LESSON PLAN 9

CLASS : 9 SUBJECT : MATHEMATICS **TEACHER'S NAME :**

NAME OF THE UNIT	SUB-TOPICS		NO OF PERIODS REQUIRED			Time line for teaching	
			Teaching	Practice	TOTAL	From	To
CIRCLES	9.1	ANGLE SUBTENDED BY A CHORD AT A POINT	2	2	4		
	9.2	PERPENDICULAR FROM A CENTRE TO A CHORD	1	2	3		
	9.3	EQUAL CHORDS AND THEIR DISTANCES FROM CENTRE	2	2	4		
	9.4	ANGLE SUBTENDED BY AN ARC OF CIRCLE	2	2	4		
	9.5	CYCLIC QUADRILATERALS	2	2	4		
		TOTAL	9	10	19		

PRE-REQUISITES & SKILLS	Every Pupil is expected to have basic knowledge in # definition of a circle # terminology related to circle like radius,diameter, centre, arc, chord, angle, sector, semicircle etc. # terminology like right angle, complementrary angles, supplementary angles, perpendicular, parallel etc., # properties of a quadrilateral # Usage of Mathematical instrument box

Learning Outcomes

After Completion of this lesson every student will be able to

 # recognize that equal chords subtend equal angles at the centre and vice versa.

 # apprehend that perpendicular from the centre of a circle bisects the chord and vice versa & equal chords of a circle are equidistant from centre and vice versa.

 # understand and utilize the property "The angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle"

 # utilize the property "Angles in the same segment of a circle are equal" in usual sums wherever necessary.

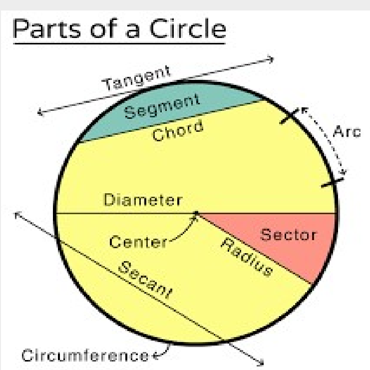
 # discriminates the differences between a normal quadrilateral and a cyclic quadrilateral and identifies the special quality which makes a quadrilateral cyclic.

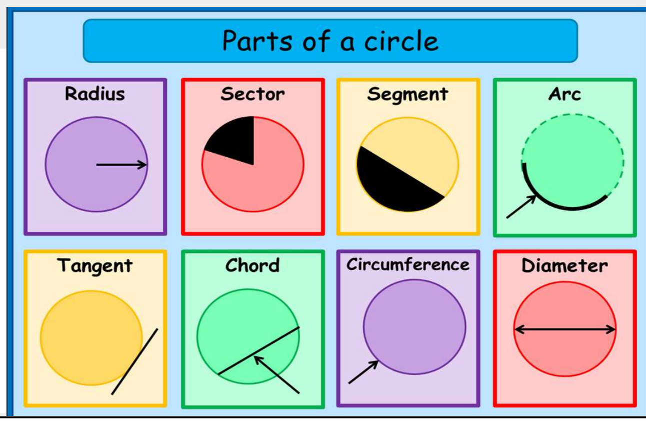
 # appriciate the beauty of circles and its different properties in geometry and real life sums

Teaching Learning Process

INTRODUCTION /INDUCTION

Teacher introduces the chapter of circles by recalling their previous knowledge on circles and its related terminology and parts like radius, diameter, centre, chord, arc etc., by showing some models and pictures



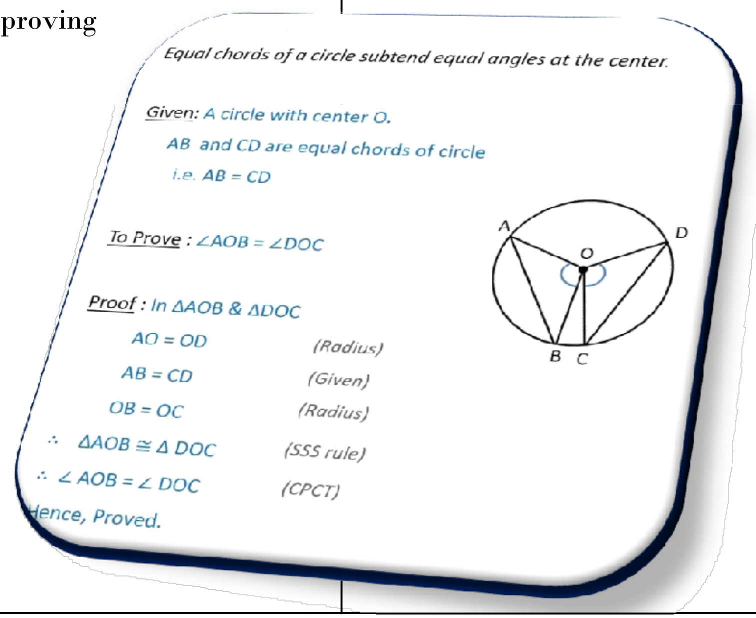


Experience & Reflection

Pupils will recollect their knowledge on Circle and its properties and utilize that in exploring and learning new concepts of Circles

Students will experience the usage of the different properties of circle and appreciate their usage.

EXPLICIT TEACHING/TEACHER MODELLING (I DO)	GROUP WORK (WE DO)	INDEPENDENT WORK (YOU DO)	NOTES
9.1. Angle subtended by a chord at a point Teacher first explains what does it mean by the angle subtended by a chord at a point and later explains the thoerem 9.1 : Equal chords of a circle subtend equal angles at the centre along with theorem 9.2 : Its converse.	Pupils will work in groups and try to recall their previous apprehensions on various properties of a circle and will try to understand these new properties through discussion	Every individual will participate in the activiy and learns the way of proving	Proofs of theorem 9.1 to 9.2 along with associated examples and exercise 9.1

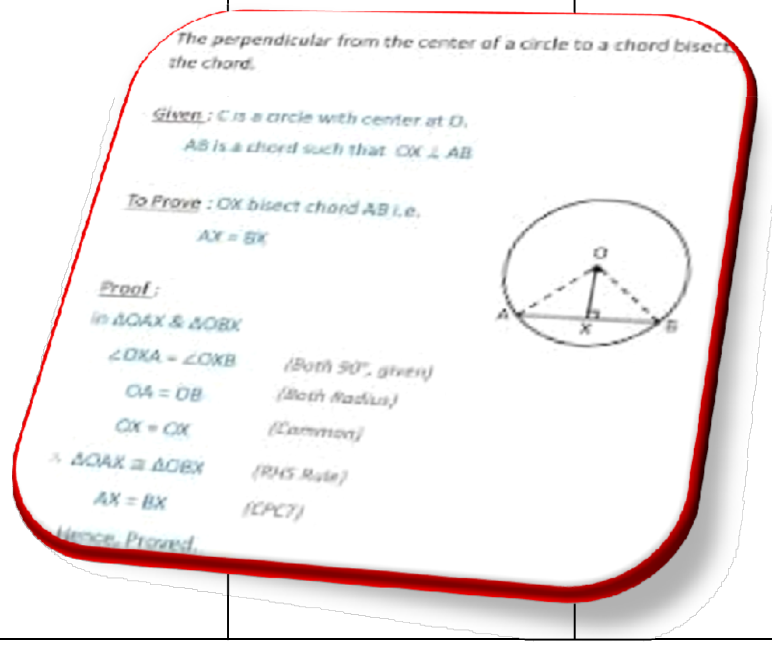

Equal chords of a circle subtend equal angles at the center.

Given: A circle with center O.
AB and CD are equal chords of circle
i.e. AB = CD

To Prove : ∠AOB = ∠DOC

Proof : In ΔAOB & ΔDOC
AO = OD (Radius)
AB = CD (Given)
OB = OC (Radius)
∴ ΔAOB ≅ Δ DOC (SSS rule)
∴ ∠ AOB = ∠ DOC (CPCT)
Hence, Proved.

EXPLICIT TEACHING/TEACHER MODELLING (I DO)	GROUP WORK (WE DO)	INDEPENDENT WORK (YOU DO)	NOTES
9.2 Perpendicular from a centre to a chord Teacher gives the proof of the theorem "The perpendicular from the centre of a circle to a chord bisects the chord" by conducting a simple activity involving pupil groups where groups are given circles with different radii and chords and are asked to draw a perpendicular from centre to the chord in each case. Now Pupils are asked to check the lengths of both line segements formed in the chord after the perpendicular intersection. After having apprehension on the concept teacher gives the proof along with its converse	Pupil groups will participate in the activity and learn the concept and try to synchronize it with the proof by discussion	Every individual will participate in the activiy and learns the way of proving	Proofs of theorem 9.3 to 9.4 along with associated examples and exercise 9.2



EXPLICIT TEACHING/TEACHER MODELLING (I DO)	GROUP WORK (WE DO)	INDEPENDENT WORK (YOU DO)	NOTES
9.3 Equal chords and their distances from Centre Teacher gives the proof of two different theorems 1) Equal chords of a circle (or of congruent circles) are equidistant from the centre (or centres) 2) Chords equidistant from the centre of a circle are equal in length using Geoboard and later explains the concept literally by proving.	Pupils groups can easily understand the concept using geoboard and confirm the authenticity of the theorem by proving themselves through discussion	Every pupil is focused to learn the concept by indulging them in doing the acivity	Proofs of theorem 9.5 & 9.6 along with examples and exercise sums of 9.2

Now, given that

AB = CD

$\frac{AB}{2} = \frac{CD}{2}$

AX = DY (From (1) and (2)) ...(3)

In Δ AOX and ΔDOY

∠OXA = ∠OYD (Both 90°, given)

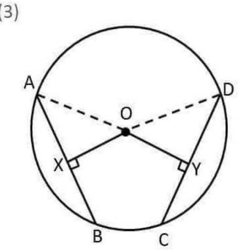
OA = OD (Radius)

AX = DY (From (1))

∴ ΔAOX ≅ ΔDOY (by R.H.S rule)

OX = OY (CPCT)

Hence, Proved.



hords equidistant from the centre of a circle are equal in length.

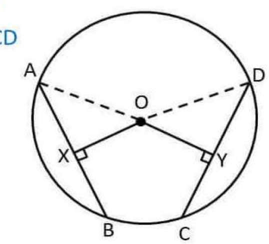
Given : C is a circle with center at 0.

AB and CD are two Chords of the circle where

OX is distance from center i.e. OX ⊥ AB

& OY is distance from center i.e. OY ⊥ CD

& OX = OY



To Prove : AB = CD

Proof : In ΔAOX and ΔDOY

∠OXA = ∠OYD (Both 90°, given)

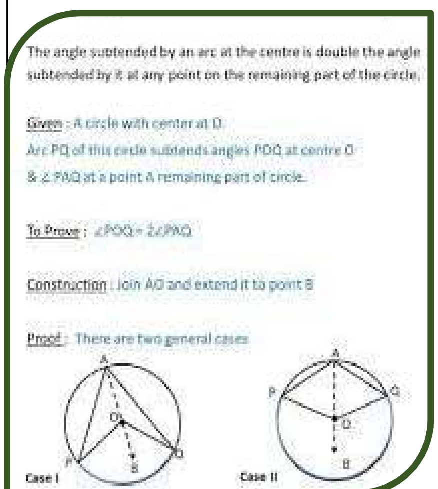
OA = OD (Radius)

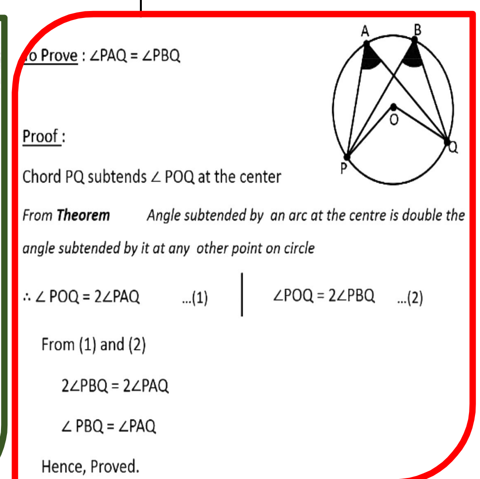
OX = OY (Given)

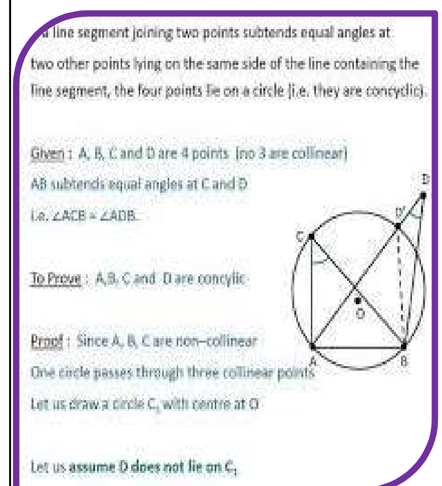
∴ ΔAOX ≅ ΔDOY (By R.H.S rule)

AX = DY (CPCT) ...(1)

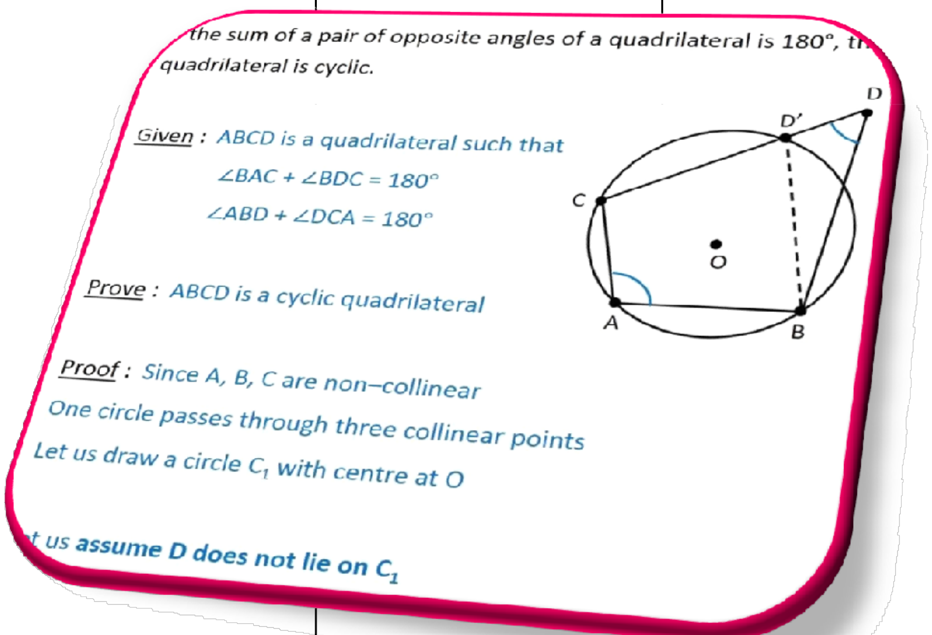
EXPLICIT TEACHING/TEACHER MODELLING (I DO)	GROUP WORK (WE DO)	INDEPENDENT WORK (YOU DO)	NOTES
9.4 Angle subtended by an arc of a circle Teacher gives the proof of 3 different theorems 1) The angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle 2) Angles in the same segment of a circle are equal 3)If a line segment joining two points subtends equal angles at two other points lying on the same side of the line containing the line segment, the four points lie on a circle (i.e. they are concyclic) using Geoboard and later explains the concept literally by proving.	Pupils groups can easily understand the concept using geoboard and confirm the authenticity of the theorem by proving themselves through discussion	Every pupil is focused to learn the concept by indulging them in doing the acivity	Proofs of theorem 9.7 to 9.9 along with examples and exercise sums of 9.3







EXPLICIT TEACHING/TEACHER MODELLING (I DO)	GROUP WORK (WE DO)	INDEPENDENT WORK (YOU DO)	NOTES
9.5 Cyclic Quadrilaterals Teacher conducts an activity by groupin chilren. Each groups is instructed to draw circles of different radii and are asked to mark 4 different points on each circle and make a quadrilateral in each case. Now pupils are instructed to measure the angles of each quadrilateral and observe the measures of opposite angles in each case .Now teacher gives the proof of 2 different theorems " The sum of either pair of opposite angles of a cyclic quadrilateral is 180º." and its converse	Pupils groups can easily understand the concept usingactivity and confirm the authenticity of the theorem by proving themselves through discussion	Every pupil is focused to learn the concept by indulging them in doing the acivity	Proofs of theorem 9.10 to 9.11 along with examples and exercise sums of 9.3



CHECK FOR UNDERSTANDING QUESTIONS	
1. Factual	1) Two circles of radii 5 cmand 3 cm intersect at two points and the distance between their centres is 4 cm. Find the length of the common chord. 2) Prove that if chords of congruent circles subtend equal angles at their centres, then the chords are equal.
2. Open Ended/Critical Thinking	1) Three girls Reshma, Salma and Mandip are playing a game by standing on a circle of radius 5m drawn in a park.Reshma throws a ball to Salma, Salma to Mandip, Mandip to Reshma. If the distance between Reshma and Salma and between Salma and Mandip is 6m each, what is the distance between Reshma and Mandip? 2) ABCD is a cyclic quadrilateral whose diagonals intersect at a point E. If LDBC= 70°, LBAC is 30°, find LBCD. Further, ifAB = BC, find LECD
3.Student Practice questions & Activities	1. If the non-parallel sides of a trapezium are equal, prove that it is cyclic 2.Prove that a cyclic parallelogram is a rectangle
4. Assessment	Exercise sums and worksheet on Circles