GRADE 9

MATHEMATICS

MATHEMATICS

$$\pi = \frac{c}{d}$$

Lesson -18

CIRCUMFERENCE OF A CIRCLE

K.G.Niluka Lakmali

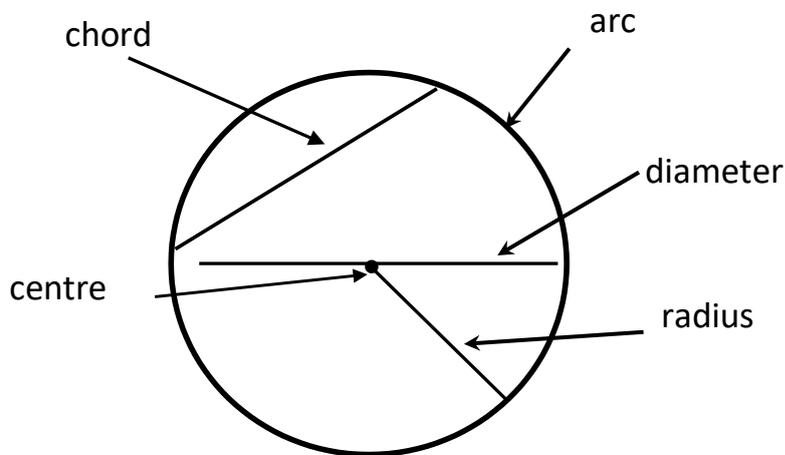Aloysius National School,Rathnapura

CIRCUMFERENCE OF A CIRCLE

> **By studying this lesson you will be able to**
>
> - Find the diameter of a circle using different methods
> - Find the circumference of a circle and the perimeter of a semicircle using formulae.
> - Solve problems related to the circumference of a circle.

You have learnt about the parts of a circle in Grace 7 and 8.

Let's develop a formula to find the circumference of a circle

Things needed:

1) Some circular objects(a plate,a saucer,a cup, a lid of a tin , a two rupee coin)
2) A thread
3) A metre ruler
4) Two set squares

Activity 1

Measuring the circumference of a circle

Place the thread around the circular lamina as the above picture. Measure the relevant length of the thread with meter ruler.It is the circumference of the circular lamina. If it is not possible to measure the circumference using the thread paste a gumtape around the circular lamina and find the circumference of it by measuring the length of the gumtape


The lengthof the thread is 17.6 cm

Therefore the circumference of the circle is 17.6 cm

Activity 2

Measuring the diameter of a circle

Method 1

Draw any angle and its angle bisector in a piece of paper. Place the saucer on the paper such that the edges of it touches the two arms of the angle. Mark the two points that the edges of the saucer intersects the angle bisector. Measure the distance between the two points.
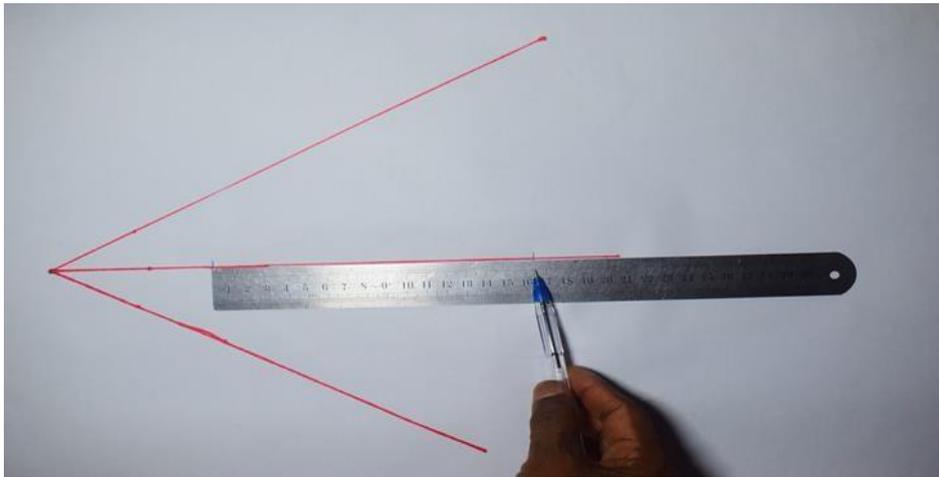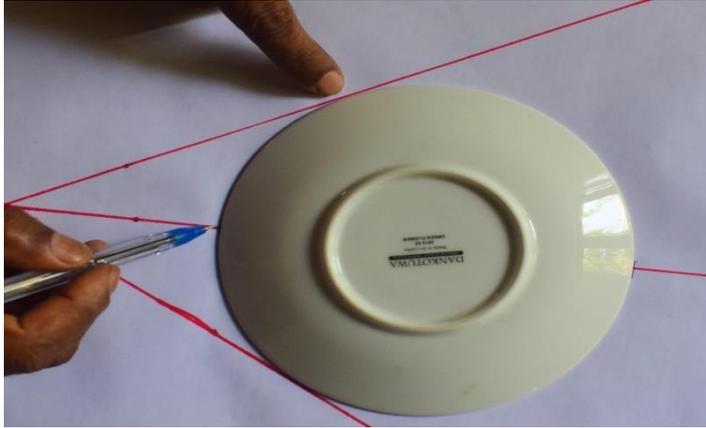
The distance between the two points is 16.4cm.
Therefore the diameter of the saucer is 16.4cm
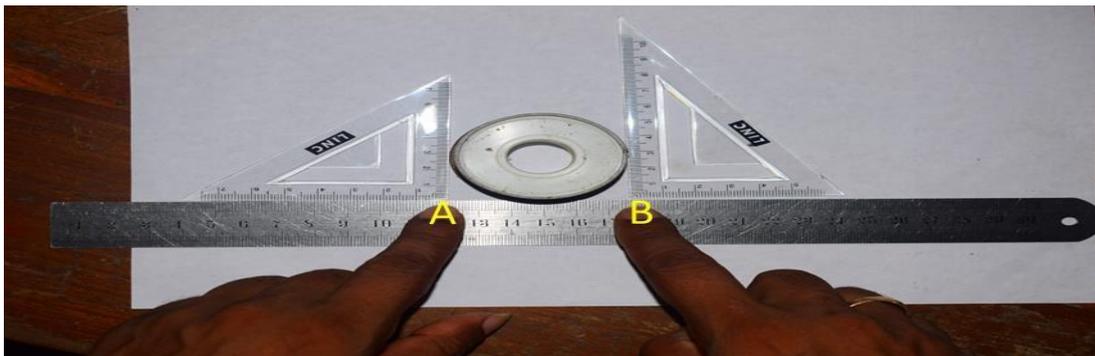
Place the circular lamina and the two set squares touching the ruler as shown the in the picture. Get the readings of the two points where the 90⁰ vertices of the two set squares touch the meter ruler.

Reading at A = 12 cm   **Reading at B = 17.6 cm**

Subtract the reading of A from the reading of B to obtain the diameter of the circle.

Diameter of the circle = 17.6 cm − 12 cm = 5.6 cm

 The above method can't be used to find the diameter of a circular wall such as a well. In such a situation measure the circumference of the circular wall using a rope,then cut half of the length of the rope and place that rope around the circular wall. Measure the shortest distance between the final and the initial positions of the rope.It is the external diameter of the well.

Circular object	Circumference (c)	Diameter of the circle(d)	$\frac{c}{d}$
glass	17.6	5.6	3.14
saucer	56.2	16.6	3.12
cup	25.6	8.2	3.09

The value of c/d when rounded off to the nearest 1 st decimal is 3.1.
It can be concluded that when the cirumference of a circle is divided by its diameter the value obtained is closer to 3.1.

$$\frac{c}{d} \quad \text{is a constant}$$

The Greek letter π is used for the above constant

$$\frac{c}{d} = \pi \qquad \text{Let's make } C \text{ the subject in this formula.}$$

$$\boxed{\begin{array}{c} \mathbf{C = \pi d} \\ \textbf{Circumference of a circle = πd} \end{array}}$$

Diameter of a circle=2 x Radius
If radius is r, d=2r
Substitute d=2r in the formula c=πd

C=π x 2r

$$\boxed{\begin{array}{c} \text{C=2πr} \\ \text{Circumference=2πr} \end{array}}$$

If the diameter or the radius is known in any circlre,the circumference can be calculated using c = πd or c=2πr.

For the calculations the value of π is taken as $\frac{22}{7}$ or 3.14.

Example 1

The diameter of a circle is 14cm.

Find the circumference (Take π = $\frac{22}{7}$)

As the diameter is given the formula

c = πd can be used.

circumference= πd

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

= 22 x 2

= 44 cm

Example 2

The radius of a circle is 21cm.

Find the circumference (Take π = $\frac{22}{7}$)

As the radius is given the formula
c = 2 πr can be used.

circumference $= 2\pi r$

$= 2 \times \frac{22}{7_1} \times 2\!\!\!/1^3 \text{ cm}$

$= 2 \times 22 \times 3 \text{ cm}$

$= 132 \text{ cm}$

Exercise 1

1. The diameter of a circle is 28 cm. Find the circumference
2. The diameter of a circular flower bed is 3.5 m. Find the circumference of the flower bed.
3. If the radius of a circle is 7 cm,fnd its circumference.
4. Find the length around a bicycle wheel of radius 28 cm.
5. The diameter of a circle is 21 cm. Find the circumference.

   Do the exercise 18.1 in the text book.

The perimeter of a semi circle

| perimeter of a semi circle | = | arc length of the semi circle | + | diameter of the semi circle |
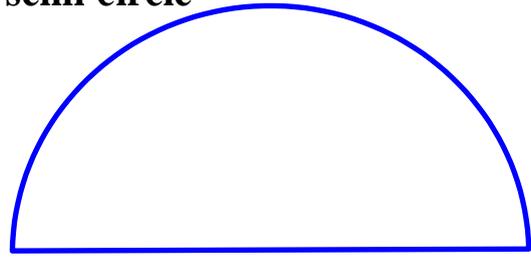
Perimeter of the semi circle

$$= \frac{1}{2} \times \pi d + d$$

or

$$= \frac{1}{2} \times 2\pi r + 2r$$

Example 3

Find the perimeter of a semi circular lamina of radius 10.5 cm (Take $\pi = \frac{22}{7}$)

perimeter of the lamina $= \frac{1}{2} \times 2\pi r + 2r$

$= \frac{1}{2} \times \frac{22}{7} \times 10.5 + 2 \times 10.5$ cm

$= 11 \times 3 + 21$ cm

$= 33 + 21$ cm

$= \underline{54 \text{ cm}}$

Example 4

The diameter of a semi circular lamina is 14 cm. Find the perimter.. .(Take π $\frac{22}{7}$ &

perimeter $= \frac{1}{2} \times \pi d + d$

$= \frac{1}{2} \times \frac{22}{7} \times 14 + 14$ cm

$= 22 + 14$ cm

$= 36 \text{ cm}$

Example 5

The diagram below represents a wall decoration prepared with a rectangular lamina of length 16 cm and breadth 14 cm and a semi circular lamina. A colour code is needed to be attach around the wall decoration. Find the length of the minimum code needed.
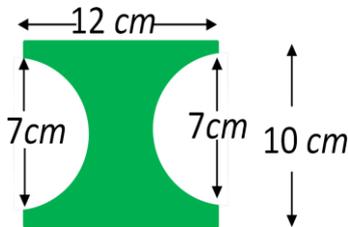
Perimeter of the figure $= \frac{1}{2} \times \pi d + 14 + 16 + 16$ cm

$= \frac{1}{2} \times \frac{22}{7} \times 14 + 46$ cm

$= 22 + 46$ cm

$= 68$ cm

Minimum length of the code

$= \underline{68 \text{ cm}}$

14cm

16cm
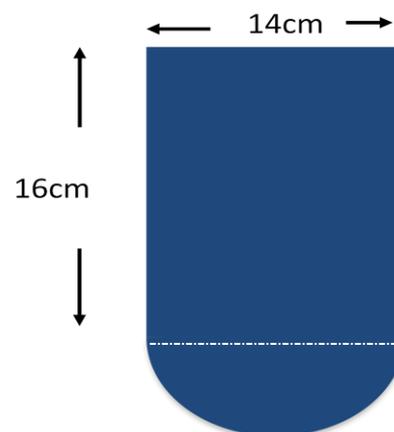
Exercise 2

1) Find the perimeter of the following figures according to the given data.

i.

12 cm

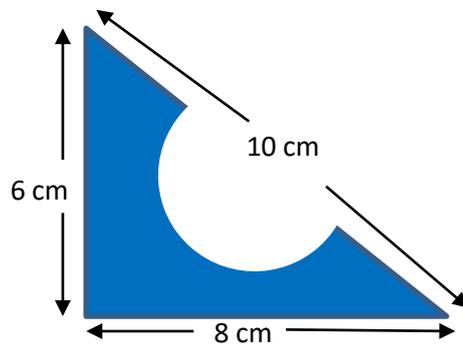7cm   7cm   10 cm

ii.

10.5 cm

3.5cm   3.5cm
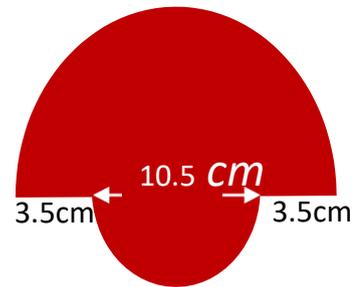
iii. The diameter of the semi circle in the figure is 3.5 cm. Find the perimeter of the figure.

10 cm

6 cm

8 cm

2). The wheel of radius 28 cm moves along a straight line. Find the distance it moves during one full rotation

3). A wheel of a motor bike rotates 700 times when it travels a distance of 1232 Km.

   i. Find the distance it moves during one full rotation.

   ii. Find the radius of the wheel.

4). Given below is a rough sketch of a running track. It consists of a rectangular part of length 45m and breadth 35m and two semi circular parts.

- Find the distance covered by a runner who completes one round of this running track.

- Find the number of rounds he had to complete to cover 1 Km.

- Find the number of rounds that should be completed in this running track in a 1500 m race.
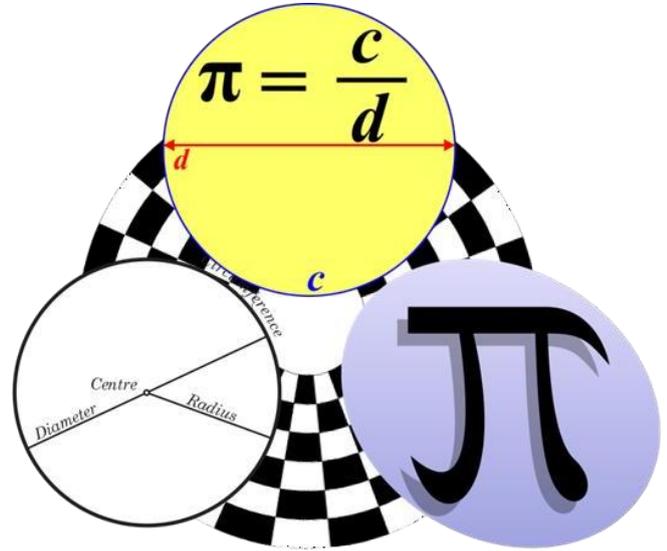
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