2. $3x \quad \frac{2}{3} \quad 2x \quad 1$

$$\frac{9x \quad 2}{3} \quad (2x \quad 1)$$

$$9x \quad 2 \quad 6x \quad 3$$

$$9x \quad 6x \quad 3 \quad 2$$

$$3x \quad 1$$

$$x \quad \frac{1}{3}$$

3. $\frac{x \quad 5}{2} \quad \frac{x \quad 3}{5} \quad \frac{1}{2}$

$$\frac{5(x \quad 5) \quad 2(x \quad 3)}{10} \quad \frac{1}{2}$$

$$\frac{5x \quad 25 \quad 2x \quad 6}{10} \quad \frac{1}{2}$$

$$3x \quad 19 \quad \frac{10}{2}$$

$$3x \quad 19 \quad 5$$

$$3x \quad 24$$

$$x \quad 8$$

4. $\frac{2x \quad 7}{5} \quad \frac{3x \quad 11}{2} \quad \frac{2x \quad 8}{3} \quad 5$

$$\frac{2(2x \quad 7) \quad 5(3x \quad 11)}{10} \quad \frac{2x \quad 8 \quad 15}{3}$$

$$\frac{4x \quad 14 \quad 15x \quad 55}{10} \quad \frac{2x \quad 7}{3}$$

$$\frac{11x \quad 41}{10} \quad \frac{2x \quad 7}{3}$$

$$33x \quad 123 \quad 20x \quad 70$$

$$33x \quad 20x \quad 70 \quad 123$$

$$53x \quad 53$$

$$x \quad 1$$

5. $\frac{4x \quad 1}{3} \quad \frac{2x \quad 1}{2} \quad \frac{3x \quad 7}{5} \quad 6$

$$\frac{10(4x \quad 1) \quad 15(2x \quad 1) \quad 6(3x \quad 7)}{30} \quad 6$$

$$40x \quad 10 \quad 30x \quad 15 \quad 18x \quad 42 \quad 6 \quad 30$$

$$52x \quad 47 \quad 180$$

$$52x \quad 227$$

$$x \quad \frac{227}{52}$$

$$4\frac{19}{52}$$

6. $5x \quad \frac{1}{3}(x \quad 1) \quad 6 \quad x \quad \frac{1}{30}$

$$\frac{3 \quad 5x \quad (x \quad 1)}{3} \quad \frac{\cancel{6}(30x \quad 1)}{\cancel{30}_{5}}$$

$$15x \quad x \quad 1 \quad \frac{30x \quad 1}{5}$$

$$5(14x \quad 1) \quad 30x \quad 1$$

$$70x \quad 5 \quad 30x \quad 1$$

$$40x \quad 6$$

$$x \quad \frac{6}{40}$$

$$x \quad \frac{3}{20}$$

7. $0.3y \quad 0.4y \quad 0.2 \quad 0.5$

$$0.3y \quad 0.4y \quad 0.2 \quad 0.5$$

$$0.1y \quad 0.7$$

$$y \quad \frac{0.7}{0.1}$$

$$y \quad 7$$

8. $\frac{0.25 \quad y}{3} \quad \frac{24 \quad 1}{2}$

$$2(0.25 \quad y) \quad 3(2y \quad 1)$$

$$0.50 \quad 2y \quad 6y \quad 3$$

$$2y \quad 6y \quad 3 \quad 0.50$$

$$4y \quad 2.5$$

$$y \quad \frac{2.5}{4}$$

$$y \quad \frac{25}{40}$$

$$y \quad \frac{5}{8}$$

$$y \quad 0.625$$

9. $\frac{5x \quad 4}{2x \quad 3} \quad 2$

$$5x \quad 4 \quad 4x \quad 6$$

$$x \quad 2$$

10. $\frac{2y \quad 4}{3y \quad 2} \quad \frac{2}{3}$

$$3(2y \quad 4) \quad 2(3y \quad 2)$$

$$6y \quad 12 \quad 6y \quad 4$$

$$12y \quad 4 \quad 12$$

$$12y \quad 8$$

$$y \quad \frac{8}{12}$$

$$y \quad \frac{2}{3}$$

11. $\dfrac{2x \quad \frac{3}{4}}{9x \quad \frac{4}{7}} \quad \frac{1}{4}$

$$\frac{\frac{8x \quad 3}{4}}{\frac{63x \quad 4}{7}} \quad \frac{1}{4}$$

$$\frac{8x \quad 3}{4} \quad \frac{7}{63x \quad 4} \quad \frac{1}{4}$$

$$(8x \quad 3)7 \quad 63x \quad 4$$
$$56x \quad 21 \quad 63x \quad 4$$
$$56x \quad 63x \quad 4 \quad 21$$
$$7x \quad 25$$
$$x \quad \frac{25}{7}$$

12. $\dfrac{3x \quad 4}{2x \quad 4} \quad \frac{3}{4}$

$$4(3x \quad 4) \quad 3(2x \quad 4)$$
$$12x \quad 16 \quad 6x \quad 12$$
$$12x \quad 6x \quad 12 \quad 16$$
$$6x \quad 28$$
$$x \quad \frac{14}{3}$$

13. $\dfrac{2 \quad 7x}{1 \quad 5x} \quad \dfrac{3 \quad 7x}{4 \quad 5x}$

$$(2 \quad 7x)(4 \quad 5x) \quad (3 \quad 7x)(1 \quad 5x)$$
$$8 \quad 10x \quad 28x \quad 35x^2 \quad 3 \quad 15x$$
$$17x \quad 35x^2$$
$$8 \quad 38x \quad 3 \quad 8x$$
$$38x \quad 8x \quad 3 \quad 8$$
$$30x \quad 5$$
$$x \quad \frac{5}{30}$$
$$x \quad \frac{1}{6}$$

14. $\dfrac{5x \quad 2}{x \quad 4} \quad \dfrac{10x}{2x \quad 3}$

$$(5x \quad 2)(2x \quad 3) \quad 10x \quad (x \quad 4)$$
$$10x^2 \quad 15x \quad 4x \quad 6 \quad 10x^2 \quad 40x$$
$$11x \quad 6 \quad 40x$$
$$11x \quad 40x \quad 6$$
$$29x \quad 6$$
$$x \quad \frac{6}{29}$$

15. $\dfrac{x^2 \quad (x \quad 1)(x \quad 2)}{5x \quad 1} \quad 6$

$$x^2 \quad (x^2 \quad 2x \quad x \quad 2) \quad 6(5x \quad 1)$$
$$x^2 \quad x^2 \quad 2x \quad x \quad 2 \quad 30x \quad 6$$
$$3x \quad 2 \quad 3x \quad 6$$
$$3x \quad 30x \quad 2 \quad 6$$
$$33x \quad 8$$
$$x \quad \frac{8}{33}$$

16. $\dfrac{(2x \quad 3) \quad (5x \quad 7)}{6x \quad 11} \quad \dfrac{8}{3}$

$$\frac{2x \quad 3 \quad 5x \quad 7}{6x \quad 11} \quad \frac{8}{3}$$

$$\frac{3x \quad 10}{6x \quad 11} \quad \frac{8}{3}$$

$$9x \quad 30 \quad 48x \quad 88$$
$$39x \quad 118$$
$$x \quad \frac{118}{39}$$

17. $\dfrac{4}{x \quad 3} \quad \dfrac{2}{x \quad 2} \quad \dfrac{6}{x}$

$$\frac{4(x \quad 2) \quad 2(x \quad 3)}{(x \quad 3)(x \quad 2)} \quad \frac{6}{x}$$

$$\frac{4x \quad 8 \quad 2x \quad 6}{x^2 \quad 2x \quad 3x \quad 6} \quad \frac{6}{x}$$

$$\frac{6x \quad 14}{x^2 \quad 5x \quad 6} \quad \frac{6}{x}$$

$$6x^2 \quad 14x \quad 6x^2 \quad 30x \quad 36$$
$$14x \quad 30x \quad 36$$
$$16x \quad 36$$
$$x \quad \frac{36}{16}$$
$$x \quad \frac{9}{4}$$
$$x \quad 2\frac{1}{4}$$

18. $\dfrac{3}{2x \quad 1} \quad \dfrac{4}{2x \quad 1} \quad \dfrac{7}{2x}$

$$\frac{3(2x \quad 1) \quad 4(2x \quad 1)}{(2x \quad 1)(2x \quad 1)}$$

$$\frac{6x \quad 3 \quad 8x \quad 4}{4x^2 \quad 2x \quad 2x \quad 1} \quad \frac{7}{2x}$$

$$\frac{14x \quad 1}{4x^2 \quad 1} \quad \frac{7}{2x}$$

$$2x(14x \quad 1) \quad 7(4x^2 \quad 1)$$

$$28x^2 \quad 2x \quad 28x^2 \quad 7$$

$$2x \quad 7$$

$$x \quad \frac{7}{2}$$

$$x \quad 3\frac{1}{2}$$

19. $\frac{1}{2}[5x \quad 30] \quad \frac{1}{3}[1 \quad 7p] \quad \frac{1}{4}$

$$\frac{1}{2}[5(p \quad 1) \quad 30] \quad \frac{1}{3}[1 \quad 7p) \quad \frac{1}{4}$$

$$\frac{1}{2}[5p \quad 5 \quad 30] \quad \frac{1}{3}[1 \quad 7p] \quad \frac{1}{4}$$

$$\frac{1}{2}[5p \quad 25] \quad \frac{1}{3}[1 \quad 7p] \quad \frac{1}{4}$$

$$\frac{3(5p \quad 25) \quad 2(1 \quad 7p)}{6} \quad \frac{1}{4}$$

$$4[15p \quad 75 \quad 2 \quad 14p] \quad 6$$

$$4[\quad p \quad 77] \quad 6$$

$$2(\quad p \quad 77) \quad 3$$

$$2p \quad 154 \quad 3$$

$$2p \quad 157$$

$$p \quad 78\frac{1}{2}$$

20. $\frac{x \quad 3}{3} \quad \frac{x \quad 2}{3} \quad 1$

$$\frac{2(x \quad 3) \quad 3(x \quad 2)}{6} \quad 1$$

$$2x \quad 6 \quad 3x \quad 6 \quad 6$$

$$x \quad 12 \quad 6$$

$$x \quad 6$$

$\because$ $\frac{1}{x} \quad p \quad 1$

$$\frac{1}{6} \quad p \quad 1$$

$$p \quad 1 \quad \frac{1}{6}$$

$$p \quad \frac{5}{6}$$

Exercise 11.2

1. Let Ist odd number x

2nd odd number $x \quad 2$

3rd odd number $x \quad 4$

and 4th odd number $x \quad 6$

$$x \quad (x \quad 2) \quad (x \quad 4) \quad (x \quad 6) \quad 80$$

$$4x \quad 12 \quad 80$$

$$4x \quad 68$$

$$x \quad 17$$

Ist odd number = 17

2nd odd number = 19

3rd odd number = 21

4th odd number = 23

2. Let Ist multiple of 17 x

2nd multiple of 17 $x \quad 17$

$$x \quad (x \quad 17) \quad 85$$

$$2x \quad 68$$

$$x \quad 34$$

Multiples of 17 are = 34, 51

3. Let breadth of Rectangle x

length of Rectangle $2x$

$\because$ $pr \quad 300$

$$2(l \quad b) \quad 300$$

$$2[2x \quad x] \quad 300$$

$$2(3x) \quad 300$$

$$6x \quad 300$$

$$x \quad 50$$

breadth = 50 m

length = 100 m

4. Let Ist side of triangle x

2nd side of triangle $x \quad 3$

3rd side of triangle $x \quad 6$

$$p \quad 81$$

$$x \quad (x \quad 3) \quad (x \quad 6) \quad 81$$

$$3x \quad 9 \quad 81$$

$$3x \quad 72$$

$$x \quad 24$$

sides are 24 cm, 27 cm and 30 cm.

5. Let age of Anil's son x years

age of Anil $3x$ years

After 5 years Age of son $x \quad 5$

After 5 years Anil's age $3x \quad 5$

$\because$ Anil's age $2\frac{1}{2}$ (son's age)

$$3x \quad 5 \quad \frac{5}{2}(x \quad 5)$$

$2(3x \quad 5) \quad 5(x \quad 5)$

$6x \quad 10 \quad 5x \quad 25$

$x \quad 15$

Age of son $\quad 15$ years

Age of Anil $\quad 3 \quad 15 \quad 45$ years.

6. Let age of son $\quad x$ years

age of father $\quad 6x$ years

After four years son's age $\quad x \quad 4$

After four years fathers age $\quad 6x \quad 4$

$\because \quad 6x \quad 4 \quad 4(x \quad 4)$

$6x \quad 4 \quad 4x \quad 16$

$2x \quad 12$

$x \quad 6$

Son's age = 6 years

father's age $\quad 6 \quad 6 \quad 36$ years

7. Let Sia age $\quad 4x$

Anisha age $\quad 5x$

After 5 years Sia age $\quad 4x \quad 5$

After Anisha age $\quad 5x \quad 5$

$$\frac{4x \quad 5}{5x \quad 5} \quad \frac{6}{7} \qquad \text{(given)}$$

$28x \quad 35 \quad 30x \quad 30$

$2x \quad 5$

$x \quad \frac{5}{2}$

Age of Sia $\quad 4 \quad \frac{5}{2} \quad 10$ years

Age of Anisha $\quad 5 \quad \frac{5}{2} \quad 12.5$ years.

8. Let number added be x

$$\frac{12 \quad x}{22 \quad x} \quad \frac{42 \quad x}{72 \quad x}$$

$(12 \quad x)(72 \quad x) \quad (42 \quad x)(22 \quad x)$

$864 \quad 12x \quad 72x \quad x^2$

$924 \quad 42x \quad 22x \quad x^2$

$864 \quad 84x \quad 924 \quad 64x$

$20x \quad 60$

$x \quad 3$

3 should be added.

9. Let 50 paise coins be $\quad x$

₹ 2 coins $\quad x \quad 7$

$0.50x \quad 2(x \quad 7) \quad 76.50$

$0.50x \quad 2x \quad 14 \quad 76.50$

$2.5x \quad 62.50$

$x \quad \frac{62.50}{2.5}$

$x \quad 25$

No. of 50 paise coins = 25

No of ₹ 2 paise coins $\quad 25 \quad 7$

$= 32$

10. Let No. of 1 rupee coins $\quad 3x$

No. of 50 paise coins $\quad 5x$

No. of 10 paise coins $\quad 7x$

$1 \quad 3x \quad 0.50 \quad 5x \quad 0.10 \quad 7x \quad 155$

$3x \quad 2.5x \quad 0.70x \quad 155$

$6.2x \quad 155$

155

$x \quad \frac{155}{6.2}$

$x \quad 25$

No. of 1 rupee coins $\quad 3 \quad 25 \quad 75$

No. of 50 paise coins $\quad 5 \quad 25 \quad 125$

No. of 10 paise coins $\quad 7 \quad 25 \quad 175$

11. Let the angles by $5x, 6x, 7x$

$5x \quad 6x \quad 7x \quad 180$

sum of all angles of triangle = 180

$18x \quad 180$

$x \quad 10$

angles are $5 \quad 10, 6 \quad 10, 7 \quad 10$

$50 \ , 60 \ , 70$

12. Let numerator be x

Denominator $\quad x \quad 7$

New numerator $\quad x \quad 17$

New Denominator $\quad x \quad 7 \quad 6$

$x \quad 1$

$$\frac{x \quad 17}{x \quad 1} \quad 2$$

$x \quad 17 \quad 2x \quad 12$

$15 \quad x$

fraction is $\quad \frac{x}{x \quad 7} \quad \frac{15}{22}$

13. Let Ist part $\quad x$

2nd part $\quad 200 \quad x$

$\frac{1}{3}x \quad \frac{1}{2}(200 \quad x)$ given

$2x \quad 3(200 \quad x)$

$2x \quad 600 \quad 3x$

$5x \quad 600$

$x \quad 120$

Ist part = 120

2nd part $200 \quad 120$

80

14. Let first part x

Let 2nd part $\frac{5}{6}x$

3rd part $\frac{4}{5} \quad \frac{5}{6}x$

$\frac{2x}{3}$

$x \quad \frac{5}{6}x \quad \frac{2x}{3} \quad 150$

$\frac{6x \quad 5x \quad 4x}{6} \quad 150$

$\frac{15x}{6} \quad 150$

$x \quad 150 \quad \frac{6}{15} \quad 60$

Ist part = 60

2nd part $\frac{5}{6}^{10} \quad 60$

50

3rd part $\frac{2}{3}^{20} \quad 60$

40

15. Let after x hours they are 27 km a part

distance travelled by $x \quad 4 \quad x$

distance travelled by $y \quad 5 \quad x$

$4x \quad 5x \quad 27$

$9x \quad 27$

$x \quad 3$

After 3 hours they are 27 km a part.

16. Let speed on one motory-cycle x km/hr

Speed on 2nd motor-cycle

$(x \quad 7)$ km/hr

distance travelled by Ist motor cycle

$x \quad 2$

distance travelled by 2nd motor cycle

$(x \quad 7)2$

Now, $x \quad 2 \quad (x \quad 7)2 \quad 300 \quad 34$

$2x \quad 2x \quad 14 \quad 266$

$4x \quad 266 \quad 14$

$4x \quad 252$

$x \quad 63$

Speed of Ist motor cycle $\quad 63$ km/hr

speed of Ist motor cycle

$(63 \quad 7)$ km/hr

70 km/hr

17. Let digit at unit place x

digit at ten's place $\quad 7 \quad x$

two digit number $\quad 10(7 \quad x) \quad x$

two digit number after, interchanging the digits

$10x \quad (7 \quad x)$

$10x \quad (7 \quad x) \quad 10(7 \quad x) \quad x \quad 27$

$9x \quad 7 \quad 70 \quad 10x \quad x \quad 27$

$9x \quad 10x \quad x \quad 97 \quad 7$

$18x \quad 90$

$x \quad 5$

digit at unit place = 5

digit at unit ten's place $\quad 7 \quad 5$

$\because$ Number is 25.

18. Let unit place digit x

ten's place digit $\quad 2x$

two digit number $\quad 10(2x) \quad x$

reversing the digits $\quad 10(x) \quad 2x$

Now, $(10x \quad 2x) \quad 15 \quad \frac{3}{4}[10(2x) \quad x]$

$12x \quad 15 \quad \frac{3}{4}(21x)$

$48x \quad 60 \quad 63x$

$60 \quad 15x$

$4 \quad x$

digit at unit place = 4

digit at ten's place $\quad 2 \quad 4 \quad 8$

No. is 84.

19. Let speed of boat in still water $\quad x$ km/hr

speed of boat in upstream $\quad (x \quad 2)$ km/hr

speed of boat down upstream

$(x \quad 2)$ km/hr

distance travelled in upstream $\quad s \quad t$

$(x \quad 2) \quad 6$

distance travelled in down stream

$(x \quad 2) \quad 5$

Now, $\quad (x \quad 2) \quad 6 \quad (x \quad 2) \quad 5$

$6x \quad 12 \quad 5x \quad 10$

$x \quad 22$

speed of boat in still water = 22 km/hr.

Exercise 12.1

1. $\because$ $P \quad Q \quad R \quad S \quad 360$

$60 \quad 70 \quad 120 \quad S \quad 360$

$250 \quad S \quad 360$

$S \quad 110$

2. Let equal angles be x

$x \quad x \quad x \quad 90 \quad 360$

$3x \quad 90 \quad 360$

$3x \quad 270$

$x \quad 90$

each equal angle = 90°

3. Let opposite angle be x

$x \quad x \quad 180$

$2x \quad 180$

$x \quad 90$

Similarly other opposite angles be y

$y \quad y \quad 180$

$2y \quad 180$

$y \quad 90$

angles of Quadrilateral are 90 each

4. Let angles of Quadrilateral be $1x, 2x, 3x, 4x$

$1x \quad 2x \quad 3x \quad 4x \quad 360$

$10x \quad 360$

$x \quad 36$

s are 1 36, 2 36, 3 36, 4 36

36°, 72°, 108°, 144°

5. Let equal angles be x

$x \quad x \quad 115 \quad 45 \quad 360$

$2x \quad 160 \quad 360$

$2x \quad 200$

$x \quad 100$

each equal angles are 100.

6. Let fourth angle be x

$55 \quad 85 \quad 70 \quad x \quad 360$

$210 \quad x \quad 360$

$x \quad 360 \quad 210$

$x \quad 150$

fourth angle = 150°.

7. Let angles be $1x, 2x, 4x$ and $5x$

$1x \quad 2x \quad 4x \quad 5x \quad 360$

$12x \quad 360$

$x \quad 30$

angles are 1 30, 2 30, 4 30, 5 30

30°, 60°, 120°, 150°

8. Let others angles be $5x$, and $6x$

$70 \quad 70 \quad 5x \quad 6x \quad 360$

$140 \quad 11x \quad 360$

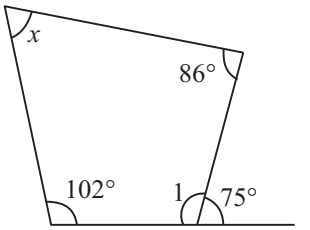
$11x \quad 220$

$x \quad 20$

other angles are 5 20, 6 20

100°, 120°

9. 1 180 75 (Linear Pair)



1 105

$x \quad 86 \quad 102 \quad 1 \quad 360$

$x \quad 86 \quad 102 \quad 105 \quad 360$

$x \quad 293 \quad 360$

$x \quad 67$

10. $x \quad (x \quad 20) \quad (x \quad 30)$

$(x \quad 10) \quad 360$

$4x \quad 40 \quad 360$

$4x \quad 400$

$x \quad 100$

angles are 100, (100 20), (100 30), (100 10)

100°, 80°, 70°, 110°

11. Let $A \quad 2x, \quad D \quad 3x$

$\because \quad AB \,||\, DC$

$A \quad D \quad 180$

$2x \quad 3x \quad 180$

$5x \quad 180$

$x \quad 36$

$A \quad 2 \quad 36, \quad D \quad 3 \quad 36$

$A \quad 72 \quad D \quad 108$

Let $B \quad 7y \quad C \quad 8y$

$\because \quad A \quad B \quad C \quad D \quad 360$

$72 \quad 7y \quad 8y \quad 108 \quad 360$

$15y \quad 180 \quad 360$

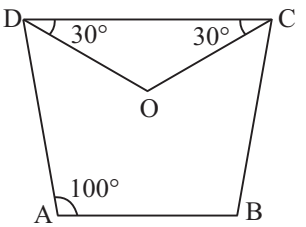
$15y \quad 180$

$y \quad 12$

$B \quad 7 \quad 12 \quad C \quad 8 \quad 12$

$B \quad 84 \quad C \quad 96$

12. $A \quad B \quad C \quad D \quad 360$



$100 \quad B \quad 60 \quad 60 \quad 360$

$B \quad 220 \quad 360$

B or $ABC \quad 140$

In DOC

$ODC \quad OCD \quad \frac{60}{2} \quad 30$

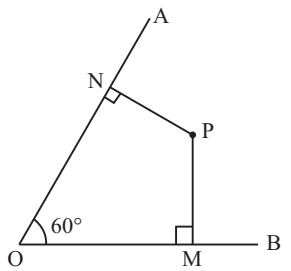
In DOC

$30 \quad 30 \quad DOC \quad 180$

$DOC \quad 180 \quad 60$

$DOC \quad 120$

13. In Quadrilateral $OMPN$



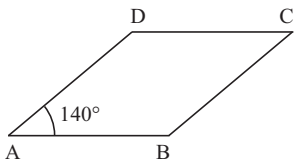
$60 \quad 90 \quad 90 \quad NPM \quad 360$

$240 \quad NPM \quad 360$

$NPM \quad 120$

Exercise 12.2

1.



$C \quad A \quad 140$

$C \quad A \quad 70$

opp. angles of parallelogram are equal

$A \quad B \quad 180$

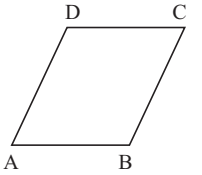
$70 \quad B \quad 180$

$B \quad 110$

$D \quad B \quad 110$

opp. angles of parallelogram.

2.



Let adjacent angles of parallelogram be $4x, 5x$

$4x \quad 5x \quad 180$

$9x \quad 180$

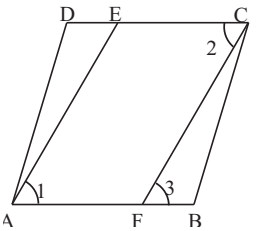
$x \quad 20$

$A \quad 4 \quad 20 \quad B \quad 5 \quad 20$

$A \quad 80 \quad B \quad 100$

$C \quad 80 \quad D \quad 100$

3.



$A \quad C$

opposite angles of parallelogram

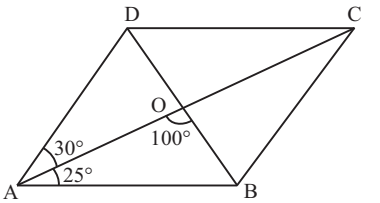
$2 \quad 1 \quad 2 \quad 2$ bisectors

$1 \quad 2$

$2 \quad 3$ alternate angles

$AE \parallel FC$ corresponding angles are =

4.



$C \quad A \quad 30 \quad 25$

55 opp. angles of parallelogram

$A \quad B \quad 180$

$55 \quad B \quad 180$

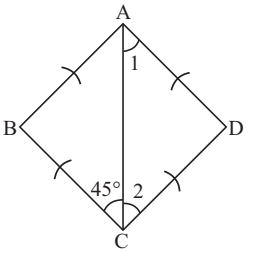
$B \quad 180 \quad 55$

125

$D \quad B \quad 125$

5. $1 \quad 45$ alternate angles

$2 \quad 1 \quad 45$ angles opp. to = sides



In ADC

$1 \quad 2 \quad ADC \quad 180$

$45 \quad 45 \quad ADC \quad 180$

$90 \quad ADC \quad 180$

$ADC \quad 90$

6. $A \quad C$ opp. angles of parallelogram

$4x \quad 5 \quad 3x \quad 10$

$x \quad 15$

$A \quad 4 \quad 15 \quad 5 \quad 55 \qquad C \quad 55$

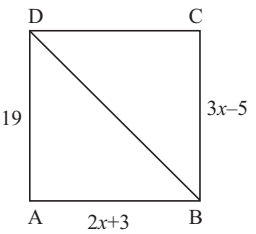
$\because \qquad A \quad D \quad 180$

$55 \quad D \quad 180$

$D \quad 135$

$B \quad D \quad 135$

7.



$\because \qquad AB \quad BC$

$2x \quad 3 \quad 3x \quad 5$

$8 \quad x$

$AB \quad BC \quad 3 \quad 8 \quad 5$

19

$AD \quad 19$

In ADB

$BD^2 \quad AD^2 \quad AB^2$

$BD \quad 19^2 \quad 19^2 \quad \sqrt{2 \quad 19^2}$

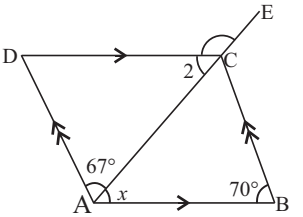
$BD \quad 19\sqrt{2}$ cm.

8. $\because \qquad A \quad B \quad 180$

$(67 \quad x) \quad 70 \quad 180$

$x \quad 180 \quad 67 \quad 70$

$x \quad 180 \quad 137$



$x \quad 43$

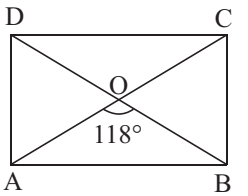
$2 \quad x \quad 43$ alternate angles

$y \quad 180 \quad 2$

$180 \quad 43$

$y \quad 137$

9.



$OA \quad OB$ half of equal diagonals

$OB \quad OC$ of Rectangle

$OC \quad OD$

$OAB \quad OBA \quad x$

angles opposite to equal sides

$x \quad x \quad 118 \quad 180$

$2x \quad 62$

$x \quad 31$

$OBA \quad 31$

$OBC \quad 90 \quad 31$

$OBC \quad 59$

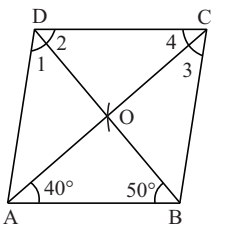
$ADO \quad OBC$ alt angles

59

$OCB \quad OBC \quad 59$

angles opp to = sides

10.



In AOB

$OAB \quad 90 \quad 50 \quad 180 \quad \because AC \quad BD$

$OAB \quad 180 \quad 140$

$OAB \quad 40$

1 50 angles opp. to = sides

2 50 alt angles

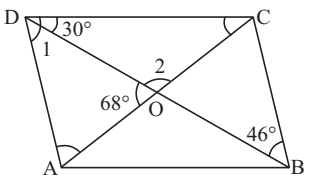
$ADC \quad 50 \quad 50 \quad 100$

3 40 angles opp. to = sides

4 40 alternate angles

$BCD \quad 40 \quad 40 \quad 80$

11.



1 46 alternate angles

$ADC \quad 46 \quad 30$

$ADC \quad 76$

In AOD

1 68 $OAD \quad 180$

46 68 $OAD \quad 180 \quad 114$

$OAD \quad 66$

or $CAD \quad 66$

$2 \quad 180 \quad 68$

$2 \quad 112$

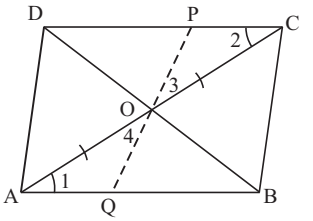
In ODC

30 112 $OCD \quad 180$

$OCD \quad 180 \quad 142$

$OCD \quad 38$

12. In AOQ and POC



1 2 at angles

$OA \quad OC$ diagonal of parallelogram

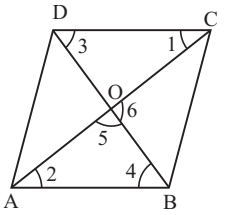
4 3 V.O.A.

$AOQ \quad POC$ ASA

$OP \quad OQ$ CPCTC

O is mid point of PQ.

13.



Given : $ABCD$ is a Rhombus

To prove : $OA \quad OC$

$OB \quad OD$

$AC \quad BD$

Proof

In COD and AOB

1 2 alternate angles

$CD \quad AB$ opp. sides of Rhombus

3 4 alt. angles ASA

$COD \quad AOB$ ASA

$OC \quad OA$

$OB \quad OD$ CPCTC

In AOB and COB

$OA \quad OC$ proved above

$OB \quad OB$

$AB \quad BC$ sides of Rhombus

$AOB \quad COB$ SSS

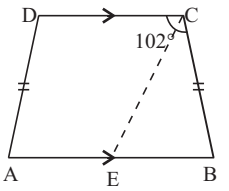
5 6 CPCTC

5 6 180 LP

5 6 90

$AC \quad BD$

14.



Given : $AD \quad BC$

$DC \parallel AB$

To find : A, B and D

(i) $B \quad C \quad 180$ cointerior angles

$B \quad 102 \quad 180$

$B \quad 78$

Draw $CE \parallel AD$

$DC \parallel AE$ given

$ACED$ is a parallelogram.

$AD \quad BC$ given

$AD \quad CE$ opp. sides of parallelogram

$BC \quad CE$

$B \quad CEB \quad 78$ angles opp. to = sides

$A \quad CEB \quad 78$ corresponding angles

$\because \quad D \quad A \quad 180$

$D \quad 78 \quad 180$

$D \quad 102$

$A \quad 78 \quad B \quad 78 \quad C \quad 102$

$D \quad 102$

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

13 Visualising Solid Shapes

Exercise 13.1

1.

Figure		No. of vertices
(i)	Triangular prism	6
(ii)	Pentogonal pyramid	6
(iii)	Octahedron	6
(iv)	Octagonal Pyramid	9
(v)	Hexagonal prism	12
(vi)	Tetrahedron	4

2.

Figure		No. of edges
(i)	Cube	12
(ii)	Hexagonal prism	18
(iii)	Octahedron	12
(iv)	Regular tetrahedron	6
(v)	Rectangular Pyramid	8
(vi)	Hexagonal pyramid	12

3.

Figure		No. of faces
(i)	Cone	2
(ii)	Square prism	6
(iii)	Cylinder	3
(iv)	Octagonal pyramid	9
(v)	Regular octahedron	8

4. (i) A sphere has **no** vertex and **no** edge.

(ii) **2** faces are triangular and **3** are rectangular of triangular prism.

(iii) A rectangular prism has **8** vertices **12** edges and 6 rectangular faces.

(iv) A cylinder has **2** flat faces and **1** curved face.

(v) A pentagonal prism has **2** pentagonal faces and **5** rectangular faces.

(vi) A hexagonal prism has **2** hexagonal faces and **6** rectangular faces.

(vii) **4** faces are triangular and **1** is rectangular of rectangular pyramid.

(viii) **5** faces faces are triangular and **1** is pentagonal of pentagonal pyramid.

(ix) Hexagonal pyramid has **6** triangular faces and **1** is hexagonal face.

(x) A regular Octahedron has **6** vertices, **12** edges and 8 triangular faces.

Exercise 13.2

1. (i) Yes it is a polyhedron.

(ii) Yes it is a polyhedron.

(iii) No it is not a polyhedron.

2. (i) Yes it is a regular polyhedron.

(ii) No it is not a regular polyhedron.

(iii) No it is not a regular polyhedron.

3.

Solid	V	F	E	V	F	E	2
(i)	6	5	9	6	5	9	2
(ii)	12	8	18	12	8	18	2
(iii)	7	7	12	7	7	12	2
(iv)	6	6	10	6	6	10	2
(v)	8	6	12	8	6	12	2
(vi)	5	15	8	5	15	8	2

4. We have

$F \quad 6 \; V \quad 8$

$\because \quad V \quad F \quad E \quad 2$

$8 \quad 6 \quad E \quad 2$

$E \quad 12$

No. of edges are 12.

5. We have

$E \quad 30 \; V \quad 20$

$\because \quad V \quad F \quad E \quad 2$

$20 \quad F \quad 30 \quad 2$

$F \quad 12$

No. of faces = 12.

6. We have

$F \quad 40 \; E \quad 60$

$\because \quad V \quad F \quad E \quad 2$

$V \quad 40 \quad 60 \quad 2$

V 22

No. of vertices are 22.

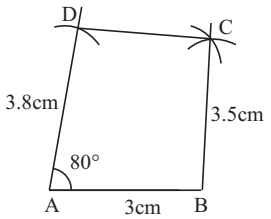
7.

	faces	edges	vertices
prism	n 2	n 2	n 3
pyramid	n 1	n 1	n 2

14 Practical Geometry

Exercise 14.1

1.



Steps of constructions

(i) Draw AB 3 cm.

(ii) Draw XAB 80 .

(iii) With centre A cut an are D on AX of radius 3.8 cm.

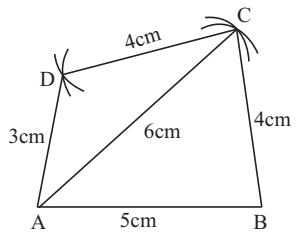
(iv) With D as centre and radius = 2.8 cm cut an arc 3.8 cm.

(v) With B as centre and radius 3.5 cm cut the previous arc at C.

(vi) Join CD and BC.

$ABCD$ is a required Quadrilateral.

2.



steps of constructions.

(i) Draw AB 5 cm.

(ii) With B as centre and radius 4 cm cut an arc.

(iii) With A as centre and radius 6 cm cut the previous arc at C.

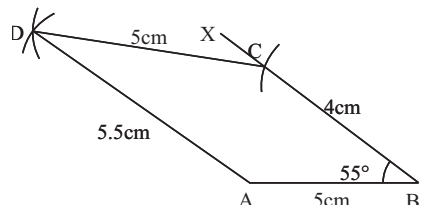
(iv) With C as centre and radius 4 cm cut an arc.

(v) With A as centre and radius 3 cm cut the previous arc at D.

Join AC, BC, CD and AD.

$ABCD$ is a required Quadrilateral.

3.



Steps of constructions

(i) Draw AB 3.5 cm.

(ii) Draw ABX 55 .

(iii) With B as centre and radius 4 cm cut an arc C on BX.

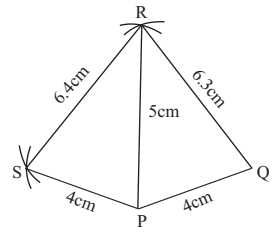
(iv) With C as centre and radius 5 cm cut an arc.

(v) With A as centre and radius 5.5 cm cut the previous arc at D.

(vi) Join CD and AD.

$ABCD$ is a required Quadrilateral.

4.



Steps of constructions

(i) Draw PQ 4 cm.

(ii) With Q as cetnre and radius 6.3 cut an arc.

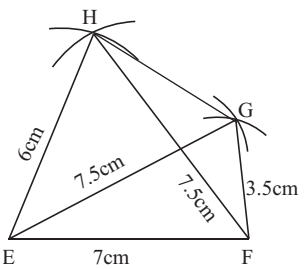
(iii) With P as centre and radius 5 cm cut the previous arc at R.

(iv) With R as centre and radius 6.4 cm cut an arc.

(v) With P as centre and radius 4.4 cm cut the previous arc at S.

Join RQ, PR, SR and PS.
$PQRS$ is a required Quadrilateral.

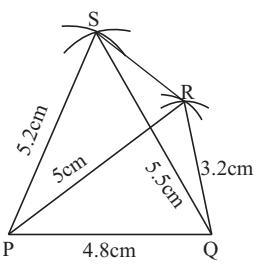
5.



Steps of constructions

(i) Draw EF 7 cm.
(ii) With E as centre and radius 7.5 cm cut an arc.
(iii) With F as centre and radius 3.5 cm cut the previous arc at G.
(iv) With F as centre and radius 7.5 cm cut an arc.
(v) With E as centre and radius 6 cm cut the previous arc at H.
(vi) Join GF, HG, HE
$EFGH$ is a required Quadrilateral.

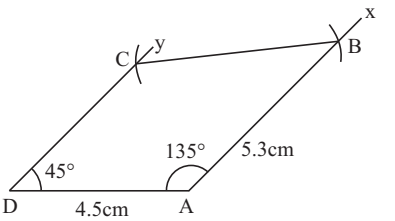
6.



Steps of constructions

(i) Draw PQ 4.8 cm.
(ii) With P as centre and radius 5 cm cut an arc.
(iii) With Q as centre and radius 3.2 cm cut the previous arc at R.
(iv) With P as centre and radius 5.2 cm cut an arc.
(v) With Q as centre and radius 5.5 cm cut the previous arc at S.
Join QR, SR, PS.
$PQRS$ is required Quadrilateral.

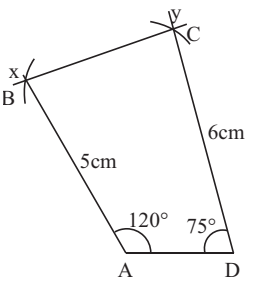
7.



Steps of construction

(i) Draw AD 4.5 cm.
(ii) Draw XAD 135 .
(iii) With A as centre and radius 5.3 cm cut an arc B on AX.
(iv) Draw YDA 45 .
(v) With B as centre and radius 5.5 cm cut DY at C.
(vi) Join BC.
$ABCD$ is required Quadrilateral.

8.



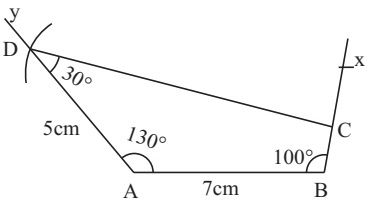
Steps of construction

(i) Draw AD 2.8 cm.
(ii) Draw XAD 120 .
(iii) Draw YDA 75 .
(iv) With A as centre and radius 5 cm cut an arc B on AX.
(v) With D as centre and radius 6 cm cut an arc C on DY
Join CB
$ABCD$ is required Quadrilateral.

9. D 360 (125 105 100)
360 330 30

Steps of construction

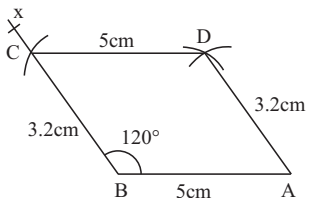
(i) Draw AB 7 cm.
(ii) Draw XBA 100 .
(iii) Draw YAB 130 .
(iv) With A as centre and radius 5 cm cut an arc D at AY.



(v) At D draw ADC 30 .
$ABCD$ is required Quadrilateral.

Exercise 14.2

1.



Steps of construction

(i) Draw AB 5 cm.

(ii) Draw XBA 120 .

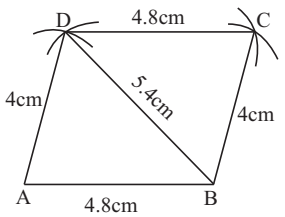
(iii) With B as centre and radius 3.2 cm cut an arc C on BX.

(iv) With C as centre and radius 5 cm cut can arc.

(v) With A as centre and radius 3.2 cm cut the previous arc at D.
Join AD and CD.

$ABCD$ is required parallelogram

2.



Steps of construction

(i) Draw AB 4.8 cm.

(ii) With A as centre and radius 4 cm cut an arc.

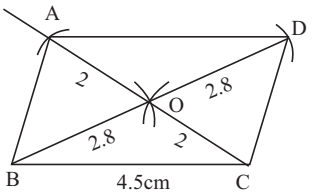
(iii) With B as centre and radius 5.4 cm cut the previous arc at D.

(iv) With B as centre and radius 4 cm cut an arc.

(v) With D as centre and radius 4.8 cm cut the previous arc at C
Join AD, BD, BC and CD.
$ABCD$ is required parallelogram.

3. OA OC $\frac{4}{2}$ 2 cm,

OB OD $\frac{5\ \ 6}{2}$ 2.8 cm



Steps of construction

(i) Draw BC 4.5 cm.

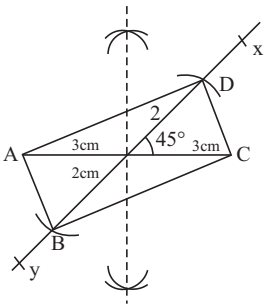
(ii) With B as centre and radius $\frac{BD}{2}$ 2.8 cut an arc.

(iii) With C as centre and radius $\frac{AC}{2}$ 2 cm cut the previous arc at O.

(iv) Produce BO to D such that OD 2.8 cm.

(v) Produce CO to A such that OA 2 cm.
Join DC, AD, and AB
$ABCD$ is a required parallelogram.

4.



Steps of construction

(i) Draw diagonal AC 6 m.

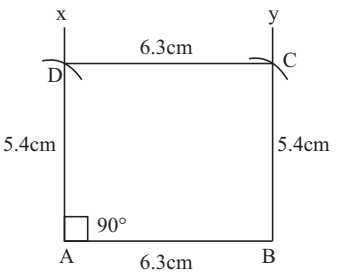
(ii) Draw perpendicular bisector of AC intersecting at O.

(iii) Draw COX 45 and produce XO to y.

(iv) With O as centre and radius $\frac{BD}{2}$ $\frac{4}{2}$ 2 cm cut arcs B and D on xy.

(v) Join AB, BC, CD and AD.
$ABCD$ is required parallelogram.

5.



Steps of construction

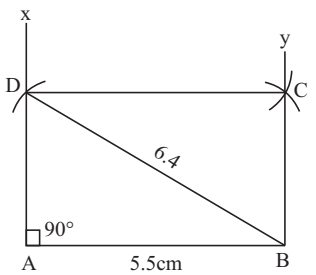
(i) Draw AB 6.3 cm.

(ii) Draw XAB 90 and YBA 90 .

(iii) With A as centre and radius 5.4 cm cut an arc D on AX.

(iv) With B as centre as radius 5.4 cm cut an arc C on BY.
Join CD
$ABCD$ is required Rectangle.

6.



Steps of construction

(i) Draw AB 5.5 cm.

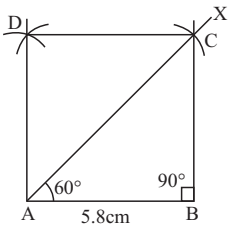
(ii) Draw XAB 90 .

(iii) With B as centre and radius 6.4 cm cut an arc D on AX.

(iv) With B as cut an arc.

(v) With D as centre and radius 5.5 cm cut the previous arc at C.
Join DC and BC
$ABCD$ is required rectangle.

7.



Steps of construction

(i) Draw AB 5.8 cm.

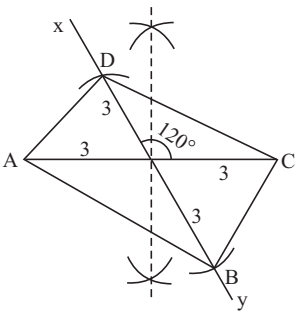
(ii) Draw BAX 60.

(iii) Draw ABC 90 meeting AX at C.

(iv) With C as centre and radius 5.8 cm cut an arc.

(v) With A as centre and radius equal to BC cut the previous arc at D.
Join AD and DC.
$ABCD$ is required rectangle.

8. Draw rough figure
Steps of construction



(i) Draw diagonal AC 6 cm.

(ii) Draw perpendicular bisector of AC meeting it at O.

(iii) Draw XOC 120 .

(iv) Produce XO to y.

(v) With O as centre and radius 3 cm cut arcs B and D on xy.
Join AD, DC, CB and AB.
$ABCD$ is required Rectangle.

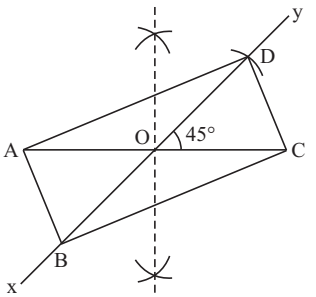
9. Steps of construction

(i) Draw diagonal AC 6.5 cm.

(ii) Draw perpendicular bisector of AC meeting it at O.

(iii) Draw COY 45 .

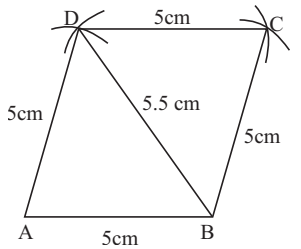
(iv) Produce YO to x.



(v) With O as centre and radius $\frac{AC}{2}$ cut arcs B and D on xy.

(vi) Join AB, BC, CD and AD.
$ABCD$ is required rectangle.

10.



Steps of constructions

(i) Draw AB 5 cm.

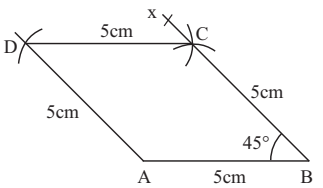
(ii) With A as centre and radius 5 cm cut an arc.

(iii) With B as centre and radius 5.5 cm cut the previous arc at D.

(iv) With D as centre and radius 5 cm cut an arc.

(v) With B as centre and radius 5 cm cut the previous arc at C.
Join AD, DC, BC and BD.
$ABCD$ is required rhombus.

11.



Steps of constructions

(i) Draw AB 5 cm.

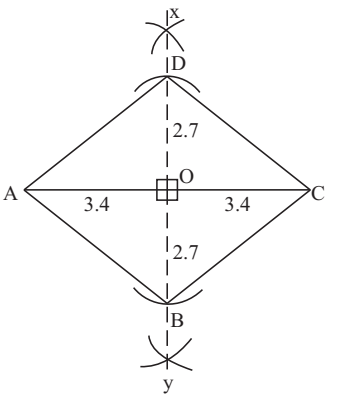
(ii) Draw XBA 45 .

(iii) With B as centre and radius 5 cm.

(iv) With C as centre and radius 5 cm cut an arc.

(v) With A as centre and radius 5 cm cut the previous arc at D.
Join AD, CD, BC.
$ABCD$ is required rhombus.

12.



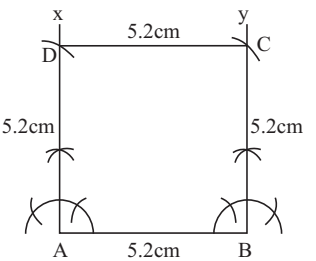
Steps of constructions.

(i) Draw diagonal AC 6.8 cm.

(ii) Draw perpendicular bisector of AC meetng AC at O.

(iii) With O as centre and radius $BD/2$ 2.7 cm cut arcs B and D on perpendicular bisector.
Join AD, DC, BC and AB.
$ABCD$ is required rhombus.

13.



Steps of constructions

(i) Draw AB 5.2 cm.

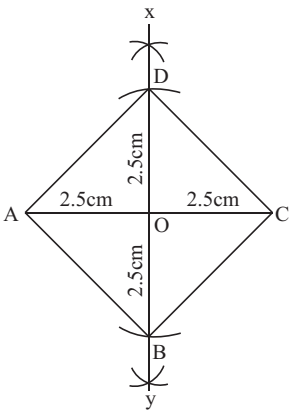
(ii) Draw YAB 90 .

(iii) Draw XBA 90 .

(iv) With A as centre and radius 5.2 cm cut an arc D on AY.

(v) With B as centre and radius 5.2 cm cut an arc C on BX.
Join CD
$ABCD$ is required square.

14.



Steps of constructions

(i) Draw diagonal AC 5 cm.

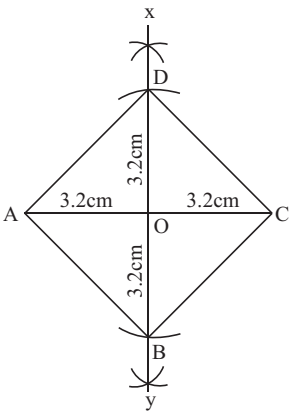
(ii) Draw perpendicular bisector of AC meeting it at O radius $\frac{BD}{2}$ 2.5

cut two arcs B and D on perpendicular bisector.

Join AD, DC, CB and AB.

$ABCD$ is required square.

15.



Steps of constructions

try yourself as Q. 14.

15 Area

Exercise 15.1

1. $AC^2 \quad AB^2 \quad BC^2$

$10^2 \quad AB^2 \quad 6^2$

$100 \quad AB^2 \quad 36$

$64 \quad AB^2$

$8^2 \quad AB^2$

$AB \quad 8\,\text{cm}$

Area of triangle $\frac{1}{2} \quad BC \quad AB$

$\frac{1}{2} \quad 6 \quad 8$

$24\,\text{cm}^2$

2. distance travelled by a girl

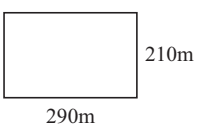
$2 \quad \text{perimeter}$

$2 \quad 2(l \quad b)$

$2 \quad 2(290 \quad 210)$

$4 \quad 500$

$2000\,\text{m}.$



time taken $\frac{d}{s} \quad \frac{2000}{1.5}$ seconds

$\frac{2000}{15}$

$\frac{20000}{15 \quad 60}$ min.

$22\frac{2}{9}$ min.

3. Area of cloth required

$2500 \quad (50 \quad 17)\,\text{cm}^2$

$2500 \quad 850\,\text{cm}^2$

$\frac{2500 \quad 850}{100 \quad 100}\,\text{m}^2$

$\frac{25 \quad 85}{10}$

$\because$ As of cloth $l \quad b$

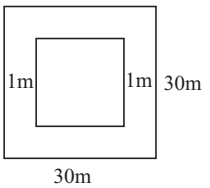
$\frac{25 \quad 85}{10} \quad l \quad 17$

$\frac{25 \quad \overset{5}{\cancel{85}}}{\underset{2}{\cancel{10}} \quad 7} \quad l$

$12.5\,\text{m} \quad l$

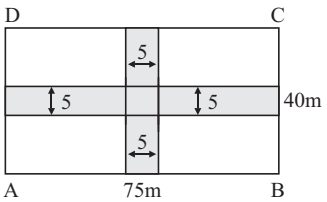
length of cloth requred is 12.5 m.

4. Side of inside square 30 (1 1)
28 m
Area of inside square 28 20 m^2
784 m^2



total cost of grassing ₹ 1176
Cost/m^2 of grassing $\frac{1176}{784}$
₹ 1.5

5.



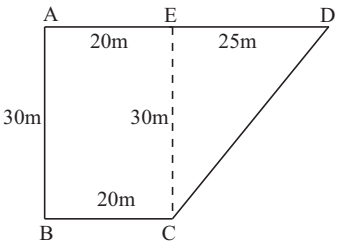
Area of Road
75 5 40 5 5 5
375 200 25
575 25
550 m^2
Cost of construction of Roads
₹ 150 550
₹ 82500

6. Area of shaded
= Area of Rectangle – Area of triangle
25 16 $\frac{1}{2}$ 16 10
400 80 320 m^2

7. **(i)** Let original length x
breadth y
Original Area xy
Now, length $2x$
Now, breatdh $2y$
Now, Area $2x$ $2y$
$4xy$
4 xy
= 4 (Original Area)
Now Area become 4 times.

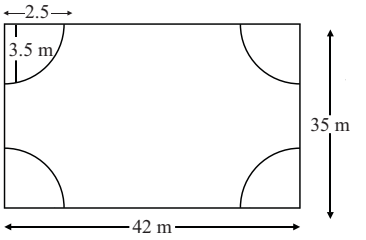
(ii) New length $\frac{x}{2}$
New breadth $2y$
New Area $\frac{x}{2}$ $2y$
xy
= Original Area
Area Remain the same.

8. Draw CE AD



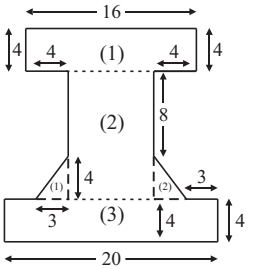
$ABCE$ is a Rectangle
AE BC 20 m
CE AD 30 m
ED 45 20 25 m
Area of Quadrilateral
= Area of Rectangle + Area of triangle
30 20 $\frac{1}{2}$ 25 30
600 375
975 m^2

9. Remaining Area



Area of Rectangle – Area of 4 Quadrant
l b 4 $\frac{r^2}{4}$
42 35 $\frac{22}{7}$ $(3.5)^2$
1470 38.5
1431.5 m^2
Cost of laying grass ₹ 1431.5 40
₹ 57260.

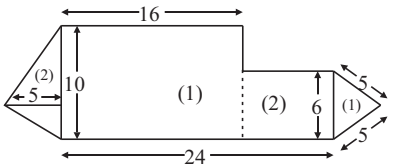
10. (i) Area of figure



Area of Rectangle (1) + Area of Rectangle (2) + Area of Rectangle (3) + Area of triangle (1) + Area of Triangle (2)

$$16 \quad 4 \quad 8 \quad 8 \quad 20 \quad 4$$
$$\frac{1}{2} \quad 3 \quad 4 \quad \frac{1}{2} \quad 3 \quad 4$$
$$64 \quad 64 \quad 80 \quad 6 \quad 6$$
$$220\,\text{m}^2$$

(ii)



For Area of triangle (1)

$$s \quad \frac{6 \quad 5 \quad 5}{2} \quad 8$$
$$A \quad \sqrt{s(s \quad a)(s \quad b)(s \quad c)}$$
$$\sqrt{8(8 \quad 6)(8 \quad 5)(8 \quad 5)}$$
$$\sqrt{8 \quad 2 \quad 3 \quad 3}$$
$$4 \quad 3$$
$$12$$

Total = Area of Rect. (1) + Area of Rect. (2) + Area of triangle (1) + Area of triangle (2)

$$16 \quad 10 \quad 8 \quad 6 \quad 12 \quad \frac{1}{2} \quad 10 \quad 5$$
$$150 \quad 48 \quad 12 \quad 25$$
$$245\,\text{cm}^2$$

Exercise 15.2

1. Given $d_1 \quad 24\,\text{cm}$ $d_2 \quad 10\,\text{cm}$

Side $\sqrt{\left(\frac{d_1}{2}\right)^2 \quad \left(\frac{d_2}{2}\right)^2}$

$$\sqrt{\left(\frac{24}{2}\right)^2 \quad \left(\frac{10}{2}\right)^2}$$
$$\sqrt{12^2 \quad 5^2} \quad \sqrt{169} \quad 13$$

Now = Area of Rhombus

$$\frac{1}{2} \quad d_1 \quad d_2$$
$$\frac{1}{2} \quad 24 \quad 10$$
$$= 120\,\text{cm}^2$$

Perimeter of Rhombus

$$= 4 \times \text{side}$$
$$4 \quad 13$$
$$52\,\text{cm.}$$

2. Area of Rhombus $\frac{1}{2} \quad d_1 \quad d_2$

$$300 \quad \frac{1}{2} \quad 40 \quad d_2$$
$$\frac{600}{40} \quad d_2$$
$$15\,\text{cm} \quad d_2$$

3. Area of Rhombus = base × height

$$96 \quad \frac{\text{Perimeter}}{4} \quad \text{height}$$
$$96 \quad \frac{64}{4} \quad \text{height}$$
$$96 \quad 16 \quad \text{height}$$
$$6\,\text{cm} = \text{height}$$

4. (i) Area of Trapezium $\frac{1}{2}(a \quad b) \quad h$

$$\frac{1}{2}(9 \quad 5) \quad 6$$
$$\frac{1}{2} \quad 14 \quad 6$$
$$7 \quad 6$$
$$42\,\text{cm}^2$$

(ii) Area of Trapezium $\frac{1}{2}(a \quad b) \quad h$

$$\frac{1}{2}(7.5 \quad 4.5) \quad 5$$
$$\frac{1}{2} \quad 12 \quad 5$$
$$30\,\text{cm}^2$$

(iii) Area of trapezium $\frac{1}{2}(a \quad b) \quad h$

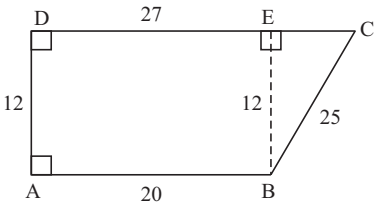
$\frac{1}{2}(10 \quad 8) \quad 12$

$\frac{1}{2} \quad 18 \quad 12$

$9 \quad 12$

$108\,\text{cm}^2$

5.



$BE \quad AD \quad 12\,\text{cm}$

$EC \quad CD \quad DE \quad 27 \quad 20 \quad 7$

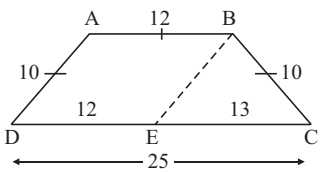
Area of Trapezium = Area of Rectangle + Area of triangle

$20 \quad 12 \quad \frac{1}{2} \quad 12 \quad 7$

$240 \quad 42$

$282\,\text{cm}^2$

6. Draw $BE \parallel AD$



$ABCD$ is a parallelogram

$AD \quad BE \quad 10$

opp. sides of parallelogram

for Area of BEC

$s \quad \frac{10 \quad 10 \quad 13}{2} \quad 16.5$

Area of BEC

$\sqrt{16.5\,(16.5 \quad 10)(16.5 \quad 10)(16.5 \quad 13)}$

$\sqrt{16.5 \quad 6.5 \quad 6.5 \quad 3.5}$

$6.5\sqrt{16.5 \quad 3.5}$

$6.5 \quad 7$

45.5

$\frac{1}{2} \quad EC \quad h \quad 45.5$

$\frac{1}{2} \quad 13 \quad h \quad 45.5$

$h \quad \frac{45.5 \quad 2}{13}$

$h \quad 7$

Area of trapezium $\frac{1}{2}(a \quad b) \quad h$

$\frac{1}{2} \quad (12 \quad 25) \quad 7$

$\frac{37 \quad 7}{2}$

$= 129.5\,\text{cm}^2$

7. Side $\sqrt{\left(\frac{d_1}{2}\right)^2 \quad \left(\frac{d_2}{2}\right)^2}$

$25 \quad \sqrt{\left(\frac{14}{2}\right)^2 \quad \left(\frac{d_2}{2}\right)^2}$

$25 \quad \sqrt{7^2 \quad \left(\frac{d_2}{2}\right)^2}$

$25^2 \quad 7^2 \quad \left(\frac{d_2}{2}\right)^2$

$625 \quad 49 \quad \left(\frac{d_2}{2}\right)^2$

$\sqrt{576} \quad \frac{d_2}{2}$

$24 \quad \frac{d_2}{2}$

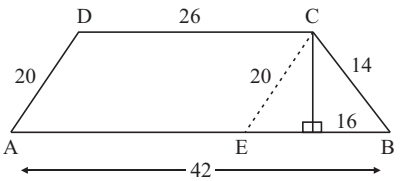
$48 \quad d_2$

Area of Rhombus $\frac{1}{2} \quad d_1 \quad d_2$

$\frac{1}{2} \quad 14 \quad 48$

$336\,\text{cm}^2$

8. Draw $CE \parallel AD$



$ADCE$ is a parallelogram

$EC \quad AD \quad 20$

$BE \quad 42 \quad 26 \quad 16$

for BEC

$$s \quad \frac{20 \quad 14 \quad 16}{2} \quad \frac{50}{2} \quad 25$$

Area of BEC

$$\sqrt{s(s \quad a)(s \quad b)(s \quad c)}$$

$$\sqrt{25(25 \quad 16)(125 \quad 14)(25 \quad 20)}$$

$$\sqrt{11583}$$

$$\sqrt{25 \quad 9 \quad 11 \quad 5}$$

$$\frac{1}{2} \quad BE \quad h \quad 5 \quad 3 \quad \sqrt{55}$$

$$\frac{1}{2} \quad 16 \quad h \quad 15\sqrt{55}$$

$$h \quad \frac{15}{8}\sqrt{55}$$

Area $\quad \frac{1}{2}(a \quad b) \quad h$

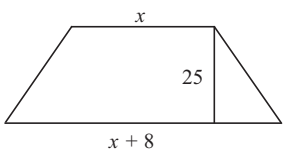
$$\frac{1}{2} \quad (42 \quad 26) \quad \frac{15}{8}\sqrt{55}$$

$$\frac{1}{2} \quad \overset{17}{\cancel{68}} \quad \frac{15}{8} \quad \sqrt{55}$$

$$\frac{17 \quad 15}{4}\sqrt{55}$$

$$21.25\sqrt{55}\ \text{cm}^2$$

9.



Let $a \quad x$

$b \quad x \quad 8$

Area $\quad \frac{1}{2}(a \quad b) \quad h$

$$400 \quad \frac{1}{2}(x \quad x \quad 8) \quad 25$$

$$400 \quad \frac{1}{2}(2x \quad 8) \quad 25$$

$$\frac{400 \quad 2}{25} \quad 2x \quad 8$$

$$16 \quad 2 \quad 2x \quad 8$$

$$24 \quad 2x$$

$$12 \quad x$$

parallel sides are 12 and $12 \quad 8$

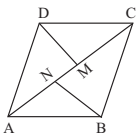
or $\quad 12$ cm and 20 cm

10. given

$AC \quad 28$

$BN \quad 6.8$

$DM \quad 8$ cm



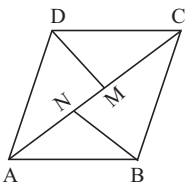
Area $\quad \frac{1}{2}(AC)[BN \quad DM]$

$$\frac{1}{2} \quad 28[6.8 \quad 8]$$

$$14\,(14.8)$$

$$= 207.2\ \text{cm}^2$$

11.



Let perpendiculars be $3x, 2x$

Area $\quad \frac{1}{2}AC\,(DM \quad BN)$

$$390 \quad \frac{1}{2} \quad 24\,(3x \quad 2x)$$

$$390 \quad 12\,(5x)$$

$$390 \quad 60x \qquad x \quad \frac{390}{60}$$

$$x \quad 6.5$$

perpendicular are $3x, 2x$

$= 3 \quad 6.5, 2 \quad 6.5$

$= 19.5$ cm, 13 cm

12. Area of Rhombus = Area of triangle

$$\frac{1}{2}d_1 \quad d_2 \quad \frac{1}{2} \quad \text{base} \quad ht$$

$$\frac{1}{2} \quad 22 \quad d_2 \quad \frac{1}{2} \quad 24.8 \quad 16.5$$

$$11d_2 \quad \frac{12.4 \quad 16.5}{11}$$

$$d_2 \quad 18.6\ \text{cm}$$

other diagonal = 18.6 cm

13. Let parallel sides be $7x, 5x$

$\because$ Area $\quad \frac{1}{2}(a \quad b) \quad h$

$$540 \quad \frac{1}{2}[7x \quad 5x] \quad 18$$

$540 \quad 2 \quad 12x \quad 18$

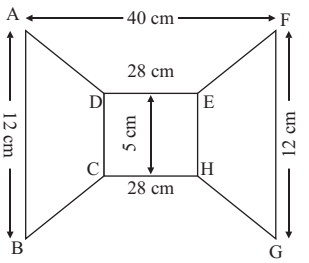
$\frac{540 \quad 2}{12 \quad 18} \quad x$

$5 \quad x$

parallel sides are $7 \quad 5, 5 \quad 5$

35 cm, 25 cm

14.



height of each trapezium is $\frac{(40 \quad 28)}{2}$

6 cm

Total Area is

$2 \times$ Area of Trapezium

+ Area of Rectangle

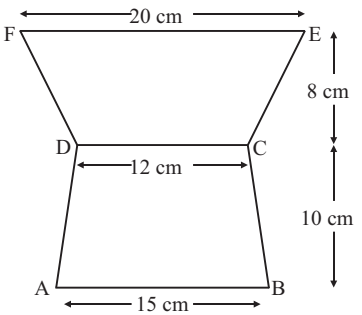
$2 \quad \frac{1}{2}(a \quad b) \quad h \quad l \quad b$

$(5 \quad 12) \quad 6 \quad 28 \quad 5$

$17 \quad 6 \quad 140$

$102 \quad 140 \quad 242\,\text{cm}^2$

(ii)



Total Area is

Area *ABCD* Area Trapezium *DCEF*

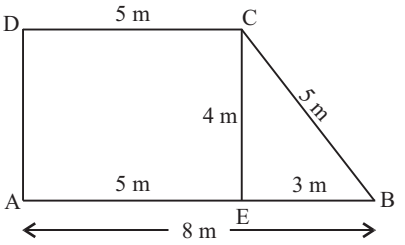
$\frac{1}{2}(15 \quad 12) \quad \cancel{10}^{5} \quad \frac{1}{\cancel{2}}(20 \quad 12) \quad \cancel{8}^{4}$

$27 \quad 5 \quad 32 \quad 4$

$135 \quad 128$

$263\,\text{cm}^2$

15. In *BCE*



$BC^2 \quad CE^2 \quad BE^2$

$5^2 \quad CE^2 \quad E^2$

$25 \quad 9 \quad CE^2$

$\sqrt{16} \quad CE$

$4\,\text{cm} \quad CE$

(i) Area *ABCD*

Area Rectangle + Area

$5 \quad 4 \quad \frac{1}{2} \quad 3 \quad 4$

$20 \quad 6$

$26\,\text{cm}^2$

(ii) Area Trapezium *ABCD*

$\frac{1}{2}(a \quad b) \quad h$

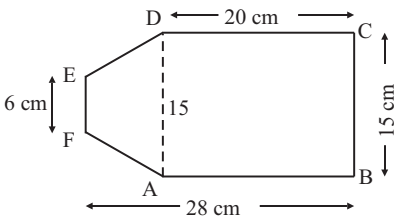
$\frac{1}{2}(8 \quad 5) \quad 4$

$13 \quad 2$

$26\,\text{cm}^2$

Exercise 15.3

1. (i)



Area of *ABCDEF*

Area *ABCD* Area of Trapezium *ADEF*

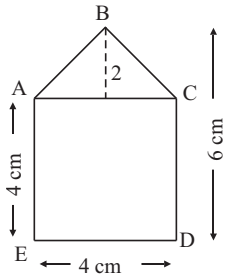
$15 \quad 20 \quad \frac{1}{2}(15 \quad 6) \quad 8$

$300 \quad 21 \quad 4$

$300 \quad 84$

$384\,\text{cm}^2$

(ii)

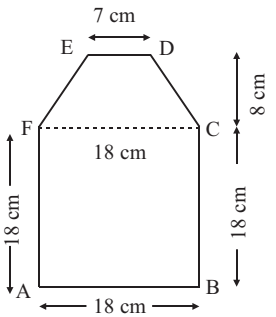


Area = Area *ABC* Area sq. *ACDE*

$\frac{1}{2}$ 4 2 4 4

4 16 20 cm

(iii)



Area *ABCDEF*

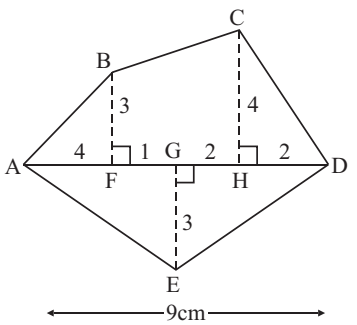
Area sq. *ABCF* Ar. Trapezium *FCDE*

18 18 $\frac{1}{2}$(18 7) 8

324 25 4

324 100 424 cm^2

2.



Area *ABCD*

Area *ACE* Area *ABF* Area *CHD* + Area *DGE* + Area Trapezium *FHCB*

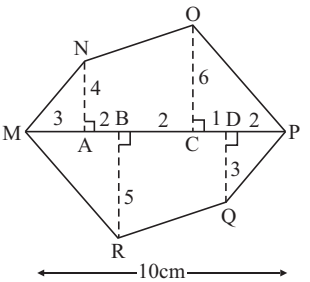
$\frac{1}{2}$ 3 5 $\frac{1}{2}$ 4 3 $\frac{1}{2}$ 4 2

$\frac{1}{2}$ 4 3 $\frac{1}{2}$(3 4) 3

7.5 6 4 6 10.5

34 cm^2

3.



Area of *MNOPQR*

Area *MNA* Area *MBR* + Area *OCP* + Area *PDQ* + Area Trapezium *MOCA* + Area Trapezium *RQDB*

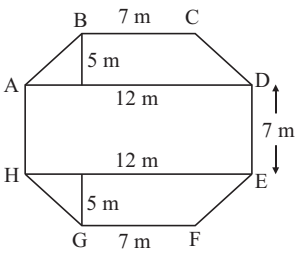
$\frac{1}{2}$ 3 4 $\frac{1}{2}$ 5 5 $\frac{1}{2}$ 6 3

$\frac{1}{2}$ 2 3 $\frac{1}{2}$(4 6) 4 $\frac{1}{2}$(5 3) 3

6 12.5 + 9 + 3 + 20 + 12

62.5 cm^2

4.



Area of *ABCDEFGH*

Area Trapezium *ABCD* Area Trapezium *GFEH* Area Rectangle

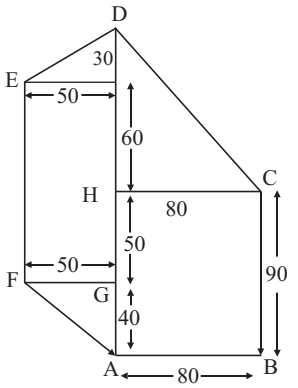
$\frac{1}{2}$(12 7) 5 $\frac{1}{2}$(12 7) 5 12 7

$\frac{1}{2}$ 19 5 $\frac{1}{2}$ 19 5 84

47.5 47.5 84

97 84 179 cm^2

5.



Area *ABCDEF*
Area *AFG* + Area *DEI* + Area *DHC* + Area Trapezium *FGIE* Ar Rectangle *ABCH*

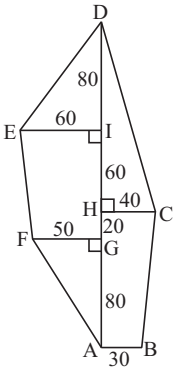
$\frac{1}{2}$ 40 50 $\frac{1}{2}$ 50 30 $\frac{1}{2}$ 80 90

$\frac{1}{2}(50 \quad 50)$ 110 90 80

1000 750 3600 5500 7200

18050 m^2

6.



Area *ABCDEF*
Area *DEI* Area *AFG* + Area *DHC* + Area Trapezium *FGIE* *ABCH*

$\frac{1}{2}$ 60 80 $\frac{1}{2}$ 80 50

$\frac{1}{2}$ 40 140 $\frac{1}{2}(60 \quad 50)$ 80

$\frac{1}{2}(40 \quad 30)$ 100

2400 2000 2800 4400 3500

15100 m^2

16 Volume and Surface Area

Exercise 16.1

1. Side (edge) of cube = 7 cm

(i) Volume = edge 7^3 343 cm^3

SA = 6 $edge^2$ 6 7^2 294 cm^2

diagonal $\sqrt{3}$ edge $\sqrt{3}$ 7

$7\sqrt{3}$cm

(ii) edge = 4.5 cm

Volume = $edge^3$ $= (4.5)^3$

91.125 cm^3

SA = 6 $edge^2$ 6 $(4.5)^2$

121.5 cm^2

diagonal $\sqrt{3}$ edge

$\sqrt{3}$ 4.5

$4.5\sqrt{3}$cm

2. diagonal $12\sqrt{3}$

$\sqrt{3}$ edge = $12\sqrt{3}$

edge = 12 cm

Volume of cube = $edge^3$

12^3 1728 cm^3

SA of cube = 6 $edge^2$

6 12^2 864 cm^2

3. SA of cube = 486

6 $edge^2$ = 486

$edge^2$ = 81

$edge^2$ = 9^2

edge = 9

Volume of cube = $edge^3$

9^3 729 cm^3

diagonal of cube $\sqrt{3}$ edge

$\sqrt{3}$ 9 $9\sqrt{3}$ cm

4. *l* 10 cm *b* 7 cm *ht* 8 cm

Volume *l* *b* *h*

10 7 8 560 cm^3

SA $21(lb \quad bh \quad hl)$
$2(10 \quad 7 \quad 7 \quad 8 \quad 10 \quad 8)$
$2(70 \quad 50 \quad 80)$
$412\,\text{cm}^2$

CSA $2h(l \quad b)$
$2 \quad 8(10 \quad 7)$
$16 \quad 17 \quad 272\,\text{cm}^2$

diagonal $\sqrt{l^2 \quad b^2 \quad b^2}$
$\sqrt{10^2 \quad 7^2 \quad 8^2}$
$\sqrt{100 \quad 49 \quad 64}$
$\sqrt{213}\text{cm}$

(ii) l 1.5 m b 90 cm h 70 cm
l 150 cm
$V \quad l \quad b \quad h$
$150 \quad 90 \quad 70$
945000cm^3

SA $2(lb \quad bh \quad hl)$
$2(150 \quad 90 \quad 90 \quad 70 \quad 70 \quad 150)$
$2(13500 \quad 6300 \quad 10500)$
$2(30300)$
$60600\,\text{cm}^2$

CSA $2h(l \quad b) \quad 2 \quad 70(150 \quad 90)$
$140(240)$
$33600\,\text{cm}^2$

diagonal $\sqrt{l^2 \quad b^2 \quad h^2}$
$\sqrt{150^2 \quad 90^2 \quad 70^2}$
$\sqrt{22500 \quad 8100 \quad 4900}$
$\sqrt{35500}$
$= 188.41$ cm

5. Volume of Cuboid = $448\,\text{cm}^3$
$l \quad b \quad h \quad 448$
Let $l \quad b \quad x$
$x \quad x \quad 7 \quad 448$
$x^2 \quad 7 \quad 448$
$x^2 \quad 64$
$x \quad \sqrt{64} \qquad x \quad 8$
side of square base = 8 cm.
$l \quad 8\,\text{cm}$ $b \quad 8\,\text{m}$ $h \quad 7\,\text{cm}$
SA $2(lb \quad bh \quad hl)$
$2(8 \quad 8 \quad 8 \quad 7 \quad 7 \quad 8)$
$2(64 \quad 56 \quad 56)$
$352\,\text{cm}^2$

6. Volume of one match box $l \quad b \quad h$
$4 \quad 2.5 \quad 1.5$
$15\,\text{cm}^3$
Volume of packet $144 \quad 15$
$2160\,\text{cm}^3$
Volume of Carton $150 \quad 80 \quad 60\,\text{cm}^3$
720000
No. of packets $\dfrac{720000}{2160}$
334 packets.

7. Volume of side 4 cm $4^3 \quad 64$
Volume of side 1 cm $1^3 \quad 1$
No. of small cubes cut $\dfrac{64}{1} \quad 64$

8. $V \quad l \quad b \quad h$
$2000 \quad 25 \quad 20 \quad h$
$\dfrac{2000}{25 \quad 20} \quad h$ (depth)
$4\text{m} \quad h$

9. Volume of cube of edge 3 cm = $3^3 \quad 27$
Volume of cube of edge $\dfrac{1}{2}$ cm
$\left(\dfrac{1}{2}\right)^3 \quad \dfrac{1}{8}$
No. of small cubes $\dfrac{27}{\frac{1}{8}}$
$27 \quad 28$
216

10. Volume of cube cuboid $12 \quad 9 \quad 6$
648
Volume of small cuboid $4 \quad 3 \quad 2 \quad 24$
No. of small cube $\dfrac{648}{24} \quad 27$

11. Volume of vessel 4.5 ht
$4.5 \quad 1000\,\text{cm}^3$
$l \quad b \quad h \quad 4500\,\text{cm}^3$
$30 \quad 25 \quad h \quad 4500$
$h \quad \dfrac{4500}{30 \quad 25}$
$h \quad 6\,\text{cm}$
Vessel hold water to the height of 6 cm.

12. External t 56 cm
b 39 cm
h 30 cm
Internal l 56 6 50 cm
b 39 6 33 cm
h 30 6 24 cm
Capacity of box = Internal volume
50 33 24
39600 cm^3
Volume of wood
= External volume – Internal volume
56 39 30 39600
65520 39600
25920 cm^3

13. External l 36 cm
b 25 cm
h 16.5 cm
Internal l 36 3 33
b 25 3 22
h 16.5 1.5 15
Volume of iron
= External volume – Internal volume
36 25 16.5 33 22 15
14850 10890
3960 cm^3
wt of box 3960 8.5 gm
33600 gm
or 33.66 kg

14. SA of cube = 150
6 $edge^2$ = 150
$edge^2$ = 25
$edge^2$ 5^2
edge = 5 cm
Volume of cube 5^3 125 cm^3

15. Volume of cube = 64 cm^3
$edge^3$ 4^3
edge = 4 cm
SA = 6 $edge^2$
6 4^2
6 16
96 cm^2

16. L.SA of cube = 144
4 $edge^2$ = 144
$edge^2$ = 36
$edge^2$ 6^2
edge = 6 cm
Volume of cube 6^3
216 cm^3

17. Let l $4x$ b $2x$ h $1x$
T.SA 2800
$2(lb \quad bh \quad hl)$ 2800
$2[4x \quad 2x \quad 2x \quad x \quad x \quad 4x]$ 2800
$2(8x^2 \quad 2x^2 \quad 4x^2)$ 2800
$2 \quad 14x^2$ 2800
x^2 100
x 10
l 4 10 40 cm b 2 10 20 cm
h 1 10 10 cm

18. Area of four walls $2h(l \quad b)$
2 3.5 [7.4 5.6]
7 13
91 m^2
Area of windows and doors
2(1.5 1) 2(1.5 2)
3 6
9
Area to be painted 91 9
82 m^2
Cost of painting 82 15
₹ 1230

Exercise 16.2

1. (i) r 7 cm h 50 cm
Volume of cylinder
r^2h
$\frac{22}{7}$ 7^2 50 7700 m^3
CSA $2 \; rh$ $2 \; \frac{22}{7}$ 7 50 2200 m^2
TSA $2 \; r(r \quad h)$
$2 \; \frac{22}{7}$ 7(7 50) 44 (57)
2508 m^2
(ii) r 5.6 m h 1.25 m
$V \quad r^2h \quad \frac{22}{7} \quad (5.6)^2 \quad 1.25$
123.2 m^3

CSA $2\ rh$

$2\ \frac{22}{7}\ 5.6\ \ 1.25\ \ 44\,\text{m}^2$

TSA $2\ r(r\ \ h)$

$2\ \frac{22}{7}\ 5.6\,(5.6\ \ 1.25)$

$2\ \ 22\ \ 0.8\,(6.85)$

$241.12\,\text{m}^2$

2. $r\ \ 7\,\text{m}\ h\ \ 20\,\text{m}$

Capacity $r^2 h$

$\frac{22}{7}\ \ 7^2\ \ \ 20\ \ \ 3080\text{m}^3$

$3080\,\text{kl}$ $(\because\ 1\,\text{m}^3 = 1\,\text{kl})$

Sheet required = TSA $2\ r(r\ \ h)$

$2\ \frac{22}{7}\ \ 7(7\ \ \ 28)$

$44\ \ (27)$

$1188\,\text{m}^2$

3. $r\ \ 7\,\text{cm}\ h\ \ 10\,\text{cm}$

CSA $2\ rh\ \ 2\ \frac{22}{7}\ \ 7\ \ 10\ \ 440\,\text{cm}^2$

TSA $2\ r(r\ \ h)$

$2\ \frac{22}{7}\ \ 7(7\ \ \ 10)$

$44\ \ 17\ \ \ 748\,\text{cm}^2$

Volume $r^2 h$

$\frac{22}{7}\ \ 7^2\ \ \ 10$

$1540\,\text{cm}^3$

4. Let $d_1\ \ 2x\ d_2\ \ 3x$

$r_1\ \ x\ r_2\ \ \frac{3}{2}x$

$V_1\ \ V_2$ (given)

$r_1^2 h\ \ \ r_2^2 h_2$

$r_1^2 h_1\ \ \ r_2^2 h_2$

$x^2 h_1\ \ \ \frac{3}{2}x\ \ ^2\ \ h_2$

$x^2 h_1\ \ \ \frac{9}{4}x^2 h_2$

$\frac{h_1}{h_2}\ \ \frac{9}{4}\qquad h_1 : h_2\ \ \ 9:4$

5. Let $r_1\ \ \ 2x\ r_2\ \ \ 3x$ and $h_1\ \ \ 5y\ h_2\ \ \ 4y$

$\frac{V_1}{V_2}\ \ \frac{r_1^2 h_1}{r_2^2 h_2}$

$\frac{(2x)^2\ \ \ 5y}{(3x)^2\ \ \ 4y}$

$\frac{4x^2\ \ \ 5y}{9x^2\ \ \ 4y}$

$\frac{V_1}{V_2}\ \ \frac{5}{9}$

6. CSA = 264 Volume = 924

$2\ rh\ \ \ 264\ (1)\qquad r^2 h\ \ \ 924\ (2)$

divide (2) by (1)

$\frac{r^2 h}{2\ rh}\ \ \frac{924}{264}$

$\frac{r}{2}\ \ \frac{924}{264}$

$\frac{r}{2}\ \ 3.5$

$r\ \ 7\,\text{cm}$ put in (1)

$2\ r(7)\ \ \ 264$

$2\ \frac{22}{7}\ \ r\ \ \ 7\ \ \ 264$

$r\ \ \frac{264}{44}$

$r\ \ 6\,\text{cm}$

7. Let $r_1\ \ \ 4x\ r_2\ \ \ 5x$ and $h_1\ \ \ 5y,\ h_2\ \ \ 6y$

$\frac{V_1}{V_2}\ \ \frac{r_1^2 h_1}{r_2^2 h_2}$

$\frac{(4x)^2\ \ \ 5y}{(5x)^2\ \ \ 6y}$

$\frac{\overset{8}{\cancel{16}}x^2\ \ \ \cancel{5}y}{\underset{5}{\cancel{25}}x^2\ \ \ \underset{3}{\cancel{6}}y}$

$\frac{V_1}{V_2}\ \ \frac{8}{15}$

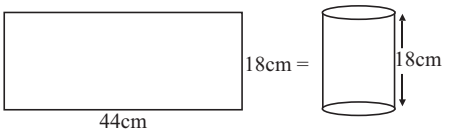
$8:15$

8. Circumference of base = 44

$2\ r\ \ \ 44$

$2\ \frac{22}{7}\ \ r\ \ \ 44$

$r\ \ \ 7$



ht of cylinder = 18 cm

Volume of cylinder $r^2 h$

$\frac{22}{7}$ 7^2 18

2772 cm^3

9. V 6538

$r^2 h$ 6538

$\frac{22}{7}$ r^2 28 6538

r^2 $\frac{6538 \quad 7}{22 \quad 84}$

r^2 72.25

r $\sqrt{72.25}$

r 8.5

CSA 2 rh

2 $\frac{22}{7}$ 8.5 28

1496 cm^2

10. r 24 m h 7 m

CSA of 1 pillar 2 rh

2 $\frac{22}{7}$ 24 7

1056

CSA of 15 pillars 1056 15

15840 m^2

Cost of painting ₹ 2.50 × 15840

₹ 39600

11. Volume of cube = Volume of wire

edge^3 $r^2 h$

$(2.2)^3$ $\frac{22}{7}$ $\left(\frac{1}{10}\right)^2$ h

$\frac{(2.2)^3 \quad 7 \quad 100}{22}$ h

338.8 cm h

338.8 cm h (length of wire)

12. h 1 m V 15.4 l

= 100 cm 15.4 1000 cm^3

15400 cm^3

V $r^2 h$

15400 $\frac{22}{7}$ r^2 100

$\frac{154 \quad 7}{22}$ r^2

49 r^2

7 cm r

Sheet required = TSA of cyclinder

2 $r(r \quad h)$

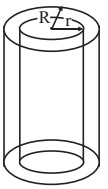
2 $\frac{22}{7}$ 7(7 100)

44 107

4708 cm^2

= 0.4708 m^2

13. R $\frac{28}{2}$ r $\frac{14}{2}$



R = 14 cm, r = 7 cm

h 1 m

= 100 cm

Area to be painted

Outer CSA + Inter (CSA) + (Ar of Ring)

2 rh 2 rh 2 $(R^2 \quad r^2)$

2 $[Rh \quad rh \quad (R^2 \quad r^2)]$

2 $\frac{22}{7}[14 \quad 100 \quad 7 \quad 100 \quad (196 \quad 49)]$

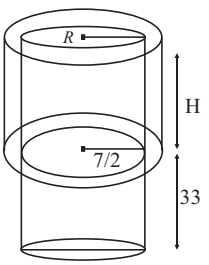
$\frac{44}{7}$ (2247) 14124 cm^2

Cost of painting = 10 14124

₹ 141240

3.5

14. r $\frac{7}{2}$ R $\frac{7}{2}$ 2 5.5



Vol. of earth dug Vol. of Embankment

$r^2 h$ $H(R^2 \quad r^2)$

$(3.5)^2 \quad 33 \quad H[(5.5)^2 \quad (3.5)^2]$

$12.25 \quad 33 \quad H[30.25 \quad 12.25]$

$12.25 \quad 33 \quad H(18)$

$$\frac{12.25 \quad 33}{18} \quad H$$

22.45 m = H

15. (i) CSA = $2 \quad RH$

New height $2H$

New CSA = $2 \quad R(2H)$

$(2 \quad RH)$

2(CSA)

Now CSA becomes 2 times.

(ii) New height = $2H$

New radius $\frac{R}{2}$

New CSA $2 \quad \frac{R}{2} \quad (2H)$

$2 \quad RH$

= CSA

CSA remain the same.

Exercise 16.3

1. $r \quad 3.5 \; h \quad 12\,\text{cm}$

(i) $l \quad \sqrt{h^2 \quad r^2}$

$\sqrt{(3.5)^2 \quad 12^2}$

$\sqrt{12.25 + 144}$

$\sqrt{156.25}$

12.5 cm

Volume $\frac{1}{3} \quad r^2 h$

$\frac{1}{3} \quad \frac{22}{7} \quad (3.5)^2 \quad 12$

$154\,\text{cm}^3$

CSA rl

$\frac{22}{7} \quad 3.5 \quad 12.5$

$137.5\,\text{cm}^2$

TSA $r(r \quad l)$

$\frac{22}{7} \quad 3.5\,(3.5 \quad 12.5)$

$\frac{22}{7} \quad 3.5 \quad 16$

$176\,\text{cm}^2$

2. $r \quad 12\,\text{cm} \; h \quad 16$

$l \quad \sqrt{r^2 \quad h^2}$

$\sqrt{12^2 \quad 16^2}$

$\sqrt{400} \quad 20$ cm

CSA $rl \quad \frac{22}{7} \quad 12 \quad 20 \quad 754.28\,\text{cm}^2$

TSA $r(r \quad l) \quad \frac{22}{7} \quad 12 \quad (12 \quad 10)$

$\frac{22}{7} \quad 12 \quad 32$

$= 1206.85\,\text{cm}^2$

3. $r \quad 12\,\text{m} \; h \quad 9\,\text{m} \quad l \quad \sqrt{12^2 \quad 9^2} \quad 15$

Area of canvas rl

$\frac{22}{7} \quad 12 \quad 15$

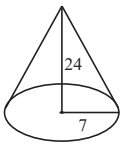
$= 565.71\,\text{m}^2$

Cost of Canvas

= ₹ 565.71 120

₹ 67824.

4. $r \quad 7\,\text{cm} \; h \quad 24$ cm



$l \quad \sqrt{h^2 \quad r^2}$

$\sqrt{24^2 \quad 7^2}$

$\sqrt{576 \quad 49}$

$\sqrt{625} \quad 25\,\text{cm}.$

Area of 1 cap rl

$\frac{22}{7} \quad 7 \quad 25 \quad 550\,\text{cm}^2$

Area of 10 caps $550 \quad 10$

$5500\,\text{cm}^2$

5. $l \quad 12\,\text{cm}$ CSA = 113.04

$rl \quad 113.04$

$\frac{22}{7} \quad r \quad 12 \quad 113.04$

$r \quad \frac{113.04 \quad 7}{22 \quad 12}$

$r \quad 3\,\text{cm}$

6. Volume cone = Volume of cylinder

$\frac{1}{3}\ r^2h \quad r^2h_2$

$\frac{1}{3}h \quad h_2$

$\frac{1}{3}h \quad 7$

$h \quad 21\text{cm}$

Volume of cone is 21 cm.

7. $r \quad 35\text{ cm}\ h \quad 12\text{ cm}$

Volume of cone $\frac{1}{3}\ r^2h$

$\frac{1}{3}\ \frac{22}{7}\ 35^2 \quad 12$

15400 cm^3

Volume of cone

$15400 \quad 9\text{ gm}$

138600 gm

$= 138.6\text{ kg}$

8. Volume of cone $\frac{1}{3}\ r^2h$

Volume of cylinder r^2h

$\frac{\text{Volume of cylinder}}{\text{Volume of cone}} \quad \frac{r^2h}{\frac{1}{3}\ r^2h}$

$\frac{3}{1}$

Volume of cylinder : Volume of cone = 3 : 1.

9. Volume of cone $\frac{1}{3}\ r^2h$

New radius $2r$

New height $3h$

New Volume $\frac{1}{3}\ (2r)^2\ (3h)$

$\frac{1}{3}\ (4r^2)\,3h$

$12\ \frac{1}{3}\ r^2h$

12 (Volume of cone).

New volume become 12 times of original volume.

10. Let $h_1 \quad 1x \quad h_2 \quad 3x$

Let $d_1 \quad 2y \quad d_2 \quad 3y$

$r_1 \quad y \quad r_2 \quad \frac{3y}{2}$

$\frac{V_1}{V_2} \quad \frac{\frac{1}{3}\ r_1^2h_1}{\frac{1}{3}\ r_2^2h_2} \quad \frac{y^2 \quad 1x}{\frac{3y}{2} \quad 3x}$

$\frac{y^2 \quad x}{\frac{9y^2}{3} \quad 3x}$

$\frac{V_1}{V_2} \quad \frac{4}{27}$

$V_1 : V_2 \quad 4 : 27$

Exercise 16.4

1. $r \quad 2.1\text{ cm}$

$V \quad \frac{4}{3}\ r^3$

$\frac{4}{3}\ \frac{22}{7}\ (2.1)^3$

38.808 cm^3

CSA $4\ r^2 \quad 4\ \frac{22}{7}\ (2.1)^2$

55.44 cm^2

2. $r \quad 6.3$

$V \quad \frac{2}{3}\ r^3 \quad \frac{2}{3}\ \frac{22}{7}\ (6.3)^3$

523.90 cm^3

CSA $2\ r^2 \quad 2\ \frac{22}{7}\ (6.3)^2$

249.48 cm^2

3. Volume 38808

$\frac{4}{3}\ r^3 \quad 38808$

$\frac{4}{3}\ \frac{22}{7}\ r^3 \quad 38808$

$r^3 \quad \frac{38808 \quad 21}{4 \quad 22}$

$r^3 \quad 9261$

$r^3 \quad 21^3$

$r \quad 21$

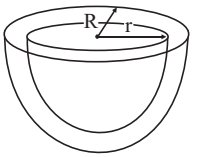
CSA $4\ r^2$

$4\ \frac{22}{7}\ 21^2$

$4 \quad 22 \quad 21 \quad 3$

CSA of ball = 5544 cm^2

4. R 3.5 cm r 2.8 cm



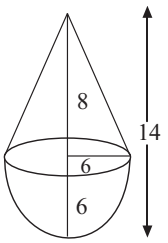
Area to be tin plated

$$2R^2 \quad 2r^2 \quad (R^2 \quad r^2)$$
$$[2R^2 \quad 2r^2 \quad (R^2 \quad r^2)]$$
$$(3R^2 \quad r^2)$$
$$\frac{22}{7}[3 \quad (3.5)^2 \quad (2.8)^2]$$
$$\frac{22}{7}[36.75 \quad 7.84]$$
$$= 140.14 \text{ cm}^2$$

Cost of tin plating ₹ $\frac{15}{100}$ 140.14

₹ 21.02

5. Area to be pointed



$$l \quad \sqrt{6^2 \quad 8^2}$$
$$\sqrt{100}$$
$$l \quad 10$$

Area to be painted $2r^2 \quad rl$

$$r(2r \quad l)$$
$$\frac{22}{7} \quad 6[2 \quad 6 \quad 10]$$
$$\frac{22}{7} \quad 6 \quad 22$$
$$= 414.85 \text{ cm}^2$$

Cost of painting 414.85 12

₹ 4978.28

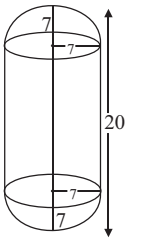
6. Height of cylinder 20 (7 7)

6

Capacity of tank

= volume of cylinder + 2 (vol of sphere)

$$r^2h \quad 2\frac{2}{3} \quad r^3$$
$$r^2 \quad h \quad \frac{4}{3}r$$
$$\frac{22}{7} \quad 7^2 \quad 6 \quad \frac{4}{3} \quad 7$$
$$\frac{22}{7} \quad 49 \quad 6 \quad \frac{28}{3}$$
$$\frac{22}{7} \quad 49 \quad \frac{18 \quad 28}{3}$$
$$\frac{22}{7} \quad 49 \quad \frac{46}{3}$$
$$= 361.33 \text{ m}^3$$



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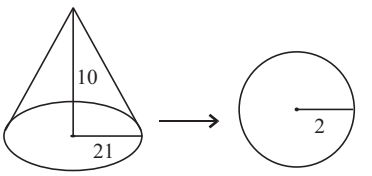
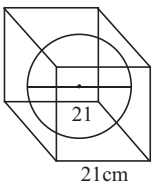


Volume of cone = Volume of n spheres

$$\frac{1}{3} \quad r^2h \quad n \quad \frac{4}{3} \quad r^3$$
$$21^2 \quad 10 \quad n \quad 4 \quad 2^3$$
$$\frac{21 \quad 21 \quad 10}{4 \quad 8} \quad n$$
$$137 \text{ balls} \quad n$$

8. Largest sphere is of diameter equal to side of cube



d 21

r 10.5

Volume of sphere

$$\frac{4}{3} \quad r^3$$
$$\frac{4}{3} \quad (10.5)^3 \quad \frac{4}{3} \quad \frac{22}{7} \quad (1.05)^3$$
$$4851 \text{cm}^3$$

Volume of cube = Side^3 21^3

$= 9261$

Volume of remaining solid

$= 9261 \quad 4851$

$4410\,\text{cm}^3$

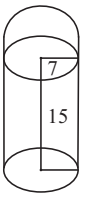
9. Volume of solid = Volume of Cylinder + Volume of hemisphere

$$r^2 h \quad \frac{2}{3} \quad r^3$$

$$r^2 \quad h \quad \frac{2}{3} r$$

$$\frac{22}{7} \quad 7^2 \quad 15 \quad \frac{2}{3} \quad 7$$

$$22 \quad 7 \quad 15 \quad \frac{14}{3}$$



$$22 \quad 7 \quad \frac{45 \quad 14}{3}$$

$$\frac{22 \quad 7 \quad 59}{3}$$

$= 3028.66\,\text{cm}^3$

10. $V_1 \quad \frac{4}{3} \quad r^3$

New r becomes $2r$

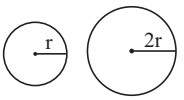
$$V_2 \quad \frac{4}{3} \quad (2r)^3$$

$$\frac{4}{3} \quad 8r^3$$

$$8 \quad \frac{4}{3} \quad r^3$$

$$8V_1$$

Volume becomes 8 times of its original volume.



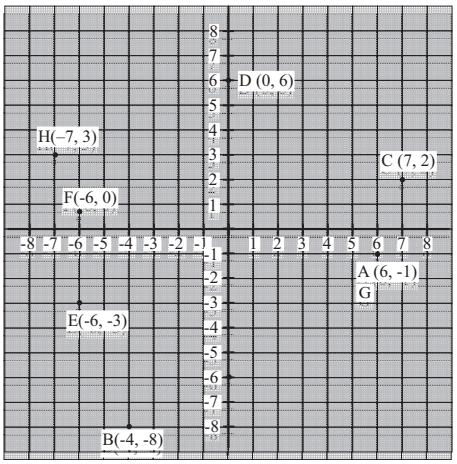
17 Coordinate System and Graphs

Exercise 17.1

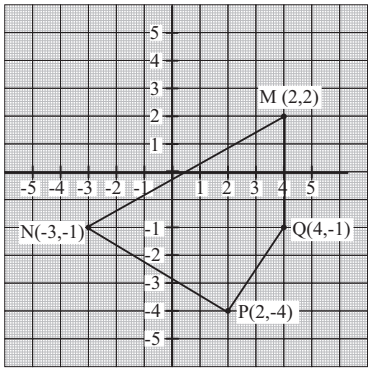
1. $A\,(2,21)\,D\,(\ 3,1)\,C\,(\ 3,\ \ 2)\,B\,(1,\ \ 2)$

2. (i) (4, 3) III Quadrant (ii) (7 6) IV Quadrant (iii) (12,10) II Quadrant (iv) (8, 3) I Quadrant (v) (8,15) II Quadrant (vi) (1, 11) III Quadrant (vii) $(3,4)$ I Quadrant (viii) ($5,7$) II Quadrant

3.



4. Quadrilateral *MNPQ* is obtained

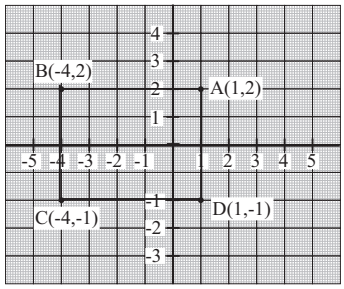


5. Mid point of ($5,4$) and (3, 2) is

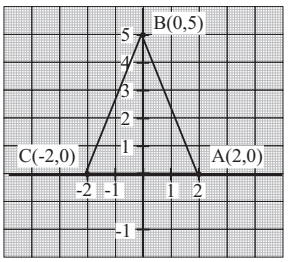
$$\frac{5 \quad 3}{2}, \frac{4 \quad 2}{2} \quad (\ 1,3)$$

6. Rectangle is obtained and Area

$5 \quad 3 \quad 15$ sq units



7. Isosceles triangle is obtained



8. Yes (4.5, 0) lies on *x*-axis
(i) False (ii) False (iii) True (iv) False (v) False (vi) True (vii) True (viii) False.

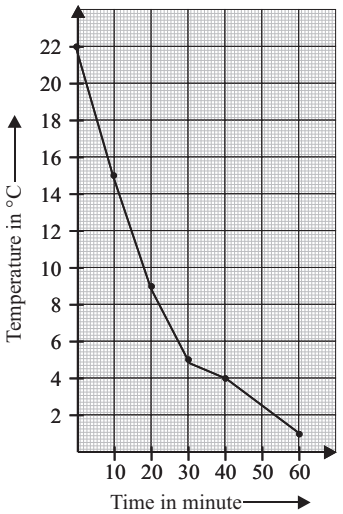
Exercise 17.2

1. (i) 101°F (ii) 12 a..m. (iii) 10 am to 11 am.

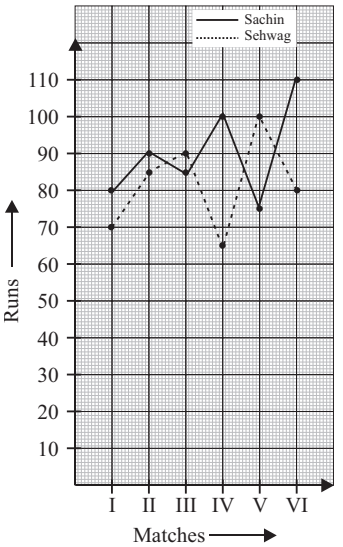
2. (i) May (ii) July (iii) 500 fans.

3. (i) 3 pm (ii) 1 pm to 3 pm (iii) Total distance travelled = 180 180 360 km

4. (i) Yes it is a curve.
(ii) After 5 minutes temperature is 19°C
(iii) After 15 minutes temperature was 12°C



5.



6. (i) Speed from 0 to 10 seconds $\frac{30}{10}$ 3 m/s

(ii) 15 seconds to 20 seconds speed is zero

(iii) At 20th second speed is abruptly too high.

(iv) Total distance travelled
30 30 30 90 m

7. (i) Speed from 0 to 2 seconds $\frac{0}{2}$ 2 m/s

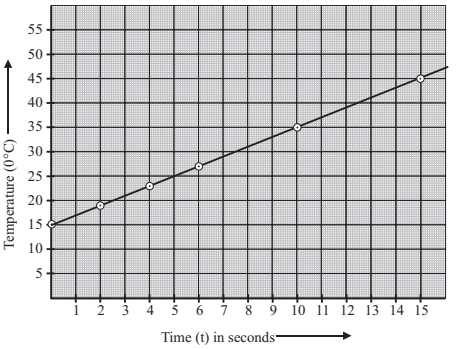
(ii) Speed from 2 to 4 seconds
$\frac{40}{2}$ 20 m/s

(iii) Speed from 4 to 8 seconds
$\frac{20}{4}$ 5 m/s

(iv) Average speed from 0 to 8
$\frac{\text{total distance}}{\text{total time}}$
$\frac{60}{8}$ m/s
$\frac{15}{2}$ m/s = 7.5 m/s

8. (i) Temperature after 5 seconds is 25°C

(ii) Temperature after 12 seconds is 39°C



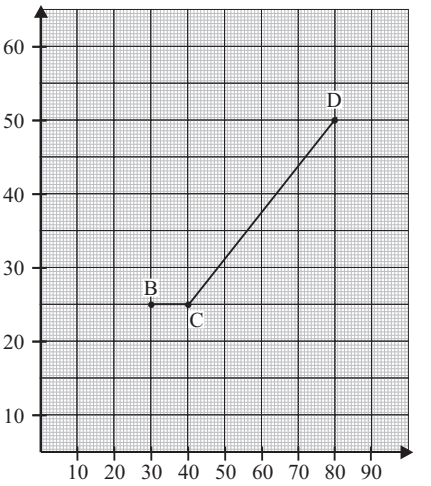
(iii) After 12.5 second temperature is 40°C

(iv) t 120 sec If T 55 C

9. Distance travelled in first 30 minutes

$$\frac{1}{2} \quad 50$$

25 km



(i) Total distance travelled is 50 km

(ii) Average speed = $\frac{\text{total distance}}{\text{total time}}$

$\frac{50\,\text{km}}{80\,\text{min}}$

$\frac{50000}{80 \quad 60}$ m/s

$\frac{500}{48}$ m/s or 37.5 km/hr

18 Data Handling

Exercise 18.1

1. (i) Class size : Difference between upper limit and lower limit is known as class size.

(ii) Class mark : Mid point of class interval is called class mark.

(iii) Frequency of a class : Number of observation of a class is called frequency of a class.

2. (i) Class size is 10.

(ii) Lower limit of 30-40 is 30

(iii) Upper limit of 40-50 is 50

(iv) Class mark of 20-30 is $\frac{30 \quad 20}{2}$ 25

(v) Frequency of 10-20 is 90

3. (i)

Class interval	Tally Mark	Frequency
0-10	||	2
10-20	𝍸	5
20-30	𝍸 |	6
30-40	𝍸 |	6
40-50	𝍸 |	6
		25

(ii) Second class is 10-20, width is 10 lower limit is 10 and upper limit is 20 class mark is 15.

(iii) Fourth class is 30-40, width is 10 lower limit is 30. Upper limit is 40 class-mark is 35.

4.

Class Interval	Tally mark	Frequency
0-5	𝍸 𝍸 ||	12
5-10	𝍸 | |	7
10-15	||||	4
15-20	||	2
20-25	|||	3
25-30	|	1
30-35	|	1

5.

Class interval	Tally mark	Frequency
10-15	|	1
15-20	𝍸 𝍸 |||	13
20-25	𝍸 𝍸 𝍸 𝍸 |	21
25-30	|||	3
30-35	||	2

6.

Class interval	Tally mark	Frequency
100-110		0
110-120	||	2
120-130	||	2
130-140	|	1
140-150	||||	4
150-160	||	2
160-170	||	2
170-180	||	2
180-190	|	1
190-200	|	1
		20

7.

Class interval	Tally mark	Frequency
600-640	|||	3
640-680	|||	3
680-720	||	2
720-760	|||	3
760-800	||	2
800-840	|||	3
840-880	||	2
880-920	||	2
		20

Exercise 18.2

1. (i) Class size is 10

(ii) Students got less than 50% marks 4 8 6 12 8 38

(iii) Student got more than 40% but less than 60% marks 8 16 24

(iv) Students got more than 80% marks 4 4 8

(v) Students got marks between 12 8 20

(vi) Students failed 12 6 8 4 30

2. (i) Total workers
= 4 + 6 + 10 + 12 + 8 + 6= 46

(ii) Maximum workers are in income group of ₹ 2500 to ₹ 3000

(iii) Minimum workers are in income group of ₹ 1000 to ₹ 1500

(iv) Total works in ₹ 2000 to ₹ 3000
10 12 22

3. (i) Students getting less than ₹ 200 as pocket

(i) Money 30 20 10 60

(ii) Students getting more than ₹ 300 pocket money 5 5 10

(iii) Students getting less than ₹ 150 pocket money 10 20 30

(iv) Maximum number of students getting pocket money between ₹ 150 to ₹ 200

(v) Students getting between ₹ 200 and ₹ 300 25 15 40

4. (i) Total employees 6 4 10 8
30

(ii) Class size is 5

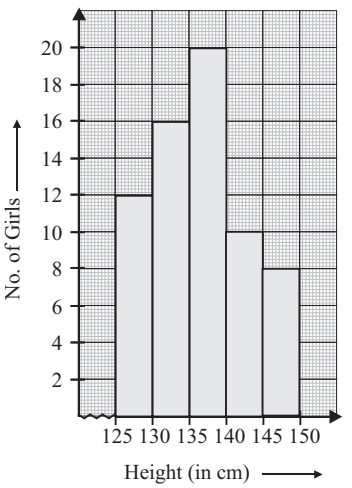
(iii) Maximum number of employees are in income group of (20 to 25) thousand

(iii) Minimum number of employees are in income group of (15-20) thousand

(v) Number of employees in the salary group of ₹ (10 to 20) thousand is 6

(vi) Histogram is showing number of employees in different salary group.

5.



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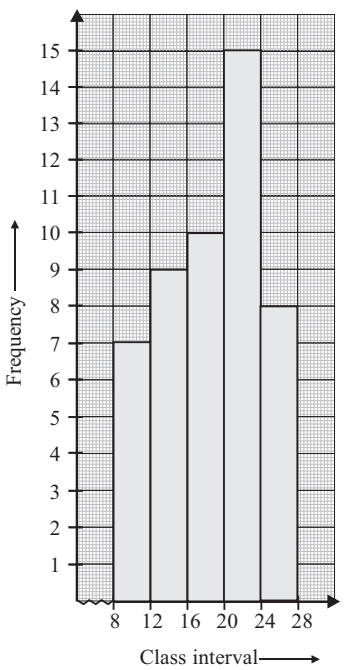

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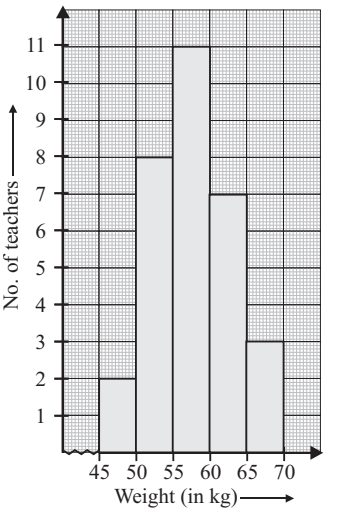

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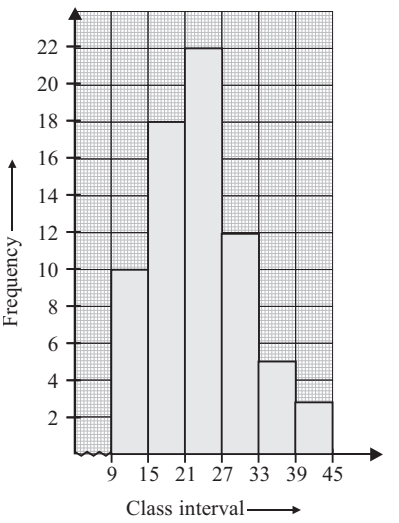


Exercise 18.3

1. (i) On studies Neha spent half of her time

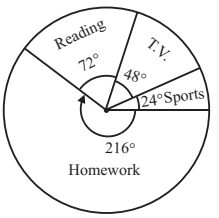
(ii) In games and Laboratory Neha spent one fourth of the time

(iii) Assembly take minimum time

(iv) Neha spend $\frac{5}{2}$ hours in studies

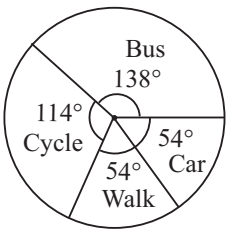
2.

Activity	Time spent	Central angle
Reading	1	$\frac{1}{5}$ 360 72
Homework	3	$\frac{3}{5}$ 360 216
T.V.	$\frac{40}{60}$	$\frac{\cancel{40}^{8}}{\cancel{60}\ \cancel{5}}$ $\cancel{360}^{6}$ 48
Sports	$\frac{20}{60}$	$\frac{\cancel{20}^{4}}{\cancel{60}\ \cancel{5}}$ $\cancel{360}^{6}$ 24



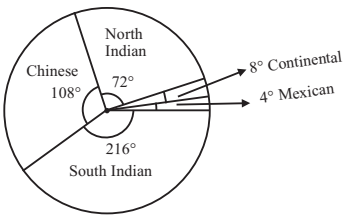
3.

Mode	No. of students	Central angle
Bus	115	$\frac{115}{300}$ 360 138
Car	45	$\frac{45}{300}$ 360 54
Cycle	95	$\frac{95}{300}$ 360 114
Walk	45	$\frac{45}{300}$ 360 54



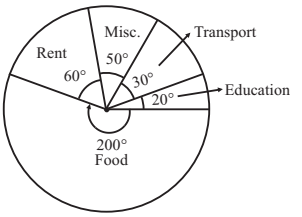
4.

Cuisine	No. of people	Central angle
North Indian	24	$\frac{24}{120}$ 360 72
Chinese	36	$\frac{36}{120}$ 360 108
South Indian	48	$\frac{48}{120}$ 360 144
Continental	6	$\frac{6}{120}$ 360 18
Mexican	6	$\frac{6}{120}$ 360 18



5.

Item	Spent	Central angle
Rent	2400	$\frac{2400}{14400}$ 360 60
Food	8000	$\frac{8000}{14400}$ 360 200
Educatio n	800	$\frac{800}{14400}$ 360 20
Transport	1200	$\frac{1200}{14400}$ 360 30
Miscella-neous	2000	$\frac{2000}{14400}$ 360 50



6. (i) Amount spent cricket $\frac{150}{360}$ 72000

150 200

₹ 30000

(ii) Amount spent on hockey

$\frac{100}{360}$ 72000

100 200

₹ 20000

Amount spent on football $\frac{60}{360}$ 72000

60 200

= ₹ 12000

Amount spent more on hockey

20000 12000

₹ 8000

(iii) On Tennis minimum amount is spent.

(iv) $\frac{\text{Tennis}}{\text{Football}}$ $\frac{50}{60}$ $\frac{5}{6}$ or 5 : 6

7. (i) Learnt tabla $\frac{78}{360}$ 300 65

(ii) Learnt violin $\frac{90}{360}$ 300 75

(iii) Learnt Guitar $\frac{90}{360}$ 300 75

(iv) other than piano

(360 78 90 90 36)

(360 296) 640

$\frac{66}{360}$ 300 55

❑