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.

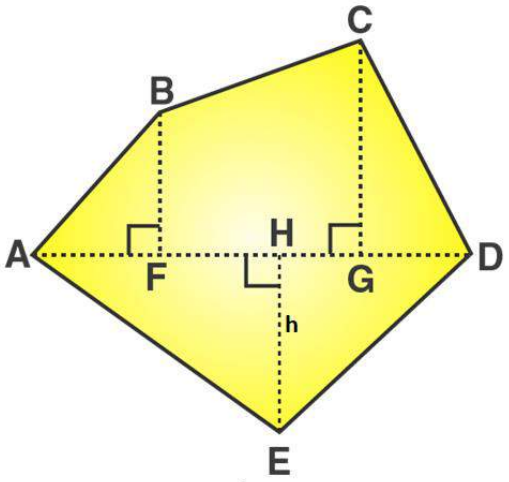


Fig. 20.48

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.

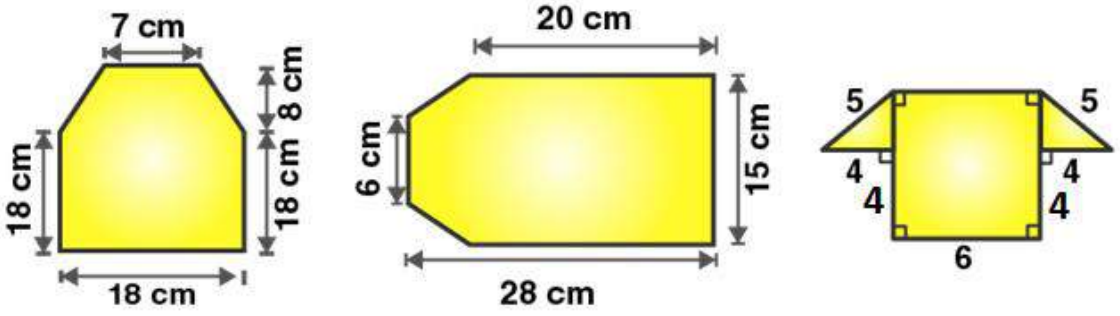


Fig. 20.49

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?

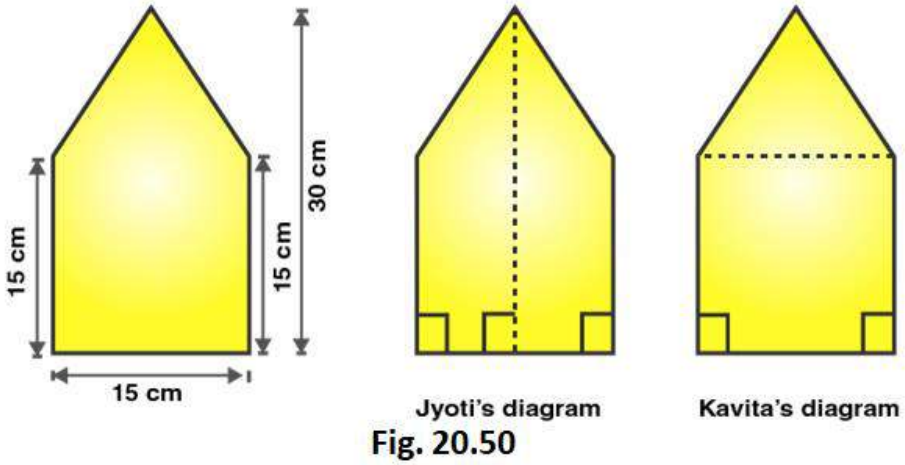


Fig. 20.50

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.

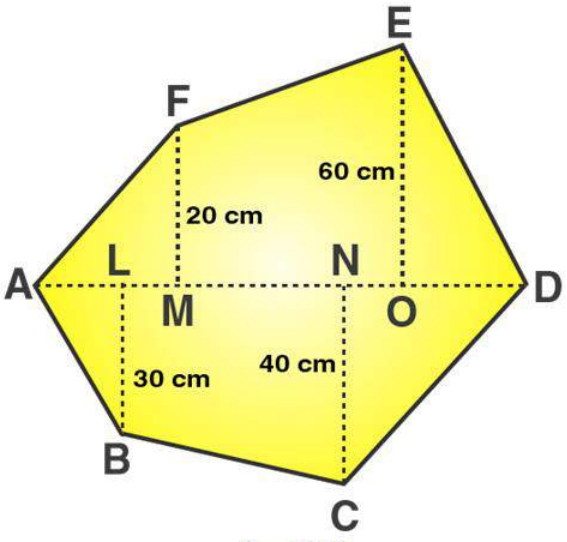


Fig. 20.51

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.

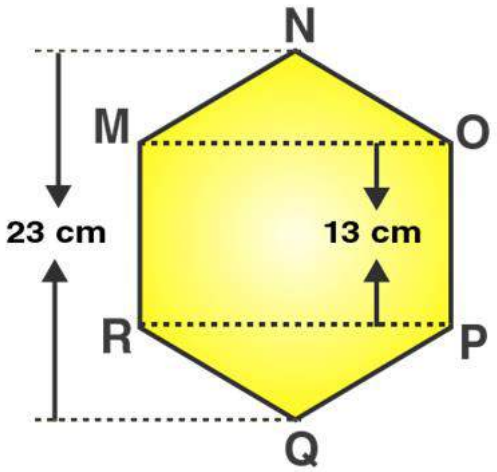
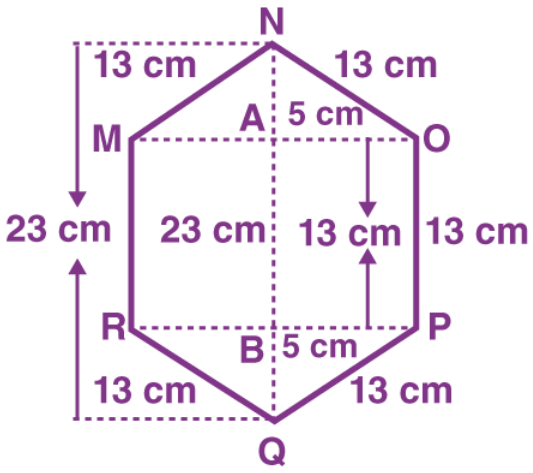


Fig. 20.52



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

Here

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

Therefore, area of given hexagon is 432 cm^2