Chapter 24. Perimeter and Area

Ex 24.1

Answer 5.

We know that , Area of an equilateral triangle(A) of side a is

$A=\frac{\sqrt{3}}{4}a^2$

Here, $A = 16\sqrt{3}$

$\Rightarrow 16\sqrt{3}=\frac{\sqrt{3}}{4}a^2$

$\Rightarrow 16=\frac{a^2}{4}$

$\Rightarrow 4x16=a^2$

$\Rightarrow a = 2x4 = 8$

i.e side of the equilateral triangle is 8 cm

The Perimeter of an equilateral triangle of side a =3a

$\Rightarrow$ The Perimeter of an equilateral triangle of side 8cm =3x8=24cm

Answer 6.

We know that , Perimeter of an equilateral triangle(P) of side a =3a

Here, P = 18cm

$\Rightarrow$ side of the equilateral triangle is =6 cm

Area of an equilateral triangle(A) of side a is $A=\frac{\sqrt{3}}{4}a^2$

$\Rightarrow A=\frac{\sqrt{3}}{4}(6)^2$

$\Rightarrow \frac{\sqrt{3}}{4}(36)$

$\Rightarrow 9\sqrt{3}$

Area of an equilateral triangle(A) of side 6cm is $9\sqrt{3}$ cm^2

Answer 7.

Perimeter P of the triangle = P= 36 cm
Ratio of the sides = 5:12:13
Let the constant of proportionality be k
$\Rightarrow 5k+12k+13k = 36$
$\Rightarrow 30k = 36$
$\Rightarrow k = \frac{36}{30} = 1.2$
$\therefore$ the sides are: 5x1.2,12x1.2 and13 x 1.2
i.e 6 cm,14.4 cm and 15.6 cm
We know that ,Area of a Triangle whose sides are a,b,and c and semiperimeter is s
is given by $\sqrt{s(s-a)(s-b)(s-c)}$;$s=\frac{a+b+c}{2}$

For a triangle whose sides are 6 cm,2.4 cm and 15.6 cm

i.e a=6 b= 14.4and c=15.6 ,$s=\frac{36}{2} = 18$

Area $=\sqrt{18(18-6)(18-14.4)(18-15.6)} = \sqrt{18(12)(3.6)(2.4)} = \sqrt{1866.24} = 43.2cm^2$

Answer 8.

Perimeter P of the triangle = P= 72 cm
Ratio of the sides = 3:4:5
Let the constant of proportionality be k
$\Rightarrow 3k+4k+5k = 72$
$\Rightarrow 12k = 72$
$\Rightarrow k = \frac{72}{12} = 6$
$\therefore$ the sides are: 3x6,4x6 and5x6
i.e 18 cm,24 cm and 30 cm

We know that ,Area of a Triangle whose sides are a,b,and c and semiperimeter is s
is given by $\sqrt{s(s-a)(s-b)(s-c)}$;$s=\frac{a+b+c}{2}$

For a triangle whose sides are 18 cm,24 cm and 30 cm

i.e a=18 b= 24and c=30 ,$s=\frac{72}{2} = 36$

Area $=\sqrt{36(36-18)(36-24)(36-30)} = \sqrt{36(18)(12)(6)}$
$= 216cm^2$

Let the length of the perpendicular of the triannge to the side 15 cm be h cm
i.e height =h cm

We also know that ,Area of a Triangle $=\frac{1}{2}$b.h i.e $\frac{1}{2}$(Base $\times$Height)

Area of a Triangle with base =30 cm and height =h cm

$\Rightarrow \frac{1}{2}15.h = 216cm^2$

$\Rightarrow h = \frac{216x2}{30} = 14.4cm$

Answer 9.

The perpendicular of a right triangle whose hypotenuse is h and base is b , is given by

$\sqrt{h^2 - b^2}$

The perpendicular of a right triangle whose hypotenuse is 15 and base is 9 , is given by

$\sqrt{15^2 - 9^2} = \sqrt{225 - 81} = \sqrt{144} = 12cm$

We also know that ,Area of a Triangle $=\frac{1}{2}$b.h i.e $\frac{1}{2}$(Base $\times$Height)

Area of a Triangle with base =9 cm and height=perpendicular =12 cm

$\Rightarrow \frac{1}{2}b.h = \frac{1}{2} \times 9 \times 12$

$= 54\ cm^2$

Answer 14.

The sum of the equal sides of the given Isosceles triangle =50 – 24 = 26

So, each the equal sides of the given Isosceles triangle = ½ (26) =13 cm

We know that ,Area of a Triangle whose sides are a,b,and c and semiperimeter is s is given by $\sqrt{s(s-a)(s-b)(s-c)}$;$s=\frac{a+b+c}{2}$

Here, sides are 13cm, 13cm and 24 cm

$,s=\frac{P}{2} = \frac{50}{2} = 25$

Area $=\sqrt{25(25-13)(25-13)(25-24)} = \sqrt{25(12)(12)(1)} = 5x12 = 60cm^2$

Answer 15.

The sum of the equal sides of the given Isosceles triangle $=72 - 20 = 52$

So, each the equal sides of the given Isosceles triangle $= \frac{1}{2}(52) = 26$ cm

We know that ,Area of a Triangle whose sides are a,b,and c and semiperimeter is s is given by $\sqrt{s(s-a)(s-b)(s-c)}$;$s=\frac{a+b+c}{2}$

Here, sides are 26cm, 26cm and 20 cm

$,s=\frac{P}{2}=\frac{72}{2}=36$

Area $=\sqrt{36(36-26)(36-26)(36-20)}=\sqrt{36(10)(10)(16)}=6x10x4=240cm^2$

Answer 16.

Let the Area of the triangular plot of land $= A\ m^2$

$\therefore Ax42 = 7560$

$\Rightarrow A = \frac{7560}{42} = 180$

Let the base and height of the plot be 2x and 5x respectively

We know that ,Area of a Triangle $=\frac{1}{2}b.h$ i.e $\frac{1}{2}(Base \times Height)$

$\Rightarrow 180=\frac{1}{2}(2x).(5x)$

$\Rightarrow 5x^2 = 180$

$\Rightarrow x^2 = \frac{180}{5} = 36 \Rightarrow x = 6$

$\Rightarrow Base = 2(6) = 12m; Height=5(6)=30m$

Answer 17.

Let the Perimeter of the triangular plot of land = P

$\therefore$ Px15 = 900

$\Rightarrow P = \frac{900}{15} = 60$

Let the sides of the triangular plot of land = 3x,4x and 5x

So, 3x+4x + 5x = 60$\Rightarrow$ x = 5

So, the sides of the triangular plot of land = 3x5,4x5 and 5x5 = 15 m,20m, 25 m

We know that ,Area of a Triangle whose sides are a,b,and c and semiperimeter is s is given by $\sqrt{s(s-a)(s-b)(s-c)}$;$s=\frac{a+b+c}{2}$

For a triangle whose sides are cm, cm and cm

i.e a=15 b=20and c=25 ,$s=\frac{60}{2} = 30$

Area $=\sqrt{30(30-15)(30-20)(30-25)} = \sqrt{30(15)(10)(5)} = \sqrt{22500} = 150m^2$

Cost of cultivating 1 m^2 =Rs 48

Cost of cultivating 150 m^2 =Rs 48x 150 = Rs 7200

Answer 18.

We know that the Area of a Rectangle , with length l and breadth b is A = l xb

The Area of the given Rectangle is 96 cm^2 and length of the given Rectangle is 12 cm

Let its breadth = b cm

$\therefore$ 12 x b = 96

$\Rightarrow$ $b = \frac{96}{12} = 8$ cm

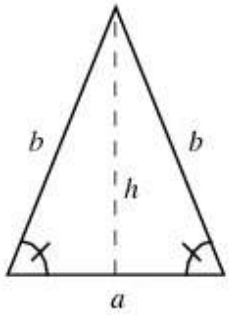
The height of the triangle = 8 cm. We are given that th base of the triangle = 12 cm

Area of a Triangle $=\frac{1}{2}b.h$

$=\frac{1}{2}(12).(8) = 48cm^2$

Answer 19.

Area of an isosceles triangle=192 cm^2



An isosceles triangle is a triangle with (at least) two equal sides. In the figure above, the two equal sides have length b and the remaining side has length a. This property is equivalent to two angles of the triangle being equal. An isosceles triangle therefore has both two equal sides and two equal angles. Let h be the height of the isosceles triangle as illustrated.

So, $h=\sqrt{b^2-\frac{a^2}{4}}$

We know that ,Area of a Triangle $=\frac{1}{2}(\text{Base}\times\text{Height})$

$=\frac{1}{2}\times a\times h=\frac{1}{2}\times a\times\sqrt{b^2-\frac{a^2}{4}}$

$=\frac{1}{2}\times a^2\times\sqrt{\frac{b^2}{a^2}-\frac{1}{4}}$

Here, The area is therefore given by

$=\frac{1}{2}\times x^2\times\sqrt{\frac{20^2}{x^2}-\frac{1}{4}}$

$=\frac{x^2}{2}\sqrt{\frac{1600-x^2}{4x^2}}$

$\Rightarrow 192=\frac{x^2}{2}\sqrt{\frac{1600-x^2}{4x^2}}$

$\Rightarrow 192^2=\frac{x^4}{4}\times\frac{1600-x^2}{4x^2}$

$\Rightarrow 192^2\times 16=x^2(1600-x^2)$

$\Rightarrow x^4-1600x^2+589824=0$

$\Rightarrow t^2-1600t+589824=0;\text{where}\,x^2=t$

$\Rightarrow t^2-1024t-576t+589824=0$

$\Rightarrow t(t-1024)-576(t-1024)=0$

$\Rightarrow t=1024$ or 576

$\Rightarrow x^2=1024$ or 576

$\Rightarrow x=32$ cm or 24cm

Answer 20.

Let the unequal side of the Isosceles triangle = x

Then the equal side of the Isosceles triangle = x − 3

And the perpendicular to the unequal side from the opposite vertex = x -6

We know that ,Area of a Triangle $=\frac{1}{2}$b.h i.e $\frac{1}{2}$(Base × Height)

$\therefore$ Area of the Isosceles Triangle $=\frac{1}{2}x.(x-6)=108$

$\Rightarrow x^2-6x=216$

$\Rightarrow x^2-6x-216=0$

$\Rightarrow x^2-6x+9-9-216=0$

$\Rightarrow (x-3)^2=225$

$\Rightarrow x-3=15$

$\Rightarrow x=18 \Rightarrow x-3=15$

$\Rightarrow$ Perimeter=18+15+15=48cm

Ex 24.2

Answer 7.

Area of a parallelogram with base b and height h is $A = b \times h$

$\therefore$ Area of a parallelogram with base 12cm and height 5cm is $A = 12 \times 5 = 60cm^2$

Answer 8.

Let the height of the parallelogram = h

Area of a parallelogram with base b and height h is $A = b \times h$

$\therefore$ Area of a parallelogram with base 18cm and height h cm is $A = 18 \times h = 144cm^2$

$\Rightarrow h = \frac{144}{18} = 8cm$

Answer 12.

Area of a parallelogram with base b and height h is $A = b \times h$

$\therefore$ Area of a parallelogram with base 12cm and height 8cm is $A = 12 \times 8 = 96cm^2$

Let the length of the adjacent side of the parallelogram = xcm

The height corresponding to it = 16

$\therefore$ Area of a parallelogram with base xcm and height 16cm is $A = 16x = 96$

$\Rightarrow x = \frac{96}{16} = 6cm$

Answer 13.

Area of a parallelogram with base b and height h is $A = b \times h$

$\therefore$ Area of a parallelogram with base 20cm and height 9cm is $A = 20 \times 9 = 180cm^2$

The height corresponding to the side 18cm = x cm

Area of a parallelogram with base 18cm and height xcm is $A = 18 \times x$

$\Rightarrow 20 \times 9 = 18 \times x$

$\Rightarrow x = \frac{20 \times 9}{18} = 10cm$

Answer 14.

The area of a rectangle with length l and breadth b = $A = l \times b$

The perimeter of a rectangle with length l and breadth b = $P = 2(l+b)$

$\therefore$ For a rectangle with length 12cm and breadth 9cm

$P = 2(12+9) = 2(21) = 42cm; A = 12 \times 9 = 108cm^2$

Answer 15.

The area of a rectangle with length l and breadth b = A = $l \times b$

Let the breadth of the rectangle =bcm

$\therefore$ For a rectangle with length 24cm and breadth bcm, $A = 24 \times b$

$$\Rightarrow 360 = 24b \Rightarrow b = \frac{360}{24} = 15\text{cm}$$

The perimeter of a rectangle with length l and breadth b = P=2(l+b)

$\therefore$ For a rectangle with length 24cm and breadth 15cm, $P=2(24+15) = 78\text{cm}$

Answer 16.

Let the breadth of the rectangle = x m length and of the rectangle = 3x m

The perimeter of a rectangle with length l and breadth b = P=2(l+b)

$\therefore$ The perimeter of a rectangle with length 3x and breadth x = P=2(3x+x)

$= 2(4x) = 8x$

$\Rightarrow 8x = 1.6\text{km} = 1.6 \times 1000\text{m} = 1600\text{m}$

$$\Rightarrow x = \frac{1600}{8} = 200\text{m}$$

$\Rightarrow$ the breadth of the rectangle = 200 m length

and of the rectangle = 3(200)=600 m

The area of a rectangle with length l and breadth b = A = $l \times b$

The area of a rectangle with length 600 and breadth 200 = A = 600×200

$= 120000\text{m}^2$

Answer 17.

Let the breadth of the rectangle = x m

The area of a rectangle with length l and breadth b = A = $l \times b$

$\therefore$ The area of a rectangle with length 240m and breadth xm = A = 240x

$\Rightarrow 240x = 36000$

$$\Rightarrow x = \frac{36000}{240} = 150\text{m}$$

Now, The perimeter of a rectangle with length l and breadth b = P=2(l+b)

$\therefore$ The perimeter of a rectangle with length 240 and breadth 150 is

$P=2(240+150) = 2(390) = 780$

The cost of fencing 1m = Rs2.50

$\Rightarrow$ The cost of fencing 780m = $\text{Rs}2.50 \times 780 = \text{Rs}1950$

Answer 18.

Area of a Trapezium = $\frac{1}{2}(a+b)\times h$,

Where a and b are the lengths of its parallel sides and
h the perpendicular distance between them
here, a =12cm , b = 8cm and h = 6cm

$\therefore$ Area of Trapezium = $\frac{1}{2}(12+8)\times 6 = \frac{1}{2}(20)\times 6 = 10\times 6 = 60cm^2$

Answer 20.

The area of a rectangle with length l and breadth b = A = $l\times b$
The area of a rectangle with length 40m
and breadth 24m= A = $40\times 24m^2$
The area of the rectangular carpet with sides 6m and 4 m = a = 6×4
Number of carpets required to cover the floor completely=$\frac{A}{a} = \frac{40\times 24}{6\times 4} = 40$

Answer 21.

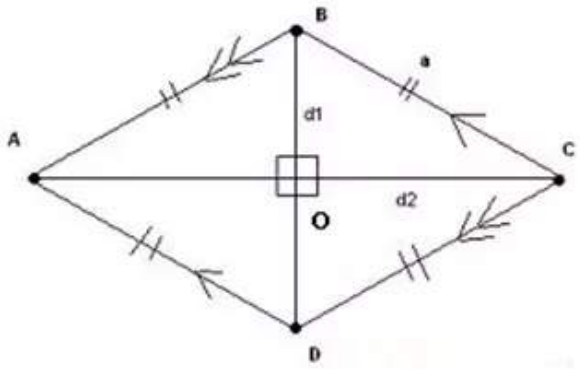
The area of a rectangle with length l and breadth b = A = $l\times b$
$\therefore$ The area of the rectanglular plot with length 160m and breadth 40m
= A = 160×40
= area of the square garden
We know,The area of a square with side s = s^2
$\therefore s^2 = 160\times 40$
$\Rightarrow s = \sqrt{160\times 40} = \sqrt{16\times 4\times 100} = 4\times 2\times 10 = 80m$
The perimeter of a square with side s = P=4s
$\therefore$ The perimeter of a square with side 80 = $4\times 80 = 320m$
The cost of fencing at the rate of Rs 12 per m=320×12 = Rs3840

Answer 22.

The sides and diagonal of a square form a right triangle
as each angle of a square is a right angle.
Diagonal is the side opposite to the right angle , therefore it is the hypotenuse
Here , Diagonal of the square = $12\sqrt{2}cm$
Let the side of the square=s
$\therefore \sqrt{s^2+s^2} = 12\sqrt{2}$
$\Rightarrow \sqrt{2s^2} = 12\sqrt{2}$
$\Rightarrow s\sqrt{2} = 12\sqrt{2} \Rightarrow s = 12$
We know,The area of a square with side s = s^2
$\therefore s^2 = (12)^2 = 144cm^2$

Answer 24.

In the given Rhombus diagonal AC = 24cm and diagonal BD = 10 cm



We know that, diagonals of a Rhombus bisect at right angles. In Triangle AOB ,

$\angle AOB = 90°$, AB is the hypotenuse

OB = 12cm($\frac{1}{2}$ (24 cm)) and

AO = 5 cm($\frac{1}{2}$ (10 cm))

$AB = \sqrt{OB^2 + OA^2} = \sqrt{12^2 + 5^2} = \sqrt{144 + 25} = \sqrt{169} = 13$

Further all sides of a Rhombus are equal by definition

So, AB = BC = CD = AD = 13 cm

Perimeter = 4(13) = 52 cm.

Answer 25.

The perimeter of a square with side s = P=4s

$\therefore$ Here, the perimeter of the square 64m

let the side of the square =s

$\therefore 4s = 64 \Rightarrow s = 16m$

We know, The area of a square with side s = s^2

$\therefore s^2 = 16^2 = 256m^2$

$\therefore$ The area of the rectangle = 256 + 64 = $280m^2$

The area of a rectangle with length l and breadth b = A = l × b

Here, l = 14 m , let breadth = b

The area of a rectangle with length 14 and breadth b = A = 14 × b

$\Rightarrow 14b = 280$

$\Rightarrow b = \frac{280}{14} = 20m$

Answer 26.

The perimeter of a square with side s = P=4s

$\therefore$ Here, the perimeter of the squares are 128cm and 96cm

$\therefore$ the sides of the two squares are =32cm and 24 cm

We know,The area of a square with side s = s^2

$\therefore$ the areas of the two squares are =$32cm^2$=1024 cm^2 and $24cm^2$=$576cm^2$

$\therefore$ the combined area=area of the new square=1024 cm^2 +$576cm^2$=$1600cm^2$

the side of the square = $\sqrt{1600}$ = 40cm

The perimeter of a square with side 40 = $4 \times 40 = 160cm$

The sides and diagonal of a square form a right triangle

as each angle of a square is a right angle.

Diagonal is the side opposite to the right angle , therefore it is the hypotenuse

Here , Diagonal of the square =$\sqrt{40^2 + 40^2} = 40\sqrt{2} = 40(1.414) = 56.57cm$

Answer 27.

The area of a square plot with side 80 m = 80^2=$6400m^2$

Let the width of the rectanglular plot=b

The area of a rectangle with length l and breadth b = $A = l \times b$

The area of a rectangle with length 160 and breadth b = $A = 160 \times b = 6400$

$\Rightarrow b = \frac{6400}{160} = 40m$

The perimeter of a rectangle with length l and breadth b = P=2(l+b)

The perimeter of a rectangle with length 160m and breadth 40m = P=2(160+40)

= 2(200) = 400m

The cost of fencing at the rate of Rs 7.50 per m=400×7.50 = Rs3000

Answer 28.

Let the side of the smaller square = x

$\therefore$ the side of the larger square = x+4

We know,The area of a square with side s = s^2

$\therefore$ The area of a square with side x = x^2

and, The area of a square with side x+4 = $(x+4)^2$

Now, the sum of the two area =400

$\Rightarrow x^2 + (x+4)^2 = 400$

$\Rightarrow x^2 + x^2 + 16 + 8x = 400$

$\Rightarrow 2x^2 + 8x + 16 = 400$

$\Rightarrow 2(x^2 + 4x + 8) = 2(200)$

$\Rightarrow x^2 + 4x + 8 = 200$

$\Rightarrow x^2 + 4x - 192 = 0$

Splitting the middle term , we have

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

$\Rightarrow x(x + 16) - 12(x + 16) = 0$

$\Rightarrow (x + 16)(x - 12) = 0$

$\Rightarrow x = -16, x = 12$

But x is the length of the side of a square,

$\therefore x \neq -16$

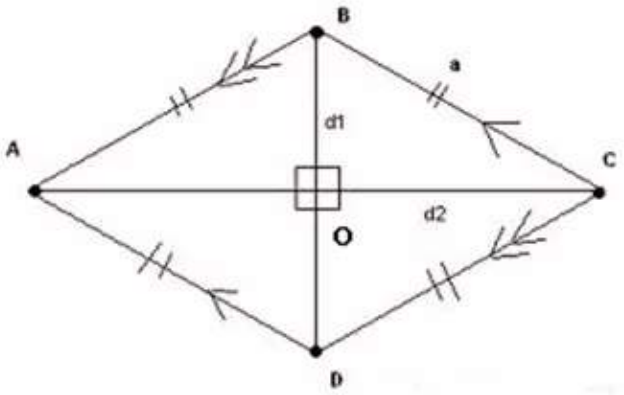
$\therefore x = 12$

$\Rightarrow$ the side of the smaller square = 12cm

$\therefore$ the side of the larger square = 12+4=16cm

Answer 29.

In the given Rhombus diagonal AC = 24cm .



We know that, diagonals of a Rhombus bisect at right angles. In Triangle AOB ,

$\angle AOB = 90°$, AB is the hypotenuse

AO = 12 cm($\frac{1}{2}$ (24 cm))

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

$\Rightarrow OB = \sqrt{AB^2 - OA^2} = \sqrt{20^2 - 12^2} = \sqrt{400 - 144} = \sqrt{256} = 16$

$\Rightarrow$ AB = 32cm

We know that the area of a rhombus whose diagonals are d_1 and d_2, is

$A = \frac{1}{2} \times d_1 \times d_2$

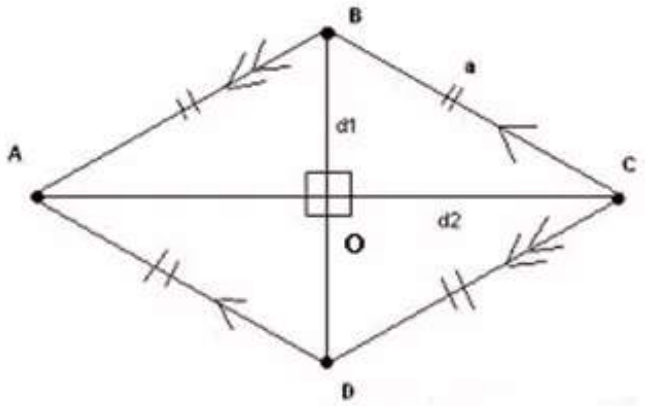
$\therefore$ the area of a rhombus whose diagonals are 24 and 32, is

$A = \frac{1}{2} \times 24 \times 32 = 384cm^2$

Answer 31.

The perimeter of the Rhombus = 260 cm

Each side of the Rhombus= $\frac{1}{4}$ (260)=65 cm



In the given Rhombus,AB = 65 cm, diagonal AC = 66cm

We know that, diagonals of a Rhombus bisect at right angles.

In Triangle AOB ,

$\angle AOB = 90°$, AB is the hypotenuse

AO = 33 cm($\frac{1}{2}$ (66 cm))

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

$\Rightarrow OB = \sqrt{AB^2 - OA^2} = \sqrt{65^2 - 33^2} = \sqrt{4225 - 1089} = \sqrt{3136} = 56$

$\Rightarrow$ AB = 112cm

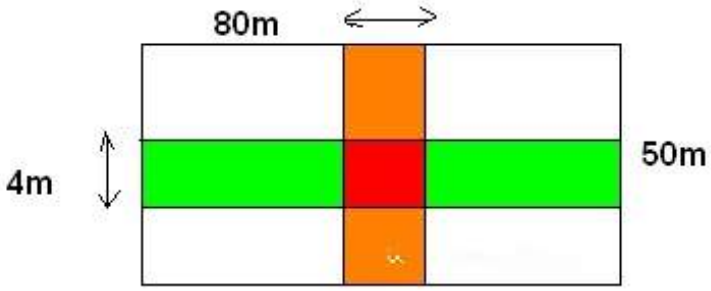
We know that the area of a rhombus whose diagonals are $d_1$and d_2,is

$A = \frac{1}{2} \times d_1 \times d_2$

$\therefore$ the area of a rhombus whose diagonals are 112 and 66,is

$A = \frac{1}{2} \times 112 \times 66 = 3696 cm^2$

Answer 32.



The road that run parallel to the length of the rectangular field (Shown in Green and Red)is a rectangle with length 80 m and breadth 4 m

Area= 80 x 4 =320 m^2

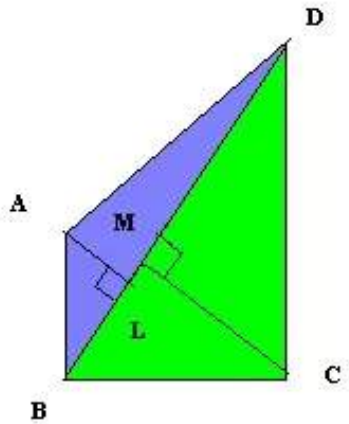
The road that run parallel to the breadth of the rectangular field (Shown in Orange and Red)is a rectangle with length 80 m and breadth 4 m

Area= 50 x 4 =200 m^2

The area in Red is include in both the rectangular roads is included in both the roads

⇒Required area = 320 +200 -4x4= 320 +200 -16 = 504 m^2

Answer 33.



In quadrilateral ABCD, the sides AB,BC,CD and AD are unequal.

The longer diagonal BD =140m

AM ⊥ BD,CL ⊥ BD

AM = 20 m and CL = 14 m.

We split a quadrilateral into triangles and find its area.

We know that ,Area of a Triangle $=\frac{1}{2}$b.h i.e $\frac{1}{2}$(Base $\times$Height)

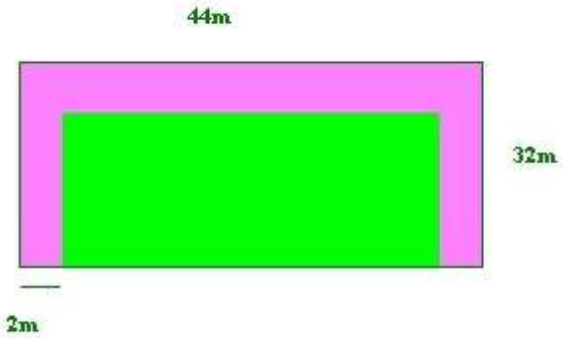
$Ar(\triangle ABD)=\frac{1}{2}BD\times AL; Ar(\triangle CBD)=\frac{1}{2}BD\times CM$

$Ar(QuadABCD)=Ar(\triangle ABD)+Ar(\triangle CBD)$

$=\frac{1}{2}BD\times AL+\frac{1}{2}BD\times CM=\frac{1}{2}BD\times(AL+CM)$

$=\frac{1}{2}\times 140\times(20+14)=70\times 34=2380m^2$

Answer 34.



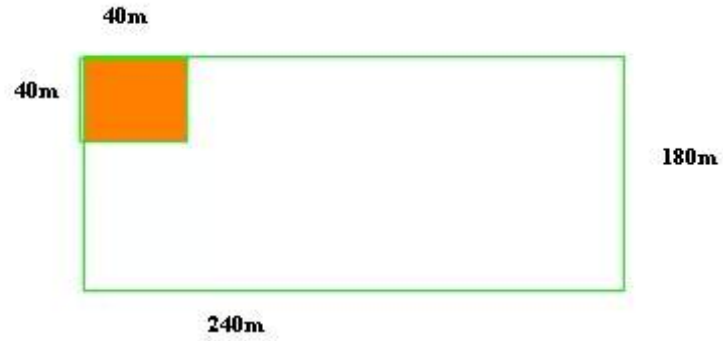
The dimensions of the rectangular Park are 44 x 32.

Area of the rectangular Park = 44 x 32 = 1408m²

The area of the rectangular Part in which grass has to be laid = (44 -4)x(32-2)=40x30=1200m²

The area of the Part in which flowers have to be planted = 1408 – 1200 = 208m².

Answer 36.



The area of a rectangle with length l and breadth b = $A = l \times b$

The area of a rectangle with length 240m and breadth 180m = $240 \times 180 = 43200m^2$

The area of a square plot with side 40 m on which the farmhouse is made

$= 40^2 = 1600m^2$

The area of the remaining plot $= 43200 - 1600 = 41600m^2$

The perimeter of a rectangle with length l and breadth b = $P = 2(l+b)$

The perimeter of a rectangle with length 240m and breadth 180m

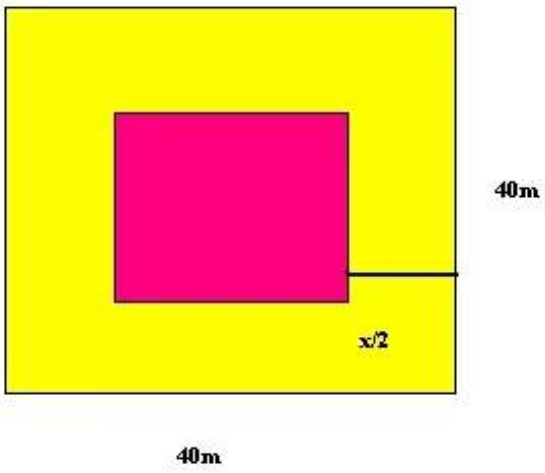
$= P = 2(240+180) = 840$

The boundary to be fenced $= 840 - 2 \times 40 = 760$

The cost of fencing 1m = Rs25

$\Rightarrow$ The cost of fencing 760m = $Rs25 \times 760 = Rs19000$

Answer 37.



Let the width of the gravel path = $\frac{x}{2}m$

Now, Area of flower bed (shown in Pink) x 25 + Area of gravel path(Shown in Yellow) =Rs 80320

i.e $(44-x)^2 x25 + [44^2 - (44-x)^2 x120 = 80320$

$(44-x)^2 x25 + 44^2 x 120 - (44-x)^2 x 120 = 80320$

$(44-x)^2 x(25-120) + 44^2 x 120 = 80320$

$(44-x)^2 x(-95) + 1936 x 120 = 80320$

$(44-x)^2 x(-19) + 1936 x 24 = 16064$

$46464 - 1664 = 19(44-x)^2$

$30400 = 19(44-x)^2$

$(44-x)^2 = 16000$

$44-x = 40$

$x = 4$

the width of the gravel path $= \frac{x}{2} = 2$ m

Answer 38.

Let the sides of the rectangular field = 8x and 5x

So, the sides of the rectangular field after leaving the path of 2m on all sides= 8x -4 and 5x -4

Area of the rectangular field = (8x) (5x)

Area of the rectangular field after leaving the path of 2m on all sides= (8x - 4)(5x -4)

Area of the the path of 2m on all sides =(8x) (5x) - (8x -4)(5x -4) $=40x^2 - (40x^2 - 32x - 20x + 16) = 848$

$52x + 16 = 848$

$x = 16$

The sides of the rectangular field = 8x and 5x = 128 m and 80 m

Answer 42.

The length of the rectangle = x m

Let the breadth of the rectangle = b m

The perimeter of a rectangle with length l and breadth b = $P=2(l+b)$

The perimeter of a rectangle with length x and breadth b = $2(x+b)=300$

$\Rightarrow (x+b)=150$

$\Rightarrow b=150-x$

The area of a rectangle with length l and breadth b = $A=l\times b$

The area of a rectangle with length x and breadth $(150-x)$ = $x\times(150-x)=5600$

$\Rightarrow 150x-x^2=5600$

$\Rightarrow x^2-150x+5600=0$

$\Rightarrow x^2-80x-70x+5600=0$

$\Rightarrow x(x-80)-70(x-80)=0$

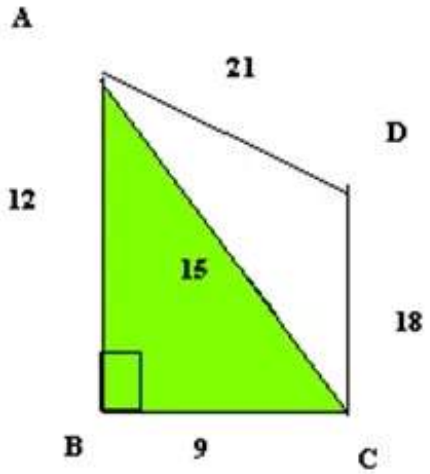
$\Rightarrow (x-80)(x-70)=0$

$\Rightarrow x=70m, 80m$

When breadth = 70 m , then the length = 150 – 70 = 80m

When breadth = 80 m , then the length = 150 – 80 = 70m

Answer 43.



In the given quadrilateral ABCD , join diagonal AC

ABC is a right triangle

We know that ,Area of a Triangle $=\frac{1}{2}b.h$ i.e $\frac{1}{2}(\text{Base} \times \text{Height})$

Area of a Triangle ABC$=\frac{1}{2}9.12=54m^2$

AC is the hypotenuse , AC$=\sqrt{12^2+9^2}=\sqrt{225}=15m$

Triangle ACD has sides 15 m, 18m, 21 m

We know that ,Area of a Triangle whose sides are a,b,and c and semiperimeter is s is given by $\sqrt{s(s-a)(s-b)(s-c)}$;s$=\frac{a+b+c}{2}$

For a triangle whose sides are cm, cm and cm

i.e a=15, b=18and c=21 ,s$=\frac{15+18+21}{2}=\frac{54}{2}=27$

Area $=\sqrt{27(27-15)(27-18)(27-21)}=\sqrt{27(12)(9)(6)}$

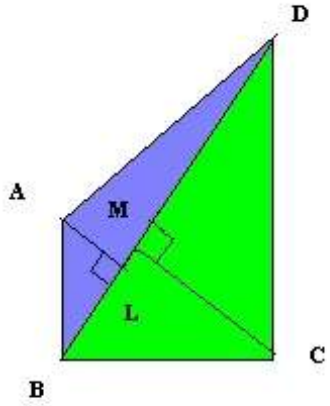
$=\sqrt{9x3(6x2)(9)(6)}$

$=9x6\sqrt{6}=54\sqrt{6}=54(2.5)$

Area (Quad ABCD) = Ar (Triangle ABC) + Ar (Triangle ADC)

54+ 54(2.5) = 54 (1+2.5) = 54 (3.5)= 189 m^2

Answer 44.



In Quadrilateral ABCD, BD is a diagonal, $AM \perp BD, CL \perp BD$

AM = 17cm and CL = 19cm and Ar(Quadrilateral ABCD) = 756 cm^2

Let diagonal BD =x cm

$$\text{Ar(Quadrilateral ABCD)} = \frac{1}{2} \times BD(AM + CL)$$

$$\Rightarrow 756 = \frac{1}{2} x(19 + 17)$$

$$\Rightarrow 756 = 18x$$

$$\Rightarrow x = 42cm$$

Answer 46.

Area of each of the 64 squares of the chess board =6.25cm^2

So, Side of each of the 64 squares of the chess board =2.5cm

The sum of Sides of each of the 8 squares on one side of the chess board= 8 x 2.5 = 20cm

The border on each side is 2 cm . So, the length of the board = 20 + 4 = 24 cm

Answer 47.

The cross-section of the canal is a trapezium

$$\text{Area of a Trapezium} = \frac{1}{2}(a + b) \times h,$$

Where a and b are the lengths of its parallel sides

Let h the perpendicular distance between them

here, a =10 , b =6 and perpendicular distance =h

$$\therefore \text{Area of Trapezium} = \frac{1}{2}(10 + 6) \times h = 72m^2$$

$$\Rightarrow 8h = 72$$

$$\Rightarrow h = 9m$$

Ex 24.3

Answer 1.

(i)The Area of a Circle with radius r $=\pi r^2$

$\therefore$ The Area of a Circle with radius 2.8cm $=\pi(2.8)^2=\frac{22}{7}(2.8)^2=24.64cm^2$

The Circumference of a Circle with radius r $=2\pi r$

The Circumference of a Circle with radius 2.8 $=2\pi(2.8)=2\times\frac{22}{7}(2.8)=17.6cm$

(ii)The Area of a Circle with radius r $=\pi r^2$

$\therefore$ The Area of a Circle with radius 10.5cm $=\pi(10.5)^2=\frac{22}{7}(10.5)^2=346.5cm^2$

The Circumference of a Circle with radius r $=2\pi r$

The Circumference of a Circle with radius 10.5 $=2\pi(10.5)=2\times\frac{22}{7}(10.5)=66cm$

(iii)

The radius of a Circle with diameter d is r $=\frac{d}{2}$

The Area of a Circle with radius r $=\pi r^2$

The radius of a Circle with diameter 77 is r $=\frac{77}{2}=38.5cm$

The Area of a Circle with radius r $=\pi(38.5)^2=\frac{22}{7}\times(38.5)^2=4658.5cm^2$

The Circumference of a Circle with diameter d is πd

The Circumference of a Circle with diameter 77 is $\pi\times77=\frac{22}{7}\times77=242cm$

(iv)

The radius of a Circle with diameter d is r $=\frac{d}{2}$

The Area of a Circle with radius r $=\pi r^2$

The radius of a Circle with diameter 35 is r $=\frac{35}{2}=17.5cm$

The Area of a Circle with radius r $=\pi(17.5)^2=\frac{22}{7}\times(17.5)^2=962.5cm^2$

The Circumference of a Circle with diameter d is πd

The Circumference of a Circle with diameter 35 is $\pi\times35=\frac{22}{7}\times35=110cm$

Answer 2.

(i)

The Area of a Semi-circle with radius r $=\frac{\pi r^2}{2}$

The Perimeter of a Semi-circle with radius r $=\pi r+2r$

$=r(\pi+2)=r(\frac{22}{7}+2)=\frac{36}{7}\times r$

The Area of a Semi-circle with radius 1.4cm $=\frac{\pi(1.4)^2}{2}=\frac{22}{7}\times\frac{(1.4)^2}{2}=3.08cm^2$

The Perimeter of a Semi-circle with radius r $=\pi(1.4)+2\times1.4$

$=1.4(\pi+2)=1.4(\frac{22}{7}+2)=\frac{36}{7}\times1.4=7.2cm$

(ii)The radius of a Circle with diameter d is r $=\frac{d}{2}$

The Area of a Semi-circle with radius r $=\frac{\pi r^2}{2}$

The Perimeter of a Semi-circle with radius r $=\pi r+2r$

$=r(\pi+2)=r(\frac{22}{7}+2)=\frac{36}{7}\times r$

The radius of a Circle with diameter7 is r $=\frac{7}{2}=3.5cm$

The Area of a Semi-circle with radius 3.5 $=\frac{\pi(3.5)^2}{2}=19.25cm^2$

The Perimeter of a Semi-circle with radius r $=\pi\times3.5+2\times3.5$

$=3.5(\pi+2)=3.5(\frac{22}{7}+2)=\frac{36}{7}\times3.5=25cm$

(iii)The radius of a Circle with diameter d is r $=\frac{d}{2}$

The Area of a Semi-circle with radius r $=\frac{\pi r^2}{2}$

The Perimeter of a Semi-circle with radius r $=\pi r+2r$

$=r(\pi+2)=r(\frac{22}{7}+2)=\frac{36}{7}\times r$

The radius of a Circle with diameter5.6 is r $=\frac{5.6}{2}=2.8cm$

The Area of a Semi-circle with radius 2.8 $=\frac{\pi(2.8)^2}{2}=12.32cm^2$

The Perimeter of a Semi-circle with radius r $=\pi\times2.8+2\times2.8$

$=2.8(\pi+2)=2.8(\frac{22}{7}+2)=\frac{36}{7}\times2.8=14.4cm$

Answer 3.

The Circumference of a Circle with radius r $=2\pi r$

Here, Circumference of a Circle $=396$

$\Rightarrow 2\pi r=396 \Rightarrow r=\frac{396}{2\pi}=\frac{396\times 7}{2\times 22}=63m$

The Area of a Circle with radius r $=\pi r^2$

$\Rightarrow$ The Area of a Circle with radius 63m $=\pi(63)^2=\frac{22}{7}\times(63)^2=\frac{22}{7}\times 3969=12,474m^2$

Answer 4.

The Area of a Circle with radius r $=\pi r^2$

Here, Area of a Circle $=81\pi cm^2$

$\Rightarrow 81\pi=\pi r^2 \Rightarrow 81=r^2 \Rightarrow r=9cm$

The Circumference of a Circle with radius r $=2\pi r$

The Circumference of a Circle with radius 9 $=2\pi\times 9=18\pi cm$

Answer 5.

The Circumference of a Circle with diameter d is πd

The Circumference of a Circle with diameter 1.4m is $\pi\times 1.4$

$=\frac{22}{7}\times 1.4=22\times 0.2=4.4m$

Total distance moved $=2.2km=2.2\times 1000m=2200m$

Number of revolutions $=\frac{\text{Total distance moved}}{\text{Circumference of Circle}}=\frac{2200}{4.4}=500$

Answer 13.

The Circumference of a Circle with diameter d is πd

The Circumference of a Circle with diameter 70cm is $\pi\times 70$

$=\frac{22}{7}\times 70=22\times 10=220cm$

Total distance moved in 10 revoloutions $=2.2km=2200cm$

distance moved in 1 second $=2200cm$

$\Rightarrow$ distance moved in 1 hour $=2200cm\times 60\times 60=7920000cm$

$=\frac{7920000}{100\times 1000}km=79.2km$

$\therefore$ Speed $=79.2km/hr$

Answer 14.

The Circumference of a Circle with diameter d is πd

The Circumference of a Circle with diameter 140cm is $\pi \times 140$

$= \frac{22}{7} \times 140 = 440cm$

distance moved in 1 hour $= 66km = 6600000cm$

distance moved in 1 minute $= \frac{6600000cm}{60} = 110000cm$

Number of revolutions $= \frac{\text{Total distance moved}}{\text{Circumference of Circle}} = \frac{110000}{440} = 250$

Answer 15.

The Circumference of a Circle with diameter d is πd

The Circumference of a Circle with diameter 42cm is $\pi \times 42$

$= \frac{22}{7} \times 42 = 22 \times 6 = 132cm$

$\Rightarrow$ distance moved in 1 revoloution $= 132cm$

Total distance moved in 9 revoloutions $= 9 \times 132cm = 1188cm$

Total distance moved in 1 second $= 1188cm$

$\Rightarrow$ Total distance moved in 1 hour $= 1188cm \times 60 \times 60 = 4276800cm$

$= \frac{4276800}{100 \times 1000} km$

$\Rightarrow$ Speed $= 42.7km/hr$

$\therefore$ Speed $= 42.7km/hr$

Answer 16.

The Circumference of a Circle with diameter d is πd

The Circumference of a Circle with diameter 35cm is $\pi \times 35$

$= \frac{22}{7} \times 35 = 22 \times 5 = 110cm$

$\Rightarrow$ distance moved in 1 revoloution $= 110cm = \frac{110}{100} m = 1.1m$

Total distance moved in 1 second $= 1.1m$

$\Rightarrow$ Total distance moved in 1 revoloution $=$ Total distance moved in 1 second

$\Rightarrow$ Total distance moved in 2min $= 2 \times 60$(Total distance moved in 1 revoloution)

$= 2 \times 60 \times .1m = 120m$

Answer 17.

The Circumference of a Cirde $= 280\text{cm} = 2.8\text{m}$

$$\text{Number of revolutions} = \frac{\text{Total distance moved}}{\text{Circumference of Cirde}} = \frac{490}{2.8} = 175$$

Answer 18.

The Circumference of a wheel with diameter d is πd

The Circumference of a wheel with diameter $4\frac{5}{11}\text{cm} = \frac{49}{11}$ is $\pi \times \frac{49}{11}$

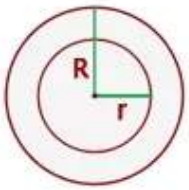
$$= \frac{22}{7} \times \frac{49}{11} = 14\text{cm}$$

$\text{Total distance moved} = 6.3\text{km} = 6.3 \times 100000\text{cm} = 630000\text{cm}$

$$\text{Number of revolutions} = \frac{\text{Total distance moved}}{\text{Circumference of wheel}} = \frac{6.3 \times 100000}{14} = 45000$$

Answer 20.

We know,



The area of the ring between two concentric circles equals the area of the larger circle minus the area of smaller circle. Let the radius of the outer and inner ring be R and r respectively

Here, the radius of the outer circle = 13 cm and the radius of the inner circle = 6 cm

The Area of a Circle with radius r $= \pi r^2$

The area of the ring $= \pi\left((13)^2 - 6^2\right)$

$$= \frac{22}{7}(169 - 36)$$

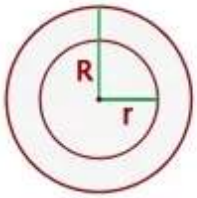
$$= \frac{22}{7}(133)$$

$$= 22 \times 19$$

$$= 418\text{cm}^2$$

Answer 21.

We know,



The area of the ring between two concentric circles equals the area of the larger circle minus the area of smaller circle. Let the radius of the outer and inner ring be R and r respectively

The Area of a Circle with radius $r = \pi r^2$

area of the ring between two concentric circles $= \pi(R^2 - r^2) = 2464 cm^2$

The Circumference of a Circle with radius $r = 2\pi r$

The Circumference of the inner Circle with radius $r = 132$

$2\pi r = 132 \Rightarrow r = 21cm$

$\pi(R^2 - 21^2) = 2464$

$\Rightarrow \frac{22}{7}(R^2 - 441) = 2464$

$\Rightarrow (R^2 - 441) = 784$

$\Rightarrow R^2 = 1225$

$\Rightarrow R = 35cm$

Answer 22.

The side of a square whose area is $484 cm^2 = \sqrt{484} = 22cm$

$\Rightarrow$ The perimeter of the square $= 4 \times 22cm$

The Circumference of a Circle with radius $r = 2\pi r$

Her, $2\pi r = 4 \times 22cm$

$\Rightarrow r = \frac{88}{2\pi} = \frac{88 \times 7}{2 \times 22} = 14cm$

The Area of a Circle with radius $r = \pi r^2$

The Area of a Circle with radius $14 = \pi(14)^2$

$= \frac{22}{7} \times (14)^2 = 22 \times 2 \times 14 = 616 cm^2$

Answer 23.

We know that , Area of an equilateral triangle(A) of side a is

$A=\frac{\sqrt{3}}{4}a^2$

Here, $A = 121\sqrt{3}$

$\Rightarrow 121\sqrt{3}=\frac{\sqrt{3}}{4}a^2 \Rightarrow 121=\frac{a^2}{4} \Rightarrow 11=\frac{a}{2} \Rightarrow a = 22 \Rightarrow 3a = 66cm$

The Circumference of a Circle with radius $r = 2\pi r$

Here, $66cm = 2\pi r \Rightarrow 66 \Rightarrow r = 10.5cm$

The Area of a Circle with radius $r = \pi r^2$

The Area of a Circle with radius $10.5 = \frac{22}{7}(10.5)^2 = 346.5cm^2$,

Answer 24.

The Area of a Circle with radius $r = \pi r^2$

The Area of a Circle with radius $7 = \pi(7)^2$

The Area of the bigger Circle $= 25 \times \pi(7)^2 = \pi(7^2 \times 5^2) = \pi(35^2)$

Let radius of the bigger Circle = R

$R^2 = \pi(35^2)$

$\Rightarrow$ radius of the bigger Circle = 35

The Circumference of a Circle with radius $r = 2\pi r$

The Circumference of a Circle with radius $35r = 2\pi \times 35 = 220cm$

Answer 25.

Let the side of the square = s and the radius of the circle = r

$\therefore 2\pi r = 4s$

But, the area of the square $484m^2$

$\therefore$ the side of the square $= \sqrt{484} = 22m$

$\Rightarrow 2\pi r = 4 \times 22 \in r = 14m$

The Area of a Circle with radius $r = \pi r^2$

The Area of a Circle with radius $14 = \pi(14)^2 = \frac{22}{7} \times (14)^2 = 616m^2$

Answer 26.

Let the side of the square = s and the radius of the cirde = r

The Circumference of a Cirde with radius r $=2\pi r$

The Circumference of a Cirde with radius 42 $=2\pi \times 42 = 264cm$

The Area of a Cirde with radius r $=\pi r^2=\pi(42)^2 = 5544cm^2$

The Circumference of the Cirde= Perimeter of the Square

$\Rightarrow$ Perimeter of the Square=264cm $\Rightarrow 4s = 264cm \Rightarrow s = 66cm$

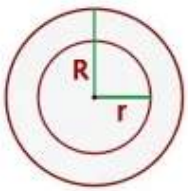
Area of a Square with side s $= 4s^2$

Area of a Square with side 66 $= 4(66)^2 = 4356cm^2$

Ratio of Area of the Circle to the Area of the Square=5544:4356=14:11

Answer 27.

We know,



The area of the ring between two concentric circles equals the area of the larger circle minus the area of smaller circle.

Let the radius of the outer and inner ring be R and r respectively.

Here the circular garden is the inner circle and the 7 m wide road is the ring

area of the ring between two concentric circles $=\pi(R^2 - r^2)$

The Area of a Cirde with radius r $=\pi r^2$

Here, $\pi r^2 = 5544m^2 \Rightarrow r = 42 \Rightarrow R = 42 + 7 = 49$

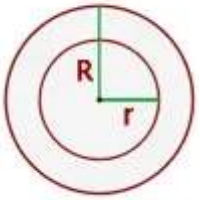
inner Cirde has radius r =42and outer Circle has radius R =49

$$\pi(49^2 - 42^2) = \frac{22}{7} \times (2401 - 1764) = \frac{22}{7} \times 637 = 2002m^2$$

The cost of paving the road at the rate of Rs 150 per m^2=2002x 150 = Rs 3,00,300

Answer 28.

We know,



The area of the ring between two concentric circles equals the area of the larger circle minus the area of smaller circle.
Let the radius of the outer and inner ring be R and r respectively.
Here the circular garden is the inner circle and the 7 m wide road is the ring

The Circumference of a Circle with radius r $=2\pi r$

Here $2\pi r = 176 \Rightarrow r = \frac{176}{2\pi} = \frac{176 \times 7}{2 \times 22} = 28$

$\Rightarrow r = 28m \Rightarrow R = 28 + 4.2 = 32.2m$

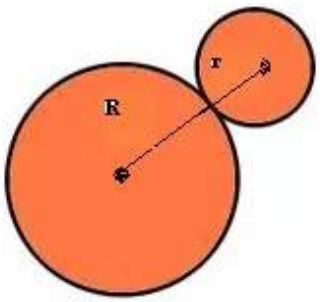
inner Circle has radius r =28m and outer Circle has radius R =32.2m

$\pi\left(32.2^2 - 28^2\right) = \frac{22}{7} \times (1036.84 - 784) = \frac{22}{7} \times 252.84 = 794.64m^2$

The cost of paving the road at the rate of Rs 150 per m^2=794.64x 75 = Rs 59,598

Answer 29.

Let one of the two circles touching externally have a radius of R and the other have radius r



Given R + r = 10 cm . So, R = 10 – r

The Area of a Circle with radius r $=\pi r^2$

The Area of a Circle with radius R $=\pi R^2$

Sum of the areas of the two circles $=\pi r^2 + \pi R^2 = \pi\left(r^2 + R^2\right) = 58\pi$

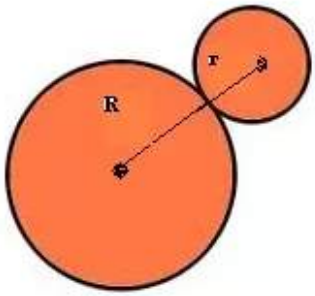
$\Rightarrow r^2 + R^2 = 58 \Rightarrow r^2 + (10 - r)^2 = 58$

$\Rightarrow r^2 + 100 + r^2 - 20r = 58$

$\Rightarrow 2r^2 - 20r + 42 = 0$
$\Rightarrow r^2 - 10r + 21 = 0$
$\Rightarrow r^2 - 7r - 3r + 21 = 0$
$\Rightarrow r(r-7) - 3(r-7) = 0$
$\Rightarrow (r-7)(r-3) = 0$
$\Rightarrow r = 7, 3$
So,one of the two circles touching externally has a radius of 7 cm and the other have radius 3 cm

Answer 30.

Let one of the two circles touching externally have a radius of R and the other have radius r

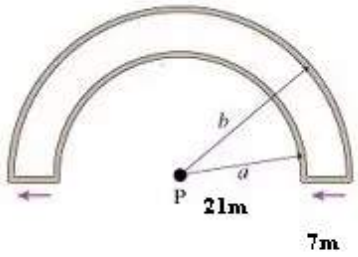


Given $2R + 2r = 112$ cm $R + r = 56$ cm . So, $R = 56 - r$

The Area of a Cirde with radius $r = \pi r^2$
The Area of a Cirde with radius $R = \pi R^2$
Sum of the areas of the two circles $= \pi r^2 + \pi R^2 = \pi(r^2 + R^2) = 5236$

$\Rightarrow r^2 + R^2 = 1666 \Rightarrow r^2 + (56$
$\Rightarrow 2r^2 - 112r + 1470 = 0$
$\Rightarrow r^2 - 56r + 735 = 0$
$\Rightarrow r^2 - 35r - 21r + 735 = 0$
$\Rightarrow r(r-35) - 21(r-35) = 0$
$\Rightarrow (r-35)(r-21) = 0$
$\Rightarrow r = 35, 21$
So,one of the two circles touching externally has a radius of 35 cm and the other has radius 21 cm.

Answer 32.



There are two concentric semi circles. The diameter of the inner circle = 42 or radius, a = 21 m. The radius of the outer circle, b = 21+7 =28 m.

Because the radius of a Cirde with diameter d is $r = \frac{d}{2}$

The Area of the inner Semi-cirde with radius a $= \frac{\pi a^2}{2} = \frac{\pi 21^2}{2}$

∴ The Area of the outer Semi-cirde with radius b $= \frac{\pi b^2}{2} = \frac{\pi 28^2}{2}$

andThe Area of a Semi-circle with radius r $= \frac{\pi r^2}{2}$

The Area of the flower bed $= \frac{\pi 28^2}{2} - \frac{\pi 21^2}{2} = \frac{\pi}{2}(28^2 - 21^2)$

$= \frac{\pi}{2}(784 - 441) = \frac{\pi}{2}(343) = \frac{22}{7 \times 2}(343) = 539 m^2$

Answer 35.

Area of the ring between two concentric circles $= \pi(R^2 - r^2)$

Where R and r are the radii of the outer and the inner circle respectively

Here there are three concentric circles,
the innermost of radius 6.3 cm , the second of radius 8.4 cm and
the outermost of radius x cm (say)

$\Rightarrow \pi(8.4^2 - 6.3^2) = \pi(x^2 - 8.4^2)$

$\Rightarrow \pi(2 \times 8.4^2 - 6.3^2) = \pi x^2$

$\Rightarrow (2 \times 8.4^2 - 6.3^2) = x^2$

$\Rightarrow (141.12 cm^2 - 39.69 cm^2) = x^2$

$\Rightarrow x^2 = 101.43 cm^2$

$\Rightarrow x = 10.07 cm$

Answer 36.

The area of a rectangle with length l and breadth b = A = $l \times b$

he area of a rectangle with length 44 cm and breadth 28 cm = A = $44 \times 28 = 1232 cm^2$

The largest circle that can be cut from a rectangle of length 44 cm and breadth 28 cm can have diameter 28 cm or radius $\frac{28}{2} = 14cm$

The Area of a Circle with radius r = πr^2

The Area of a Circle with radius 14 = $\pi(14)^2 = 616cm^2$

Remaing area = $1232cm^2 - 616cm^2 = 616cm^2$