

# ACTIVITY

Angle At Centre Is Double The Angle Subtended By Same Arc At Any At Any Point On Circumference Of Circle

## Objective

To verify that the angle subtended by an arc at the center of the circle is double the angle subtended at any point on the remaining part of the circle, experimentally.

## Material Required

Glazed papers, white sheet, pencil, a pair of scissors, glue stick.

## Theory

1. Basic terms related to a circle.
2. Concept of an angle subtended by an arc at the center and the circumference of the circle.

## Procedure

1. Cut one circle of radius 2.5 cm with center O from red colored glazed paper.
2. Cut three more circles from different colored glazed papers of same radius.
3. Keep all four circles one on the other. Now fold along any part and press them to make a crease. On unfolding, we get chords of same length on each circle.
4. Name the chords, AB in the first circle with center O.
5. Join OA and OB with pencil [fig. (i)].

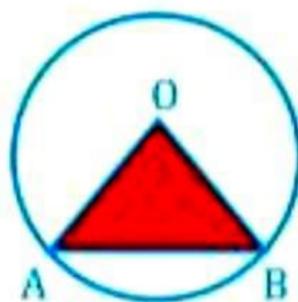


Fig. (i)

6. Take two other circles of yellow and green color and put one on the other and fold it such as to form an angle on the circumference with the same chord AB [fig. (ii) and (iii)].

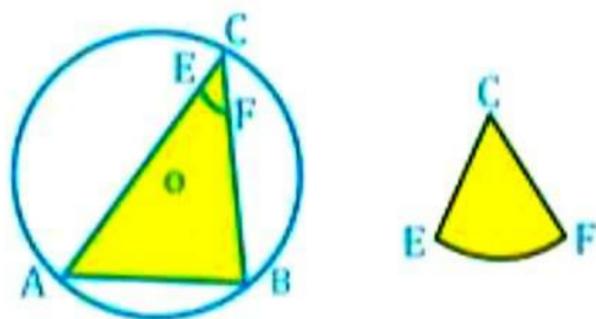


Fig. (ii)

7. Name these angles as ACB where AB is a chord.
8. Cut angles from fig. (ii) and (iii),  $\angle ACB$  from yellow circle and  $\angle ACB$  from green circle.

9. Cut the small portion of  $\angle ACB$  from both the circles [fig (ii) and (iii)].

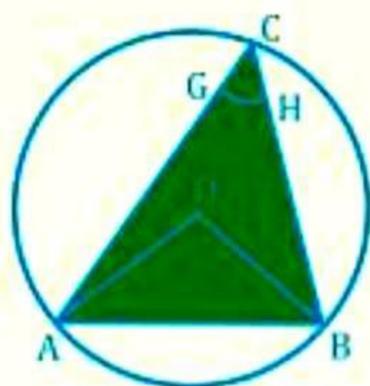


fig. (iii)

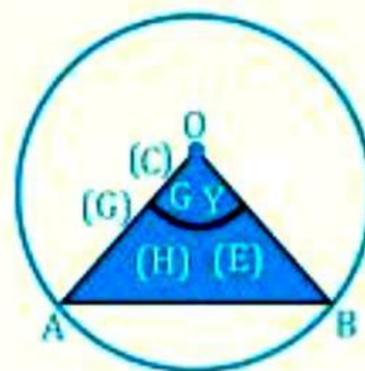
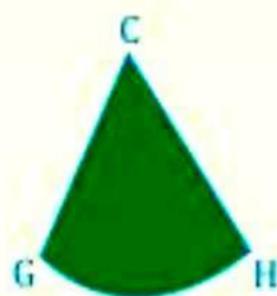


fig. (iv)

10. Paste these two cut outs of fig. (ii) and (iii) on the other (blue) circle [fig. (iv)] at center O such that their arms lie on the radius OA and OB of circle.

### Observation

We observe that two cut outs of angles fully cover  $\angle AOB$  in fig. (iv).

$$\angle AOB = \angle ECF + \angle GCH \text{ ( as } \angle ECF = \angle GCH = \angle ACB) = 2\angle ACB$$

### Result

Hence, we verified that the angle subtended by an arc at the center of circle is double the angle subtended by the same arc at any point on the remaining part of the circle.

### Learning Outcome

Verification of the above theorem can be done for arc AB as major arc or semicircular arc. For semicircle, the angle on the diameter is  $90^\circ$ .

### Activity Time

To verify the converse of this theorem experimentally.

## Viva Voce

**Q1. Define a circle.**

**Ans:** A circle is the collection of all points in a plane that are equidistant from a fixed point within the same plane.

**Q2. What will be the distance of two equal chords from the center?**

**Ans:** Both chords are at equal distance from the center.

**Q3. What is the diameter?**

**Ans:** The chord which passes through the center of the circle is known as the diameter of circle.

**Q4. What is a chord?**

**Ans:** A line segment is formed by joining any two points on the circumference of a circle.

**Q5. Which is the longest chord of a circle?**

**Ans:** Diameter.

**Q6. If the angle subtended by an arc at the center is  $110^\circ$ , then what will be the angle on the remaining part of the circle subtended by the same arc?**

**Ans:**  $55^\circ$ .

## Multiple Choice Questions

- Q 1.** A regular octagon is inscribed in a circle. The angle that each side of the octagon subtends at the center is:  
(a)  $45^\circ$                       (b)  $75^\circ$                       (c)  $90^\circ$                       (d)  $60^\circ$
- Q 2.** Greatest chord of a circle is called its:  
(a) Chord                      (b) Secant                      (c) Radius                      (d) Diameter
- Q 3.** AD is the diameter of a circle and AB is a chord. If  $AD = 34$  cm,  $AB = 30$  cm, the distance of AB from the center of the circle is:  
(a) 4 cm                      (b) 8 cm                      (c) 15 cm                      (d) 17 cm
- Q 4.** A line that intersects a circle in two distinct points are:  
(a) a Secant                      (b) a Chord                      (c) a Radius                      (d) a Diameter
- Q 5.** If chords AB and CD of congruent circles subtend equal angles at their centers, then:  
(a)  $AB = CD$                       (b)  $AB > CD$                       (c)  $AB < CD$                       (d) None of the above
- Q 6.** If there are two separate circles drawn apart from each other, then the maximum number of common points they have:  
(a) 0                      (b) 1                      (c) 2                      (d) 3
- Q 7.** The angle subtended by the diameter of a semi-circle is:  
(a)  $90^\circ$                       (b)  $45^\circ$                       (c)  $180^\circ$                       (d)  $60^\circ$
- Q 8.** The region between chord and either of the arc is called:  
(a) A sector                      (b) A semicircle                      (c) A segment                      (d) A quarter circles
- Q 9.** The region between an arc and the two radii joining the center of the end points of the arc is called a:  
(a) Segment                      (b) Semi circle                      (c) Minor arc                      (d) Sector
- Q 10.** The degree measure of a semicircle is:  
(a)  $0^\circ$                       (b)  $90^\circ$                       (c)  $360^\circ$                       (d)  $180^\circ$

### ANSWER KEY

1. (a)    2. (d)    3. (b)    4. (a)    5. (a)    6. (a)    7. (a)    8. (c)    9. (d)    10. (d)