RS Aggarwal Solutions for Class 9 Maths Chapter 14 – Areas of Triangles and Quadrilaterals

EXERCISE 14 PAGE: 533

1. Find the area of the triangle whose base measures 24cm and the corresponding height measures 14.5cm.
Solution:

It is given that b = 24 cm and h = 14.5 cm
We know that the
Area of triangle = ½ × b × h
By substituting the values
Area of triangle = ½ × 24 × 14.5
So we get
Area of triangle = 174 cm^2

Therefore, the area of the triangle is 174 cm^2.

2. The base of a triangular field is three times its altitude. If the cost of sowing the field at ₹ 58 per hectare is ₹ 783, find its base and height.
Solution:

Take x and the height and 3x as the base of the triangular field
We know that
Area of triangle = ½ × b × h
By substituting the values
Area of triangle = ½ × x × 3x
So we get
Area of triangle = 3/2 x^2

1 hectare = 1000 sq. metre
It is given that
Cost of sowing the field per hectare = ₹ 58
Total rate of sowing the field = ₹ 783

So we can find the total cost by
Total cost = Area of the field × ₹ 58
By substituting the values
(3/2) x^2 × (58/10000) = 783
By cross multiplication
x^2 = (783/58) × (2/3) × 10000
On further calculation
x^2 = 90000
By taking the square root
x = √90000
So we get
x = 300 m
Base = 3 × 300 = 900 m

Therefore, base = 900 m and height = 300 m.

3. Find the area of the triangle whose sides are 42cm, 34cm and 20cm in length. Hence, find the height corresponding to the longest side.

Solution:

Consider a = 42 cm, b = 34 cm and c = 20 cm
So we get

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

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

$By\,division$

$$s = 48$$

$We\,know\,that$

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

$By\,substituting\,the\,values$

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

$So\,we\,get$

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

$It\,can\,be\,written\,as$

$$Area = \sqrt{4 \times 4 \times 3 \times 3 \times 2 \times 14 \times 14 \times 2}$$

$On\,further\,calculation$

$$Area = 4 \times 3 \times 2 \times 14$$

So we get
Area = 336 cm^2

It is given as
b = Longest side = 42 cm
Consider h as the height corresponding to the longest side

We know that
Area of the triangle = ½ × b × h
By substituting the values
½ × b × h = 336
On further calculation
42 × h = 336 × 2
So we get
h = (336 × 2)/42
By division
h = 16 cm

Therefore, Area = 336 cm^2 and the height corresponding to the longest side is 16cm.

4. Calculate the area of the triangle whose sides are 18cm, 24cm and 30cm in length. Also, find the length of the altitude corresponding to the smallest side.
Solution:

It is given that a = 18cm, b = 24cm and c = 30cm
So we get

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

$s = \frac{18+24+30}{2}$

$By\,division$

$s = 36$

$We\,know\,that$

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

$By\,substituting\,the\,values$

$Area = \sqrt{36(36-18)(36-24)(36-30)}$

$So\,we\,get$

$Area = \sqrt{36 \times 18 \times 12 \times 6}$

$It\,can\,be\,written\,as$

$Area = \sqrt{6 \times 6 \times 6 \times 3 \times 3 \times 4 \times 6}$

$On\,further\,calculation$

$Area = 6 \times 6 \times 3 \times 2$

So we get
Area = 216 cm^2

It is given as
b = Smallest side = 18 cm
Consider h as the height corresponding to the smallest side

We know that
Area of the triangle = ½ × b × h
By substituting the values
½ × b × h = 216
On further calculation
18 × h = 216 × 2
So we get
h = (216 × 2)/18
By division
h = 24 cm

Therefore, Area = 216 cm^2 and the length of the altitude corresponding to the smallest side is 24 cm.

5. Find the area of a triangular field whose sides are 91m, 98m and 105m in length. Find the height corresponding to the longest sides.
Solution:

Consider a = 91m, b = 98m and c = 105m
So we get

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

$s = \frac{91+98+105}{2}$

By division

$s = 147$

We know that

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

By substituting the values

$Area = \sqrt{147(147-91)(147-98)(147-105)}$

So we get

$Area = \sqrt{147 \times 56 \times 49 \times 42}$

It can be written as

$Area = \sqrt{49 \times 3 \times 7 \times 2 \times 2 \times 2 \times 49 \times 7 \times 3 \times 2}$

On further calculation

$Area = 49 \times 3 \times 2 \times 2 \times 7$

So we get
Area = 4116 m^2

It is given as
b = Longest side = 105 m
Consider h as the height corresponding to the longest side

We know that
Area of the triangle = ½ × b × h
By substituting the values
½ × b × h = 4116
On further calculation
105 × h = 4116 × 2
So we get
h = (4116 × 2)/105
By division
h = 78.4 m

Therefore, Area = 4116 m^2 and the height corresponding to the longest sides is 78.4 m.

6. The sides of a triangle are in the ratio 5: 12: 13 and its perimeter is 150m. Find the area of the triangle.
Solution:

Consider the sides of the triangle as 5x, 12x and 13x
It is given that perimeter of the triangle = 150m
We can write it as
5x + 12x + 13x = 150m
On further calculation
30x = 150
So we get

x = 15/30
By division
x = 5m

By substituting the value of x we get
5x = 5 (5) = 25m
12x = 12 (5) = 60m
13x = 13 (5) = 65m

Consider a = 25m, b = 60m and c = 65m
So we get

$$s = \frac{a+b+c}{2}$$
$$s = \frac{25+60+65}{2}$$
$$By\, division$$
$$s = 75m$$
$$We\, know\, that$$
$$Area = \sqrt{s(s-a)(s-b)(s-c)}$$
$$By\, substituting\, the\, values$$
$$Area = \sqrt{75(75-25)(75-60)(75-65)}$$
$$So\, we\, get$$
$$Area = \sqrt{70 \times 50 \times 15 \times 10}$$
$$It\, can\, be\, written\, as$$
$$Area = \sqrt{25 \times 3 \times 25 \times 2 \times 5 \times 3 \times 5 \times 2}$$
$$On\, further\, calculation$$
$$Area = \sqrt{25 \times 25 \times 5 \times 5 \times 3 \times 3 \times 2 \times 2}$$
$$So\, we\, get$$
$$Area = 25 \times 5 \times 3 \times 2$$

By multiplication
Area = 750 sq. m

Therefore, the area of the triangle is 750 sq. m.

7. The perimeter of a triangular field is 540m and its sides are in the ratio 25: 17: 12. Find the area of the field. Also, find the cost of ploughing the field at ₹ 5 per m^2.
Solution:

Consider a, b, c as the sides of a triangle in the ratio 25: 17: 12
It can be written as
a: b: c = 25: 17: 12
So we get
a = 25, b = 17 and c = 12
It is given that
Perimeter = 540 m

So we get
25x + 17x + 12x = 540
On further calculation
54x = 540
By division
x = 10

By substituting the value of x
a = 25x = 25(10) = 250m
b = 17x = 17(10) = 170m
c = 12x = 12(10) = 120m

We know that

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

$$s = \frac{250+170+120}{2}$$

By division

$$s = 270m$$

We know that

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

By substituting the values

$$Area = \sqrt{270(270-250)(270-170)(270-120)}$$

So we get

$$Area = \sqrt{270 \times 20 \times 100 \times 150}$$

It can be written as

$$Area = \sqrt{9 \times 6 \times 5 \times 4 \times 5 \times 100 \times 25 \times 6}$$

On further calculation

$$Area = \sqrt{9 \times 36 \times 25 \times 4 \times 100 \times 25}$$

So we get

$$Area = 3 \times 6 \times 5 \times 2 \times 10 \times 5$$

Area = $9000m^2$

It is given that the cost of ploughing the field is ₹ 5 per m^2
So the cost of ploughing $9000m^2$ = 5 × 9000
By multiplication
The cost of ploughing $9000m^2$ = ₹ 45000

Therefore, the area of the field is $9000m^2$ and the cost of ploughing the field is ₹ 45000.

8. Two sides of a triangular field are 85m and 154m in length and its perimeter is 324m. Find
(i) the area of the field and
(ii) the length of the perpendicular from the opposite vertex on the side measuring 154m.
Solution:

It is given that two sides of a triangular field are 85m and 154m

Consider the third side as x m
It is given that the perimeter = 324m

We can write it as
85 + 154 + x = 324
On further calculation we get
x = 324 – 85 – 154
By subtraction
x = 85m

Consider a = 85m, b = 154m and c = 85m

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

$$s = \frac{85+154+85}{2}$$

By division

$$s = 162$$

We know that

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

By substituting the values

$$Area = \sqrt{162(162-85)(162-154)(162-85)}$$

So we get

$$Area = \sqrt{162 \times 77 \times 8 \times 77}$$

It can be written as

$$Area = \sqrt{2 \times 9 \times 9 \times 7 \times 11 \times 2 \times 2 \times 2 \times 7 \times 11}$$

On further calculation

$$Area = \sqrt{11 \times 11 \times 9 \times 9 \times 7 \times 7 \times 2 \times 2 \times 2 \times 2}$$

We get

$$Area = 11 \times 9 \times 7 \times 2 \times 2$$

By multiplication
Area = 2772 m^2

We know that
Area of the triangle = ½ × b × h
By substituting the values
½ × 154 × h = 2772
On further calculation
77 × h = 2772
So we get
h = 2772/77
By division
h = 36 m

Therefore, area of the field is 2772 m^2 and the length of the perpendicular from the opposite vertex on the side measuring 154m is 36m.

9. Find the area of an isosceles triangle each of whose equal sides measures 13cm and whose base measures 20cm.
Solution:

Consider a = 13cm, b = 13cm and c = 20cm
So we get

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

$$s = \frac{13+13+20}{2}$$

By division

$$s = 23cm$$

We know that

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

By substituting the values

$$Area = \sqrt{23(23-13)(23-13)(23-20)}$$

So we get

$$Area = \sqrt{23 \times 10 \times 10 \times 3}$$

It can be written as

$$Area = 10\sqrt{69}$$

We get

$$Area = 10 \times 8.306$$

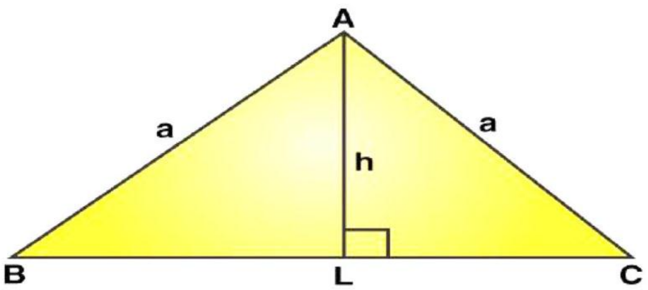
By multiplication

$$Area = 83.06cm^2$$

Therefore, area of an isosceles triangle is $83.06cm^2$.

10. The base of an isosceles triangle measures 80cm and its area is 360cm². Find the perimeter of the triangle.
Solution:

Consider △ ABC as an isosceles triangle with AL perpendicular to BC
It is given that BC = 80cm and area = 360 cm^2
We know that area of a triangle = ½ × b × h
By substituting the values
½ × BC × AL = 360 cm^2
So we get
½ × 80 × AL = 360 cm^2
On further calculation
40 × h = 360
By division
h = 9cm



We know that BL = ½ × BC
By substituting the values
BL = ½ × 80
By division
BL = 40cm and AL = 9cm

Using the Pythagoras theorem
We know that
$a = \sqrt{(BL^2 + AL^2)}$
By substituting the values
$a = \sqrt{(40^2 + 9^2)}$
So we get
a = √ (1600 + 81)
By addition
a = √ 1681
So we get
a = 41 cm

So the perimeter of the isosceles triangle = 41 + 41 + 8
We get
Perimeter of the isosceles triangle = 162 cm

Therefore, the perimeter of the triangle is 162 cm.

11. The perimeter of an isosceles triangle is 32cm. The ratio of the equal side to its base is 3:2. Find the area of the triangle.
Solution:

We know that the ratio of the equal side to its base is 3:2
For an isosceles triangle the ratio of sides can be written as 3: 3: 2
So we get
a: b: c = 3: 3: 2
Consider a = 3x, b = 3x and c = 2x
We know that the perimeter = 32cm

It can be written as
3x + 3x + 2x = 32
On further calculation
8x = 32
By division
x = 4

By substituting the value of x
a = 3x = 3(4) = 12cm
b = 3x = 3(4) = 12cm
c = 2x = 2(4) = 8cm

So we get

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

$$s = \frac{12+12+8}{2}$$

By division

$$s = 16cm$$

We know that

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

By substituting the values

$$Area = \sqrt{16(16-12)(16-12)(16-8)}$$

So we get

$$Area = \sqrt{16 \times 4 \times 4 \times 8}$$

It can be written as

$$Area = \sqrt{16 \times 16 \times 4 \times 2}$$

On further calculation

$$Area = 16 \times 2\sqrt{2}$$

We get

$$Area = 32\sqrt{2}cm^2$$

Therefore, area of the triangle is $32\sqrt{2}$ cm^2.

12. The perimeter of a triangle is 50cm. One side of the triangle is 4 cm longer than the smallest side and the third side is 6cm less than twice the smallest side. Find the area of the triangle.
Solution:

Consider the three sides of a triangle as a, b and c with c as the smallest side
So we get
a = c + 4
In the same way
b = 2c – 6
It is given that perimeter of a triangle = 50cm

We know that
a + b + c = 50
By substituting the values
(c + 4) + (2c – 6) + c = 50
On further calculation
4c – 2 = 50
By addition
4c = 50 + 2

4c = 52
By division
c = 13

By substituting the value of c
a = c + 4 = 13 + 4
a = 17cm

b = 2c – 6 = 2(13) – 6
b = 20cm

So we get

$$s = \frac{a+b+c}{2}$$
$$s = \frac{17+20+13}{2}$$
$$By\,division$$
$$s = 25cm$$
$$We\,know\,that$$
$$Area = \sqrt{s(s-a)(s-b)(s-c)}$$
$$By\,substituting\,the\,values$$
$$Area = \sqrt{25(25-17)(25-20)(25-13)}$$
$$So\,we\,get$$
$$Area = \sqrt{25 \times 8 \times 5 \times 12}$$
$$It\,can\,be\,written\,as$$
$$Area = \sqrt{25 \times 4 \times 2 \times 5 \times 4 \times 3}$$
$$On\,further\,calculation$$
$$Area = 5 \times 4\sqrt{30}$$
$$We\,get$$
$$Area = 20\sqrt{30}cm^2$$

Therefore, area of the triangle is $20\sqrt{30}$ cm^2.

13. The triangular side walls of a flyover have been used for advertisements. The sides of the walls are 13m, 14m, 15m. The advertisements yield an earning of ₹ 2000 per m^2 a year. A company hired one of its walls for 6 months. How much rent did it pay?
Solution:

Consider three sides of the wall as a = 13m, b = 14m and c = 15m
So we get

$$s = \frac{a+b+c}{2}$$
$$s = \frac{13+14+15}{2}$$
$By\, division$
$$s = 21cm$$
$We\, know\, that$
$$Area = \sqrt{s(s-a)(s-b)(s-c)}$$
$By\, substituting\, the\, values$
$$Area = \sqrt{21(21-13)(21-14)(21-15)}$$
$So\, we\, get$
$$Area = \sqrt{21 \times 8 \times 7 \times 6}$$
$It\, can\, be\, written\, as$
$$Area = \sqrt{7 \times 3 \times 4 \times 2 \times 7 \times 3 \times 2}$$
$On\, further\, calculation$
$$Area = 7 \times 2 \times 3 \times 2$$
$We\, get$
$$Area = 84cm^2$$

It is given that the advertisements yield per year = ₹ 2000 per m^2
So the rent for 6 months = ₹ 1000 per m^2
Total rent paid for advertisements for 6 months = ₹ (1000 × 84) = ₹ 84000

Therefore, the total rent paid in 6 months is ₹ 84000.

14. The perimeter of an isosceles triangle is 42cm and its base is 1 ½ times each of the equal sides. Find
(i) the length of each side of the triangle,
(ii) the area of the triangle, and
(iii) the height of the triangle. (Given, √7 = 2.64.)
Solution:

We know that the lateral sides of an isosceles triangle are of equal length
Consider the length of lateral side as x cm
It is given that base = 3/2 × x cm

(i) It is given that the perimeter = 42cm
We can write it as
x + x + 3/2 x = 42cm
By multiplying the entire equation by 2
2x + 2x + 3x = 84cm
On further calculation
7x = 84
By division
x = 12 cm
So the length of lateral side = 12 cm
Base = 3/2 x = 3/2 (12)

So we get the base = 18cm

Therefore, the length of each side of the triangle is 12cm, 12 cm and 18cm.

(ii) Consider a = 12cm, b = 12cm and c = 18cm

$$s = \frac{a+b+c}{2}$$
$$s = \frac{12+12+18}{2}$$
$$By\,division$$
$$s = 21cm$$
$$We\,know\,that$$
$$Area = \sqrt{s(s-a)(s-b)(s-c)}$$
$$By\,substituting\,the\,values$$
$$Area = \sqrt{21(21-12)(21-12)(21-18)}$$
$$So\,we\,get$$
$$Area = \sqrt{21 \times 9 \times 9 \times 3}$$
$$It\,can\,be\,written\,as$$
$$Area = \sqrt{3 \times 7 \times 9 \times 9 \times 3}$$
$$On\,further\,calculation$$
$$Area = 27\sqrt{7}$$
$$We\,get$$
$$Area = 27 \times 2.64$$
$$Area = 71.28cm^2$$

Therefore, the area of the triangle is $71.28cm^2$.

(iii) We know that
Area of a triangle = ½ × b × h
By substituting the values
71.28 = ½ × 18 × h
On further calculation
71.28 = 9 × h
By division
h = 7.92cm

Therefore, the height of the triangle is 7.92cm.

15. If the area of an equilateral triangle is 36√3 cm^2, find its perimeter.
Solution:

Consider a as the length of a side of an equilateral triangle
We know that
Area of an equilateral triangle = (√3 × a^2)/4 sq units
It is given that the area = 36√3 cm^2

We can write it as
$(\sqrt{3} \times a^2)/4 = 36\sqrt{3}$
On further calculation
$a^2 = (36\sqrt{3} \times 4)/ \sqrt{3}$
So we get
$a^2 = 36 \times 4$
By multiplication
$a^2 = 144$
By taking the square root
$a = \sqrt{144}$
So we get
$a = 12$ cm

By substituting the value of a
Perimeter = 3a = 3 (12) = 36cm

Therefore, the perimeter of the equilateral triangle is 36cm.

16. If the area of an equilateral triangle is $81\sqrt{3}$ cm^2, find its height.
Solution:

Consider a as the length of a side of an equilateral triangle
We know that
Area of an equilateral triangle = $(\sqrt{3} \times a^2)/4$ sq units
It is given that the area = $81\sqrt{3}$ cm^2
We can write it as
$(\sqrt{3} \times a^2)/4 = 81\sqrt{3}$
On further calculation
$a^2 = (81\sqrt{3} \times 4)/ \sqrt{3}$
So we get
$a^2 = 324$
By taking the square root
$a = \sqrt{324}$
So we get
$a = 18$ cm

We know that the height of an equilateral triangle = $\sqrt{3}/2$ a
By substituting the value of a
Height of an equilateral triangle = $\sqrt{3}/2\ (18) = 9\sqrt{3}$ cm

Therefore, the height of an equilateral triangle is $9\sqrt{3}$ cm.

17. Each side of an equilateral triangle measures 8cm. Find
(i) the area of the triangle, correct to 2 places of decimal and
(ii) the height of the triangle, correct to 2 places of decimal. (Take $\sqrt{3} = 1.732$)
Solution:

(i) Consider a as the side of equilateral triangle i.e. a = 8cm
Area of an equilateral triangle = $(\sqrt{3} \times a^2)/4$ sq units
So we get

Area of the equilateral triangle = $(\sqrt{3} \times 8^2)/4$
On further calculation
Area of the equilateral triangle = $(\sqrt{3} \times 64)/4$
So we get
Area of the equilateral triangle = $\sqrt{3} \times 16$
By substituting the value of $\sqrt{3}$
Area of the equilateral triangle = $1.732 \times 16 = 27.712$
By correcting to two places of decimal
Area of the equilateral triangle = 27.71 cm^2

(ii) We know that
Height of an equilateral triangle = $\sqrt{3}/2$ a
By substituting the value
Height of an equilateral triangle = $\sqrt{3}/2 \times 8$
So we get
Height of an equilateral triangle = $\sqrt{3} \times 4$
By substituting the value of $\sqrt{3}$
Height of an equilateral triangle = $1.732 \times 4 = 6.928$
By correcting to two places of decimal
Height of an equilateral triangle = 6.93 cm

18. The height of an equilateral triangle measures 9cm. Find its area, correct to 2 places of decimal. (Take $\sqrt{3} = 1.732$)
Solution:

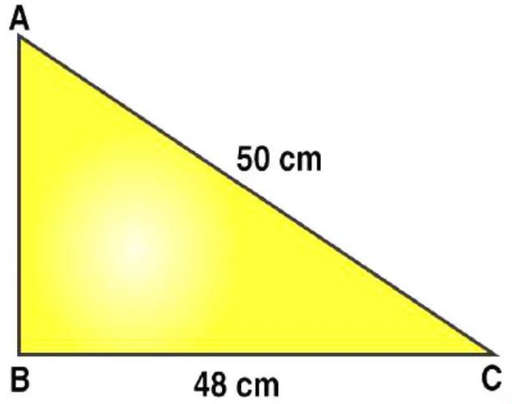
Consider a as the side of an equilateral triangle
We know that
Height of an equilateral triangle = $\sqrt{3}/2$ a
It is given that height = 9cm
So we get
$\sqrt{3}/2 \text{ a} = 9$
On further calculation
$a = (9 \times 2)/ \sqrt{3}$
Multiplying both numerator and denominator by $\sqrt{3}$
We get
$a = (9 \times 2 \times \sqrt{3}) / (\sqrt{3} \times \sqrt{3})$
So we get
Base = a = $6\sqrt{3}$cm

We know that the area of an equilateral triangle = ½ × b × h
By substituting the values
Area of the equilateral triangle = $\frac{1}{2} \times 6\sqrt{3} \times 9$
On further calculation
Area of the equilateral triangle = $27\sqrt{3} \text{ cm}^2$
By substituting the value of $\sqrt{3}$
Area of the equilateral triangle = $27 \times 1.732 = 46.764$
By correcting to 2 places of decimal
Area of the equilateral triangle = 46.76 cm^2

Therefore, the area of an equilateral triangle = 46.76 cm^2.

19. The base of a right-angled triangle measures 48 cm and its hypotenuse measures 50 cm. Find the area of the triangle.
Solution:

It is given that
Base = BC = 48 cm
Hypotenuse = AC = 50 cm
Consider AB = x cm

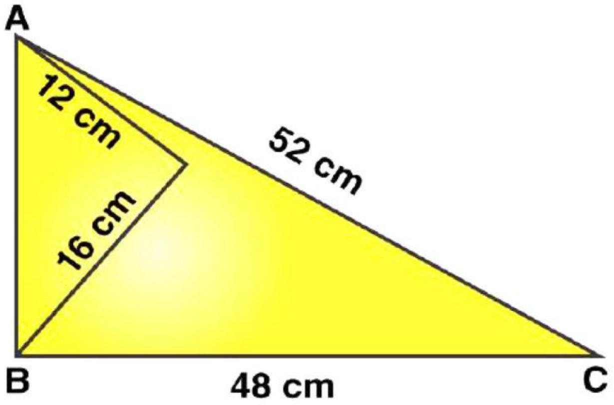


Using the Pythagoras theorem
$AC^2 = AB^2 + BC^2$
By substituting the values
$50^2 = x^2 + 48^2$
On further calculation
$x^2 = 50^2 - 48^2$
So we get
$x^2 = 2500 – 2304$
By subtraction
$x^2 = 196$
By taking the square root
$x = \sqrt{196}$
So we get
x = 14cm

We know that the area of a right angled triangle = ½ × b × h
By substituting the values
Area of a right angled triangle = ½ × 48 × 14
On further calculation
Area of a right angled triangle = 24 × 14
By multiplication
Area of the triangle = 336 cm^2

Therefore, the area of the triangle = 336 cm^2.

20. Find the area of the shaded region in the figure given below.



Solution:

Consider △ ABD
Using Pythagoras theorem
$AB^2 = AD^2 + BD^2$
By substituting the values
$AB^2 = 12^2 + 16^2$
On further calculation
$AB^2 = 144 + 256$
By addition
$AB^2 = 400$
By taking out the square root
$AB = \sqrt{400}$
So we get
AB = 20cm
We know that the area of △ ABD = ½ × b × h
It can be written as
Area of △ ABD = ½ × AD × BD
By substituting the values
Area of △ ABD = ½ × 12 × 16
On further calculation
Area of △ ABD = 96 cm^2

Consider △ ABC

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

$s = \frac{20+48+52}{2}$

$By\, division$

$s = 60cm$

$We\, know\, that$

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

$By\, substituting\, the\, values$

$Area = \sqrt{60(60-20)(60-48)(60-52)}$

$So\, we\, get$

$Area = \sqrt{60 \times 40 \times 12 \times 8}$

$It\, can\, be\, written\, as$

$Area = \sqrt{12 \times 5 \times 8 \times 5 \times 12 \times 8}$

$On\, further\, calculation$

$Area = 12 \times 5 \times 8$

$We\, get$

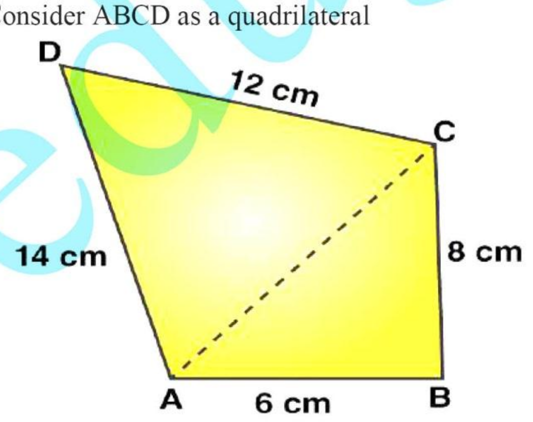
$Area = 480cm^2$

So the area of the shaded region = Area of △ ABC – Area of △ ABD
By substituting the values
Area of the shaded region = 480 – 96 = 384 cm^2

Therefore, the area of the shaded region is 384 cm^2.

21. The sides of a quadrilateral ABCD taken in order are 6cm, 8cm, 12 cm and 14cm respectively and the angle between the first two sides is a right angle. Find its area. (Given, √6 = 2.45.)
Solution:

Consider ABCD as a quadrilateral



It is given that AB = 6cm, BC = 8cm, CD = 12cm and AD = 14cm

Consider △ ABC
Using the Pythagoras theorem

$AC^2 = AB^2 + BC^2$
By substituting the values
$AC^2 = 6^2 + 8^2$
On further calculation
$AC^2 = 36 + 64$
By addition
$AC^2 = 100$
By taking out the square root
$AC = \sqrt{100}$
So we get
AC = 10cm

We know that the area of △ ABC = ½ × b × h
It can be written as
Area of △ ABC = ½ × AB × BC
By substituting the values
Area of △ ABC = ½ × 6 × 8
On further calculation
Area of △ ABC = 24 cm^2

Consider △ ADC
We know that AC = 10cm, CD = 12cm and AD = 14cm
It can be written as a = 10cm, b = 12cm and c = 14cm

So we get

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

$$s = \frac{10+12+14}{2}$$

By division

$$s = 18cm$$

We know that

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

By substituting the values

$$Area = \sqrt{18(18-10)(18-12)(18-14)}$$

So we get

$$Area = \sqrt{18 \times 8 \times 6 \times 4}$$

It can be written as

$$Area = \sqrt{9 \times 2 \times 2 \times 4 \times 6 \times 4}$$

On further calculation

$$Area = 3 \times 2 \times 4 \times \sqrt{6}$$

We get

$$Area = 24 \times 2.45$$

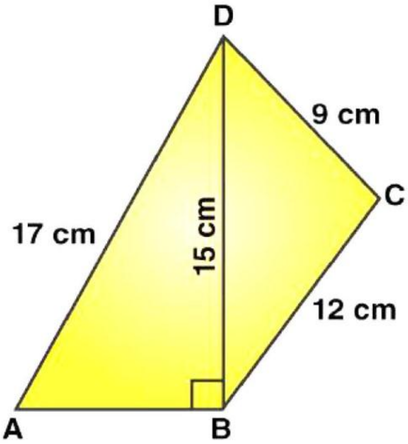
By multiplication

$$Area = 58.8cm^2$$

So the area of quadrilateral ABCD = Area of △ ABC + Area of △ ACD
By substituting the values
Area of quadrilateral ABCD = 24 + 58.8
By addition
Area of quadrilateral ABCD = 82.8 cm^2

Therefore, the area of quadrilateral ABCD is 82.8 cm^2.

22. Find the perimeter and area of a quadrilateral ABCD in which BC = 12 cm, CD = 9 cm, BD = 15cm, DA = 17 cm and ∠ ABD = 90°.



Solution:

Consider △ ABD
Using the Pythagoras theorem
$AD^2 = AB^2 + BD^2$
By substituting the values
$17^2 = AB^2 + 15^2$
On further calculation
$AB^2 = 289 - 225$
By subtraction
$AB^2 = 64$
By taking out the square root
$AB = \sqrt{64}$
So we get
AB = 8cm

We know that
Perimeter of quadrilateral ABCD = AB + BC + CD + AD
By substituting the values
Perimeter = 8 + 12 + 9 + 17
By addition
Perimeter = 46cm

We know that area of △ ABD = ½ × b × h
It can be written as
Area of △ ABD = ½ × AB × BD

By substituting the values
Area of △ ABD = ½ × 8 × 15
On further calculation
Area of △ ABD = 60 cm^2

Consider △ BCD
We know that BC = 12cm, CD = 9cm and BD = 15cm
It can be written as a = 12cm, b = 9cm and c = 15cm

So we get

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

$$s = \frac{12+9+15}{2}$$

$$By\,division$$

$$s = 18cm$$

$$We\,know\,that$$

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

$$By\,substituting\,the\,values$$

$$Area = \sqrt{18(18-12)(18-9)(18-15)}$$

$$So\,we\,get$$

$$Area = \sqrt{18 \times 6 \times 9 \times 3}$$

$$It\,can\,be\,written\,as$$

$$Area = \sqrt{6 \times 3 \times 6 \times 9 \times 3}$$

$$On\,further\,calculation$$

$$Area = 6 \times 3 \times 3$$

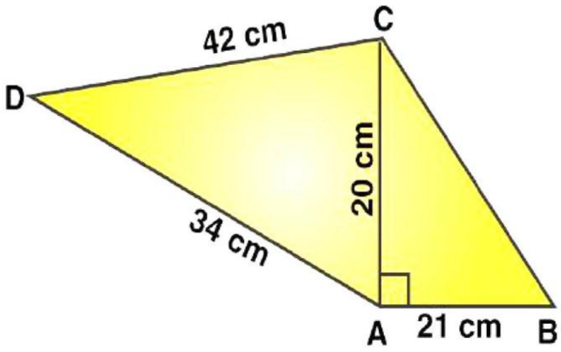
$$By\,multiplication$$

$$Area = 54cm^2$$

So the area of quadrilateral ABCD = Area of △ ABD + Area of △ BCD
By substituting the values
Area of quadrilateral ABCD = 60 + 54 = 114 cm^2

Therefore, the perimeter is 46cm and the area is 114 cm^2.

23. Find the perimeter and area of the quadrilateral ABCD in which AB = 21 cm, ∠ BAC = 90°, AC = 20cm, CD = 42 cm and AD = 34 cm.



Solution:

Consider △ BAC
Using the Pythagoras theorem
$BC^2 = AC^2 + AB^2$
By substituting the values
$BC^2 = 20^2 + 21^2$
On further calculation
$BC^2 = 400 + 441$
By addition
$BC^2 = 841$
By taking out the square root
$BC = \sqrt{841}$
So we get
BC = 29cm

We know that
Perimeter of quadrilateral ABCD = AB + BC + CD + AD
By substituting the values
Perimeter = 21 + 29 + 42 + 34
By addition
Perimeter = 126cm

We know that area of △ ABC = ½ × b × h
It can be written as
Area of △ ABC = ½ × AB × AC
By substituting the values
Area of △ ABC = ½ × 21 × 20
On further calculation
Area of △ ABC = 210 cm^2

Consider △ ACD
We know that AC = 20cm, CD = 42cm and AD = 34cm
It can be written as a = 20cm, b = 42cm and c = 34cm

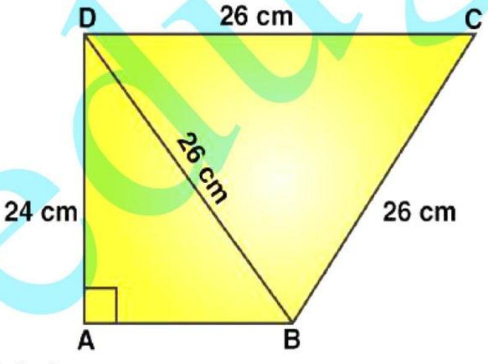
So we get

$s = \frac{a+b+c}{2}$
$s = \frac{20+42+34}{2}$
By division
$s = 48cm$
We know that
$Area = \sqrt{s(s-a)(s-b)(s-c)}$
By substituting the values
$Area = \sqrt{48(48-20)(48-42)(48-34)}$
So we get
$Area = \sqrt{48 \times 28 \times 6 \times 14}$
It can be written as
$Area = \sqrt{16 \times 3 \times 14 \times 2 \times 3 \times 2 \times 14}$
On further calculation
$Area = 4 \times 3 \times 14 \times 2$
By multiplication
$Area = 336cm^2$

So the area of quadrilateral ABCD = Area of △ ABC + Area of △ ACD
By substituting the values
Area of quadrilateral ABCD = 210 + 336 = 546 cm^2

Therefore, the perimeter is 126cm and the area is 546 cm^2.

24. Find the area of the quadrilateral ABCD in which BCD is an equilateral triangle, each of whose sides is 26cm, AD = 24cm and ∠ BAD = 90°. Also, find the perimeter of the quadrilateral. (Given, √3 = 1.73.)



Solution:

In △ ABD
Using the Pythagoras theorem
$BD^2 = AB^2 + AD^2$
By substituting the values
$26^2 = AB^2 + 24^2$

On further calculation
$AB^2 = 676 - 576$
By subtraction
$AB^2 = 100$
By taking out the square root
AB = √100
So we get
Base = AB = 10cm

We know that area of △ ABD = ½ × b × h
By substituting the values
Area of △ ABD = ½ × 10 × 24
On further calculation
Area of △ ABD = 120 cm^2

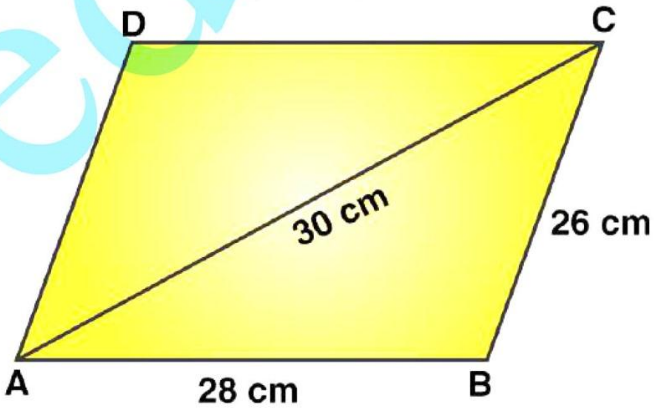
We know that the area of △ BCD = √3/4 a^2
By substituting the values
Area of △ BCD = (1.73/4) $(26)^2$
So we get
Area of △ BCD = 292.37 cm^2

So we get area of quadrilateral ABCD = Area of △ ABD + Area of △ BCD
By substituting the values
Area of quadrilateral ABCD = 120 + 29237
By addition
Area of quadrilateral ABCD = 412.37 cm^2

The perimeter of quadrilateral ABCD = AB + BC + CD + DA
By substituting the values
Perimeter = 10 + 26 + 26 + 24
So we get
Perimeter = 86cm

Therefore, the area is 412.37 cm^2 and perimeter is 86cm.

25. Find the area of a parallelogram ABCD in which AB = 28 cm, BC = 26 cm and diagonal AC = 30 cm.



Solution:

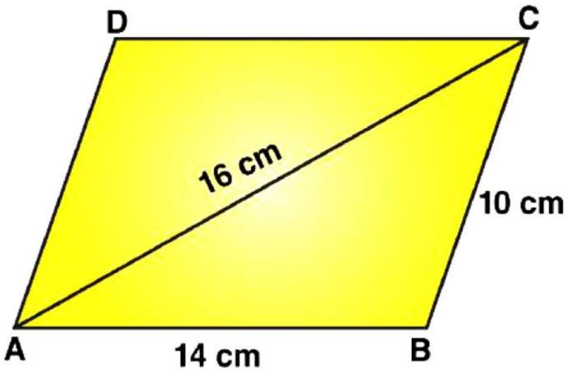
In △ ABC
Take a = 26cm, b = 30cm and c = 28cm

So we get
$$s = \frac{a+b+c}{2}$$
$$s = \frac{26+30+28}{2}$$
$By\,division$
$$s = 42cm$$
$We\,know\,that$
$$Area = \sqrt{s(s-a)(s-b)(s-c)}$$
$By\,substituting\,the\,values$
$$Area = \sqrt{42(42-26)(42-30)(42-28)}$$
$So\,we\,get$
$$Area = \sqrt{42 \times 16 \times 12 \times 14}$$
$It\,can\,be\,written\,as$
$$Area = \sqrt{14 \times 3 \times 16 \times 4 \times 3 \times 14}$$
$On\,further\,calculation$
$$Area = \sqrt{14 \times 14 \times 3 \times 3 \times 16 \times 4}$$
$So\,we\,get$
$$Area = 14 \times 3 \times 4 \times 2$$
$By\,multiplication$
$$Area = 336cm^2$$

We know that the diagonal divides the parallelogram into two equal area
So the area of parallelogram ABCD = Area of △ ABC + Area of △ ACD
It can be written as
Area of parallelogram ABCD = 2(Area of △ ABC)
By substituting the values
Area of parallelogram ABCD = 2 (336)
By multiplication
Area of parallelogram ABCD = 672 cm^2

Therefore, the area of parallelogram ABCD is 672 cm^2.

26. Find the area of a parallelogram ABCD in which AB = 14cm, BC = 10cm and AC = 16cm. (Given, √3 = 1.73.)



Solution:

In △ ABC
Take a = 10cm, b = 16cm and c = 14cm

So we get

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

$$s = \frac{10+16+14}{2}$$

$By\,division$

$s = 20cm$

$We\,know\,that$

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

$By\,substituting\,the\,values$

$Area = \sqrt{20(20-10)(20-16)(20-14)}$

$So\,we\,get$

$Area = \sqrt{10 \times 2 \times 10 \times 4 \times 3 \times 2}$

$It\,can\,be\,written\,as$

$Area = \sqrt{10 \times 10 \times 4 \times 2 \times 2 \times 3}$

$On\,further\,calculation$

$Area = 10 \times 2 \times 2 \times \sqrt{3}$

$By\,multiplication$

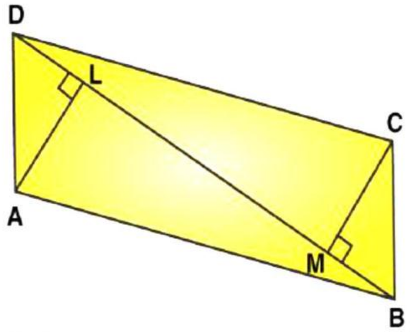
$Area = 40\sqrt{3}cm^2$

We know that a diagonal in a parallelogram divides it into two equal area
So we get
Area of parallelogram ABCD = Area of △ ABC + Area of △ ACD
It can be written as
Area of parallelogram ABCD = 2(Area of △ ABC)
By substituting the values
Area of parallelogram ABCD = 2 (40 √3)
So we get
Area of parallelogram ABCD = 80√3

By substituting √3
Area of parallelogram ABCD = 80 (1.73)
So we get
Area of parallelogram ABCD = 138.4 cm^2

Therefore, the area of parallelogram ABCD is 138.4 cm^2.

27. In the given figure, ABCD is a quadrilateral in which diagonal BD = 64cm, AL ⊥ BD and CM ⊥ BD such that AL = 16.8 cm and CM = 13.2 cm. Calculate the area of the quadrilateral ABCD.



Solution:

We know that
Area of △ ABD = ½ × b × h
It can be written as
Area of △ ABD = ½ × BD × AL
By substituting the values
Area of △ ABD = ½ × 64 × 16.8
On further calculation
Area of △ ABD = 537.6 cm^2

We know that
Area of △ BCD = ½ × b × h
It can be written as
Area of △ BCD = ½ × BD × CM
By substituting the values
Area of △ BCD = ½ × 64 × 13.2
On further calculation
Area of △ BCD = 422.4 cm^2

So we get area of quadrilateral ABCD = Area of △ ABD + Area of △ BCD
By substituting the values
Area of quadrilateral ABCD = 537.6 + 422.4
By addition
Area of quadrilateral ABCD = 960 cm^2

Therefore, the area of quadrilateral ABCD is 960 cm^2.

28. The area of a trapezium is 475 cm^2 and its height is 19cm. Find the lengths of its two parallel sides if one side is 4cm greater than the other.
Solution:

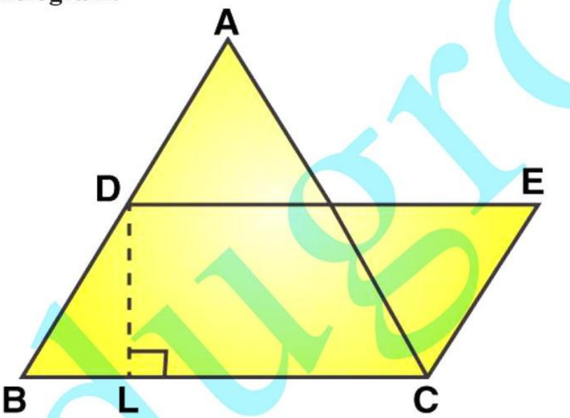
Consider x cm as the smaller side of the trapezium
So the larger parallel can be written as (x + 4) cm

We know that the area of trapezium = ½ × sum of parallel sides × height
By substituting the values
475 = ½ × (x + (x + 4)) × 19
On further calculation
25 = ½ × (2x + 4)
So we get
50 = 2x + 4
By subtraction
2x = 50 - 4
2x = 46
By division
x = 23cm

So we get Larger parallel side (x + 4) = 23 + 4 = 27cm

Therefore, the length of two parallel sides is 23cm and 27cm.

29. In the given figure, a △ ABC has been given in which AB = 7.5 cm, AC = 6.5 cm and BC = 7cm. On base BC, a parallelogram DBCE of the same area as that of △ ABC is constructed. Find the height DL of the parallelogram.



Solution:

Consider △ ABC
It is given that AB = 7.5cm, BC = 7cm and AC = 6.5cm
Take a = 7.5cm, b = 7cm and c = 6.5 cm

So we get

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

$s = \frac{7.5+7+6.5}{2}$

$By\,division$

$s = 10.5cm$

$We\,know\,that$

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

$By\,substituting\,the\,values$

$Area = \sqrt{10.5(10.5-7.5)(10.5-7)(10.5-6.5)}$

$So\,we\,get$

$Area = \sqrt{10.5 \times 3 \times 3.5 \times 4}$

$It\,can\,be\,written\,as$

$Area = \sqrt{441}$

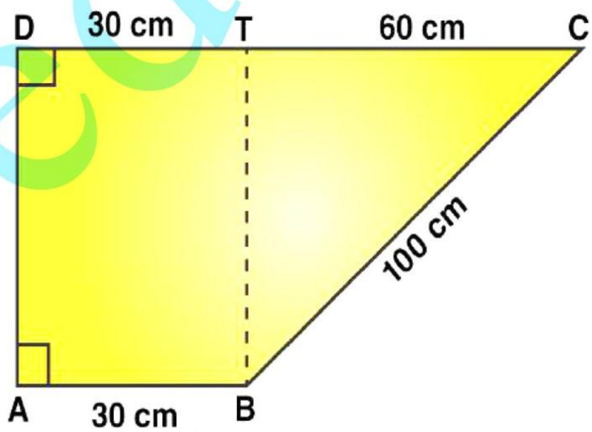
$By\,multiplication$

$Area = 21cm^2$

We know that the area of parallelogram DBCE = Area of △ ABC
It can be written as
BC × DL = 21
By substituting the values
7 × DL = 21
By division
DL = 3cm

Therefore, the height DL of the parallelogram is 3cm.

30. A field is in the shape of a trapezium having parallel sides 90 m and 30 m. These sides meet the third side at right angles. The length of the fourth side is 100 m. If it costs ₹ 5 to plough 1m² of the field, find the total cost of ploughing the field.
Solution:



Construct BT parallel to CD

Consider △ BTC
Using the Pythagoras theorem
$BC^2 = BT^2 + CT^2$
By substituting the values
$100^2 = BT^2 + 60^2$
On further calculation
$BT^2 = 10000 - 3600$
By subtraction
$BT^2 = 6400$
By taking out the square root
$BT = \sqrt{6400}$
So we get
AD = BT = 80m

We know that
Area of field = Area of trapezium ABCD
So we get
Area of trapezium ABCD = ½ × Sum of parallel sides × height
It can be written as
Area of trapezium ABCD = ½ × (AB + CD) × AD
By substituting the values
Area of trapezium ABCD = ½ × (30 + 90) × 80
On further calculation
Area of trapezium ABCD = 120 × 40
By multiplication
Area of trapezium ABCD = 4800 m^2

It is given that the cost of ploughing 1m^2 is ₹ 5
So the cost of ploughing 4800 m^2 = ₹ (5 × 4800)
The cost of ploughing 4800 m^2 = ₹ 24000

Therefore, the total cost of ploughing the field is ₹ 24000.

31. A rectangular plot is given for constructing a house, having a measurement of 40m long and 15m in the front. According to the laws, a minimum of 3m wide space should be left in the front and back each and 2m wide space on each of the other sides. Find the largest area where house can be constructed.
Solution:

It is given that the length of rectangular plot = 40m
Width = 15m

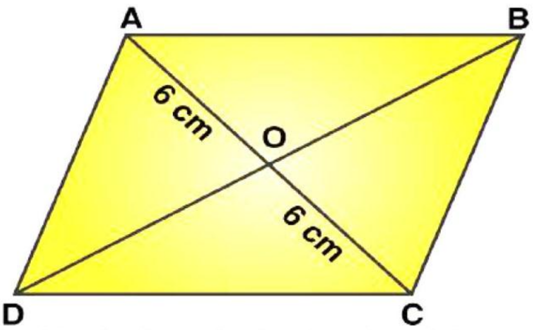
By keeping 3m wide space both in front and back
The length becomes = 40 – 3 – 3 = 34m

By keeping 2m wide space both the sides
Width = 15 – 2 – 2 = 11m

So the largest area where the house can be constructed = 34 × 11 = 374 m^2

Therefore, the largest area where the house can be constructed is 374 m^2.

32. A rhombus-shaped sheet with perimeter 40cm and one diagonal 12cm, is painted on both sides at the rate of ₹5 per cm^2. Find the cost of painting.
Solution:



Consider ABCD as the rhombus shaped sheet
It is given that the perimeter = 40cm
It can be written as
4 (side) = 40cm
So we get
Side = 10cm
We get
AB = BC = CD = AD = 1cm

Consider the diagonal AC = 12cm
We know that the diagonals of a rhombus bisect each other at right angles
So we get
AO = OC = 6cm

Consider △ AOD
Using the Pythagoras theorem
$AD^2 = OD^2 + AO^2$
By substituting the values
$10^2 = OD^2 + 6^2$
On further calculation
$OD^2 = 100 - 36$
By subtraction
$OD^2 = 64$
By taking out the square root
$OD = \sqrt{64}$
So we get
OD = 8cm

We know that
BD = 2OD
So we get
BD = 2(8)
BD = 16cm

We know that
Area of rhombus ABCD = ½ (Product of diagonals)

It can be written as
Area of rhombus ABCD = ½ × AC × BD
By substituting the values
Area of rhombus ABCD = ½ × 12 × 16
By multiplication
Area of rhombus ABCD = 96 cm^2

It is given that the cost of painting is ₹5 per cm^2
So the cost of paining both sides of rhombus = ₹5 × (96 + 96)
We get
The cost of painting both sides of rhombus = ₹5 × 192 = ₹960

Therefore, the cost of painting is ₹960.

33. The difference between the semiperimeter and the sides of a △ ABC are 8cm, 7cm and 5cm respectively. Find the area of the triangle.
Solution:

Consider a, b and c as the sides of a triangle and s as the semi perimeter
So we get
s – a = 8cm
s – b = 7cm
s – c = 5cm

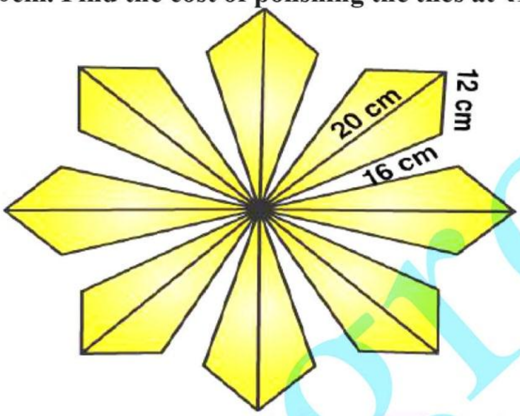
We know that
(s – a) + (s – b) + (s – c) = 8 + 7 + 5
On further calculation
3s – (a + b + c) = 20
We know that a + b + c = 2s
3s – 2s = 2
So we get
s = 20

By substituting the value of s
a = s – 8 = 20 – 8 = 12cm
b = s – 7 = 20 – 7 = 13cm
c = s – 5 = 20 – 5 = 15cm

$We\, know\, that$
$Area = \sqrt{s(s-a)(s-b)(s-c)}$
$By\, substituting\, the\, values$
$Area = \sqrt{20(20-12)(20-13)(20-15)}$
$So\, we\, get$
$Area = \sqrt{20 \times 8 \times 7 \times 5}$
$It\, can\, be\, written\, as$
$Area = \sqrt{4 \times 5 \times 4 \times 2 \times 7 \times 5}$
$By\, multiplication$
$Area = 20\sqrt{14} cm^2$

Therefore, the area of the triangle is 20√14 cm^2.

34. A floral design on a floor is made up of 16 tiles, each triangular in shape having sides 16cm, 12cm and 20cm. Find the cost of polishing the tiles at ₹1 per sq cm.



Solution:

Consider a = 16cm, b = 12cm and c = 20cm
So we get

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

By substituting the values

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

So we get

$s = 24cm$

We know that

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

By substituting the values

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

So we get

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

It can be written as

$Area = 2 \times 2 \times 2 \times 2 \times 2 \times 3$

By multiplication

$Area = 96cm^2$

So the area of one tile = $96cm^2$
The area of 16 triangular tiles = 96 (16) = 1536 cm^2
It is given that the cost of polishing the tiles per sq cm = ₹1
So the cost of polishing all the tiles = ₹ (1 × 1536) = ₹ 1536

Therefore, the cost of polishing the tiles is ₹ 1536.

35. An umbrella is made by stitching 12 triangular pieces of cloth, each measuring (50cm × 20cm × 50cm). Find the area of the cloth used in it.

Solution:

Consider a = 50cm, b = 20cm and c = 50cm
So we get

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

$By\ substituting\ the\ values$

$s = \frac{50+20+50}{2}$

$So\ we\ get$

$s = 60cm$

$We\ know\ that$

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

$By\ substituting\ the\ values$

$Area = \sqrt{60(60-50)(60-20)(60-50)}$

$So\ we\ get$

$Area = \sqrt{60 \times 10 \times 40 \times 10}$

$It\ can\ be\ written\ as$

$Area = \sqrt{6 \times 10 \times 10 \times 4 \times 10 \times 10}$

$So\ we\ get$

$Area = \sqrt{10 \times 10 \times 10 \times 10 \times 2 \times 2 \times 2 \times 3}$

$We\ get$

$Area = 10 \times 10 \times 2\sqrt{6}$

$By\ multiplication$

$Area = 200\sqrt{6}$

$By\ substituting\ the\ value$

$Area = 200 \times 2.45$

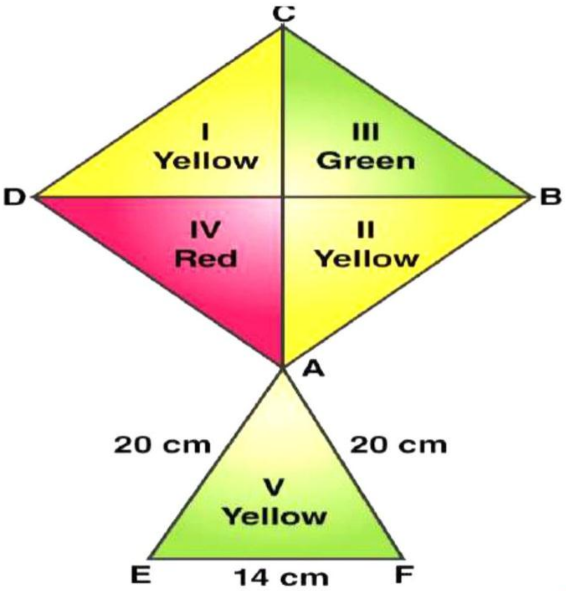
$We\ get$

$Area = 490cm^2$

So the area of one piece of cloth = 490 cm^2
We know that the area of 12 pieces = 12 (490)
By multiplication
The area of 12 pieces = 5880 cm^2

Therefore, the area of cloth used in it is 5880 cm^2.

36. In the given figure, ABCD is a square with diagonal 44cm. How much paper of each shade is needed to make a kite given in the figure.



Solution:

We know that
Area of square sheet ABCD = ½ × diagonal^2
By substituting the value
Area of square sheet ABCD = ½ × 44 × 44 = 968 cm^2

From the figure we know that the
Area of yellow sheet = Area of region I + Area of region II
It can be written as
Area of yellow sheet = ½ × Area of square sheet ABCD
By substituting the value
Area of yellow sheet = ½ × 968 = 484 cm^2

From the figure we know that the
Area of red sheet = Area of region IV
It can be written as
Area of red sheet = 1/4 × Area of square sheet ABCD
By substituting the value
Area of red sheet = 1/4 × 968 = 242 cm^2

Consider △ AEF
We know that AE = 20cm, EF = 14cm and AF = 20cm
Consider a = 20cm, b = 14cm and c = 20cm

So we get

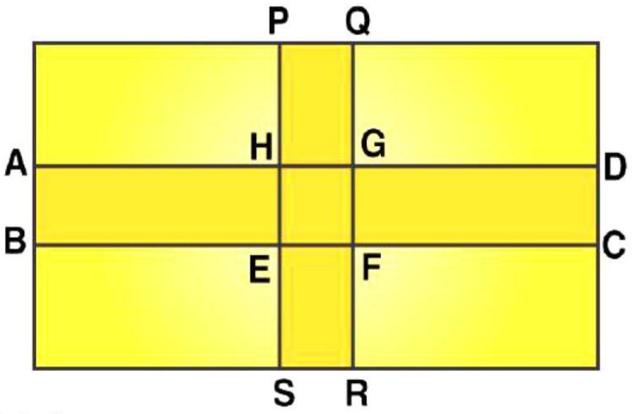
$$s = \frac{a+b+c}{2}$$
$By\, substituting\, the\, values$
$$s = \frac{20+14+20}{2}$$
$So\, we\, get$
$$s = 27cm$$

$We\, know\, that$
$$Area = \sqrt{s(s-a)(s-b)(s-c)}$$
$By\, substituting\, the\, values$
$$Area = \sqrt{27(27-20)(27-14)(27-20)}$$
$So\, we\, get$
$$Area = \sqrt{27 \times 7 \times 13 \times 7}$$
$By\, multiplication$
$$Area = 21\sqrt{39}$$
$By\, substituting\, the\, value$
$$Area = 21 \times 6.25$$
$We\, get$
$$Area = 131.25cm^2$$

From the figure we know that
Area of green sheet = Area of region III + Area of region V
It can be written as
Area of green sheet = ¼ × Area of square sheet ABCD + 131.25
By substituting the values
Area of green sheet = ¼ × 968 + 131.25
On further calculation
Area of green sheet = 242 + 131.25
By addition
Area of green sheet = 373.25 cm^2

Therefore, the area of yellow sheet is 484 cm^2, area of red sheet is 242 cm^2 and the area of green sheet is 373.25cm^2.

37. A rectangular lawn, 75m by 60m, has two roads, each road 4m wide, running through the middle of the lawn, one parallel to length and the other parallel to breadth, as shown in the figure. Find the cost of gravelling the roads at ₹ 50 per m^2.



Solution:

We know that for the road ABCD
It is given that length = 75m and breadth = 4m

We know that
Area of road ABCD = l × b
By substituting the values
Area of road ABCD = 75 × 4
So we get
Area of road ABCD = 300 m^2

We know that for the road PQRS
It is given that length = 60m and breadth = 4m

We know that
Area of road PQRS = l × b
By substituting the values
Area of road PQRS = 60 × 4
So we get
Area of road PQRS = 240 m^2

We know that for road EFGH
It is given that side = 4m
Area of road EFGH = $side^2$
By substituting the value
Area of road EFGH = 4^2 = 16 m^2

The total area of the road for gravelling = Area of road ABCD + Area of road PQRS – Area of road EFGH
By substituting the values
Total area of the road for gravelling = 300 + 340 – 16
So we get
Total area of the road for gravelling = 524 m^2

It is given that the cost of gravelling the road = ₹ 50 per m^2
So the cost of gravelling 524 m^2 road = ₹ (50 × 524) = ₹ 26200

Therefore, the cost of gravelling the road is ₹ 26200.

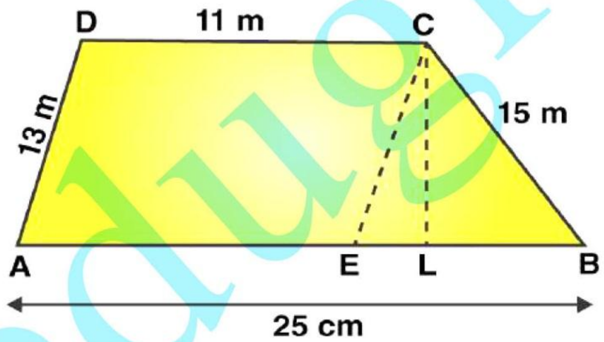
38. The shape of the cross section of a canal is a trapezium. If the canal is 10m wide at the top, 6m wide at the bottom and the area of its cross section is 640m^2, find the depth of the canal.
Solution:

It is given that the area of cross section = 640 m^2
We know that
Length of top + Length of bottom = sum of parallel sides
It can be written as
Length of top + Length of bottom = 10 + 6 = 16m

We know that
Area of cross section = ½ × sum of parallel sides × height
By substituting the values
640 = ½ × 16 × height
So we get
Height = (640 × 2)/16
By division
Height = 80m

Therefore, the depth of the canal is 80m.

39. Find the area of a trapezium whose parallel sides are 11m and 25m long, and the nonparallel sides are 15m and 13m long.
Solution:



From the point C construct CE || DA
We know that ADCE is a parallelogram having AE || DC and AD || EC with AD = 13m and D = 11m
It can be written as
AE = DC = 11m and EC = AD = 13m
So we get
BE = AB – AE
By substituting the values
BE = 25 – 11 = 14m

Consider △ BCE
We know that BC = 15m, CE = 13m and BE = 14m
Take a = 15m, b = 13m and c = 14m

So we get

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

By substituting the values

$$s = \frac{15+13+14}{2}$$

So we get

$$s = 21m$$

We know that

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

By substituting the values

$$Area = \sqrt{21(21-15)(21-13)(21-14)}$$

So we get

$$Area = \sqrt{21 \times 6 \times 8 \times 7}$$

It can be written as

$$Area = \sqrt{7 \times 3 \times 2 \times 3 \times 4 \times 2 \times 7}$$

We get

$$Area = 7 \times 3 \times 2 \times 2$$

So We get

$$Area = 84m^2$$

We know that
Area of △ BCE = ½ × BE × CL
By substituting the values
84 = ½ × 14 × CL
On further calculation
84 = 7 × CL
By division
CL = 12m

We know that
Area of trapezium ABCD = ½ × sum of parallel sides × height
It can be written as
Area of trapezium ABCD = ½ × (AB + CD) × CL
By substituting the values
Area of trapezium ABCD = ½ × (11 + 25) × 12
On further calculation
Area of trapezium ABCD = 36 × 6
By multiplication
Area of trapezium ABCD = 216 m^2

Therefore, the area of trapezium ABCD is 216 m^2.

40. The difference between the lengths of the parallel sides of a trapezium is 8cm, the perpendicular

distance between these sides is 24cm and the area of the trapezium is 312cm^2. Find the length of each of the parallel sides.
Solution:

Consider x cm as the smaller parallel side
So the longer parallel side can be written as (x + 8) cm
It is given that height = 24cm
Area = 312 cm^2

We know that
Area of trapezium = ½ × sum of parallel sides × height
By substituting the values
312 = ½ × (x + x + 8) × 24
On further calculation
312 = 12 × (2x + 8)
By division
2x + 8 = 26
So we get
2x = 26 – 8
By subtraction
2x = 18
By division
x = 9cm

So we get
x + 8 = 9 + 8 = 17cm

Therefore, the length of each of the parallel sides is 9cm and 17cm.

41. A parallelogram and a rhombus are equal in area. The diagonals of the rhombus measure 120m and 44m. If one of the sides of the parallelogram measures 66m, find its corresponding altitude.
Solution:

It is given that
Area of parallelogram = Area of rhombus
We can write it as
Base × altitude = ½ × product of diagonals
By substituting the values
66 × altitude = ½ × 120 × 44
On further calculation
66 × altitude = 60 × 44
So we get
Altitude = (60 × 44)/66
Altitude = 40 m

Therefore, the corresponding altitude is 40m.

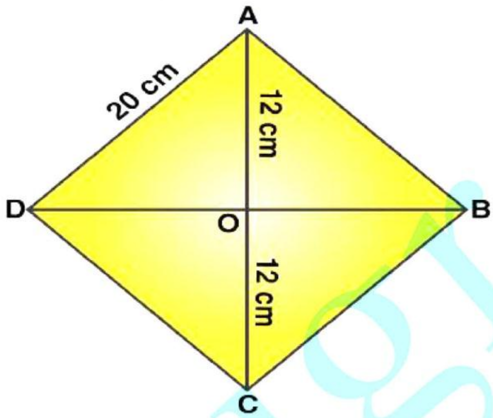
42. A parallelogram and a square have the same area. If the sides of the square measure 40m and altitude of the parallelogram measures 25m, find the length of the corresponding base of the parallelogram.
Solution:

It is given that
Area of parallelogram = Area of square
We know that
Base × altitude = side^2
By substituting the value
Base × 25 = 40^2
On further calculation
Base = (40 × 40)/25
So we get
Base = 64m

Therefore, the length of the corresponding base of the parallelogram is 64m.

43. Find the area of the rhombus one side of which measures 20cm and one of whose diagonals is 24cm.
Solution:

Consider ABCD as a rhombus with AC and BD as diagonals which intersect each other at O



The diagonals of a rhombus bisect at right angles

Consider △ AOD
Using the Pythagoras theorem
$AD^2 = OD^2 + AO^2$
By substituting the values
$20^2 = OD^2 + 12^2$
On further calculation
$OD^2 = 400 - 144$
By subtraction
$OD^2 = 256$
By taking out the square root
OD = √256
So we get
OD = 16cm

We know that BD = 2OD
So we get
BC = 2 (16) = 32cm

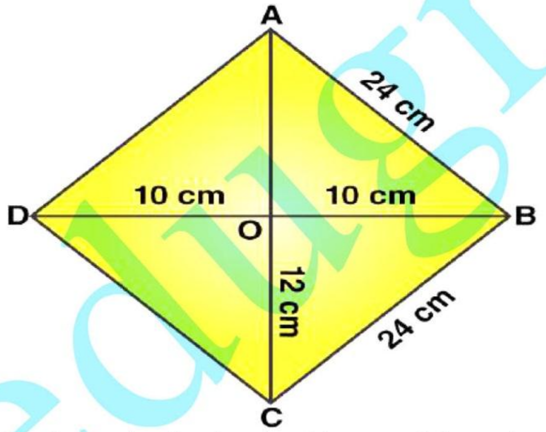
We know that
Area of rhombus ABCD = ½ × AC × BD
By substituting the values
Area of rhombus ABCD = ½ × 24 × 32
On further calculation
Area of rhombus ABCD = 384 cm^2

Therefore, the area of rhombus ABCD is 384 cm^2.

44. The area of a rhombus is 480cm^2, and one of its diagonals measures 48cm. Find
(i) the length of the other diagonal,
(ii) the length of each of its sides, and
(iii its perimeter.
Solution:

(i) It is given that
Area of rhombus = 480 cm^2
It can be written as
½ × diagonal 1 × diagonal 2 = 480
So we get
½ × 48 × diagonal 2 = 480
On further calculation
Diagonal 2 = 20cm

(ii) Consider AC = 48cm and BD = 20cm



The diagonals of a rhombus bisect at right angles
Consider △ AOD
Using the Pythagoras theorem
$AD^2 = OD^2 + AO^2$
By substituting the values
$AD^2 = 24^2 + 10^2$
On further calculation
$AD^2 = 576 + 100$
By addition
$AD^2 = 676$
By taking out the square root

AD = √676
So we get
AD = 26cm

We know that AD = BC = CD = AD = 26cm

Therefore, the length of each side of rhombus is 26cm.

(iii) We know that
Perimeter of a rhombus = 4 (side)
By substituting the value
Perimeter of a rhombus = 4 (26)
So we get
Perimeter of a rhombus = 104 cm