $(5x - 4x)$ = ₹ x

$$\text{Profit\%} = \dfrac{\text{Profit} \times 100}{\text{C. P.}}$$

$$= \dfrac{x \times 100}{4x} = \mathbf{25\%}$$

15. Do yourself.

16. Difference in the percentages of Profit = 10% − (−5%), 10 + 5 = 15%, Let the CP be x, Then 15% of x = 375

$$\dfrac{15 \times x}{100} = 375, \qquad x = ₹\ \mathbf{2500}$$

17. Case I : SP = 67.50, Loss = 10%, CP = ?,

$$\text{CP} = \dfrac{100}{100-10} \times 67.50$$

$$= \dfrac{100 \times 6750}{90 \times 100}$$

CP = ₹ 75

Case II : SP = 82.50 and CP = ₹ 75,

Profit = 82.50 − 75.00 = 7.50

$$\text{Profit\%} = \dfrac{\text{Profit} \times 100}{\text{C. P.}}$$

$$= \dfrac{7.50 \times 100}{75}$$

$$= \dfrac{750 \times 100}{75 \times 100} = \mathbf{10\%}$$

18. SP = ₹ 644, CP = x, gain = $\dfrac{x}{6}$, gain% = $\dfrac{\text{gain} \times 100}{\text{CP}} = \dfrac{x \times 100}{6 \times x}$

$$= \dfrac{100}{6}\% = \dfrac{50}{3}\% = \mathbf{16.7\%}$$

19. Case I. CP $= 800 \times \dfrac{3}{4} = 600,$ Loss $= \dfrac{600 \times 10}{100} = 60,$

Loss $=$ CP $-$ SP, $60 = 600 -$ SP,   SP $=$ ₹ 540

Case II. CP $= 800 \times \dfrac{1}{4} = 200,$ Profit $= \dfrac{200 \times 10}{100} = 20,$

SP $= 200 + 20 = 220$

Total SP $= 540 + 220 =$ ₹ 760,   Total CP $=$ ₹ 800,

Loss $=$ CP $-$ SP $=$ ₹ $(800 - 760)$ Loss $=$ ₹ **40**

20. Do yourself.

EXERCISE 10.2

1. (i) Net selling Price $=$ Marked price $-$ Discount

$$\text{Discount\%} = \frac{\text{Discount}}{\text{Marked Price}} \times 100,$$

$$20 = \frac{x \times 100}{85} \Rightarrow x = 17$$

$$\text{NSP} = 85 - 17$$

$$= ₹ \, \textbf{68}$$

(ii) Do yourself.

2. (i) Market Price $= \dfrac{100}{100 - \text{Discount\%}} \times$ Net S. P.

$$= \frac{100 \times 1860}{100 - 7}$$

$$= ₹ \, \frac{1860 \times 100}{93} = ₹ \, \textbf{2000}$$

(ii) Do yourself.

3. (i) Discount $=$ Marked Price $-$ Net SP $= 40 - 34 =$ ₹ 6

$$\text{Discount\%} = \frac{\text{Discount} \times 100}{\text{Marked Price}} = \frac{6 \times 100}{40} = \textbf{15\%}$$

(ii) Do yourself.

4. Discount\% $= \dfrac{\text{Discount} \times 100}{\text{Marked Price}} = \dfrac{75 \times 100}{750} = \textbf{10\%}$

5. Discount\% $= \dfrac{\text{Discount} \times 100}{\text{Marked Price}}, 8 = \dfrac{x \times 100}{8750}, x = \dfrac{8 \times 8750}{100} =$ ₹ 700

Net SP $=$ Marked Price $-$ Discount

$$= 8750 - 700 = ₹ \, \textbf{8050}$$

6. Do yourself.

7. Net SP $= 54,$ Discount $= 10\%,$ Marked Price $= ?,$

Marked Price $= \dfrac{100}{100 - 10} \times 54 = \dfrac{100 \times 54}{90} = ₹ \, \textbf{60}$

8. Do yourself.

9. Let the CP be ₹ 100,

then Marked Price $= 100 + 25 = 125$,

$\text{Discount} = \dfrac{125 \times 20}{100} = 25$ $\qquad$ $\text{SP} = 125 - 25 = ₹ 100$,

$\qquad \text{Profit} = 100 - 100 = \mathbf{0}$

No loss, No profit.

10. $\text{Net selling price} = \dfrac{(100 - \text{Discount\%})}{100} \times \text{Marked Price}$

$= ₹ \dfrac{100 - 12}{100} \times 5400 = ₹ 4752$

Now, $\qquad$ $\text{C.P.} = \dfrac{100}{100 + 8} \times 4752$

$= ₹ \dfrac{100 \times 4752}{108} = ₹ \mathbf{4400}$

11. $\text{Marked Price} = ₹ 800, \text{First discount} = \dfrac{800 \times 12}{100} = ₹ 96$

Price after first discount $= 800 - 96 = ₹ 704$

$\text{Second discount} = \dfrac{704 \times 4}{100} = ₹ 28.16$

Price after second discount $= ₹ 704.00 - 28.16 = ₹ \mathbf{675.84}$

12. Do yourself.

EXERCISE 10.3

1. On ₹ 100, the tax paid was ₹ 5

(i) On ₹ 12000 for a T.V. the tax paid would be

$= ₹ \dfrac{5}{100} \times 12000 = ₹ 600$

Bill amount for a T.V. $= ₹ 12000 + ₹ 600$

$= ₹ \mathbf{12600}$

(ii) On ₹ 1800 for a leather coat, the tax paid would be

$= ₹ \dfrac{5}{100} \times 1800 = ₹ 90$

Bill amount for a leather coat $= ₹ 1800 + ₹ 90 = ₹ \mathbf{1890}$

(iii) On ₹ 50 for two bars soaps, the tax paid would be

$= ₹ \dfrac{5}{100} \times 50 = ₹ 2.50$

Bill amount for two bars soaps $= ₹ 50 + ₹ 2.50 = ₹ \mathbf{52.50}$

(iv) On ₹ 3300 for an air cooler, the tax paid would be

$$= ₹\ \frac{5}{100} \times 3300 = ₹\ 165$$

Bill amount for an air cooler = ₹ 3300 + ₹ 165 = ₹ **3465**

2. Salex tax = ₹ 2700 – ₹ 2500 = ₹ 200

$$\text{The rate of sale tax} = \frac{₹\ 200}{₹\ 2500} \times 100\% = \textbf{8\%}$$

3., 4. Do yourself.

11.   Compound Interest

EXERCISE 11.1

1.   Principal for the first year = ₹ 5000

$$\text{Interest for first year} = \frac{₹\ 5000 \times 10 \times 1}{100} = ₹\ 500$$

Amount at the end of first year = ₹ (5000 + 500)

Principal for the second year = ₹ 5500

$$\text{Interest for second year} = \frac{₹\ 5500 \times 10 \times 1}{100} = 550$$

Amount at the end of second year = ₹ (5500 + 550) = ₹ **6050**

CI = Amount – Principal

= ₹ 6050 – ₹ 5000

= ₹ **1050**

2. Principal for the first year = ₹ 3000

$$\text{Interest for the first year} = ₹\ \frac{3000 \times 1 \times 5}{100} = ₹\ 150$$

Amount at the end of the first year = ₹ (3000 + 150) = ₹ 3150

Principal for the second year = ₹ 3150

$$\text{Interest for the second year} = ₹\ \frac{3150 \times 1 \times 5}{100} = ₹\ 157.50$$

Amount at the end of the second year = ₹ (3150 + 157.50)

= ₹ 3307.50

CI = Amount – Principal = ₹ 3307.50 – ₹ 3000

= ₹ **307.50**

3. Principal for the first year = ₹ 625

$$\text{Interest for the first year} = ₹\ \frac{625 \times 1 \times 4}{100} = ₹\ 25$$

Amount at the end of the first year = ₹ (625 + 25) = ₹ 650

Principal for the second year = ₹ 650

$$\text{Interest for the second year} = \frac{650 \times 1 \times 4}{100} = ₹\,26$$

Amount at the end of second year $= ₹\,(650 + 26) = ₹\,676$

C.I. = Amount − Principal $= ₹\,(676 − 625) = ₹\,\mathbf{51}$

4., **5.**, **6.**, **7.**, **8.**, **9.** Do yourself.

10. Principal for the first year $= ₹\,2400$

$$\text{Interest for the first year} = ₹\,\frac{2400 \times 1 \times 20}{100} = ₹\,480$$

Amount at the end of the first year $= ₹\,(2400 + 480) = ₹\,2880$

Principal for the second year $= ₹\,2880$

$$\text{Interest for second year} = \frac{2880 \times 1 \times 20}{100} = 576$$

$$= ₹\,(2880 + 576) = ₹\,\mathbf{3456}$$

Amount at the end of second year $= ₹\,3456$

Principal for the third year $= ₹\,3456$

$$\text{Interest for the third year} = ₹\,\frac{3456 \times 1 \times 20}{100} = ₹\,691.20$$

Amount at the end of third year $= ₹\,(3456 + 691.20)$

$$= ₹\,4147.20$$

C.I. = Amount − Principal $= ₹\,(4147.20 − 2400) = ₹\,\mathbf{1747.20}$

EXERCISE 11.2

1. $P = ₹\,625, R = 4\%, n = 2$ years,

$$A = P\left(1 + \frac{R}{100}\right)^n = 625\left(1 + \frac{4}{100}\right)^2 = 625 \times \left(\frac{26}{25}\right)^2$$

$$A = 625 \times \frac{26 \times 26}{25 \times 25} \Rightarrow ₹\,\mathbf{676}$$

2., **3.**, **4.**, **5.** Do yourself.

7. $P = ₹\,4000, R = 2.5\%, n = 2, A = P\left(1 + \frac{R}{100}\right)^2$

$$= 4000\left(1 + \frac{2.5}{100}\right)^n = ₹\,4000 \times \left(\frac{41}{40}\right)^2$$

$$= ₹\,4000 \times \frac{41 \times 41}{40 \times 40} = ₹\,\mathbf{4202.50}$$

8. Do Yourself.

9. $P = ₹\,16000,\ R = \dfrac{25}{2}\,\%,\ n = 3$ years,

$$A = ₹\,16000\left(1 + \dfrac{25}{2 \times 100}\right)^3 = ₹\,16000\left(\dfrac{9}{8}\right)^3$$

$$= ₹\,16000 \times \dfrac{9 \times 9 \times 9}{8 \times 8 \times 8} = ₹\,\textbf{22781.25}$$

10. Do yourself.

EXERCISE 11.3

1. $P = ₹\,4096,\ R = 12\dfrac{1}{2}$ or $\dfrac{25}{2}\,\%$ per annum or $\dfrac{25}{4}$ per half yearly.

$$T = 18 \text{ months or 3 half years.}$$

$$A = P\left(1 + \dfrac{R}{100}\right)^n = 4096\left(1 + \dfrac{25}{4 \times 100}\right)^3$$

$$= ₹\,4096\left(\dfrac{17}{16}\right)^3 = \dfrac{4096 \times 17 \times 17 \times 17}{16 \times 16 \times 16}$$

$$= ₹\,\textbf{4913}$$

2. Do yourself.

3. $P = ₹\,1000,\ R = 2\%,\ n = 1$ year

When interest is compounded half yearly, then

$$P = ₹\,1000,\ R = \dfrac{2}{2}\,\% = 1\%,\ n = 1 \times 2 = 2 \text{ years}$$

$$A = P\left(1 + \dfrac{R}{100}\right)^n = 1000\left(1 + \dfrac{1}{100}\right)^2$$

$$= 1000 \times \dfrac{101 \times 101}{100 \times 100} = ₹\,\textbf{1020.10}$$

4. Do yourself.

5. $P = ₹\,8000,\ R = 10\%,\ n = \dfrac{3}{2}$ years.

When interest is compounded half yearly, then.

$$P = ₹\,8000,\ R = \dfrac{10}{2} = 5\%,\ n = \dfrac{3 \times 2}{2} = 3 \text{ years}$$

$$A = P\left(1 + \dfrac{R}{100}\right)^n = 8000\left(1 + \dfrac{5}{100}\right)^3 = 8000\left(\dfrac{21}{20}\right)^3$$

$$= ₹\,\dfrac{8000 \times 21 \times 21 \times 21}{20 \times 20 \times 20} = ₹\,\textbf{9261}$$

6., **7.** Do yourself.

8. $P = 40960,\ R = \dfrac{12.5}{2}\,\%,\ n = \dfrac{3 \times 2}{2}$ years $= 3$ years

$$A = P\left(1 + \frac{R}{100}\right)^{n} = 40960\left(1 + \frac{125}{20 \times 100}\right)^{3}$$

$$= 40960\left(\frac{17}{16}\right)^{3} = ₹\, 40960\,\frac{17 \times 17 \times 17}{16 \times 16 \times 16}$$

$$= ₹\, 49130$$

Amount − Principal = C.I.,

C.I. = 49130 − 40960 = ₹ **8170**

EXERCISE 11.4

1. $P = ₹\, x, A = ₹\, 4913, R = \dfrac{25}{2 \times 2}, n = \dfrac{3 \times 2}{2}$ years

$$A = P\left(1 + \frac{R}{100}\right)^{n}, 4913 = x\left(1 + \frac{25}{4 \times 100}\right)^{3}, 4913 = x \times \left(\frac{17}{16}\right)^{3},$$

$$\frac{4913 \times 16 \times 16 \times 16}{17 \times 17 \times 17} = x \quad \Rightarrow \quad x = ₹\, 4096$$

Principal = ₹ **4096**

2. $P = 2000$, C.I. = 163.20, $R = 4\%$, $n = ?$

$A = P +$ C.I. = 2000 + 163.20 = 2163.20

$$A = P\left(1 + \frac{R}{100}\right)^{n}$$

$$2163.20 = 2000\left(1 + \frac{4}{100}\right)^{n}$$

$$\frac{2163.20}{2000} = \left(\frac{26}{25}\right)^{n}$$

$$\frac{676}{625} = \left(\frac{26}{25}\right)^{n} \Rightarrow \left(\frac{26}{25}\right)^{2} = \left(\frac{26}{25}\right)^{n}$$

$\Rightarrow \qquad\qquad\qquad n = $ **2 years**

3. $P = ₹\, x, R = 10\%, n = 3$ years, C.I. = ₹ 331,

Amount $= P +$ C.I. $= ₹\, (x + 331)$

$$A = P\left(1 + \frac{R}{100}\right)^{n}$$

$$x + 331 = x\left(1 + \frac{10}{100}\right)^{3}$$

$$x + 331 = x \times \frac{11 \times 11 \times 11}{10 \times 10 \times 10}$$

$1000x + 331000 = 1331x, \quad 331000 = (1331 - 1000)x,$

$331000 = 331x, x = ₹\, 1000$

Principal = ₹ **1000**

Advance Mathematics-8

4., **5.**, **6.**, **7.** Do yourself.

8. $P = ₹\,1000$, $A = ₹\,2000$, $n = 5 \times 2$ years, $R = \dfrac{x}{2}\%$

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$2000 = 1000\left(1 + \frac{x}{2 \times 100}\right)^{10}$$

$$\frac{2000}{1000} = \left(1 + \frac{x}{200}\right)^{10}$$

$$2^{\frac{1}{10}} = 1 + \frac{x}{200}$$

$$1.072 - 1 = \frac{x}{200},$$

$$0.072 = \frac{x}{200}$$

$$x = 200 \times 0.072 = 14.4\%$$

$$\text{Rate} = \textbf{14.4\%}$$

9. Let the principal $= ₹\,x$ and Rate $= R$

Case I
$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$200 = \frac{x \times R \times 2}{100} \qquad \ldots(i)$$

Case II, Principal $= ₹\,x$ and Rate $= R$

C.I. $= ₹\,210$, Amount $= $ C.I. $+P = ₹\,(210 + x)$

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$210 + x = x\left(1 + \frac{R}{100}\right)^2 \qquad \ldots(ii)$$

From equations (ii) and (i), $20000 = 2xR \Rightarrow x = \dfrac{10000}{R}$,

$$210 + \frac{10000}{R} = \frac{10000}{R}\left(1 + \frac{R}{100}\right)^2$$

$$\frac{210R + 10000}{R} = \frac{10000}{R}\left(1 + \frac{R}{100}\right)^2,$$

$$210R + 10000 = 10000\left(1 + \frac{R^2}{10000} + \frac{2R}{100}\right)$$

$$210R + 10000 = 10000 + \frac{10000R^2}{10000} + \frac{2R \times 10000}{100}$$

$$210R = R^2 + 200R, \qquad 210R - 200R = R^2,$$

$$10R = R^2 \Rightarrow R = \textbf{10\%}, \quad 200 = \frac{x \times 10 \times 2}{100}$$

$$\frac{200 \times 100}{2 \times 10} = x \Rightarrow x = ₹\ 1000$$

Rate **10%** and Principal = ₹ **1000**

10. Do yourself.

EXERCISE 11.5

1. Value of boat after 2 years = ₹ $16{,}000\left(1 - \dfrac{5}{100}\right)^2$

$$= ₹\ 16{,}000\left(\frac{19}{20}\right)^2$$

$$= 16{,}000 \times \frac{19}{20} \times \frac{19}{20} = ₹\ \textbf{14{,}440}$$

2. The present value of flat = ₹ 100000

$$\text{Cost after 3 years} = P\left(1 - \frac{R}{100}\right)^n$$

$$= 100000\left(1 - \frac{10}{100}\right)^3$$

$$= 100000 \times \left(\frac{9}{10}\right)^3$$

$$= 100000\left(\frac{9 \times 9 \times 9}{10 \times 10 \times 10}\right)$$

$$= ₹\ \textbf{72900}$$

3. The present population of stray dogs = 1250

$$\text{Population after 3 month} = P\left(1 - \frac{R}{100}\right)^n = 1250\left(1 - \frac{20}{100}\right)^3$$

$$= 1250 \times \frac{4 \times 4 \times 4}{5 \times 5 \times 5} = \textbf{640 dogs}$$

4. Do yourself.

5. Present population of a city = 125000

The birth rate = 3.3% and death rate = 1.3%

Difference of rate = $(3.3 - 1.3)\% = 2\%$

$$\text{Population after 3 years} = 125000\left(1 + \frac{2}{100}\right)^3$$

$$= 125000 \times \frac{51 \times 51 \times 51}{50 \times 50 \times 50}$$

$$= \mathbf{132651}$$

6. $\text{Total Amount} = 40000 \times \left(1 + \frac{5}{100}\right)\left(1 + \frac{10}{100}\right)\left(1 + \frac{15}{100}\right)$

$$= 40000 \times \frac{21}{20} \times \frac{11}{10} \times \frac{23}{20} = ₹ \ 53130$$

Total Profit = Amount − Principal = $53130 - 40000 = ₹ \ \mathbf{13130}$

7., **8.** Do yourself.

11. Population of Pakistan in $1980 = 7.95 \times 10^7$

Population after 3 years $= 8.65 \times 10^7$

$$8.65 \times 10^7 = 7.95 \times 10^7 \left\{1 + \frac{R}{100}\right\}^3 , \quad \frac{8.65 \times 10^7}{7.95 \times 10^7} = \left\{1 + \frac{R}{100}\right\}^3$$

$$\left(\frac{8.65}{7.95}\right)^{1/3} = \left(1 + \frac{R}{100}\right)$$

$$1.02853 = 1 + \frac{R}{100}, \qquad 0.02853 = \frac{R}{100} \Rightarrow \ R = \mathbf{2.853\%}$$

12. Direct and Inverse Variations

EXERCISE 12.1

3. Let the commission will be x

It is a case of direct variation

Ration of number of money = Ration of number of commission

$$1000 : 100 :: 73 : x$$

$$x = \frac{100 \times 73}{1000} = ₹ \ \mathbf{7.30}$$

4. Let the number of bottles of soft drink be x

It is a case of direct variation

Then,

Ratio of number of children = Ratio of number of bottles

$$5 : 40 :: 8 : x$$

$$5 \times x = 40 \times 8$$

$$x = \frac{40 \times 8}{5}$$

$$x = \mathbf{64 \ bottles}$$

The number of bottles 64 would be served for 40 children.

5. Let the number of stamps bought for ₹ 36 be x

It is a case of direct variation

Ratio of the cost of stamps in Rupees = Ratio of number of the stamp

$$18 : 36 : : 15 : x$$

$$\frac{18}{36} = \frac{15}{x}$$

$$x \times 18 = 15 \times 36$$

$$x = \frac{15 \times 36}{18}$$

$$x = \textbf{30 stamps}$$

The number of stamps that can be bought for ₹ 36 is 30.

6. Let the number of tools be x

It is a case of direct variation

Ratio of number of hours = Ratio of number of tools

$$5 : 20 : : 120 : x$$

$$5 \times x = 20 \times 120$$

$$x = \frac{20 \times 120}{5}$$

$$x = \textbf{480 tools}$$

Thus, the number of tools cuts by machine 480 tools in 20 hours.

7. Let the thickness of sheet be x cm

It is a case of direct variation

Then,

Ratio of number of sheets = Ratio of thickness of the sheets

$$500 : 275 : : 3.5 : x$$

$$500 \times x = 3.5 \times 275$$

$$x = \frac{35 \times 275}{500 \times 10}$$

$$x = \frac{35 \times 275}{500 \times 10}$$

$$= \frac{35 \times 55}{1000}$$

$$x = \textbf{1.925 cm}$$

So, thickness of 275 sheets is 1.925 cm.

8., **9.**, **10.** Do yourself.

EXERCISE 12.2

4. Let the number of hours be x

Ratio of number of pumps = Inverse ratio of number of hours

$$20 : 45 : : x : 12$$
$$20 \times 12 = x \times 45$$
$$x = \frac{20 \times 12}{45}$$
$$x = \frac{16}{3}$$
$$x = \mathbf{5\frac{1}{3} \ hours}$$

Required number of hours will be $5\frac{1}{3}$ hours for 45 pumps to do the same work.

5. Let the required speed be x km/h

Ratio of speed = inverse ratio of time taken

$$12 : x : : 15 : 20$$
$$12 \times 20 = x \times 15$$
$$x = \frac{12 \times 20}{15}$$
$$x = \mathbf{16 \ km/h}$$

Hence, Shalu's average speed should be 16 km/h.

6. Let x persons are needed for the construction of the building in 24 days

Then,

Ratio of days = inverse ratio of persons.

$$40 : 24 : : x : 1800$$
$$40 \times 1800 = x \times 24$$
$$x = \frac{40 \times 1800}{24}$$
$$x = \mathbf{3000 \ persons}$$

Needed persons are 3000 for the construction of the building in 24 days.

7., **8.**, **9.** Do yourself.

10. Let the number of days be x

Ratio of cows = Inverse ratio of the days.

$$50 : 60 : : x : 15$$
$$50 \times 15 = x \times 60$$
$$x = \frac{50 \times 15}{60}$$

$$x = \frac{25}{2} = 12\frac{1}{2} \text{ days.}$$

The required days will be $\mathbf{12\frac{1}{2}}$.

Let's Recall

2. **(c)** Let 15 men do it in x days.

Ratio of the number of men = Inverse ratio of the number of days

$$36 : 15 : : x : 25$$

$$36 \times 25 = x \times 15$$

$$x = \frac{36 \times 25}{15}$$

$$x = \mathbf{60 \text{ days}}$$

Hence, 15 men can finish the work in 60 days.

3. **(a)** Number of persons in second situation = $500 + 300 = 800$

Let the food lasts for x days in the new situation

Ratio of persons = Inverse ratio of corresponding number of days

$$500 : 800 : : x : 24$$

$$500 \times 24 = x \times 800$$

$$x = \frac{500 \times 24}{800}$$

$$x = \frac{5 \times 24}{8}$$

$$x = \mathbf{15 \text{ days}}$$

Hence, the food will last for 15 days.

Unit-IV : Geometry

13. Understanding Quadrilaterals

EXERCISE 13

4. $\angle A + \angle B + \angle C + \angle D = 360°$,
$65° + 65° + \angle C + \angle D = 360°$,
$130° + \angle C + \angle D = 360°$
$\angle C + \angle D = 230°$, $\angle C = \angle D$; $\therefore$ Each angle = $\mathbf{115°}$

5. Let the angles be $2x$, $3x$, $5x$ and $8x$, $2x + 3x + 5x + 8x = 360°$,
$18x° = 360°$

$x = \dfrac{360°}{18} = 20°, 2 \times 20° = \mathbf{40}°, 3 \times 20° = \mathbf{60}°, 5 \times 20° = \mathbf{100}°,$

$8 \times 20° = \mathbf{160}°$

6. Perimeter of Parallelogram = Sum of four sides

$$= 7 + 7 + 10 + 10 = 34 \text{ cm}$$

7. Let two adjacent angles be x and y

$$x - y = 30°, \qquad x + y = 180°$$
$$x + y = 180°$$

on adding $\qquad \dfrac{x - y = 30°}{2x = 210°}$

$$x = 105°$$
$$105° + y = 180°$$
$$y = 75°$$

Angles 105°, 75°, 105°, 75°

8., **9.**, **10.** Do yourself.

11. Let the length and breadth of rectangle are $3x$ and $2x$ respectively, then

Perimeter of rectangle $= 2 \times (l + b)$

$$20 = 2 \times (3x + 2x)$$
$$20 = 2 \times 5x$$
$$20 = 10x \implies x = 2$$

Length $= 3 \times 2 = \mathbf{6 \text{ cm}}$

Breadth $= 2 \times 2 = \mathbf{4 \text{ cm}}$
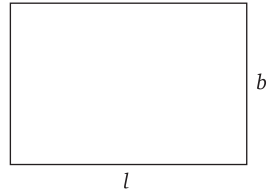
Unit-V : Mensuration

16.   Areas of Rectilinear Figures

EXERCISE 16.1

1. Area of a rectangle $=$ length $\times$ breadth

$$98 = 14 \times b$$
$$b = \dfrac{98}{14} = 7 \text{ cm}$$

Perimeter of rectangle $= 2 \times$ (length $+$ breadth)

$$= 2 \times (14 + 7)$$
$$= 2 \times (21)$$
$$= \mathbf{42 \text{ cm}}$$

2. Area of rectangular lawn *ABCD*

$$= l \times b$$
$$= 60 \times 30$$
$$= 1800\,\text{m}^2$$

Area of rectangular lawn with 2 m wide path

$$= l \times b$$
$$= 64 \times 34$$
$$= 2176\,\text{m}^2$$
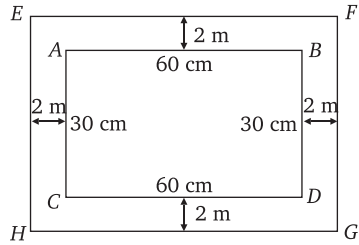
Area of path $=$ Area of *EFGH* $-$ Area of *ABCD*
$$= 2176 - 1800 = \mathbf{376\ m^2}$$

3. Area of square $= (\text{side})^2$

$$729 = (\text{side})^2$$
$$(\text{side})^2 = (27)^2$$
$$\text{Side} = 27\,\text{m}$$

4. Area of a wall $=$ length $\times$ bradth

$$= 5.76\,\text{m} \times 3.1\,\text{m}$$
$$= 576\,\text{cm} \times 310\,\text{cm}$$
$$= 178560\,\text{cm}$$

Area of a rectangular tiles $=$ length $\times$ breadth

$$= 24 \times 10 = 240\,\text{cm}$$

No. of tiles $= \dfrac{\text{Area of wall}}{\text{Area of tiles}}$

$$= \frac{178560}{240} = 744$$

Total cost of tiles $= 744 \times 1.50 = ₹\ \mathbf{1116}$

5. Altitude of the rhombus $= \dfrac{\text{Area of rhombus}}{\text{Base}}$

$$= \frac{10.2\ \text{cm}^2}{6} = \mathbf{1.7\ cm}$$

6. Perimeter of rhombus $=$ Sum of four sides, $28 = 4 \times a \Rightarrow a = 7\,\text{cm}$

Area of rhombus $=$ Base $\times$ Altitude,

$$28 = 7 \times h$$
$$4 = h \Rightarrow h = \mathbf{4\ cm}$$

7. Area of trapezium *ABCD* = Area of rectangle *AECD* + Area of triangle *CEB*,

$AB = 8$ m, $DC = 5$ m,

$$BE = AB - DC = (8 - 5) = 3 \text{m}, \qquad\qquad CE^2 = CB^2 - EB^2$$
$$= 5^2 - 3^2 \Rightarrow CE = \sqrt{25 - 9}, CE = 4 \text{ m}$$

Area of rectangle $= 5 \times 4 = 20 \text{ m}^2$,

Area of triangle $= \dfrac{1}{2} \times 3 \times 4 = 6 \text{ m}^2$

Total area $= (20 + 6) \text{ m}^2 = \mathbf{26 \text{ m}^2}$

8. Let the one side $= x$

Then another side $= (x + 8)$

Area of trapezium $= \dfrac{1}{2} \times$ (Sum of parallel sides)

$\times$ Distance between them

$$91 = \dfrac{1}{2} \times (x + x + 8) \times 7,$$

$$91 \times 2 = (2x + 8) \times 7,$$

$$\dfrac{91 \times 2}{7} = 2(x + 4), \Rightarrow 13 = x + 4 \Rightarrow x = \mathbf{9}$$

Then another side $= (x + 8) = 9 + 8 = \mathbf{17}$

Sides are **9 cm** and **17 cm**.

10. Area of triangle $= \sqrt{s(s - a)(s - b)(s - c)}$

$$s = \dfrac{10 + 10 + 12}{2} = 16$$

$$= \sqrt{16(16 - 10)(16 - 10)(16 - 12)}$$
$$= \sqrt{16 \times 6 \times 6 \times 4} = 2 \times 4 \times 6 = 48$$

$$48 = \dfrac{1}{2} \times 12 \times h \Rightarrow 8 = h;$$

Altitude $= \mathbf{8 \text{ cm}}$

Area of trapezium $= \dfrac{1}{2} \times$ (Sum of Parallel sides)

$\times$ Distance between Parallel sides

$$= \dfrac{1}{2}(10 + 22) \times 8 = \dfrac{1}{2} \times 32 \times 8 = \mathbf{128 \text{ cm}^2}$$

11., 12. Do yourself.

EXERCISE 16.2

1. Area of equilateral triangle $= \dfrac{\sqrt{3}}{4} \text{ (side)}^2$

$$= \dfrac{\sqrt{3}}{4} \times (12)^2$$

$$= \frac{\sqrt{3}}{4} \times 12 \times 12 = 36\sqrt{3} \text{ cm}^2$$

$$= \textbf{62.35 cm}^2 \text{ (approx)}$$

2. $a = 12, b = 10, c = 10$

$$s = \frac{12 + 10 + 10}{2} = \frac{32}{2} = 16$$

$$\text{Area of triangle} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{16(16-12)(16-10)(16-10)}$$

$$= \sqrt{16 \times 4 \times 6 \times 6}$$

$$= 4 \times 2 \times 6$$

$$= \textbf{48 cm}^2$$

3. Area of triangle $= \sqrt{s(s-a)(s-b)(s-c)}$

$$s = \frac{a+b+c}{2}$$

$$\Rightarrow \qquad s = \frac{10 + 24 + 26}{2} = \frac{60}{2} = 30$$

$$= \sqrt{30(30-10)(30-24)(30-26)}$$

$$= \sqrt{30 \times 20 \times 6 \times 4}$$

$$= \sqrt{2 \times 3 \times 5 \times 2 \times 2 \times 5 \times 2 \times 3 \times 2 \times 2}$$

$$= 2 \times 2 \times 2 \times 3 \times 5$$

$$= \textbf{120 cm}^2$$

4., **5.**, **6.** Do yourself.

7. $AB = 5\,\text{cm}, BC = 7\,\text{cm}, AC = 9\,\text{cm}$

Area of parallelogram

$ABCD = $ Area of $\triangle ACD +$ Area of $\triangle ABC$

Area of $\triangle ABC$, $AB = 5$ cm, $BC = 7$ cm, $CA = 9\,\text{cm}$,

$$s = \frac{5+7+9}{2} = \frac{21}{2} \text{ cm}$$

$$= \sqrt{\frac{21}{2} \times \left(\frac{21}{2} - 5\right)\left(\frac{21}{2} - 7\right)\left(\frac{21}{2} - 9\right)}$$

$$= \sqrt{\frac{21}{2} \times \frac{11}{2} \times \frac{7}{2} \times \frac{3}{2}}$$
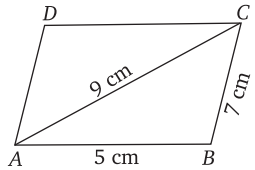
$$= \frac{21\sqrt{11}}{4} = \frac{21}{4} \times 3.317$$

$$= \frac{69.657}{4} = 17.414$$

Area of $\triangle ABC + \triangle ADC = 17.414 \times 2 =$ **34.82 cm^2**

8. Do yourself.

9. Area of rhombus = Area of $\triangle ABC$ + Area of $\triangle ACD$

Area of $\triangle ABC$, $AB = 25$ m,

$BC = 25$ m, $AC = 48$ m

$$s = \frac{25 + 25 + 48}{2} = \frac{98}{2} = 49$$

$$= \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{49(49-25)(49-25)(49-48)}$$

$$= \sqrt{49 \times 24 \times 24 \times 1} = 7 \times 24 = 168$$

Area of rhombus $= 2 \times 168 =$ **336 m^2**
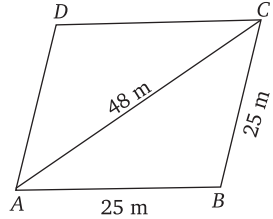
10. Altitude $= AD$

$$s = \frac{25 + 56 + 39}{2}$$

$$= \frac{120}{2} = 60$$

$$= \sqrt{60(60-25)(60-56)(60-39)}$$

$$= \sqrt{60 \times 35 \times 4 \times 21}$$

$$= \sqrt{2 \times 2 \times 3 \times 5 \times 5 \times 7 \times 2 \times 2 \times 7 \times 3}$$

$$= 2 \times 5 \times 2 \times 7 \times 3$$

$$= 10 \times 42 = 420$$

Area of triangle $= \frac{1}{2} \times$ Base $\times$ Altitude

$$420 = \frac{1}{2} \times 56 \times h$$

$$\frac{420 \times 2}{56} = h$$

$\Rightarrow \qquad h =$ **15 cm**
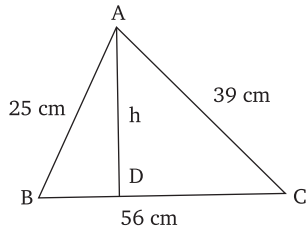
EXERCISE 16.3

1. Area of field = Area (ΔAGB) + Area (trap $GBHI$) + Area (ΔCID) + Area (ΔDEJ) + Area (trap $JEFH$) + Area (ΔFAH)

(1) Area $= \dfrac{1}{2} \times AG \times GB$

$= \dfrac{1}{2} \times 110 \times 10 = 550\,\text{m}^2$

(2) Area $= \dfrac{1}{2} \times (IC + GB) \times IG$

$= \dfrac{1}{2} \times (50 + 10) \times 210$

$= \dfrac{1}{2} \times 60 \times 210 = 6300\,\text{m}^2$

(3) Area $= \dfrac{1}{2} \times IC \times ID = \dfrac{1}{2} \times 50 \times 230$

$= 25 \times 230 = 5750\,\text{m}^2$

(4) Area $= \dfrac{1}{2} \times JE \times DJ = \dfrac{1}{2} \times 60 \times 140 = 4200\,\text{m}^2$

(5) Area $= \dfrac{1}{2} \times (EJ + FH) \times JH$

$= \dfrac{1}{2} \times (60 + 20) \times 210 = \dfrac{1}{2} \times 80 \times 210 = 8400\,\text{m}^2$

(6) Area $= \dfrac{1}{2} \times FH \times AH = \dfrac{1}{2} \times 20 \times 200 = 2000\,\text{m}^2$

Total area $(550 + 6300 + 5750 + 4200 + 8400 + 2000)\,\text{m}^2$

$$= \mathbf{27200\,m^2}$$

2., 3., 4. Do yourself.

5. Area of field = Area (ΔAPH) + Area (tra $HPQJ$) + Area (tra $JQRB$) + Area (ΔBSK) + Area (tra $SKIT$) + Area (ΔTIA)

(1) Area $= \dfrac{1}{2} \times AH \times HP$

$= \dfrac{1}{2} \times 60 \times 30 = 900\,\text{m}^2$

(2) Area $= \dfrac{1}{2} \times (HP + JQ) \times HJ$

$= \dfrac{1}{2} \times (30 + 40) \times 60$
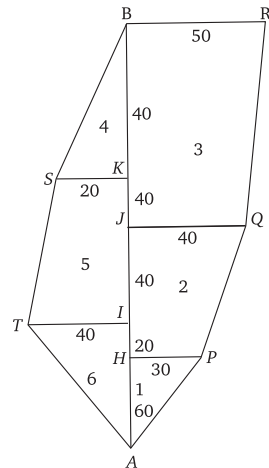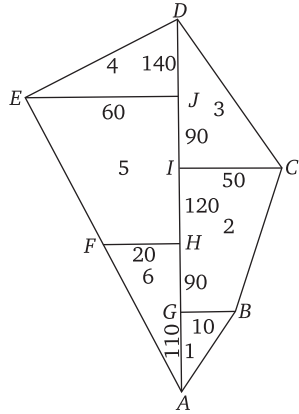
$$= \frac{1}{2} \times 70 \times 60 = 2100 \, \text{m}^2$$

(3) Area $= \frac{1}{2} \times (BR + JQ) \times BJ$

$$= \frac{1}{2} \times (50 + 40) \times 80$$

$$= \frac{1}{2} \times 90 \times 80 = 3600 \, \text{m}^2$$

(4) Area $= \frac{1}{2} \times BK \times SK = \frac{1}{2} \times 40 \times 20 = 400 \, \text{m}^2$

(5) Area $= \frac{1}{2} \times (SK + TI) \times IK$

$$= \frac{1}{2} \times (20 + 40) \times 80 = \frac{1}{2} \times 60 \times 80 = 2400 \, \text{m}^2$$

(6) Area $= \frac{1}{2} \times TI \times AI = \frac{1}{2} \times 40 \times 80 = 1600 \, \text{m}^2$

Total Area $= (900 + 2100 + 3600 + 400 + 2400 + 1600) \, \text{m}^2$

$$= \mathbf{11000 \, m^2}$$

Let's Recall

2. **(b)** $(2 \times 10) + (3 \times 8) - (2 \times 3)$

$$= 20 + 24 - 6 = \mathbf{38}$$

3. **(d)** Area of triangle with base x = Area of a square of side x

$$\frac{1}{2} \times x \times h = x^2$$

$$\frac{1}{2} h = x \Rightarrow h = 2x$$

Hence, the altitude of the triangle is $2x$

4. **(b)** 1 : 2 from the figure

$$i.e., = \frac{x^2}{(\sqrt{2}x)^2} = \left[\frac{x^2}{2x^2} \right]$$

$$= \frac{1}{2}$$

Ratio $= \mathbf{1 : 2}$

5. **(b)** Other leg $= \sqrt{(5)^2 - (2)^2}$

$$= \sqrt{25 - 4}$$

$$= \sqrt{\mathbf{21}}$$
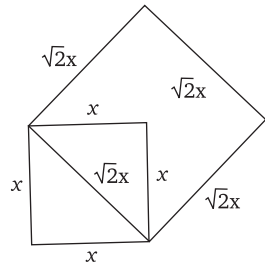
17.   Circumference and Area of a Circle

EXERCISE 17.1

1. (i) Circumference $= 2\pi r$

$7.7 = 2 \times \dfrac{22}{7} \times r \Rightarrow \dfrac{77}{10} = 2 \times \dfrac{22}{7} \times r, \, r = \dfrac{77 \times 7}{2 \times 10 \times 22}, \, r = 1.225 \, \text{m}$

$d = 2r = 2 \times 1.225 = \textbf{2.45 m}$

(ii), (iii) Do yourself.

2. (i) Circumference of circle $= 2\pi r$

$= 2 \times \dfrac{22}{7} \times 7 = \textbf{44 cm}$ $\left[\because r = \dfrac{14}{2} = 7 \, cm \right]$

(ii), (iii) Do yourself.

3. (i) Circumference of circle $= 2\pi r = 2 \times \dfrac{22}{7} \times 3.5 = 22 \, \text{cm}$

(ii), (iii) Do yourself.

4. (i) Circumference of circle $= 2\pi r$

$6.28 = 2 \times 3.141 \times r, \dfrac{6.28}{2 \times 3.14} = r \Rightarrow r = 1 \, \text{cm}$

Diameter $= 2r = 2 \times 1 = 2 \, \text{cm}$

(ii), (iii) Do yourself.

5. (i) Circumference of circle $= 2\pi r$

$26.4 = 2 \times \dfrac{22}{7} \times r,$

$26.4 \times 7 = 2 \times 22 \times r$

$r = \dfrac{26.4 \times 7}{2 \times 22} = \textbf{4.2 cm}$

(ii), (iii) Do yourself.

6. See example 4.

7. Perimeter of equilateral triangle $=$ Circumference of circle

$3 \times 6.6 = 2 \times \dfrac{22}{7} \times r$

$\dfrac{3 \times 66 \times 7}{10 \times 2 \times 22} = r$

$\Rightarrow \qquad r = 3.15 \, \text{cm}$

Diameter $= 2r = 2 \times 3.15$

$\qquad = 6.3 \, \text{cm}$
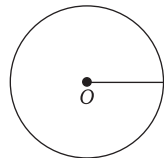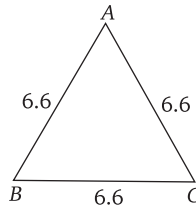
8. Radius of wheel $= 35 \, \text{cm}$,

One complete round $= 2\pi r$

$$\text{24 complete round} = 24 \times 2\pi r$$
$$= 24 \times 2 \times \frac{22}{7} \times 35$$
$$= 10 \times 22 \times 24 = 5280 \, \text{cm}$$

9. Do yourself

10. Circumference of pond $= 2\pi r$
$$66 \times 400 = 2 \times \frac{22}{7} \times x, \quad \frac{66 \times 400 \times 7}{2 \times 22} = r$$
$$\Rightarrow \qquad r = 4200 \, \text{cm}$$
$$\text{Diameter} = 2r = 2 \times 4200 = \textbf{8400 cm}$$

EXERCISE 17.2

1. (i) Circumference of circle $= 2\pi r, 31.4 = 2 \times 3.14 \times r,$
$$\frac{31.4}{2 \times 3.14} = r \Rightarrow r = 5 \, \text{m}$$
$$\text{Area of circle} = \pi r^2 = 3.14 \times 5 \times 5 = 78.50 \, \text{m}^2$$
(ii) and (iii) Do yourself.

2. (i) Area of circle $= \pi r^2 = \frac{22}{7} \times 3.5 \times 3.5 = 38.5 \, \text{cm}^2$

(ii) and (iii) Do yourself.

3. (i) Diameter $= 2 \times$ Radius
$$4.2 = 2 \times \text{Radius} \Rightarrow r = 2.1 \, \text{cm},$$
$$\text{Area of circle} = \pi r^2 = \frac{22}{7} \times 2.1 \times 2.1$$
$$= \frac{22}{7} \times \frac{21 \times 21}{100} = \textbf{13.86 cm}^2$$
(ii) and (iii) Do yourself.

4. Area of circle $= \pi r^2 = \frac{22}{7} \times \frac{5}{2} \times \frac{5}{2} = \textbf{19.625 cm}^2$

5. Area of circle $= \pi r^2, \quad 154 = \frac{22}{7} \times r^2, \quad r^2 = \frac{154 \times 7}{22} \Rightarrow r = 7$
$$\text{Circumference} = 2\pi r = 2 \times \frac{22}{7} \times 7 = \textbf{44 m}$$

6. (i) Area of circle $= \pi r^2, \quad \pi = \pi r^2, \quad r^2 = 1 \Rightarrow r = \textbf{1 cm}$
(ii) and (iii) Do yourself.

7. Perimeter of square $= 4 \times a, \quad 44 = 4 \times a \Rightarrow a = 11 \, \text{cm},$
$$\text{Circumference of circle} = 2\pi r$$
$$44 = 2 \times \frac{22}{7} \times r, \, r = 7 \, \text{cm}$$
Area of square $=$ side$^2 = 11^2 = 121 \, \text{cm}^2$, Area of circle

$$= \pi r^2 = \frac{22}{7} \times 7 \times 7$$

$$= 154 \text{cm}^2$$

Circle, $154 - 121 = \textbf{33 cm}^2$

8. Area of a face washer $= \pi R_1^2 - \pi R_2^2 = \pi\{4^2 - 2^2\} = \pi \times 12$

$$= \frac{22}{7} \times 12 = \textbf{37.71 cm}^2$$

9. Area of rectangular sheet $= 36 \times 24 = 864 \text{ cm}^2$

Area of each buttons $= \pi r^2 = \pi \times \frac{3}{2} \times \frac{3}{2}$

Area of 64 button $= \frac{9\pi \times 64}{4} = 16 \times 9\pi$

$$= 144\pi$$

$$= 452.16 \text{cm}^2$$

Remaining Area $= 864 - 452.16$

$$= \textbf{411.84cm}^2$$

10., **11.** Do yourself.

EXERCISE 17.3

1. (i) Area of segment AxB

$=$ Area of sector $OAxB -$ Area of $\triangle OAB$

Area of sector $OAxB = \frac{90}{360} \times \frac{22}{7} \times 14 \times 14$

$$= 154 \text{ cm}^2$$

Area of right triangle $= \frac{1}{2} \times 14 \times 14$

$$= 98 \text{ cm}^2$$

Area of segment $AxB = 154 - 98 = \textbf{56 cm}^2$

(ii), (iii) Do yourself.

2. Area of disc $= \pi r^2 = \pi 2^2 = 4\pi$

Area of sector $= \pi r^2 \times \frac{x}{360} = \pi \times 4 \times \frac{45}{360} = \frac{\pi}{2}$

Remaining part of the disc $= 4\pi - \frac{\pi}{2} = \frac{7\pi}{2} = \frac{7 \times 22}{7 \times 2} = \textbf{11 cm}^2$

3. (i) Length of Arc $= \frac{2\pi rx}{360} = \frac{2 \times 22 \times 2.8}{7} \times \frac{90}{360}$

$$= \frac{2 \times 22 \times 28 \times 1}{4 \times 7 \times 10}$$

$$= \textbf{4.4 cm}$$

(ii), (iii) Do yourself.

Advance Mathematics-8
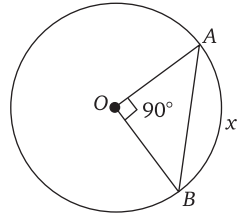
4. (i) Area of sector $= \dfrac{\pi r^2 \times x}{360} = \dfrac{22}{7} \times 3.5 \times 3.5 \times \dfrac{60}{360}$

$\qquad = \dfrac{22 \times 35 \times 35}{7 \times 100 \times 6}\text{cm}^2 = \mathbf{6\dfrac{5}{12}\ cm^2}$

(ii), (iii) Do yourself.

5. Do yourself.

6. Length of Arc $= \dfrac{2\pi r x}{360}, \quad 22 = \dfrac{2\pi r \times 18}{360} \quad \Rightarrow \quad 2\pi r = \mathbf{440\ m}$

Circumference of circle $= 440$ m

7. Area of sector $= \dfrac{\pi r^2 \times 36}{360}, 3.85 = \dfrac{\pi \times r^2 \times 1}{10},$

$\qquad r^2 = \dfrac{3.85 \times 10}{\pi} \Rightarrow r = \dfrac{7}{2}$

Length of Arc $= \dfrac{2\pi r \times x}{360} = 2 \times \dfrac{22}{7} \times 7 \times \dfrac{18}{360} = \mathbf{2.2\ cm}$

8. Do yourself.

9. In a equilateral triangle every angle be $60°$

Area of sector $= \pi r^2 \times \dfrac{x}{360}$

$\qquad = 3.14 \times 10 \times 10 \times \dfrac{60}{360}$

$\qquad = \dfrac{314}{6} = \mathbf{52.38\ m^2}$
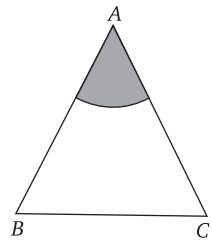
10. Do yourself.

Let's Recall

1. (b)

$2\pi r_1 = 176$	$2\pi r_2 = 132$
$r_1 = \dfrac{176}{2\pi}$	$r_2 = \dfrac{132}{2\pi}$
$r_1 = \dfrac{176 \times 7}{2 \times 22}$	$r_2 = \dfrac{132 \times 7}{2 \times 22}$
$r_1 = 28$ m	$= 21$ m

Difference between their radii $(r_1 - r_2) = 28$ m $- 21$ m $= \mathbf{7\ m}$

Option (b) is right.

2. (a) If the radius of a circle is increased two times

Then the circumference of the circle will increase

$r_1 = r$ then $\Rightarrow \dfrac{2\pi r_1}{2\pi r_2} = \dfrac{2\pi r}{2\pi \times 2r} = \dfrac{2\pi r}{2(2\pi r)}$

$r_2 = \mathbf{2r}$

So, two times the original value option (a) is right.

3. **(a)** $\pi r^2 = 2464$

$$r^2 = \frac{2464}{\pi}$$

$$= \frac{2464 \times 7}{22}$$

$\Rightarrow \qquad r^2 = 112 \times 7$

$r^2 = 784$

$r^2 = \sqrt{784}$

$= \sqrt{28 \times 28},$

$= \sqrt{28^2} = \mathbf{28\ m}$

Hence, the length of the rope is 28 m.

4. **(c)** $2\pi r \times 1000 = 88 \times 1000\,\text{m}$ $\qquad [\because 1\ \text{km} = 1000\ \text{m}]$

$$r = \frac{88 \times 1000}{2\pi \times 1000}\ \text{m},$$

$$r = \frac{88 \times 1000 \times 7}{2 \times 22 \times 1000}\ \text{m},$$

$r = 14\ \text{m}$

The diameter of the wheel $= 2r = 2 \times 14\ \text{m} = \mathbf{28\ m}$

18. Volumes and Surface Areas of Solids

EXERCISE 18.1

2. (i) In given figure

$l = 6$ cm $\qquad b = 8$ cm $\qquad h = 10$ cm

The volume of cuboid from given figure

$= l \times b \times h$

$= 6\ \text{cm} \times 8\ \text{cm} \times 10\ \text{cm}$

$= 480\ \text{cm}^3$

Surface area of cuboid from given figure

$= 2\,[lb + bh + hl]$

$= 2\,[6\ \text{cm} \times 8\ \text{cm} + 8\ \text{cm} +10\ \text{cm} + 10\ \ \text{cm} \times 6\ \text{cm}]$

$= 2\,[48\ \text{cm}^2 + 80\ \text{cm}^2 + 60\ \text{cm}^2]$

$= 2\,[188\ \text{cm}^2]$

$= 376\ \text{cm}^2$

Part (ii), (iii), (iv), (v) and (vi) Do yourself.

3. (i) Capacity $= l \times b \times h$

$= 5.5\ \text{m}\ \times 3.5\ \text{m}\ \times 3.6\ \text{m}$

$= 69.3\ \ \text{m}^3$

(ii), (iii) and (iv) Do yourself.

4. The volume of rectangular tank whose sides are

$$\text{Length } (l) = 65 \text{ cm}$$
$$\text{Width (b)} = 40 \text{ cm}$$
$$\text{Height } (h) = 54 \text{ cm}$$

Then,

$$\text{Volume of rectangular tank} = l \times b \times h$$
$$= 65 \text{ cm} \times 40 \text{ cm} \times 54 \text{ cm}$$
$$= 140400 \text{ cm}^3$$

The number of glasses of sugarcane = $140400 \div 200 = \mathbf{702}$

5. Capacity of water in water tank = 4.8 liters

$$= 4.8 \times 1000 \text{ cm}^3$$
$$= 4800 \text{ cm}^3$$

$$\text{Volume of water tank} = l \times b \times h$$
$$4800 = 20 \text{ cm} \times 15 \text{ cm} \times h$$
$$\frac{4800}{20 \times 15} = h$$
$$h = \frac{4800}{20 \times 15}$$
$$h = \mathbf{16 \text{ cm}}$$

Total surface area of the cuboid $= 2[lb + bh + hl]$
$$= 2[20 \text{ cm} \times 15 \text{ cm} + 15 \text{ cm} \times 16 \text{ cm} + 16 \text{ cm} \\ \times 20 \text{ cm}]$$
$$= 2[300 \text{ cm}^2 + 240 \text{ cm}^2 + 320 \text{ cm}^2]$$
$$= 2[860 \text{ cm}^2]$$
$$= \mathbf{1720 \text{ cm}^3}$$

6. Given,

The volume of solid cube $= 64 \text{ cm}^3$
$$(\text{side})^3 = (4 \text{ cm})^3$$
$$\text{side} = 4 \text{ cm}$$

Then,

Total surface area of the solid $= 6 \times (\text{side})^2$
$$= 6 \times (4 \text{ cm})^2 = \mathbf{96 \text{ cm}^2}$$

7., **8.** Do yourself.

EXERCISE 18.2

1. (i) Do yourself.

(ii) Volume of cylinder $= \pi r^2 h = \dfrac{22}{7} \times 2.8 \times 2.8 \times 15$

$$= \frac{22}{7} \times \frac{28 \times 28 \times 15}{100} = 369.6 \text{ m}^3$$

2. (i) Volume of cylinder $= \pi r^2 h = \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \times 20 = \mathbf{6930 \text{ cm}^3}$

(ii) Do yourself.

3. Volume of cylinder $= \pi r^2 h = 154 \times 15 = \mathbf{2310 \text{ cm}^3}$

4. Circumference of the base of the cylinder, $132 = 2\pi r$,

$\Rightarrow \qquad r = \frac{132 \times 7}{2 \times 22}$

$\Rightarrow \qquad r = 21 \text{ cm}$

Volume of cylinder $= \pi r^2 h = \frac{22}{7} \times 21 \times 21 \times 25 = \mathbf{34650 \text{ cm}^3}$

5. First pack Volume $=$ Area of base $\times$ Height $= 5 \times 5 \times 12 = 300 \text{ cm}^3$

Second pack Volume $=$ Area of base $\times$ Height

$$= \pi r^2 h = \frac{22}{7} \times 3.5 \times 3.5 \times 10$$

$$= \frac{22}{7} \times \frac{35 \times 35}{100} \times 10 = 385 \text{ cm}^3$$

Difference $= 385 - 300 = \mathbf{85 \text{ cm}^3}$

6. Do yourself.

7. Volume of roof $= \frac{18 \times 16.5 \times 10}{100} = 29.7 \text{ cm}^3$

Volume of roof $=$ Volume of cylindrical tank

$$29.7 = \pi \times 4 \times 4 \times h$$

$$29.7 = 3.14 \times 4 \times 4 \times h$$

$$h = \frac{29.7}{3.14 \times 4 \times 4} \Rightarrow h = 0.596 \text{ m}$$

$$= \mathbf{59.6 \text{ cm}}$$

8., **9.** Do yourself.

10. Volume of cylinder $=$ Volume of wire

$$\pi r_1^2 h_1 = \pi r_2^2 h_2$$

$$\pi \times \frac{1}{2} \times \frac{1}{2} \times 5 = \pi \times \frac{1}{20} \times \frac{1}{20} \times h$$

$$\frac{5}{4} = \frac{h}{20 \times 20}$$

$$4h = 20 \times 20 \times 5$$

$$h = \frac{20 \times 20 \times 5}{4}$$

$\Rightarrow \qquad h = 500 \text{ cm}$

$$= \mathbf{5 \text{ m}}$$

EXERCISE 18.3

1. Total surface area of cylinder $= 2\pi r(r+h)$

$$= 2 \times \frac{22}{7} \times 5 \times (5+15)$$

$$= 2 \times \frac{22}{7} \times 5 \times 20$$

$$= \mathbf{628.57 \ cm^2}$$

2. $2\pi r = 176$ cm, $h = 100$ cm, circumference $= 2 \times \frac{22}{7} \times r = 176$

$$r = \frac{176 \times 7}{2 \times 22} \quad \Rightarrow \quad r = 28 \text{ cm}$$

Lateral surface area of cylinder $= 2\pi rh = 176 \times 100$

$$= 17600 \text{ cm}^2$$

$$= \mathbf{1.76 \ m^2}$$

3., **4.** Do yourself.

5. $r = \dfrac{3.5}{2 \ m}, h = 10$ m

Curved surface area $= 2\pi rh$

$$= 2 \times \frac{22}{7} \times \frac{3.5}{2} \times 10$$

$$= 2 \times \frac{22}{7} \times \frac{35}{2} = 110 \text{ m}^2$$

The coat of plastering $= 110 \times 4 = ₹ \ \mathbf{440}$

6. Total surface area of cylinder $= 2\pi r \ (r+h)$

$$= 2 \times \frac{22}{7} \times 21 \times (100+21)$$

$$= 2 \times \frac{22}{7} \times 21 \times 121$$

$$= 132 \times 121$$

$$= \mathbf{15972 \ cm^2}$$

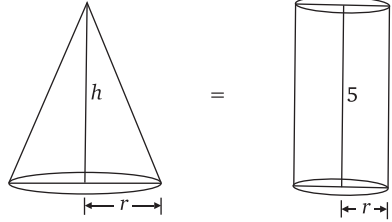**7.**, **8.**, **9.** Do yourself.

EXERCISE 18.4

1. Volume of cone $= \dfrac{\pi r^2 h}{3} = \dfrac{22}{7} \times \dfrac{6 \times 6 \times 8}{3} = \mathbf{301.71 \ cm^3}$

2. Volume of cone $= \dfrac{\pi r^2 h}{3} = \dfrac{314 \times 15}{3} = 314 \times 5 = \mathbf{1570 \ cm^3}$

3. $\dfrac{\pi r_1^2 h_1}{3} = \pi r_2^2 h_2$

$\dfrac{\pi \times r^2 \times h}{3} = \pi r^2 \times 5$

$\dfrac{h}{3} = 5 \Rightarrow h = \mathbf{15\,cm}$

4. Volume of cone $= \dfrac{\pi r^2 h}{3}$

$48\pi = \pi \times \dfrac{4 \times 4 \times h}{3}, \qquad h = \dfrac{48 \times 3}{4 \times 4} \Rightarrow h = \mathbf{9\,cm}$

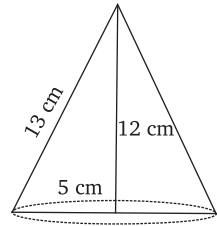**5.** Do yourself.

6. $\dfrac{\pi r^2 h}{3} = \dfrac{22 \times 2 \times 2 \times 5}{7 \times 3}\,cm^3 = \mathbf{20.95\,cm^3}$

7. Volume $= \dfrac{\pi r^2 h}{3} = \dfrac{22 \times 5 \times 5 \times 12}{7 \times 3}$

$= \mathbf{314\ (approx)}$

8. Do yourself.

EXERCISE 18.5

2. $r = 5, l = 10\,cm$

Lateral surface area $= \pi r l$

$= \dfrac{22 \times 5 \times 10}{7}$

$= \mathbf{157.14\ cm^2}$

3. Do yourself.

4. (i)   Lateral surface area $= \pi r l$

$= \dfrac{22}{7} \times 5 \times 15$

$= \mathbf{235.71\ cm^3}$

(ii)   Area of base $= \pi r^2$

$= \dfrac{22}{7} \times 5 \times 5$

$= \mathbf{78.57\ cm^2}$

(iii)   Total surface area $D = \pi r (r + l)$

$= \dfrac{22}{7} \times 5 \times (5 + 15)$

$= \dfrac{22}{7} \times 20 \times 5$

$= \mathbf{314.28\ cm^2}$

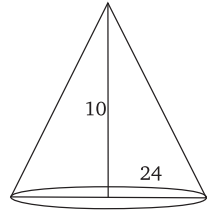**5., 6.** Do yourself.

7. $r = 24$ m, $h = 10$ m, $l = ?$

$$l^2 = r^2 + h^2$$
$$l^2 = 24^2 + 10^2$$
$$l^2 = 576 + 100$$
$$\Rightarrow \qquad l^2 = 676$$
$$\Rightarrow \qquad l = \textbf{26 m}$$

Area of lateral surface $= \pi r l = \dfrac{22}{7} \times 24 \times 26$

Total cost of canvas $= ₹ \dfrac{22}{7} \times 24 \times 26 \times 15 = ₹ \, \textbf{29417.14}$

8. Volume of cone $= \dfrac{\pi r^2 h}{3}$

$$1232 = \dfrac{22}{7} \times \dfrac{14 \times 14}{3} \times h$$

$$\Rightarrow \qquad \dfrac{1232 \times 7 \times 3}{22 \times 14 \times 14} = h$$

$$h = \dfrac{25872}{4312} \quad \Rightarrow \quad h = 6 \text{ cm}$$

$$l^2 = h^2 + r^2 \quad \Rightarrow \quad l^2 = 6^2 + 14^2$$
$$l^2 = 36 + 196, \quad l = \sqrt{232}$$

Curved Surface $= \pi r l = \dfrac{22}{7} \times 14 \times \sqrt{232} = \dfrac{22 \times 14 \times 2\sqrt{58}}{7}$

$$= \textbf{88}\sqrt{\textbf{58}} \textbf{ cm}^{\textbf{2}}$$

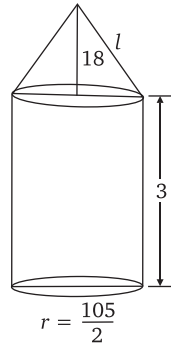**9.** $l^2 = h^2 + r^2$

$$l^2 = (18)^2 + \left(\dfrac{105}{2}\right)^2$$

$$l^2 = 3080.25 \Rightarrow l = \textbf{55.5 m}$$

Total canvas used $= 2\pi r h + \pi r l$

$$l = \dfrac{22}{7} \times \dfrac{105}{2} \{2 \times 3 + 55.5\}$$

$$= \dfrac{22}{7} \times \dfrac{105}{2} \times 61.5$$

$$= \textbf{10147.5 m}^{\textbf{2}}$$

10. Do yourself.

EXERCISE 18.6

1. (i) Radius $= \dfrac{\text{Diameter}}{2} = \dfrac{14}{2} = 7$ cm

Volume of sphere $= \dfrac{4}{3}\pi r^3 = \dfrac{4}{3} \times \dfrac{22}{7} \times 7 \times 7 \times 7$

$$= \dfrac{30184}{21} = \textbf{1437.33 cm}^{\textbf{3}}$$

(ii), (iii) Do yourself.

2. (i) Volume of sphere $= \dfrac{4}{3}\pi r^3 = \dfrac{4}{3} \times \dfrac{22}{7} \times 2 \times 2 \times 2 = \textbf{33.52 cm}^{\textbf{3}}$

(ii), (iii) Do yourself.

3. Volume of hemisphere $= \dfrac{2}{3}\pi R^3 = \dfrac{2}{3} \times \dfrac{22}{7} \times \dfrac{11.2}{2} \times \dfrac{11.2}{2} \times \dfrac{11.2}{2}$

$$= \dfrac{2}{3} \times \dfrac{22}{7} \times \dfrac{112 \times 112 \times 112}{1000 \times 8}$$

$$= \dfrac{61816832}{168000}$$

$$= \textbf{367.96 cm}^{\textbf{3}}$$

4. When $r = r$, then, Volume of sphere $= \dfrac{4}{3}\pi r^3$, When $r = 2r$, then

Volume of sphere $= \dfrac{4}{3}\pi(2r)^3$,

Volume of increased $\Rightarrow \dfrac{4}{3}\pi r^3 : \dfrac{4}{3}\pi 8r^3 = \textbf{8 times.}$

5. Volume of hemisphere $= \dfrac{2}{3}\pi r^3$

$$= \dfrac{2}{3} \times \dfrac{22}{7} \times \dfrac{28 \times 28 \times 28}{10 \times 10 \times 10}$$

$$= \dfrac{965888}{21000}$$

$$= 45.995 \, \text{m}^3$$

$$= 45.995 \times 1000 \, \text{L} = 45995 \, \text{L}$$

6., 7., 8. Do yourself.

EXERCISE 18.7

1. (i) Surface area of the sphere $= 4\pi r^2 = 4 \times \dfrac{22}{7} \times \dfrac{15 \times 15}{2 \times 2}$

$$= \textbf{707.14 cm}^{\textbf{2}}$$

(ii), (iii) Do yourself.

2. (i) Surface area of the sphere $= 4\pi r^2 = 4 \times \dfrac{22}{7} \times 12 \times 12$

$$= \textbf{1810.29 cm}^{\textbf{2}}$$

or   Take $\pi = 3.14 = 4 \times 3.14 \times 12 \times 12$

$= \mathbf{1808.64\ cm^2}$

(ii), (iii) Do yourself.

3. Case I, Surface area $= 4\pi r^2 = 4 \times \dfrac{22}{7} \times 7 \times 7 = 616\ cm^2$

Case II, Surface area $= 4\pi r^2 = 4 \times \dfrac{22}{7} \times 14 \times 14 = 2464\ cm^2$

Ratio $= 616 : 2464 = \mathbf{1 : 4}$

4.   Surface area of hemisphere $= 2\pi r^2 = 2 \times \dfrac{22}{7} \times \dfrac{10.5}{2} \times \dfrac{10.5}{2}$

$= \dfrac{2 \times 22 \times 105 \times 105}{7 \times 2 \times 2 \times 100}$

$= \dfrac{2 \times 22 \times 105 \times 105}{2800}$

$= \dfrac{485100}{2800}$

$= 173.25\ cm^2$

Cost of painting $= ₹\ \dfrac{173.25 \times 4}{100}$

$= ₹\ \dfrac{693}{100}$

$= ₹\ \mathbf{6.93}$

5., 6. , 7. Do yourself.

8. Surface area of sphere $= 4\pi r^2$, $154 = 4 \times \dfrac{22}{7} \times r^2$, $r = 3.5\ cm$

Volume of sphere $= \dfrac{4}{3}\pi r^3 = \dfrac{4}{3} \times \dfrac{22}{7} \times 3.5 \times 3.5 \times 3.5$

$= \dfrac{4 \times 22 \times 35 \times 35 \times 5}{3 \times 1000}\ cm^3$

$= \mathbf{179.67\ cm^3}$

Let's Recall

2. (b) $\dfrac{\text{Volume of cylinder}}{\text{Volume of cone}} = \dfrac{\pi r^2 h}{\dfrac{1}{3}\pi r^2 h} = \dfrac{3\pi r^2 h}{\pi r^2 h} = \dfrac{3}{1}$

Hence, the ratio of volume of cylinder and cone is **3 : 1**.

3. (b) Volume of cube $= 125\ cm^3$

$a^3 = (5)^3$

$$a = 5 \text{ cm Where } a \text{ is a side of cube}$$

Then lateral surface area of a cube $= 4a^2$

$$= 4 \times (5)^2$$
$$= 4 \times 25$$
$$= \mathbf{100 \text{ cm}^2}$$

5. (d) $\dfrac{h_1}{h_2} = \dfrac{1}{2}$ then $\pi r_1^{\,2} h_1 = \pi r_2^2 h_2$

$$\left(\frac{r_1}{r_2}\right) = \sqrt{\frac{2}{1}} = \frac{\sqrt{2}}{1}$$

$$\left(\frac{r_1}{r_2}\right)^2 = \left(\frac{h_2}{h_1}\right)$$

$$\frac{r_1}{r_2} = \frac{\sqrt{2}}{1}$$

$$r_1 : r_2 = \mathbf{\sqrt{2} : 1}$$

Notes