speed = 54 km/hr

$= 354 \times \frac{5}{18}$ m/s

$= 15$ m/s

$\therefore$ time taken to cross the tunnel

$= \frac{d}{s} = \frac{720}{15}$ sec.

$= 48$ seconds

7. Distance travelled by train $= 16 + 200$

$= 360$ m

time = 18 sec.

$\therefore$ speed of train $= \frac{d}{s} = \frac{360}{18}$ m/s

$= 20$ m/s

$= 20 \times \frac{18}{5}$ km/hr

$= 72$ km/hr

8. In 1 hours tap till the tap $= \frac{1}{7}$

1 hours tap emptied tap $= \frac{1}{9}$

In 1 hours tap A and B till the take

$= \frac{1}{7} - \frac{1}{9}$

$= \frac{9-7}{63}$

Take $= \frac{2}{63}$

Take can fill $\frac{63}{2}$ hours

Time taken tank fill $31\frac{1}{2}$ hours

MCQs

1. (a) **2.** (c) **3.** (b) **4.** (b) **5.** (d)

Mental Maths

1. $\frac{5}{18}, \frac{18}{5}$

2. Distance = speed $\times$ time

3. $\frac{96}{12} \times 5 =$ ` 40

4. $\frac{1}{10}$

5. $\frac{7.2}{6} \times 3 = 3.6$ kg

6. 90 km

7. directly

12 Quadrilaterals

Exercise 12.1

1. $\because \quad \angle P + Q + \angle R + \angle S = 360°$

$\therefore \quad 60 + 70 + 120 + \angle S = 360°$

$250 + \angle S = 360$

°

$\angle S = 110°$

2. Let equal angles be x

$\therefore \quad x + x + x + 90 = 360$

$3x + 90 = 360$

$3x = 270$

$x = 90$

$\therefore$ each equal angle = 90°

3. Let equal angles be = x

one angle of a quadrilateral = 120°

$\therefore \quad x + x + x + 120 = 360°$

$3x = 360° - 120°$

$3x = 240°$

$x = 80°$

$\therefore$ Each equal angle = 80°

4. Let equal angles be x

$\therefore \quad x + x + 115° + 45 = 360$

$2x + 160 = 360$

$2x = 200$

$x = 100°$

$\therefore$ each equal angles are 100.

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

$\therefore \quad 1x + 2x + 3x + 4x = 360$

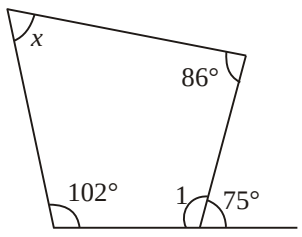
$10x = 360$

$x = 36$

$\therefore \angle s$ are $1 \times 36, 2 \times 36, 3 \times 36, 4 \times 36$

36°, 72°, 108°, 144°

6. $\angle 1 = 180 - 75°$ (Linear Pair)



$\angle 1 = 105°$

$\therefore \quad x + 86° + 102° + \angle 1 = 360°$

$x + 86 + 102 + 105 = 360$

$x + 293 = 360$

$x = 67°$

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

$\therefore \quad 70 + 70 + 5x + 6x = 360$

$140 + 11x = 360$

$11x = 220$

$x = 20$

$\therefore$ Other angles are $5 \times 20, 6 \times 20$

$100°, 120°$

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

$\therefore \quad 1x + 2x + 4x + 5x = 360$

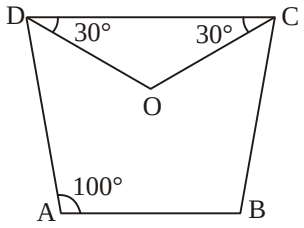
$12x = 360$

$x = 30$

$\therefore$ angles are $1 \times 30, 2 \times 30, 4 \times 30, 5 \times 30$

$30°, 60°, 120°, 150°$

9. $\angle A + \angle B + \angle C + \angle D = 360$



$100 + \angle B + 60 + 60 = 360$

$\angle B + 220 = 360$

$\angle B$ or $\angle ABC = 140°$

In ΔDOC

$\angle ODC = \angle OCD = \frac{60}{2} = 30°$

In ΔDOC

$30 + 30 + \angle DOC = 180$

$\angle DOC = 180 - 60$

$\angle DOC = 120$

10. Let $\angle A = 2x, \angle D = 3x$

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

$\therefore \quad \angle A + \angle D = 180$

$2x + 3x = 180$

$5x = 180$

$x = 36°$

$\therefore \quad \angle A = 2 \times 36, \angle D = 3 \times 36$

$\angle A = 72° \; \angle D = 108°$

Let $\angle B = 7y \; \angle C = 8y$

$\because \quad \angle A + \angle B + \angle C + \angle D = 360$

$72 + 7y + 8y + 108 = 360$

$15y + 180 = 360$

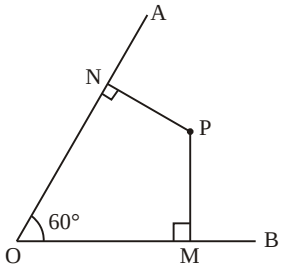
$15y = 180$

$y = 12$

$\therefore \; \angle B = 7 \times 12 \; \angle C = 8 \times 12$

$\angle B = 84° \; \angle C = 96°$

11. In Quadrilateral $OMPN$



$60 + 90 + 90 + \angle NPM = 360$

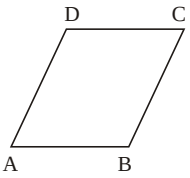
$240 + \angle NPM = 360$

$\angle NPM = 120°$

12. (i) four (ii) four (iii) four
(iv) 2 (v) $360°$ (vi) opposite

Exercise 12.2

1.



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

$\therefore \quad 4x + 5x = 180$

$9x = 180$

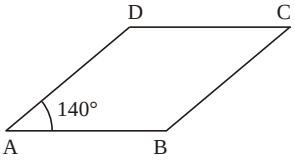
$x = 20$

$\therefore \quad \angle A = 4 \times 20 \angle B = 5 \times 20$

$\angle A = 80° \; \angle B = 100°$

$\therefore \quad \angle C = 80° \; \angle D = 100°$

2.



$\angle C + \angle A = 140°$

$\therefore \quad \angle C = \angle A = 70°$

opp. angles of parallelogram are equal

$\angle A + \angle B = 180$

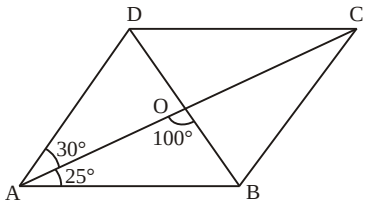
$70 + \angle B = 180$

$\angle B = 110°$

$\angle D = \angle B = 110°$

opp. angles of parallelogram.

3.



$\angle C = \angle A = 30 + 25$

$= 55$ opp. angles of parallelogram

$\angle A + \angle B = 180$

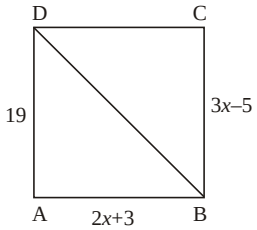
$55° + \angle B = 180$

$\angle B = 180 - 55°$

$= 125$

$\therefore \quad \angle D = \angle B = 125°$

4.



$\because \quad AB = BC$

$\therefore \quad 2x + 3 = 3x - 5$

$8 = x$

$\therefore \quad AB = BC = 3 \times 8 - 5$

$= 19$

$\therefore \quad AD = 19$

In ΔADB

$BD^2 = AD^2 + AB^2$

$BD = 19^2 + 19^2 = \sqrt{2 \times 19^2}$

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

5. $\angle A = \angle C$

opp. angles of parallelogram

$4x - 5 = 3x + 10$

$x = 15$

$\therefore \quad \angle A = 4 \times 15 - 5 = 55° \quad \therefore \angle C = 55°$

$\because \quad \angle A + \angle D = 180$

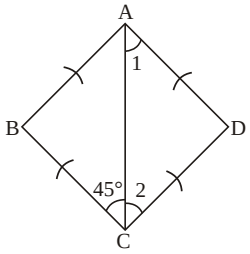
$55° + \angle D = 180$

$\angle D = 135°$

$\therefore \quad \angle B = \angle D = 135°$

6. $\angle 1 = 45°$ alternate angles

$\angle 2 = \angle 1 = 45°$ angles opp. to = sides



In ΔADC

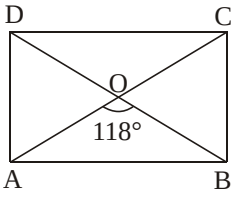
$\angle 1 + \angle 2 + \angle ADC = 180$

$45 + 45 + \angle ADC = 180$

$90 + \angle ADC = 180$

$\angle ADC = 90°$

7.



$OA = OB$ } half of equal diagonals

$OB = OC$ } of Rectangle

$OC = OD$

$\angle OAB = \angle OBA = x$

angles opposite to equal sides

$\therefore \quad x + x + 118 = 180°$

$2x = 62$

$x = 31$

$\therefore \angle OBA = 31°$

$\angle OBC = 90 - 31$

$\angle OBC = 59°$

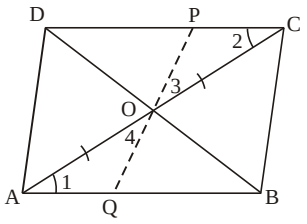
$\angle ADO = \angle OBC$ alt angles

$= 59°$

$\angle OCB = \angle OBC = 59°$

angles opp to = sides

8. In ΔAOQ and ΔPOC



$\angle 1 = \angle 2$ at angles

$OA = OC$

diagonal of parallelogram

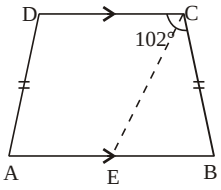
$\angle 4 = \angle 3$ V.O.A.

$\therefore \quad \Delta AOQ \cong \Delta POC$ ASA

$\therefore \quad OP = OQ$ CPCTC

$\therefore$ O is mid point of PQ.

9.



Given : $AD = BC$

$DC \parallel AB$

To find : $\angle A, \angle B$ and $\angle D$

(i) $\angle B + \angle C = 180$ cointerior angles

$\angle B + 102 = 180$

$\therefore \quad \angle B = 78°$

Draw $CE \parallel AD$

$DC \parallel AE$ given

$\therefore$ $ACED$ is a parallelogram.

$AD = BC$ given

$AD = CE$

opp. sides of parallelogram

$\therefore \quad BC = CE$

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

$\therefore \quad \angle A = \angle CEB = 78°$ corresponding angles

$\because \quad \angle D + \angle A = 180$

$\angle D + 78 = 180$

$\therefore \quad \angle D = 102$

$\therefore \quad \angle A = 78°, \ \angle B = 78°, \ \angle C = 102°, \ \angle D = 102°$

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

MCQs

1. (d) **2.** (a) **3.** (d) **4.** (c) **5.** (d)

Mental Maths

1. 135°, 135°, 45°
2. right angles
3. 360°
4. rhombus
5. kite
6. four
7. square

13 Visualizing and System

Exercise 13.1

1.

S. No.	3-D Solid	Vertices	Edges	Face
(i)	Sphere	**0**	**0**	**1**
(ii)	Rectangular prism	**0**	**0**	**1**
(iii)	Triangular prism	**6**	**9**	**5**
(iv)	Regular Octahedron	**6**	**12**	**8**
(v)	Square prism	**8**	**6**	**12**
(vi)	Cylinder	**0**	**2**	**3**
(vii)	Hexagonal prism	**12**	**18**	**8**
(viii)	Triangular pyramid	**4**	**6**	**4**

2.

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

3.

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

4.

Figure	No. of faces
(i) Cone	2
(ii) Square prism	6
(iii) Cylinder	3

(iv) Octagonal pyramid 9
(v) Regular octahedron 8

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.

S. No.	Polyhedron	F	V	E	F + V	E + 2	True/ False
(i)	Cube	6	8	12	14	14	True
(ii)	Cuboid	6	8	12	14	14	True
(iii)	Triangular Pyramid	4	4	6	8	8	True

4. We have
$E = 30,\ V = 20$
$\because \quad V + F - E = 2$
$20 + F - 30 = 2$
$F = 12$
$\therefore$ No. of faces = 12.

5. We have
$F = 40,\ E = 60$
$\because \quad V + F - E = 2$
$V + 40 - 60 = 2$
$V = 22$
$\therefore$ No. of vertices are 22.

6.

	faces	edges	vertices
prism	$n+2$	$n \times 2$	$n \times 3$
pyramid	$n+1$	$n \times 1$	$n \times 2$

7. We have
$F = 6,\ V = 8$
$\because \quad V + F - E = 2$
$\therefore \quad 8 + 6 - E = 2$
$E = 12$
$\therefore$ No. of edges are 12.

MCQs

1. (c) **2.** (a) **3.** (c) **4.** (a) **5.** (d) **6.** (a) **7.** (d)

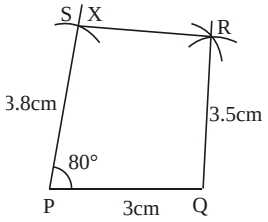
Mental Maths

1. 6
2. $F + V - E = 2$
3. 3
4. 6, 6, 10
5. Veterx
6. 8, 7, 9
7. cuboid
8. Tetrahedron

14 Practical Geometry

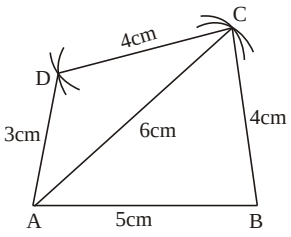
Exercise 14.1

1.



Steps of constructions
(i) Draw $PQ = 3$ cm.
(ii) Draw $\angle XPQ = 80°$.
(iii) With centre P cut an arc S on PX of radius 3.8 cm.
(iv) With S as centre and radius = 2.8 cm cut an arc 3.8 cm.
(v) With Q as centre and radius 3.5 cm cut the previous arc at R.
(vi) Join RS and RQ.
$PQRS$ is the 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.

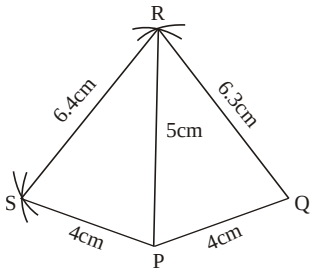
(iv) With C as centre and radius 4 cm cut an arc.

(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 $PQ = 4$ cm.

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

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

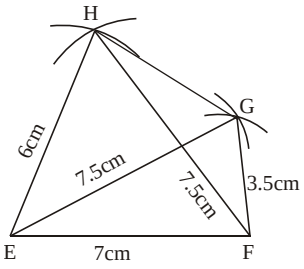
(iv) With R as centre and radius 6.4 cm cut an arc.

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

Join RQ, PR, SR and PS.

$\therefore$ $PQRS$ is a required Quadrilateral.

4.



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.

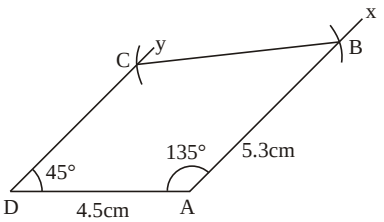
(iv) With F as centre and radius 7.5 cm cut the an arc.

(v) With E as centre and radius 6 cm cut the previous arc at H.

(vi) Join GF, HG, HE

$\therefore$ $EFGH$ is a required Quadrilateral.

5.



Steps of construction

(i) Draw $AD = 4.5$ cm.

(ii) Draw $\angle XAD = 135°$.

(iii) With A as centre and radius 5.3 cm cut an arc B on AX.

(iv) Draw $\angle YDA = 45°$.

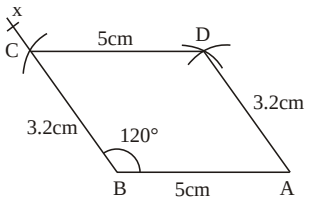
(v) With B as centre and radius 5.5 cm cut DY at C.

(vi) Join BC.

$\therefore$ $ABCD$ is required Quadrilateral.

Exercise 14.2

1.



Steps of construction

(i) Draw $AB = 5$ cm.

(ii) Draw $\angle XBA = 120°$.

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

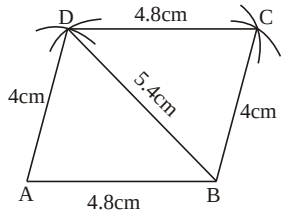
(iv) With C as centre and radius 5 cm cut can arc.

(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.

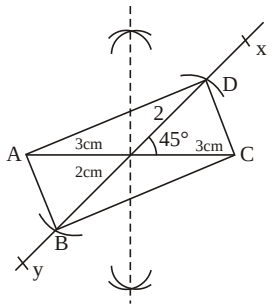
(iii) With B as centre and radius 5.4 cm cut the previous arc at D.

(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

$ABCD$ is required parallelogram.

3.



Steps of construction

(i) Draw diagonal $AC = 6$ m.

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

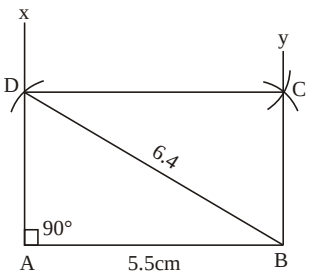
(iii) Draw $\angle COX = 45°$ and produce XO to y.

(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.

$\therefore$ $ABCD$ is required parallelogram.

4.



Steps of construction

(i) Draw $AB = 5.5$ cm.

(ii) Draw $\angle XAB = 90°$.

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

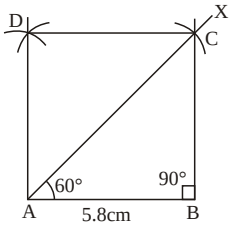
(iv) With B as cut an arc.

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

Join DC and BC

$\therefore$ $ABCD$ is required rectangle.

5.



Steps of construction

(i) Draw $AB = 5.8$ cm.

(ii) Draw $\angle BAX = 60$.

(iii) Draw $\angle ABC = 90$ 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.

$\therefore$ $ABCD$ is required rectangle.

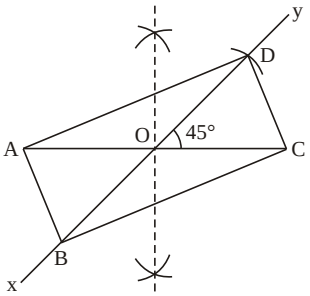
6. Steps of construction

(i) Draw diagonal $AC = 6.5$ cm.

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

(iii) Draw $\angle COY = 45°$.

(iv) Produce YO to x.

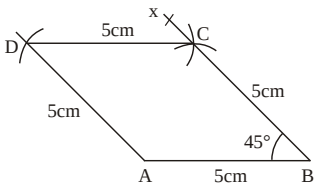


(v) With O as centre and radius $\frac{AC}{2}$ cut arcs B and D on xy.

(vi) Join AB, BC, CD and AD.

$\therefore$ $ABCD$ is required rectangle.

7.



Steps of constructions

(i) Draw $AB = 5$ cm.

(ii) Draw $\angle XBA = 45°$.

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

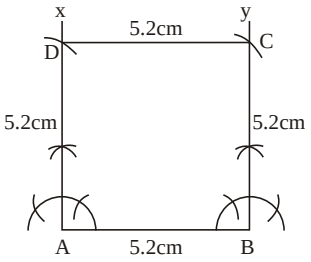
(iv) With C as centre and radius 5 cm cut an arc.

(v) With A as centre and radius 5 cm cut the previous arc at D.

Join AD, CD, BC.

$\therefore$ $ABCD$ is required rhombus.

8.



Steps of constructions

(i) Draw $AB = 5.2$ cm.

(ii) Draw $\angle YAB = 90°$.

(iii) Draw $\angle XBA = 90°$.

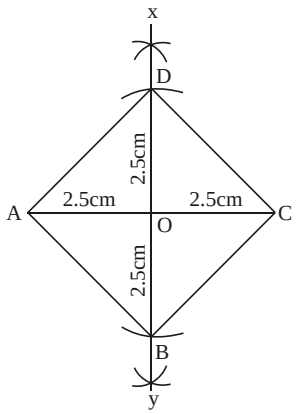
(iv) With A as centre and radius 5.2 cm cut an arc D on AY.

(v) With B as centre and radius 5.2 cm cut an arc C on BX.

Join CD

$\therefore$ $ABCD$ is required square.

9.



Steps of constructions

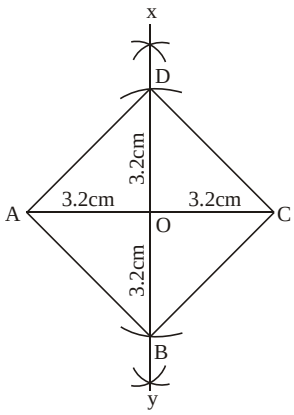
(i) Draw diagonal $AC = 5$ cm.

(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.

$\therefore$ $ABCD$ is required square.

15.



MCQs

1. (b) **2.** (c) **3.** (a) **4.** (b) **5.** (c) **6.** (d)

Mental Maths

1. rhombus

2. convex

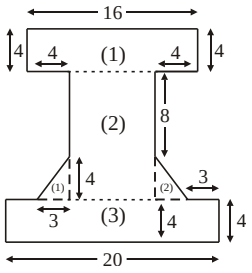
3. special

4. 360°

5. parallelogram

Exercise 15.1

1. (i) Area of figure



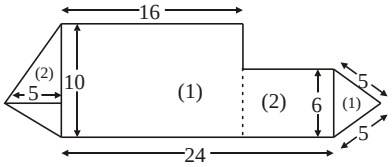
Area of Rectangle (1) + Area of Rectangle (2) + Area of Rectangle (3) + Area of triangle (1) + Area of Triangle (2)

$$= 16\times 4 + 8\times 8 + 20\times 4 + \frac{1}{2}\times 3\times 4 + \frac{1}{2}\times 3\times 4$$

$$= 64 + 64 + 80 + 6 + 6$$

$$= 220\,\text{m}^2$$

(ii)



For Area of triangle (1)

$$s = \frac{6+5+5}{2} = 8$$

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

$$= \sqrt{8(8-6)(8-5)(8-5)}$$

$$= \sqrt{8\times 2\times 3\times 3}$$

$$= 4\times 3$$

$$= 12$$

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

$$= 16\times 10 + 8\times 6 + 12 + \frac{1}{2}\times 10\times 5$$

$$= 150 + 48 + 12 + 25$$

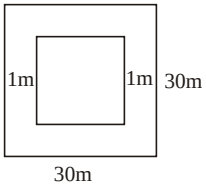
$$= 245\,\text{cm}^2$$

2. Side of inside square $= 30 - (1+1)$

$$= 28\,\text{m}$$

Area of inside square $= 28\times 28\,\text{m}^2$

$$= 784\,\text{m}^2$$



Total cost of grassing = ` 1176

Cost/m^2 of grassing $= \frac{1176}{784}$

$$= \text{`}\ 1.5$$

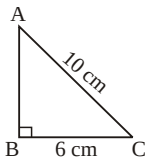
3. $AC^2 = AB^2 + BC^2$

$10^2 = AB^2 + 6^2$

$100 = AB^2 + 36$

$64 = AB^2$

$8^2 = AB^2$



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

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

$$= \frac{1}{2}\times 6\times 8$$

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

4. Distance travelled by a girl

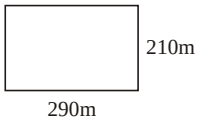
$= 2\times$ perimeter

$= 2\times 2(l+b)$

$= 2\times 2(290+210)$

$= 4\times 500$

$= 2000\,\text{m}.$



Time taken $= \frac{d}{s} = \frac{2000}{1.5}$ seconds

$$= \frac{2000}{15}$$

$$= \frac{20000}{15\times 60}\,\text{min.}$$

$$= 22\frac{2}{9}\,\text{min.}$$

5. Area of cloth required

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

$$= 2500\times 850\,\text{cm}^2$$

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

$$= \frac{25 \times 85}{10}$$

$\because$ As of cloth $= l \times b$

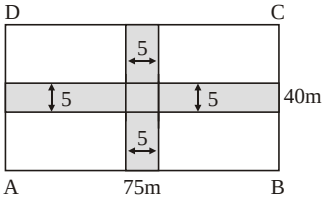
$$\frac{25 \times 85}{10} = l \times 17$$

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

$$12.5 \text{ m} = l$$

$\therefore$ length of cloth required is 12.5 m.

6.



Area of Road

$75 \times 5 + 40 \times 5 - 5 \times 5$

$= 375 + 200 - 25$

$= 575 - 25$

$= 550 \text{ m}^2$

Cost of construction of Roads

$= ` 150 \times 550$

$= ` 82500$

8. (i) Let original length $= x$

breadth $= y$

$\therefore$ Original Area $= xy$

Now, length $= 2x$

Now, breatdh $= 2y$

Now, Area $= 2x \times 2y$

$= 4xy$

$= 4 \times xy$

$= 4$ (Original Area)

$\therefore$ Now area become 4 times.

(ii) New length $= \frac{x}{2}$

New breadth $= 2y$

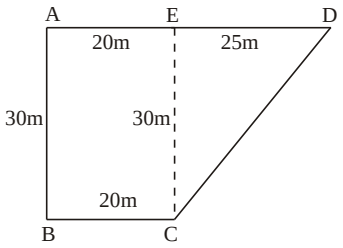
New Area $= \frac{x}{2} \times 2y$

$= xy$

$=$ Original Area

$\therefore$ Area Remain the same.

9. Draw $CE \perp AD$



$\therefore$ $ABCE$ is a Rectangle

$AE = BC = 20 \text{ m}$

$CE = AB = 30 \text{ m}$

$\therefore$ $ED = 45 - 20 = 25 \text{ m}$

Area of Quadrilateral

= Area of Rectangle + Area of triangle

$= 30 \times 20 + \frac{1}{2} \times 25 \times 30$

$= 600 + 375$

$= 975 \text{ m}^2$

10. (i) Base × Height

(ii) radius

(iii) $\sqrt{\text{Area}}$

(iv) $\sqrt{l^2 + b^2}$

(v) base × height

Exercise 15.4

1. (i) Area of trapezium $= \frac{1}{2}(a + b) \times h$

$= \frac{1}{2}(9 + 5) \times 6$

$= \frac{1}{2} \times 14 \times 6$

$= 7 \times 6$

$= 42 \text{ cm}^2$

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

$= \frac{1}{2}(7.5 + 4.5) \times 5$

$= \frac{1}{2} \times 12 \times 5$

$= 30 \text{ cm}^2$

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

$= \frac{1}{2}(10 + 8) \times 12$

$= \frac{1}{2} \times 18 \times 12$

$= 9 \times 12$

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

2. Area of rhombus = base × height

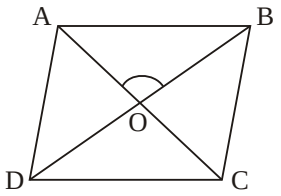
$$96 = \frac{\text{Perimeter}}{4} \times \text{height}$$

$$96 = \frac{64}{4} \times \text{height}$$

$$96 = 16 \times \text{height}$$

6 cm = height

3.



Diagonals of a rhombus = 24 cm

Second of a rhombus = 10 cm

Area of rhombus

$$= \frac{1}{2} \times \text{product of the diagonals}$$

$$= \frac{1}{2} \times 24 \times 10 = 120\,\text{cm}^2$$

In, $\angle ABO$,

$$\angle AOB = 90°$$

$$AO = \frac{1}{2}AC = \frac{1}{2} \times 24 = 12\,\text{cm}$$

$$BO = \frac{1}{2}BD = \frac{1}{2} \times 10 = 5\,\text{cm}$$

$$AB^2 = AO^2 + OB^2$$

$$= (12)^2 + (5)^2$$

$$= 144 + 25 = 169$$

$$AB = \sqrt{169} = 13\,\text{cm}$$

Area of rhombus $= 120\ \text{cm}^2$ and measure of side = 13 cm.

4. Area of a rhombus = $300\,\text{cm}^2$

one diagonals = 40 cm

Let, other diagonals = x cm

Area of a rhombus $= \frac{1}{2}$ product of the diagonals

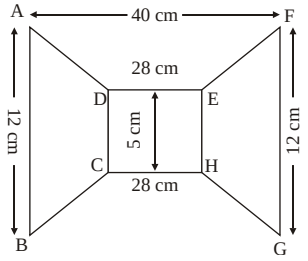
$$300 = \frac{1}{2} \times 40 \times x$$

$$300 \times 2 = 40x$$

$$x = \frac{600}{40} = 150\,\text{cm}$$

Length of other diagonals is 150 cm of a rhombus.

5.



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

$= 6\,\text{cm}$

Total area is Area of *ABCD* and *EHFGH* × Area of *CDEH*

= 2 × Area of Trapezium + Area of Rectangle

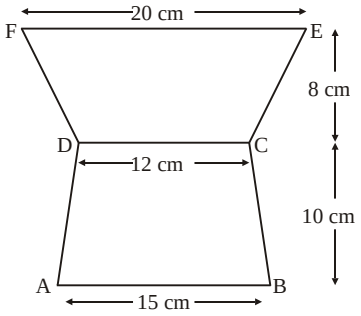
$$= 2 \times \frac{1}{2}(a + b) \times h + l \times b$$

$$= (5 + 12) \times 6 + 28 \times 5$$

$$= 17 \times 6 + 140$$

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

(ii)



Total Area is

Area *ABCD* + Area Trapezium *DCEF*

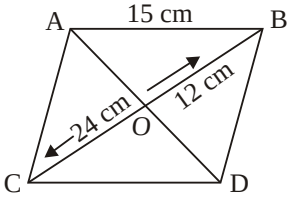
$$= \frac{1}{2}(15 + 12) \times \cancel{10}^{5} + \frac{1}{\cancel{2}}(20 + 12) \times \cancel{8}^{4}$$

$$= 27 \times 5 + 32 \times 4$$

$$= 135 + 128$$

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

6.



Side of rhombus = 15 cm

Length of one diagonals = 24 cm

$$BO = BC \times \frac{1}{2};\ BO = \frac{24}{2} = 12\text{ cm}$$

$$(AB)^2 = (AO)^2 + (BO)^2$$

$$(15)^2 = (AO)^2 + (12)^2$$

$$(AO)^2 = (15)^2 - (12)^2$$

$$= 225 - 144 = 81$$

$$AO = \sqrt{81} = 9\text{ cm}$$

$$AD = 2AO = 9 \times 2 = 18\text{ cm}$$

Area of rhombus

$$= \frac{1}{2}\text{ product of diagonals}$$

$$= \frac{1}{2} \times 24 \times 18 = 216\text{ cm}^2$$

Thus, Area of rhombus is 216 cm^2

7. Area of rhombus = 252 cm^2

One diagonals = 28 cm

Let other diagonals = x cm

Area of rhombus

$$= \frac{1}{2}\text{ Product of diagonals}$$

$$252 = \frac{1}{2} \times 28 \times x$$

$$252 \times 2 = 28x$$

$$x = \frac{504}{28} = 18\text{ cm}$$

other diagonals is 18 cm.

8. Let parallel sides be $3x$, $5x$

Area of a trapezium $= \frac{1}{2}(a+b) \times h$

$$128 = \frac{1}{2}(3x + 5x) \times 8$$

$$128 = \frac{1}{2} \times 8x \times 8$$

$$128 \times 2 = 8x \times 8$$

$$x = \frac{128 \times 2}{8 \times 8} = 4$$

Parallel sides are $3 \times 4 = 12$ cm, $5 \times 3 = 15$ cm.

9. Let one parallel side = x cm

Other parallel side = $x + 6$ cm

Area of trapezium $= \frac{1}{2}(a+b) \times h$

$$105 = \frac{1}{2}(x + x + 6) \times 6$$

$$105 \times 2 = (2x + 6)7$$

$$210 = 14x + 42$$

$$\frac{210 - 42}{14} = x$$

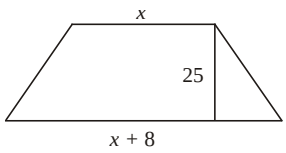
$$x = 12$$

One parallel side is = 12 cm

Other parallel side is $12 + 6 = 18$ cm

Parallel sides are 12 cm and 18 cm.

10.



Let $a = x$

$\therefore \quad b = x + 8$

$$\text{Area} = \frac{1}{2}(a+b) \times h$$

$$400 = \frac{1}{2}(x + x + 8) \times 25$$

$$400 = \frac{1}{2}(2x + 8) \times 25$$

$$\frac{400 \times 2}{25} = 2x + 8$$

$$16 \times 2 = 2x + 8$$

$$24 = 2x$$

$$12 = x$$

$\therefore$ parallel sides are 12 and $12 + 8$

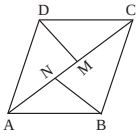
or 12 cm and 20 cm

11. given

$AC = 28$

$BN = 6.8$

$DM = 8\text{ cm}$



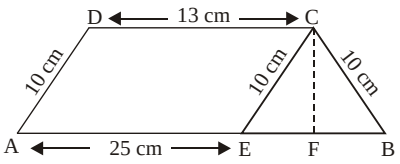
$$\text{Area} = \frac{1}{2}(AC)[BN + DM]$$

$$= \frac{1}{2} \times 28[6.8 + 8]$$

$$= 14\,(14.8)$$

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

12.



Let $ABCD$ be a trapezium such that $AE = 25$ cm, $CD = 13$ cm

and $AD = 10\,\text{cm}$; $BC = 10\,\text{cm}$

$\therefore$ $AECD$ is a parallelogram and

$AE = CD = 13\,\text{cm}$

$CE = AD = 10\,\text{cm}$

$EB = AB - AE$

$EB = AB - CD = 25 - 13 = 12\,\text{cm}$

$CE = CB = 10\,\text{cm}$

$\therefore$ ΔCEB is an isosceles triangle

$$EF = BF = \frac{1}{2} \times EB$$

$$= \frac{1}{2} \times 12\,\text{cm} = 6\,\text{cm}$$

By pythagoras theorem in ΔCBF, we gave

$$CB^2 = CF^2 + BF^2$$

$$10^2 = CF^2 + 6^2$$

$$CF^2 = 10^2 - 6^2 = 100 - 36 = 64$$

$$CF = \sqrt{64} = 8\,\text{cm}$$

Area of $\Delta CEB = \frac{1}{2} BE \times CF$

$$= \frac{1}{2} \times 12 \times 8 = 48\,\text{cm}^2$$

Area of the parallelogram $AECD$

height of the parallelogram $AECD$ and ΔCEB is same as they are between same parallel lines $= AE \times CF$

$$= 13 \times 8 = 104\,\text{cm}^2$$

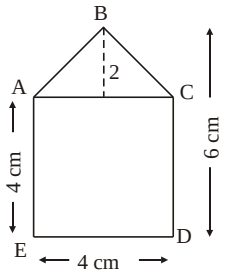
Area of trapezium = Area of the triangle BEC + Area of parallelogram $ACED$

$$= (48 + 104)\,\text{cm}^2$$

$$= 152\,\text{cm}^2$$

Exercise 15.3

1. (i)

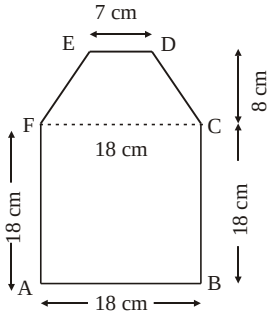


Area = Area ΔABC + Area sq. $ACDE$

$$= \frac{1}{2} \times 4 \times 2 + 4 \times 4$$

$$= 4 + 16 = 20\,\text{cm}$$

(ii)



Area $ABCDEF$

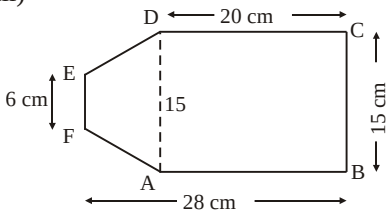
= Area sq. $ABCF$ + Area trapezium $FCDE$

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

$$= 324 + 25 \times 4$$

$$= 324 + 100 \quad = 424\,\text{cm}^2$$

(iii)



Area of $ABCDEF$

= Area $ABCD$ + Area of Trapezium $ADEF$

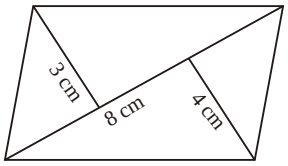
$$= 15 \times 20 + \frac{1}{2}(15 + 6) \times 8$$

$$= 300 + 21 \times 4$$

$$= 300 + 84$$

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

(iv)



Area of quadrilateral

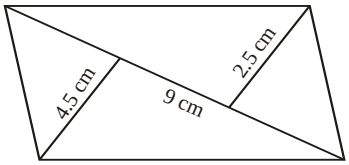
$$= \frac{1}{2}(b_1 + b_2) \times d$$

$$= \frac{1}{2}(3 + 4) \times 8$$

$$= \frac{1}{2} \times 7 \times 8$$

$$= 28\,\text{cm}^2$$

(v)



Area of quadrilateral

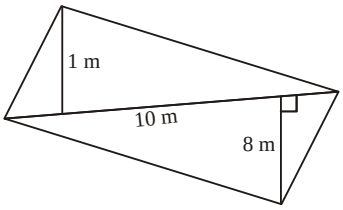
$$= \frac{1}{2}(b_1 + b_2)d$$

$$= \frac{1}{2}(4.5 + 2.5) \times 9$$

$$= \frac{1}{2} \times 7 \times 9$$

$$= 31.5 \text{ cm}^2$$

(vi)



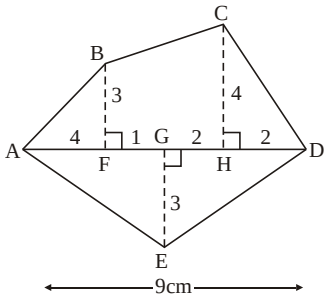
Area of quadrilateral

$$\frac{1}{2}(b_1 + b_2) \times d$$

$$\frac{1}{2}(1+8) \times 10$$

$$\frac{1}{2} \times 9 \times 10 = 45 \text{cm}^2$$

2.



Area *ABCD*

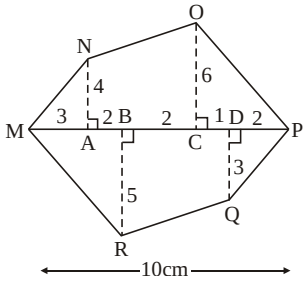
Area Δ *ACE* + Area *ABF* + Area *CHD* + Area *DGE* + Area Trapezium *FHCB*

$$= \frac{1}{2} \times 3 \times 5 + \frac{1}{2} \times 4 \times 3 + \frac{1}{2} \times 4 \times 2 + \frac{1}{2} \times 4 \times 3 + \frac{1}{2}(3+4) \times 3$$

$$= 7.5 + 6 + 4 + 6 + 10.5$$

$$= 34 \text{ cm}^2$$

3.



Area of *MNOPQR*

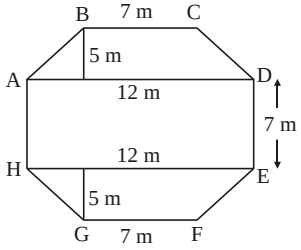
Area *MNA* + Area Δ *MBR* + Area Δ *OCP* + Area Δ *PDQ* + Area Trapezium *MOCA* + Area Trapezium *RQDB*

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

$$= 6 + 12.5 + 9 + 3 + 20 + 12$$

$$= 62.5 \text{ cm}^2$$

4.



Area of *ABCDEFGH*

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

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

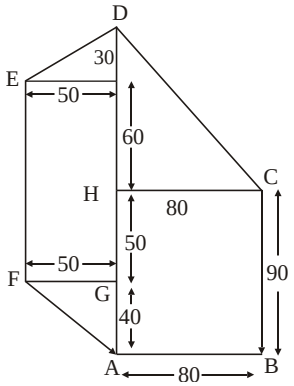
$$= \frac{1}{2} \times 19 \times 5 + \frac{1}{2} \times 19 \times 5 + 84$$

$$= 47.5 + 47.5 + 84$$

$$= 97 + 84$$

$$= 179 \text{ cm}^2$$

5.



Area *ABCDEF*

Area ΔAFG + Area ΔDEI + Area ΔDHC + Area rectangle *FGIE* + Ar Rectangle *ABCH*

$$= \frac{1}{2}\times 40\times 50 + \frac{1}{2}\times 50\times 30 + \frac{1}{2}\times 80\times 90 + \frac{1}{2}(50+50)\times 110 + 90\times 80$$

$$= 1000 + 750 + 3600 + 5500 + 7200$$

$$= 18050\,\text{m}^2$$

MCQs

1. (c) **2.** (d) **3.** (c) **4.** (c) **5.** (d)

Mental Maths

1. 1

2. Sum of parallel × height

3. $\frac{1}{2}$ product of diagonals

4. length × breadth

5. 1

6. 1 hectare

7. πr^2

8. 100 cm^2

16 Volume and Surface Area

Exercise 16.1

1.

	Length (l)	Breadth (b)	Height (h)	Volume (V)
(i)	5 cm	6 cm	8 cm	240 cm^3
(ii)	**12 cm**	10 cm	2 cm	240 cm^3
(iii)	9 cm	**9 cm**	5 cm	405 cm^3
(iv)	10 cm	5 cm	**6.4 cm**	320 cm^3

2. Side (edge) of cube = 7 cm

(i) Volume = edge $= 7^3 = 343\,\text{cm}^3$

SA = 6 edge $^2 = 6\times 7^2 = 294\,\text{cm}^2$

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

$= 7\sqrt{3}$cm

(ii) edge = 4.5 cm

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

$= 91.125\,\text{cm}^3$

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

$= 121.5\,\text{cm}^2$

diagonal = $\sqrt{3}$ edge

$= \sqrt{3}\times 4.5$

$= 4.5\sqrt{3}$cm

3. diagonal = $12\sqrt{3}$

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

$\therefore$ edge = 12 cm

Volume of cube = edge ^{3}

$= 12^3 = 1728\,\text{cm}^3$

SA of cube = 6 edge ^{2}

$= 6\times 12^2 = 864\,\text{cm}^2$

4. SA of cube = 486

6 edge ^{2} = 486

edge ^{2} = 81

edge $^2 = 9^2$

edge = 9

$\therefore$ Volume of cube = edge ^{3}

$= 9^3 = 729\,\text{cm}^3$

diagonal of cube = $\sqrt{3}$ edge

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

5. $l = 10$ cm $b = 7$ cm $ht = 8$ cm

Volume = $l\times b\times h$

$= 10\times 7\times 8 = 560\,\text{cm}^3$

SA = $2(lb + bh + hl)$

$= 2(10\times 7 + 7\times 8 + 10\times 8)$

$= 2(70 + 56 + 80)$

$= 412\,\text{cm}^2$

CSA = $2h(l + b)$

$= 2\times 8(10 + 7)$

$= 16 \times 17 = 272\,\text{cm}^2$

diagonal $= \sqrt{l^2 + b^2 + b^2}$

$= \sqrt{10^2 + 7^2 + 8^2}$

$= \sqrt{100 + 49 + 64}$

$= \sqrt{213}\text{cm}$

(ii) $l = 1.5$ m, $b = 90$ cm, $h = 70$ cm

$l = 150\,\text{cm}$

$V = l \times b \times h$

$= 150 \times 90 \times 70$

$= 945000\,\text{cm}^3$

$SA = 2(lb + bh + hl)$

$= 2(150 \times 90 + 90 \times 70 + 70 \times 150)$

$= 2(13500 + 6300 + 10500)$

$= 2(30300)$

$= 60600\,\text{cm}^2$

$CSA = 2h(l + b) = 2 \times 70(150 + 90)$

$= 140(240)$

$= 33600\,\text{cm}^2$

diagonal $= \sqrt{l^2 + b^2 + h^2}$

$= \sqrt{150^2 + 90^2 + 70^2}$

$= \sqrt{22500 + 8100 + 4900}$

$= \sqrt{35500}$

$= 188.41$ cm

6. Volume of Cuboid $= 448\,\text{cm}^3$

$l \times b \times h = 448$

Let $l = b = x$

$x \times x \times 7 = 448$

$x^2 \times 7 = 448$

$x^2 = 64$

$x = \sqrt{64} \Rightarrow x = 8$

$\therefore$ Side of square base = 8 cm.

$\therefore$ $l = 8\,\text{cm}$, $b = 8\,\text{m}$, $h = 7\,\text{cm}$

$SA = 2(lb + bh + hl)$

$= 2(8 \times 8 + 8 \times 7 + 7 \times 8)$

$= 2(64 + 56 + 56)$

$= 352\,\text{cm}^2$

7. $V = l \times b \times h$

$2000 = 25 \times 20 \times h$

$\frac{2000}{25 \times 20} = h$ (depth)

$4\text{m} = h$

8. Volume of side 4 cm $= 4^3 = 64$

Volume of side 1 cm $= 1^3 = 1$

No. of small cubes cut $= \frac{64}{1} = 64$

9. Volume of cube of edge 3 cm $= 3^3 = 27$

Volume of cube of edge $\frac{1}{2}$ cm

$= \left(\frac{1}{2}\right)^3 = \frac{1}{8}$

No. of small cubes $= \frac{27}{\frac{1}{8}}$

$= 27 \times 8$

$= 216$

10. External $t = 56\,\text{cm}$

$b = 39\,\text{cm}$

$h = 30\,\text{cm}$

Internal $l = 56 - 6 = 50\,\text{cm}$

$b = 39 - 6 = 33\,\text{cm}$

$h = 30 - 6 = 24\,\text{cm}$

Capacity of box = Internal volume

$= 50 \times 33 \times 24$

$= 39600\,\text{cm}^3$

Volume of wood

= External volume – Internal volume

$= 56 \times 39 \times 30 - 39600$

$= 65520 - 39600$

$= 25920\,\text{cm}^3$

11. External $l = 36\,\text{cm}$

$b = 25\,\text{cm}$

$h = 16.5$ cm

Internal $l = 36 - 3 = 33$

$b = 25 - 3 = 22$

$h = 16.5 - 1.5 = 15$

Volume of iron

= External volume – Internal volume

$= 36 \times 25 \times 16.5 - 33 \times 22 \times 15$

$= 14850 - 10890$

$= 3960\,\text{cm}^3$

weight of box $= 3960 \times 8.5$ gm

$= 33600$ gm

or 33.66 kg

12. Volume of cube cuboid $= 12 \times 9 \times 6$

$= 648$

Volume of small cuboid $= 4 \times 3 \times 2 = 24$

No. of small cube $= \frac{648}{24} = 27$

13. Volume of vessel = 4.5 ht

$= 4.5 \times 1000\,\text{cm}^3$

$l \times b \times h = 4500\,\text{cm}^3$

$30 \times 25 \times h = 4500$

$h = \dfrac{4500}{30 \times 25}$

$h = 6\,\text{cm}$

Vessel hold water to the height of 6 cm.

14. Let $l = 4x$, $b = 2x$, $h = 1x$

T.SA = 2800

$2(lb + bh + hl) = 2800$

$2[4x \times 2x + 2x \times x + x \times 4x] = 2800$

$2(8x^2 + 2x^2 + 4x^2) = 2800$

$2 \times 14x^2 = 2800$

$x^2 = 100$

$x = 10$

$\therefore\ l = 4 \times 10 = 40\,\text{cm}$, $b = 2 \times 10 = 20\,\text{cm}$,

$h = 1 \times 10 = 10\,\text{cm}$

15. Area of four walls $= 2h(l + b)$

$= 2 \times 3.5\,[7.4 + 5.6]$

$= 7 \times 13$

$= 91\,\text{m}^2$

Area of windows and doors

$= 2(1.5 \times 1) + 2(1.5 \times 2)$

$= 3 + 6$

$= 9$

Area to be painted $= 91 - 9$

$= 82\,\text{m}^2$

Cost of painting $= 82 \times 15$

$=$ ` 1230

Exercise 16.2

1. (i) $r = 7\,\text{cm}$ $h = 50\,\text{cm}$

Volume of cylinder

$= \pi r^2 h$

$= \dfrac{22}{7} \times 7^2 \times 50 = 7700\,\text{m}^3$

$\text{CSA} = 2\pi rh = 2 \times \dfrac{22}{7} \times 7 \times 50 = 2200\,\text{m}^2$

$\text{TSA} = 2\pi r(r + h)$

$= 2 \times \dfrac{22}{7} \times 7(7 + 50) = 44(57)$

$= 2508\,\text{m}^2$

(ii) $r = 5.6$ m $h = 1.25$ m

$V = \pi r^2 h = \dfrac{22}{7} \times (5.6)^2 \times 1.25$

$= 123.2\,\text{m}^3$

$\text{CSA} = 2\pi rh$

$= 2 \times \dfrac{22}{7} \times 5.6 \times 1.25 = 44\,\text{m}^2$

$\text{TSA} = 2\pi r(r + h)$

$= 2 \times \dfrac{22}{7} \times 5.6\,(5.6 + 1.25)$

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

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

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

Capacity $= \pi r^2 h$

$= \dfrac{22}{7} \times 7^2 \times 20 = 3080\,\text{m}^3$

$= 3080\,\text{kl}$

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

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

$= 2 \times \dfrac{22}{7} \times 7(7 + 28)$

$= 44 \times (37) = 1188\,\text{m}^2$

3. CSA = 264 Volume = 924

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

divide (2) by (1)

$\therefore\ \dfrac{\pi r^2 h}{2\pi rh} = \dfrac{924}{264}$

$\dfrac{r}{2} = \dfrac{924}{264}$

$\dfrac{r}{2} = 3.5$

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

$2\pi r(7) = 264$

$2 \times \dfrac{22}{7} \times r \times 7 = 264$

$r = \dfrac{264}{44}$

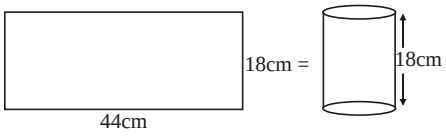
$r = 6\,\text{cm}$

4. Circumference of base = 44

$2\pi r = 44$

$2 \times \dfrac{22}{7} \times r = 44$

$r = 7$



$\therefore$ ht of cylinder = 18 cm

$\therefore$ Volume of cylinder $= \pi r^2 h$

$= \dfrac{22}{7} \times 7^2 \times 18$

$= 2772\,\text{cm}^3$

5. $r = 24\text{ m}\ h = 7\text{ m}$

CSA of 1 pillar $= 2\pi rh$

$= 2 \times \frac{22}{7} \times 24 \times 7 = 1056$

CSA of 15 pillars $= 1056 \times 15$

$= 15840\text{ m}^2$

Cost of painting = ` 2.50×15840

= ` 39600

6. Volume of cube = Volume of wire

$\text{edge}^3 = \pi r^2 h$

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

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

$338.8\text{ cm} = h$

$338.8\text{ cm} = h$ (length of wire)

7. Let $r_1 = 2x$, $r_2 = 3x$ and $h_1 = 5y$, $h_2 = 4y$

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

$= \frac{(2x)^2 \times 5y}{(3x)^2 \times 4y} = \frac{4x^2 \times 5y}{9x^2 \times 4y}$

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

8. $r = 7\text{ cm}\ h = 10\text{ cm}$

$\text{CSA} = 2\pi rh = 2 \times \frac{22}{7} \times 7 \times 10 = 440\text{ cm}^2$

$\text{TSA} = 2\pi r(r + h)$

$= 2 \times \frac{22}{7} \times 7(7 + 10)$

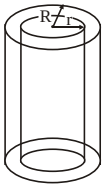
$= 44 \times 17 = 748\text{ cm}^2$

$\text{Volume} = \pi r^2 h$

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

$= 1540\text{ cm}^3$

9. $R = \frac{28}{2}$ $r = \frac{14}{2}$



$R = 14\text{ cm},\ r = 7\text{ cm}$

$h = 1\text{m}$

$= 100\text{ cm}$

Area to be painted

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

$= 2\pi rh + 2\pi rh + 2\pi(R^2 - r^2)$

$= 2\pi[Rh + rh + (R^2 - r^2)]$

$= 2 \times \frac{22}{7}[14 \times 100 + 7 \times 100 + (196 - 49)]$

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

Cost of painting $= 10 \times 14124$

= ` 141240 = 3.5

S. No.	Radius	Height	Volume
(i)	7 cm	3 cm	**462 cm^3**
(ii)	14 cm	50 cm	**30800 cm^3**
(iii)	3.5 cm	**$3\frac{69}{77}$ cm**	150 m^3
(iv)	**17 cm**	7 cm	6358 cm^3

Exercise 16.3

1. $r = 3.5\ h = 12\text{ cm}$

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

$= \sqrt{(3.5)^2 + 12^2}$

$= \sqrt{12.25 + 144}$

$= \sqrt{156.25} = 12.5\text{ cm}$

$\text{Volume} = \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times (3.5)^2 \times 12 = 154\text{ cm}^3$

$\text{CSA} = \pi rl$

$= \frac{22}{7} \times 3.5 \times 12.5 = 137.5\text{ cm}^2$

$\text{TSA} = \pi r(r + l)$

$= \frac{22}{7} \times 3.5\,(3.5 + 12.5)$

$= \frac{22}{7} \times 3.5 \times 16 = 176\text{ cm}^2$

2. $r = 12\text{ cm}\ h = 16$

$\therefore\quad l = \sqrt{r^2 + h^2}$

$= \sqrt{12^2 + 16^2} = \sqrt{400} = 20\text{ cm}$

$\text{CSA} = \pi rl = \frac{22}{7} \times 12 \times 20 = 754.28\text{ cm}^2$

$\text{TSA} = \pi r(r + l) = \frac{22}{7} \times 12 \times (12 + 10)$

$= \frac{22}{7} \times 12 \times 32$

$= 1206.85\text{ cm}^2$

3. $r = 12\text{ m}\ h = 9\text{ m} \therefore\ l = \sqrt{12^2 + 9^2} = 15$

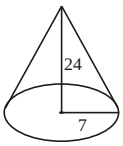
Area of canvas $= \pi rl$

$= \frac{22}{7} \times 12 \times 15 = 565.71\text{ m}^2$

Cost of Canvas

$= ` 565.71 \times 120 = ` 67824.$

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



$\therefore \quad l = \sqrt{h^2 + r^2}$

$= \sqrt{24^2 + 7^2}$

$= \sqrt{576 + 49}$

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

Area of 1 cap $= \pi rl$

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

Area of 10 caps $= 550 \times 10 = 5500\,\text{cm}^2$

5. Surface are of a cone $= 308\,\text{cm}^2$

$l = 14\,\text{cm}$

Surface area of cone $= \pi rl$

$308 = \frac{22}{7} r \times 14$

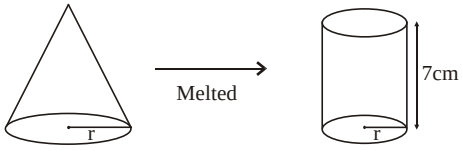
$r = \frac{308 \times 7}{22 \times 14} = 7\,\text{cm}$

Total surface area of cone $= \pi r(r + l)$

$= \frac{22}{7} \times 7(7 + 14)$

$= 22 \times 21 = 462\,\text{cm}^3$

6. Volume cone = Volume of cylinder



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

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

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

$h = 21\,\text{cm}$

$\therefore$ Volume of cone is 21 cm.

7. Same as question no. 4.

8. Same as question no. 2.

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

New radius $= 2r$

New height $= 3h$

New volume $= \frac{1}{3}\pi (2r)^2 (3h)$

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

$= 12\left(\frac{1}{3}\pi r^2 h\right)$

$= 12$ (Volume of cone).

$\therefore$ New volume become 12 times of original volume.

10. Let $h_1 = 1x \qquad h_2 = 3x$

Let $d_1 = 2y \qquad d_2 = 3y$

$\therefore \quad r_1 = y \qquad r_2 = \frac{3y}{2}$

$\frac{V_1}{V_2} = \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = \frac{y^2 \times 1x}{\left(\frac{3y}{2}\right) \times 3x}$

$= \frac{y^2 \times x}{\frac{9y^2}{3} \times 3x}$

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

$\therefore \quad V_1 : V_2 = 4 : 27$

Exercise 16.4

1. $r = 2.1\,\text{cm}$

$V = \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times (2.1)^3 = 38.808\,\text{cm}^3$

$\text{CSA} = 4\pi r^2 = 4 \times \frac{22}{7} \times (2.1)^2$

$= 55.44\,\text{cm}^2$

2. $r = 6.3$

$V = \frac{2}{3}\pi r^3 = \frac{2}{3} \times \frac{22}{7} \times (6.3)^3 = 523.90\,\text{cm}^3$

$\text{CSA} = 2\pi r^2 = 2 \times \frac{22}{7} \times (6.3)^2$

$= 249.48\,\text{cm}^2$

3. Volume $= 38808\,\text{cm}^3$

$\frac{4}{3}\pi r^3 = 38808$

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

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

$r^3 = 9261$

$r^3 = 21^3$

$r = 21$

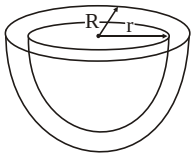
$CSA = 4\pi r^2$

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

$= 4 \times 22 \times 21 \times 3$

CSA of ball = 5544 cm^2

4. $R = 3.5$ cm $r = 2.8$ cm



Area to be tin plated

$= 2\pi R^2 + 2\pi r^2 + \pi (R^2 - r^2)$

$= \pi [2R^2 + 2r^2 + (R^2 - r^2)]$

$= \pi (3R^2 + r^2)$

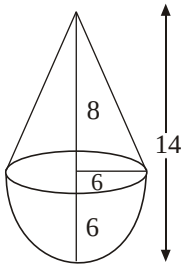
$= \frac{22}{7}[3 \times (3.5)^2 + (2.8)^2]$

$= \frac{22}{7}[36.75 + 7.84] = 140.14 \text{ cm}^2$

Cost of tin plating = ` $\left[\frac{15}{100} \times 140.14\right]$

= ` 21.02

5. Area to be pointed



$l = \sqrt{6^2 + 8^2}$

$= \sqrt{100}$

$l = 10$

Area to be painted = $2\pi r^2 + \pi rl$

$= \pi r(2r + l)$

$= \frac{22}{7} \times 6[2 \times 6 + 10]$

$= \frac{22}{7} \times 6 \times 22$

$= 414.85 \text{ cm}^2$

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)

$= \pi r^2 h + 2\left(\frac{2}{3}\pi r^3\right)$

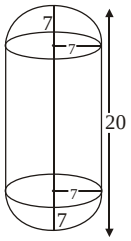
$= \pi r^2 \left(h + \frac{4}{3} r\right)$

$= \frac{22}{7} \times 7^2 \left[6 + \frac{4}{3} \times 7\right]$

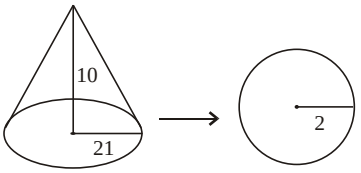
$= \frac{22}{7} \times 49\left(6 + \frac{28}{3}\right)$

$= \frac{22}{7} \times 49\left(\frac{18 + 28}{3}\right) = \frac{22}{7} \times 49 \times \frac{46}{3}$

$= 361.33 \text{ m}^3$



7.



Volume of cone = Volume of n spheres

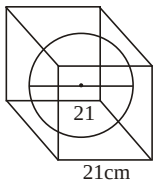
$\frac{1}{3}\pi r^2 h = n \times \frac{4}{3}\pi r^3$

$21^2 \times 10 = n \times 4 \times 2^3$

$\frac{21 \times 21 \times 10}{4 \times 8} = n$

137 balls = n

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



$\therefore\ d = 21$

$\therefore\ r = 10.5$

$\therefore$ Volume of sphere

$= \frac{4}{3}\pi r^3 = \frac{4}{3}\pi (10.5)^3$

$= \frac{4}{3} \times \frac{22}{7} \times (1.05)^3 = 4851 \text{ cm}^3$

Volume of cube = $\text{Side}^3 = 21^3 = 9261$

$\therefore$ Volume of remaining solid

$= 9261 - 4851 = 4410 \text{ cm}^3$