Chapter 19. Mensuration I

Ex 19.1

Answer 4.

Circumference = 396 m

$2\pi r = 396$

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

$r = 396m \times \frac{7}{22} \times \frac{1}{2}$

$r = 63m$

Area = πr^2

$= \frac{22}{7} \times 63 \times 63$

$= 12474m^2$

Area of the circular field = 12474 m^2

Answer 5.

Area = πr^2

$\pi r^2 = 81\pi$

$r^2 = 81$

$r = 9cm$

Circumference $= 2\pi r$

$= 2 \times \pi \times 9$

$= 18\pi cm$

Circumference $= 18\pi$ cm

Answer 6.

Diameter of the wheel = 1.4 m

Circumference = $2\pi r = \pi d$

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

Circumference = 8.8 m

Distance travelled = 2.2 km = 2200 m

No. of revolutions =

$$= \frac{2200}{4.4}$$
$$= 500$$

Wheel makes 500 revolutions in travelling 2.2 km

Answer 7.

Circumference = $2\pi r = \pi d$

$$= \frac{22}{7} \times 70$$
$$= 220\text{cm} = 2.2\text{m}$$

Circumference = 2.2 m

No. of revolutions = 10 per second

No. of revolutions per hour = $10 \times 60 \times 60 = 36000$

Distance covered in one hour = $36000 \times 2.2 = 79200\text{m/hour}$

Speed of the car in km/hour = $\frac{79200}{1000} = 79.2\text{km/hour}$

Speed = 79.2 km/hr

Answer 8.

Circumference $= 2\pi r = \pi d$

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

$$= 440\text{cm} = 4.4\text{m}$$

Circumference $= 4.4$ m

Distance travelled in one hour $= 66\text{km} = 66000\text{m}$

Distance travelled in one minute $= \frac{66000}{60} = 1100\text{m}$

No. of revolutions in one minute $= \frac{\text{Distance}}{\text{circumference}}$

$$= \frac{1100}{4.4}$$

$$= 250$$

No. of revolutions made by each wheel $= 250$ rpm.

Answer 9.

Circumference $= 2\pi r = \pi d$

$$= \frac{22}{7} \times 42$$

$$= 132\text{cm} = 1.32\text{m}$$

Circumference $= 1.32$m

No. of revolutions $= 9$ per second

No. of revolutions per hour $= 9 \times 60 \times 60 = 32400$

Distance covered in one hour $= 32400 \times 1.32 = 42768\text{m/hour}$

Speed of the wheel in km/hour=

$$\frac{42768}{1000} = 42.768\text{km/hour} = 43\text{km/hr}$$

Speed $= 43$ km/hr

Answer 10.

Diameter of the wheel = 35 cm

Circumference = $2\pi r = \pi d$

$$= \frac{22}{7} \times 35$$

$$= 110\text{cm}$$

Circumference = 110 cm

Time taken by the bucket = 2 min. = 2 x 60 = 120 seconds

Speed of the rope = 1.1 m/s

Length of the rope = 120 x 1.1 = 132m

No. of revolutions = $= \frac{132 \times 100}{110} = 120$

No. of revolutions made by rope = 120

Answer 11.

Circumference = 280 cm = 2.8m

Distance travelled = 490 m

No. of revolutions = $\frac{490}{2.8} = 175$

Roller takes 175 revolutions in moving 490 m

Answer 12.

Diameter $= 4\frac{5}{11}\text{cm} = \frac{49}{11}\text{cm}$

Circumference $= 2\pi r = \pi d$

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

Circumference $= 14\text{ cm} = 0.14\text{m}$

Distance travelled $= 6.3\text{ km} = 6300\text{ m}$

No. of revolutions $= \frac{6300}{0.14} = 45000$

Wheel takes 45000 revolutions in moving 6.3 km

Answer 13.

Let r cm be the radius of inner circle.

Radius of outer circle $= (r+1)$ cm

Area of circular ring = Area of outer circle − area of inner circle

$\Rightarrow \pi(r+1)^2 - \pi r^2 = 88$
$\Rightarrow \pi(r^2 + 2r + 1) - \pi r^2 = 88$
$\Rightarrow \pi r^2 + 2\pi r + \pi - \pi r^2 = 88$
$\Rightarrow \frac{22}{7}(2r+1) = 88$
$\Rightarrow 2r + 1 = 88 \times \frac{7}{22}$
$\Rightarrow 2r + 1 = 28$
$\Rightarrow 2r = 27$
$\Rightarrow r = \frac{27}{2} = 13.5\text{cm}$

$(r+1) = 13.5+1 = 14.5$ cm

Therefore, radii are 13.5 cm and 14.5 cm.

Answer 14.

Area between two concentric circles = Area of larger circle – area of smaller circle

Area of circle = πr^2

Radius of bigger circle = r1 = 13 cm

Radius of smaller circle = r2 = 6 cm

Required Area = $\pi r1^2 - \pi r2^2$

$$= \left(\frac{22}{7} \times 13 \times 13\right) - \left(\frac{22}{7} \times 6 \times 6\right)$$
$$= 531.1429 - 113.1429$$
$$= 418 cm^2$$

Hence, required area = 418 cm^2

Answer 16.

Area of the square = 484 cm^2

Side of the square = $\sqrt{484} = 22cm$

Perimeter of the square = $4 \times 22 = 88cm$

Perimeter of square = perimeter of circle

$2\pi r = 88$

$$r = 88 \times \frac{7}{22} \times \frac{1}{2}$$

$r = 14cm$

Radius of circle = 14 cm

Area of circle = πr^2

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

Hence, area of the circle = 616 cm^2

Answer 17.

f equilateral triangle $= 121\sqrt{3}\,cm^2$

$$\Rightarrow \frac{s^2\sqrt{3}}{4} = 121\sqrt{3}$$
$$\Rightarrow s^2 = 484$$
$$\Rightarrow s = 22cm$$

Side of the triangle = 22 cm

Perimeter of the triangle = $3 \times 22 = 66$ cm

Perimeter of the circle = perimeter of the triangle

$$\Rightarrow 2\pi r = 66$$
$$\Rightarrow r = 66 \times \frac{7}{22} \times \frac{1}{2}$$
$$\Rightarrow r = 10.5cm$$

Radius of circle = 10.5 cm

Area of circle = πr^2

$$= \frac{22}{7} \times 10.5 \times 10.5$$
$$= 346.5cm^2$$

Hence, area of the circle = 346.5 cm^2

Answer 18.

of the circle with radius 7 cm = πr^2

$$= \frac{22}{7} \times 7 \times 7$$
$$= 154 cm^2$$

Area of new circle = 25 x area of the circle with radius 7 cm

$$= 25 \times 154\, cm^2$$

$$= 3850\ cm^2$$

Therefore,

$$\pi R^2 = 3850$$
$$R^2 = 3850 \times \frac{7}{22}$$
$$R^2 = 1225$$
$$R = 35 cm$$

Radius of new circle = 35 cm

Circumference of new circle = $2\pi R$

$$= 2 \times \frac{22}{7} \times 35$$
$$= 220 cm$$

Hence, Circumference of new circle = 220 cm

Answer 19.

Area of the square = 484 m^2

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

Perimeter of the square = $4 \times 22 = 88m$

Perimeter of square = circumference of circle

$$2\pi r = 88$$

$$r = 88 \times \frac{7}{22} \times \frac{1}{2}$$

$$r = 14m$$

Radius of circle = 14 m

Area of circle = πr^2

$$= \frac{22}{7} \times 14 \times 14$$

$$= 616m^2$$

Hence, area of the circle = 616 m^2

Answer 20.

us of the circle = 42 cm

Area of the circle = πr^2

$$= \frac{22}{7} \times 42 \times 42$$
$$= 5544 cm^2$$

Area of the circle = 5544 cm^2

Circumference of the circle = $2\pi r$

$$= 2 \times \frac{22}{7} \times 42$$
$$= 264 cm$$

Perimeter of the square = Circumference of the circle = 264 cm

$$4 \times side = 264$$
$$side = \frac{264}{4} = 66 cm$$

Side of square =66 cm

Area of square = $side^2$ = 66 x 66 = 4356 cm^2

Area of the circle: Area of square= $\frac{5544}{4356} = \frac{14}{11}$

Side of square = 66 cm

Area of the circle: Area of square = 14 : 11

Answer 21.

rea of garden = 5544 m^2

Radius of circular garden=

$$\pi r^2 = 5544$$
$$r^2 = 5544 \times \frac{7}{22}$$
$$r^2 = 1764$$
$$r = 42m$$

Radius of circular garden = 42 m

Radius of garden with surrounding road =R = 42 + 7 m = 49 m

Area of garden with surrounding road=πR^2

$$= \frac{22}{7} \times 49 \times 49$$
$$= 7546m^2$$

Area of garden with surrounding road = 7546 m^2

Area of road = Area of garden with surrounding road – area of garden

= 7546 – 5544 m^2

= 2002 m^2

Area of road = 2002 m^2

Cost of tarring one sq m = Rs. 150

Cost of tarring area of road = Rs.(150 x 2002) = Rs 3,00,300

Cost of tarring the road = Rs. 3,00,300

Answer 22.

Circumference of the plot = 176 m

Radius of the circular plot =

$$2\pi r = 176$$

$$r = 176 \times \frac{7}{22} \times \frac{1}{2}$$

$$r = 28m$$

Radius of circular plot = 28 m

Area of circular plot = πr^2

$$= \frac{22}{7} \times 28 \times 28$$

$$= 2464m^2$$

Area of circular plot = 2464 m^2

Radius of circular plot with surrounding road= R = (28 + 4.2) m= 32.2 m

Area of circular plot with surrounding road = πR^2

$$= \frac{22}{7} \times 32.2 \times 32.2$$

$$= 3258.64m^2$$

Area of circular plot with surrounding road =3258.64 m^2

Area of road = Area of circular plot with surrounding road- Area of circular plot

$$= (3258.64 - 2464)\ m^2$$

$$= 794.64\ m^2$$

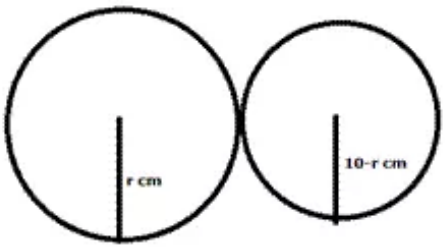
Area of road = 794.64 m^2

Cost of paving one sq m = Rs. 75

Cost of paving the road = Rs (75 x 794.64) = Rs. 59,598

Cost of paving the road = Rs. 59,598

Answer 23.



Let r be radius of one circle, so the radius of other circle is (10-r)

Sum of the areas = $\pi r^2 + \pi(10-r)^2$

$\Rightarrow \pi r^2 + \pi(10-r)^2 = 58\pi$
$\Rightarrow \pi r^2 + \pi(100-20r+r^2) = 58\pi$
$\Rightarrow r^2 + 100 - 20r + r^2 = 58$
$\Rightarrow 2r^2 + 100 - 20r - 58 = 0$
$\Rightarrow 2r^2 - 20r + 42 = 0$
$\Rightarrow r^2 - 10r + 21 = 0$
$\Rightarrow (r-7)(r-3) = 0$
$\Rightarrow r = 7, r = 3$

Therefore, radii of the two circles is 7cm and 3 cm

Answer 24.

Sum of the diameters = 112 cm

Therefore, sum of the radii $= \frac{112}{2}\text{cm} = 56\text{cm}$

If r is the radius of one circle, radius of other circle is (56-r)

Sum of the areas $= \pi r^2 + \pi(56-r)^2$

$\Rightarrow \pi r^2 + \pi(56-r)^2 = 5236$

$\Rightarrow \pi r^2 + \pi(3136 - 112r + r^2) = 5236$

$\Rightarrow (r^2 + 3136 - 112r + r^2) \times \frac{22}{7} = 5236$

$\Rightarrow 2r^2 - 112r + 3136 = 1666$

$\Rightarrow 2r^2 - 112r + 3136 - 1666 = 0$

$\Rightarrow 2r^2 - 112r + 1470 = 0$

$\Rightarrow r^2 - 56r + 735 = 0$

$\Rightarrow (r-35)(r-21) = 0$

$\Rightarrow r = 35, r = 21$

Therefore, radii of the two circles is 35 cm and 21 cm

Answer 25.

The sum of the radii = 10.5 cm

$r_1 + r_2 = 10.5$ cm .....(i)

The difference of circumferences = 13.2 cm

$2\pi(r_1 - r_1) = 13.2$

$r_1 - r_2 = \frac{13.2}{2\pi}$

$r_1 - r_2 = \frac{13.2 \times 7}{2 \times 22}$

$r_1 - r_2 = 2.1$.....(ii)

Adding (i) and (ii)

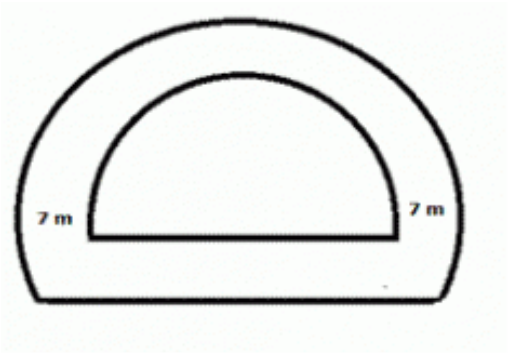
$2r_1 = 12.6$

$r_1 = 6.3$ cm

Therefore, r_2 = (10.5 - 6.3) cm = 4.2 cm

Hence, the two radii are 6.3 cm and 4.2 cm

Answer 26.



Diameter of the inner semi-circle = 42 m

Hence, radius of the inner semi-circle = r = 21 m

Width of the flower bed = 7m

Diameter of the outer semi-circle = (42 + 2 x 7) m = 56 m

Hence, radius of the outer semi-circle = R = 28 m

Area of the semicircular flower bed = Area of outer semi-circle – area of inner semi-circle

$$= \frac{1}{2}\pi R^2 - \frac{1}{2}\pi r^2$$

$$= \frac{1}{2}\pi(R^2 - r^2)$$

$$= \frac{1}{2} \times \frac{22}{7} \times (28^2 - 21^2)$$

$$= \frac{1}{2} \times \frac{22}{7} \times (784 - 441)$$

$$= \frac{1}{2} \times \frac{22}{7} \times 343$$

$$= 539 m^2$$

Answer 27.

s of innermost circle = r1 = 6.3 cm

Radius of central circle = r2 = 8.4 cm

Area between two inner circles = $\pi r2^2 - \pi r1^2$

$= \pi(8.4)^2 - \pi(6.3)^2$
$= 70.56\pi - 39.69\pi$ .....(i)
$= 221.76 - 124.74$
$= 97.02 cm^2$

Area between two inner circles = 97.02 cm^2

Let radius of third circle be r

Area between next two circles = $\pi r^2 - \pi r2^2$

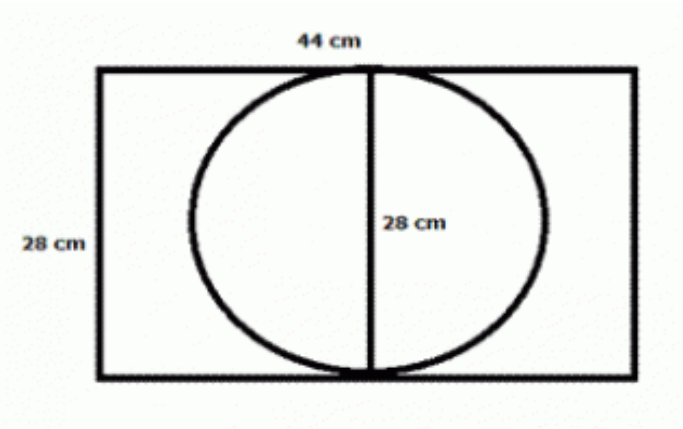
$= \pi r^2 - \pi(8.4)^2$
$= \pi r^2 - 70.56\pi$.....(II)

Given that (i) and (ii) are equal

$\Rightarrow \pi r^2 - 70.56\pi = 70.56\pi - 39.69\pi$
$\Rightarrow r^2 - 70.56 = 70.56 - 39.69$
$\Rightarrow r^2 = 70.56 - 39.69 + 70.56$
$\Rightarrow r^2 = 101.43$
$\Rightarrow r = 10.07 cm$

Therefore, radius of third circle is 10.07 cm

Answer 28.



Area of piece of paper = 44 x 28 = 1232 cm^2

The biggest circle that can be cut from rectangular piece of paper is of diameter 28 cm (ie. Radius 14 cm).

Area of circle = πr^2

$$= \frac{22}{7} \times 14 \times 14$$

$$= 616 cm^2$$

Area of the circle = 616 cm^2

Area of paper left = area of paper – area of circle

= (1232 – 616) cm^2

= 616 cm^2

Therefore, area of paper left = 616 cm^2

Answer 30.

An equilateral triangle has all angles of 60 degrees

The horse will be able to graze over a sector of a circle of radius 21cm and angle 60, so

$$\text{Area} = \frac{60°}{360°} \pi r^2$$

$$= \frac{60°}{360°} \times \frac{22}{7} \times 21 \times 21$$

$$= 231 m^2$$

Horse can graze in 231 m^2