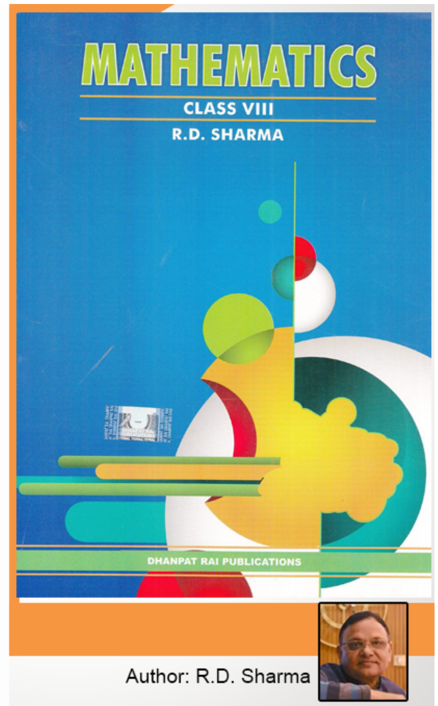
Class 8 - Chapter 20 Mensuration - I (Area of a Trapezium and a Polygon)



RD Sharma Solutions for Class 8 Maths Chapter 20–Mensuration - I (Area of a Trapezium and a Polygon)

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RD Sharma 8th Maths Chapter 20, Class 8 Maths Chapter 20 solutions

EXERCISE 20.1 PAGE NO: 20.13

1. A flooring tile has the shape of a parallelogram whose base is 24 cm and the corresponding height is 10 cm. How many such tiles are required to cover a floor of area 1080 m^2?

Solution:

Given that,

Base of parallelogram = 24cm

Height of parallelogram = 10cm

Area of floor = 1080m^2

We know that,

Area of parallelogram = Base × Height

Area of 1 tile = 24 × 10 = 240cm^2

We know that, 1m = 100cm

So for 1080m^2 = 1080 × 100 × 100 cm^2

To calculate the Number of tiles required = Area of floor/Area of 1 tile

i.e., Number of tiles required = (1080 × 100 × 100) / (24 × 10) = 45000

∴ Number of tiles required = 45000

2. A plot is in the form of a rectangle ABCD having semi-circle on BC as shown in Fig. 20.23. If AB = 60 m and BC = 28 m, Find the area of the plot.

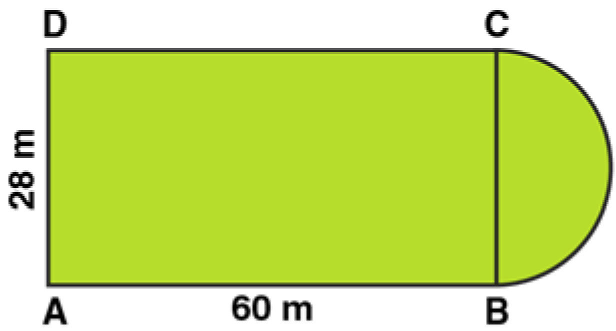


Fig. 20.23

Solution:

Area of the plot = Area of the rectangle + Area of semi-circle

Radius of semi-circle = BC/2 = 28/2 = 14m

Area of the Rectangular plot = Length × Breadth = 60 × 28 = 1680 m^2

Area of the Semi-circular portion = $\pi r^2/2$

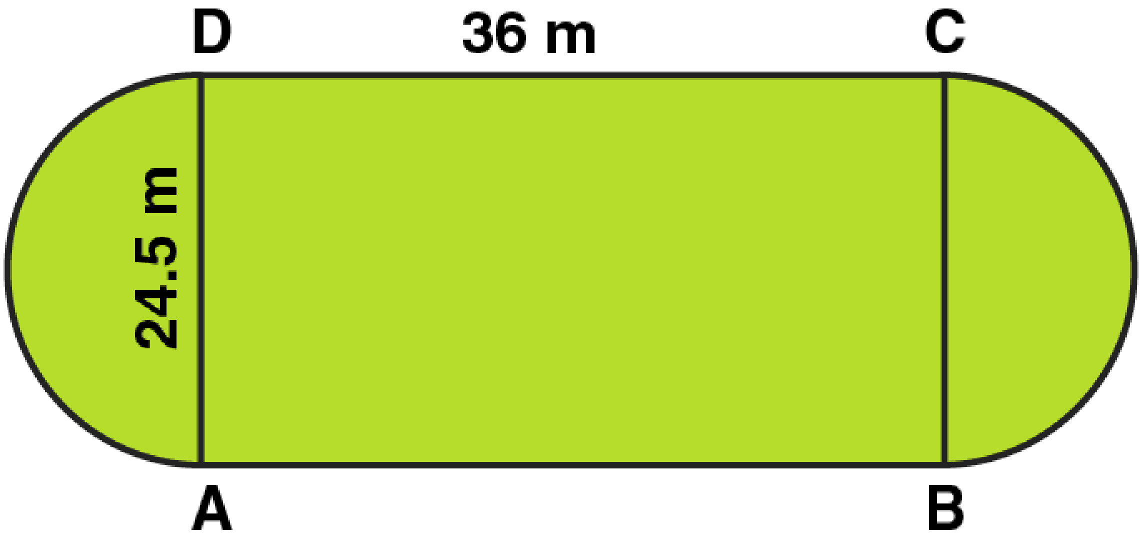
= 1/2 × 22/7 × 14 × 14

= 308 m^2

∴ The total area of the plot = 1680 + 308 = 1988 m^2

3. A playground has the shape of a rectangle, with two semi-circles on its smaller sides as diameters, added to its outside. If the sides of the rectangle are 36 m and 24.5 m, find the area of the playground. (Take π= 22/7.)

Solution:



Area of the plot = Area of the Rectangle + 2 × area of one semi-circle

Radius of semi-circle = BC/2 = 24.5/2 = 12.25m

Area of the Rectangular plot = Length × Breadth = 36 × 24.5 = 882 m^2

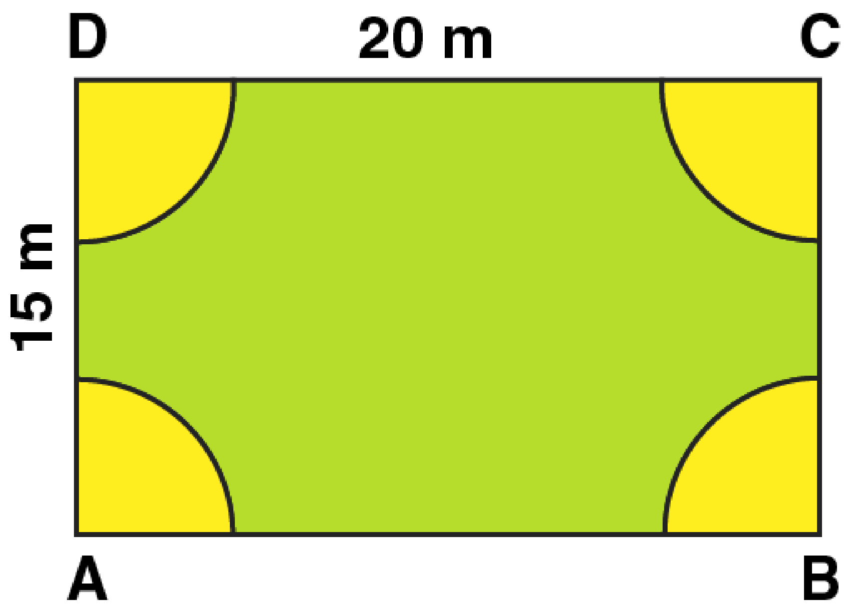
Area of the Semi-circular portions = 2 × $\pi r^2/2$

= 2 × 1/2 × 22/7 × 12.25 × 12.25 = 471.625 m^2

Area of the plot = 882 + 471.625 = 1353.625 m^2

4. A rectangular piece is 20 m long and 15 m wide. From its four corners, quadrants of radii 3.5 m have been cut. Find the area of the remaining part.

Solution:



Area of the plot = Area of the rectangle – 4 × area of one quadrant

Radius of semi-circle = 3.5 m

Area of four quadrants = area of one circle

Area of the plot = Length × Breadth – πr^2

Area of the plot = 20 × 15 – (22/7 × 3.5 × 3.5)

Area of the plot = 300 – 38.5 = 261.5 m^2

5. The inside perimeter of a running track (shown in Fig. 20.24) is 400 m. The length of each of the straight portion is 90 m and the ends are semi-circles. If track is everywhere 14 m wide, find the area of the track. Also, find the length of the outer running track.

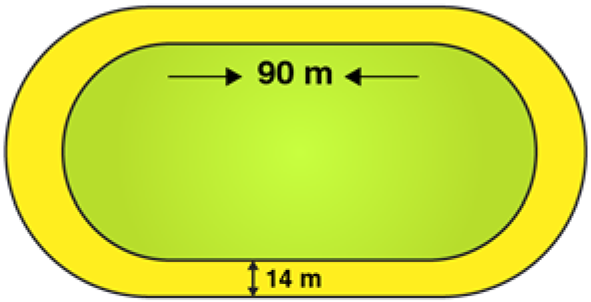


Fig. 20.24

Solution:

Perimeter of the inner track = 2 × Length of rectangle + perimeter of two semi-circular ends

Perimeter of the inner track = Length + Length + $2\pi r$

$400 = 90 + 90 + (2 \times 22/7 \times r)$

$(2 \times 22/7 \times r) = 400 – 180$

$(2 \times 22/7 \times r) = 220$

$44r = 220 \times 7$

$44r = 1540$

$r = 1540/44 = 35$

r = 35m

So, the radius of inner circle = 35 m

Now, let's calculate the radius of outer track

Radius of outer track = Radius of inner track + width of the track

Radius of outer track = 35 + 14 = 49m

Length of outer track = 2× Length of rectangle + perimeter of two outer semi-circular ends

Length of outer track = 2× 90 + $2\pi r$

Length of outer track = 2× 90 + (2 × 22/7 × 49)

Length of outer track = 180 + 308 = 488

So, Length of outer track **=** 488m

Area of inner track = Area of inner rectangle + Area of two inner semi-circles

Area of inner track = Length × Breadth + πr^2

Area of inner track = 90 × 70 + (22/7 × 35 × 35)

Area of inner track = 6300 + 3850

So, Area of inner track = 10150 m^2

Area of outer track = Area of outer rectangle + Area of two outer semi-circles

Breadth of outer track = 35 + 35 +14 + 14 = 98 m

Area of outer track = length× breadth + πr^2

Area of outer track = 90 × 98 + (22/7 × 49 × 49)

Area of outer track = 8820 + 7546

So, Area of outer track = 16366 m^2

Now, let's calculate area of path

Area of path = Area of outer track – Area of inner track

Area of path = 16366 – 10150 = 6216

So, Area of path = 6216 m^2

6. Find the area of Fig. 20.25, in square cm, correct to one place of decimal. (Take π =22/7)

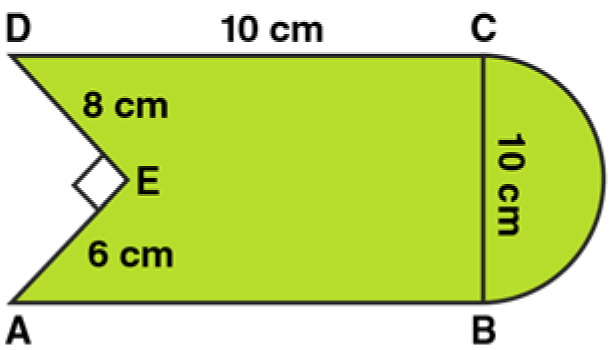


Fig. 20.25

Solution:

Area of the Figure = Area of square + Area of semi-circle – Area of right angled triangle

Area of the Figure = side × side + $\pi r^2/2$ – (1/2 × base × height)

Area of the Figure = 10 × 10 + (1/2 × 22/7 × 5 × 5) – (1/2 × 8 × 6)

Area of the Figure = 100 + 39.28 – 24

Area of the Figure = 115.3

So, Area of the Figure = 115.3 cm^2

7. The diameter of a wheel of a bus is 90 cm which makes 315 revolutions per minute. Determine its speed in kilometres per hour. (Take π=22/7)

Solution:

Given that, Diameter of a wheel = 90 cm

We know that, Perimeter of wheel = πd

Perimeter of wheel = 22/7 × 90 = 282.857

So, Perimeter of a wheel = 282.857 cm

Distance covered in 315 revolutions = 282.857× 315 = 89099.955 cm

One km = 100000 cm

Therefore, Distance covered = 89099.955/100000 = 0.89 km

Speed in km per hour = 0.89 × 60 = 53.4 km per hour

8. The area of a rhombus is 240 cm^2 and one of the diagonal is 16 cm. Find another diagonal.

Solution:

Area of rhombus = $1/2 \times d_1 \times d_2$

$240 = 1/2 \times 16 \times d_2$

$240 = 8 \times d_2$

$d_2 = 240/8 = 30$

So, the other diagonal is 30 cm

9. The diagonals of a rhombus are 7.5 cm and 12 cm. Find its area.

Solution:

Area of rhombus = $1/2 \times d_1 \times d_2$

Area of rhombus = 1/2 × 7.5 × 12

Area of rhombus = 6 × 7.5 = 45

So, Area of rhombus = 45 cm^2

10. The diagonal of a quadrilateral shaped field is 24 m and the perpendiculars dropped on it from the remaining opposite vertices are 8 m and 13 m. Find the area of the field.

Solution:

Area of quadrilateral = $1/2 \times d_1 \times (p_1 + p_2)$

Area of quadrilateral = 1/2 × 24 × (8 + 13)

Area of quadrilateral = 12 × 21 = 252

So, Area of quadrilateral is 252 cm^2

11. Find the area of a rhombus whose side is 6 cm and whose altitude is 4 cm. If one of its diagonals is 8 cm long, find the length of the other diagonal.

Solution:

Given that,

Side of rhombus = 6 cm

Altitude of rhombus = 4 cm

Since rhombus is a parallelogram, therefore area of parallelogram = base × altitude

i.e., Area of parallelogram = 6 × 4 = 24 cm^2

Area of parallelogram = Area of rhombus

Area of rhombus = 1/2 × d_1 × d_2

24 = 1/2 × 8 × d_2

24 = 4 × d_2

d_2 = 24/4 = 6

So, length of other diagonal of rhombus is 6 cm

12. The floor of a building consists of 3000 tiles which are rhombus shaped and each of its diagonals are 45 cm and 30 cm in length. Find the total cost of polishing the floor, if the cost per m^2 is Rs. 4.

Solution:

We know that,

Area of rhombus = 1/2 × d_1 × d_2

Area of rhombus = 1/2 × 45 × 30

Area of rhombus = 1350/2 = 675

So, Area of rhombus = 675 cm^2

∴ Area of one tile = 675 cm^2

Now, Area of 3000 tiles = 675× 3000 = 2025000 cm^2

Area of tiles in m^2 = 2025000/10000 = 202.5 m^2

Total cost for polishing the floor = 202.5× 4 = Rs 810

13. A rectangular grassy plot is 112 m long and 78 m broad. It has gravel path 2.5 m wide all around it on the side. Find the area of the path and the cost of constructing it at Rs. 4.50 per square metre.

Solution:

We know that,

Outer area of rectangle = length × breadth

Outer area of rectangle = 112 × 78 = 8736 m^2

Width of path = 2.5 m

Length of inner rectangle = 112 – (2.5 + 2.5) = 107 m

Breadth of inner rectangle = 78 – (2.5 + 2.5) = 73 m

And,

Inner area of rectangle = length × breadth

Inner area of rectangle = 107 × 73 = 7811 m^2

Now let's calculate Area of path,

Area of path = Outer area of rectangle – Inner area of rectangle

Area of path = 8736 – 7811 = 925 m^2

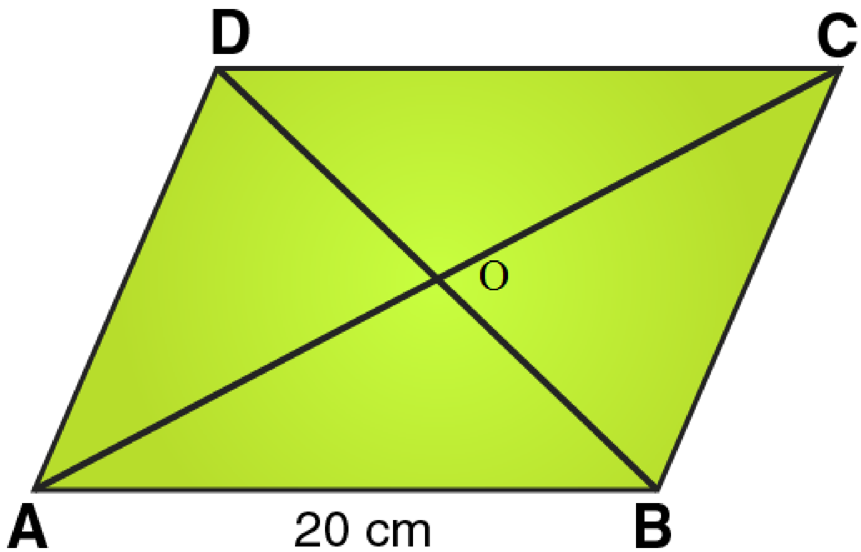
Also given that,

Cost of construction for 1 m^2 = Rs 4.50

∴ Cost of construction for 925 m^2 = 925 × 4.50 = Rs 4162.5

14. Find the area of a rhombus, each side of which measures 20 cm and one of whose diagonals is 24 cm.

Solution:



Given that,

Length of side of rhombus = 20 cm

Length of one diagonal = 24 cm

In ΔAOB,

Using Pythagoras theorem:

$AB^2 = OA^2 + OB^2$

$20^2 = 12^2 + OB^2$

$OB^2 = 20^2 - 12^2$

$OB^2 = 400 - 144$

$OB^2 = 256$

OB = 16

So, length of the other diameter = 16 × 2 = 32 cm

Area of rhombus = 1/2 × d_1 × d_2

Area of rhombus = 1/2 × 24 × 32

Area of rhombus = 384 cm^2

15. The length of a side of a square field is 4 m. What will be the altitude of the rhombus, if the area of the rhombus is equal to the square field and one of its diagonal is 2 m?

Solution:

Given that,

Length of a side of a square = 4 m

Area of square = $side^2$

Area of square = 4 × 4 = 16 m^2

We know that,

Area of square = Area of rhombus

So, Area of rhombus = 16 m^2

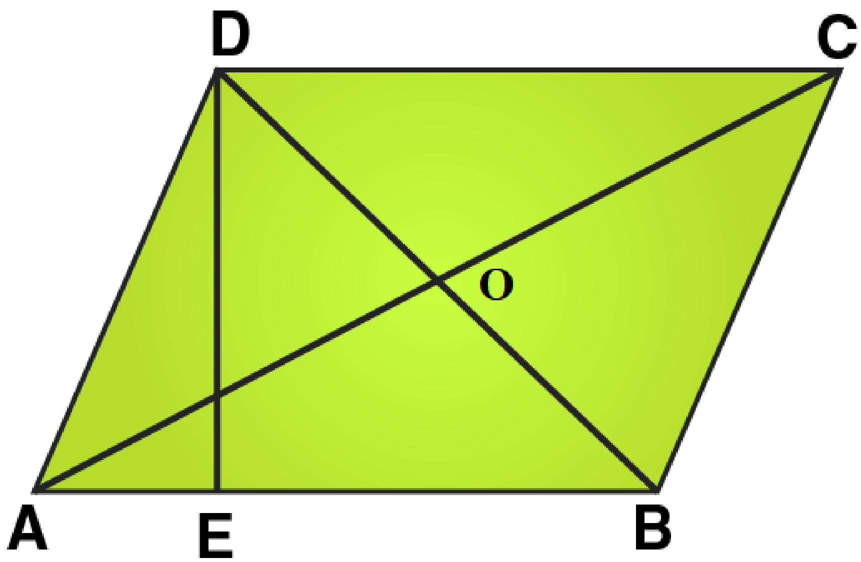
Area of rhombus = 1/2 × d_1 × d_2

16 = 1/2 × 2 × d_2

16 = d_2

∴ the diagonal of rhombus = 16 m

In ΔAOB,



Using Pythagoras theorem:

$AB^2 = OA^2 + OB^2$

$AB^2 = 8^2 + 1^2$

$AB^2 = 65$

$AB = \sqrt{65}$

Since rhombus is a parallelogram, therefore area of parallelogram = base × altitude

Area of parallelogram = AB × DE

$16 = \sqrt{65} \times DE$

$DE = 16/\sqrt{65}$

i.e., Altitude of Rhombus = $16/\sqrt{65}$ cm

16. Find the area of the field in the form of a rhombus, if the length of each side be 14 cm and the altitude be 16 cm.

Solution:

Given that,

Side of rhombus = 14 cm

Altitude of rhombus = 16 cm

Since rhombus is a parallelogram, therefore

Area of parallelogram = base × altitude

Area of parallelogram = 14 × 16 = 224 cm^2

17. The cost of fencing a square field at 60 paise per metre is Rs. 1200. Find the cost of reaping the field at the rate of 50 paise per 100 sq. metres.

Solution:

Perimeter of square field = Cost of fencing / rate of fencing

Perimeter of square field = 1200/0.6 = 2000

So, Perimeter of square field = 2000 m

Perimeter of square = 4 × side

Side of square = Perimeter / 4 = 2000/4 = 500

So, Side of square = 500 m

We know that, Area of square = $side^2$

Area of square = 500 × 500 = 250000 m^2

Cost of reaping = (250000 × 0.5) / 100 = 1250

∴ Cost of reaping the field is Rs 1250

18. In exchange of a square plot one of whose sides is 84 m, a man wants to buy a rectangular plot 144 m long and of the same area as of the square plot. Find the width of the rectangular plot.

Solution:

Area of square = $side^2$

Area of square = 84 × 84 = 7056

Since, Area of square = Area of rectangle

7056 = 144 × width

Width = 7056/144 = 49

∴ Width of rectangle = 49 m

19. The area of a rhombus is 84 m^2. If its perimeter is 40 m, then find its altitude.

Solution:

Given that,

Area of rhombus = 84 m^2

Perimeter = 40 m

We know that,

Perimeter of rhombus = 4 × side

∴ Side of rhombus = Perimeter / 4 = 40/4 = 10

So, Side of rhombus = 10 m

Since rhombus is a parallelogram, therefore Area of parallelogram = base × altitude

84 = 10 × altitude

Altitude = 84/10 = 8.4

So, Altitude of rhombus = 8.4 m

20. A garden is in the form of a rhombus whose side is 30 metres and the corresponding altitude is 16 m. Find the cost of levelling the garden at the rate of Rs. 2 per m^2.

Solution:

Given that,

Side of rhombus = 30 m

Altitude of rhombus = 16 m

Since rhombus is a parallelogram, therefore Area of parallelogram = base × altitude

Area of parallelogram = 30 × 16 = 480 m^2

Cost of levelling the garden = area × rate

Cost of levelling the garden = 480 × 2 = 960

So, Cost of levelling the garden is Rs 960

21. A field in the form of a rhombus has each side of length 64 m and altitude 16 m. What is the side of a square field which has the same area as that of a rhombus?

Solution:

Given that,

Side of rhombus = 64 m

Altitude of rhombus = 16 m

Since rhombus is a parallelogram, therefore Area of parallelogram = base × altitude

Area of parallelogram = 64 × 16 = 1024 m^2

Since Area of rhombus = Area of square

Therefore, Area of square = $side^2$

Or $side^2$ = Area of square

Side of a square = √square

Side of square = √1024 = 32

∴ Side of square = 32 m

22. The area of a rhombus is equal to the area of a triangle whose base and the corresponding altitude are 24.8 cm and 16.5 cm respectively. If one of the diagonals of the rhombus is 22 cm, find the length of the other diagonal.

Solution:

Given that,

Length of base of triangle = 24.8 cm

Length of altitude of triangle= 16.5 cm

∴ Area of triangle = 1/2 × base × altitude

Area of triangle = 1/2 × 24.8 × 16.5 = 204.6

So, Area of triangle = 204.6 cm

Since, Area of triangle = Area of rhombus

∴ Area of rhombus = 1/2 × d_1 × d_2

204.6 = 1/2 × 22 × d_2

204.6 = 11 × d_2

d_2 = 204.6/11 = 18.6

∴ The length of other diagonal is 18.6 cm

EXERCISE 20.2 PAGE NO: 20.22

1. Find the area, in square metres, of the trapezium whose bases and altitudes are as under:

(i) bases = 12 dm and 20 dm, altitude = 10 dm

(ii) bases = 28 cm and 3 dm, altitude = 25 cm

(iii) bases = 8 m and 60 dm, altitude = 40 dm

(iv) bases = 150 cm and 30 dm, altitude = 9 dm

Solution:

(i) Given that,

Length of bases of trapezium = 12 dm and 20 dm

Length of altitude = 10 dm

We know that, 10 dm = 1 m

∴ Length of bases in m = 1.2 m and 2 m

Similarly, length of altitude in m = 1 m

Area of trapezium = 1/2 (Sum of lengths of parallel sides) × altitude

Area of trapezium = 1/2 (1.2 + 2.0) × 1

Area of trapezium = 1/2 × 3.2 = 1.6

So, Area of trapezium = $1.6m^2$

(ii) Given that,

Length of bases of trapezium = 28 cm and 3 dm

Length of altitude = 25 cm

We know that, 10 dm = 1 m

∴ Length of bases in m = 0.28 m and 0.3 m

Similarly, length of altitude in m = 0.25 m

Area of trapezium = 1/2 (Sum of lengths of parallel sides) × altitude

Area of trapezium = 1/2 (0.28 + 0.3) × 0.25

Area of trapezium = 1/2 × 0.58× 0.25 = 0.0725

So, Area of trapezium = $0.0725m^2$

(iii) Given that,

Length of bases of trapezium = 8 m and 60 dm

Length of altitude = 40 dm

We know that, 10 dm = 1 m

∴ Length of bases in m = 8 m and 6 m

Similarly, length of altitude in m = 4 m

Area of trapezium = 1/2 (Sum of lengths of parallel sides) × altitude

Area of trapezium = 1/2 (8 + 6) × 4

Area of trapezium = 1/2 × 56 = 28

So, Area of trapezium = $28m^2$

(iv) Given that,

Length of bases of trapezium = 150 cm and 30 dm

Length of altitude = 9 dm

We know that, 10 dm = 1 m

∴ Length of bases in m = 1.5 m and 3 m

Similarly, length of altitude in m = 0.9 m

Area of trapezium = 1/2 (Sum of lengths of parallel sides) × altitude

Area of trapezium = 1/2 (1.5 + 3) × 0.9

Area of trapezium = 1/2 × 4.5 × 0.9 = 2.025

So, Area of trapezium = $2.025m^2$

2. Find the area of trapezium with base 15 cm and height 8 cm, if the side parallel to the given base is 9 cm long.

Solution:

Given that,

Length of bases of trapezium = 15 cm and 9 cm

Length of altitude = 8 cm

We know that,

Area of trapezium = 1/2 (Sum of lengths of parallel sides) × altitude

Area of trapezium = 1/2 (15 + 9) × 8

Area of trapezium = 1/2 × 192 = 96

So, Area of trapezium = 96m^2

3. Find the area of a trapezium whose parallel sides are of length 16 dm and 22 dm and whose height is 12 dm.

Solution:

Given that,

Length of bases of trapezium = 16 dm and 22 dm

Length of altitude = 12 dm

We know that, 10 dm = 1 m

∴ Length of bases in m = 1.6 m and 2.2 m

Similarly, length of altitude in m = 1.2 m

Area of trapezium = 1/2 (Sum of lengths of parallel sides) × altitude

Area of trapezium = 1/2 (1.6 + 2.2) × 1.2

Area of trapezium = 1/2 × 3.8 × 1.2 = 2.28

So, Area of trapezium = 2.28m^2

4. Find the height of a trapezium, the sum of the lengths of whose bases (parallel sides) is 60 cm and whose area is 600 cm^2.

Solution:

Given that,

Length of bases of trapezium = 60 cm

Area = 600 cm^2

We know that,

Area of trapezium = 1/2 (Sum of lengths of parallel sides) × altitude

600 = 1/2 (60) × altitude

600 = 30 × altitude

Which implies, altitude = 600/30 = 20

∴ Length of altitude is 20 cm

5. Find the altitude of a trapezium whose area is 65 cm^2 and whose base are 13 cm and 26 cm.

Solution:

Given that,

Length of bases of trapezium = 13 cm and 26 cm

Area = 65 cm^2

We know that,

Area of trapezium = 1/2 (Sum of lengths of parallel sides) × altitude

65 = 1/2 (13 + 26) × altitude

65 = 39/2 × altitude

Which implies, altitude = (65×2) /39 = 130/39 = 10/3

∴ Length of altitude = 10/3 cm

6. Find the sum of the lengths of the bases of a trapezium whose area is 4.2 m^2 and whose height is 280 cm.

Solution:

Given that,

Height of trapezium = 280 cm = 2.8m

Area = 4.2 m^2

We know that,

Area of trapezium = 1/2 (Sum of lengths of parallel sides) × altitude To calculate the length of parallel sides we can rewrite the above equation as,

Sum of lengths of parallel sides = (2 × Area) / altitude

Sum of lengths of parallel sides = (2 × 4.2) / 2.8 = 8.4/2.8 = 3

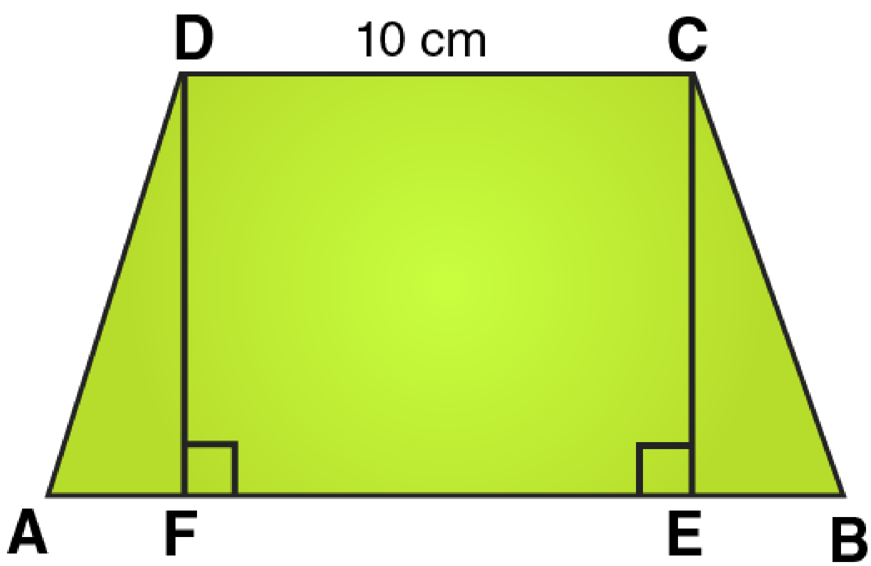
∴ Sum of lengths of parallel sides = 3 m

7. Find the area of a trapezium whose parallel sides of lengths 10 cm and 15 cm are at a distance of 6 cm from each other. Calculate this area as,

(i) the sum of the areas of two triangles and one rectangle.

(ii) the difference of the area of a rectangle and the sum of the areas of two triangles.

Solution:



We know that, Area of a trapezium ABCD

= area (ΔDFA) + area (rectangle DFEC) + area (ΔCEB)

= (1/2 × AF × DF) + (FE × DF) + (1/2 × EB × CE)

= (1/2 × AF × h) + (FE × h) + (1/2 × EB × h)

= 1/2 × h × (AF + 2FE + EB)

= 1/2 × h × (AF + FE + EB + FE)

= 1/2 × h × (AB + FE)

= 1/2 × h × (AB + CD) [Opposite sides of rectangle are equal]

= 1/2 × 6 × (15 + 10)

= 1/2 × 6 × 25 = 75

∴ Area of trapezium = 75 cm^2

8. The area of a trapezium is 960 cm^2. If the parallel sides are 34 cm and 46 cm, find the distance between them.

Solution:

We know that,

Area of trapezium = 1/2 (Sum of lengths of parallel sides) × distance between parallel sides

i.e., Area of trapezium = 1/2 (Sum of sides) × distance between parallel sides

To calculate the distance between parallel sides we can rewrite the above equation as,

Distance between parallel sides = (2 × Area) / Sum of sides

= (2 × 960) / (34 + 46)

= (2 × 960) / 80 = 1920/80 = 24

∴ Distance between parallel sides = 24 cm

9. Find the area of Fig. 20.35 as the sum of the areas of two trapezium and a rectangle.

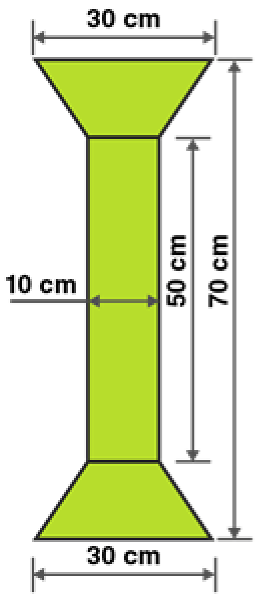


Fig. 20.35

Solution:

From the figure we can write,

Area of figure = Area of two trapeziums + Area of rectangle

Given that,

Length of rectangle = 50 cm

Breadth of rectangle = 10 cm

Length of parallel sides of trapezium = 30 cm and 10 cm

Distance between parallel sides of trapezium = (70–50)/2 = 20/2 = 10

So, Distance between parallel sides of trapezium = 10 cm

Area of figure = 2 × 1/2 (Sum of lengths of parallel sides) × altitude + Length × Breadth

Area of figure = 2 × 1/2 (30+10) × 10 + 50 × 10

Area of figure = 40 × 10 + 50 × 10

Area of figure = 400 + 500 = 900

∴ Area of figure = 900 cm^2

10. Top surface of a table is trapezium in shape. Find its area if its parallel sides are 1 m and 1.2 m and perpendicular distance between them is 0.8 m.

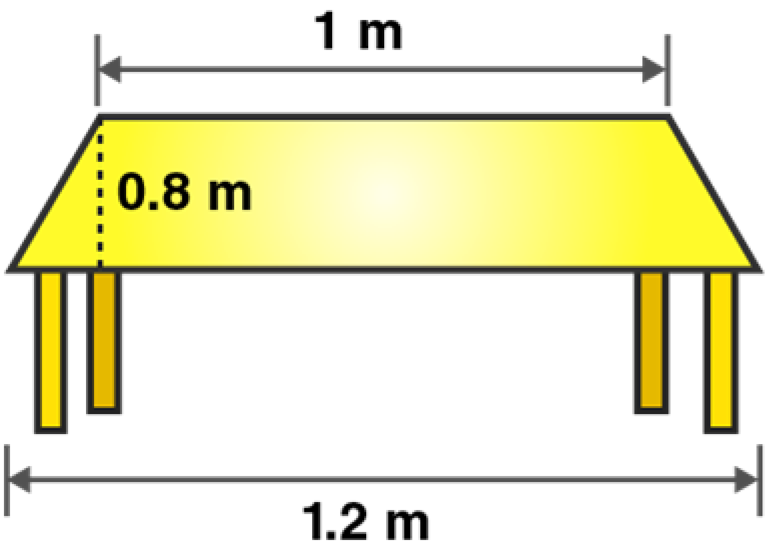


Fig. 20.36

Solution:

Given that,

Length of parallel sides of trapezium = 1.2m and 1m

Distance between parallel sides of trapezium = 0.8m

We know that,

Area of trapezium = 1/2 (Sum of lengths of parallel sides) × distance between parallel sides

i.e., Area of trapezium = 1/2 (Sum of sides) × distance between parallel sides

Area of trapezium = 1/2 (1.2 + 1) × 0.8

Area of trapezium = 1/2 × 2.2 × 0.8 = 0.88

So, Area of trapezium = $0.88m^2$

11. The cross-section of a canal is a trapezium in shape. If the canal is 10 m wide at the top 6 m wide at the bottom and the area of cross-section is 72 m^2 determine its depth.

Solution:

Given that,

Length of parallel sides of trapezium = 10m and 6m

Area = 72 m^2

Let the distance between parallel sides of trapezium = x meter

We know that,

Area of trapezium = 1/2 (Sum of lengths of parallel sides) × distance between parallel sides

i.e., Area of trapezium = 1/2 (Sum of sides) × distance between parallel sides

72 = 1/2 (10 + 6) × x

72 = 8 × x

x = 72/8 = 9

∴ The depth is 9m.

12. The area of a trapezium is 91 cm^2 and its height is 7 cm. If one of the parallel sides is longer than the other by 8 cm, find the two parallel sides.

Solution:

Given that,

Let the length of one parallel side of trapezium = x meter

Length of other parallel side of trapezium = (x+8) meter

Area of trapezium = 91 cm^2

Height = 7 cm

We know that,

Area of trapezium = 1/2 (Sum of lengths of parallel sides) × altitude

91 = 1/2 (x+x+8) × 7

91 = 1/2(2x+8) × 7

91 = (x+4) × 7

(x+4) = 91/7

x+4 = 13

x = 13 – 4

x = 9

∴ Length of one parallel side of trapezium = 9 cm

And, Length of other parallel side of trapezium = x+8 = 9+8 = 17 cm

13. The area of a trapezium is 384 cm^2. Its parallel sides are in the ratio 3:5 and the perpendicular distance between them is 12 cm. Find the length of each one of the parallel sides.

Solution:

Given that,

Let the length of one parallel side of trapezium = 3x meter

Length of other parallel side of trapezium = 5x meter

Area of trapezium = 384 cm^2

Distance between parallel sides = 12 cm

We know that,

Area of trapezium = 1/2 (Sum of lengths of parallel sides) × distance between parallel sides i.e., Area of trapezium = 1/2 (Sum of sides) × distance between parallel sides

384 = 1/2 (3x + 5x) × 12

384 = 1/2 (8x) × 12

4x = 384/12

4x = 32

x = 8

∴ Length of one parallel side of trapezium = 3x = 3× 8 = 24 cm

And, Length of other parallel side of trapezium = 5x = 5× 8 = 40 cm

14. Mohan wants to buy a trapezium shaped field. Its side along the river is parallel and twice the side along the road. If the area of this field is 10500 m^2 and the perpendicular distance between the two parallel sides is 100 m, find the length of the side along the river.

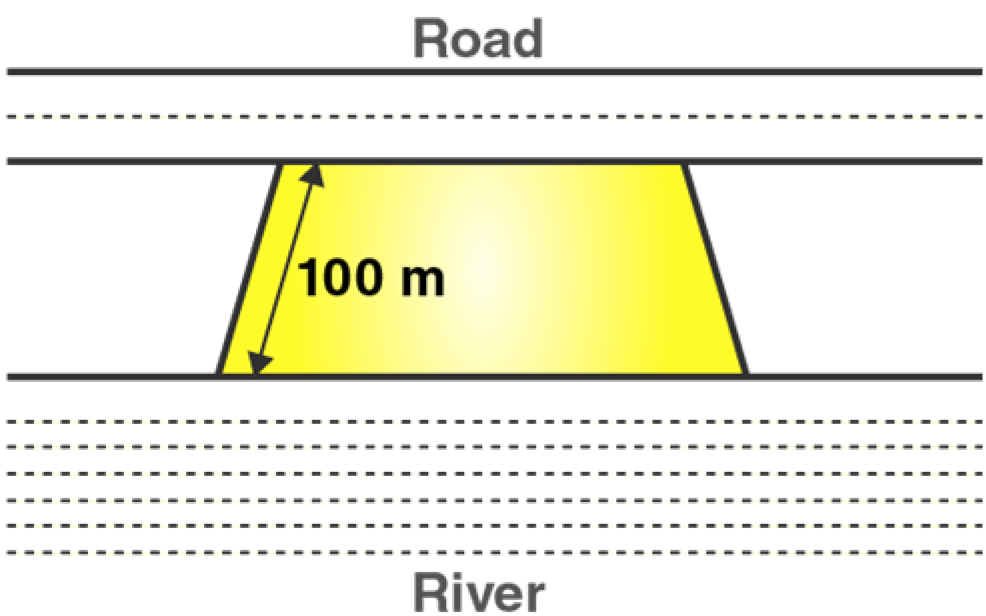


Fig. 20.37

Solution:

Given that,

Let the length of side of trapezium shaped field along road = x meter

Length of other side of trapezium shaped field along road = 2x meter

Area of trapezium = 10500 cm^2

Distance between parallel sides = 100 m

We know that,

Area of trapezium = 1/2 (Sum of lengths of parallel sides) × distance between parallel sides

i.e., Area of trapezium = 1/2 (Sum of sides) × distance between parallel sides

10500 = 1/2 (x + 2x) × 100

10500 = 1/2 (3x) × 100

3x = 10500/50

3x = 210

x = 210/3 = 70

x = 70

∴ Length of side of trapezium shaped field along road = 70 m

And, Length of other side of trapezium shaped field along road = 2x = 70× 2 = 140 m

15. The area of a trapezium is 1586 cm^2 and the distance between the parallel sides is 26 cm. If one of the parallel sides is 38 cm, find the other.

Solution:

Given that,

Let the length of other parallel side of trapezium = x cm

Length of one parallel side of trapezium = 38 cm

Area of trapezium = 1586 cm^2

Distance between parallel sides = 26 cm

We know that,

Area of trapezium = 1/2 (Sum of lengths of parallel sides) × distance between parallel sides

i.e., Area of trapezium = 1/2 (Sum of sides) × distance between parallel sides

1586 = 1/2 (x + 38) × 26

1586 = (x + 38) × 13

(x + 38) = 1586/13

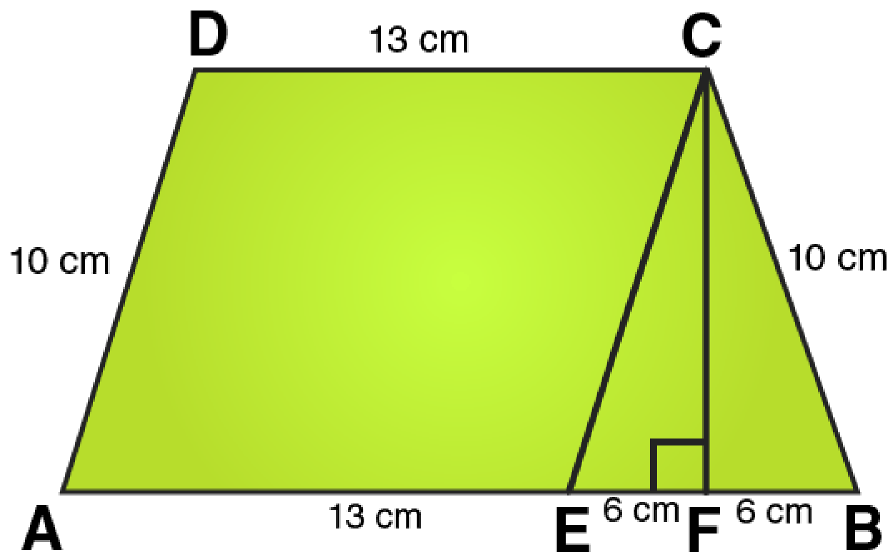
x = 122 – 38

x =84

∴ Length of the other parallel side of trapezium = 84 cm

16. The parallel sides of a trapezium are 25 cm and 13 cm; its nonparallel sides are equal, each being 10 cm, find the area of the trapezium.

Solution:



In ΔCEF,

CE = 10 cm and EF = 6cm

Using Pythagoras theorem:

$CE^2 = CF^2 + EF^2$

$CF^2 = CE^2 - EF^2$

$CF^2 = 10^2 - 6^2$

$CF^2 = 100-36$

$CF^2 = 64$

CF = 8 cm

From the figure we can write,

Area of trapezium = Area of parallelogram AECD + Area of area of triangle CEF

Area of trapezium = base × height + 1/2 (base × height)

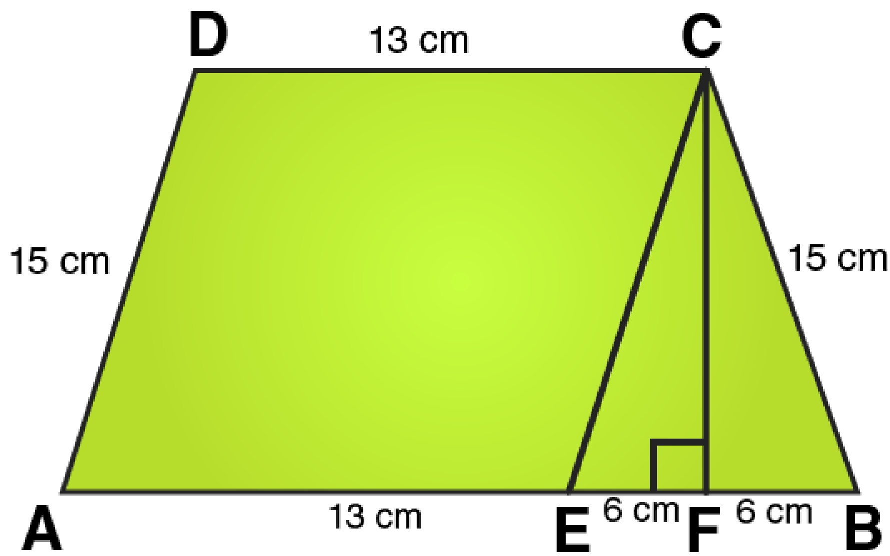
Area of trapezium = 13 × 8 + 1/2 (12 × 8)

Area of trapezium = 104 + 48 = 152

∴ Area of trapezium = 152 cm^2

17. Find the area of a trapezium whose parallel sides are 25 cm, 13 cm and the other sides are 15 cm each.

Solution:



In ΔCEF,

CE = 10 cm and EF = 6cm

Using Pythagoras theorem:

$CE^2 = CF^2 + EF^2$

$CF^2 = CE^2 – EF^2$

$CF^2 = 15^2 – 6^2$

$CF^2 = 225-36$

$CF^2 = 189$

$CF = \sqrt{189}$

$= \sqrt{(9 \times 21)}$

$= 3\sqrt{21}$ cm

From the figure we can write,

Area of trapezium = Area of parallelogram AECD + Area of area of triangle CEF

Area of trapezium = height + 1/2 (sum of parallel sides)

Area of trapezium = $3\sqrt{21} \times 1/2\ (25 + 13)$

Area of trapezium = $3\sqrt{21} \times 19 = 57\sqrt{21}$

∴ Area of trapezium = $57\sqrt{21}$ cm^2

18. If the area of a trapezium is 28 cm^2 and one of its parallel sides is 6 cm, find the other parallel side if its altitude is 4 cm.

Solution:

Given that,

Let the length of other parallel side of trapezium = x cm

Length of one parallel side of trapezium = 6 cm

Area of trapezium = 28 cm^2

Length of altitude of trapezium = 4 cm

We know that,

Area of trapezium = 1/2 (Sum of lengths of parallel sides) × distance between parallel sides

i.e., Area of trapezium = 1/2 (Sum of sides) × distance between parallel sides

$28 = 1/2\ (6 + x) \times 4$

$28 = (6 + x) \times 2$

$(6 + x) = 28/2$

(6 + x) = 14

x = 14 – 6

x = 8

∴ Length of the other parallel side of trapezium = 8 cm

19. In Fig. 20.38, a parallelogram is drawn in a trapezium, the area of the parallelogram is 80 cm², find the area of the trapezium.

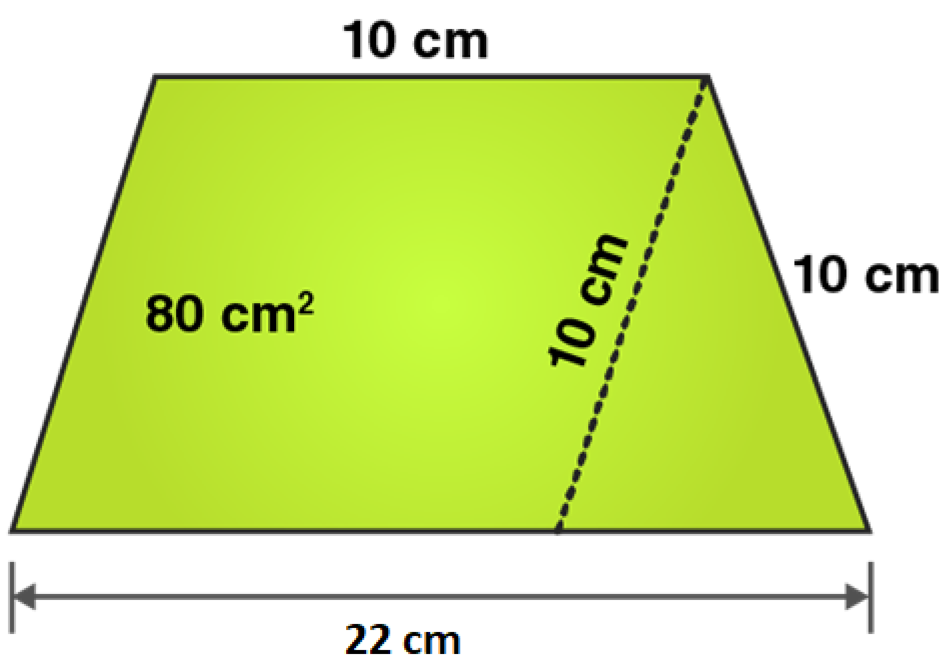
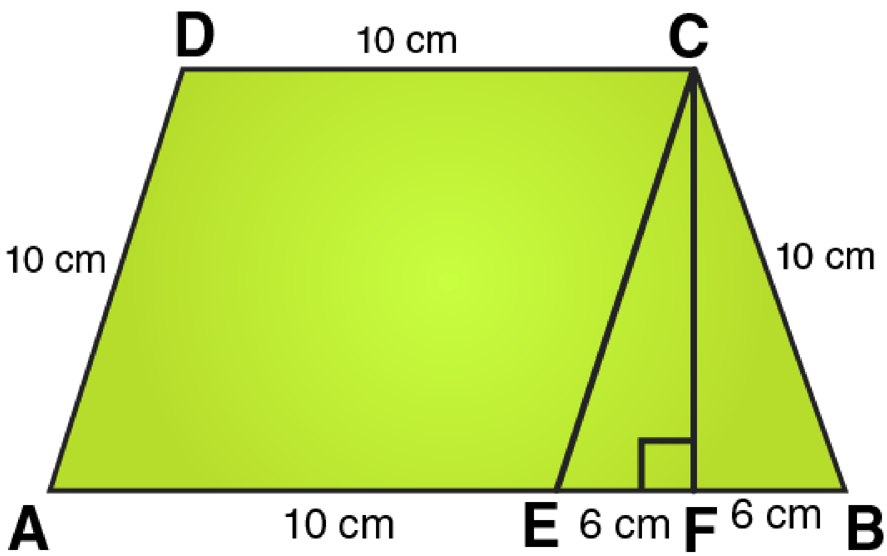


Fig. 20.38

Solution:



In ΔCEF,

CE = 10 cm and EF = 6cm

Using Pythagoras theorem:

$CE^2 = CF^2 + EF^2$

$CF^2 = CE^2 – EF^2$

$CF^2 = 10^2 – 6^2$

$CF^2 = 100-36$

$CF^2 = 64$

CF = 8 cm

Area of parallelogram = 80 cm^2

From the figure we can write,

Area of trapezium = Area of parallelogram AECD + Area of area of triangle CEF

Area of trapezium = base × height + 1/2 (base × height)

Area of trapezium = 10 × 8 + 1/2 (12 × 8)

Area of trapezium = 80 + 48 = 128

∴ Area of trapezium = 128 cm^2

20. Find the area of the field shown in Fig. 20.39 by dividing it into a square, a rectangle and a trapezium.

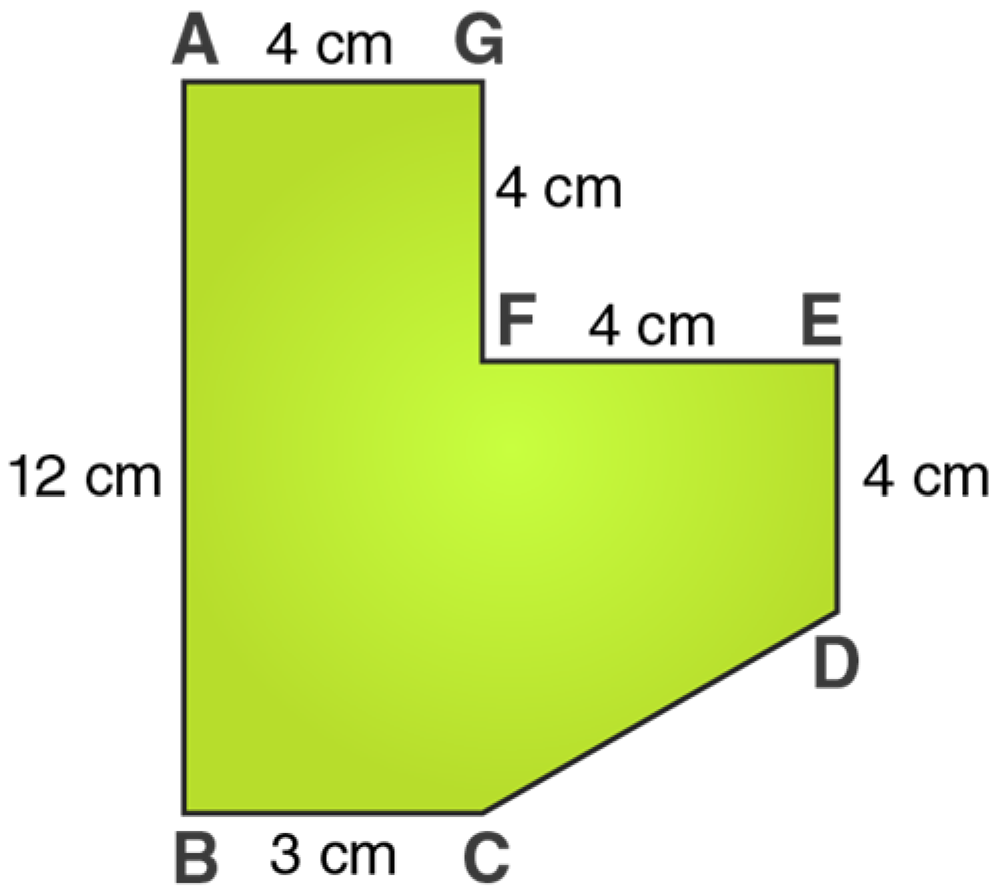
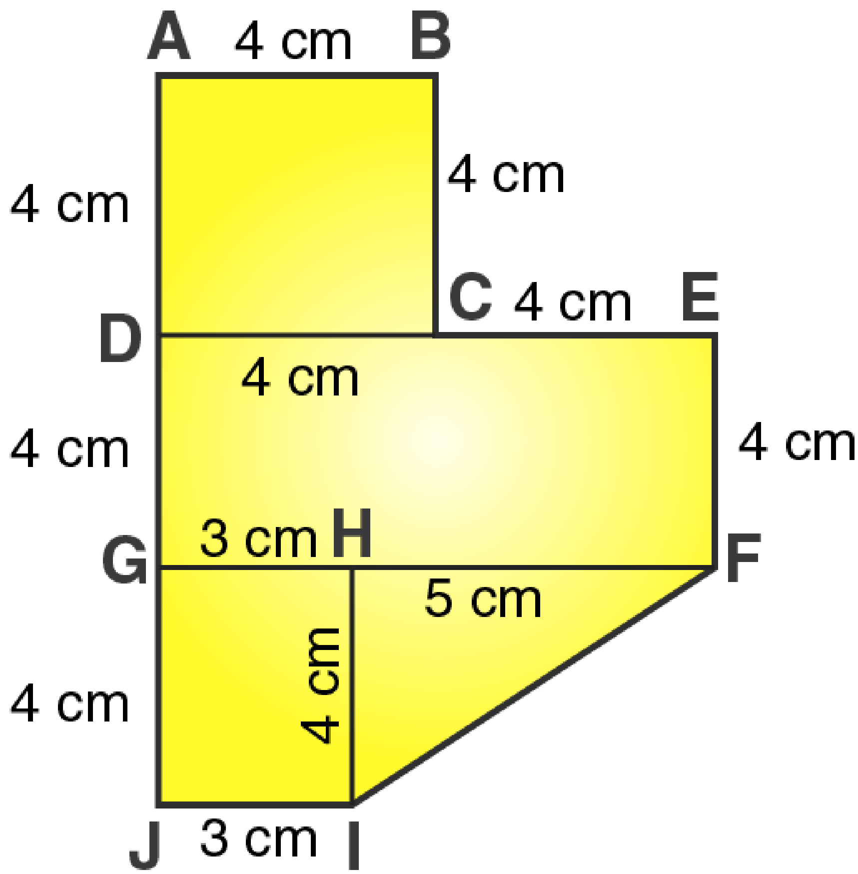


Fig. 20.39

Solution:



From the figure we can write,

Area of given figure = Area of square ABCD + Area of rectangle DEFG + Area of rectangle GHIJ + Area of triangle FHI

i.e., Area of given figure = side × side + length × breadth + length × breadth + 1/2 × base × altitude

Area of given figure = 4×4 + 8×4 + 3×4 + 1/2×5×5

Area of given figure = 16 + 32 + 12 + 10 = 70

∴ Area of given figure = 70 cm^2

EXERCISE 20.3 PAGE NO: 20.28

1. Find the area of the pentagon shown in fig. 20.48, if AD = 10 cm, AG = 8 cm, AH = 6 cm, AF = 5 cm, BF = 5 cm, CG = 7 cm and EH = 3 cm.

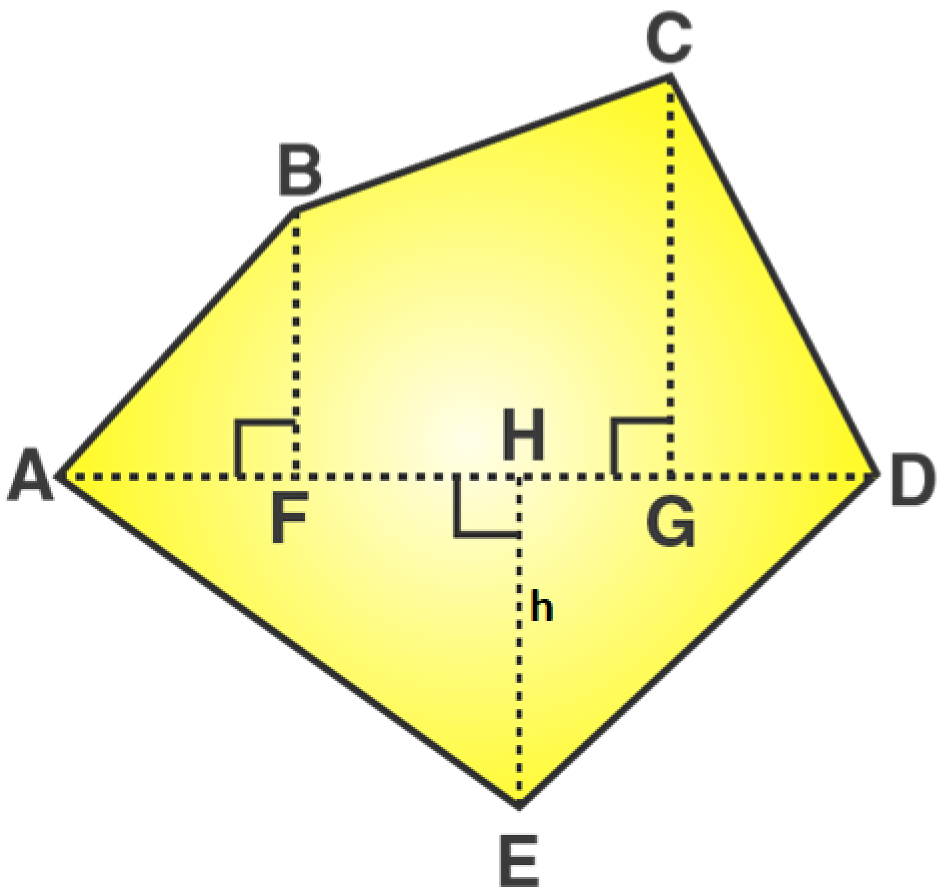


Fig. 20.48

Solution:

GH = AG – AH = 8 – 6 = 2 cm

HF = AH – AF = 6 – 5 = 1 cm

GD = AD – AG = 10 – 8 = 2 cm

From the figure we can write,

Area of given figure = Area of triangle AFB + Area of trapezium BCGF + Area of triangle CGD + Area of triangle AHE + Area of triangle EGD

We know that,

Area of right angled triangle = 1/2 × base × altitude

Area of trapezium = 1/2 (Sum of lengths of parallel sides) × altitude

Area of given pentagon = 1/2 × AF × BF + 1/2 (CG + BF) × FG + 1/2 × GD × CG + 1/2 × AH × EH + 1/2 × HD × EH

Area of given pentagon = 1/2 × 5 × 5 + 1/2 (7 + 5) × 3 + 1/2 × 2 × 7 + 1/2 × 6 × 3 + 1/2 × 4 × 3

Area of given pentagon = 12.5 + 18 + 7 + 9 + 6 = 52.5

∴ Area of given pentagon = 52.5 cm^2

2. Find the area enclosed by each of the following figures [fig. 20.49 (i)-(ii)] as the sum of the areas of a rectangle and a trapezium.

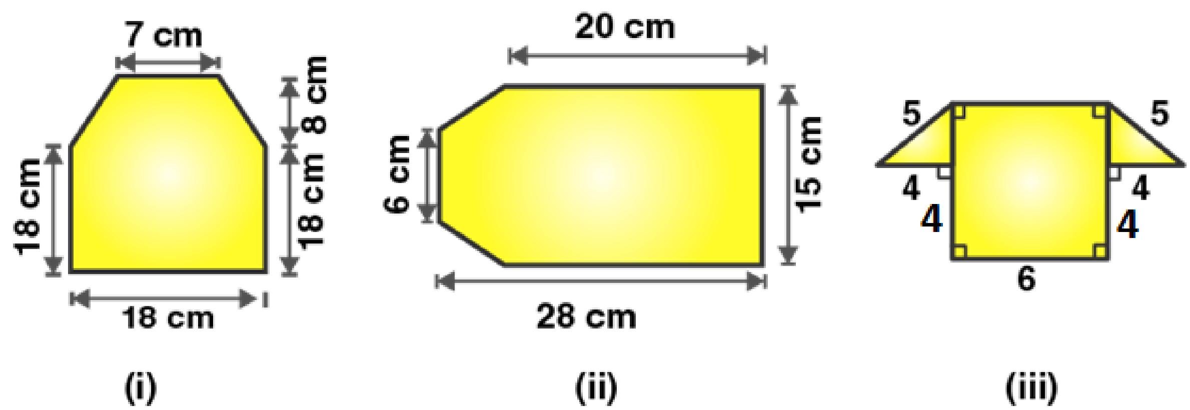


Fig. 20.49

Solution:

Figure (i)

From the figure we can write,

Area of figure = Area of trapezium + Area of rectangle

Area of figure = 1/2 (Sum of lengths of parallel sides) × altitude + Length × Breadth

Area of figure = 1/2 (18 + 7) × 8 + 18 × 18

Area of figure = 1/2 (25) × 8 + 18 × 18

Area of figure =

$$100 + 324 = 424$$

∴ Area of figure is 424 cm^2

Figure (ii)

From the figure we can write,

Area of figure = Area of trapezium + Area of rectangle

Area of figure = 1/2 (Sum of lengths of parallel sides) × altitude + Length × Breadth

Area of given figure = 1/2 (15 + 6) × 8 + 15 × 20

Area of given figure = 84 + 300 = 384

∴ Area of figure is 384 cm^2

Figure (iii)

Using Pythagoras theorem in the right angled triangle,

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

$x^2 = 25 – 16$

$x^2 = 9$

x = 3 cm

From the figure we can write,

Area of figure = Area of trapezium + Area of rectangle

Area of figure = 1/2 (Sum of lengths of parallel sides) × altitude + Length × Breadth

Area of given figure = 1/2 (14 + 6) × 3 + 4 × 6

Area of given figure = 30 + 24 = 54

∴ Area of figure is 54 cm^2

3. There is a pentagonal shaped park as shown in Fig. 20.50. Jyoti and Kavita divided it in two different ways.

Find the area of this park using both ways. Can you suggest some another way of finding its area?

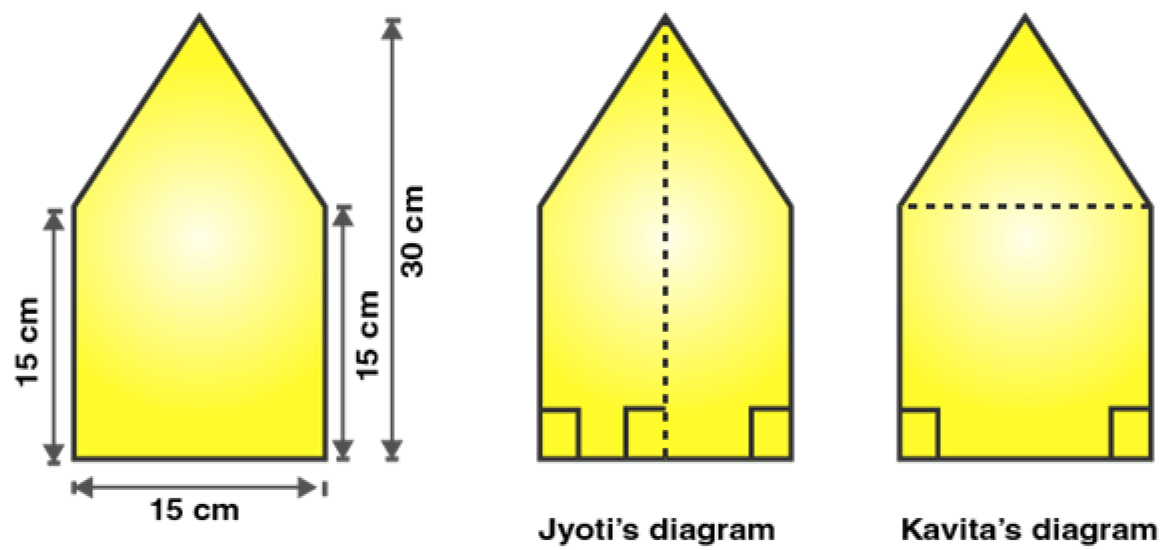


Fig. 20.50

Solution:

From the figure we can write,

Area of figure = Area of trapezium + Area of rectangle

Area of Jyoti's diagram = 2 × 1/2 (Sum of lengths of parallel sides) × altitude

Area of figure = 2 × 1/2 × (15 + 30) × 7.5

Area of figure = 45 × 7.5 = 337.5

Therefore, Area of figure = 337.5 cm^2

We also know that,

Area of Pentagon = Area of triangle + area of rectangle

Area of Pentagon = 1/2 × Base × Altitude + Length × Breadth

Area of Pentagon = 1/2 × 15 × 15 + 15 × 15

Area of Pentagon = 112.5 + 225 = 337.5

∴ Area of pentagon is 337.5 m^2

4. Find the area of the following polygon, if AL = 10 cm, AM = 20 cm, AN = 50 cm. AO = 60 cm and AD = 90 cm.

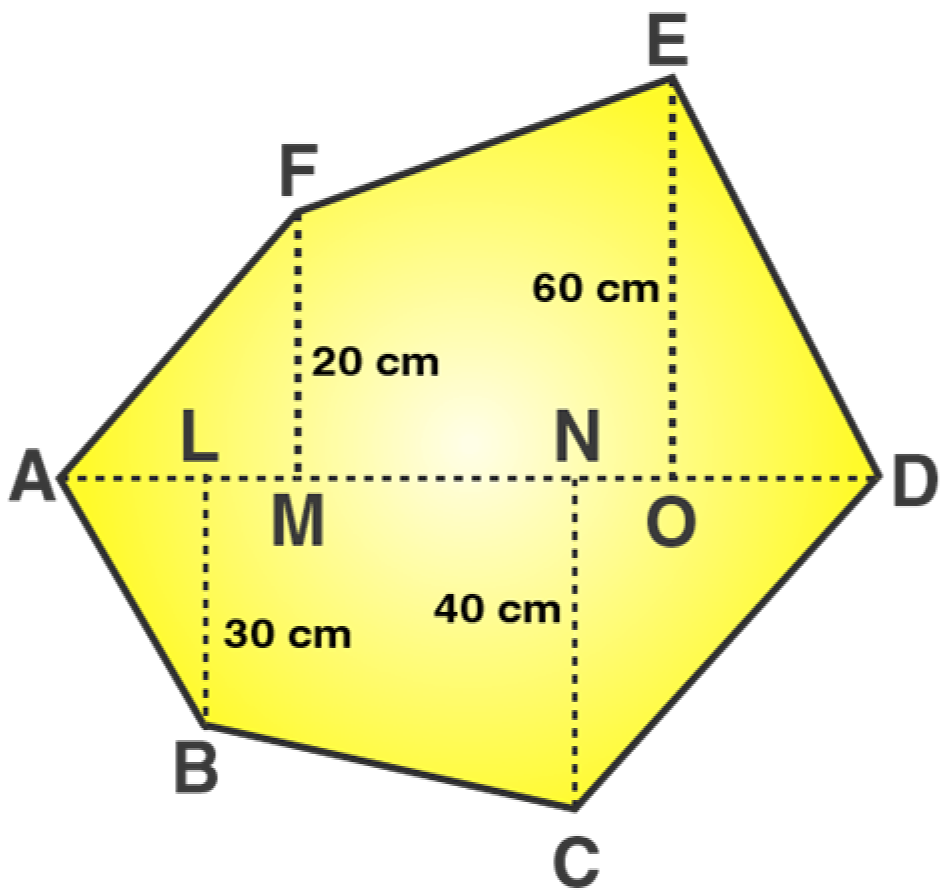


Fig. 20.51

Solution:

Given that,

AL = 10 cm; AM = 20 cm; AN = 50 cm; AO = 60 cm; AD = 90 cm

LM = AM – AL = 20 – 10 = 10 cm

MN = AN – AM = 50 – 20 = 30 cm

OD = AD – AO = 90 – 60 = 30 cm

ON = AO – AN = 60 – 50 = 10 cm

DN = OD + ON = 30 + 10 = 40 cm

OM = MN + ON = 30 + 10 = 40 cm

LN = LM + MN = 10 + 30 = 40 cm

From the figure we can write,

Area of figure = Area of triangle AMF + Area of trapezium FMNE + Area of triangle END + Area of triangle ALB + Area of trapezium LBCN + Area of triangle DNC

We know that,

Area of right angled triangle = 1/2 × base × altitude

Area of trapezium = 1/2 (Sum of lengths of parallel sides) × altitude

Area of given hexagon = 1/2 × AM × FM + 1/2 (MF + OE) × OM + 1/2 × OD × OE + 1/2 × AL × BL + 1/2 × (BL + CN) × LN + 1/2 × DN × CN

Area of given hexagon = 1/2 × 20 × 20 + 1/2 (20 + 60) × 40 + 1/2 × 30 × 60 + 1/2 × 10 × 30 + 1/2 × (30 + 40) × 40 + 1/2 × 40 × 40

Area of given hexagon = 200 + 1600 + 900 + 150 + 1400 + 800 = 5050

∴ Area of given hexagon is 5050 cm^2

5. Find the area of the following regular hexagon.

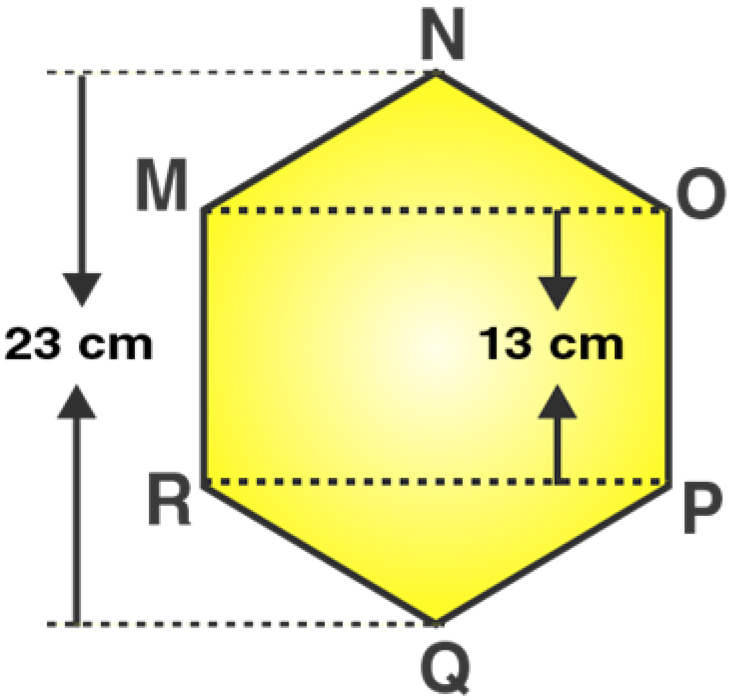
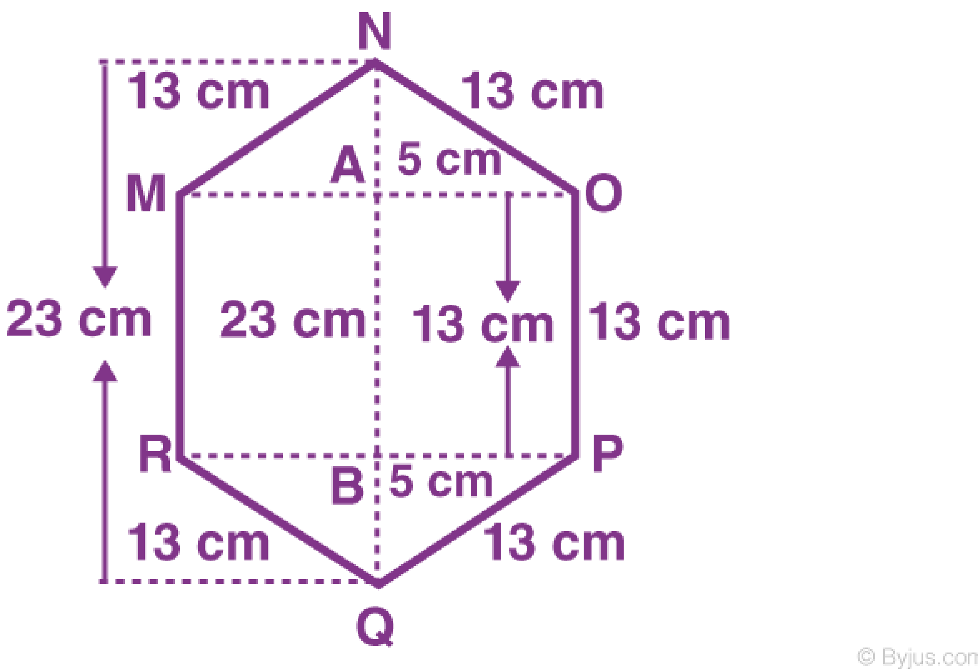


Fig. 20.52

Solution:

Given that,



NQ = 23 cm

NA = BQ = 10/2 = 5 cm

MR = OP = 13 cm

In the right triangle BPQ

$PQ^2 = BQ^2 + BP^2$

Substituting the values

$(13)^2 = (5)^2 + BP^2$

$169 = 25 + BP^2$

So we get

$BP^2 = 169 – 25 = 144$

BP = 12 cm

PR = MO = 2 × 12 = 24 cm

Area of rectangle RPOM = RP × PO = 24 × 13 = 321 cm^2

Area of triangle PRQ = 1/2 × PR × BQ

= 1/2 × 24 × 5

= 60 cm^2

Area of triangle MON = 60 cm^2

Area of hexagon = 312 + 60 + 60 = 432 cm^2

∴ Area of given hexagon is 432 cm^2

Chapterwise RD Sharma Solutions for Class 8 Maths :

About RD Sharma

RD Sharma i*sn't the kind of author you'd bump into at lit fests. But his bestselling books have helped many* CBSE *students lose their dread of* maths. *Sunday Times profiles the tutor turned internet star*

He dreams of algorithms that would give most people nightmares. And, spends every waking hour thinking of ways to explain concepts like 'series solution of linear differential equations'. Meet Dr Ravi Dutt Sharma — mathematics teacher and author of 25 reference books — whose name evokes as much awe as the subject he teaches. And though students have used his thick tomes for the last 31 years to ace the dreaded maths exam, it's only recently that a spoof video turned the tutor into a YouTube star.

R D Sharma had a good laugh but said he shared little with his on-screen persona except for the love for maths. "I like to spend all my time thinking and writing about maths problems. I find it relaxing," he says. When he is not writing books explaining mathematical concepts for classes 6 to 12 and engineering students, Sharma is busy dispensing his duty as vice-principal and head of department of science and humanities at Delhi government's Guru Nanak Dev Institute of Technology.