CLASS – 10

CHAPTER -12 Areas related to Circles

Introduction

Area of a Circle

Area of a circle is πr2, where π=22/7 or ≈3.14 (can be used interchangeably for problem-solving purposes) and r is the radius of the circle.
π is the ratio of the circumference of a circle to its diameter.

Circumference of a Circle

The perimeter of a circle is the distance covered by going around its boundary once. The perimeter of a circle has a special name: Circumference, which is π times the diameter which is given by the formula 2πr

Segment of a Circle

A circular segment is a region of a circle which is "cut off" from the rest of the circle by a secant or a chord.

Sector of a Circle

A circle sector/ sector of a circle is defined as the region of a circle enclosed by an arc and two radii. The smaller area is called the minor sector and the larger area is called the major sector.

Angle of a Sector

The angle of a sector is that angle which is enclosed between the two radii of the sector.

Length of an arc of a sector

The length of the arc of a sector can be found by using the expression for the circumference of a circle and the angle of the sector, using the following formula:

$L= (\theta/360°)\times 2\pi r$

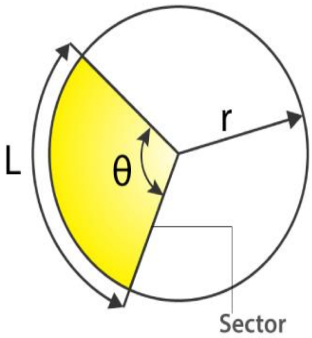
Where θ is the angle of sector and r is the radius of the circle.

Area of a Sector of a Circle

Area of a sector is given by

(θ/360°)×πr2

where ∠θ is the angle of this sector(minor sector in the following case) and r is its radius

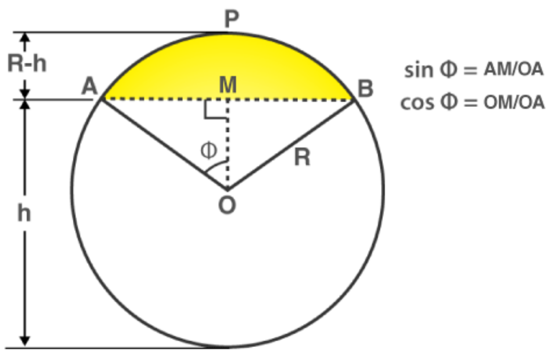


Area of a sector

Area of a Triangle

The Area of a triangle is,
Area=(1/2)×base×height
If the triangle is an equilateral then
Area=**(√**3/4)×a2 where "a" is the side length of the triangle.

Area of a Segment of a Circle



Area of segment APB (highlighted in yellow)
= (Area of sector OAPB) – (Area of triangle AOB)

=[(Ø/360°)×πr2] – [(1/2)×AB×OM]

[To find the area of triangle AOB, use trigonometric ratios to find OM (height) and AB (base)]

Also, Area of segment APB can be calculated directly if the angle of the sector is known using the following formula.

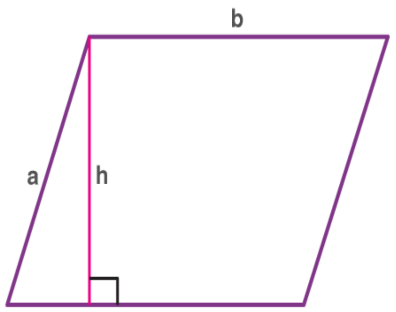
$=[(\theta/360°)\times\pi r2] – [r2\times\sin\theta/2 \times \cos\theta/2]$

Where θ is the angle of the sector and r is the radius of the circle

Visualizations

Areas of different plane figures

– Area of a square (side l) $=l^2$
– Area of a rectangle $=l\times b$, where l and b are the length and breadth of the rectangle
– Area of a parallelogram $=b\times h$, where “b” is the base and “h” is the perpendicular height.



parallelogram

Area of a trapezium $=[(a+b)\times h]/2$,

where

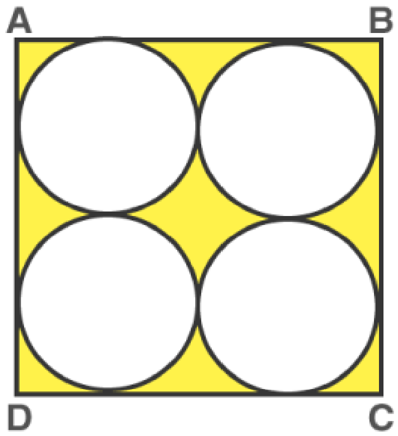
a & b are the length of the parallel sides

h is the trapezium height

Area of a rhombus $=pq/2$, where p & q are the diagonals.

Areas of Combination of Plane figures

For example: Find the area of the shaded part in the following figure: Given the ABCD is a square of side 28 cm and has four equal circles enclosed within.



Area of the shaded region

Looking at the figure we can visualize that the required shaded area
= A(square ABCD) − 4 ×A(Circle).

Also, the diameter of each circle is 14 cm.
$=(l2)-4\times(\pi r2)$
$=(282)-[4\times(\pi\times 49)]$
$=784-[4\times 22/7\times 49]$
$=784-616$
$=168cm^2$