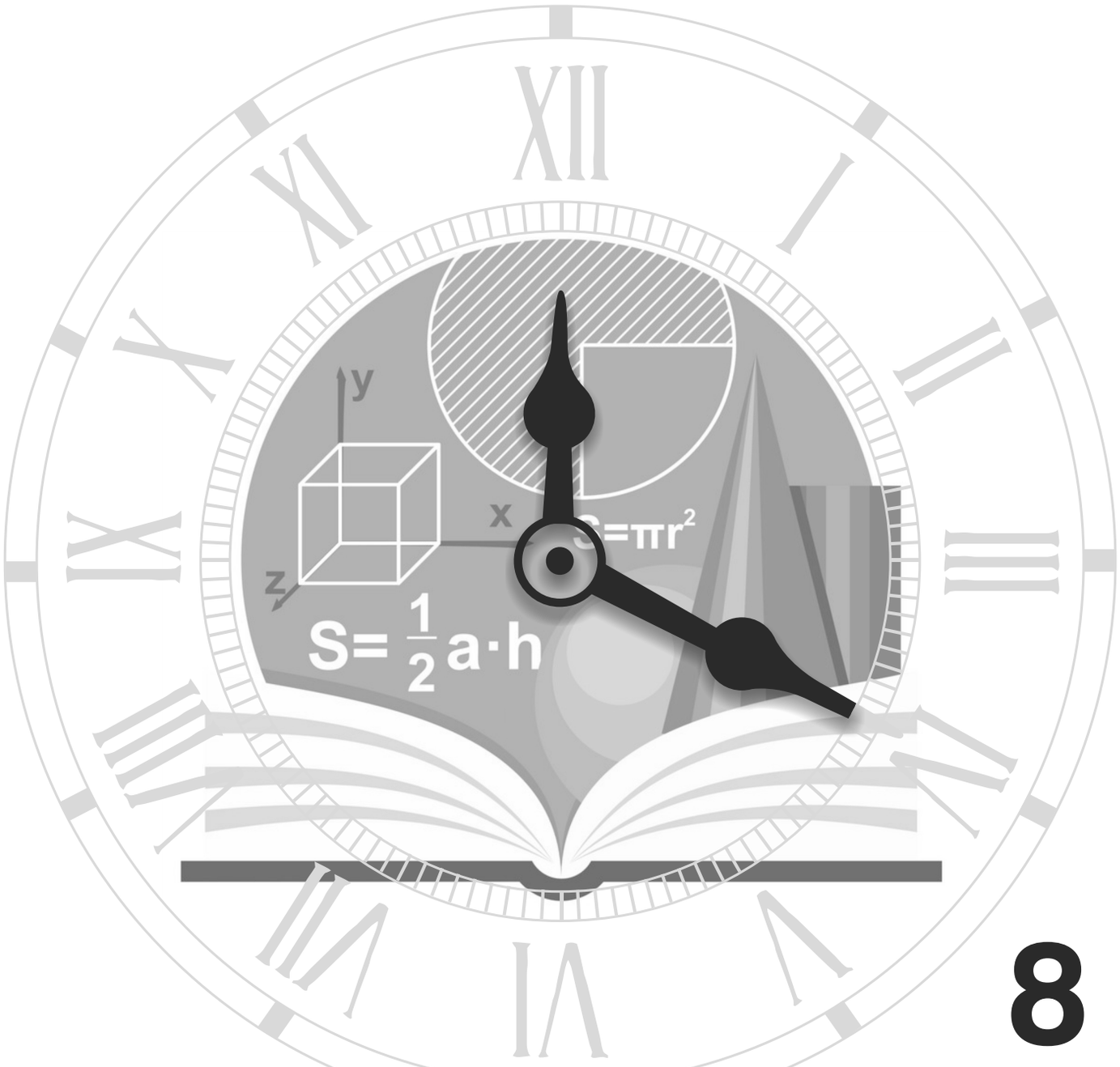


8

MathsTime

A Textbook **of Mathematics**

Unit-I : Number System

1. Rational Numbers

Exercise 1.1

1. (i) F, (ii) T, (iii) F, (iv) T, (v) F, (vi) F,

2. (i) 12, (ii) 6, (iii) –15, (iv) –67,

3. (i) 7, (ii) 49, (iii) –9, (iv) –9,

4. (i) $\frac{1}{5}$, (ii) $\frac{-1}{5}$, (iii) $\frac{1}{4}$, (iv) $\frac{3}{5}$, (v) $\frac{11}{107}$,

5. (i) $\frac{5}{20}$, (ii) $\frac{9}{36}$, (iii) $\frac{-20}{-80}$, (iv) $\frac{1000}{4000}$, (v) $\frac{-25}{-100}$,

6. (i) 90 (ii) 12 (iii) 7 (iv) 8 (v) 9

7. (i) $\frac{2}{7}$, (ii) $\frac{2}{7}$, (iii) $\frac{-2}{7}$, (iv) $\frac{9}{25}$.

Exercise 1.2

1. (i) $\frac{1}{13}$ (ii) $\frac{10}{7}$ (iii) $\frac{-5}{17}$ (iv) –1

2. (i) $\frac{82}{99}$ (ii) $-\frac{1}{36}$ (iii) $-\frac{26}{57}$ (iv) $-\frac{43}{78}$

3. & **4.** Do it yourself **5.** (i) $\frac{-86}{63}$ (ii) $\frac{37}{15}$

6. (i) $\frac{9}{11}$ (ii) $\frac{16}{17}$ (iii) $\frac{2}{5}$ (iv) $\frac{-12}{5}$.

Exercise 1.3

1. (i) F (ii) T (iii) T (iv) T

2. (i) $\frac{29}{75}$ (ii) $\frac{-17}{72}$ (iii) $\frac{29}{63}$ (iv) $\frac{1}{195}$

3. (i) $\frac{1}{4}, \frac{-1}{4}$, No (ii) $\frac{3}{8}, \frac{-3}{8}$, No (iii) $\frac{1}{66}, \frac{-1}{66}$, No

4. $\frac{-41}{7}$ **5.** $\frac{35}{38}$ **6.** $\frac{103}{72}$; **7.** $\frac{41}{33}$

8. (i) $\frac{-119}{36}, \frac{-143}{36}$, No (ii) $\frac{67}{63}, \frac{76}{63}$, No

9. (i) $\frac{19}{18}$ (ii) $\frac{41}{72}$ (iii) $\frac{-1}{10}$ (iv) $\frac{-35}{72}$

10. (i) $\frac{-5}{26}$ (ii) $\frac{-9}{14}$ (iii) $\frac{34}{9}$ (iv) $\frac{77}{23}$.

Exercise 1.4

1. (i) $\frac{3}{25}$ (ii) $\frac{-1}{12}$ (iii) 6 (iv) 2

2. (i) $\frac{6}{55}$ (ii) $\frac{-6}{35}$ (iii) 12 (iv) $\frac{5}{6}$ (v) $-\frac{24}{13}$ (vi) $\frac{2}{3}$ (vii) $\frac{1}{10}$ (viii) 48

3. (i) 8 (ii) $-7\frac{23}{40}$ (iii) 2 (iv) $-\frac{14}{45}$ (v) $-\frac{1}{6}$

4. (i) $\frac{111}{40}$ (ii) $\frac{-104}{15}$ (iii) $\frac{-89}{150}$ (iv) $\frac{17}{20}$

5. $\frac{-15}{88}$ **6.** $\frac{-53}{180}$

7. Speed $= 65\frac{1}{3}$ km/h. or $= \frac{196}{3}$ km/h.

Time $= 6\frac{1}{2}$ hours $= \frac{13}{2}$ hours.

Distance = Speed × 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 = ₹ $16\frac{1}{2}$

Cost of $3\frac{5}{7}$ litre milk = ₹ $\frac{33}{2} \times \frac{26}{7} = \frac{429}{7} =$ ₹ $\mathbf{61\frac{2}{7}}$

Exercise 1.5

1. (i) T (ii) F (iii) T (iv) F (v) T (vi) F (vii) T (viii) F

2. to **5.** Do it yourself

6. (i) $\frac{1}{15}$ (ii) $\frac{1}{-16}$ (iii) $\frac{6}{5}$ (iv) $\frac{21}{4}$ (v) $\frac{16}{9}$ (vi) $\frac{5}{3}$ (vii) does not exist (viii) $\frac{29}{-13}$.

Exercise 1.6

1. (i) F (ii) F (iii) F (iv) T (v) T

2. (i) $\frac{16}{-15}$ (ii) $\frac{-4}{9}$ (iii) $\frac{1}{14}$ (iv) 30 (v) $\frac{224}{375}$ (vi) $\frac{4}{3}$ (vii) $\frac{21}{10}$ (viii) $\frac{7}{8}$

3. Do it yourself

4. (i) $\frac{3}{40}$ (ii) $\frac{-3}{7}$ (iii) $\frac{5}{2}$ (iv) $\frac{25}{2}$

5. Do it yourself **6.** $\frac{10}{3}$ **7.** $\frac{4}{3}$

8. Do it yourself **9.** $\frac{4}{3}$ **10.** $\frac{154}{145}$

11. $\frac{7}{9}$ **12.** $\frac{5}{4}$ **13.** $\frac{4}{3}$

14. ₹ $19\frac{9}{34}$ **15.** 2.4 metres.

Exercise 1.7

1. (ii)

2. (i) $\frac{3}{11}$ (ii) $\frac{-5}{8}$ (iii) $\frac{-7}{12}$ (iv) $\frac{-3}{-7}$

3. (i) $\frac{5}{-7}$ (ii) $\frac{6}{13}$ (iii) $\frac{16}{-5}$ (iv) $\frac{4}{-3}$

4. (i) $\frac{-7}{4}, \frac{3}{-2}, \frac{1}{10}, \frac{3}{8}$ (ii) $\frac{-7}{10}, \frac{8}{-15}, \frac{1}{2}, \frac{3}{5}$

5. (i) $\frac{5}{6}, \frac{2}{3}, \frac{2}{-3}, \frac{-7}{2}$ (ii) $\frac{8}{9}, \frac{13}{45}, 0, \frac{-15}{27}$

6. (i) < (ii) > (iii) = (iv) >.

Exercise 1.8

1. Quantity of paint that Ravi has $= \frac{3}{4}$ L

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

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

Let AL paint need to made it $= \frac{4}{5}$ L

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

$A = \frac{4}{5} - \frac{1}{4} = \frac{16-5}{20} = \mathbf{\frac{11}{20}\ L}$

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

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

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

(b) Quantity of sugar she has left $= \frac{7}{9} - \frac{3}{4} = \frac{28-27}{36} = \mathbf{\frac{1}{36}}$ **cup**

3. (a) Their total height $= 1\frac{7}{10}\text{ m} + 1\frac{5}{8}\text{ m} = \frac{17}{10}\text{ m} + \frac{13}{8}\text{ m}$

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

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

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

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

4. (a) $\frac{64}{15}$ km (b) $\frac{64}{15}$ km

5. $\frac{199}{42}$ hrs; $\frac{55}{42}$ hrs

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

$= \frac{5\text{ hrs} + 8\text{ hrs}}{20} = \mathbf{\frac{13}{20}}$ hrs

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

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

7. ₹ $\frac{1889}{120}$

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

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

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

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

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

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

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

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

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

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

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

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

11. Let two numbers are x and y

According to question, $x \times y = \frac{6}{5}$

Given, $x = \frac{1}{5}$

So, $\frac{1}{5} \times y = \frac{6}{5} \quad \Rightarrow \quad y = \frac{6}{5} \times \frac{5}{1}$

$y = 6$

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

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

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

12. $\frac{127}{24}$

13. 2460cm^2

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

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

Fraction of chocolate taken to $B = \frac{3}{4} \times \frac{3}{8} = \frac{9}{32} = \frac{24-9}{32} = \frac{15}{32}$

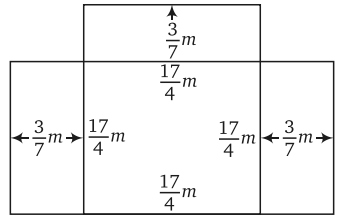
Fraction of chocolate taken to $C = \frac{15}{32} \times \frac{5}{9} = \frac{25}{96}$

Fraction of chocolate taken to $D = \frac{15}{32} - \frac{25}{96} = \frac{45-25}{96}$

$= \frac{20}{96} = \mathbf{\frac{5}{24}}$

15. 10 kilolitres

16. From the figure



Area of the border

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

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

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

17. Length of paper box $l = \frac{25}{100}\ \text{m} = \frac{25}{100} \times 100\ \text{cm} = 25\ \text{cm}$

Breadth of paper box $b = \frac{16}{100}\ \text{m} = \frac{16}{100} \times 100\ \text{cm} = 16\ \text{cm}$

Height of paper box $h = \frac{5}{100}\ \text{m} = \frac{5}{100} \times 100\ \text{cm} = 5\ \text{cm}$

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

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

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

Per m^2 carpenting cost $= ₹\ \frac{21}{4}$

Required carpeting cost of hall $= ₹\ \frac{21}{4} \times 44 = 21 \times 11 = ₹\ \mathbf{231}$

19. Radius of bucket $= \frac{22}{2 \times 100}\ \text{m}$

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

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

Depth $= 9.68\ \text{m} = \frac{968}{100} \times 100\ \text{cm} = 968\ \text{cm}$

Number of turns $= \frac{968}{2 \times \frac{22}{7} \times 11} = \frac{968 \times 7}{2 \times 22 \times 11} = \mathbf{14}$

❑

2. Exponents and Radicals

Exercise 2.1

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

(iii) $\left(\frac{6}{17}\right)^{\frac{1}{9}} = \sqrt[\mathbf{9}]{\frac{\mathbf{6}}{\mathbf{17}}}$ (iv) $\left(\frac{11}{7}\right)^{\frac{1}{11}} = \sqrt[\mathbf{11}]{\frac{\mathbf{11}}{\mathbf{17}}}$

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

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

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

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

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) 32

(iv) $(16)^{-\frac{3}{4}} = (2^4)^{\frac{-3}{4}} = 2^{4\times\frac{-3}{4}} = 2^{-3} = \frac{1}{2^3} = \mathbf{\frac{1}{8}}$ (v) $\frac{1}{36}$

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

(vii) 25 (viii) 49

(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) $(512)^{\frac{-2}{9}} = (2^9)^{\frac{-2}{9}} = 2^{9\times\frac{-2}{9}} = 2^{-2} = \frac{1}{2^2} = \mathbf{\frac{1}{4}}$

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

2. (i) $(5)^{\frac{1}{4}} = \mathbf{\sqrt[4]{5}}$ (ii) $21^{\frac{2}{3}} = \mathbf{\sqrt[3]{21^2}}$

(iii) $\sqrt[6]{2^5}$ (iv) $\left(\frac{5}{17}\right)^{\frac{1}{9}} = \mathbf{\sqrt[9]{\frac{5}{17}}}$

(v) $\sqrt[5]{\left(\frac{17}{21}\right)^2}$ (vi) $(-215)^{\frac{1}{7}} = \mathbf{\sqrt[7]{-215}}$

3. (i) $\sqrt[4]{37} = \mathbf{(37)^{\frac{1}{4}}}$ (ii) $(27)^{\frac{1}{5}}$

(iii) $\sqrt[7]{29^2} = \mathbf{(29)^{\frac{2}{7}}}$ (iv) $\left(\frac{8}{9}\right)^{\frac{1}{6}}$ (v) $\left(\frac{2}{3}\right)^{2/3}$

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

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

$$= \frac{4}{(2)^{-1}(3)^{-1}} = \frac{4 \times 2 \times 3}{1} = \mathbf{24}$$

2	36
2	18
3	9
3	3
	1

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

5. (i) $13^{\frac{4}{3}} \div 13^{\frac{1}{3}} = 13^{\frac{4}{3} - \frac{1}{3}}$ (ii) 100

$= 13^{\frac{3}{3}} = \mathbf{13}$

(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) 121

(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) $\frac{1}{3}$

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) $\frac{2}{9}$ (iii) $\frac{1}{25}$

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

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

(ii) 0.04

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

$= \frac{32}{1000000} = \mathbf{0.00032}$

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

$= \left(\frac{25}{10}\right)^{3} = \frac{25\times25\times25}{10\times10\times10} = \frac{15625}{1000} = \mathbf{15.625}$

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

$= 8\times(8+1) = 8\times9 = \mathbf{72}$

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

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

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

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

(iii) 328

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

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

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

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

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

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

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

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) 13 (iii) 17

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

Exercise 2.3

1. (i) 6.25×10^{9} (ii) 7.196×10^{16} (iii) 2.13×10^{-8} (iv) 9.25×10^{-8}

2. (i) 967000 (ii) 837000000 (iii) 0.000942 (iv) 0.000000675

3. (i) 1.6×10^{-3} cm (ii) 2.2×10^{-10} m (iii) 3.34×10^{-21} tons
(iv) 3.0×10^{8} m/sec (v) 1.040688×10^{9} sec (vi) 3.72×10^{9}kg

4. 3.84×10^{8} m **5.** 5.0×10^{-7}

6. 1,989,000, 000, 000, 000, 000, 000, 000, 000, 000.

❑

3. Squares and Square Roots

Exercise 3.1

1. (i) 16,36 **2.** 100 **3.** 121 **4.** 256, 1296

5. (i) $65^2=65\times65=$ **4225** (ii) $75^2=75\times75=$ **5625**

6. (i) $23^2-22^2=(23+22)(23-22)=45\times1=$ **45**

(ii) $101^2-100^2=(101+100)(101-100)=201\times1=$ **201**

(iii) 1101

7. (3, 4, 5); (6, 8, 10)

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

9. $\dfrac{(4444)^2}{1+2+3+4+3+2+1}, \dfrac{(55555)^2}{1+2+3+4+5+4+3+2+1}$

$\dfrac{(666666)^2}{1+2+3+4+5+6+5+4+3+2+1}$

$\dfrac{(7777777)^2}{1+2+3+4+5+6+7+6+5+4+3+2+1}$

$\dfrac{(88888888)^2}{1+2+3+4+5+6+7+8+7+6+5+4+3+2+1}$

10. (i) Yes (ii) Yes

11. 6561, 6724, 6889, 7056, 7225, 7396, 7569, 7744, 7921.

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) 9 (iv) 10 (v) 13

(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) 20

(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 subtract 10 times.

$\sqrt{49}=7$ and $\sqrt{100}=10$, $\sqrt{4900}=7\times10=$ **70**

(ix) 39 (x) 320.

2. (i) Factorizing 16 by the division method

$16 = 2\times2\times2\times2$

$\Rightarrow$ $\sqrt{16}=2\times2=$ **4**

2	16
2	8
2	4
2	2
	1

(ii) 14

(iii) Factorizing 529 by the division method.

$529 = 23\times23$

$\sqrt{529}=$ **23**

23	529
23	23
	1

(iv) 20

(v) Factorizing 1764 by the division method

$1764 = 2 \times 2 \times 3 \times 3 \times 7 \times 7$

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

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

(vi) 64

(vii) Factorizing 7744 by the division method.

$7744 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 11 \times 11$

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

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

(viii) 108, (ix) 1000

(x) Factorizing 298116 by the division method

$298116 = 2 \times 2 \times 3 \times 3 \times 7 \times 7 \times 13 \times 13$

$\sqrt{298116} = 2 \times 3 \times 7 \times 13 =$ **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, $\frac{9408}{3} = \frac{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 7 \times 7}{3}$

$= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 7 \times 7 = 2 \times 2 \times 2 \times 7 =$ **56**

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

4. 5, 30

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 $= 2304$

$\therefore$ $x^2 = 2304$

$x = \sqrt{2304}$

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

$x = 2 \times 2 \times 2 \times 2 \times 3 =$ **48**

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

6. 77

Exercise 3.3

1. (i) $\sqrt{\frac{625}{1296}} = \sqrt{\frac{5\times5\times5\times5}{6\times6\times6\times6}} = \frac{5\times5}{6\times6} = \mathbf{\frac{25}{36}}$

(ii) $\sqrt{4\frac{29}{49}} = \sqrt{\frac{225}{49}} = \sqrt{\frac{3\times3\times5\times5}{7\times7}} = \frac{3\times5}{7} = \frac{15}{7} = \mathbf{2\frac{1}{7}}$

(iii) $1\frac{9}{14}$, (iv) $4\frac{9}{11}$, (v) $7\frac{11}{46}$ (vi) $8\frac{5}{7}$

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

$$= \sqrt{\frac{3\times3\times3\times3\times3\times3\times3\times89\times89}{10\times10\times10\times10\times10\times10}}$$

$$= \frac{3\times3\times3\times89}{10\times10\times10} = \frac{2403}{1000} = \mathbf{2.403}$$

(viii) 0.0231, (ix) 897, (x) $\frac{1}{2}$, (xi) $\frac{4}{5}$

(xii) $\sqrt{0.09} = \sqrt{\frac{9}{100}} = \sqrt{\frac{3\times3}{10\times10}} = \frac{3}{10} = \mathbf{0.3}$

(xiii) 0.02, (xiv) $\frac{13}{17}$

(xv) $\sqrt{\frac{121}{1000}} = \sqrt{\frac{11\times11}{10\times10\times10\times10}} = \frac{11}{10\times10} = \mathbf{\frac{11}{100}}$

(xvi) 0.25, (xvii) 0.18

2. Area of a square field $= 101\frac{1}{400}\ m^2 = (Arm)^2$

Then $(Arm)^2 = 101\frac{1}{400}$

$$Arm = \sqrt{101\frac{1}{400}} = \sqrt{\frac{40401}{400}} = \sqrt{\frac{201}{20}} = \mathbf{10\frac{1}{20}\ m}$$

Exercise 3.4

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

	48
4	$\overline{23}\ \overline{04}$
	16
88	704
	704
	0

2. 67 **3.** 59 **4.** 99 **5.** 210

6. 165 **7.** 234 **8.** 222

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

	316
3	$\overline{9}\ \overline{98}\ \overline{56}$
	9
61	98
	61
626	3756
	3756
	0

10. 625 **11.** 345 **12.** 440 **13.** 1111

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

	2222
2	$\overline{4}\ \overline{93}\ \overline{72}\ \overline{84}$
	4
42	93
	84
442	972
	884
4442	8884
	8884
	0

15. 4607 **16.** 9070 **17.** 8027 **18.** 7906 **19.** 62573

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

	56804
5	$\overline{32}\ \overline{26}\ \overline{69}\ \overline{44}\ \overline{16}$
	25
106	726
	636
1128	9069
	9024
113604	454416
	454416
	0

21. 57 **22.** 110 **23.** 40 **24.** 25 **25.** 1024

26. The greatest number of six digits is 999999.

	999
9	$\overline{99}\ \overline{99}\ \overline{99}$
	81
189	1899
	1701
1989	19899
	17901
	1998

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

$\therefore$ 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,

$x^2 = 8100$

$x = \sqrt{8100} = \sqrt{9 \times 9 \times 10 \times 10}$ = **90 soldiers**

Exercise 3.5

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

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

3. $5\frac{6}{7}$ **4.** $9\frac{2}{11}$ **5.** $4\frac{23}{27}$ **6.** $4\frac{8}{13}$ **7.** $3\frac{4}{15}$

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

	237
2	$\overline{5}\ \overline{61}\ \overline{69}$
	4
43	161
	129
467	3269
	3269
	×

9. $\sqrt{7.29} = \dfrac{\sqrt{729}}{\sqrt{100}} = \dfrac{27}{10} = \mathbf{2.7}$

	27
2	$\overline{7}\ \overline{29}$
	4
47	329
	329
	×

10. 4.1 **11.** 3.05 **12.** 9.21 **13.** 12.25

14. 21.85 **15.** 15.02

16. $\sqrt{0.00008281} = \dfrac{\sqrt{8281}}{\sqrt{100000000}} = \dfrac{91}{10000} = \mathbf{0.0091}$

	91
9	$\overline{82}\ \overline{81}$
	81
181	181
	181
	×

17. Let the number be x

$x \times x = 251953.8025$

$x^2 = 251953.8025$

$x = \dfrac{\sqrt{2519538025}}{\sqrt{10000}} = \dfrac{50195}{100} = \mathbf{501.95}$

	50195
5	$\overline{25}\ \overline{19}\ \overline{53}\ \overline{80}\ \overline{25}$
	25
1001	1953
	1001
10029	95280
	90261
100385	501925
	501925
	×

18. 47.968

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

$256.6404 = a^2$

$a = \sqrt{256.6404}$

$a = \dfrac{\sqrt{2566404}}{\sqrt{10000}} = \dfrac{1602}{100} = \mathbf{16.02\ m}$

	1602
1	$\overline{2}\ \overline{56}\ \overline{64}\ \overline{04}$
	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.

	1.3038
1	$\overline{1.70}\ \overline{00}\ \overline{00}\ \overline{00}$
	1
23	70
	69
2603	10000
	7809
26068	219100
	208544
	10556

2. 4.806 **3.** 2.236

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

Correct upto three places of decimal.

5. 0.949 **6.** 4.472 **7.** 0.316 **8.** 0.126

9. 0.025 **10.** 2.646

11. $\sqrt{\dfrac{7}{8}} = \sqrt{0.875} = \dfrac{\sqrt{8750}}{\sqrt{10000}} = \dfrac{93.94}{100} = 0.935$

Correct upto three places of decimal.

	93.54
9	$\overline{87}\ \overline{50}$
	81
183	650
	549
1865	10100
	9325
18704	77500
	74816
	2684

12. 8.124 **13.** 3.914 **14.** 1.443 **15.** 16.960
16. 3.4651

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**

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4. Cubes and Cube Roots

Exercise 4.1

1. (i) $7^3 = 7 \times 7 \times 7 =$ **343**
(ii) $12^3 = 12 \times 12 \times 12 =$ **1728**
(iii) $21^3 = 21 \times 21 \times 21 =$ **9261**

(iv) $100^3 = 100 \times 100 \times 100 =$ **1000000**

(v) $(302)^3 = 302 \times 302 \times 302 =$ **27543608**

2. $1^3 = 1 \times 1 \times 1 = 1$ $\quad 2^3 = 2 \times 2 \times 2 = 8$

$3^3 = 3 \times 3 \times 3 = 27$ $\quad 4^3 = 4 \times 4 \times 4 = 64$

$5^3 = 5 \times 5 \times 5 = 125$

$6^3 = 6 \times 6 \times 6 = 216$

$7^3 = 7 \times 7 \times 7 = 343$

$8^3 = 8 \times 8 \times 8 = 512$

$9^3 = 9 \times 9 \times 9 = 729$

$10^3 = 10 \times 10 \times 10 = 1000$

$11^3 = 11 \times 11 \times 11 = 1331$

$12^3 = 12 \times 12 \times 12 = 1728$

.....

$19^3 = 19 \times 19 \times 19 = 6859$

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 = $(\text{side})^3 = 13^3 = 13 \times 13 \times 13 =$ **2197 m^3**

9. 5

Exercise 4.2

1. (i) $\sqrt[3]{-125} = -\sqrt[3]{125} = -\sqrt[3]{5 \times 5 \times} =$ **–5.**

(ii) –18 (iii) –26

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

$= -\sqrt[3]{2 \times 2 \times 2 \times 7 \times 7 \times 7 \times 10 \times 10 \times 10}$

$= -2 \times 7 \times 10 =$ **–140**

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

Exercise 4.3

1. $\sqrt[3]{8 \times 64} = \sqrt[3]{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2} = 2 \times 2 \times 2 =$ **8**

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

2	8
2	4
2	2
	1

2. $\sqrt[3]{(-216)\times 1728}$

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

$= -2\times 3\times 2\times 2\times 3 = -8\times 9 = \mathbf{-72}$

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

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

3. -42

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

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

5	125
5	25
5	5
3	1

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

5. 225 **6.** -77 **7.** -78

8. $\sqrt[3]{-5832000} = \sqrt[3]{583200}$

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

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

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

2	583200
2	2916000
2	1458000
2	72900
2	364500
2	182250
3	91125
3	30375
3	10125
3	3375

3	1125
3	375
5	125
5	25
5	5
	1

Exercise 4.4

1. (i) $(0.3)^3 = 0.3 = \frac{3\times3\times3}{1000} = \frac{27}{1000} = \mathbf{0.027}$ (ii) 3.375

(iii) $(0.08)^3 = 0.08\times0.08\times0.08 = \frac{8\times8\times8}{100\times100\times100}$

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

(iv) 9.261

2. (i) $\left(\frac{7}{9}\right)^3 = \frac{7\times7\times7}{9\times9\times9} = \mathbf{\frac{343}{729}}$

(ii) $\left(\frac{-8}{11}\right)^3 = \frac{-8\times-8\times-8}{11\times11\times11} = \mathbf{\frac{-512}{1331}}$

(iii) $\frac{1728}{343}$ (iv) $-\frac{2197}{512}$

(v) $\left(2\frac{3}{5}\right)^3 = \left(\frac{13}{5}\right)^3 = \frac{13\times13\times13}{5\times5\times5} = \mathbf{\frac{2197}{125}}$

(vi) $\frac{2197}{64}$

3. (i) $\sqrt[3]{\frac{27}{64}} = \sqrt[3]{\frac{3\times3\times3}{4\times4\times4}} = \mathbf{\frac{3}{4}}$

(ii) $\sqrt[3]{\frac{125}{128}} = \sqrt[3]{\frac{5\times5\times5}{2\times2\times2\times2\times2\times2\times2}}$

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 $= (\text{Side})^3$

$$32.768 = (\text{Side})^3$$

$$\sqrt[3]{32.768} = \text{Side} \quad \Rightarrow \quad \sqrt[3]{\frac{32768}{1000}} = \text{Side}$$

$$\text{Side} = \frac{2\times2\times2\times2\times2}{10} = \frac{32}{10} = \mathbf{3.2\ m}$$

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) $\sqrt[3]{\frac{8}{125}} = \sqrt[3]{\frac{2\times2\times2}{5\times5\times5}} = \mathbf{\frac{2}{5}}$

(ii) $\sqrt[3]{\frac{-64}{1331}} = -\sqrt[3]{\frac{4\times4\times4}{11\times11\times11}} = -\mathbf{\frac{4}{11}}$ (iii) $\frac{-3}{16}$

(iv) $\sqrt[3]{\frac{-2197}{-9261}} = \sqrt[3]{\frac{2197}{9261}} = \sqrt[3]{\frac{13\times13\times13}{21\times21\times21}} = \mathbf{\frac{13}{21}}$

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Unit-II : Algebra

5. Algebraic Expression and their Factorization

Exercise 5.1

1. (i) $(x+8)(x-2) = x(x+8) - 2(x+8) = x^2 + 8x - 2x - 16$

$$= \boldsymbol{x^2 + 6x - 16}$$

(ii) $z^2 - 8z + 15$ (iii) $p^2 - 7p - 18$ (iv) $x^2 + \frac{25}{12}x + 1$

(v) $(y-9)(y-2) = y(y-9) - 2(y-9) = y^2 - 9y - 2y + 18$

$= \mathbf{y^2 - 11y + 18}$

(vi) $(z^2+2)(z^2-3) = (z^2+2)\,z^2 + (z^2+2)\,(-3)$

$= z^4 + 2z^2 - 3z^2 - 6$

$= \mathbf{z^4 - z^2 - 6}$

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) $103 \times 96 = (100+3) \times (100-4)$

$= (100+3) \times 100 + (100+3) \times (-4)$

$= 10000 + 300 - 400 - 12$

$= 10300 - 412 = \mathbf{9888}$

(iii) $95 \times 97 = (100-5)\,(100-3)$

$= (100-5) \times 100 + (100-5) \times (-3) = \mathbf{9215}$

(iv) 2915

(v) $34 \times 36 = (30+4) \times (30+6) = (30+4) \times 30 + (30+4) \times 6$

$= 900 + 120 + 180 + 24 = \mathbf{1224}$

(vi) 11663

Exercise 5.2

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

$= (x)^2 + (2y)^2 + (3z)^2 + 2\,(x \times 2y + 2y \times 3z + 3z \times x)$

$= \mathbf{x^2 + 4y^2 + 9z^2 + 4xy + 12yz + 6zx}$

(ii) $(x + y - 2z)^2$

$= (x)^2 + (y)^2 + (-2z)^2 + 2\,\{x \times y + y \times (-2z) + (-2z) \times x\}$

$= \mathbf{x^2 + y^2 + 4z^2 + 2xy - 4yz - 4zx}$

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

(iv) $(p - 3q - 2z)^2$

$= (p)^2 + (-3q)^2 + (-2z)^2 + 2\,\{p \times -3q) + (-3q) \times (-2z) + (-2z) \times p\}$

$= \mathbf{p^2 + 9q^2 + 4z^2 - 6pq + 12qz - 4pz}$

(v) $x^2 + 25y^2 + 4z^2 - 10xy - 20yz + 4xz$

(vi) $81x^2 + 4y^2 + 9z^2 - 36xy + 12xz - 54xz$

(vii) $9m^2 + 25n^2 + 4p^2 + 30mn - 20np - 12mp$

(viii) $\left(3x-\frac{1}{2}p+2q\right)^2$

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

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

(ix) $(5x^2 + y + z)^2$

$= (5x^2)^2 + (y)^2 + (z)^2 + 2\{5x^2\times y + y\times z + z\times 5x^2\}$

$= \mathbf{25x^4 + y^2 + z^2 + 10x^2y + 2yz + 10zx^2}$

2. (i) 4, 9, 25, 12, 30, 20 (ii) 4, 2, 4, 4

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

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

$= x^2 + y^2 + z^2 + 2xy + 2yz + 2zx + x^2 + y^2 + z^2 + 2xy - 2yz - 2zx$

$= \mathbf{2x^2 + 2y^2 + 2z^2 + 4xy}$

(ii) $(2x+p-c)^2 - (2x-p+c)^2$ $\because (a)^2 - (b)^2 = (a+b)(a-b)$

$= (2x+p-c+2x-p+c)(2x+p-c-2x+p-c)$

$= (4x)(2p-2c) = \mathbf{8px - 8cx}$

Exercise 5.3

1. (i) $(3x-2y)^3 = (3x)^3 - (2y)^3 - 3\times 3x\times 2y(3x-2y)$

$= \mathbf{27x^3 - 8y^3 - 54x^2y + 36xy^2}$

(ii) $(x+3y)^3 = (x)^3 + (3y)^3 + 3\times x\times(3y)\{x+3y\}$

$= x^3 + 27y^3 + 9xy(x+3y)$

$= \mathbf{x^3 + 27y^3 + 9x^2y + 27xy^2}$

(iii) $p^3x^3 + 8z^3 + 6p^2x^2z + 12pxz^2$

(iv) $x^6 + y^3 + 3x^4y + 3x^2y^2$

(v) $8x^3 - y^6 - 12x^2y^2 + 6xy^4$

(vi) $343x^3 + 729y^3 + 1323x^2y + 1701xy^2$

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

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

$=\mathbf{\frac{8}{27}x^3-\frac{125}{27}z^3-\frac{20}{9}x^2z+\frac{50}{9}xz^2}$

(viii) $8z^3-343y^3-84yz^2+294y^2z$

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

$27x^3+8y^3=(3x)^3+(2y)^3$

$=(3x+2y)^3-3\times3x\times2y\ (3x+2y)$

$=(14)^3-18xy\times14=(14)^3-18\times8\times14$

$=14\ \{14^2-18\times8\}$

$=14\ (196-144\}=14\times52=\mathbf{728}$

(ii) 7440

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

$p^3-q^3=(p-q)^3+3pq\ (p-q)$

$=(-8)^3+3\times(-12)\times(-8)$

$=-512+288=\mathbf{-224}$

(ii) $\frac{5050}{729}$

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

$64x^3-125z^3=(4x-5z)^3+3\times4x\times5z\times(4x-5z)$

$=(16)^3+60xz\times16=(16)^3+60\times12\times16$

$=16\ \{(16)^2+60\times12\}=16\ \{256+720\}$

$=16\times976=\mathbf{15616}$

(ii) $64x^3-125z^3$, $4x-5z-\frac{3}{5}$ and $64x^3-125z^3$

$=(4x-5z)^3+3\times4x\times5z\times(4x-5z)$

$=\left(\frac{3}{5}\right)^3+60\times6\times\frac{3}{5}$

$=\frac{3}{5}\left\{\left(\frac{3}{5}\right)^2+60\times6\right\}=\frac{3}{5}\left\{\frac{9}{25}+360\right\}$

$=\frac{3\times9009}{25\times5}=\mathbf{\frac{27027}{125}}$

5. (i) $(105)^3 = (100+5)^2 = (100)^3 + (5)^3 + 3\times 100\times 5\,(100+5)$

$= 1000000 + 125 + 1500\times 105 = \mathbf{1157625}$

(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) 128787625 (iv) 1015075125 (v) 997002999

(vi) $(601)^3 = (600+1)^3$

$= (600)^3 + (1)^3 + 3\times 600\times 1\times (600+1)$

$= 216000000 + 1 + 1800\times 601$

$= 216000000 + 1 + 108800 = \mathbf{217081801}$

(vii) 214921799 (viii) 65450827 (ix) 1157.625

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

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

$= (4x)^3 - 3\,(4x^2 - 9p^2)\times (4x)$

$= 64x^3 - 12x\,(4x^2 - 9p^2) = 64x^3 - 48x^3 + 108p^2x$

$= \mathbf{16x^3 + 108xp^2}$

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

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

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

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

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

(iii) $16x^3 + 12xz^2$ (iv) $-250n^3 - 1470t^2n$

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

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

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

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

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

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

7. (i) $m^3n^3, 27, 9, 27$ (ii) $y^6, 3, 3x^2$ (iii) $\frac{2}{3}y, \frac{216}{343}, \frac{8}{7}, \frac{72}{49}$

(iv) $8t^6, 36, 54.$

Exercise 5.4

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) $27x^3 + 125$ (iv) $343y^3 - 125z^3$

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

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

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

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

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

2. (i) $4t^2, 9$ (ii) $9z^2, 4, 8$ (iii) $1, x$ (iv) x^4.

Exercise 5.5

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

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

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

$$= x(x-4) - 2(x-4) = \mathbf{(x-4)(x-2)}$$

(iii) $(z+4)(z-3)$

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

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

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

(v) $(m-5)(m+3)$

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

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

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

$= \mathbf{(m+9n)\,(m+2n)}$

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

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

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

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

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

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

(iii) $(2x - y - 3z)^2$ (iv) $(\sqrt{2}x + 2y - \sqrt{3}z)^2$

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

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

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

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

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

(ii) $(x+4y)^3$

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

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

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

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

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

(iv) $(x+5z)^3$

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

(ii) $(y+5)\,(y^2 - 5y + 25)$

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

(iv) $(2xy + 3z)\,(4x^2y^2 - 6xyz + 9z^2)$

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

(vi) $(m-3n)\,(m^2 + 3mn + 9n^2)$

(vii) $\frac{1}{216}p^3 - 8q^3 = \left(\frac{p}{6}\right)^3 - (2q)^3$

$= \left(\frac{p}{6} - 2q\right)\left(\frac{p^2}{36} + \frac{pq}{3} + 4q^2\right)$

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

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

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

$= 2x^3y\ \{(3x)^3 + (y)^3\}$

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

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

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

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

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

(iv) $(3x + m - 3)\ (9x^2 + m^2 - 18x - 3mx + 3m + 9)$

Exercise 5.6

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

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

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

(ii) $(2x - 3y + z)\ (4x^2 + 9y^2 + z^2 + 6xy + 3yz - 2xz)$

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

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

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

(iv) $(-3x + y - z)\ (9x^2 + y^2 + z^2 + 3xy + yz - 3xz)$

(v) $(x - 2y - 4z)(x^2 + 4y^2 + 16z^2 + 2xy - 8yz + 4xz)$

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

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

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

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

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

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

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

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

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

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

(ii) $3\,(p-3q)\,(3q-7r)\,(7r-p)$

(iii) $3\,(5x-6p)\,(7z-5x)\,(6p-7z)$

(iv) $3\left(\frac{1}{2}x-3y\right)(3y-\sqrt{3}z)\left(\sqrt{3}z-\frac{1}{2}x\right)$

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

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

Then, $a+b+c=0$

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

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

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

(ii) -310764

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

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

Then, $a+b+c=0$

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

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

$=\mathbf{-498.33}$

(iv) 14.256

❑

6. Division of Algebraic Expressions

Exercise 6.1

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

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

(iii) $(x-y)$

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

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

$= \mathbf{36z^2+49p^2+42pz}$

Exercise 6.2

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

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

$= \dfrac{x\,(x+4)+3\,(x+4)}{x+3}$

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

(iii) $2y+\dfrac{1}{2}$ (iv) $-8z^2-12z+2$

(v) $(3m^3 + 4m^2 + 5m + 18) \div (m + 12)$

$$
\begin{array}{r}
\mathbf{3m^2 - 2m + 9} \\
m + 2 \overline{)\,3m^3 + 4m^2 + 5m + 18} \\
\underline{-\,3m^3 \mp 6m^2} \\
-2m^2 + 5m \\
\underline{-2m^2 \mp 4m} \\
9m + 18 \\
\underline{-\,9m \mp 18} \\
\times
\end{array}
$$

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

$$
\begin{array}{r}
\mathbf{3y^2 + 3y + 2} \\
y^2 - 2y \overline{)\,3y^4 - 3y^3 - 4y^2 + 4y} \\
\underline{-\,3y^4 \pm 6y^3} \\
-3y^3 - 4y^2 \\
\underline{-3y^3 \pm 6y^2} \\
2y^2 - 4y \\
\underline{-\,2y^2 \pm 4y} \\
\times
\end{array}
$$

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

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

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

Now, Dividend = Divisor × Quotient + Remainder

RHS = Divisor × Quotient + Remainder

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

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

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

LHS = Dividend $= 14x^2 + 13x - 15$

Thus, LHS = RHS

(ii) $5z^2 + \frac{10}{3}z + 11$, Remainder $= 54$ (iii) $3y^3 - 5y + \frac{3}{2}$

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

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

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

Now, Dividend = Divisor × Quotient + Remainder

RHS = Divisor × Quotient + Remainder

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

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

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

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

Thus, LHS = RHS

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

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

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

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

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

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

(iii) No, (iv) Yes

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

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

$= $ Yes, $(z^2 - 3)$ is a factor of $(z^5 - 9z)$

❑

7. Linear Equations in One Variable

Exercise 7.1

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

$$2y + 6 = y + 4$$
$$2y - y = 4 - 6$$
$$y = \mathbf{-2}$$

Check :

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

LHS = RHS

(ii) $\frac{3x+5}{2x+7}=\frac{4}{1}$

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

$3x+5=8x+28$

$5-28=8x-3x$

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

Check :

L.H.S. $=\frac{3x+5}{2x+7}=\frac{3\times\left(\frac{-23}{5}\right)+5}{2\times\left(\frac{-23}{5}\right)+7}=\frac{\frac{-69+25}{5}}{\frac{-46+35}{5}}=\frac{-44}{-11}=\frac{4}{1}$ RHS

LHS = RHS

(iii) $\frac{2x+1}{3x-2}=\frac{5}{9}\Rightarrow 18x+9=15x-10, 18x-15x=-10-9,$

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

Check : $\text{LHS}=\frac{2x+1}{3x-2}=\frac{2\times\left(-\frac{19}{3}\right)+1}{3\times\left(-\frac{19}{3}\right)-2}=\frac{\frac{-38+3}{3}}{-19-2}=\frac{-35}{3\times(-21)}$

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

LHS = RHS

(iv) $-4x^3+2x^2-8x+30$, Remainder :–285

(v) $\frac{1-9y}{19-3y}=\frac{5}{8}, 8-72y=95-15y\Rightarrow 8-95=-15y+72y$

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

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

2. (i) $\frac{17}{21}$

(ii) $\frac{0.4z-3}{1.5z+9}=\frac{-7}{5} \quad \Rightarrow \quad 2z-15=-10.5z-63,$

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

(iii) 0.

(iv) $\frac{2x}{3x+1}=\frac{-3}{1}, 2x=-9x-3, 2x+9x=-3, 11x=-3, x=\mathbf{\frac{-3}{11}}$

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

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

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

(vi) $\frac{y-(7-8y)}{9y-(3+4y)}=\frac{2}{3}, 3y-3(7-8y)=18y-2(3+4y),$

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

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

3. (i) -7 (ii) $\frac{2}{3}$ (iii) $\frac{-156}{17}$ (iv) $\frac{1}{5}$ (v) 2 (vi) $\frac{682}{139}$

4. (i) 2 (ii) $\frac{7}{3}$ (iii) $\frac{-41}{20}$ (iv) $\frac{-18}{11}$ (v) -4 (vi) $\frac{9}{20}$

❑

Unit-III : Commercial Mathematics

8. Ratios and Percentages

Exercise 8.1

1. (i) 10 : 1 (ii) 1 : 2000 (iii) 20 : 1 (iv) 500 : 7

2. (i) 30% (ii) 4.5% (iii) 125%

3. (i) 75% (ii) $33\frac{1}{3}\%$ (iii) 67% (iv) $16\frac{2}{3}\%$

4. (i) $\frac{5}{6}$ (ii) $83\frac{1}{3}\%$

5. 6%

6. 20%, 30%, 45%, 5%

7. (i) ₹ 99.20 (ii) 325 persons (iii) 3.60 kg (iv) 62.5 m
(v) 91.8 kg (vi) 4.84 hrs

8. 7225 people

9. Number of defective tyres $= 28000 \text{ of } 4\frac{1}{4}\% = 28000 \times \frac{17}{4 \times 100}$

$$= \frac{280 \times 17}{4} = 70 \times 17 = 1190$$

Hence, the number of defective tyres in company is **1190**.

Exercise 8.2

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

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

Decrease value $= 216 - 81 =$ **135**.

2. Increase 28 by 125%

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

increased value $= 28 + 35 =$ **63**

3. Let the number of x.

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

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

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

$$x = \frac{161 \times 20}{23}$$

$$x = 140$$

Hence, the number is **140**.

4. 240

5. The cost of flat after $36\% = 100\% + 36\% = 136\%$ 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

Amount for rent = 26%

Amount of that his rent = 26% of ₹ 880

$$= 880 \times \frac{26}{100} = \frac{88 \times 26}{10} = ₹\ \mathbf{228.60}$$

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. ₹ 65

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. ₹ 302400

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

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

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

$$\text{Increase in 2004 to 2006} = \left(\frac{27}{25}\right)^2 x - x = \frac{729}{625}x - x$$

$$= \frac{729x - 625x}{625} = \frac{104}{625}x$$

$$\text{In Percentage} = \frac{104x \times 100}{625 \times x} = \frac{104 \times 100}{625} = \mathbf{16.64\%}$$

13. Method-I

Mohan is taller than Ram = 108%

Ankur is shorter than Ram = 90%

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

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

$$= \left[\frac{1}{5} \times 100\right]\% = \mathbf{20\%}$$

Method-II

Let the Ram tall be x.

Then,

$$\text{Mohan is taller than Ram} = x + x \text{ of } 8\% = x + x \times \frac{8}{100}$$

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

$$\text{Ankur is shorter than Ram} = x - x \times 10\% = x - x \times \frac{10}{100}$$

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

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

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

$$= \left[\frac{10 \times 100}{59}\right]\% = \mathbf{20\%}$$

❑

9. Profit and Loss

Exercise 9.1

1. SP = ₹ 3240, gain = 8%, CP = ?

$$\text{CP} = \frac{100}{100 + 8} \times 3240 = \text{₹ } \mathbf{3000}$$

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

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

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

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

Total CP $= ₹\ (200 + 50) = ₹\ 250$

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

Profit $= SP - CP = ₹\ (260 - 250) = ₹\ 10$

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

Profit = **4%**

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

$= ₹\ \frac{100 \times 1320}{88} = ₹\ \mathbf{1500}$

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 = ?

$$SP = \frac{100+12}{100} \times 1320 = ₹\ \frac{112 \times 1320}{100} = ₹\ \mathbf{1478.40}$$

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

Gain% = 20% , CP = ₹ 12.50

$$SP = \frac{100 + \text{Gain}\%}{100} \times CP$$

$$SP = \frac{100+20}{100} \times 12.50$$

$$SP = ₹\ \frac{120 \times 1250}{100 \times 100} = ₹\ \mathbf{15}$$

6. ₹ 54.05 **7.** ₹ 3000

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

Profit = ₹ (460 − 400) = ₹ 60

$$\text{Profit } \% = \frac{\text{Profit } \% \times 100}{CP} = \frac{60 \times 100}{400}$$

Profit = 15%

9. 10%, ₹ 1.35 **10.** 25% **11.** ₹ 1 each

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

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

Now the CP = ₹ 480 and Gain = 25%

$$SP = \frac{100+25}{100} \times 480 = ₹\ \frac{125 \times 480}{100}$$

$$= ₹\ \mathbf{600}$$

13. 15%, ₹ 170

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

$$\text{Profit\%} = \frac{\text{Profit} \times 100}{\text{C.P.}} = \frac{x \times 100}{4x} = \mathbf{25\%}$$

15. $33\frac{1}{3}\%$

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

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

17. Case I : SP = 67.50, Loss = 19%, CP = ?

$$CP = \frac{100}{100-10} \times 67.50 = \frac{100 \times 6750}{90 \times 100}$$

$$CP = ₹\ 75$$

Case II : SP = 82.50 and CP = ₹ 75,

$$\text{Profit} = 82.50 - 75.00 = 7.50$$

$$\text{Profit\%} = \frac{\text{Profit} \times 100}{\text{C.P.}} = \frac{7.50 \times 100}{75}$$

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

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

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

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

Loss = CP – SP, 60 = 600 – SP, SP = ₹ 540

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

SP = 200 + 20 = 220

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

Loss = CP – SP = ₹ (800 – 760) Loss = ₹ **40**

20. ₹ 60

Exercise 9.2

1. (i) Net Selling Price = Marked Price – Discount

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

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

$$\text{NSP} = 85 - 17 = ₹\ \mathbf{68}$$

(ii) ₹ 841.50

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

$$= \frac{100 \times 1860}{100 - 7} = ₹\ \frac{1860 \times 100}{93} = ₹\ \mathbf{2000}$$

(ii) ₹ 1100

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

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

(ii) 16%

4. $\text{Discount\%} = \frac{\text{Discount} \times 100}{\text{Marked Price}} = \frac{750 - 675 \times 100}{750} = \frac{75 \times 100}{750} = \mathbf{10\%}$

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

Net SP = Marked Price – Discount

= 8750 – 700 = ₹ **8050**

6. ₹ 864

7. Net SP = 54, Discount = 10%, Makred Price = ?

$$\text{Marked Price} = \frac{100}{100 - 10} \times 54 = \frac{100 \times 54}{90} = ₹\ \mathbf{60}$$

8. ₹ 300

9. Let the CP be ₹ 100,

then Marked Price = 100 + 25 = 125,

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

Profit = 100 – 100 = **0**

No loss, No profit.

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

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

Now, C.P. $= \frac{100}{100+8} \times 4752 = ₹ \frac{100 \times 4752}{108} = ₹$ **4400**

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

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

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

Price after second discount $= ₹\ 704.00 - 28.16 = ₹$ **675.84**

12. 20%

Exercise 9.3

1. On ₹ 100, the tax paid was ₹ 5

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

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

Bill amount for A T.V. $= ₹\ 12000 + ₹\ 600 = ₹$ **12600**

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

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

Bill amount for a leather coat $= ₹\ 1800 + ₹\ 90 = ₹$ **1890**

(iii) On ₹ 50 for two bars soaps, the tax paid would be

$= ₹ \frac{5}{100} \times 50 = ₹\ 2.50$

Bill amount for two bars soaps $= ₹\ 50 + ₹\ 2.50 = ₹$ **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. Sales tax $= ₹\ 2700 - ₹\ 2500 = ₹\ 200$

The rate of sale tax $= \frac{₹\ 200}{₹\ 2500} \times 100\% =$ **8%**

3. (i) ₹ 200 (ii) ₹ 3000 **4.** ₹ 30000

❑

10. Compound Interest

Exercise 10.1

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) = ₹ **51**

4. ₹ 4167.00 **5.** ₹ 249.93 **6.** ₹ 202.50

7. ₹ 1261.00 **8.** ₹ 331.00 **9.** ₹ 6781.25

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) = **₹ 1747.20**

Exercise 10.2

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. ₹ 2249.73 **3.** ₹ 3307.50 **4.** ₹ 5010

5. ₹ 12167.00 **6.** ₹ 1331.00

7. $P = ₹\ 4000, R = 2.5\%, n = 2, A = P\left(1 + \frac{R}{100}\right)^2$

$$= 4000\left(1 + \frac{2.5}{100}\right)^n = ₹\ 4000 \times \left(\frac{41}{40}\right)^2$$

$$= ₹\ 400 \times \frac{41 \times 41}{40 \times 40} = ₹\ \mathbf{4202.50}$$

8. ₹ 4147.2

9. $P = ₹\ 16000, R = \frac{25}{2}\%, n = 3$ years,

$$A = 16000\left(1 + \frac{25}{2 \times 100}\right)^3 = ₹\ 16000\left(\frac{9}{8}\right)^3$$

$$= ₹\ 16000 \times \frac{9 \times 9 \times 9}{8 \times 8 \times 8} = ₹\ \mathbf{22781.25}$$

10. ₹ 9261

Exercise 10.3

1. $P = 2000$, C.I. $= 163.20, R = 4\%, n = ?$

$A = P$ + C.I. $= 2000 + 163.20 = 2163.20$

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$2163.20 = 2000\left(1+\frac{4}{100}\right)^n \Rightarrow \frac{2163.20}{2000} = \left(\frac{26}{25}\right)^n$$

$$\frac{676}{625} = \left(\frac{26}{25}\right)^n \Rightarrow \left(\frac{26}{25}\right)^2 = \left(\frac{26}{25}\right)^n$$

$\Rightarrow$ $n = \mathbf{2\ years}$

2. $P = ₹\ x, R = 10\%, n = 3$ years, C.I. $= ₹\ 331$,
Amount $= P +$ C.I. $= ₹\ (x + 331)$

$$A = P\left(1+\frac{R}{100}\right)^n$$

$$x + 331 = x\left(1+\frac{10}{100}\right)^3$$

$$x + 331 = x \times \frac{11\times 11\times 11}{10\times 10\times 10}$$

$1000x + 331000 = 1331x, 331000 = (1331-1000)x,$
$331000 = 331x,\ x = ₹\ 1000$
Principal = **₹ 1000**

3. ₹ 4000.00 **4.** 10% **5.** ₹ 1000; 10%
6. ₹ 1261.00

Exercise 10.4

1. Value of boat after 2 years $= ₹\ 16{,}000\left(1-\frac{5}{100}\right)^2$

$$= ₹\ 16{,}000\left(\frac{19}{20}\right)^2 = 16{,}000\times\frac{19}{20}\times\frac{19}{20}$$

$= ₹\ \mathbf{14{,}440}$

2. The present value of flat $= ₹\ 100000$

$$\text{Cost after 3 years} = P\left(1-\frac{R}{100}\right)^n = 100000\left(1-\frac{10}{100}\right)^3$$

$$= 100000\times\left(\frac{9}{10}\right)^3 = 100000\left(\frac{9\times 9\times 9}{10\times 10\times 10}\right)$$

$= ₹\ \mathbf{72900}$

3. The present population of stray dogs $= 1250$

$$\text{Population after 3 month} = P\left(1-\frac{R}{100}\right)^n = 1250\left(1-\frac{20}{100}\right)^3$$

$$= 1250\times\frac{4\times 4\times 4}{5\times 5\times 5} = \mathbf{640\ dogs}$$

4. 2648

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. $\text{Total Amount} = 40000\times\left(1+\frac{5}{100}\right)\left(1+\frac{10}{100}\right)\left(1+\frac{15}{100}\right)$

$$= 40000\times\frac{21}{10}\times\frac{11}{10}\times\frac{23}{20} = ₹\ 53130$$

Total Profit = Amount – Principal = 53130 – 40000 = ₹ **13130**

7. 3591 **8.** ₹ 7938.00 **9.** 80.725%

10. 0.842%

11. Population of Pakistan in 1980 $= 7.95\times 10^7$

Population after 3 years $= 8.65\times 10^7$

$$8.65\times 10^7 = 7.95\times 10^7\left\{1+\frac{R}{100}\right\}^3, \quad \frac{8.65\times 10^7}{7.95\times 10^7} = \left\{1+\frac{R}{100}\right\}^3$$

$$\left(\frac{8.65}{7.95}\right)^{1/3} = \left(1+\frac{R}{100}\right)$$

$$1.02853 = 1+\frac{R}{100}, \qquad 0.02853 = \frac{R}{100} \Rightarrow R = \mathbf{2.853\%}$$

❑

11. Direct and Inverse Variations

Exercise 11.1

1. (i)

x	–	–	–	–	11	–
y	2.5	–	7.5	10	–	12

(ii)

x	–	–	–	21	–
y	–	27	39	–	75

(iii)

x	–	–	–	8	–
y	0.4	2	–	–	128

2.

Time	—	—	7	—	155
Height of the balloon (in metres)	36	—	—	300	—

3. Let the commission will be x

It is a case of direct variation

Ratio of number of money = Ratio of number of commission

$$1000 : 100 :: 73 : x$$

$$x = \frac{100 \times 73}{1000} = \text{₹ } \mathbf{7.30}$$

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

$$5 : 40 :: 8 : x$$

$$5 \times x = 40 \times 8$$

$$x = \frac{40 \times 8}{5}$$

$$x = \mathbf{64 \text{ bottles}}$$

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

$$18 : 36 :: 15 : x$$

$$\frac{18}{36} = \frac{15}{x}$$

$$x \times 18 = 15 \times 36$$

$$x = \frac{15 \times 36}{18}$$

$$x = \mathbf{30 \text{ stamps}}$$

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

$$5 : 20 :: 120 : x$$

$$5 \times x = 20 \times 120$$

$$x = \frac{20 \times 120}{5}$$

$$x = \mathbf{480 \text{ tools}}$$

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

$$500 : 275 :: 3.5 : x$$

$$500 \times x = 3.5 \times 275$$

$$x = \frac{35 \times 275}{500 \times 10} = \frac{35 \times 55}{1000}$$

$$x = \mathbf{1.925\ cm}$$

So, thickness of 275 sheets is 1.925 cm.

8. 108 words **9.** 252 metres **10.** ₹ 1575

Exercise 11.2

1. (i) Inverse variation (ii) Inverse variation (iii) Direct variation

2. (i), (ii), (iii) are possible (iv) Not possible

3. (i) Possible (ii) Possible (iii) Not possible (iv) Possible

4. Let the number of hours be x

Ratio of number of pumps = Inverse ratio of number of hours

$$20 : 45 :: x : 12$$

$$20 \times 12 = x \times 45$$

$$x = \frac{20 \times 12}{45} \Rightarrow x = \frac{16}{3}$$

$$x = \mathbf{5\frac{1}{3}\ hours}$$

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

$$12 : x :: 15 : 20$$

$$12 \times 20 = x \times 15$$

$$x = \frac{12 \times 20}{15}$$

$$x = 16\ \text{km/h}$$

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

$$40 : 24 :: x : 1800$$

$$40 \times 1800 = x \times 24$$

$$x = \frac{40 \times 1800}{24}$$

$$x = \textbf{3000 persons}$$

Needed persons are 3000 for the construction of the building in 24 days.

7. 10 weeks **8.** 29 bats **9.** 162 persons

10. Let the number of days be x

$$\text{Ratio of cows} = \text{Inverse ratio of the days}$$

$$50 : 60 :: x : 15$$

$$50 \times 15 = x \times 60$$

$$x = \frac{50 \times 15}{60} = \frac{25}{2} = 12\frac{1}{2} \text{ days}$$

The required days will be $\mathbf{12\frac{1}{2}}$.

❑

Unit-IV : Geometry

12. Understanding Quadrilaterals

Exercise 12.1

1. (i) equal (ii) intersect, 90° (iii) equal (iv) 90° (v) equal

2. (i) False (ii) False (iii) False (iv) False (v) False

3. 100°, 80°, 100°

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 = **115°**

5. Let the angles be $2x$, $3x$, $5x$ and $8x$, $2x + 3x + 5x + 8x = 360°$,

$18x = 360°$

$x = \frac{360°}{18} = 20°$, $2 \times 20° = \mathbf{40°}$, $3 \times 20° = \mathbf{60°}$, $5 \times 20° = \mathbf{100°}$,

$8 \times 20° = \mathbf{160°}$

6. Perimeter of Parallelogram = Sum of four sides

$$= 7 + 7 + 10 + 10 = \textbf{34 cm}$$

7. Let two adjacent angles be x and y

$$x - y = 30°, \qquad x + y = 180°$$

$$x + y = 180°$$

on adding $x - y = 30°$

$$2x = 210°$$
$$x = 105°$$
$$105° + y = 180°$$
$$y = 75°$$

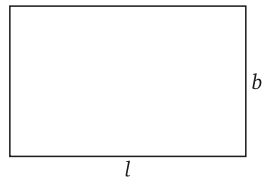
Angles 105°, 75°, 105°, 75°.

8. 50°, 130°, 50°, 130°

9. 10 cm each

10. 13 cm each

11. Let the length and breadth of rectangle are $3x$ and $2x$ respectively, then



Perimeter of rectangle $= 2 \times (l + b)$

$$20 = 2 \times (3x + 2x)$$
$$20 = 2 \times 5x$$
$$20 = 10x \Rightarrow x = 2$$

Length $= 3 \times 2 =$ **6 cm**

Breadth $= 2 \times 2 =$ **4 cm**

❑

Unit-V : Mensuration

13. Areas of Rectilinear Figures

Exercise 13.1

1. Area of rectangle = length × breadth

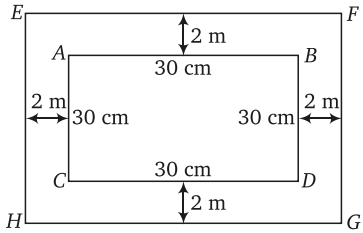
$$98 = 14 \times b$$
$$b = \frac{98}{14} = \mathbf{7\ cm}$$

Perimeter of rectangle $= 2 \times$ (length + breadth)

$$= 2 \times (14 + 7) = 2 \times (21) = \mathbf{42\ cm}$$

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

$$= l \times b$$
$$= 64 \times 34$$
$$= 2176\,\text{m}^2$$

$$\text{Area of path} = \text{Area of } EFGH - \text{Area of } ABCD$$
$$= 2176 - 1800 = \mathbf{376\ m^2}$$

3. $\text{Area of square} = (\text{side})^2$
$$729 = (\text{side})^2$$
$$(\text{side})^2 = (27)^2$$
$$\text{Side} = \mathbf{27\ m}$$

4. $\text{Area of a wall} = \text{length} \times \text{breadth}$
$$= 5.76\ \text{m} \times 3.1\ \text{m}$$
$$= 576\ \text{cm} \times 310\ \text{cm}$$
$$= 178560\ \text{cm}$$
$\text{Area of rectangular tiles} = \text{length} \times \text{breadth} = 24 \times 10 = 240\ \text{cm}$
$$\text{No. of tiles} = \frac{\text{Area of wall}}{\text{Area of tiles}} = \frac{178560}{240} = 744$$
$$\text{Total cost of tiles} = 744 \times 1.50 = \mathbf{₹\ 1116}$$

5. $$\text{Altitude of the rhombus} = \frac{\text{Area of rhombus}}{\text{Base}}$$
$$= \frac{10.2\ \text{cm}^2}{6} = \mathbf{1.7\ cm}$$

6. $\text{Perimeter of rhombus} = \text{Sum of four sides}, 28 = 4 \times a \Rightarrow a = 7\ \text{cm}$
$$\text{Area of rhombus} = \text{Base} \times \text{Altitude},$$
$$28 = 7 \times h$$
$$4 = h \Rightarrow h = \mathbf{4\ cm}$$

7. Area of trapezium $ABCD$ = Area of rectangle $AECD$ + Area of triangle CEB,
$AB = 8\ \text{m}, DC = 5\ \text{m}$
$$BE = AB - DC = (8 - 5) = 3\ \text{m}, \qquad CE^2 = CB^2 - EB^2$$
$$= 5^2 - 3^2 \Rightarrow CE = \sqrt{25 - 9}, CE = 4\ \text{m}$$
$$\text{Area of recntagle} = 5 \times 4 = 20\ \text{m}^2,$$
$$\text{Area of triangle} = \frac{1}{2} \times 3 \times 4 = 6\ \text{m}^2$$
$$\text{Total area} = (20 + 16)\ \text{m}^2 = \mathbf{26\ m^2}$$

8. Let the one side $= x$
Then another side $= (x + 8)$
$$\text{Area of trapezium} = \frac{1}{2} \times (\text{Sum of parallel sides}) \times \text{Distance between them}$$
$$91 = \frac{1}{2} \times (x + x + 8) \times 7,$$

$$91\times 2=(2x+8)\times 7,$$
$$\frac{91\times 2}{7}=2\,(x+4)\Rightarrow =x+4\Rightarrow x=\mathbf{9}$$

Then another side $=(x+8)=9+8=\mathbf{17}$

Sides are **9 cm** and **17 cm**.

9. $26\,\text{m}^2$

10. Area of triangle $=\sqrt{s(s-a)(s-b)(s-c)}$

$$s=\frac{10+10+12}{2}=16$$
$$=\sqrt{16(16-10)(16-10)(16-12)}$$
$$=\sqrt{16\times 6\times 6\times 4}=2\times 4\times 6=8$$
$$48=\frac{1}{2}\times 12\times h\Rightarrow 8=h;$$

Altitude = **8 cm**

Area of trapezium $=\frac{1}{2}\times$ (Sum of Parallel Sides)

$\times$ Distance between Parallel sides

$$=\frac{1}{2}(10+22)\times 8=\frac{1}{2}\times 32\times 8=\mathbf{128\ cm^2}$$

11. $227.2\,\text{m}^2$ **12.** $192\,\text{cm}^2$

Exercise 13.2

1. Area of equilateral triangle $=\frac{\sqrt{3}}{4}(\text{side})^2=\frac{\sqrt{3}}{4}\times(12)^2$

$$=\frac{\sqrt{3}}{4}\times 12\times 12=36\sqrt{3}\ \text{cm}^2$$
$$=\mathbf{62.35\ cm^2}\ \text{(approx)}$$

2. $a=12, b=10, c=10$

$$s=\frac{12+10+10}{2}=\frac{32}{2}=16$$
$$\text{Area of triangle}=\sqrt{s(s-a)\,(s-b)\,(s-c)}$$
$$=\sqrt{16\,(16-12)\,(16-10)\,(16-10)}$$
$$=\sqrt{16\times 4\times 6\times 6}=4\times 2\times 6$$
$$=\mathbf{48\ cm^2}$$

3. Area of triangle $=\sqrt{s\,(s-a)\,(s-b)\,(s-c)}$

$$s=\frac{a+b+c}{2}$$

$\Rightarrow \quad s = \dfrac{10+24+26}{2} = \dfrac{60}{2} = 30$

$= \sqrt{30\,(30-10)\,(30-24)\,(30-26)}$

$= \sqrt{30\times 20\times 6\times 4}$

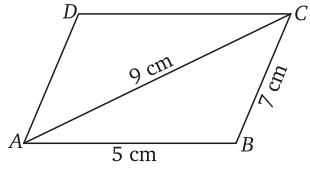
$= \sqrt{2\times 3\times 5\times 2\times 2\times 5\times 2\times 3\times 2\times 2}$

$= 2\times 2\times 2\times 3\times 5 = \mathbf{120\ cm^2}$

4. $204\,m^2$ **5.** $43.82\,cm^2$ (approx.)

6. $5656\,dm^2$

7. $AB = 5\,cm, BC = 7\,cm, AC = 9\,cm$



Area of parallelogram

$ABCD$ = Area of ΔACD + Area of ΔABC

Area of ΔABC, $AB = 5\,cm$,

$BC = 7\,cm$, $CA = 9\,cm$,

$s = \dfrac{5+7+9}{2} = \dfrac{21}{2}\,cm$

$= \sqrt{\dfrac{21}{2}\times\left(\dfrac{21}{2}-5\right)\left(\dfrac{21}{5}-7\right)\left(\dfrac{21}{2}-9\right)}$

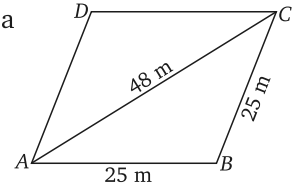
$= \sqrt{\dfrac{21}{2}\times\dfrac{11}{2}\times\dfrac{7}{2}\times\dfrac{3}{2}} = \dfrac{21\sqrt{11}}{4} = \dfrac{21}{4}\times 3.317$

$= \dfrac{69.657}{4} = 17.414$

Area of $\Delta ABC + \Delta ADC = 17.414\times 2 = \mathbf{34.82\ cm^2}$

8. $120\,m^2$

9. Area of rhombus = Area of ΔABC + Area of ΔACD



Area of ΔABC, $AB = 25\,m$,

$BC = 25\,m$, $AC = 48\,m$

$s = \dfrac{25+25+48}{2} = \dfrac{98}{2} = 49$

$= \sqrt{s\,(s-a)\,(s-b)\,(s-c)}$

$= \sqrt{49\,(49-25)\,(49-25)\,(49-48)}$

$= \sqrt{49\times 24\times 24\times 1} = 7\times 24 = 168$

Area of rhombus $= 2\times 168 = \mathbf{336\ m^2}$

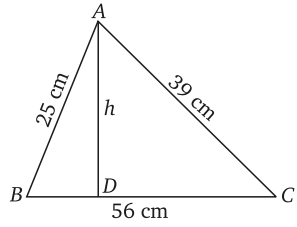
10. Altitude = AD

$s = \dfrac{25+56+39}{2} = \dfrac{120}{2} = 60$

$= \sqrt{60\,(60-25)\,(60-56)\,(60-39)}$

$$= \sqrt{60 \times 35 \times 4 \times 21}$$
$$= \sqrt{2 \times 2 \times 3 \times 5 \times 5 \times 7 \times 2 \times 2 \times 7 \times 3}$$
$$= 2 \times 5 \times 2 \times 7 \times 3 = 10 \times 42 = 420$$

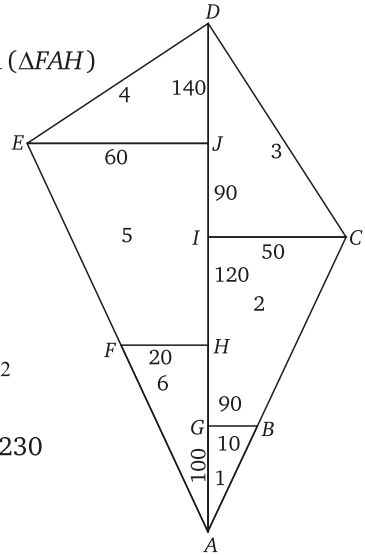
Area of triangle $= \frac{1}{2} \times \text{Base} \times \text{Altitude}$



$$420 = \frac{1}{2} \times 56 \times h$$
$$\frac{420 \times 2}{56} = h$$
$$\Rightarrow \quad h = \mathbf{15\ cm}$$

Exercise 13.3

1. Area of field = Area (ΔAGB) + Area (trap $GBHI$) + Area (ΔCID) + Area (ΔDEJ) + Area (trap $JEFH$) + Area (ΔFAH)



(i) Area $= \frac{1}{2} \times AG \times GB$

$$= \frac{1}{2} \times 110 \times 10 = 550\ \text{cm}^2$$

(ii) Area $= \frac{1}{2} \times (IC + GB) \times IG$

$$= \frac{1}{2} \times (50 + 10) \times 210$$
$$= \frac{1}{2} \times 60 \times 210 = 6300\ \text{cm}^2$$

(iii) Area $= \frac{1}{2} \times IC \times ID = \frac{1}{2} \times 50 \times 230$

$$= 25 \times 230 = 5750\ \text{m}^2$$

(iv) Area $= \frac{1}{2} \times JE \times DJ = \frac{1}{2} \times 60 \times 140 = 4200\ \text{m}^2$

(v) Area $= \frac{1}{2} \times (EJ \times FH) \times JH$

$$= \frac{1}{2} \times (60 + 20) \times 210 = \frac{1}{2} \times 80 \times 210 = 8400\ \text{m}^2$$

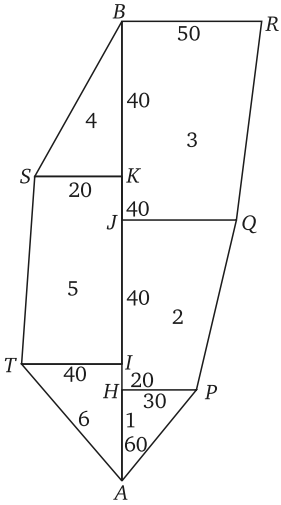
(vi) Area $= \frac{1}{2} \times FH \times AH = \frac{1}{2} \times 20 \times 200 = 2000\ \text{m}^2$

Total area $(550 + 6300 + 5750 + 4200 + 8400 + 2000)\ \text{m}^2$

$$= \mathbf{27200\ m^2}$$

2. 58550 m^2 **3.** 7525 m^2 **4.** 3409 m^2

5. Area of field = Area (ΔAPH) + Area (tra $HPQJ$) + Area (tra $JQRB$) + Area (ΔBSK) + Area (tra SKIT) + Area (ΔTIA)



(i) Area $= \frac{1}{2} \times AH \times HP$

$= \frac{1}{2} \times 60 \times 30 = 900 \text{ m}^2$

(ii) Area $= \frac{1}{2} \times (HP + JQ) \times HJ$

$= \frac{1}{2} \times (30 + 40) \times 60$

$= \frac{1}{2} \times 70 \times 60 = 2100 \text{ m}^2$

(iii) Area $= \frac{1}{2} \times (BR + JQ) \times BJ$

$= \frac{1}{2} \times (50 + 40) \times 80$

$= \frac{1}{2} \times 90 \times 80 = 3600 \text{ m}^2$

(iv) Area $= \frac{1}{2} \times BK \times SK = \frac{1}{2} \times 40 \times 20 = 400 \text{ m}^2$

(v) Area $= \frac{1}{2} \times (SK + TI) \times IK$

$= \frac{1}{2} \times (20 + 40) \times 80 = \frac{1}{2} \times 60 \times 80 = 2400 \text{ m}^2$

(vi) Area $= \frac{1}{2} \times TI \times AI = \frac{1}{2} \times 40 \times 80 = 1600 \text{ m}^2$

Total Area $= (900 + 2100 + 3600 + 400 + 2400 + 1600) \text{ m}^2$

$= \mathbf{11000 \text{ m}^2}$

❑

14. Circumference and Area of a Circle

Exercise 14.1

1. (i) Circumference $= 2\pi r$

$7.7 = 2 \times \frac{22}{7} \times r \Rightarrow \frac{77}{10} = 2 \times \frac{22}{7} \times r, r = \frac{77 \times 7}{2 \times 10 \times 22}, r = 1.225 \text{ m}$

$d = 2r = 2 \times 1.225 = \mathbf{2.45 \text{ m}}$

(ii) $d = 5.6$ m, $c = 17.6$ m

(iii) $r = 2.1$ m, $c = 13.2$ m

2. (i) Circumference of circle $= 2\pi r$

$$= 2 \times \frac{22}{7} \times 7 = \textbf{44 cm} \qquad \left[\because r = \frac{14}{7} = 4 \text{ cm}\right]$$

(ii) $\frac{220}{7}$m (iii) $\frac{88}{7}$ km

3. (i) Circumference of circle $= 2\pi r = 2 \times \frac{22}{7} \times 3.5 = \textbf{22 cm}$

(ii) 13.2 m (iii) 35.2 km

4. (i) Circumference of circle $= 2\pi r$

$$6.28 = 2 \times 3.141 \times r, \frac{6.28}{2 \times 3.14} = r \Rightarrow r = 1 \text{ cm}$$

Diameter $= 2r = 2 \times 1 = \textbf{2 cm}$

(ii) 14 m (iii) 1.75 km

5. (i) Circumference of circle $= 2\pi r$

$$26.4 = 2 \times \frac{22}{7} \times r,$$

$$26.4 \times 7 = 2 \times 22 \times r$$

$$r = \frac{26.4 \times 7}{2 \times 22} = \textbf{4.2 cm}$$

(ii) 5.57 m (iii) 1.05 km

6. 3 : 2

7. Perimeter of equilateral triangle = Circumference of circle

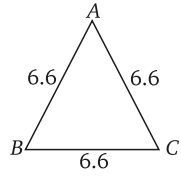
$$3 \times 6.6 = 2 \times \frac{22}{2} \times r$$

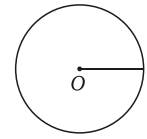
$$\frac{3 \times 66 \times 7}{10 \times 2 \times 22} = r$$

$$\Rightarrow \qquad r = 3.15 \text{ cm}$$

Diameter $= 2r = 2 \times 3.15$

$= \textbf{6.3 cm}$





8. Radius of wheel = 35 cm,

One complete round $= 2\pi r$

$$24 \text{ complete round} = 24 \times 2\pi r = 24 \times 2 \times \frac{22}{7} \times 35$$

$$= 10 \times 22 \times 24 = \textbf{5280 cm}$$

9. 44 m

10. Circumference of pound $= 2\pi r$

$$66 \times 400 = 2 \times \frac{22}{7} \times x, \frac{66 \times 400 \times 7}{2 \times 22} = r$$

$\Rightarrow$ $r = 4200$ cm

Diameter $= 2r = 2 \times 4200 =$ **8400 cm**

Exercise 14.2

1. (i) Circumference of circle $= 2\pi r$, $31.4 = 2 \times 3.14 \times r$,

$$\frac{31.4}{2 \times 3.14} = r \Rightarrow r = 5 \text{ m}$$

Area of circle $= \pi r^2 = 3.14 \times 5 \times 5 =$ **78.50 m^2**

(ii) $r = 4$ m, $c = 25.12$ m, (iii) $c = 15.7$ m, $A = 19.625\,\text{m}^2$

2. (i) Area of circle $= \pi r^2 = \frac{22}{7} \times 3.5 \times 3.5 =$ **38.5 cm^2**

(ii) $55.44\,\text{m}^2$, (iii) $154\,\text{km}^2$

3. (i) Diameter $= 2 \times$ Radius

$4.2 = 2 \times$ Radius $\Rightarrow r = 2.1$ cm,

Area of circle $= \pi r^2 = \frac{22}{7} \times 2.1 \times 2.1$

$$= \frac{22}{7} \times \frac{21 \times 21}{100} =$$ **13.86 cm^2**

(ii) $98.56\,\text{m}^2$ (iii) $9.625\,\text{km}^2$

4. Area of circle $= \pi r^2 = \frac{22}{7} \times \frac{5}{2} \times \frac{5}{2} =$ **19.625 cm^2**

5. Area of circle $= \pi r^2$, $154 = \frac{22}{7} \times r^2$, $r^2 = \frac{154 \times 7}{22} \Rightarrow r = 7$

Circumference $= 2\pi r = 2 \times \frac{22}{7} \times 7 =$ **44 m**

6. (i) Area of circle $= \pi r^2$, $\pi = \pi r^2$, $r^2 = 1 \Rightarrow r =$ **1 cm**

(ii) 4.2 m (iii) 0.7 km

7. Perimeter of square $= 4 \times a$, $44 = 4 \times a \Rightarrow a = 11$ cm,

Circumference of circle $= 2\pi r$

$$44 = 2 \times \frac{22}{7} \times r, r = 7 \text{ cm}$$

Area of square $= \text{side}^2 = 11^2 = 121\,\text{cm}^2$, Area of circle

$$= \pi r^2 = \frac{22}{7} \times 7 \times 7 = 154\,\text{cm}^2$$

Circle, $154 - 121 =$ **33 cm^2**

8. Area of a face washer $= \pi R_1^2 - \pi R_2^2 = \pi\{4^2 - 2^2\} = \pi \times 12$

$$= \frac{22}{7} \times 12 = \mathbf{37.71\ cm^2}$$

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 $= 864 - 452.16 = \mathbf{411.84\ cm^2}$

10. 10 : 1 **11.** 26 cm

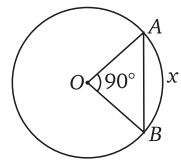
Exercise 14.3

1. (i) Area of segment AxB

$$= \text{Area of sector } OAxB - \text{Area of } \Delta OAB$$

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 $AxB = 154 - 98 = \mathbf{56\ cm^2}$

(ii) $\left(\frac{308}{3} - 49\sqrt{3}\right)\text{cm}^2$, (iii) $\left(\frac{616}{3} - 49\sqrt{3}\right)\text{cm}^2$

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 $= 4\pi - \frac{\pi}{2} = \frac{7\pi}{2} = \frac{7 \times 22}{7 \times 2} = \mathbf{11\ cm^2}$

3. (i) Length of Arc $= \frac{2\pi rx}{360} = \frac{2 \times 22 \times 2.8}{7} \times \frac{90}{360}$

$$= \frac{2 \times 22 \times 28 \times 1}{4 \times 7 \times 10} = \mathbf{4.4\ cm}$$

(ii) 6.6 cm, (iii) $11\frac{11}{15}$ cm

4. (i) Area of sector $= \frac{\pi r^2 \times x}{360} = \frac{22}{7} \times 3.5 \times 3.5 \times \frac{60}{360}$

$$= \frac{22 \times 35 \times 35}{7 \times 100 \times 6}\ \text{cm}^2 = \mathbf{6\frac{5}{12}\ cm^2}$$

(ii) $4\frac{13}{16}\text{cm}^2$, (iii) $12\frac{5}{6}\text{cm}^2$

5. 36°

6. Length of Arc $= \frac{2\pi rx}{360}$, $22 = \frac{2\pi r \times 18}{360} \Rightarrow 2\pi r =$ **440 m**

Circumference of circle = 440 m

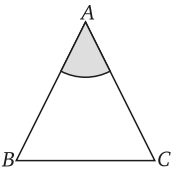
7. Area of sector $= \frac{\pi r^2 \times 36}{360}$, $3.85 = \frac{\pi \times r^2 \times 1}{10}$,

$$r^2 = \frac{3.85 \times 10}{\pi} \Rightarrow r = \frac{7}{2}$$

Length of Arc $= \frac{2\pi r \times x}{360} = 2 \times \frac{22}{7} \times 7 \times \frac{18}{360} =$ **2.2 cm**

8. Arc of the circle of radius 10 cm

9. In a equilateral triangle every angle be 60°



Area of sector $= \pi r^2 \times \frac{x}{360}$

$$= 3.14 \times 10 \times 10 \times \frac{60}{360}$$

$$= \frac{314}{6} =$$ **52.38 m²**

10. 2346 m²

❑

15. Volumes and Surface Areas of Solids

Exercise 15.1

1. (i) 2160 mm³, 1284 mm² (ii) 8 cm, 158 cm² (iii) 2.5 cm, 89.5 cm² (iv) 8 m, 432 m² (v) $3\frac{1}{4}$ cm, $102\frac{5}{8}$ cm² (vi) 5 cm, 540 cm³

2. (i) In given figure

$l = 6$ cm $\quad b = 8$ cm $\quad h = 10$ 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 cm²**

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 cm²**

(ii) $420\ cm^3, 358\ cm^2$ (iii) $115200\ mm^3, 27360\ mm^2$

(iv) $7\frac{1}{2}\ cm^3, 41\frac{1}{2}\ cm^2$ (v) $\frac{21}{64}\ cm^3, 3\frac{43}{160}\ cm^2$

(vi) $4.095\ cm^3, 19.26\ cm^2$

3. (i) Capacity $= l \times b \times h$

$= 5.5\ m \times 3.5\ m \times 3.6\ m =$ **69.3 m^3**

(ii) 33345 L (iii) 6.84 L (iv) 35.568 L

4. The volume of rectangular tank whose sides are

Length $(l) = 65\ cm$

Width $(b) = 40\ cm$

Height $(h) = 54\ cm$

Then,

Volume of rectangular tank $= l \times b \times h$

$= 65\ cm \times 40\ cm \times 54\ cm$

$= 140400\ cm^3$

The number of glasses of sugarcane $= 140400 \div 200 =$ **702**

5. Capacity of water in water tank $= 4.8$ litres

$= 4.8 \times 1000\ cm^3$

$= 4800\ cm^3$

Volume of water tank $= l \times b \times h$

$4800 = 20\ cm \times 15\ cm \times h$

$\frac{4800}{20 \times 15} = h \Rightarrow h = \frac{4800}{20 \times 15}$

$h =$ **16 cm**

Total surface area of the cuboid $= 2[lb + bh + hl]$

$= 2[20\ cm \times 15\ cm + 15\ cm \times 16\ cm + 16\ cm \times 20\ cm]$

$= 2[300\ cm^2 + 230\ cm^2 + 320\ cm^2]$

$= 2[860\ cm^2] =$ **1720 cm^3**

6. Given,

The volume of solid cube $= 64\ cm^3$

$(side)^3 = (4\ cm)^3$

$side = 4\ cm$

Then,

Total surface area of the solid $= 6 \times (side)^2$

$= 6 \times (4\ cm)^2 =$ **96 cm^2**

7. (i) 4 times (ii) 8 times **8.** 2.9 m

Exercise 15.2

1. (i) $2310\ \text{cm}^3$

(ii) Volume of cylinder $= \pi r^2 h = \frac{22}{7} \times 2.8 \times 2.8 \times 15$

$$= \frac{22}{7} \times \frac{28 \times 28 \times 15}{100} = \mathbf{369.6\ m^3}$$

2. (i) Volume of cylinder $= \pi^2 h = \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \times 20 = \mathbf{6930\ cm^3}$

(ii) $462\ \text{cm}^3$

3. Volume of cylinder $= \pi r^2 h = 154 \times 15 = \mathbf{2310\ cm^3}$

4. Circumference of the base of the cylinder, $132 = 2\pi r$,

$\Rightarrow \quad r = \frac{1320 \times 7}{2 \times 22}$

$\Rightarrow \quad r = 21\ \text{cm}$

Volume of cylinder $= \pi r^2 h = \frac{22}{7} \times 21 \times 21 \times 25 = \mathbf{34650\ cm^3}$

5. First pack Volume = Area of base × 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 $= 385 - 300 = \mathbf{85\ cm^3}$

6. 2.5 m

7. Volume of roof $= \frac{18 \times 16.5 \times 10}{100} = 29.7\ \text{cm}^3$

Volume of roof = Volume of cylindrical tank

$$29.7 = \pi \times 4 \times 4 \times h$$

$$29.7 = 3.14 \times 4 \times 4 \times h$$

$$h = \frac{29.7}{3.14 \times 4 \times 4} \Rightarrow h = 0.596\ \text{m}$$

$$= \mathbf{59.6\ cm}$$

8. $5720\ \text{cm}^3$ **9.** 31.869 kg

10. Volume of cylinder = Volume of wire

$$\pi r_1^2 h_1 = \pi r_2^2 h_2$$

$$\pi \times \frac{1}{2} \times \frac{1}{2} \times 5 = \pi \times \frac{1}{20} \times \frac{1}{20} \times h$$

$$\frac{5}{4} = \frac{h}{20 \times 20}$$

$$4h = 20 \times 20 \times 5$$

$$h = \frac{20 \times 20 \times 5}{4}$$

$$\Rightarrow \quad h = 500 \text{ cm} = \mathbf{5\ m}$$

Exercise 15.3

1. Total surface area of cylinder $= 2\pi r\,(r + h)$

$$= 2 \times \frac{22}{7} \times 5 \times (5 + 15)$$

$$= 2 \times \frac{22}{7} \times 5 \times 20 = \mathbf{628.57\ m^2}$$

2. $2\pi r = 176$ cm, $h = 100$ cm, circumference $= 2 \times \frac{22}{7} \times 5 = 176$

$$r = \frac{176 \times 7}{2 \times 22} \quad \Rightarrow \quad r = 28 \text{ cm}$$

Lateral surface area of cylinder $= 2\pi rh = 176 \times 100$

$$= 17600 \text{ cm}^2 = \mathbf{1.76\ m^2}$$

3. 150.86 cm^2 (approx.)

4. 3168 m^2

5. $r = \frac{3.5}{2}$ 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. ₹ 330 **8.** ₹ 5.97 **9.** ₹ 6.88 (approx.)

Exercise 15.4

1. Volume of cone $= \frac{\pi r^2 h}{3} = \frac{22}{7} \times \frac{6 \times 6 \times 8}{3}$

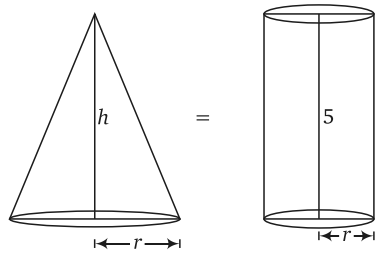
$= \mathbf{301.71\ cm^3}$ (approx.)

2. Volume of cone $= \dfrac{\pi r^2 h}{3} = \dfrac{314 \times 15}{3} = 314 \times 5 =$ **1570 cm^3**

3. $\dfrac{\pi r_1^2 h_1}{3} = \pi r_2^2 h_2$

$\dfrac{\pi \times r^2 \times h}{3} = \pi r^2 \times 5$

$\dfrac{h}{3} = 5 \Rightarrow h =$ **15 cm**



4. Volume of cone $= \dfrac{\pi r^2 h}{3}$

$48\pi = \pi \times \dfrac{4 \times 4 \times h}{3}$, $\quad h = \dfrac{48 \times 3}{4 \times 4} \Rightarrow \quad h =$ **9 cm**

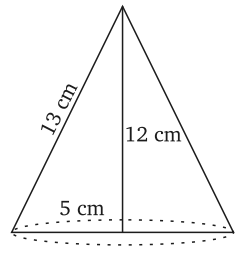
5. 154 m^3

6. $\dfrac{\pi r^2 h}{3} = \dfrac{22 \times 2 \times 2 \times 5}{7 \times 3}$ cm^3 = **20.95 cm^3**

7. Volume $= \dfrac{\pi r^2 h}{3}$

$= \dfrac{22 \times 5 \times 5 \times 12}{7 \times 3}$

= **314 (approx)**



8. 9.625 kl.

Exercise 15.5

1. 198 cm^2

2. $r = 5,\ l = 10$ cm

Lateral surface area $= \pi rl$

$= \dfrac{22 \times 5 \times 10}{7} =$ **157.14 cm^2**

3. 4714.29 cm^2 (approx.)

4. (i) Lateral surface area $= \pi rl = \dfrac{22}{7} \times 5 \times 15 =$ **235.71 cm^3**

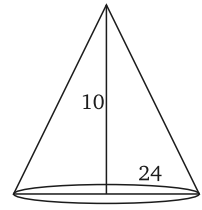
(ii) Area of base $= \pi r^2 = \dfrac{22}{7} \times 5 \times 5 =$ **78.57 cm^2**

(iii) Total surface area $D = \pi r\ (r + l) = \dfrac{22}{7} \times 5 \times (5 + 15)$

$= \dfrac{22}{7} \times 20 \times 5 =$ **314.28 cm^2**

5. 282.86 m^2 (approx.) **6.** 251.43 m

7. $r = 24$ m, $h = 10$ m, $l = ?$



$$l^2 = r^2 + h^2$$
$$l^2 = 24^2 + 10^2$$
$$l^2 = 576 + 100$$
$$\Rightarrow \quad l^2 = 676$$
$$\Rightarrow \quad l = \mathbf{26\ m}$$

Area of lateral surface $= \pi rl = \frac{22}{7} \times 24 \times 26$

Total cost of canvas $= ₹\ \frac{22}{7} \times 24 \times 26 \times 15 = ₹\ \mathbf{29417.14}$

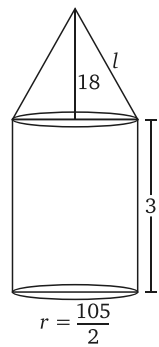
8. Volume of cone $= \frac{\pi r^2 h}{3}$

$$1232 = \frac{22}{7} \times \frac{14 \times 14}{3} \times h$$
$$\Rightarrow \quad \frac{1232 \times 7 \times 3}{22 \times 14 \times 14} = h$$
$$h = \frac{25872}{4312} \quad \Rightarrow \quad h = 6\,\text{cm}$$
$$l^2 = h^2 + r^2 \quad \Rightarrow \quad l^2 = 6^2 + 14^2$$
$$l^2 = 36 + 196, \qquad l = \sqrt{232}$$

Curved Surface $= \pi rl = \frac{22}{7} \times 14 \times \sqrt{232} = \frac{22 \times 14 \times 2\sqrt{58}}{7}$

$= \mathbf{88\sqrt{58}\ cm^2}$

9. $l^2 = h^2 + r^2$



$$l^2 = (18)^2 + \left(\frac{105}{2}\right)^2$$
$$l^2 = 3080.25 \quad \Rightarrow \quad l = \mathbf{55.5\ m}$$

Total canvas used $= 2\pi rh + \pi rl$

$$l = \frac{22}{7} \times \frac{105}{2} \{2 \times 3 + 55.5\}$$
$$= \frac{22}{7} \times \frac{105}{2} \times 61.5 = \mathbf{10147.5\ m^2}$$

10. ₹ 27.50

Exercise 15.6

1. (i) Radius $= \frac{\text{Diameter}}{2} = \frac{14}{2} = 7$ cm

Volume of Sphere $= \frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 7 \times 7 \times 7$

$= \frac{30184}{21} =$ **1437.33 cm^3**

(ii) 4.851 m^3 (iii) 22.46 dm^3 (approx.)

2. (i) Volume of sphere $= \frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 2 \times 2 \times 2 =$ **33.52 cm^3**

(ii) 179.67 cm^3 (approx.) (iii) 1437.33 dm^3 (approx.)

3. Volume of hemisphere $= \frac{2}{3}\pi R^3 = \frac{2}{3} \times \frac{22}{7} \times \frac{11.2}{2} \times \frac{11.2}{2} \times \frac{11.2}{2}$

$= \frac{2}{3} \times \frac{22}{7} \times \frac{112 \times 112 \times 112}{1000 \times 8}$

$= \frac{61816832}{168000} =$ **367.96 cm^3**

4. When $r = r$, then, Volume of sphere $= \frac{4}{3}\pi r^3$, When $r = 2r$, then

Volume of sphere $= \frac{4}{3}\pi (2r)^3$,

Volume of increased $\Rightarrow \frac{4}{3}\pi r^3 : \frac{4}{3}\pi 8r^3 =$ **8 times.**

5. Volume of hemisphere $= \frac{2}{3}\pi r^3 = \frac{2}{3} \times \frac{22}{7} \times \frac{28 \times 28 \times 28}{10 \times 10 \times 10}$

$= \frac{965888}{21000} = 45.995$ m^3

$= 45.995 \times 1000$ L $=$ **45995 L**

6. $\frac{1}{64}$ **7.** 77.616 kg **8.** 11.5 kg (approx.)

Exercise 15.7

1. (i) Surface area of the sphere $= 4\pi r^2 = 4 \times \frac{22}{7} \times \frac{15 \times 15}{2 \times 2}$

$=$ **707.14 cm^2**

(ii) 1386 m^2 (iii) 50.29 dm^2 (approx.)

2. (i) Surface area of the sphere $= 4\pi r^2 = 4 \times \frac{22}{7} \times 12 \times 12$

$=$ **1810.29 cm^2**

or Take $\pi = 3.14 = 4 \times 3.14 \times 12 \times 12$

$=$ **1808.64 cm^2**

(ii) 314 m^2, (iii) 113.04 dm^2

3. Case I, Surface area $= 4\pi r^2 = 4 \times \frac{22}{7} \times 7 \times 7 = 616 \text{ cm}^2$

Case II, Surface area $= 4\pi r^2 = 4 \times \frac{22}{7} \times 14 \times 14 = 2464 \text{ cm}^2$

Ratio $= 616 : 2464 =$ **1 : 4**

4. Surface area of hemisphere $= 2\pi r^2 = 2 \times \frac{22}{7} \times \frac{10.5}{2} \times \frac{10.5}{2}$

$$= \frac{2 \times 22 \times 105 \times 105}{7 \times 2 \times 2 \times 100}$$

$$= \frac{2 \times 22 \times 105 \times 105}{2800}$$

$$= \frac{485100}{2800} = 173.25 \text{ cm}^2$$

$$\text{Cost of painting} = ₹ \frac{173.25 \times 4}{100} = ₹ \frac{693}{100} = ₹ \textbf{ 6.93}$$

5. 52 paise (approx.) **6.** ₹ 498.96

7. Do yourself.

8. Surface area of sphere $= 4\pi r^2$, $154 = 4 \times \frac{22}{7} \times r^2$, $r = 3.5 \text{ cm}$

Volume of sphere $= \frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 3.5 \times 3.5 \times 3.5$

$$= \frac{4 \times 22 \times 35 \times 35 \times 5}{3 \times 1000} \text{ cm}^3 = \textbf{179.67 cm}^3$$

❑

Unit-VI : Statistics

16. Data Handling

Exercise - 16.1

1. (i) 53 (ii) 50%

2. (i) 2: 1 (ii) 66.7%

3. (i) Product 1 (ii) April (iii) 35 lakhs (iv) 45 lakhs (v) 135 lakhs (vi) 120 lakhs

4. Draw the bar graph Yourself

5. (i) 4 : 5 (ii) $33\frac{1}{3}\%$

6. Prepare a pie-chart yourself.

7. (i) Prepare a pie chart and a bar graph yourself. (ii) a pie-chart (iii) a bar chart

8. Prepare a bar graph yourself

9. (i) Construct yourself (ii) 3 (iii) 6

10.

Health Care	(i)	(ii)
Hospital	324 lakh	45%
Research	25 lakh	3.5%
Public health	25 lakh	3.5%
Dental Clinics	36 lakh	5%
Drugs	40 lakh	5.6%
Doctors	130 lakh	18.1%
Nursing Homes	80 lakh	11.1%
Others	60 lakh	8.3%

11. (i) 20 (ii) (a) 540 (b) 225.

Exercise - 16.2

1. (i) $\frac{1}{6}$ (ii) $\frac{2}{3}$ (iii) $\frac{1}{2}$ (iv) $\frac{1}{3}$

2. (i) elementary (ii) elementary, random (iii) compound (iv) $\frac{m}{n}$

3. (i) $\frac{1}{2}$ (ii) $\frac{3}{4}$ (iii) $\frac{1}{4}$ **4.** (i) $\frac{3}{8}$ (ii) $\frac{3}{8}$

5. (i) $\frac{1}{2}$ (ii) $\frac{1}{26}$ (iii) $\frac{3}{26}$ (iv) $\frac{1}{26}$

6. (i) $\frac{5}{12}$ (ii) $\frac{1}{12}$ (iii) $\frac{1}{6}$ (iv) $\frac{1}{3}$.

❑

17. Introduction to Graphs

Exercise - 17.1

1. Quadrant I (+, +) Quadrant II (–, +) Quadrant III (–, –) Quadrant IV (+, –)

2. (i) coordinate (ii) origin (iii) Cartesian

3. **Abscissa :** The abscissa is the x-coordinate of a point on the coordinate plane. The distance along the horizontal axis. **Ordinate :** The ordinate is the y-coordinate of a point on the coordinate plane. The distance along the vertical axis.

4. (i) Draw after consulting the lesson
(ii) (a) quadrant I (b) quadrant IV (c) quadrant II (d) quadrant III

5. (i) 14 tonnes (ii) 4 tonnes (iii) 55 tonnes

6. (i) 1999 and 2000 (ii) $56\frac{1}{4}$

7. (i) Draw yourself (ii) 39°, 38°

❑

Half Yearly Model Test Paper

1. (i) $\frac{7}{13}$ and $\frac{-6}{13}$; $\frac{7}{13}+\left(\frac{-6}{13}\right)=\frac{7}{13}-\frac{6}{13}=\frac{1}{13}$

(ii) $\frac{10}{7}$ (iii) $\frac{-5}{17}$ (iv) -1

2. (i) $\frac{-3}{-11}+\frac{5}{9}$; $\frac{3}{11}+\frac{5}{9}=\frac{3\times 9+5\times 11}{99}=\frac{27+55}{99}=\frac{82}{99}$

(ii) $-\frac{1}{36}$ (iii) $-\frac{26}{57}$ (iv) $-\frac{43}{78}$

3. (i) $\frac{-2}{3}+\frac{5}{9}-\frac{-7}{6}=\frac{-2}{3}+\frac{5}{9}+\frac{7}{6}=\frac{-2\times 6+5\times 2+7\times 3}{18}$

$=\frac{-12+10+21}{18}=\frac{19}{18}$

(ii) $\frac{41}{72}$ (iii) $-\frac{1}{10}$ (iv) $\frac{-35}{72}$

4. (i) F (ii) F (iii) F (iv) T (v) T

5. Quantity of paint that Ravi has $=\frac{3}{4}$ L

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

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

Let AL paint need to made if $=\frac{4}{5}$ L

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

$A=\frac{4}{5}-\frac{1}{4}=\frac{6-5}{20}=\mathbf{\frac{11}{20}\ L}$

6. Length of paper box $l=\frac{25}{100}\text{ m}=\frac{25}{100}\times 100\text{ cm}=25\text{ cm}$

Breadth of paper box $b=\frac{16}{100}\text{ m}=\frac{16}{100}\times 100\text{ cm}=16\text{ cm}$

Height of paper box $h=\frac{5}{100}\text{ m}=\frac{5}{100}\times 100\text{ cm}=5\text{ cm}$

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

$= 2\,[25\text{ cm} \times 16\text{ cm} + 16\text{ cm} \times 5\text{ cm} + 5\text{ cm} + 25\text{ cm}]$

$= 2\,[400\text{ cm}^2 + 80\text{ cm}^2 + 125\text{ cm}^2] = 2\,[605\text{ cm}^2]$

$= 1210\text{ cm}^2$

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

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

7. (i) $(37)^{\frac{1}{4}}$ (ii) $(27)^{\frac{1}{5}}$ (iii) $(29)^{\frac{2}{7}}$ (iv) $\left(\frac{8}{9}\right)^{\frac{1}{6}}$ (v) $\left(\frac{2}{3}\right)^{2/3}$ (vi) 2^{-2}

8. Let there be x rows in the auditorium.

No. of students in x rows $= x \times x = x^2$

The total no. of students in the auditorium = 5929

$x^2 = 5929 \Rightarrow \quad x = \sqrt{5929}$

$x = \sqrt{7 \times 7 \times 11 \times 11} = 7 \times 11 = 77$

Hence, there are 77 rows in the auditorium.

9. 40

10. (i) Cube root of $(-125) = \sqrt[3]{-125} = \sqrt[3]{-5 \times -5 \times -5} = -5$

(ii) -18 (iii) -26 (iv) -140

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

$27x^3 + 8y^3 = (3x + 2y)\,[(3x + 2y)^2 - 3 \times 3x \times 2y]$

$[\because a^3 + b^3 = (a + b)\,[(a + b)^2 - 3ab)]$

$= 14\,[(14)^2 - 18 \times 8]$ [By putting the values]

$= 14\,[196 - 144]$

$= 14 \times 52 = 728$

(ii) 7440

12. 20%, 30%, 45%, 5%

13. 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.

14. ₹3,02,400

15. 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 $= \frac{104x \times 100}{625 \times x} = \frac{104 \times 100}{625} = 16.44\%$

❑

Annual Model Test Paper

1. On ₹ 100, the tax paid was ₹ 5

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

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

Bill amount for A T.V. = ₹ 12000 + ₹ 600 = ₹ **12600**

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

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

Bill amount for a leather coat = ₹ 1800 + ₹ 90 = ₹ **1890**

(iii) On ₹ 50 for two bars soaps, the tax paid would be

$$= ₹ \frac{5}{100} \times 50 = ₹\ 2.50$$

Bill amount for two bars soaps = ₹ 50 + ₹ 2.50 = ₹ **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. Principal for the first year = ₹ 2000

Interest for the first year $= \frac{2000 \times 1 \times 4}{100} = ₹\ 80$

Amount at the end of the first year = ₹ (2000 + 80) = ₹ 2080

Principal for the second year = ₹ 2080

Interest for the second year $= \dfrac{2080 \times 1 \times 4}{100} = ₹\ 83.4$

Amount at the end of the second year $= ₹\ (2080 + 83.4)$

$= ₹\ 2163.4$

Principal for the third year $= ₹\ 2163.4$

Interest for the third year $= \dfrac{2163.4 \times 1 \times 4}{100} = ₹\ 86.536$

Amount at the end of the third year $= 2163.4 + 86.536$

$= ₹\ 2249.936$

CI = Amount – Principal $= 2249.936 - 2000 = ₹\ 249.936$

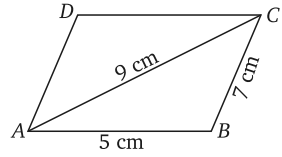
3. Value of boat after 2 years $= ₹\ 16{,}000\left(1 - \dfrac{5}{100}\right)^2$

$= ₹\ 16{,}000\left(\dfrac{19}{20}\right)^2$

$= 16{,}000 \times \dfrac{19}{20} \times \dfrac{19}{20} = ₹\ 14{,}440$

4. (i) Inverse variation (ii) Inverse variation (iii) Direct variation

5. $AB = 5$ cm, $BC = 7$ cm, $AC = 9$ cm



Area of parallelogram

$ABCD$ = Area of ΔACD + Area of ΔABC

Area of ΔABC, $AB = 5$ cm, $BC = 7$ cm,

$CA = 9$ cm,

$$s = \frac{5+7+9}{2} = \frac{21}{2} \text{ cm}$$

$$= \sqrt{\frac{21}{2} \times \left(\frac{21}{2} - 5\right)\left(\frac{21}{5} - 7\right)\left(\frac{21}{2} - 9\right)}$$

$$= \sqrt{\frac{21}{2} \times \frac{11}{2} \times \frac{7}{2} \times \frac{3}{2}} = \frac{21\sqrt{11}}{4} = \frac{21}{4} \times 3.317$$

$$= \frac{69.657}{4} = 17.414$$

Area of $\Delta ABC + \Delta ADC = 17.414 \times 2 =$ **34.82 cm^2**

6. (i) $C = 7.7$ m

Circumference of circle $= 2\pi r$

$$7.7 = 2 \times \frac{22}{7} \times r$$

$$r = \frac{7.7 \times 7}{2 \times 22} = \frac{4.9}{7} = 1.225 \text{ m}$$

$$d = 2 \times r = 2 \times 1.225 = 2.45 \text{ m}$$

(ii) 17.6 m, 5.6 m (iii) 2.1 m, 13.2 m

7. $d_1 = 10\,\text{cm}, d_2 = 24\,\text{cm}$

$r_1 = 5\,\text{cm}, r_2 = 12\,\text{cm}$ $\left[\because \text{Radius} = \dfrac{\text{Diameter}}{2}\right]$

Area of a plate which has area equal to area of the two given plates, let radius of this plate is R.

Then,

$$\pi R^2 = \pi \times 5^2 + \pi \times 12^2 \Rightarrow R^2 = \frac{\pi\,[25 + 144]}{\pi}$$

$$\pi = \sqrt{169} = 13\,\text{cm}$$

Diameter of a plate $= 2 \times 13 = 26\,\text{cm}$

8. Area of the remaining part of park

$$= \text{Area of square park} - 4 \times \text{Area of corner of a park}$$

$$= 50 \times 50 - 4 \times \frac{1}{4} \times \pi \times 7^2$$

$$= 2500 - \frac{22}{7} \times 49 = 2500 - 154 = 2346\ \text{m}^2$$

9. (i) Capacity of rectangular tank $= 3.6 \times 5.5 \times 3.5 = 69.3\ \text{m}^3$

$$= 69.3 \times 1000\ \text{L} = 69300\ \text{L}$$

(ii) 33345 L (iii) 6.84 L (iv) 35.568 L

10. Radius $= \dfrac{20}{2} = 10$ cm, Height $= 14$ cm

Curved surface area of Cylindrical vescels $= 2\pi rh$

$$= 2 \times \frac{22}{7} \times 10 \times 14$$

$$= 880\,\text{cm}^2$$

Base Surface area of Cylindrical Vessel $= \pi r^2 = \dfrac{22}{7} \times 10 \times 10$

$$= 314\ \text{cm}^2$$

Total surface area of cylindrical vescel which has tin-plating inside $= 880 + 314 = 1194\ \text{cm}^2$

Cost of tin plating $= 1194 \times 50$ paise per hundred square cm.

$$= ₹\ 1194 \times \frac{50}{100 \times 100} = ₹\ 5.97$$

11. $157.14\,\text{cm}^2$

12. (i) Product 1 (ii) April (iii) 35 lakhs (iv) 45 lakhs (v) 135 lakhs (vi) 120 lakhs

13. (i) Draw yourself (ii) 39°,78°.

❑