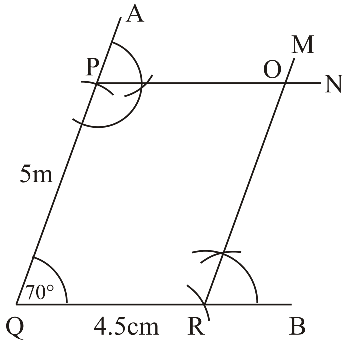
5. Steps of constructions :

(1) draw $\angle AOB = 70^\circ$

(2) With Q as centre and radius equal to 4.5 cm cut on arc R on QB.

(3) With Q as centre and radius equal to 5 cm cut an arc P on QA.



(4) At R draw $\angle MRB = \angle AQB$

(5) At P draw $\angle APN = \angle PQB$ meeting previous $\angle MRB$ at O.

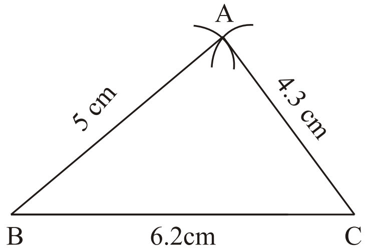
$\therefore$ $PO = QR = 4.5$ cm

$OR = QP = 5$ cm

($\because QROP$ is a parallelogram)

Exercise-12.2

1. Steps of construction :



(1) Draw $BC = 6.2$ cm

(2) With C as centre and radius 4.3 cut an arc.

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

(4) Join AB and AC

$\therefore$ ΔABC is required triangle.

2. Steps of construction :

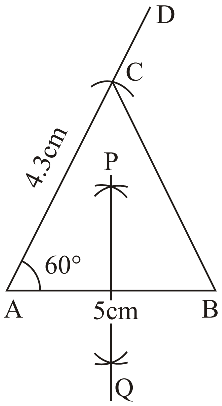
(1) Draw $AB = 5$ cm

(2) At A draw $\angle DAB = 60^\circ$

(3) With A as centre and radius 4.3 cm cut the AD at C.

(4) Join BC

$\therefore$ ΔABC is required triangle

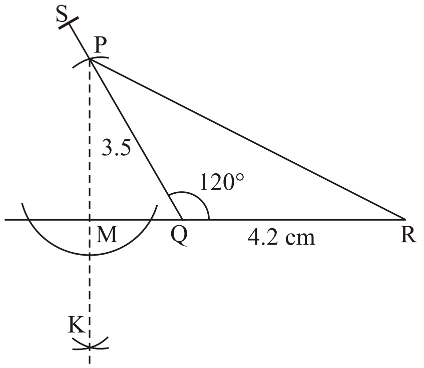


(5) With A as centre and radius more than half of AB cut two arcs.

(6) With B as centre and same radius cut the previous arcs at P and Q.

(7) Join PQ which is required perpendicular bisector.

3. Steps of construction :



(1) Draw $QR = 4.2$ cm

(2) At Q draw $\angle SQR = 120^\circ$

(3) With Q as centre and radius 3.5 cm cut an arc QS. Join PR

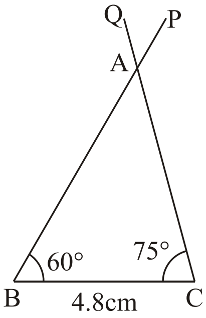
$\therefore$ ΔPQR is required triangle.

4. Steps of construction :

(1) Draw $BC =$ 4.8 cm

(2) At B draw $\angle PBC = 60^\circ$

(3) At C draw $\angle QCB = 75^\circ$



Meeting previous angle at *A*

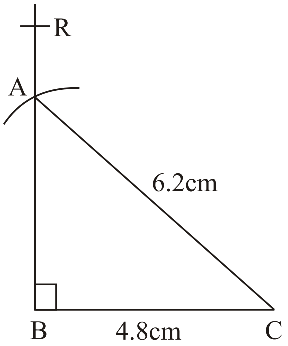
∴ ΔABC is required triangle.

5. **Step of construction :**

(1) Draw $BC = 4.8\,\text{cm}$

(2) At *B* draw $\angle B = 90°$

(3) With *C* as centre and radius 6.2 cm cut *BR* at *A*.



(4) Join *AC*

∴ ΔABC is required triangle.

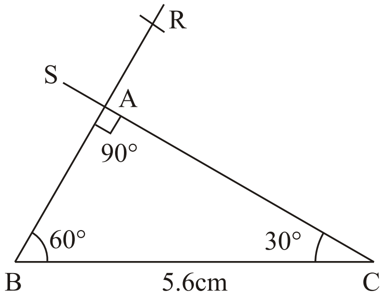
6. If one a cute angle of right angled triangle is 30° then other acute angle is 60°.

Steps of construction :

(1) Draw $BC = 5.6\,\text{cm}$

(2) At *B* draw $\angle RBC = 60°$

(3) At *C* draw $\angle SCB = 30°$



Meeting previous angle at *A*

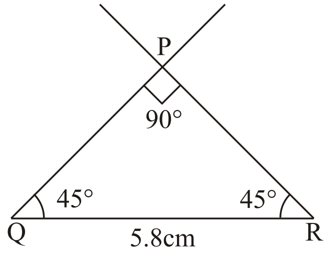
∴ ΔABC is required triangle.

7. Each acute angle of right angled triangle is 45°

Steps of construction :

(1) Draw $QR = 5.8$ cm

(2) At *Q* and *R* draw angle 45° each meeting each other at *P*.



∴ ΔPQR is required isosceles right angled triangle.

Mental Maths

1. three **2.** induced angle **3.** side **4.** No

5. SAS **6.** ASA **7.** No **8.** equilateral

13 Congruence

Exercise-13

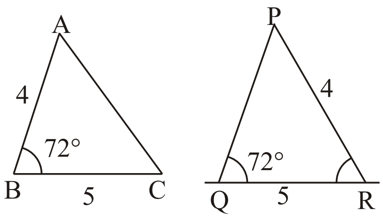
1. (i) Yes the triangles are congruent by SSS congruence condition.

(ii) Yes the triangles are congruent by ASA congruence condition.

(iii) No the triangles are not congruent.

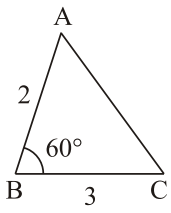
(iv) No the triangles are not congruent.

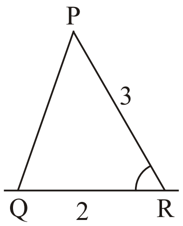
2. (i) Yes $\Delta ABC \cong \Delta PRQ$ by SAS



$\because \quad AB = PR, \angle B = \angle R, BC = QR$

(ii) Not necessary

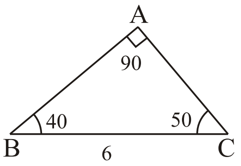


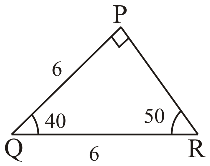


$\because$ $AB \neq PQ, \angle B = \angle R, BC = QR$

(iii) $\angle B = 180 - (90 + 50)$

$\angle B = 40°$

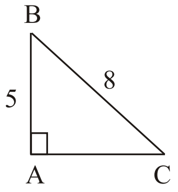


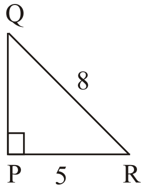


No the triangles are not congruent.

(iv) Yes $\Delta ABC \cong \Delta PRQ$

By RHS

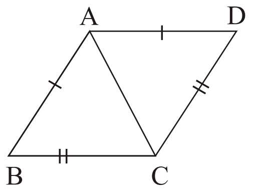




$\because$ $\angle A = \angle P, BC = QR, AB = PR$

(v) Figure is according to given condition

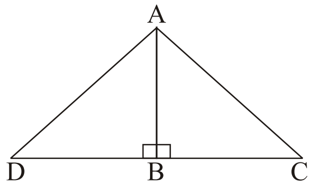
Yes, $\Delta ABC \cong \Delta ADC$ (By sss)



$\because$ $AB = AD, BC = DC, AC = AC$

(vi) Yes $\Delta ABC \cong \Delta ABD$ (By RHS)

$\because$ $\angle ABC = \angle ABD = 90$



$AC = AD$

$AB = AB$

3. ΔAOB is not $\cong$ to ΔEOD

$\because$ Only $\angle A = \angle E, \angle B = \angle D$ (alternte angles)

But no sides are equal

4. (i) $\angle ADB = \angle DBC$ (alternate angles)

In ΔDAB and ΔBCD

$AD = BC$ (given)

$\angle ADB = \angle DBC$ (alternate angles)

$BD = BD$

$\Delta DAB \cong \Delta BCD$ (By SAS)

5. In ΔAOB and ΔDOC

$\angle A = \angle D$ alternate angles

$AB = CD$ common

$\angle B = \angle C$ alternate angles

$\therefore$ $\Delta AOB \cong \Delta DOC$ by ASA

6. In ΔABC and ΔDCB

$AB = DC$ (given)

$AC = BD$ (given)

and $BC = BC$

$\therefore$ $\Delta ABC \cong \Delta DCB$ (By SSS)

In ΔABD and ΔDCA

$AD = AD$

$AB = CD$

$BD = AC$

$\therefore$ $\Delta ABD \cong \Delta DCA$ (By SSS)

7. In ΔABN and ΔACM

$AB = AC$ (given)

$\angle A = \angle A$ (Common)

$AN = AM$ (given)

$\therefore$ $\Delta ABN \cong \Delta ACM$ (by SAS)

$\therefore$ $BN = CM$ (CPCTC)

8. Yes, $\Delta LPQ \cong \Delta MPQ$ (By SSS)

$\because$ $PL = PM$

$PQ = PQ, LQ = MQ$

9. In ΔPQR and ΔSQR

$PR = SR$

$\angle PRQ = \angle SRQ$

$QR = QR$

$\therefore$ $\Delta PQR \cong \Delta SQR$ By **SAS**

10. (i) Yes $\Delta ABC \cong \Delta CDA$

(ii) SSS congruence condition

(iii) Yes $AC = AC$ (common)

11. In ΔABC and ΔDBC

$\angle A = \angle D = 90°$ (given)

$BC = BC$ (common)

$AC = BD$ (given)

$\therefore$ $\Delta ABC \cong \Delta DBC$ (by RHS)

12. $\angle A = \angle D, \angle B = \angle E, \angle C = \angle F$ (given)

But ΔABC not $\cong \Delta DEF$ becuase even in two equilateral triangles angles are equal but sides can be different.

13. (i) false (ii) true (iii) false (iv) false

14. $\Delta ABD \cong \Delta ACD$ (by ASA)

$\because$ $\angle CAD = \angle BAD$ (angle bisector)

$AD = AD$ (common)

$\angle CDA = \angle BDA$ (angle bisector)

15. (i) they are of equal lengths.

(ii) their measure are equal.

(iii) they have the same side.

(iv) their dimensions are same.

(v) they have the same radii.

MCQs

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

14 Symmetry

Exercise-14.1

1. H, I,N have rotational symmetry.
2. (i), (iii), (v), (vii), (ix) have rotational symmetry.
3. (i) 4 order (ii) 3 order (iii) 2 order (iv) 3 order (v) 6 order (vi) 4 order

Exercie-14.2

1. (i), (iv) (vi), (vii), (viii) have point symmetry.

2. (i) The point of intersection of medians.

(ii) The mid point of the line segment

(iii) The point of intersection of diagonals.

(iv) The point of intersection of the medians.

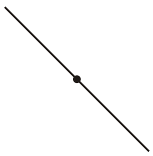
(v) The point of intersection of the diagonals.

(vi) The point of intersection of the diagonals.

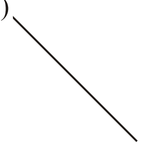
(vii) The centre of circle.

(viii) The point of intersection of the diagonals.

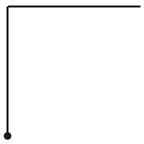
3. (i)



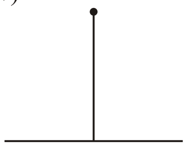
(ii)



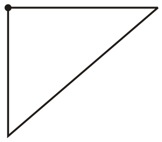
(iii)



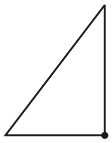
(iv)



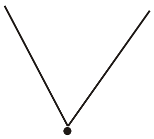
(v)



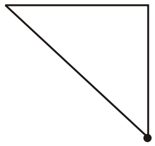
(vi)



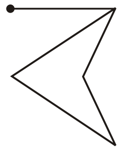
(vii)



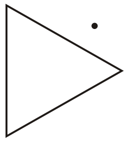
(viii)



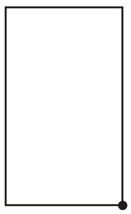
(ix)



(x)



(xi)



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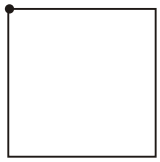
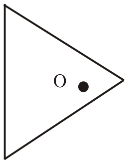
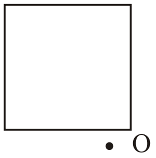


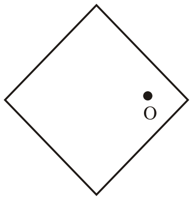
(xiii)



(xiv)



(xv)



MCQs

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

Mental Maths

1. Yes **2.** No **3.** 4 **4.** 4
5. rotational, 3 **6.** isosceles triangl

15 Three Dimensional Shapes

Exercise-15

1. (i) Cube
(ii) Rectangulr pyramid
(iii) Triangular prism
(iv) Cone

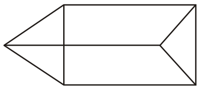
2.

Quadrilateral	2D
Hexagon	2D
Sphere	3D
Prism	3D
Circle	2D
Pyramid	3D
Triangle	2D
Cylinder	3D
Square	2D

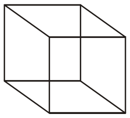
3.

Tube light	cylinder
A playing circle	cube
Match box	cuboid
An orange	sphere
Joker's cap	cone
A Kalidascope	triangular prism

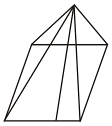
4. (i) Prism



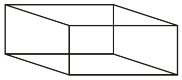
(ii) Cube



(iii) Pyramid



(iv) Cuboid



5. 6
6. (i) LM is joined to OP
(ii) RS is joined to LY
7. Do yourself
8. Do yourself
9. $A \rightarrow 2, B \rightarrow 3, C \rightarrow 1$
10. Cuboid= 8 cm × 4 cm × 4 cm
11. 24 cubes
12.

S. No.	Shapes	No. of edges	No. of faces	No. of vertices
1.	Cuboid	12	6	8
2.	Cone	1	2	1
3.	Cylinder	2	3	0
4.	Cube	12	6	8

MCQs

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

Exercise-16.1

1. (i) Perimeter of triangle $=(10+7+6)$ cm $=23$ cm

(ii) Perimeter of triangle $=(5+5+5)$ cm $=15$ cm

(iii) Perimeter of triangle $=(4+5.6+4.3)$ cm $=13.9$ cm

2. (i) Perimeter of rectangle $=2(l+b)$

$=2(10+5)$ cm $=30$ cm

(ii) Perimeter of square $=4\times$ side

$=4\times 2.5$ cm $=10$

(iii) Perimeter of rectangle $=2(l+b)$

$=2(20+25)$

$=2\times 45=90$ cm

(iv) Perimeter of square $=4\times$ side

$=(4\times 15)$ cm $=60$ cm

3. (i) Perimeter of rectangle $=2(l+b)$

$360=2[100+b]$

$180=100+b$

$80\text{ cm}=b$

(ii) Perimeter of rectangle $=2(l+b)$

$360=2[116+b]$

$180=116+b$

$64\text{ cm}=b$

(iii) Perimeter of rectangle $=2(l+b)$

$360=2[140+b]$

$180=140+b$

$40\text{ cm}=b$

(iv) Perimeter of rectangle $=2(l+b)$

$360=2(102+b)$

$180=102+b$

$78\text{ cm}=b$

4. $\because$ diagonal of squqre $=\sqrt{2}\times$ side

$10\sqrt{2}=\sqrt{2}\times\text{side}$

$10\text{ cm}=\text{side}$

$\therefore$ Perimeter of square

$=4\times$ side

$=4\times 10=40$ cm

5. (i) Diagonal of Rectangle

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

$=\sqrt{16^2+12^2}$

$=\sqrt{256+144}$

$=\sqrt{400}$

$=\sqrt{20^2}$

$\therefore$ diagonal of rectangle $=20$ cm

(ii) Similarly, diagonal of Rectangle

$=\sqrt{40^2+9^2}$

$=\sqrt{1600+81}$

$=\sqrt{1681}$

$=\sqrt{41^2}$

$\therefore$ Length of diagonalof rectangle $=41$ cm

6. $\because$ Perimeter of building $=2(l+b)$

$320=2[125+b]$

$160=125+b$

$35\text{ m}=b$

$\therefore$ breadth of building $=35$ m

7. Perimeter of rectangular playground

$=2(l+b)$

$=2[120+70]$

$=2(190)$

$=380$ cm

8. Perimeterof rectangle

$=2(l+b)$

$=2(l+3)$

$18=2l+6$

$\frac{18-6}{2}=l$

$\frac{12}{2}=l$

$\therefore$ $l=6$

$\therefore$ Length of rectangle $=6$ cm

9. Distance travelled by a boy in going round a square = Perimeter of square

$=4\times$ side

$=4\times 20$

$\therefore$ distance covered by a boy $=80$ m

10. Perimeter of equilateral triangle

$=3\times$ side

$=3\times 12.5=37.5$ cm

11. Perimeter of regular hexagon

$= 6 \times \text{side}$

$= 6 \times 8.3$

$= 49.8 \text{ cm}$

12. Perimeter of 8 sided polygon

$= 8 \times \text{side}$

$53.6 = 8 \times \text{side}$

$6.7 \text{ cm} = \text{side}$

13. Wire required = Perimeter of park

$= 2(l + b)$

$= 2[30 + 20]$

$= 100 \text{m}$

Cost of fencing $= 15 \times 100$

$= ₹ 1500$

14. Perimeter of triangle $= a + b + c$

$= 5 + 3 + 7$

$= 15 \text{cm}$

15. Perimeter of rectangular park

$= 2(l + b)$

$= 2[200 + 150]$

$= 700 \text{ m}$

$\therefore$ cost of fencing $= 20 \times 700$

$= ₹ 14000$

Exercise-16.2

1. We have $l = 240 \text{m}$

$b = 75 \text{m}$

(a) Area of field $= l \times b$

$= 240 \times 75$

$= 18000 \text{ m}^2$

Cost of turfing $= ₹ 18000 \times 0.75$

$= ₹ 13500$

(ii) Perimeter of field $= 2(l + b)$

$= 2[240 + 75]$

$= 2(315)$

$= 630 \text{m}$

Cost of fencing $= 1.25 \times 630$

$= ₹ 787.5$

2. Let length of field $= 3x$

Breadth " $= 2x$

Area of field $= l \times b$

$3456 = 3x \times 2x$

$3456 = 6x^2$

$576 = x^2$

$24^2 = x^2$

$24 = x$

$\therefore$ length $= 3 \times 24 = 72 \text{m}$

breadth $= 2 \times 24 = 48 \text{m}$

Fence for the field $= 2(l + b)$

$= 2[72 + 48]$

$= 2(120) = 240 \text{m}$

$\therefore$ Cost of fencing $= 3.50 \times 240$

$= ₹ 840$

3. Length of rectangular plot $= 35 \text{m}$

In ΔABC, Pythogoras theorem

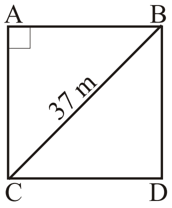
$(BC)^2 = (AC)^2 + (35)^3$

$(37)^2 = (AC)^2 + (35)^2$

$(AC)^2 = (37)^2 - (35)^2$

$(AC)^2 = 1369 - 1225$

$(AC)^2 = 144$



$AC = 12 \text{m} =$ breadth of rectangular plot

Now, Area of rectangular plot

$= 35 \times 12 \text{ m}^2$

$= 420 \text{m}^2$

4. Diagonal of square $= \sqrt{2} \times \text{side}$

$2.8 = \sqrt{2} \text{ side}$

$\frac{2.8}{\sqrt{2}} = \text{side}$

Area of square = side × side

$= \frac{2.8}{\sqrt{2}} \times \frac{2.8}{\sqrt{2}}$

$= \frac{7.84}{2} = 3.92 \text{m}^2$

5. Perimeter of square field $= \frac{\text{total cost}}{\text{cost/m}}$

$= \frac{1600}{0.80}$

$4 \times$ Side of square $= 2000 \text{m}$

$\therefore$ Side of square $= 500 \text{m}$

$\because$ Area of square $= \text{side}^2$

$= (500^2) \text{ m}^2$

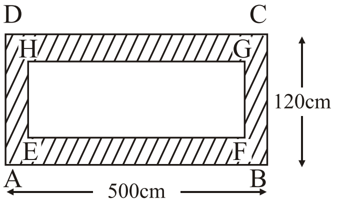
$= 250000 \text{ m}^2$

$\because$ cost of reaping $100 \text{ m}^2 = ₹ 0.60$

" " $250000 \text{ m}^2 = ₹ \frac{0.60}{100} \times 250000$

$= ₹ 1500$

6. We have *ABCD* is a saree



$AB = 500\,\text{cm}, BC = 130\,\text{cm}$

$\therefore \quad EF = 500 - (25 + 25)$

$= 450$

$GF = 130 - (25 + 25)$

$= 80\,\text{cm}$

$\therefore$ Area of border

= Area *ABCD* – Area *EFGH*

$= (500 \times 130) - (450 \times 80)$

$= 65000 - 36000 = 29000\,\text{cm}^2$

Area of border $= 29000\,\text{cm}^2$

$\therefore$ Cost of weaving border

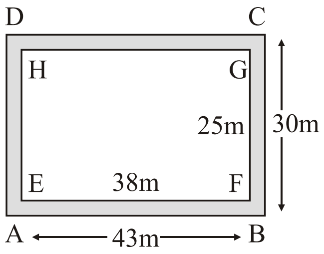
$(100)^2 = ₹\,1$

Cost of weaving border 29000 cm^2

$= \frac{1 \times \overset{290}{\cancel{29000}}}{\cancel{100}}$

$= ₹\,290$

7. *EFGH* is a grassy lawn



$AB = 38 + (2.5 + 2.5) = 43\,\text{m}$

$BC = 25 + (2.5 + 2.5) = 30\,\text{m}$

$\therefore$ Area of path

= Ar *ABCD* – Ar *EFGH*

$= 43 \times 30 - 38 \times 25$

$= 1290 - 950$

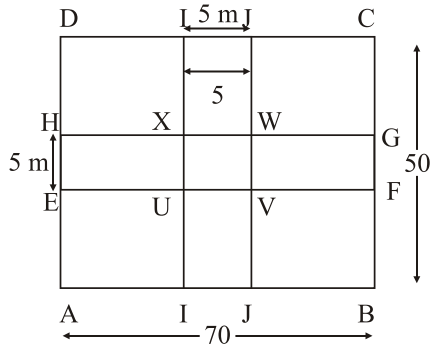
Ar of path $= 340\,\text{m}^2$

Cost of gravelling $1\text{m}^2 = ₹\,6.50$

" " " $340\,\text{m}^2 = ₹\,6.50 \times 340$

$= ₹\,2210$

8.



Area of Road

= (Area *EFGH* + Area *IJHK*)

– (Area of *UVWX*)

$= [(70 \times 5) + (50 \times 5)] - (5 \times 5)$

$= (350 + 250) - 25$

Area of road $= 600 - 25$

$= 575\,\text{m}^2$

Cost of construction of 1m^2 road= ₹ 20

" " " $575\,\text{m}^2$ road $= ₹\,20 \times 575$

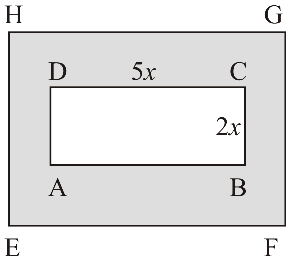
$= ₹\,11500$

9. Let breadth of park $= 5x$

breadth of park $= 2x$

$\because \quad AB = 5x,$

$BC = 2x$



$\therefore \quad EF = 5x + (2.5 + 2.5) = 5x + 5$

$FG = 2x + (2.5 + 2.5) = 2x + 5$

$\therefore$ Ar *EFGH* – Ar of *ABCD* = 305

$(2x + 5) \times (5x + 5) - 5x \times 2x = 305$

$10x^2 + 10x + 25x + 25 - 10x^2 = 305$

$35x = 305 - 25$

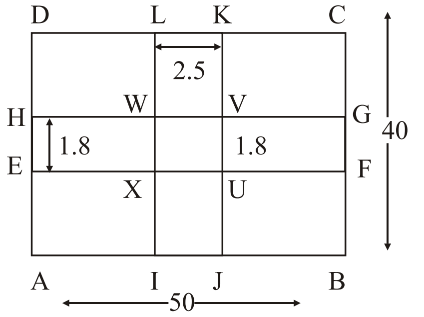
$35x = 280$

$x = 8$

$\therefore$ length of park $= 5 \times 8 = 40\,\text{m}$

breadth of park $= 2 \times 8 = 16\,\text{m}$

10.



Area of Roads

$= \text{Area of } EGFH + \text{Area of } IJKL$

$- \text{Area of } UVWX$

$= 50 \times 1.8 + 40 \times 2.5 - 2.5 \times 1.8$

$= 90 + 100 - 4.5$

$= 190 - 4.5$

Area of Raods $= 185.5\,\text{m}^2$

Area of Remaining portion

$= \text{Area of } ABCD - \text{Area of Roads}$

$= 50 \times 40 - 185.5$

$= (2000 - 185.5)\,\text{m}^2$

$= 1814.5\ \text{m}^2$

Exercise-16.3

1. We have,

$a = 3\,\text{cm}, b = 4\ \text{cm}, c = 5\,\text{cm}$

$\therefore \quad s = \frac{a+b+c}{2} = \frac{3+4+5}{2} = 6$

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

$= \sqrt{6(6-3)(6-4)(6-5)}$

$= \sqrt{6 \times 3 \times 2 \times 1}$

$= \sqrt{6 \times 6}$

$r = 6\,\text{cm}^2$

(ii) We have, $a = 50$ cm, $b = 48$ cm, $c = 14\,\text{cm}$

$\therefore \quad s = \frac{a+b+c}{2} = \frac{50+48+14}{2}$

$= \frac{112}{2} = 56$

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

$= \sqrt{56(56-50)(56-48)(56-14)}$

$= \sqrt{56 \times 6 \times 8 \times 42}$

$= \sqrt{172896}$

$A = \sqrt{(336)^2}$

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

(iii) We have, $a = 12$ cm, $b = 9.6$ cm, $c = 7.2$

$\therefore \quad s = \frac{a+b+c}{2} = \frac{12+9.6+7.2}{2}$

$= \frac{28.8}{2} = 14.4$

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

$= \sqrt{14.4\,(14.4-12)\,(14.4-9.6)\,(14.4-7.2)}$

$= \sqrt{14.4 \times 2.4 \times 4.8 \times 7.2}$

$= \sqrt{\frac{144 \times 24 \times 48 \times 72}{10000}}$

$= \sqrt{\frac{12 \times 12 \times 24 \times 24 \times 2 \times 2 \times 6 \times 6}{100 \times 100}}$

$A = \frac{12 \times 24 \times 2 \times 6}{100}$

$= 34.56\ \text{cm}^2$

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

$13^2 = AB^2 + 12^2$

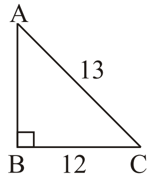
$169 = AB^2 + 144$

$169 - 144 = AB^2$

$25 = AB^2$

$5^2 = AB^2$

$\therefore \quad AB = 5\,\text{cm}$



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

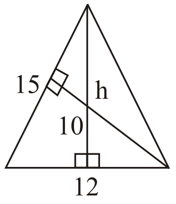
$= \frac{1}{2} \times 12 \times 5$

$= 30\,\text{cm}^2$

3. Area $= \frac{1}{2} \times \text{base} \times h$

$= \frac{1}{\cancel{2}} \times \overset{6}{\cancel{12}} \times 10$

$= 60\,\text{cm}^2$



Area of $\Delta = 60\,\text{cm}^2$

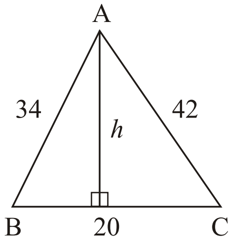
$\frac{1}{2} \times 15 \times h = 60$

$h = \frac{\cancel{60} \times 2}{\cancel{15}}$

$$h = 8\,\text{cm}$$

$\therefore$ altitude to the other side is 8 cm.

4. We have,



$a = 20, b = 42, c = 34$

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

$$= \frac{20+42+34}{2}$$

$$= \frac{96}{2}$$

$$= 48$$

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

$$= \sqrt{48(48-20)(48-42)(48-34)}$$

$$= \sqrt{48\times 28\times 6\times 14}$$

$$= \sqrt{112896}$$

$$A = \sqrt{336^2}$$

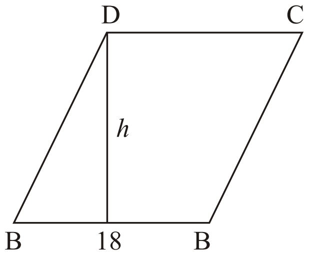
$$A = 336\text{cm}^2$$

$$\frac{1}{2}\times 20\times h = 336$$

$$h = \frac{336\times\cancel{2}}{\underset{10}{\cancel{20}}}$$

$$h = 33.6\,\text{cm}$$

5.



Area of parallelogram = base × height

$$153 = 18\times\text{height}$$

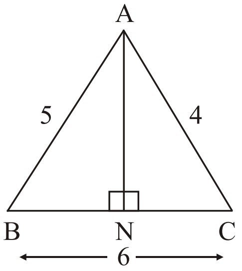
$$\frac{153}{18} = h$$

$$8.5\text{ cm} = h$$

$$8.5\text{cm} = h$$

$\therefore$ distance from opposite side = 8.5 cm

6.



We have, $a = 6, b = 4, c = 5$

$$\therefore \quad s = \frac{6+4+5}{2} = 7.5$$

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

$$= \sqrt{7.5(7.5-6)(7.5-4)(7.5-5)}$$

$$= \sqrt{7.5\times 1.5\times 3.5\times 2.5}$$

$$= \sqrt{98.4375}$$

$$A = 9.92\text{ cm}^2$$

$$\frac{1}{2}\times BC\times AN = 9.92$$

$$\frac{1}{2}\times 6\times AN = 9.92$$

$$AN = \frac{9.92\times 2}{6}$$

$$AN = 3.3\text{ cm}$$

7. Area of equilateral triangle

$$= \frac{\sqrt{3}}{4}\,\text{side}^2$$

$$= \frac{\sqrt{3}}{4}\times 6^2$$

$$= \frac{1.732\times 36}{4}$$

$$= \frac{62.352}{4}$$

Area of equilateral triangle

$$= 15.588\text{ cm}^2$$

or $\quad = 15.6\text{ cm}^2$

8. Area of equilateral triangle $= 81\sqrt{3}$

$$\frac{\sqrt{3}}{4}\,\text{side}^2 = 81\sqrt{3}$$

$$\text{side}^2 = 81\times 4$$

$$\text{side}^2 = 9^2\times 2^2$$

$\text{side} = 9 \times 2$

$\text{side} = 18$

$\therefore$ Perimeter of equilateral triangle

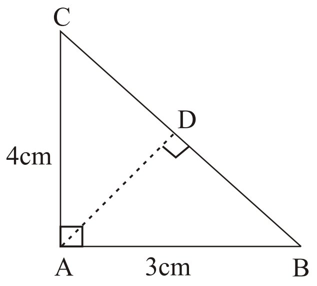
$= 3 \times \text{side}$

$= 3 \times 18 = 54 \text{ cm}$

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

(By Pythagoras Theorem

$= 4^2 + 3^2$



$BC^2 = 25$

$BC^2 = 5^2$

$BC = 5$

Area of $\Delta ABC = \frac{1}{2} \times AB \times AC$

$\frac{1}{2} \times BC \times AD = \frac{1}{2} \times AB \times AC$

$5 \times AD = 3 \times 4$

$AD = \frac{12}{5}$

$AD = 2.4 \text{ cm}$

Area of $\Delta ABC = \frac{1}{2} \times 3 \times 4$

$= 6\text{cm}^2$

10. Let sides of triangle be $3x, 4x, 5x$

$\therefore \quad 3x + 4x + 5x = 48$

$12x = 48$

$x = 4$

$\therefore$ sides are $= 3 \times 4, 4 \times 4, 5 \times 4$

$= 12, 16, 20$

$\therefore \quad a = 12, b = 16, c = 20$

$s = \frac{12 + 16 + 20}{2}$

$s = 24$

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

$= \sqrt{24(24-12)(24-16)(24-20)}$

$= \sqrt{24 \times 12 \times 8 \times 4}$

$= \sqrt{12 \times 2 \times 12 \times 2 \times 4 \times 4}$

$= 12 \times 2 \times 4$

$= 96\text{cm}^2$

11. Perimeter of equilateral triangle $= 36$

$3 \times \text{side} = 36$

$\text{side} = 12$

Area of equilateral triangle

$= \frac{\sqrt{3}}{4} \text{side}^2$

$= \frac{\sqrt{3}}{4} \times 12^2$

$= \frac{1.732 \times 144}{4}$

$= \frac{249.408}{4}$

$= 62.3 \text{ cm}^2$

$\therefore$ Height of equilateral triangle

$= \frac{\sqrt{3}}{2} \times \text{side}$

$= \frac{1.732 \times 12}{2}$

$= 10.4 \text{ cm}$

12. $PR = 24 \text{ cm}, ST = 6 \text{ cm}, QU = 6 \text{ cm}$

Area of parallelogram $PQRS$ = Area $\Delta PST +$ Area ΔROQ (taking RP as base)

$= \frac{1}{2} \times PR \times ST + \frac{1}{2} \times QU \times PR$

$= \frac{1}{2} \times PR\,(ST + PR)$

$= \frac{1}{2} \times 24 \times (6 + 6)$

$= \frac{1}{2} \times 24 \times 12$

$= 12 \times 12 \text{ cm}^2$

$= 144 \text{ cm}^2$

13. $DC = 8 \text{ m}, BC = 8 \text{ m}, AB = 12$

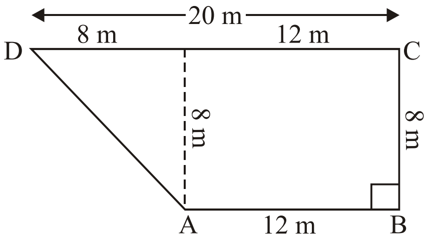
$\therefore$ Area of $ABCE$ rectangle

$= \text{Length} \times \text{Breadth}$

$= (12 \times 8) \text{ m}^2$

$(\therefore EC = 12 \text{ cm}, AB = 12 \text{ m})$

$= 96 \text{ m}^2$



$\therefore$ Area of triangle $= \frac{1}{2} \times$ Base $\times$ height

Area of $ADE = \frac{1}{2} \times DE \times AE$

$= \frac{1}{2} \times 8 \times 8\,\text{m}^2$

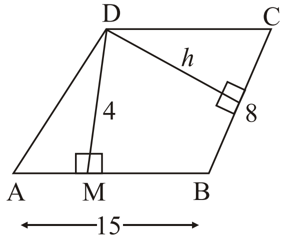
$= 32\,\text{m}^2$

Area of Quadrilateral $ABCD$

$= (96 + 32)\,\text{m}^2$

$= 128\,\text{m}^2$

14.



Area of parallelogram $= AB \times DM$

" " $= BC \times h$

$\therefore \quad AB \times DM = BC \times h$

$15 \times 4 = 8 \times h$

$\frac{15 \times \cancel{4}}{\underset{2}{\cancel{8}}} = h$

$7.5\text{ cm} = h$

$\therefore$ distance between shorter sides is 7.5 cm

15. Taking 20 cm as the base of the parallelogram, its height is 8 cm.

Area of parallelogram $=$ base $\times$ height

$= 20 \times 8$

$= 160\,\text{cm}^2$

Let d cm be the distance between the shorter sides,

Then, area of the parallelogram

$= (10 \times d)\,\text{cm}^2$

$10d = 160$

$d = 16$

Hence, the distance between the shorter sides $= 16\,\text{cm}$.

Exercise-16.4

1. (i) Radius $= 10\,\text{cm}$

Circumference of circle $= 2\pi r$

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

$= 62.85$ cm

Area of circle $= \pi r^2$

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

$= 314.28\text{ cm}^2$

(ii) Radius $= 14$ cm

Circumference of circle $= 2\pi r$

$= 2 \times \frac{22}{7} \times 14$

$= 88\,\text{cm}$

Area of circle $= \pi r^2$

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

$= 616\,\text{cm}^2$

(iii) Radius $= 5.6$ cm

Circumference of circle $= 2\pi r$

$= 2 \times \frac{22}{7} \times 5.6$

$= 35.2$ cm

Area of circle $= \pi r^2$

$= \frac{22}{7} \times 5.6 \times 5.6$

$= 98.56\text{ cm}^2$

(iv) Radius $= 28\,\text{cm}$

Circumference of circle $= 2\pi r$

$= 2 \times \frac{22}{7} \times 28$

$= 176\,\text{cm}$

Area of circle $= \pi r^2$

$= \frac{22}{7} \times 28 \times 28$

$= 2464\text{ cm}^2$

2. (i) Circumference of circles $= 132\,\text{cm}$

$\therefore \quad 2\pi r = 132$

$2 \times \frac{22}{7} \times r = 132$

$r = \frac{132 \times 7}{22 \times 2} = 21 \quad \therefore \quad r = 21\,\text{cm}$

Area of circle $= \pi r^2$

$$= \frac{21}{7} \times 21 \times 21 \, \text{cm}^2$$

$$= 1386 \, \text{cm}^2$$

(ii) Circumference of a circle $= 88$ cm

$$2\pi r = 88$$

$$2 \times \frac{22}{7} \times r = 88$$

$$r = \frac{88 \times 7}{22 \times 2} = 14 \text{ cm}$$

Area of a circle $= \pi r^2$

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

$$= 616 \, \text{cm}^2$$

(iii) Circumference of a circle $= 176$ cm

$$2\pi r = 176$$

$$\frac{2 \times 22}{7} \times r = 176$$

$$r = \frac{176 \times 7}{2 \times 22} = 28 \, \text{cm}$$

Area of a circle $= \pi r^2$

$$= \frac{22}{7} \times 28 \times 28$$

$$= 2464 \text{ cm}^2$$

3. Area of circle $= 144\pi$

$$\pi r^2 = 144 \pi$$

$$r^2 = 144$$

$$r^2 = 12^2$$

$$r = 12 \, \text{cm}$$

Area of circle $= \pi r^2$

$$= \frac{22}{7} \times (12)^2$$

$$= \frac{22}{7} \times 144$$

$$= \frac{3168}{7}$$

$$= 452.57 \text{ cm}^2$$

4. We have, $c = 18\pi$cm

$$2\pi r = 18 \pi$$

$$2\pi \times r = 18\pi$$

$$r = \frac{18\pi}{2\pi}$$

$$r = 9 \, \text{cm}$$

$\therefore$ Area $= \pi r^2$

$$= \pi (9)^2$$

$$= 81\pi \text{cm}^2$$

5. We have radius of earth $= 6398$

Length of equator of earth

$$= \text{Circumference}$$

$$= 2\pi r$$

$$= 2 \times \frac{22}{\cancel{7}} \times \overset{914}{\cancel{6398}}$$

$$= 2 \times 22 \times 914$$

$$= 40216 \, \text{km}$$

6. We have, $c = 44$ cm

$$2\pi r = 44$$

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

$$r = \frac{\overset{2}{\cancel{44}} \times 7}{\cancel{2} \times \cancel{22}}$$

$$r = 24 \text{ cm}$$

$\therefore$ diameter $= 14$ cm

7. Perimeter of square $=$ Perimeter of circle

$$4 \times \text{side} = 2\pi r$$

$$4 \times 27.5 = 2 \times \frac{22}{7} \times r$$

$$\frac{4 \times 27.5 \times 7}{2 \times 22} = r$$

$$r = 17.5 \text{ cm}$$

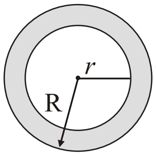
Area of circle $= \pi r^2$

$$= \frac{22}{7} \times (17.5)^2$$

$$= \frac{22}{\cancel{7}} \times 17.5 \times \overset{2.5}{\cancel{17.5}}$$

Area of circle $= 912.5 \text{ cm}^2$

8. We have, $R = \frac{11}{2}$



$$r = \frac{3}{2}$$

Area of shaded portion

$$= \text{Area of ring}$$

$$= \pi[R^2 - r^2]$$

$$= \frac{22}{7}\left[\left(\frac{11}{2}\right)^2 - \left(\frac{3}{2}\right)^2\right]$$

$$= \frac{22}{7}[(5.5)^2 - (1.5)^2]$$

$$= \frac{22}{7}(30.25 - 2.25)$$

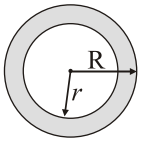
$$= \frac{22}{\cancel{7}} \times \overset{4}{\cancel{28}}$$

$$= 22 \times 4$$

Area of shaded portion $= 88\,\text{cm}^2$

9. We have,

Circumfernece of inner circle = 88



$$2\pi r = 88$$

$$2 \times \frac{22}{7} \times r = 88$$

$$r = 7 \times 2$$

$$r = 14 \text{ cm}$$

Area of shaded portion $= 346.5 \text{ cm}^2$

$$\pi(R^2 - r^2) = 346.5$$

$$\frac{22}{7}[R^2 - 14^2] = 346.5$$

$$(R^2 - 196) = \frac{346.5 \times 7}{22}$$

$$= \frac{2425.5}{22}$$

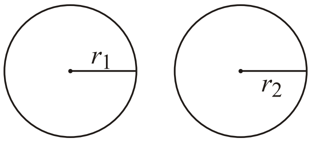
$$R^2 - 196 = 110.25$$

$$R^2 = 306.25$$

$$R^2 = (17.5)^2$$

$$R = 17.5 \text{ cm}$$

10.



We have,

$$2r_1 + 2r_2 = 2.8$$

$$r_1 + r_2 = 1.4 \text{ cm} \qquad \ldots(1)$$

$$c_1 - c_2 = 0.88$$

$$2\pi r_1 - 2\pi r_2 = 0.88$$

$$2\pi(r_1 - r_2) = 0.88$$

$$2 \times \frac{22}{7}(r_1 - r_2) = 0.88$$

$$r_1 - r_2 = \frac{0.88 \times 7}{44}$$

$$r_1 - r_2 = 0.14 \qquad \ldots(2)$$

Adding (1) + (2)

$$(r_1 + r_2) + (r_1 - r_2) = 1.4 + 0.14$$

$$2r_1 = 1.54$$

$$r_1 = 1.54$$

$$r_1 = 0.77 \text{ m}$$

Putting in (1)

$$0.77 + r_2 = 1.4$$

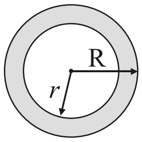
$$r_2 = 1.4 - 0.77$$

$$r_2 = 0.63$$

∴ radius of circles are 0.77m and 0.63 m.

11. We have, $R = 21$,

$$r = ?$$



∵ Area of shaded portion

$$= 770\text{cm}^2$$

$$\pi(R^2 - r^2) = 770$$

$$\frac{22}{7}[21^2 - r^2] = 770$$

$$[441 - r^2] = \frac{770 \times 7}{22}$$

$$441 - r^2 = 245$$

$$441 - 245 = r^2$$

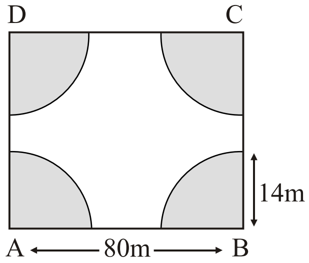
$$196 = r^2$$

$$14^2 = r^2$$

$$14 = r$$

∴ radius of inner circle = 14 cm

12.



Area of remaining portion

= Area of square – Area of 4 quadrant

$$= 80^2 - 4 \times \left(\frac{\pi r^2}{4}\right)$$

$$= 6400 - \pi r^2$$