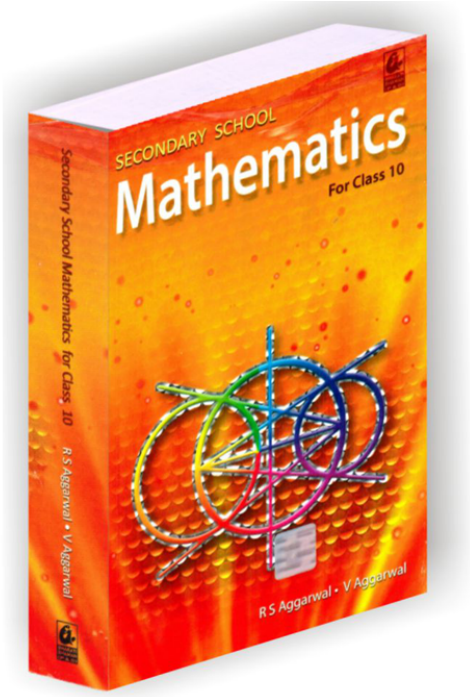
RS Aggarwal Solutions for Class 10 Maths Chapter 15–Perimeter and Areas of Plane Figures

Class 10 - Chapter 15 Perimeter and Areas of Plane Figures



For any clarifications or questions you can write to **info@indcareer.com**

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

Class 10: Maths Chapter 15 solutions. Complete Class 10 Maths Chapter 15 Notes.

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

RS Aggarwal 10th Maths Chapter 15, Class 10 Maths Chapter 15 solutions

Exercise 15A

Question 1:

$$\text{Area of given triangle} = \frac{1}{2} \times \text{Base} \times \text{Height}$$
$$= \left(\frac{1}{2} \times 24 \times 14.5\right) cm^2 = 174 cm^2$$

Question 2:

If the cost of sowing the field is Rs. 58, then area = 10000 m^2

If the cost of sowing is Re. 1, area = 1000058 m^2

If the cost of sowing is Rs. 783, area = (1000058×783) m^2

Area of the field = 135000 m^2

Let the attitude of the field be x meters

Then, Base = 3x meter

Area of the field =

$$\left(\frac{1}{2}\times 3x\times x\right)m^2 = \frac{3x^2}{2}m^2$$

$$\therefore \quad \frac{3x^2}{2} = 135000$$

$$\Rightarrow x^2 = \frac{135000\times 2}{3} = 90000$$

$$\Rightarrow \quad x = \sqrt{90000} = 300\,m$$

Altitude = 300 m

$\therefore$ base = $3\times 300 = 900$ m

Hence, the altitude = 300m and the base = 900 m

Question 3:

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

$$\text{Then,} \quad s = \frac{1}{2}(42+34+20)\,cm = 48\,cm$$

$$(s-a) = 6cm,\ (s-b) = 14\,cm \ \text{ and } (s-c) = 28\,cm$$

(i) Area of triangle =

$$\sqrt{s(s-a)(s-b)(s-c)} = \sqrt{48\times 6\times 14\times 28}\ cm^2 = 336\ cm^2$$

(ii) Let base = 42 cm and corresponding height = h cm

Then area of triangle =

$$\left(\frac{1}{2}\times 42\times h\right)cm^2 = (21h)\,cm^2 \quad 21h = 336 \Rightarrow h = \frac{336}{21} = 16\ cm$$

Hence, the height corresponding to the longest side = 16 cm

Question 4:

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Let a = 18 cm, b = 24 cm, c = 30 cm

Then, 2s = (18 + 24 + 30) cm = 72 cm

s = 36 cm

(s – a) = 18cm, (s – b) = 12 cm and (s – c) = 6 cm

(i) Area of triangle =

$$\sqrt{s(s-a)(s-b)(s-c)} = \sqrt{36 \times 18 \times 12 \times 6}\ cm^2 = 216\ cm^2$$

(ii) Let base = 18 cm and altitude = x cm

Then, area of triangle =

$$\left(\frac{1}{2} \times 18 \times x\right) = 9x\ cm^2\ \ 9x = 216 \Rightarrow x = \frac{216}{9} = 24$$

Hence, altitude corresponding to the smallest side = 24 cm

Question 5:

On dividing 150 m in the ratio 5 : 12 : 13, we get

Length of one side = $(150 \times 530)m = 25m$

Length of the second side = $(150 \times 1230)m = 60m$

Length of third side = $(150 \times 1330)m = 65m$

Let a = 25 m, b = 60 m, c = 65 m

$$\text{Then,}\quad s = \frac{1}{2}(25 + 60 + 65)\,m = 75m$$

(s – a) = 50 cm, (s – b) = 15 cm, and (s – c) = 10 cm

$$\text{Area of the triangle} = \sqrt{s(s-a)(s-b)(s-c)}$$
$$= \sqrt{75\times 50\times 15\times 10}\ m^2$$
$$= 750\ m^2$$

Hence, area of the triangle = 750 m^2

Question 6:

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

Length of one side = $(540\times\frac{25}{54})m = 250m$

Length of second side = $(540\times\frac{17}{54})m = 170m$

Length of third side = $(540\times\frac{12}{54})m = 120m$

Let a = 250m, b = 170 m and c = 120 m

$$\text{Then, } s = \frac{1}{2}(250 + 170 + 120)\,m = 270m$$

Then, (s – a) = 29 m, (s – b) = 100 m, and (s – c) = 150m

$$\text{Area of the triangle} = \sqrt{s(s-a)(s-b)(s-c)}$$
$$= \sqrt{270\times 29\times 100\times 150}\ m^2$$
$$= 9000\ m^2$$

The cost of ploughing 100 area is = Rs. 18. 80

The cost of ploughing 1 is = Rs. 18.80100

The cost of ploughing 9000 area = Rs. (18.80100×9000)

= Rs. 1692

Hence, cost of ploughing = Rs 1692.

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Question 7:

Let the length of one side be x cm

Then the length of other side = {40 × (17 + x)} cm = (23 – x) cm

Hypotenuse = 17 cm

Applying Pythagoras theorem, we get

$$\text{Then, } x^2 + (23-x)^2 = 17^2 \Rightarrow x^2 - 23x + 120 = 0$$
$$\Rightarrow (x-15)(x-8) = 0$$
$$\Rightarrow x = 15 \text{ or } x = 8$$
$$\text{Base} = 15 \text{ cm},$$
$$\text{height} = 40 - (17 + 15) = 40 - 32 = 8$$

$$\text{Area of triangle} = \frac{1}{2} \times \text{Base} \times \text{Height}$$
$$= \left(\frac{1}{2} \times 15 \times 8\right) \text{cm}^2 = 60 \text{ cm}^2$$

Hence, area of the triangle = 60 cm^2

Question 8:

Let the sides containing the right angle be x cm and (x × 7) cm

Then, its area $= \left[\frac{1}{2} \times x \times (x-7)\right] cm^2$

But area $= 60\ cm^2$

$\therefore \frac{1}{2} \times (x-7) = 60$

$\Rightarrow x^2 - 7x - 120 = 0$

$\Rightarrow x^2 - 15x + 8x - 120 = 0$

$\Rightarrow x(x-15) + 8(x-15) = 0$

$\Rightarrow (x-15)(x+8) = 0$

$\Rightarrow \quad x = 15 \left[\text{Neglecting } x = -8\right]$

One side = 15 cm and other = (15 × 7) cm = 8 cm

Hypotenuse $= \sqrt{(15)^2 + (8)^2}\ cm = \sqrt{225+64}\ cm$

$= \sqrt{289}\ cm = 17\ cm$

perimeter of triangle (15 + 8 + 17) cm = 40 cm

Question 9:

Let the sides containing the right angle be x and (x × 2) cm

Then, its area $= \left(\frac{1}{2} \times x \times (x-2)\right) cm^2$

But area $= 24\ cm^2$

$\therefore \frac{1}{2} \times (x-2) = 24$

$\Rightarrow x^2 - 2x - 48 = 0$

$\Rightarrow x^2 - 8x + 6x - 48 = 0$

$\Rightarrow x(x-8) + 6(x-8) = 0$

$\Rightarrow (x-8)(x+6) = 0$

$x = 8$ [Neglecting $x = -6$]

One side = 8 cm, and other (8 × 2) cm = 6 cm

= 10 cm

Hypotenuse $= \sqrt{(8)^2 + (6)^2}\ cm = \sqrt{64+36}\ cm$

$= \sqrt{100}\ cm$

Therefore, perimeter of the triangle = 8 + 6 + 10 = 24 cm

Question 10:

(i) Here a = 8 cm

Area of the triangle = (3√4×a2) Sq.unit

$= \left(\frac{\sqrt{3}}{4} \times 8 \times 8\right) = \left(16\sqrt{3}\right) cm^2$

$= (16 \times 1.732)\ cm^2 = 27.71 cm^2$

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(ii) Height of the triangle= (3√4×a) Sq.unit

$$= \left(\frac{\sqrt{3}}{2} \times 8\right) \text{cm} = \left(4 \times \sqrt{3}\right) \text{cm}$$
$$= \left(4 \times 1.732\right) \text{cm} = 6.93 \text{ cm}$$

Hence, area = 27.71 cm2 and height = 6.93 cm

Question 11:

Let each side of the equilateral triangle be a cm

$$\text{Then, its height} = \left(\frac{\sqrt{3}}{2} \times a\right) \text{cm}$$
$$\therefore \frac{\sqrt{3}}{2} \times a = 9 \Rightarrow a = \left(\frac{18}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}\right) = 6\sqrt{3}$$
$$\therefore \text{Each side} = a \text{ cm} = 6\sqrt{3} \text{ cm}$$
$$\therefore \text{Area of triangle} = \left(\frac{\sqrt{3}}{4} \times 6\sqrt{3} \times 6\sqrt{3}\right) \text{cm}^2 = \left(27\sqrt{3}\right) \text{cm}^2$$
$$= \left(27 \times 1.732\right) = 46.76 \text{ cm}^2$$

Question 12:

Let each side of the equilateral triangle be a cm

Perimeter of equilateral triangle = 3a = (3 × 12) cm = 36 cm

Question 13:

Let each side of the equilateral triangle be a cm

area of equilateral triangle = 3√4a2

$$\frac{\sqrt{3}}{4}a^2 = 81\sqrt{3} \Rightarrow a^2\left(\frac{81\sqrt{3}\times 4}{\sqrt{3}}\right) = 324$$

$$\Rightarrow \ a = \sqrt{324}\,\text{cm} = 18\,\text{cm}$$

Height of equilateral triangle

$$= \left(\frac{\sqrt{3}}{2}a\right) = \left(\frac{\sqrt{3}}{2}\times 18\right)\text{cm} = 9\sqrt{3}\ \text{cm}$$

Question 14:

Base of right angled triangle = 48 cm

Height of the right angled triangle =

$$\text{height} = \sqrt{(50)^2 - (48)^2}\ \text{cm}$$

$$= \sqrt{2500 - 2304}\,\text{cm}$$

$$= \sqrt{196}\ \text{cm} = 14\,\text{cm}$$

$$\text{Area of triangle} = \left(\frac{1}{2}\times \text{Base}\times \text{Height}\right)\text{cm}^2$$

$$= \left(\frac{1}{2}\times 48\times 14\right)\text{cm}^2 = 336\ \text{cm}^2$$

$$\sqrt{(\text{hypotenuse})^2 - (\text{base})^2}$$

Question 15:

Let the hypotenuse of right angle triangle = 6.5 m

Base = 6 cm

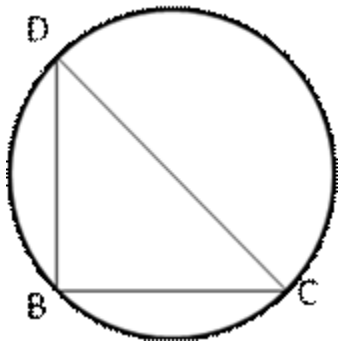
$$\text{Perpendicular} = \sqrt{(\text{Hypotenuse})^2 - (\text{base})^2}$$
$$= \sqrt{(6.5)^2 - (6)^2}\ \text{cm}$$
$$= \sqrt{42.25 - 36}\ \text{cm} = \sqrt{6.25}\ \text{cm}$$
$$= 2.5\ \text{cm}$$

$$\text{Area of triangle} = \left(\frac{1}{2} \times \text{base} \times \text{height}\right)$$
$$= \left(\frac{1}{2} \times 6 \times 2.5\right)\text{cm}^2 = 7.5\ \text{cm}^2$$

Hence, perpendicular = 2.5 cm and area of the triangle =7.5 cm^2

Question 16:

The circumcentre of a right triangle is the midpoint of the hypotenuse



Hypotenuse = 2 ×(radius of circumcircle)

= (2 × 8) cm = 16 cm

Base = 16 cm, height = 6 cm

Area of right angled triangle

$$= \left(\frac{1}{2} \times \text{base} \times \text{height}\right)$$

$$= \left(\frac{1}{2} \times 16 \times 6\right) \text{cm} = 48 \text{ cm}^2$$

Hence, area of the triangle= 48 cm^2

Question 17:

Let each side a = 13 cm and the base b = 20 cm

$$\therefore \text{Area of triangle} = \left(\frac{1}{4} b.\sqrt{4a^2 - b^2}\right) \text{cm}^2$$

$$= \left(\frac{1}{4} \times 20 \times \sqrt{4 \times 169 - 20 \times 20}\right) \text{cm}^2$$

$$= (5 \times 16.61) \text{cm}^2 = 83.1 \text{cm}^2$$

Hence, area of the triangle = 83.1 cm^2.

Question 18:

Let each equal side be a cm in length.

Then,

Hence, hypotenuse = 28.28 cm and perimeter = 68.28 cm

Question 19:

Let each equal side be a cm and base = 80 cm

$$\text{Area} = \frac{1}{4} b \times \sqrt{4a^2 - b^2} \text{ sq. units}$$

$$= \frac{1}{4} \times 80 \times \sqrt{4a^2 - 6400} \text{ cm}^2$$

$$= 20 \times \sqrt{4a^2 - 6400} \text{ cm}^2$$

But area $= 360 \text{cm}^2$

$\therefore 20\sqrt{4a^2 - 6400} = 360$

$\Rightarrow 20 \times 2\sqrt{a^2 - 1600} = 360$

$\Rightarrow \sqrt{a^2 - 1600} = 9$

$\Rightarrow a^2 - 1600 = 81$

$\Rightarrow a^2 = 1681$

$\Rightarrow a = 41 \text{ cm}$

perimeter of triangle = (2a + b) cm

= (2 ×41 + 80) cm

= (82 + 80) cm = 162 cm

Hence, perimeter of the triangle = 162 cm

Question 20:

Perimeter of an isosceles triangle = 42 cm

(i) Let each side be a cm, then base = 32a

perimeter = (2a + b) cm

Hence each side = 12 cm and Base = 3212 = 18cm

(ii) Area of triangle =

$$= \frac{1}{4} \times 18\sqrt{4 \times 12^2 - 18^2}\ cm^2$$

$$= \frac{1}{4} \times 18 \times \sqrt{576 - 324}\ cm^2$$

$$= \frac{1}{4} \times 18 \times \sqrt{252}\ cm^2$$

$\frac{1}{4}b\sqrt{4a^2 - b^2}$ sq. unit Area $= \frac{1}{4} \times 18 \times 15.87\ cm^2 = 71.42\ cm^2$

(iii) Height of the triangle =

$$\frac{\sqrt{4a^2 - b^2}}{2} \text{ units } = \left(\frac{\sqrt{4 \times 12 \times 12 - 18 \times 18}}{2}\right) cm$$

$$= \frac{\sqrt{576 - 324}}{2}\ cm = \frac{15.87}{2} = 7.94\ cm$$

Question 21:

Let the height be h cm, then a= (h + 2) cm and b = 12 cm

$$\frac{1}{2} \times 12 \times h = \frac{1}{4} \times 12 \times \sqrt{4(h+2)^2 - 144}$$

$$6h = 6\sqrt{(h+2)^2 - 36}$$

$$h = \sqrt{(h+2)^2 - 36}$$

Squaring both sides,

$$h^2 = (h+2)^2 - 36$$

$$h^2 = h^2 + 4 + 4h - 36$$

$$-4h = -32 \Rightarrow h = 8cm$$

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Therefore, a = h + 2 = (8 + 2)cm = 10 cm

$$\text{Area of isosceles triangle} = \frac{1}{4}b\times\sqrt{4a^2-b^2}$$
$$= \frac{1}{4}\times 12\times\sqrt{4\times(10)^2-(12)^2}$$
$$= 3\sqrt{400-144} = 3\times\sqrt{256}$$
$$= 3\times 16 = 48\ cm^2$$

Hence, area of the triangle = 48 cm^2.

Question 22:

Perimeter of triangle = 324 cm

(i) Length of third side = (324 – 85 – 154) m = 85 m

Let a = 85 m, b = 154 m, c = 85 m

$$\text{Then, } s = \frac{a+b+c}{2} = \left(\frac{85+154+85}{2}\right)m = 162\ m$$
$$\therefore\ (s-a) = 77,\ (s-b) = 8 \text{ and } (s-c) = 77$$
$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$
$$= \sqrt{162\times 77\times 8\times 77} = 36\times 77 = 2772\ m^2$$

(ii) The base = 154 cm and let the perpendicular = h cm

$$\text{Area of triangle} = \left(\frac{1}{2}\times 154\times h\right) = 2772\ m^2$$
$$h = \frac{2772}{77} = 36\ m$$

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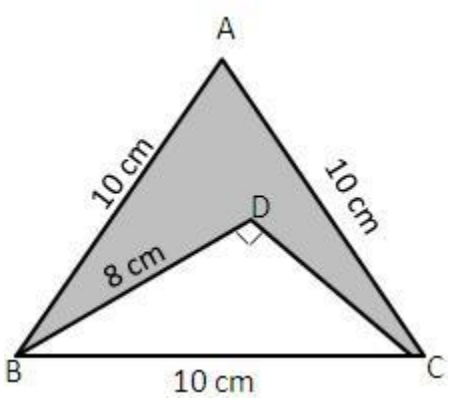
Hence, required length of the perpendicular of the triangle is 36 m.

Question 23:



Area of shaded region = Area of ΔABC – Area of ΔDBC

First we find area of ΔABC

$$\therefore \text{Area} = \frac{\sqrt{3}}{4}a^2 = \left(\frac{\sqrt{3}}{4} \times 10 \times 10\right) \text{cm}^2$$

$$= 43.30 \text{ cm}^2$$

Second we find area of ΔDBC which is right angled

$$\therefore \text{Area of } \Delta DBC = \frac{1}{2} \times \text{Base} \times \text{Height}$$

$$\text{Height} = \sqrt{BC^2 - DB^2} = \sqrt{10^2 - 8^2}$$

$$= \sqrt{100 - 64} = \sqrt{36}\ \text{cm} = 6\ \text{cm}$$

$$\therefore \text{Area} = \frac{1}{2} \times DB \times DC = \left(\frac{1}{2} \times 8 \times 6\right) \text{cm}^2$$

$$= 24\ \text{cm}^2$$

Area of shaded region = Area of ΔABC – Area of ΔDBC

= (43.30 – 24) = 19. 30

Area of shaded region = 19.3

Question 24:

Let ΔABC is a isosceles triangle. Let AC, BC be the equal sides

Then AC = BC = 10cm. Let AB be the base of ΔABC right angle at C.

Area of right isosceles triangle ABC

$$= \frac{1}{2} \times 10 \times 10\ \text{cm}^2 = 50\ \text{cm}^2$$

Hence, area = 50 cm^2 and perimeter = 34.14 cm

Exercise 15B

Question 1:

Let the length of plot be x meters

Its perimeter = 2 [length + breadth]

=2(x + 16) = (2x + 32) meters

$$\therefore (2x + 32) = 75 \Rightarrow 2x = 75 - 32$$
$$\Rightarrow 2x = 43 \Rightarrow x = \frac{43}{2} = 21.5$$

Length of the rectangle is 21. 5 meter

Area of the rectangular plot = length × breadth = (16 × 21.5) m^2 = 344 m^2

The length = 21.5 m and the area = 344 m^2

Question 2:

Let the breadth of a rectangular park be x meter

Then, its length = 2x meter

∴ perimeter = 2(length + breadth)

=2(2x + x) = 6x meters

∴ 6x = 840 m [∵ 1 km = 1000 m]

⇒ x = 140 m

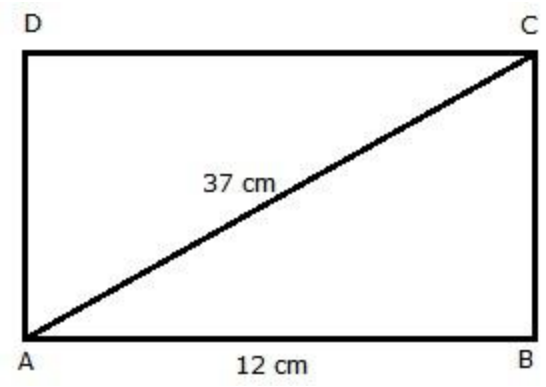
Then, breadth = 140 m and length = 280 m

Area of rectangular park = (length × breadth) = (140 × 280) m^2 = 39200 m^2

Hence, area of the park = 39200 m^2

Question 3:

Let ABCD be the rectangle in which AB = 12 cm and AC = 37 m



By Pythagoras theorem, we have

$$BC = \sqrt{AC^2 - AB^2} \text{ units}$$
$$= \sqrt{(37)^2 - (12)^2} \text{ cm}^2$$
$$= \sqrt{(37 + 12)(37 - 12)} \text{ cm}$$
$$= \sqrt{49 \times 25} \text{ cm}$$
$$= \sqrt{1225} \text{ cm} = 35 \text{ cm}$$

Thus, length = 35 cm and breadth = 12 cm

Area of rectangle = (12 × 35) cm^2 = 420 cm^2

Hence, the other side = 35 cm and the area = 420 cm^2

Question 4:

Let the breadth of the plot be x meter

Area = Length × Breadth = (28 × x) meter

= 28x m^2

$$\therefore 28x = 462 \Rightarrow x = \frac{462}{28} = 16.5 \text{ m}$$

Breadth of plot is = 16. 5 m

Perimeter of the plot is = 2(length + breadth)

= 2 (28 + 16.5) m = 2 (44.5) m = 89 m

Question 5:

Let the breadth of rectangular hall be x m

Then, Length = (x + 5) m

$$\therefore \text{Area} = \text{length} \times \text{breadth} = [x \times (x+5)]m^2$$
$$= (x^2 + 5x)m^2$$
$$\therefore (x^2 + 5x) = 750$$

$$x^2 + 30x - 25x - 750 = 0$$
$$x(x+30) - 25(x+30) = 0$$
$$(x+30)(x-25) = 0$$
$$x = 25 [\text{Neglecting } x = -30]$$

Breadth = 25 m and length = (25 + 5) m = 30 m

Perimeter of rectangular hall = 2(length + breadth)

= 2(30 + 25)m = (2 × 55) m = 110 m

Question 6:

Let the length of lawn be 5x m and breadth of the lawn be 3x m

Area of rectangular lawn = (5x × 3x) m^2 = ($15x^2$) m^2

Area of lawn = 3375 m^2

$$15x^2 = 3375 \Rightarrow x^2 = \frac{3375}{15} = 225$$

$$x = \sqrt{225} = 15 \text{ m}$$

Length = 5 × 15 = 75

Breadth = (3 × 15)m = 45 m

Perimeter of lawn = 2(length + breadth)

=2 (75 + 45)m = 240 m

Cost of fencing the lawn per meter = Rs. 8.50 per meter

Cost of fencing the lawn = Rs 8. 50 × 240 = Rs. 2040

Question 7:

Length of the floor = 16 m

Breadth of the floor = 13.5 m

Area of floor = (16 x 13.5) m^2

$$\text{length of the carpet} = \frac{\text{Area of floor}}{\text{width of the carpet}}$$

$$= \frac{(16 \times 13.5)}{0.75} \text{m} = 288 \text{m}$$

Cost of carpet = Rs. 15 per meter

Cost of 288 meters of carpet = Rs. (15 × 288) = Rs. 4320

Question 8:

Area of floor = Length × Breadth

= (24 x 18) m^2

Area of carpet = Length × Breadth

= (2.5 x 0.8) m^2

Number of carpets =

$$\frac{\text{Area of floor}}{\text{Area of carpet}} = \frac{(24 \times 18)\,m^2}{(2.5 \times 0.8)\,m^2}$$

= 216

Hence the number of carpet pieces required = 216

Question 9:

Area of verandah = (36 × 15) m^2 = 540 m^2

Area of stone = (0.6 × 0.5) m^2 [10 dm = 1 m]

Number of stones required =

$$\frac{\text{Area of verandah}}{\text{Area of stone}} = \frac{540}{0.3} = 1800$$

Hence, 1800 stones are required to pave the verandah.

Question 10:

Perimeter of rectangle = 2(l + b)

2(l + b) = 56 ⇒ l + b = 28 cm

b = (28 – l) cm

Area of rectangle = 192 m^2

$l \times (28 - l) = 192$

$28l - l^2 = 192$

$l^2 - 28l + 192 = 0$

$l^2 - 16l - 12l + 192 = 0$

$l(l - 16) - 12(l - 16) = 0$

$(l - 16)(l - 12) = 0$

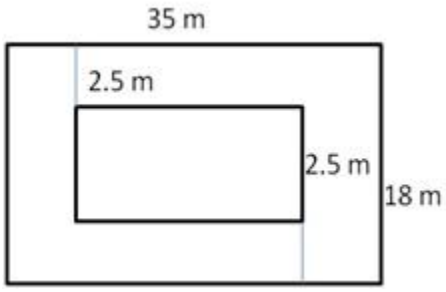
$l = 16$ or $l = 12$

Therefore, length = 16 cm and breadth = 12 cm

Question 11:

Length of the park = 35 m

Breadth of the park = 18 m



Area of the park = $(35 \times 18)\ m^2 = 630\ m^2$

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 = $(30 \times 13)\ m^2 = 390\ m^2$

Area of path without grass = Area of the whole park – area of park with grass

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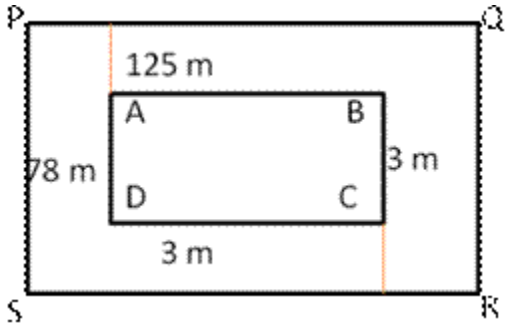
= 630 – 390 = 240 m^2

Hence, area of the park to be laid with grass = 240 m^2

Question 12:

Length of the plot = 125 m

Breadth of the plot = 78 m



Area of plot ABCD = (125 × 78) m^2 = 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

Area of plot PQRS including the path

= (131 × 84) m^2 = 11004 m^2

Area of path = Area of plot PQRS – Area of plot ABCD

= (11004 – 9750) m^2

= 1254 m^2

Cost of gravelling = Rs 75 per m^2

Cost of gravelling the whole path = Rs. (1254 × 75) = Rs. 94050

Hence, cost of gravelling the path = Rs 94050

Question 13:

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Area of rectangular field including the foot path = (54 × 35) m^2

Let the width of the path be x m

Then, area of rectangle plot excluding the path = (54 × 2x) × (35 × 2x)

Area of path = (54 × 35) + (54 × 2x) (35 × 2x)

(54 × 35) + (54 × 2x) (35 × 2x) = 420

1890 – 1890 + 108x + 70x – $4x^2$ = 420

178x – $4x^2$ = 420

$4x^2$ – 178x + 420 = 0

$2x^2$ – 89x + 210 = 0

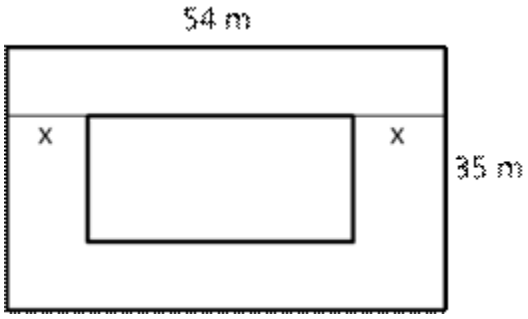
$2x^2$ – 84x – 5x + 210 = 0

2x(x – 42) – 5(x – 42) = 0

(x – 42) (2x – 5) = 0

Question 14:

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



Then, area of garden = (9x × 5x) m^2 = 45 x^2m^2

Length of park excluding the path = (9x – 7) m

Breadth of the park excluding the path = (5x – 7) m

Area of the park excluding the path = (9x – 7)(5x – 7)

Area of the path =

$$= 45x^2 - 45x^2 + 63x + 35x - 49$$
$$= 63x + 35x - 49$$
$$45x^2 - (9x - 7)(5x - 7) = (98x - 49)m^2$$

(98x – 49) = 1911

98x = 1911 + 49

$$\Rightarrow 98x = 1960 \Rightarrow x = \frac{1960}{98} = 20 \text{ m}$$

Length = 9x = 9 × 20 = 180 m

Breadth = 5x = 5 × 20 = 100 m

Hence, length = 180 m and breadth = 100 m

Question 15:

Area of carpet = (4.9 – 0.5) (3.5 – 0.5) m^2

= 4.4 × 3.0 = 13.2 m^2

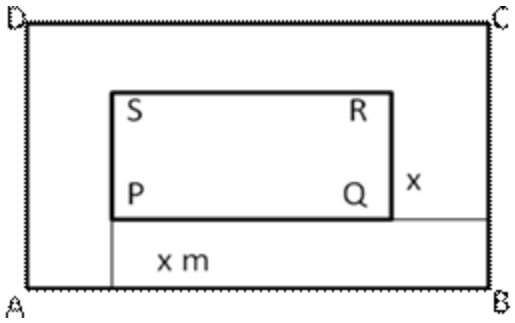
Length of the carpet = (13.20.80)m = 16.5m

Cost of carpet = Rs. 40 per meter

Cost of 16.5 m carpet = Rs. (40 × 16.5) = Rs. 660

Question 16:

Let the width of the carpet = x meter



Area of floor ABCD = $(8 \times 5)\ m^2$

Area of floor PQRS without border

$= (8 - 2x)(5 - 2x)$

$= 40 - 16x - 10x + 4x^2$

$= 40 - 26x + 4x^2$

Area of border = Area of floor ABCD – Area of floor PQRS

$= [40 - (40 - 26x + 4x^2)]\ m^2$

$=[40 - 40 + 26x - 4x^2]\ m^2$

$= (26x - 4x^2)\ m^2$

$\therefore \quad (26x - 4x^2) = 12$

$\Rightarrow \quad 26x - 4x^2 - 12 = 0$

$\Rightarrow \quad -4x^2 + 26x - 12 = 0$

$\Rightarrow \quad 2x^2 - 13x + 6 = 0$

$\Rightarrow \quad 2x^2 - 12x - x - 6 = 0$

$\Rightarrow \quad 2x(x-6) - 1(x-6) = 0$

$\Rightarrow \quad (2x-1)(x-6) = 0$

$\Rightarrow \quad x = \frac{1}{2}$ or $x = 6$

$\text{Width} = \frac{1}{2}\text{m} = 0.5\text{m}$ [Neglect $x = 6$ because width is not more than breadth]

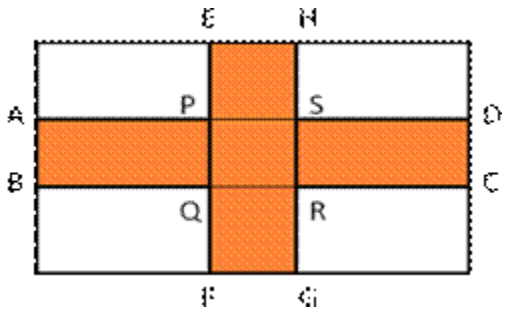
$\text{Width} = (0.5 \times 100)\text{ cm} = 50\text{ cm}$

Question 17:

Area of road ABCD

= (80 × 5) m^2

= 400 m^2



Area of road EFGH

= (64 × 5) m^2

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= 320 m^2

Area of common road PQRS

= (5 × 5) m^2

= 25 m^2

Area of the road to be gravelled

=(400 + 320 – 25) m^2 = 695 m^2

Cost of gravelling the roads

=Rs. (695 × 24) m^2 = Rs. 16680

Question 18:

Area of four walls of room = 2(l + b) × h

= 2(14 + 10) × 6.5 = 2 × 24 × 6.5

= 312 m^2

Area of two doors = 2 × (2.5 × 1.2) m^2 = 6 m^2

Area of four windows = 4 (1.5 × 1) m^2 = 6 m^2

Area of four walls to be painted = [Area of 4 walls – Area of two doors – Area of two windows]

= [312 – 6 – 6] m^2 = 300 m^2

Cost of painting the walls = Rs 38 per m^2

Cost of painting 300 m^2 of walls = Rs 38 x 300

= Rs. 11400

Question 19:

Cost of papering the wall at the cost of Rs. 30 m^2 per in Rs. 7560

$$\therefore \text{Area of 4 walls} = \frac{7560}{30} = 252 \text{ m}^2$$

Let h meter be the height and b m be the breadth of the room

Length of the room = 12 m

Area of four walls = 2 ×(12 + b) × h

2(12 + b) × h = 252

Or (12 + b) h = 126 ——(1)

The cost of covering the floor with mat at the cost of Rs. 15 per m^2 is Rs. 1620

$$\therefore \text{Area of floor} = 12 \times b = \frac{1620}{15}$$

$$\text{or } 12 \times b = 108 \quad \therefore b = \frac{108}{12} = 9$$

Putting value of b in(1)

$$(12+9)h = 126 \quad \text{or } h = \frac{126}{21} = 6$$

Thus, height of room is 6 m

Question 20:

(i) Area of the square = 12(diagonal)2 Sq.unit

$$= \left(\frac{1}{2} \times 24 \times 24\right) m^2 = 288 \ m^2$$

(ii) Side of the square = 288−−−√m = 16.97 m

Perimeter of the square = (4 × side) units

= (4 × 16.97)m

= 67.88 m

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Question 21:

Area of the square = 12(diagonal)2 Sq.unit

Let diagonal of square be x

$$\frac{1}{2} \times \left(x^2\right) = 128 \Rightarrow x^2 = 256 \Rightarrow x = 16\,\text{cm}$$

Length of diagonal = 16 m

Side of square = 128−−−√m = 11.31 m

Perimeter of square = [4 × side] sq. units

=[4 × 11.31] cm = 45.24 cm

Question 22:

Let d meter be the length of diagonal

Area of square field = 12(diagonal)2 Sq.unit = 80000 m^2 (given)

$$\therefore \frac{1}{2}d^2 = 80000 \text{ or } d^2 = 160000$$
$$\therefore d = 400\,\text{m}$$

Time taken to cross the field along the diagonal

$$= \frac{d}{\text{speed}} = \frac{400}{\frac{4000}{60}}\,\text{minute}$$
$$= \frac{400 \times 60}{4000} = 6 \text{ minute}$$

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Hence, man will take 6 min to cross the field diagonally.

Question 23:

Rs. 180 is the cost of harvesting an area = 1 hectare = 10000 m^2

Re 1 is the cost of harvesting an area = 10000180 m^2

Rs. 1620 is the cost of harvesting an area = (10000180×1620) m^2

Area = 90000 m^2

Area of square = $(side)^2$ = 90000 m^2

side = 90000−−−−−√m = 300 m

Perimeter of square = 4 × side = 4 × 300 = 1200 m

Cost of fencing = Rs 6.75 per meter.

Cost of fencing 1200 m long border = 1200 × Rs 6.75 = Rs. 8100

Question 24:

Rs. 14 is the cost of fencing a length = 1m

Rs. 28000 is the cost of fencing the length = 2800014 m = 2000 m

Perimeter = 4 × side = 2000

side = 500 m

Area of a square = $(side)^2$ = $(500)^2$ m

= 250000 m^2

Cost of mowing the lawn = Rs. (250000×54100) = Rs. 135000

Question 25:

Largest possible size of square tile = HCF of 525 cm and 378 cm

= 21 cm

Number of tiles = AreaofrectangleAreaofsquaretiles

= (525×378)(21×21) cm^2

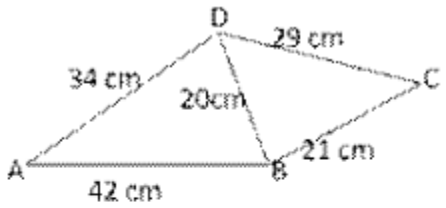
Number of tiles = 450

Question 26:

Area of quad. ABCD = Area of ∆ABD + Area of ∆DBC

For area of ∆ABD

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



$$s = \frac{a+b+c}{2} = \frac{(42+34+20)}{2}\,cm = 48$$

Then, $(s-a) = 6$, $(s-b) = 14$ and $(s-c) = 28$

$$\text{Area of } \Delta ABC = \sqrt{s\times(s-a)(s-b)(s-c)}$$
$$= \sqrt{48\times6\times14\times28}\ cm^2$$
$$= (6\times7\times8)\,cm^2 = 336\ cm^2$$

For area of ∆DBC

a = 29 cm, b = 21 cm, c = 20 cm

$s = \frac{a+b+c}{2} = \frac{(29+21+20)}{2}$ cm = 35 cm

$(s-a) = 6$ cm, $(s-b) = 14$ cm and $(s-c) = 15$ cm

Area of $\Delta DBC = \sqrt{s \times (s-a)(s-b)(s-c)}$ sq.units

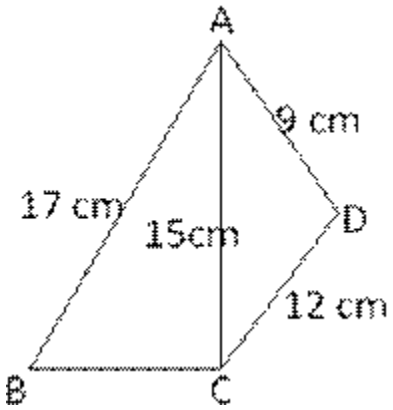
$= \sqrt{35 \times 6 \times 14 \times 15}$ cm^2

$= (5 \times 7 \times 2 \times 3)$ cm^2 = 210 cm^2

Area of quad.ABCD = Area of ΔABC + Area of ΔDBC

= (336 + 210) cm^2 = 546 cm^2

Question 27:



Area of quad. ABCD = Area of ΔABC + Area of ΔACD

$BC = \sqrt{17^2 - 15^2}$ cm = $\sqrt{289 - 225} = \sqrt{64}$ cm

BC = 8 cm

Area of $\Delta ABC = \left(\frac{1}{2} \times AC \times BC\right)$ cm^2

$= \left(\frac{1}{2} \times 15 \times 8\right)$ cm^2 = 60 cm^2

Now, we find area of a ΔACD

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$a = 15cm,\ b = 12cm$ and $c = 9cm$

$$s = \frac{a+b+c}{2} = \frac{(15+12+9)}{2} = 18\ cm$$

$(s-a) = 3cm,\ (s-b) = 6cm$ and $(s-c) = 9\ cm$

$$\text{Area of } ACD = \sqrt{s \times (s-a)(s-b)(s-c)}$$
$$= \sqrt{18 \times 3 \times 6 \times 9}\ cm^2$$
$$= (18 \times 3)cm^2 = 54cm^2$$

Area of quad. ABCD = Area of ∆ABC + Area of ∆ACD

= (60+54) cm^2 = 114 cm^2

Perimeter of quad. ABCD = AB + BC + CD + AD

=(17 + 8 + 12 + 9) cm

= 46 cm

Perimeter of quad. ABCD = 46 cm

Question 28:

ABCD be the given quadrilateral in which AD = 24 cm, BD = 26 cm, DC = 26 cm and BC = 26 cm

By Pythagoras theorem

$$AB = \sqrt{BD^2 - AD^2} = \sqrt{26^2 - 24^2}\ cm$$
$$= \sqrt{100}\ cm = 10\ cm$$
$$\text{Area of } \Delta ADB = \left(\frac{1}{2} \times AB \times AD\right) = \left(\frac{1}{2} \times 10 \times 24\right)cm^2$$
$$= 120\ cm^2$$

For area of equilateral ΔDBC, we have

a = 26 cm

$$\text{Area of } \Delta DBC = \left[\frac{\sqrt{3}}{4}a^2\right] \text{sq.units}$$

$$= \left(\frac{\sqrt{3}}{4} \times 26 \times 26\right) cm^2 = \left(169\sqrt{3}\right) cm^2$$

$$= (169 \times 1.73) cm^2 = 292.73 cm^2$$

Area of quad. ABCD = Area of ΔABD + Area of ΔDBC

= (120 + 292.37) cm^2 = 412.37 cm^2

Perimeter ABCD = AD + AB + BC + CD

= 24 cm + 10 cm + 26 cm + 26 cm

= 86 cm

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He was born on January 2, 1946 in a village of Delhi. He graduated from Kirori Mal College, University of Delhi. After completing his M.Sc. in Mathematics in 1969, he joined N.A.S. College, Meerut, as a lecturer. In 1976, he was awarded a fellowship for 3 years and joined the University of Delhi for his Ph.D. Thereafter, he was promoted as a reader in N.A.S. College, Meerut. In 1999, he joined M.M.H. College, Ghaziabad, as a reader and took voluntary retirement in 2003. He has authored more than 75 titles ranging from Nursery to M. Sc. He has also written books for competitive examinations right from the clerical grade to the I.A.S. level.

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