02/04/2021

Ch-13
Area related to circles
Exercise 13.1

Q.1 $r = 4.2$ cm

Circumference $= 2\pi r$

$= 2 \times \frac{22}{7} \times 0.6$

$= \boxed{26.4 \text{ cm}}$

Area $= \pi r^2$

$= \frac{22}{7} \times 4.2 \times 4.2$

$= \boxed{55.44 \text{ cm}^2}$ ✓

Q.2 Area of circle $= 301.84 \text{ cm}^2$

ATQ,

$\pi r^2 = 301.84$

$\frac{22}{7} \times r^2 = 301.84$

$r^2 = 301.84 \times 7$

$r^2 = \frac{30184}{100} \times 7$

$r = \sqrt{\frac{9604}{100}}$

$r = \frac{98}{10}$

$r = 9.8 \text{ cm}$

Circumference $= 2\pi r$

$= 2 \times \frac{22}{7} \times 9.8$

$= \boxed{61.6 \text{ cm}}$ ✓

Q.3 Circumference of circle = 44 cm

ATQ,

$$2\pi r = 44$$

$$r = \frac{44 \times 7}{22 \times 2}$$

$$r = 7 \text{ cm}$$

Area $= \pi r^2$

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

$$= \boxed{154 \text{ cm}^2}$$ ✓

Q.4 Let the radius of the circle be r.

ATQ,

Circumference − Diameter = 16.8 cm

$$2\pi r - 2r = 16.8$$

$$2r(\pi - 1) = 16.8$$

$$\left(2 \times \frac{22}{7} \times r\right) - 2r = 16.8$$

$$\frac{(2 \times 22 \times r)}{7} - 14r = 16.8$$

$$44r - 14r = 16.8 \times 7$$

$$30r = 16.8 \times 7$$

$$r = \frac{16.8 \times 7}{30}$$

$$r = 3.92 \text{ cm}$$

Circumference $= 2\pi r$

$$= 2 \times \frac{22}{7} \times 3.92$$

$$= \boxed{24.64 \text{ cm}}$$ ✓

Q.5 Length of string = 28 m

Area where horse can graze = Area of circle

$= \pi r^2$

$= \frac{22}{7} \times 28^4 \times 28$

$= \boxed{2464 \text{ cm}^2}$ ✓

Q.6 Area of square = 121 cm^2

ATQ,

$(\text{side})^2 = 121$

$\text{side} = \sqrt{121}$

$\text{side} = 11 \text{ cm}$

Perimeter of square = Circumference of circle

$4 \times \text{side} = 2\pi r$

$4 \times 11 = 2 \times \frac{22}{7} \times r$

$r = \frac{2 \times 11 \times 7}{2 \times 2}$

$r = 7 \text{ cm}$

Area of circle $= \pi r^2$

$= \frac{22}{7} \times 7 \times 7$ ✓

$= \boxed{154 \text{ cm}^2}$

Q.7 Ratio of circumference of two circles = 2:3

ATQ,

$\frac{\text{circumference of 1st circle}}{\text{circumference of 2nd circle}} = \frac{2}{3}$

$$\frac{2\pi r_1}{2\pi r_2} = \frac{2}{3}$$

$$\frac{r_1}{r_2} = \frac{2}{3}$$

$$\therefore \frac{\text{Area of } 1^{st} \text{ circle}}{\text{Area of } 2^{nd} \text{ circle}} = \frac{\pi r_1^2}{\pi r_1^2}$$

$$= \frac{(2)^2}{(3)^2} = \frac{4}{9}$$

$\therefore$ Ratio of area of two circles $= \boxed{4:9}$

Q.8 Let the radii of the 1st & 2nd circles be x & y respectively.

ATQ, $x + y = 140$ ——— ①

$$2\pi x - 2\pi y = 88$$

$$\left(2 \times \frac{22}{7} \times x\right) - \left(2 \times \frac{22}{7} \times y\right) = 88$$

$$2 \times \frac{22}{7}(x - y) = 88$$

$$x - y = \frac{88 \times 7}{2 \times 22}$$

$$x - y = 14 \text{ ——— } ②$$

Add ① & ②

$$x + y = 140$$

$$(+)\ x - y = 14$$

$$2x = 154$$

$$\boxed{x = 77 \text{ cm}}$$

Putting value of x in (1)

$$x + y = 140$$
$$77 + y = 140$$
$$y = 140 - 77$$
$$\boxed{y = 63 \text{ cm}}$$

Diameter of first circle $= 2x = 2 \times 77 = \boxed{154 \text{ cm}}$

Diameter of second circle $= 2y = 2 \times 63 = \boxed{126 \text{ cm}}$

Q.9 Radii of two circles = 15 cm, 18 cm

A.T.Q,

~~Circumference of circle~~

$$2\pi r = 2\pi 15 + 2\pi 18$$
$$2\pi r = 2\pi (15 + 18)$$
$$\boxed{r = 33 \text{ cm}}$$

$\therefore$ Radius of circle = $\boxed{33 \text{ cm}}$

05/04/2021

classmate
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Ch - 13

Exercise 13.1

Q.12 Area of circular playground = 22176 m^2

ATQ,

$$\pi r^2 = 22176$$

$$\frac{22}{7} r^2 = 22176$$

$$r^2 = \frac{22176 \times 7}{22}$$ (1008)

$$r = \sqrt{7056}$$

$$r = 84 \text{ m}$$

circumference $= 2\pi r$

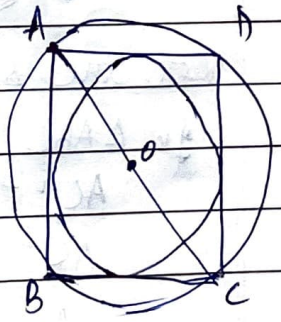
$$= 2 \times \frac{22}{7} \times 84$$ (12)

$$= 528 \text{ m}$$

Cost of fencing @ ₹50/m $= 528 \times 50$

$$= \boxed{₹\ 26,400}$$

Q.13 Side of square = 10 cm



For inscribed circle,

side of square = diameter

$\therefore r = \frac{10}{2} = 5$ cm

Area of inscribed circle $= \pi r^2 = \frac{22}{7} \times 5 \times 5$

$$= \boxed{78.57 \text{ cm}^2}$$

For circumscribed circle,

Diagonal of square ⇒ Diameter.

$\therefore (\text{Diagonal})^2 = (\text{side}_1)^2 + (\text{side}_2)^2$ [Pythagoras theorem]

$(\text{Diagonal})^2 = (10)^2 + (10)^2$

$(\text{Diagonal})^2 = 100 + 100$

$\text{Diagonal} = \sqrt{200}$

$\text{Diagonal} = 10\sqrt{2}$ cm

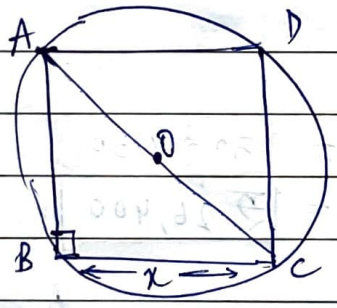
Area of circumscribed circle $= \pi r^2$

$= \frac{22}{7} \times \frac{10\sqrt{2}}{2} \times \frac{10\sqrt{2}}{2}$

$= \frac{22}{7} \times \frac{200}{4}^{50}$

$= \frac{1100}{7} = \boxed{157.14 \text{ cm}^2}$

Q.14



Let the side of square be x.

In ΔABC,

$AC^2 = AB^2 + BC^2$

$AC^2 = x^2 + x^2$

$AC = \sqrt{2x^2}$

$AC = \sqrt{2}x$ cm

AC is the diameter of the circle.

$r = \frac{\sqrt{2}x}{2}$ cm

Area of circle = πr^2

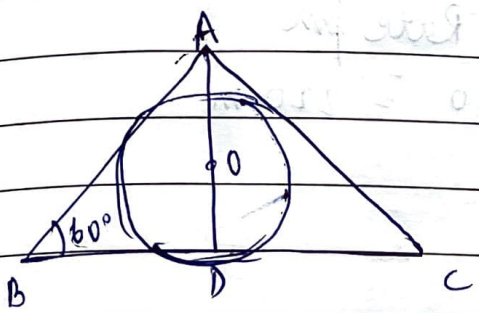
Area of square = $(side)^2$

$= \frac{\pi\left(\frac{\sqrt{2}x}{2}\right)^2}{x^2} = \frac{\pi\left(\frac{2x^2}{4}2\right)}{x^2}$

$= \frac{\pi x^2}{2x^2} = \frac{\pi}{2}$

Ratio = $\boxed{\pi : 2}$

Q.15



Area of circle = 154 cm^2

$\pi r^2 = 154$

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

$r = \sqrt{7 \times 7}$

$r = 7$ cm

Since $\triangle ABC$ is equilateral, the centre O is a centroid & hence, divides AD in ratio 2:1

$\therefore$ AD = $3r = 3 \times 7 = 21$ cm

In $\triangle ABD$,

$\sin 60° = \frac{AD}{AB}$

$\frac{\sqrt{3}}{2} = \frac{21}{AB}$

$AB = \frac{21 \times 2}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$AB = \frac{14\sqrt{3}}{1}$

$AB = 14\sqrt{3}$ cm

$\therefore$ Perimeter of Δ = 3 × side

= 3 × $14\sqrt{3}$

= 42 × 1.73

= 72.7 cm

Q.16 Cost of fencing = ₹ 2640

Rate of fencing = ₹ 12 /m

Circumference = $\frac{\text{Cost}}{\text{Rate /m}}$

= $\frac{2640}{12}$ 220 = 220 m

ATQ,

$2\pi r = 220\text{ m}$

$r = \frac{220 \times 7}{2 \times 22}$

$r = 35\text{ m}$

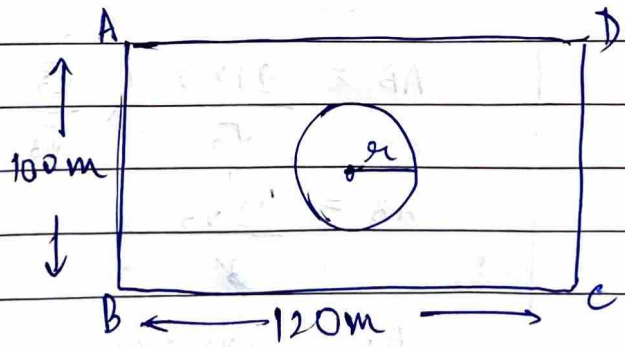
Area of circle = $\pi r^2 = \frac{22}{7} \times 35 \times 35$

= 3850 m^2

Rate of ploughing @ ₹ 0.5 per m^2 = 0.5 × 3850

= ₹ 1925

Q.17



l of park = 120 m

b of park = 100 m

Area of park = l × b

= 120 × 100

= 12000 m²

Area of park excluding lawn = 8700 m²

Area of lawn = 12000 − 8700

= 3300 m²

ATQ,

$$\pi r^2 = 3300$$

$$r^2 = \frac{3300 \times 7}{22}$$

$$r = \sqrt{1050}$$

$$r = \boxed{32.40 \text{ m}}$$

Q.18 Distance covered = 1 km = 1000 m

= 100000 cm

No. of revolutions = 450

Circumference of wheel = Distance covered in 1 revolution

$$= \frac{100000}{450}$$

$$= \frac{2000}{9} \text{ cm}$$

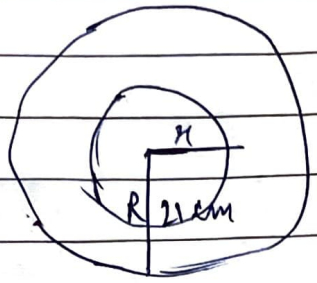
ATQ,

$$2\pi r = \frac{2000}{9}$$

$$r = \frac{2000 \times 7}{2 \times 22 \times 9} = \frac{14000}{396}$$

$$\boxed{r = 35.35 \text{ cm}}$$

Q.19

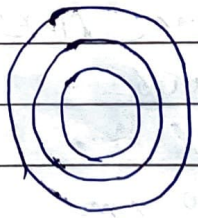


Let the radius of inner circle be r.
Radius of outer circle $(R) = 21$ cm

Area of enclosed between the concentric circles $= 770\ cm^2$

$$\pi R^2 - \pi r^2 = 770$$
$$\pi (R^2 - r^2) = 770$$
$$\pi (21^2 - r^2) = 770$$
$$441 - r^2 = \frac{770 \times 7}{22}$$
$$441 - r^2 = 245$$
$$r^2 = 441 - 245$$
$$r = \sqrt{196}$$
$$\boxed{r = 14\ cm}$$

Q.20



Ratio of diameter of concentric circles $= 1:2:3$
Let the diameter of concentric circles be x, $2x$ and $3x$ respectively

r_1 (inner circle) $= \frac{x}{2}$

r_2 (middle circle) $= \frac{2x}{2} = x$

r_3 (outer circle) $= \frac{3x}{2}$

Area of inner circle $= \pi r_1^2$

$= \pi \left(\frac{x}{2}\right)^2 = \frac{\pi x^2}{4}$

Area of middle circle $= \pi r_2^2$

$= \pi (x)^2 = \pi x^2$ ✓

Area of outer circle $= \pi r_3^2$

$= \pi \left(\frac{3x}{2}\right)^2 = \frac{\pi 9x^2}{4}$

Area enclosed between middle & inner circle $= \pi r_2^2 - \pi r_1^2$

$= \pi x^2 - \frac{\pi x^2}{4}$

$= \frac{4\pi x^2 - \pi x^2}{4} = \frac{3\pi x^2}{4}$

Area enclosed between outer & middle circle $= \pi r_3^2 - \pi r_2^2$

$= \frac{\pi 9x^2}{4} - \pi x^2$

$= \frac{\pi 9x^2 - 4\pi x^2}{4} = \frac{5\pi x^2}{4}$

Ratio of areas $= \frac{\pi x^2}{4} : \frac{3\pi x^2}{4} : \frac{5\pi x^2}{4}$ ✓

$= \boxed{1 : 3 : 5}$

6/04/2021

Ch-13
Exercise 13.1

Q.21 Radius of wheel = 35 cm = 0.35 m

Speed to be maintained = 66 km/h

$= \frac{66 \times 1000}{60}$

$= 1100$ m/min

circumference of wheel $= 2\pi r$

$= 2 \times \frac{22}{7} \times 0.35$

$= 2.2$ m

Distance covered in 1 min = 1100 m

$\therefore$ No. of revolutions $= \frac{1100}{2.2} = 500$

Q.22 Diameter of pond = 17.5 m

r of pond $= \frac{17.5}{2} = 8.75$ m



Area of pond $= \pi r^2$

$= \pi (8.75)^2$ m^2

r of pond with path $= 8.75 + 2 = 10.75$

Area of pond with park $= \pi r^2$

$= \pi (10.75)^2$ m^2

Area of path $= \pi (10.75)^2 - \pi (8.75)^2$

$= \pi [(10.75)^2 - (8.75)^2]$

$= \pi [(10.75 + 8.75)(10.75 - 8.75)]$

$= \frac{22}{7} [(19.5)(2)] = \frac{22}{7} \times 39$

$= \frac{858}{7}$

$= 122.5 \text{ m}^2$

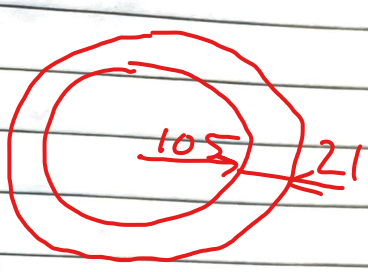
Cost of construction @ ₹ 25 per m^2 $= 25 \times 122.5$

$= \boxed{₹ 3062.5}$

Radius of park $= 105 \text{ m}$

Area of park $= \pi r^2$

$= \pi (105)^2 \text{ m}^2$



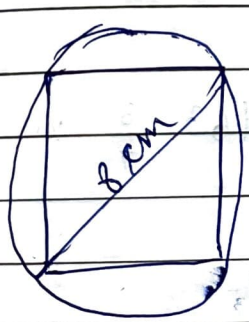
Radius of park with road $= 105 + 21$

$= 126 \text{ m}$

Area of park with road $= \pi r^2$

$= \pi (126)^2 \text{ m}^2$

Area of road $= \pi (126)^2 - \pi (105)^2$



Diameter of circle = Diagonal of square

$= 8 \text{ cm}$

r of circle $= 4 \text{ cm}$

~~Area of required region = Area of circle - Area of square~~

$= \pi r^2 -$

Diagonal of square $= 8 \text{ cm}$

$a\sqrt{2} = 8 \text{ cm}$

$$a = \frac{8\sqrt{2}}{\sqrt{2}}$$

$$\boxed{a = 4\sqrt{2}}$$

Area of required region = Area of circle - Area of square

$$= \pi r^2 - a^2$$

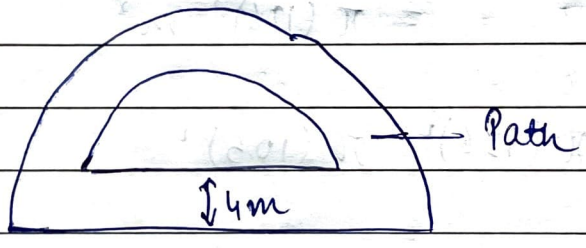
$$= \left(\frac{22}{7} \times 4 \times 4\right) - (4\sqrt{2})^2$$

$$= \frac{352}{7} - 32$$

$$= 50.28 - 32$$

$$= \boxed{18.28 \text{ cm}^2}$$

Q.25



Circumference of semi-circular grassy plot $= 163\frac{3}{7}$ m

ATQ,

$$2r + \pi r = \frac{1144}{7}$$

$$r(2 + \pi) = \frac{1144}{7}$$

$$r\left(\frac{2 + 22}{7}\right) = \frac{1144}{7}$$

$$r\left(\frac{36}{7}\right) = \frac{1144}{7}$$

$$r = \frac{\cancel{1144}^{286}}{\cancel{4}} \times \frac{\cancel{4}}{\cancel{36}9}$$

$$r = \frac{286}{9} \text{ m}$$

r of outer semi-circle = $\frac{286}{9} + 4$

$$= \frac{322}{9} \text{ m}$$

(i) Area of path = Area of outer semi circle − Area of inner semi circle

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

$$= \frac{1}{\cancel{2}} \times \frac{\overset{11}{\cancel{22}}}{7}\left[\left(\frac{322}{9}\right)^2 - \left(\frac{286}{9}\right)^2\right]$$

$$= \frac{11}{7}\left[\left(\frac{322}{9} + \frac{286}{9}\right)\left(\frac{322}{9} - \frac{286}{9}\right)\right]$$

$$= \frac{11}{7} \times \frac{608}{9} \times \frac{\cancel{36}4}{\cancel{9}} = \frac{26752}{63}$$

$$= \boxed{424.63 \text{ m}^2}$$

(ii) Cost of gravelling @ ₹ 1.50 per m^2 = 1.50×424.63

$$= \boxed{₹ 636.95}$$

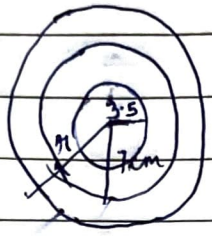
(iii) Area of plot = $\frac{1}{2}\pi r^2 = \frac{1}{2} \times \frac{22}{7} \times \frac{286}{9} \times \frac{286}{9}$

$$= \boxed{1586.87 \text{ m}^2}$$

Cost of turfing @ ₹ 0.45 / m^2 = 1586.87×0.45

$$= \boxed{₹ 714.09}$$

Q.26



r_1 of first circle = 3.5 cm
r_2 of second circle = 7 cm
Let the radius of third circle be r.

Area between first & second circle $= \pi r_2^2 - \pi r_1$
$= \pi (7)^2 - \pi (3.5)^2$
$= 49\pi - 12.25\pi$
$= 36.75\pi \text{ cm}^2$ ✓

Area between second & third circle $= \pi r_3^2 - \pi r_2^2$
$= \pi r^2 - \pi (7)^2$
$= (\pi r^2 - 49\pi) \text{ cm}^2$ ✓

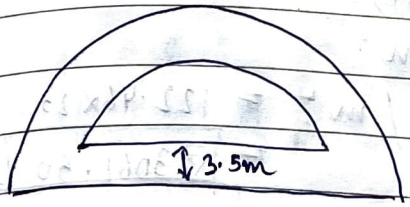
ATQ,

$$36.75\pi = \pi r^2 - 49\pi$$
$$36.75\pi + 49\pi = \pi r^2$$
$$85.75\pi = \pi r^2$$
$$r = \sqrt{85.75}$$
$$\boxed{r = 9.26 \text{ cm}}$$ ✓

Ch-13

Exercise 13.1

Q.27



Perimeter of semicircular ~~path~~ plot = 72 m

ATQ,

$$\pi r + 2r = 72 \text{ m}$$

$$r\left(2 + \frac{22}{7}\right) = 72$$

$$r = \frac{72 \times 7}{36}$$

$$r = 14 \text{ m}$$

r of outer semicircle = 14 + 3.5

= 17.5 m

Area of path = Area of outer semicircle − Area of plot

$$= \frac{1}{2}\pi (17.5)^2 - \frac{1}{2}\pi (14)^2$$

$$= \frac{1}{2}\pi \left[(17.5 + 14)(17.5 - 14)\right]$$

$$= \frac{1}{2} \times \frac{22}{7} \left[31.5 \times 3.5\right]$$

$$= \boxed{173.25 \text{ m}^2}$$

Q.28 r of pond = $\frac{17.5}{2}$ = 8.75 m

R of pond with path = 8.75 + 2 = 10.75 m

Area of path $= \pi (R^2 - r^2)$

$= \pi (10.75^2 - 8.75^2)$

$= 3.14 (115.5625 - 76.5625)$

$= 3.14 (39)$

$= 122.46 \text{ m}^2$

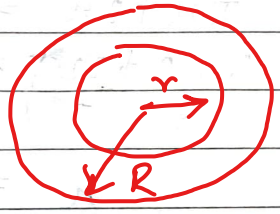
Cost of constructing @ ₹25/m² $= 122.46 \times 25$

$= ₹3061.50$

Q.29 Let the inner & outer radius be r & R respectively

Width of track = 14 m

Outer circumference = 528 m



ATQ,

$2\pi R = 528 \text{ m}$

$2 \times \frac{22}{7} \times R = 528$

$R = \frac{528 \times 7}{2 \times 22}$

$R = 84 \text{ m}$

Inner radius (r) $= 84 - 14$

$= 70 \text{ m}$

Area of track = Area of outer circle - Area of inner circle

$= \pi (R^2 - r^2)$

$= \frac{22}{7} (84^2 - 70^2)$

$= \frac{22}{7} (7056 - 4900) = \frac{22}{7} \times 2156$

$= 6776 \text{ m}^2$

Cost of levelling @ ₹ 0.50 / m² = 6776 × 0.5

= ₹ 3388

Q.30 Let the inner & outer radius be r & R respectively.

Width of road = 7 m

Circumference of park = 352 m

ATQ,

$2\pi r = 352\ m$

$r = \frac{352 \times 7}{2 \times 22}$

$r = 56\ m$

$R = 56 + 7$

$= 63\ m$

Area of road $= \pi (R^2 - r^2)$

$= \frac{22}{7} (63^2 - 56^2)$

$= \frac{22}{7} (63+56)(63-56)$

$= \frac{22}{7} \times 119 \times 7 = 2618\ m^2$

Q.31 Radius of inner circle = r } given

Width of path = a

Radius of outer circle = r + a

To prove - Area of path $= \pi a (2r + a)$

Proof - Area of path $= \pi (R^2 - r^2)$

$= \pi [(r+a)^2 - r^2]$

$= \pi (r^2 + a^2 + 2ra) - \pi r^2$