Ex - 12.1

NOTE: Unless stated otherwise, use $\pi = \frac{22}{7}$

Q1. The radii of two circles are 19 cm and 9 cm respectively. Find the radius of the circle which has circumference equal to the sum of the circumferences of the two circles.

Sol. The circumference of the circle having radius

$19 \text{ cm} = 2\pi \times 19 \text{ cm} = 38\pi \text{ cm}$ ($\because r = 19$ cm)

The circumference of the circle having radius

$9 \text{ cm} = 2\pi \times 9 \text{ cm} = 18\pi \text{ cm}$ ($\because r = 9$ cm)

Sum of the circumferences of the two circles

$= (38\pi + 18\pi) \text{ cm} = 56\pi \text{ cm}$

Therefore, if r cm be the radius of the circle which has circumference equal to the sum of the circumference of the two given circles, then

$2\pi r = 56\pi \Rightarrow r = 28$

Hence, the required radius is 28 cm.

Q2. The radii of two circles are 8 cm and 6 cm respectively. Find the radius of the circle having area equal to the sum of the areas of the two circles.

Sol. We have,

Radius of circle-I, $r_1 = 8$ cm

Radius of circle-II, $r_2 = 6$ cm

$\therefore$ Area of circle-I $= \pi r_1^2 = \pi(8)^2 \text{ cm}^2$

Area of circle-II $= \pi r_2^2 = \pi(6)^2 \text{ cm}^2$

Let the radius of the circle-III be R

$\therefore$ Area of circle-III $= \pi R^2$

$\Rightarrow \pi(8)^2 + \pi(6)^2 = \pi R^2$

$\Rightarrow \pi(8^2 + 6^2) = \pi R^2$

$\Rightarrow 8^2 + 6^2 = R^2$

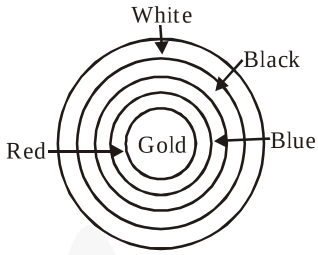
$\Rightarrow 64 + 36 = R^2$

$\Rightarrow 100 = R^2$

$\Rightarrow 10^2 = R^2 \Rightarrow R = 10$ cm

Thus, the radius of the new circle = 10 cm.

Q3. The fig. depicts an archery target marked with its five scoring regions from the centre outwards as Gold, Red, Blue, Black and White. The diameter of the region representing Gold score is 21 cm and each of the other bands is 10.5 cm wide. Find the area of each of the five scoring regions.



Sol. Radius of the Gold scoring region

$= \frac{21}{2}$ cm = 10.5 cm ($\because$ Diameter = 21 cm)

Therefore, the area of the Gold scoring region (circle)

$= \pi \times \left(\frac{21}{2}\right)^2 \text{cm}^2 = \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \text{cm}^2$

$= \frac{33 \times 21}{2} \text{cm}^2 = \frac{693}{2} \text{cm}^2 = 346.5 \text{ cm}^2$

Radius of the combined circular region scoring Gold and Red

= radius of Gold scoring region

width of the Red scoring band

= 10.5 cm + 10.5 cm = 21 cm

The area of the Red scoring region

= Combined area of Gold and Red scoring region – area of Gold scoring region.

$= \left\{\pi \times (21)^2 - \pi \times \left(\frac{21}{2}\right)^2\right\} \text{cm}^2$

$= \pi \times \left\{(21)^2 - \left(\frac{21}{2}\right)^2\right\} \text{cm}^2$

$= \frac{22}{7} \times \left\{\left(\frac{21}{2} \times 2\right)^2 - \left(\frac{21}{2}\right)^2\right\} \text{cm}^2$

$= \frac{22}{7} \times \left(\frac{21}{2}\right)^2 \times \{4 - 1\} \text{cm}^2 = \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \times 3 \text{ cm}^2$

$= \frac{693}{2} \times 3 \text{ cm}^2 = \frac{2079}{2} \text{cm}^2 = 1039.5 \text{ cm}^2$

Radius of the combined circular region scoring Gold, Red and Blue.

= 10.5 cm + 10.5 cm + 10.5 cm = 31.5 cm

$= \frac{63}{2}$ cm

Then, area of the Blue scoring region = {Combined area of Gold, Red and Blue scoring regions}

– {Combined area of Gold and Red scoring regions}

$= \pi \times \left(\frac{63}{2}\right)^2 - \pi \times (21)^2 = \pi \times (21)^2 \times \left\{\frac{9}{4} - 1\right\}$

$= \frac{22}{7} \times 21 \times 21 \times \frac{5}{4} cm^2 = \frac{11 \times 63 \times 5}{2} cm^2$

$= 1732.5\ cm^2$

Similarly, we find the area of the black scoring region

$= \{\pi \times (31.5 + 10.5)^2 - \pi \times (31.5)^2\}\ cm^2$

$= \left\{\pi \times (42)^2 - \pi \times \left(\frac{63}{2}\right)^2\right\} cm^2$

$= \pi \times (21)^2 \times \left\{4 - \frac{9}{4}\right\} cm^2 = \frac{22}{7} \times 21 \times 21 \times \frac{7}{4} cm^2$

$= \frac{231 \times 21}{2} cm^2 = \frac{4851}{2} cm^2 = 2425.5\ cm^2$

Now, the area of the white scoring region

$= \{\pi \times (42 + 10.5)^2 - \pi \times (42)^2\}\ cm^2$

$= \left\{\pi \times \left(\frac{105}{2}\right)^2 - \pi \times (42)^2\right\} cm^2$

$= \pi \times (21)^2 \times \left\{\frac{25}{4} - 4\right\} cm^2$

$= \frac{22}{7} \times 21 \times 21 \times \frac{9}{4} cm^2$

$= \frac{6237}{2} cm^2 = 3118.5\ cm^2$

Q4. The wheels of a car are of diameter 80 cm each. How many complete revolutions does each wheel make in 10 minutes when the car is travelling at a speed of 66 km per hour?

Sol. Diameter of the wheel of the car = 80 cm

Then, the radius of the wheel of the car

= 40 cm = 0.4 cm

Distance travelled by the car when the wheel of the car completes one revolution

$= 2\pi \times (0.4)\ m = \frac{4\pi}{5} m$

Let us suppose the wheel of the car completes n revolutions in 10 minutes when travelling at the speed of 66 km per hour. Then distance travelled by making n complete revolution of the wheel in 10 minutes

$= \left(\frac{4\pi}{5} \times n\right) m$

Also, distance travelled in 60 minutes

$= 66\ km = 66 \times 1000\ m$

Then the distance travelled in 10 minutes

$= \frac{66 \times 1000}{60} \times 10\ m = 11000\ m$

Therefore, we have $\frac{4\pi}{5} \times n = 11000$

($\because$ Distance travelled in 10 minutes is same)

$\Rightarrow \frac{4}{5} \times \frac{22}{7} \times n = 11000$

$\Rightarrow n = \frac{11000 \times 5 \times 7}{4 \times 22} = 125 \times 35 = 4375$

Hence, the number of complete revolutions made by the wheel in 10 minutes is 4375.

Q5. Tick the correct answer in the following and justify your choice. If the perimeter and area of a circle are numerically equal, then the radius of the circle is

(A) 2 units (B) π units (C) 4 units (D) 7 units

Sol. (A) We have

[Numerical area of the circle]

$\Rightarrow \pi r^2 = 2\pi r$

$\Rightarrow \pi r^2 - 2\pi r = 0$

$\Rightarrow r^2 - 2r = 0$

$\Rightarrow r(r - 2) = 0$

$\Rightarrow r = 0$ or $r = 2$

But r cannot be zero

$\therefore$ r = 2 units.

Thus, the radius of circle is 2 units.