EDUGROSS
WISDOMISING KNOWLEDGE

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Exercise 15A

Page No: 658

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

Solution:
Given:
Base of triangle = 24 cm
Height = 14.5 cm

Area of a triangle = 1/2 x Base X Height

= 1/2 x 24 x 14.5

= 174

Area of a triangle is 174 cm^2.

Question 2: Find the area of the triangle whose sides are 42 cm, 34 cm and 20 cm in length. Find the height corresponding to the longest side.

Solution:
Let a, b and c be the sides of a triangle.
Apply Heron's Formula to find the area of triangle.
Area = $\sqrt{S(S-a)(S-b)(S-c)}$

Where S = $\frac{a+b+c}{2}$

Here a = 42 cm, b = 34 cm and c = 20 cm

S = (42 +34 +20)/2 = 48

Area = √(48(48-42)(48-34)(48-20))

= √(48 x 6 x 14 x 28)
= 336

Area of triangle is 336 cm^2.

Clearly,
Length of longest side = 42 cm

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Also we know, Area of a triangle = 1/2 × Base × Height
336 = 1/2 × 42 × Height
336 = 21 x Height
or Height = 16
The height corresponding to the longest side is 16 cm.

Question 3: Find the area of the triangle whose sides are 18 cm, 24 cm and 30 cm. Also, find the height corresponding to the smallest side.

Solution:

Let a, b and c be the sides of a triangle.
Apply Heron's Formula to find the area of triangle.
Area = $\sqrt{S(S-a)(S-b)(S-c)}$

Where S = $\frac{a+b+c}{2}$

Here a = 18 cm, b = 24 cm, c = 30 cm
Now,
S = 1/2(18+24+30) = 36

Area = √(36(36-18)(36-24)(36-30))

= √(36 × 18× 12 × 6)

= 216

Area is 216 cm^2

From given, Length of smallest side = 18 cm

Area of a triangle = 1/2 × Base × Height
216 = 1/2 x 18 x height

Height = 24

Therefore, the height corresponding to the smallest side is 24 cm.

Question 4: The sides of a triangle are in the ratio 5: 12 : 13, and its perimeter is 150 m. Find the area of the triangle.

Solution:

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Perimeter of triangle = 150 m (given)

Let the sides of triangle be, a, b and c,
On dividing 150 m in the ratio 5 : 12 : 13, we get

a = 5x cm
b = 12x cm
c = 13x cm

We know that, Perimeter of a triangle = Sum of all the sides = a + b + c

150 = 5x + 12x + 13x
= 30 x
x = 5

Sides are:

a = 5x = 25 cm
b = 12x = 60 cm
c = 13x = 65 cm

Now,

Let a, b and c be the sides of a triangle.
Apply Heron's Formula to find the area of triangle.
Area = $\sqrt{S(S-a)(S-b)(S-c)}$

Where S = $\frac{a+b+c}{2}$

S = 1/2(25+60+65) = 75 cm

Area = √(75(75-25)(75-60)(75-65))
= √(75 × 50 × 15 × 10)
= 750

Area of triangle is 750 cm^2.

Question 5: The perimeter of a triangular field is 540 m, 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 ₹40 per 100 m^2.

Solution:

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Perimeter of triangle = 540 m

Let the sides of triangle be, a, b and c

On dividing 540 m in the ratio 25:17:12, we get

a = 25x m
b = 17x m
c = 12x m

We know that, Perimeter of a triangle = Sum of all the sides = a + b + c

540 = 25x + 17x + 12x
= 54 x
x = 10

Sides are:

a = 25x = 250 m
b = 17x = 170 m
c = 12x = 120 m

Let a, b and c be the sides of a triangle.
Apply Heron's Formula to find the area of triangle.
Area = $\sqrt{S(S-a)(S-b)(S-c)}$

Where S = $\frac{a+b+c}{2}$

S = 1/2(250+170+120) = 270 m

Area = √(270(270-250)(270-170)(270-120))
= √(270 x 20 x 10 x 150)
= 9000

Area of triangle is 9000 m^2.

Now,
The cost of ploughing 100 m^2 = ₹40

The cost of ploughing 1 m^2 = ₹ 40/100
Therefore, cost of ploughing 9000 m^2 = 9000 x 40/100 = ₹3600

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Question 6: The perimeter of a right triangle is 40 cm and its hypotenuse measures 17 cm. Find the area of the triangle.

Solution:
The perimeter of a right triangle = 40 cm

Hypotenuse measures = 17 cm.

Let x and y are the another sides.

40 = 17 + x + y

x + y = 23

or y = 23 - y

So, we have 3 sides as x, 23-x and 17.

Apply Pythagoras theorem:

Hypotenuse^2 = Base^2 + Perpendicular^2

17^2 = x^2 + (23-x)^2

289 = x^2 + 529 + x^2 - 46x

x^2 - 23x + 120 = 0

(x - 8)(x - 15) = 0

x = 8 or x = 15

If x = 8 then y = 23-8 = 15
If x = 15 then y = 23-15 = 8

Now,
Area of triangle = 1/2 × base × height
= 1/2 × 8 × 15
= 60

Therefore, Area of triangle is 60 cm^2

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Question 7: The difference between the sides at right angle in a right-angled triangle is 7 cm. The area of the triangle is 60 cm^2. Find its perimeter.

Solution:
Let x cm be the one of the sides, then (x – 7) cm be another side.
Area of triangle = 60 cm^2 (given)

We know, Area of triangle = 1/2(Base x height)

60 = 1/2(x (x - 7))

120 = x^2 - 7x

or x^2 - 7x - 120 = 0
Solving above equation, we have
(x - 15)(x + 8) = 0
x = 15 or x = -8
Since length measure cannot be negative, so neglect x = -8

One side = 15 cm
Another Side = x - 7 = 15 - 7 = 8 cm

Apply Pythagoras theorem:

Hypotenuse^2 = Base^2 + Perpendicular^2

Hypotenuse^2 = √(15^2 + 8^2)
Hypotenuse = √289 = 17

Therefore, perimeter of triangle = Sum of all the sides = (15 + 8 + 17) cm = 40 cm

Question 8: The lengths of the two sides of a right triangle containing the right angle differ by 2 cm. If the area of the triangle is 24 cm^2, find the perimeter of the triangle.

Solution:
Let x cm be the one of the sides, then (x – 2) cm be another side.
Area of triangle = 24 cm^2 (given)

We know, Area of triangle = 1/2(Base x height)

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

24 = 1/2(x (x - 2))

48 = x^2 - 2x

or x^2 - 2x - 48 = 0
Solving above equation, we have
(x + 6)(x - 8) = 0
x = -6 or x = 8
Since length measure cannot be negative, so neglect x = -6

One side = 8 cm
Another Side = x - 2 = 8 - 2 = 6 cm

Apply Pythagoras theorem:

Hypotenuse^2 = Base^2 + Perpendicular^2

Hypotenuse^2 = √(8^2 + 6^2)
Hypotenuse = √100 = 10

Therefore, perimeter of triangle = Sum of all the sides = (6 + 8 + 10) cm = 24 cm

Question 9: Each side of an equilateral triangle is 10 cm. Find
(i) the area of the triangle and (ii) the height of the triangle.

Solution:

Side of an equilateral triangle = 10 cm

(i) Area of a triangle = √3/4 (side)^2 = √3/4 x 10 x 10 = 43.3
Area of a triangle is 43.3 cm^2

(ii) Height of the triangle = √3/2 (side) = √3/2 x 10 = 8.66
Height of the triangle is 8.66 cm

Question 10: The height of an equilateral triangle is 6 cm. Find its area. [Take √3 = 1 .73]

Solution:

Height of an equilateral triangle = 6 cm
Let x be a side of triangle.

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Height = √3/2 (side) = √3/2 x

6 = √3/2 x

x = 12/√3

x = 12√3/3 = 6.92 cm

Now,
Area of a triangle = √3/4 (side)^2 = √3/4 x 6.92 x 6.92 = 20.76 cm^2

Question 11: If the area of an equilateral triangle is 36√3 cm^2, find its perimeter.

Solution:
Let each side of an equilateral triangle be "a" cm

Area of an equilateral triangle = 36√3 cm^2 (Given)

Area of an equilateral triangle = √3/4 (side)^2

36√3 = √3/4 x a^2

a^2 = 144

or a = 12 cm

Perimeter = 3 (side) = 3 x 12 = 36 cm.

Question 12: If the area of an equilateral triangle is 81√3 cm^2, find its height.

Solution:

Let each side of an equilateral triangle be "a" cm

Area of an equilateral triangle = 81√3 cm^2 (Given)

Area of an equilateral triangle = √3/4 (side)^2

81√3 = √3/4 x a^2

a^2 = 324

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

or a = 18 cm

Now,
Height of an equilateral triangle = √3/2 (side) = √3/4 (18) = 9√3 cm.

Perimeter = 3 (side) = 3 x 12 = 36 cm.

Question 13: The base of a right-angled triangle measures 48 cm and its hypotenuse measures 50 cm. Find the area of the triangle.

Solution:
We are given with a right-angled triangle whose measures are
Base = 48 cm
Hypotenuse = 50 cm

Using Pythagoras Theorem:

Hypotenuse^2 = Base^2 + Perpendicular^2
50^2 = 48^2 + Perpendicular^2

or Perpendicular^2 = 2500 - 2304

or Perpendicular = 14 cm

Now,
Area of a triangle = 1/2 × Base × Height
= 1/2 × 48 cm × 14 cm
= 336 cm^2

Question 14: The hypotenuse of a right-angled triangle is 65 cm and its base is 60 cm. Find the length of perpendicular and the area of the triangle.

Solution:

We are given with a right-angled triangle whose measures are
Base = 6 m
Hypotenuse = 6.5 m

Using Pythagoras Theorem:

Hypotenuse^2 = Base^2 + Perpendicular^2

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

(6.5)^2 = (6)^2 + Perpendicular^2

or Perpendicular^2 = 42.25 - 36

or Perpendicular = 2.5 m

Now,
Area of a triangle = 1/2 × Base × Height
= 1/2 × 6 m × 2.5 m
= 7.5 cm^2

Question 15: Find the area of a right-angled triangle, the radius of whose circumcircle measure 8 cm and the altitude drawn to the hypotenuse measures 6 cm.

Solution:

Radius of circle = 8 cm and
Altitude = 6 cm

Since, in a right-angled triangle the hypotenuse is the diameter of circumcircle. (given)

This implies, Hypotenuse = 2(Radius)
= 2 × 8
= 16
=> Hypotenuse = 16 cm

Area of a triangle = 1/2 × Base × Height

(Consider hypotenuse as base and the altitude to the hypotenuse as height)

= 1/2 × 16 x 6

= 48
=> Area of a triangle is 48 cm^2

Question 16: Find the length of the hypotenuse of an isosceles right-angled triangle whose area is 200 cm^2. Also, find its perimeter. [Given: √2 = 1.41]

Solution:
Let two sides of an isosceles right-angled triangle are of measure "a".

EDUGROSS
WISDOMISING KNOWLEDGE

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Area of triangle = 200 cm^2. (given)

200 = 1/2(a^2)

=> a = 20 cm
Now,
Hypotenuse = √(a^2+a^2) = √(2a^2) = √2 a

= 20 √2
= 20 x 1.414
= 28.28
=> Hypotenuse is 28.28 cm

Perimeter of triangle = Sum of all the sides = 2a + Hypotenuse

= 40 + 28.28
= 68.28

=> Perimeter of triangle is 68.28 cm.

Question 17: The base of an isosceles triangle measures 80 cm and its area is 360 cm2. Find the perimeter of the triangle.

Solution:

Let two sides of an isosceles triangle are of measure "a".
Base = b = 80 cm

Area of triangle = 360 cm^2. (given)

We know, Area of isosceles triangle = 1/4 × b√(4a^2 – b^2)

360 = 1/4 x 80 x √(4a^2 – (80)^2)

360 = 20 x √(4a^2 – 6400)

360 = 20 x 2√(a^2 – 1600)

9 = √(a^2 – 1600)
Squaring both sides
81 = a^2 – 1600
a = 41

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

=> a = 41 cm

Perimeter of triangle = Sum of all the sides = 41 + 41 + 80 = 162

Perimeter of triangle is 162 cm.

Now,
Hypotenuse = √(a^2+a^2) = √(2a^2) = √2 a

= 20 √2
= 20 x 1.414
= 28.28
=> Hypotenuse is 28.28 cm

Perimeter of triangle = Sum of all the sides = 2a + Hypotenuse

= 40 + 28.28
= 68.28

=> Perimeter of triangle is 68.28 cm.

Question 17: The base of an isosceles triangle measures 80 cm and its area is 360 cm^2. Find the perimeter of the triangle.

Solution:

Let two sides of an isosceles triangle are of same measure "a".
Base = b = 80 cm

Area of triangle = 360 cm^2. (given)

We know, Area of isosceles triangle = 1/4 × b√(4a^2 – b^2)

360 = 1/4 x 80 x √(4a^2 – (80)^2)

360 = 20 x √(4a^2 – 6400)

360 = 20 x 2√(a^2 – 1600)

9 = √(a^2 – 1600)
Squaring both sides
81 = a^2 – 1600
a = 41

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

=> a = 41 cm

Perimeter of triangle = Sum of all the sides = 41 + 41 + 80 = 162

Perimeter of triangle is 162 cm.

Question 18: Each of the equal sides of an isosceles triangle measures 2 cm more than its height, and the base of the triangle measures 12 cm. Find the area of the triangle.

Solution:
Let h be the height, then
Each of the equal sides of an isosceles triangle = (h + 2) cm and
Base = 12 cm

Area of a triangle = 1/2 × Base × Height
= 1/2 x 12 x h ....(1)

Area of isosceles triangle = 1/4 x b x √(4a^2 - b^2)

= 1/2 x 12 x √(4(h+2)^2 - 144) ...(2)

From (1) and (2), we get

1/2 x 12 x h = 1/2 x 12 x √(4(h+2)^2 - 144)

6h = 3√(4h2 + 16h + 16-144)

2h = √(4h^2 + 16h-128)

4h^2 = 4h^2 + 16h – 128

16h = 128

or h = 8

Height is 8 cm.

Now,
Area of a triangle = 1/2 × Base × Height
= 1/2 × 12 cm × 8 cm
= 1/2 × 96 cm^2
= 48 cm^2. Answer!!

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Question 19: Find the area and perimeter of an isosceles right triangle, each of whose equal sides measures 10 cm. [Given: √2 = 1 .41]

Solution:
Equal sides of measure = 10 cm
Here, base and perpendicular are equal sides.

Area of a triangle = 1/2 × Base × Height
= 1/2 x 10 x 10
= 50

From Pythagorean Theorem:
Hypotenuse^2 = Base^2 + Perpendicular^2

= 10^2 + 10^2

= 200

or Hypotenuse = 10 v2 cm = 10 x 1 .41 cm = 14.1 cm

Perimeter = Sum of all the sides = 10 + 10 + 14.1 = 34.1

Therefore, Area of required triangle is 50 cm^2 and perimeter = 34.1 cm

Question 20: In the given figure, ΔABC is an equilateral triangle the length of whose side is equal to 10 cm, and ΔDBC is right-angled at D and BD = 8 cm. Find the area of the shaded region. [Take √3 = 1.732.]

Solution:
ΔABC is an equilateral triangle the length of whose side is equal to 10 cm, and ΔDBC is right-angled at D and BD = 8 cm.

From figure:
Area of shaded region = Area of ABC – Area of DBC .....(1)

Area of △ABC:

Area = v3/4 (side)^2 = v3/4 (10)^2 = 43.30

So area of △ABC is 43.30 cm^2

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Area of right ∆DBC:

Area = 1/2 x base x height ...(2)

From Pythagorean Theorem:
Hypotenuse^2 = Base^2 + Height^2

BC^2 = DB^2 + Height^2
100 - 64 = Height^2
36 = Height^2
or Height = 6
equation (2) =>
Area = 1/2 x 8 x 6 = 24

So area of ∆DBC is 24 cm^2

Equation (1) implies

Area of shaded region = 43.30 - 24 = 19.30
Therefore, Area of shaded region = 19.3 cm^2

EDUGROSS
WISDOMISING KNOWLEDGE

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Exercise 15B

Page No: 666

Question 1: The perimeter of a rectangular plot of land is 80 m and its breadth is 16 m. Find the length and area of the plot.

Solution:
Perimeter of rectangle = 80 m
Let x be the length and 16m breadth.

We know, perimeter = 2 [length + breadth]
75 = 2(x + 16)
75 = (2x + 32)
Or x = 21.5
Thus,
Length of the rectangle is 21. 5 meter
Again,
Area of the rectangular plot = Length X Breadth
= (16 × 21.5)
= 344
So, Area of the rectangular plot is 344 cm^2

Therefore, length of rectangle is 21.5 m and the area is 344 m^2.

Question 2: The length of a rectangular park is twice its breadth, and its perimeter measures 840 m. Find the area of the park.

Solution:
The length of a rectangular park = 2(its breadth)
Perimeter = 840 m (Given)
Let x be the breadth of a rectangular park then, length of a rectangular park is 2x m.

We know, Perimeter of rectangle = 2(Length + Breadth)

840 = 2(Length + Breadth)

840 = 2(2x + x)

840 = 6x
or x = 140

Breadth = x = 140 m

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

and Length = 2x = 2 x 140 = 280 m

Area of a rectangular park = Length x Breadth = 140 x 280 = 39200 m^2.

Question 3: One side of a rectangle is 12 cm long and its diagonal measures 37 cm. Find the other side and the area of the rectangle.

Solution:
Let ABCD be the rectangle in which AB
Let length of rectangle = 12 cm and diagonal= 37 m
Let breadth be the other side.

By Pythagoras theorem,

(Breadth)^2 = v((37)^2 - (12)^2)

= v(49 x 25)

= v(1225)
or breadth = 35 cm

Thus, length = 12 cm and breadth = 35 cm
Area of rectangle = (12 × 35) = 420
Hence, the other side is 35 cm and the area of rectangle is 420 cm^2.

Question 4: The area of a rectangular plot is 462 m^2 and its length is 28 m. Find the perimeter of the plot.

Solution:
Area of a rectangular plot = 462 m^2
Length of rectangle = 28 m

Let x m be the breadth of the plot
Now,
Area = Length × Breadth = (28x)
462 = 28x

or x = 16.5

Again,
Perimeter of the plot = 2(length + breadth) = 2(28 + 16.5) = 89

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Therefore,
Breadth of plot = 16. 5 m
Perimeter of the plot = 89 m

Question 5: A lawn is in the form of a rectangle whose sides are in the ratio 5 : 3. The area of the lawn is 3375 m^2. Find the cost of fencing the lawn at ₹65 per metre.

Solution:
Cost of fencing lawn = ₹ 65 per metre.
Area of lawn = 3375 m^2
Length: Breadth = 5: 3

Length = 5x
Breadth = 3x

We know, Area of lawn = Length × Breadth
3375 = 5x(3x)
3375 = 15x^2
225 = x^2
or x = 15 m
Therefore,
Length = 5x = 5 × 15 = 75 m
Breadth = 3x = 3 × 15 = 45 m

Now,
Perimeter of lawn = 2(length + breadth)
= 2(75+ 45)
= 2 × 120
= 240
Perimeter is 240 m

Cost of Fencing = 240 × ₹ 65 per meter = ₹15600. Answer!!

Question 6: A room is 16 m long and 13.5 m broad. Find the cost of covering its floor with 75-m-wide carpet at ₹60 per metre.

Solution:

Cost of covering room floor = ₹60 per metre.
Length of room = 16 m
Breadth of room = 13.5 m
Breadth of carpet = 75 cm = 0.75 m

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

We know, Area of room = Length × Breadth
= 16 × 13.5
= 216
=> Area of room is 216 m^2

Length of carpet can be calculated by using below formula:

Length of carpet = (area of room)/(Breadth of carpet)

= 216/0.75

= 288 m

Now,
Cost of covering the floor = 288 m × ₹60 per meter = ₹17280

Question 7: The floor of a rectangular hall is 24 m long and 18 m wide. How many carpets, each of length 2.5 m and breadth 80 cm, will be required to cover the floor of the hall?

Solution:
Length of hall = 24 m
Breadth of hall = 18 m
Length of carpet = 2.5 m
Breadth of carpet = 80 cm = 0.8 m

Area of hall = Length × Breadth
= 24 × 18
= 432 m^2
And, Area of carpet = Length × Breadth
= 2.5 × 0.8
= 2 m^2

Number of carpets = (area of hall)/(Area of carpet) = 432/2 = 216

That is, number of carpets are 216.

Question 8: A 36 m-long, 15m-broad verandah is to be paved with stones, each measuring 6 dm by 5 dm. How many stones will be required?

Solution:
Length of verandah = 36 m
Breadth of verandah = 15 m

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Length of stones = 6 dm = 0.6 m
Breadth of stones = 5 dm = 0.5 m

Now,

Area of verandah = Length × Breadth
= 36 x 15
= 540
Area = 540 m^2

Area of stones = Length × Breadth
= 0.6× 0.5
= 0.3
Area of stone = 0.3 m^2

Number of stones = (area of verandah)/(Area of stones) = 540/0.3 = 1800

That is, number of stones required are 1800.

Question 9: The area of a rectangle is 192 cm^2 and its perimeter is 56 cm. Find the dimensions of the rectangle.

Solution:

The area of a rectangle is 192 cm^2 and its perimeter is 56 cm.
let l cm be the length and b cm be the breadth.

Area of rectangle = Length × Breadth
192 = l × b

=> l = 192/b ....(1)

Perimeter of rectangle = 2(length + breadth)

56 = 2(l + b)
from (1)

56 = 2(192/b + b)
28 = (192 + b^2)/b
b^2- 28b + 192 = 0
(b - 12)(b - 16) = 0

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

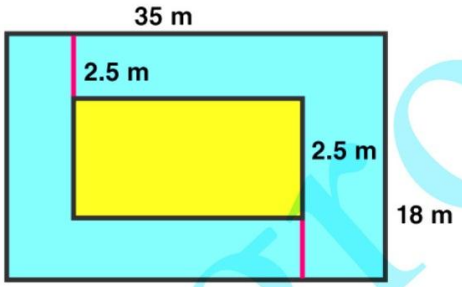
b = 12 cm or b = 16 cm

Choose b = 12cm then l = 16 cm

Hence, Length is 16 cm and Breadth is 12 cm.

Question 10: A rectangular park 35 m long 18 m wide is to be covered with grass, leaving 2.5 m uncovered all around it. Find the area to be laid with grass.

Solution:
Given:
Length of the park = 35 m
Breadth of the park = 18 m

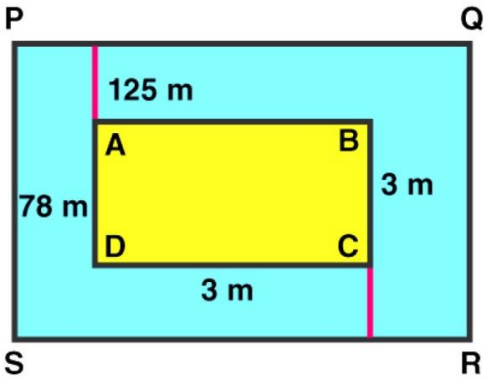


Area of the park = Length × Breadth
= 35 x 18
= 630 m^2
Length of the park with grass = (35 – 5) = 30 m
Breadth of the park with grass = (18 – 5) m = 13 m
Area of park with grass = (30 × 13) = 390 m^2
Area of path without grass = Area of the whole park area of park with grass
= 630 – 390
= 240 m^2
Hence, area of the park to be laid with grass = 240 m^2

Question 11: A rectangular plot measures 125m by 78m. It has gravel path 3m wide all around on the outside. Find the area of the path and the cost of gravelling it at ₹ 75 per m^2.

Solution:
Given:
Length of the plot = 125 m
Breadth of the plot = 78 m

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures



Area of plot ABCD = Length × Breadth
= 125 x 78
= 9750 m^2

Length of the plot including the path= (125 + 3 + 3) m = 131 m
Breadth of the plot including the path = (78 + 3 + 3) m = 84 m

Now,
Area of plot PQRS including the path = Length × Breadth
= (131 × 84)
= 11004 m^2

Area of path = Area of plot PQRS - Area of plot ABCD
= 11004 – 9750
= 1254 m^2

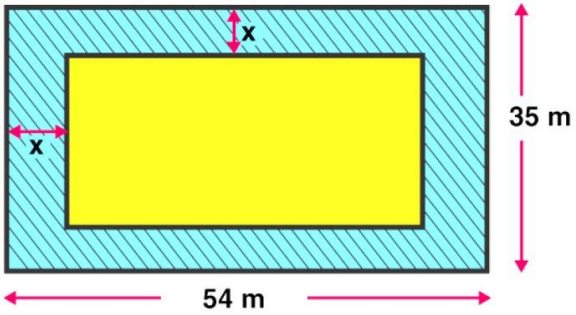
Cost of gravelling = ₹75 per m^2
Cost of gravelling the whole path = ₹ (1254 × 75) = ₹ 94050
Hence, cost of gravelling the path is ₹ 94050.

Question 12: (i) A footpath of uniform width runs all around the inside of a rectangular field 54 m long and 35m wide. If the area of the path is 420 m^2, find the width of the path.

Solution:
Given:
Length of field = 54 m

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Breadth of field = 35 m
Let x m be the width of the path.



Area of field = Length × Breadth
= 54 x 35
= 1890 m^2

Length of field without path = 54 - (x + x) = 54 - 2x
Breadth of field without path = 35 - (x + x) = 35 - 2x

Now,
Area of field without path = Length without path × Breadth without path
= (54 - 2x)(35 - 2x)
= 1890 – 70x – 108x + 4x^2
= 4x^2 – 178x + 1890 ...(1)

Area of path = Area of field - Area of field without path

420 = 1890 – (1890 – 178x + 4x^2)
(Using equation (1))
420 = 178x - 4x^2
or 4x^2 - 178x + 420 = 0
or 2x^2 - 89x + 210 = 0
On solving above equation, we have

x = 42 or x = 5/2

As width of park cannot be more than breadth of field, so width of park is 42 m.

(ii) A carpet is laid on the floor of a room 8m by 5m. There is a border of constant width all around the carpet. If the area of the border is 12 m^2, find its width.

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Solution:
Area of border = 12 m^2
Length of room = 8m
Breadth of room = 5m
Let x be the width of carpet
Length of carpet = 8-x-x = (8-2x)m
Breadth of carpet = 5-x-x = (5-2x)m

Area of room (carpet + border) = 8 x 5 = 40 m^2

Area of carpet = (8-2x)(5-2x)
= (40-16x-10x+4x^2)

= (4x^2-26x+40)

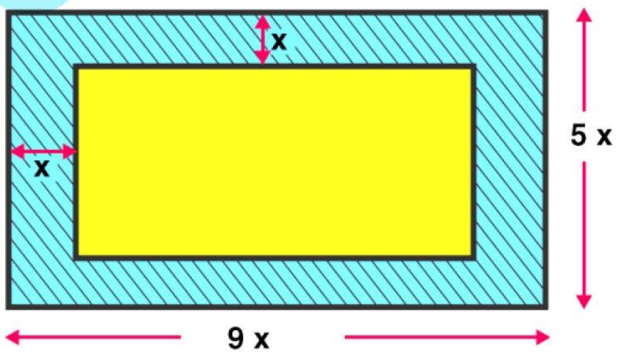
Now,

Area of ground = Area of border + Area of carpet
40 = 12 + 4x^2-26x+40
2x^2-13x+6 = 0
After solving above equation, we have
x = 1/2 or x = 6 (ignore as it is longer than room)

So, Width of border = 0.5m

Question 13: The length and the breadth of a rectangular garden are in the ratio 9 : 5. A path 3.5 m wide, running all around inside it has an area of 1911 m^2. Find the dimensions of the garden.

Solution:
Let the length and breadth of a rectangular garden be 9x and 5x.



RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Area of field = Length
× Breadth
= 9x(5x)
= 45 x^2

Length of field without path = 9x - (3.5 + 3.5) = 9x - 7
Breadth of field without path = 5x - (3.5 + 3.5) = 5x - 7

Area of field without path = Length without path x Breadth without path
= (9x - 7) x (5x - 7)
= 45x^2 – 35x – 63x + 49
= 45x2 – 98x + 49

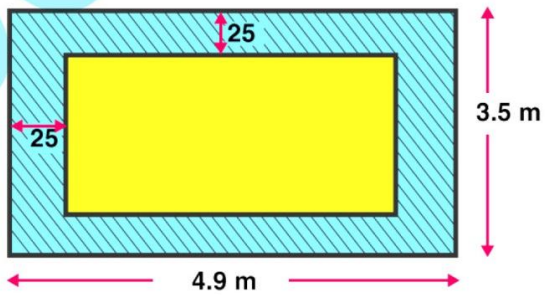
Now,
Area of path = Area of field - Area of field without path

1911 = 45x^2 – (45x^2 – 98x + 49)
1911 = 98x - 49
x = 20

Therefore:
Length of field = 9x = 9 x 20 = 180 m
Breadth of field = 5x = 5 x 20 = 100 m

Question 14: A room 4.9 m long and 35 m broad is covered with carpet, leaving an uncovered margin of 25 cm all around the room. If the breadth of the carpet is 80 cm, find its cost at ₹ 80 per meter.

Solution:
Length of room = 4.9 m
Breadth of room = 3.5 m
Margin = 25 cm = 0.25 m
Breadth of carpet = 80 cm = 0.8 m



Cost = ₹ 80 per meter

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Now,
Length to be carpeted = 4.9 m - (0.25 + 0.25) m = 4.4 m
Breadth to be carpeted = 3.5 m - (0.25 + 0.25) m = 3 m

Therefore,
Area to be carpeted = Length to be carpeted X Breadth to be carpeted
= 4.4 × 3
= 13.2 m^2

Area of carpet = Area to be carpeted = 13.2 m^2
Now,
Lengthof carpet = (area of carpet) / (breadth of carpet) = 13.2/0.8 = 16.5

Length of carpet is 16.5 m

Now,
Cost of 1 m carpet = ₹ 80
Therefore,
Cost of 16.5 m carpet = ₹ 80 × 16.5 m = ₹1,320

Question 15: A carpet is laid on the floor of a room 8 m by 5 m. There is a border of constant width all around the carpet. If the area of the border is 12 m^2, find its width.

Solution:
A carpet is laid on the floor of a room 8 m by 5 m.
Area of the border = 12 m^2
Let the width of the carpet be x meter

Area of floor = Length × Breadth
= 8 × 5
= 40 m^2
Length without border = 8 m - (x + x) = (8 – 2x) m
Breadth without border = 5 m - (x + x) m = (5 – 2x) m

Area without border = Length without border × Breadth without border
= (8 – 2x) × (5 – 2x)
= 40 – 16x – 10x + 4x^2

Area of border = Area of floor - Area without border

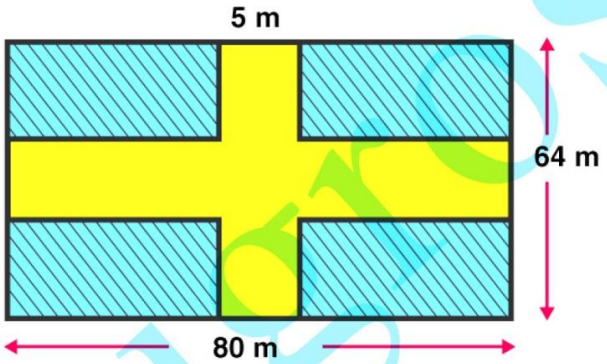
12 = 40 – (40 – 16x – 10x + 4x^2)
or 4x^2 – 26x + 12 = 0

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Solving above equation, we have
(x– 6) (4x -2) = 0
x = 6 or x = 1/2
Since Border cannot be greater than carpet.
Therefore, width of border is 1/2 m.

Question 16: A 80 m by 64 m rectangular lawn has two roads, each 5 m wide, running through its middle, one parallel to its length and the other parallel to its breadth. Find the cost of gravelling the roads at ₹40 per m^2.

Solution:
Length of rectangular lawn = 80 m
Breadth = 64 m
Width of road = 5 m



Area of horizontal road = 5 × 80 = 400 m^2
Area of vertical road = 5 × 64 = 320 m^2
Area of common part to both roads = 5 × 5 = 25 m^2
Now,
Area of roads to be gravelled = Area of horizontal road + Area of vertical road -Area of common part to both roads
= 400 + 320 - 25
= 695
Therefore, Area of roads to be gravelled is 695 m^2
Cost of gravelling = 695 x ₹ 40 per m^2 = ₹27800

Question 17: The dimensions of a room are 14m x 10 m x 6.5 m. There are two doors and 4 windows in the room. Each door measures 2.5 m x 1.2 m and each window measures 1.5 x 1 m. Find the cost of painting the four walls of the room at ₹35 per m^2.

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Solution:

Dimensions of wall:
Length = 14 m
Breadth = 10 m
Height = 6.5 m
Dimensions of windows
Length = 1.5 m
Breadth = 1 m
And,
Length of doors = 2.5 m
Breadth of doors = 1.2 m

Cost = ₹35 per m^2
Now,
Area of four walls = 2(Length of walls × Height of walls) + 2(Breadth of walls × Height of walls)

= 2(14 × 6.5) + 2(10 × 6.5)
= 182 + 130
= 312
=> Area of four walls is 312 m^2

Area of two doors = 2(Length of doors × Breadth of doors)
= 2(2.5 × 1.2)
= 6
=> Area of two doors is 6 m^2

Area of four windows = 4(Length of windows × Breadth of windows)
= 4(1.5 × 1)
= 6
=> Area of four windows is 6 m^2

Therefore,
Area to be painted = Area of 4 walls – (Area of 2 doors + Area of 4 windows)
= 312 – (6+ 6)
= 300
=> Area to be painted is 300 m^2

Cost of painting = 300 m^2 × ₹ 35 per m^2
=₹10500

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

Question 18: The cost of painting the four walls of a room 12 m long at ₹ 30 per m^2 is ₹ 7560 and the cost of covering the floor with mat at ₹25 per m^2 is ₹ 2700. Find the dimensions of the room.

Solution:
Length of a wall = 12 m
Cost per meter = ₹30
Total cost = ₹ 7560
Cost per meter for floor = ₹ 25
Total cost for floor = ₹ 2700
Let h be the height.

Breadth = (area of the floor) / Length = 108/12 = 9m

Area of the floor = (total cost)/ (cost per meter) = 2700/25 = 108 m^2

Again,
Area of walls = (total cost)/ (cost per meter) = 7560/30 = 252 m^2

Now,
Area of 4 walls = 2(Length of walls × Height of walls) + 2(Breadth of walls × Height of walls)

252 = 2(12 × h) + 2(9 × h)
252 = 24h + 18h
252 = 42h
h = 6
=> Height is 6 m

Therefore dimensions of the room are : 12 m × 9 m × 6 m

Question 19: Find the area and perimeter of a square plot of land whose diagonal is 24 m long. [Take √2 = 1. 41]

Solution:
Diagonal of a square plot = 24 m (given)
Let the side of square be 'a'
Area of square = 1/2 × Diagonal^2
= 1/2 × 24^2
= 288 m^2
Area of square = (side)^2
288 = a^2
a = 12√2 = 12 x 1. 41 = 16.92

RS Aggarwal Solutions for Class 10 Maths Chapter 15 Perimeter and Area of Plane Figures

or a = 16.92 m

Now,
Perimeter of square = 4a = 4 × 16.92 = 67.68
Perimeter of square is 67.68m.

Question 20: Find the length of the diagonal of a square of area 128 cm^2. Also find its perimeter.
Solution:

Area of a square = 128 cm^2 (given)
Let the side of square be 'a'
Area of square = 1/2 × Diagonal^2
128 = 1/2 × Diagonal^2
Diagonal = 16 cm
Area of square = (side)^2
128 = a^2

=> a = 11.31 cm
Perimeter of square = 4a = 4 × 11.31 = 45.24

Perimeter of square is 45.24 cm.