ONLINE MATHS CLASS - X - 16 (27 / 07 /2021)

2 . CIRCLES – CLASS - 4

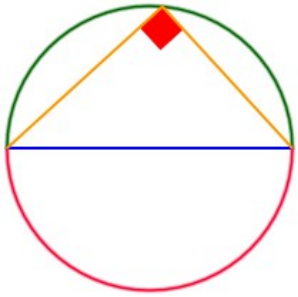
What did we study in the last class ?

- **If we join the ends of a diameter of a circle to a point on the circle , we get a right angle .**
- **Angle in a semicircle is right**
- **If a pair of lines drawn from the ends of a diameter of a circle are perpendicular to each other , then they meet on the circle .**

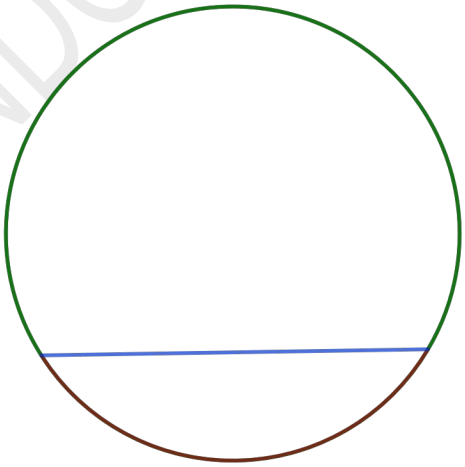
Activity 1

If we draw a diameter of a circle , it will cut the circle into two equal parts (semicircles)

We have already learned that the angle formed by joining the ends of the chord to a point on this parts of the circle is right .



What happens if we draw a chord other than a diameter ?



Does this chord (not a diameter) bisect the circle ?

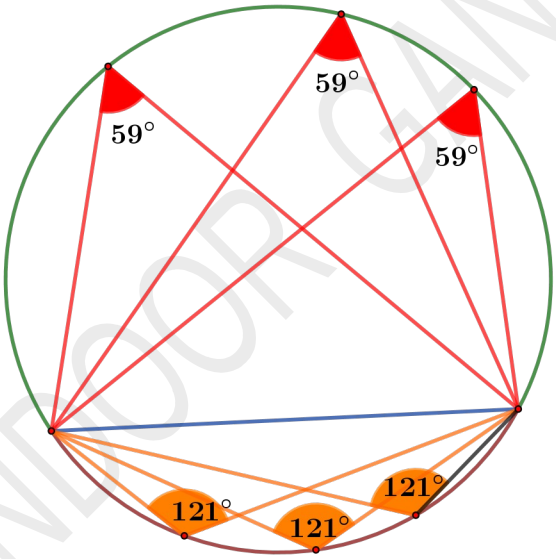
No . A chord other than a diameter divides a circle into a larger and a smaller parts .

Activty 2

Are there any peculiarity among the angles formed by joining the ends of a chord (not a diameter) to the points on the larger and smaller parts of the circle ?

Draw a circle of radius 5 cm . Draw a chord (not a diameter) on it . This chord will divide the circle into two non equal parts . Mark three points on the larger part of the circle obtained and join the ends of the chord to these points . Three angle are obtained . Measure these angles .

Similarly mark three points on the smaller part of the circle obtained and join the ends of the chord to these points . Three angle are obtained . Measure these angles .



Findings

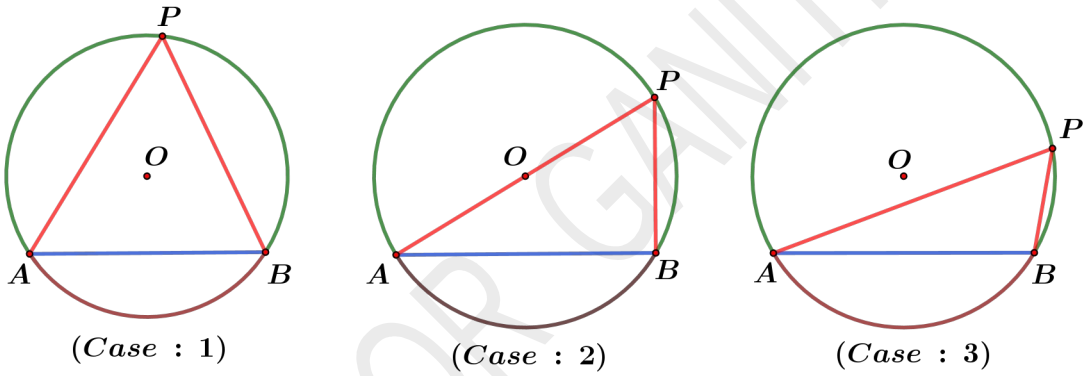
- **A chord divides a circle into two parts .**
- **A chord other than a diameter divides the circle into two non equal parts .**
- **Three angles formed by the ends of a non diametrical chord to the points on the larger part of the circle are equal .**
- **Three angles formed by the ends of a non diametrical chord to the points on the smaller part of the circle are equal .**

- **Three angles formed by the ends of a chord other than a diameter to the points on the larger part of the circle are not equal to the angles formed by the ends of a chord other than a diameter to the points on the smaller part of the circle .**

Activity 3

Are the angles formed by the ends of a chord other than a diameter to the points on the smaller part of the circle are equal ? . Let's discuss .

Draw a circle centred at O . Draw a chord AB (not a diameter) . Mark a point P on the larger part of the circle made by the chord AB . Join the ends of the chord to the point P . The following situations may arise .



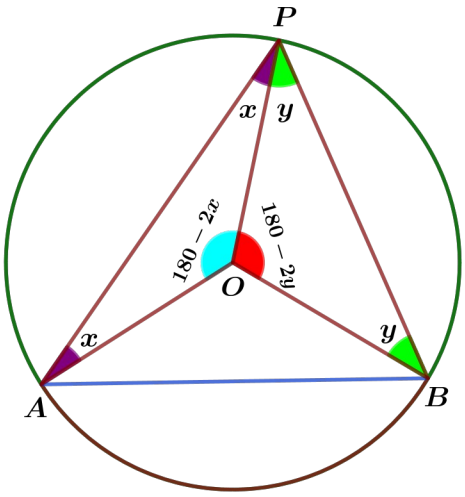
Case1 : The lines AP and BP may on the either side of the centre .

Case 2 : The line AP may pass through the centre .

Case 3 : The lines AP and BP may on the same side of the centre .

What is the value of $\angle$ APB in all these situations ? Let's discuss .

Case 1 (AP and BP are on the either side of the centre)



Draw the lines OA , OB and OP .

$OA = OB = OP$ **(Radii of a circle are equal)**

AOP is an isosceles triangle . ($OA = OP$ **)**

$\angle OAP = \angle OPA = x^0$

==> $\angle AOP = (180 - 2x)^0$ **(Sum of the angles of a**

triangle is 180 °)

BOP is an isosceles triangle . ($OB = OP$)

$\angle OBP = \angle OPB = y^0$

==> $\angle BOP = (180 - 2y)^0$

$\angle AOB = 360 - (180 - 2x + 180 - 2y)$ **(Angle around a point is 360 °)**

$= 360 - (180 + 180 - 2x - 2y)$

$= 360 - (360 - 2x - 2y)$

$= 360 - 360 + 2x + 2y = 2x + 2y$

$= 2(x + y) = 2 \times \angle APB$

Findings (Case 1)

- $\angle AOB = 2 \times \angle APB$ ==> $\angle APB = \frac{1}{2} \times \angle AOB$
- **The angle formed by joining the ends of a chord to a point on the larger part of the circle is half the angle made by joining the ends of the chord to the centre of the circle .**
- **Since the angle formed by joining the ends of the chord to the centre of the circle is always a constant , the angle formed by joining the ends of a chord to the points on the larger part of the circle are equal .**

Case 2 (The line AP passes through the centre of the circle)

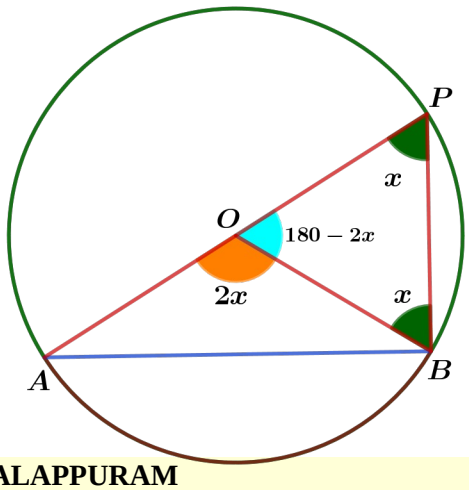
Draw the line OB .

$OA = OB = OP$ **(Radii of a circle are equal)**

BOP is an isosceles triangle . ($OB = OP$)

$\angle OBP = \angle OPB = x^0$ ==> $\angle BOP = (180 - 2x)^0$

(Sum of the angles of a triangle is 180 °)



$\angle AOB = 180 - (180 - 2x) = 180 - 180 + 2x = 2x^0$ **(linear pair)**

That is , $\angle AOB = 2 \times \angle APB$

Findings (Case 2)

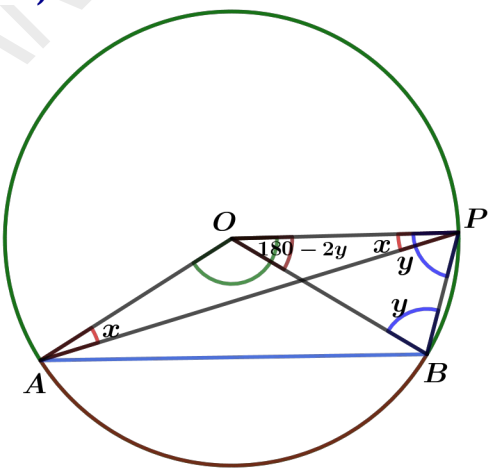
- $\angle AOB = 2 \times \angle APB$ ==> $\angle APB = \frac{1}{2} \times \angle AOB$

- **The angle formed by joining the ends of a chord to a point on the larger part of the circle is half the angle made by joining the ends of the chord to the centre of the circle .**

- **Since the angle formed by joining the ends of the chord to the centre of the circle is always a constant , the angle formed by joining the ends of a chord to the points on the larger part of the circle are equal .**

Case 3 (AP and BP are on the same side of the centre)

Draw the lines OA , OB and OP .



$OA = OB = OP$ **(Radii of a circle are equal)**

AOP is an isosceles triangle . ($OA = OP$ **)**

$\angle OAP = \angle OPA = x^0$

==> $\angle AOP = (180 - 2x)^0$

BOP is an isosceles triangle . ($OB = OP$ **)**

$\angle OBP = \angle OPB = y^0$

==> $\angle BOP = (180 - 2y)^0$ **(Sum of the angles of a triangle is 180 °)**

$\angle APB = (y - x)^\circ$

$\angle AOB = \angle AOP - \angle BOP$

$= 180 - 2x - (180 - 2y)$

$= 180 - 2x - 180 + 2y$

$= 180 - 180 + 2y - 2x \quad = 2y - 2x = 2(y - x) = 2 \times \angle APB$

Findings (Case 3)

- $\angle AOB = 2 \times \angle APB$ ==> $\angle APB = \frac{1}{2} \times \angle AOB$
- **The angle formed by joining the ends of a chord to a point on the larger part of the circle is half the angle made by joining the ends of the chord to the centre of the circle .**
- **Since the angle formed by joining the ends of the chord to the centre of the circle is always a constant , the angle formed by joining the ends of a chord to the points on the larger part of the circle are equal .**

Conclusion

If we joining the ends of a chord other than a diameter to any point on the larger part of the circle , we get an angle which is half the size of the angle , we get by joining them to the centre of the circle .

Assignment .

What is the relation among the angles formed by joining the ends of a chord other than a diameter to the points on the larger and smaller parts of the circle ?