AREAS RELATED TO CIRCLES

INTRODUCTION

SUBJECT : MATHEMATICS
CHAPTER NUMBER: 12
CHAPTER NAME : AREAS RELATED TO CIRCLES

1. Students will be able to know the concept of area and circumference of circle.

2.Students will be able to use the concept of area and circumference of circle in daily life situations.

3.Students will be able to analyze word problems involving area and circumference of circle and find solutions.

The set of all points in a plane which are at a fixed distance from a fixed point in the plane is called circle. The fixed point is called centre and the fixed distance is called radius of the circle

Circumference and Area of a Circle
(i) The circumference of a circle is defined as distance covered by travelling once around a circle and is given by C = 2πr = πd
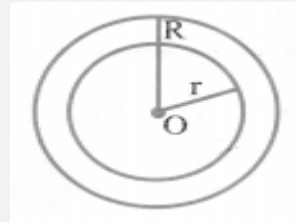where r = radius of the circle and d = diameter of the circle.
(ii) The Area of a circle of radius r is given by,
A = π r^2.
(iii) Area of a circular ring:
The area of the circular path or ring is given by the difference of the area of outer circle and the area of inner circle.
Area of circular ring = $(R^2 – r^2)$

Why study areas related to circles:
https://youtu.be/cY4huPW85HU {6.52}

Problem solving on areas related to circles:
; https://youtu.be/NUhHyZjdzRU {8.03}

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

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Given: radius of 1st circle (R_1) = 19 cm

$\therefore$ Circumference of 1st circle = $2\pi R_1$ = $2\pi(19)$ cm

Radius of 2nd circle (R_2) = 9 cm

$\therefore$ Circumference of 2nd circle = $2\pi R_2$ = $2\pi(9)$ cm

Let radius of 3rd circle be R_3

Circumference of 3rd circle = $2\pi R_3$

According to question,

$2\pi R_1 + 2\pi R_2 = 2\pi R_3$

$\Rightarrow 2\pi(R_1 + R_2) = 2\pi R_3$

$\Rightarrow R_1 + R_2 = R_3$

$\Rightarrow 19 + 9 = R_3$

$\Rightarrow R_3 = 28$ cm

2. 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..

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Radius of bigger circle = 8 cm

∴ Area of bigger circle = $\pi \times (8)^2 = 64\pi$ cm^2

Radius of smaller circle = 6 cm

∴ Area of smaller circle = $\pi \times (6)^2 = 36\pi$ cm^2

Sum of areas of two circles = $64\pi + 36\pi$

$= 100\pi$ cm^2

Let r be the radius of the required circle.

Then $\pi r^2 = 100\pi$

$\Rightarrow \quad r^2 = 100 \quad \Rightarrow \quad r = \sqrt{100} = 10$ cm.

3. 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?

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Radius of one wheel of the car = 40 cm

= 0.4 m.

Distance covered by the wheel to complete one revolution – $2\pi r \times 0.4 = 0.8$ m.

Let the wheel of the car completest revolutions in 10 minutes at a speed of 66 km/h.

Then distance covered by the wheel in making r complete revolutions in 10 minutes

= $(0.8\pi \times n)$ m

Also, distance travelled by car in 60 minutes

= (66×1000) m

$\therefore$ Distance travelled by car in 1 minute

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

$\therefore$ Distance travelled by car in 10 minutes

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

According to the question, we have:

$$0.8\pi \times n = 11000$$

$$\Rightarrow \quad n = \frac{11000}{0.8\pi} = \frac{11000 \times 7}{0.8 \times 22}$$

$$= 625 \times 7 = 4375.$$

Hence, the wheel makes **4375** complete revolutions in 10 minutes.

4. If the area of a circle is equal to sum of the areas of two circles of diameters 10 cm and 24 cm, calculate the diameter of the larger circle

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$$\pi R^2 = \pi\, r_1^2 + \pi r_2^2$$

$\pi\, R^2 = \pi(r_1^2 + r_2^2)$ [r_1 = 10/2 = 5cm, r_1 = 24/2 = 12 cm]

$R^2 = 5^2 + 12^2$ = 25 + 144

R^2 = 169

R= 13

∴ Diameter = 2(13) = 26 cm

5. If the perimeter and the area of a circle are numerically equal, then the radius of the circle is
(a) 2 units
(b) n units
(c) 4 units
(d) 7 units

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Let radius of the circle = r units

Perimeter of the circle = $2\pi r$

Area of the circle = πr^2

According to question,

Perimeter of the circle = Area of the circle

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

$\Rightarrow r = 2$ units

Hence, option (a) is correct.

HOME ASSIGNMENT Ex. 12.1 Q. 1 to Q 5

AHA

1. The cost of fencing a circular field at the rate of ` 24 per meter is ` 5280. The field is to be ploughed at the rate of ` 0.50 per m2 . Find the cost of ploughing the field.

THANKING YOU
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