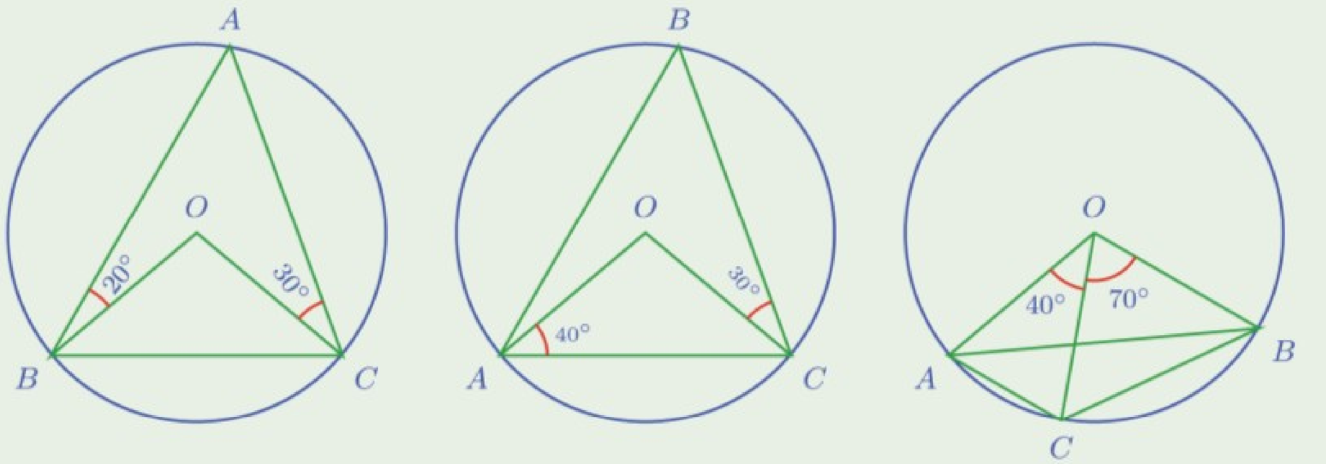
# ONLINE MATHS CLASS - X - 25 ( 07 / 09 /2020 )

*Let's do some problems related to the concepts which already we have learned .*

(1) In all the pictures given below, $O$ is the centre of the circle and $A, B, C$ are points on it. Calculate all angles of $\Delta ABC$ and $\Delta OBC$ in each.



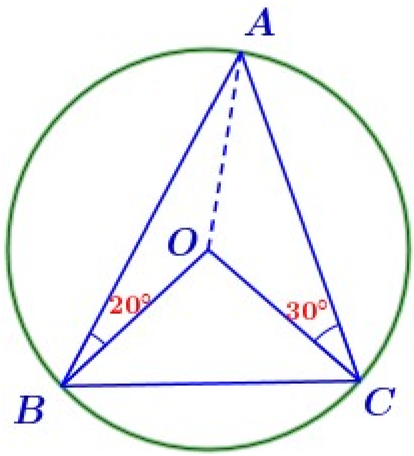

*Answer .*

a) *Join OA .*

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

*In the triangle OAB ,*

< OBA = < OAB = 20 ° ( *OA = OB , OAB is an isosceles triangle* )



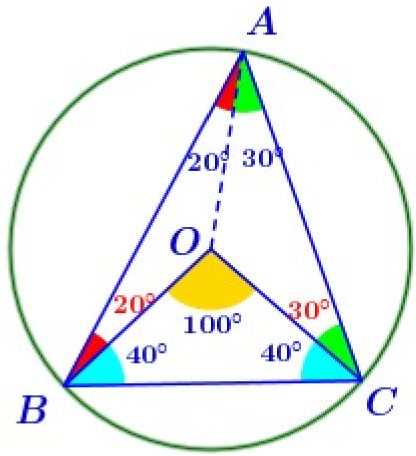

*In the triangle OAC ,*

< OCA = < OAC = 30 ° ( *OA = OC* )

< *BAC* = < *OAB* + < *OAC* = 20 ° + 30 ° = 50 °

< BOC = 2 x 50 ° = 100 °

( *The angle made by an arc of a circle at the centre is double the angle on the alternate arc .)* .



*In the triangle* OBC ,

$< OBC = < OCB = \frac{180 - 100}{2} = \frac{80^\circ}{2} = 40^\circ$ ( *OB* = *OC* )

*In the triangle* ABC ,

$< BAC = 20^\circ + 30^\circ = 50^\circ$

$< ABC = 20^\circ + 40^\circ = 60^\circ$

$< ACB = 40^\circ + 30^\circ = 70^\circ$

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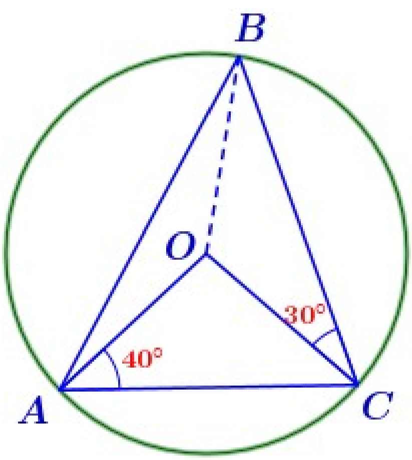
b) *Join OB* .

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

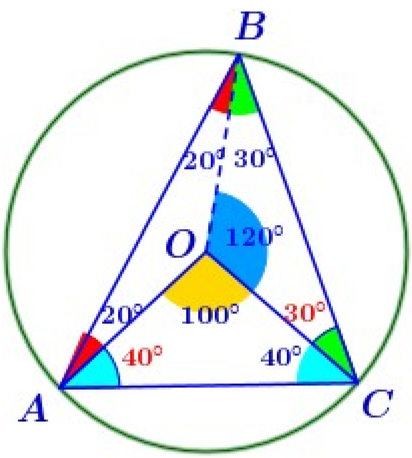



*In the triangle* *OAC* ,

$< OAC = < OCA = 40^\circ$ ( *OA* = *OC* )

$< AOC = 180 - 80 = 100^\circ$ ( *Sum of the angles in a triangle is* $180^\circ$ )

$< ABC = \frac{100}{2} = 50^\circ$ ( *The angle made by an arc of a circle on the alternate arc is half the angle made at the centre* . )




*In the triangle* OBC ,

$< OBC = < OCB = 30^\circ$ ( *OB* = *OC* )

$< BOC = 180^\circ - 60^\circ = 120^\circ$

*In the triangle* *OAB* ,

$< OBA = 50^\circ - 30^\circ = 20^\circ$

$< OAB = < OBA = 20^\circ$ ( *OA* = *OB* )

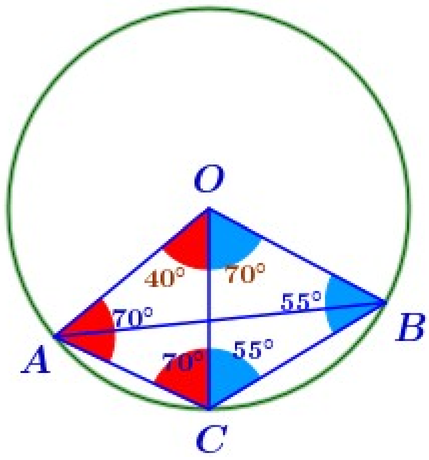
*In the triangle* *ABC* ,

$< BAC = 20^\circ + 40^\circ = 60^\circ$

$< ABC = 20^\circ + 30^\circ = 50^\circ$

$< ACB = 40^\circ + 30^\circ = 70^\circ$

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

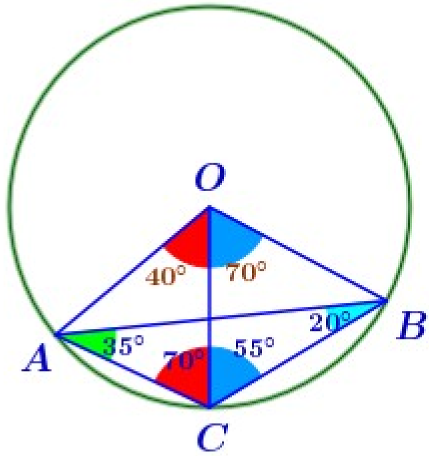



*In the triangle OAC ,*

$< OAC = < OCA = \frac{180 - 40}{2} = \frac{140}{2} = 70^\circ$ ( $OA = OC$ )

*In the triangle OBC ,*

$< OBC = < OCB = \frac{180 - 70}{2} = \frac{110}{2} = 55^\circ$ ( $OB = OC$ )

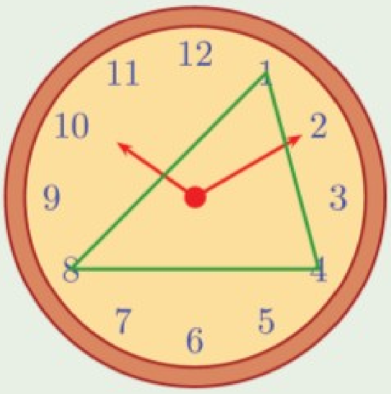



$< ABC = \frac{< AOC}{2} = \frac{40}{2}^\circ = 20^\circ$

$< BAC = \frac{< BOC}{2} = \frac{70}{2}^\circ = 35^\circ$

$< ACB = 70^\circ + 55^\circ = 125^\circ$

(2) The numbers 1 , 4, 8 on a clock's face are joined to make a triangle.



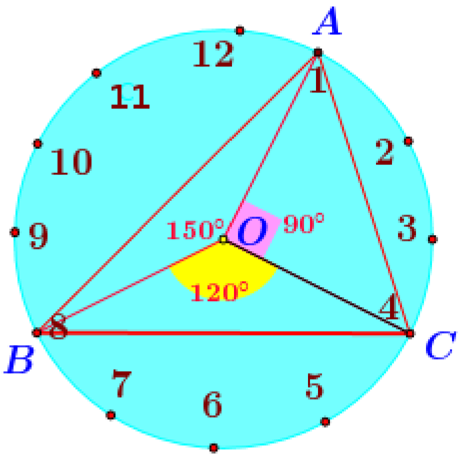

Calculate the angles of this triangle.

*Answer ,*

*In a clock's face ,*

60 minutes $= 360^\circ$

1 minute = $\frac{360^\circ}{60}$ = $6^\circ$




< *AOC* = $90^\circ$ ( 15 *minutes* = 15 x 6 = $90^\circ$ )

< *BOC* = $120^\circ$ ( 20 *minutes* = 20 x 6 = $120^\circ$ )

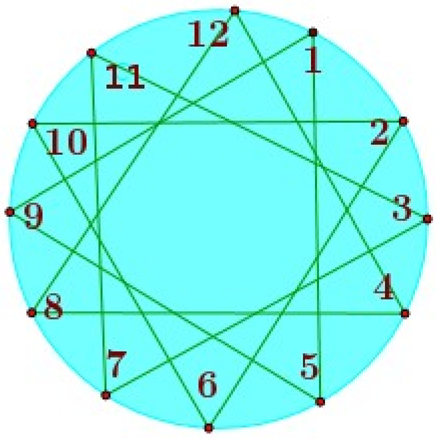
< *AOB* = $150^\circ$ ( 25 *minutes* = 25 x 6 = $150^\circ$ )

*In the triangle ABC* ,

< BAC = $\frac{120^\circ}{2}$ = $60^\circ$ .

< ABC = $\frac{90^\circ}{2}$ = $45^\circ$

< ACB = $\frac{150^\circ}{2}$ = $75^\circ$




*Each angle of an equilateral triangle is* $60^\circ$ .

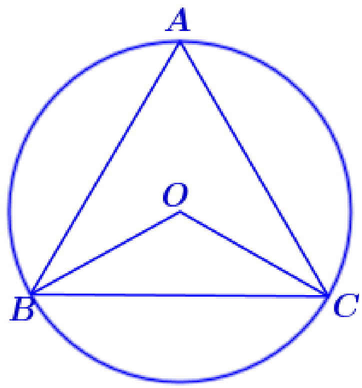
*So the side opposite to each angle makes* $120^\circ$ *at the centre of the circle* .

$120^\circ$ *is equal to* 20 *minutes* .

*So if we join the numbers* 12 , 4 *and* 8 , *we will get an equilateral triangle* .

Similarly if we join the group of numbers ( 1 , 5 , 9 ) or ( 2 , 6 , 10 ) or ( 3 . 7 , 11 ) *we will get equilateral triangles . So we get 4 equilateral triangles in total* .

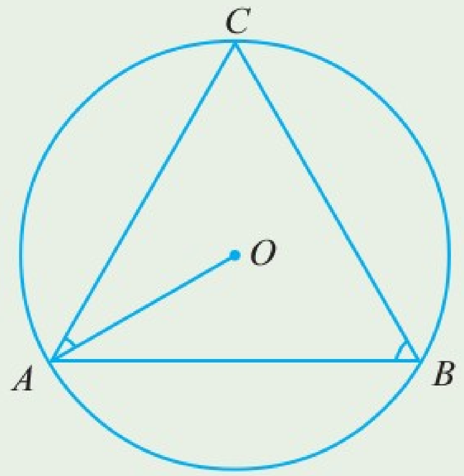
*__More activities__*




1. *In the figure O is the centre . ABC is an equilateral triangle*

*Find < BAC and < ABO ?*

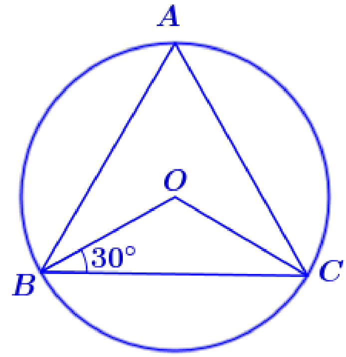
( 2 ) In the picture, $O$ is the centre of the circle and $A$, $B$, $C$, are points on it. Prove that $\angle OAC + \angle ABC = 90°$.



# ONLINE MATHS CLASS - X - 25 ( 07 / 09 /2020 )

## WORRKSHEET

1.*In the figure O is the centre of the circle . AB = AC , < OBC =* 30 º




a) *What is the measure of < OCB* ?

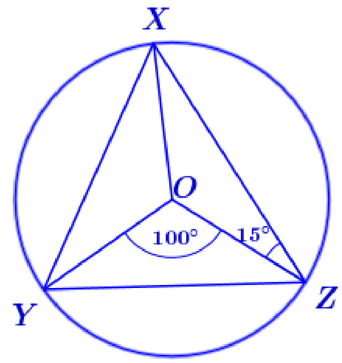
b) *What is the measure of* < BOC ?

c) *What is the measure of* < BAC ?

d) *Prove that triangle ABC is an equilateral triangle* ?

2. *In the figure O is the centre of the circle* . < Y OZ = 100 º ,

< OZX = 15 º




a) *What is the measure of* < YXZ ?

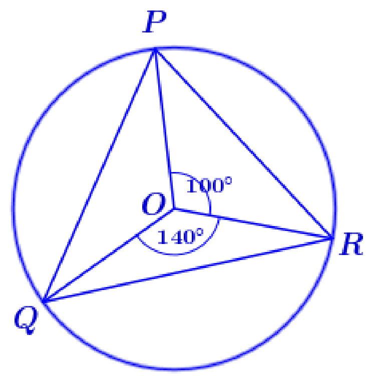
b) *What is the measure of* < OXZ ?

c) *What is the measure of* < OXY ?

d) *What is the measure of* < XYZ ?

3. *In the figure O is the centre of the circle* . < QOR = 140 º ,

< POR = 100 º



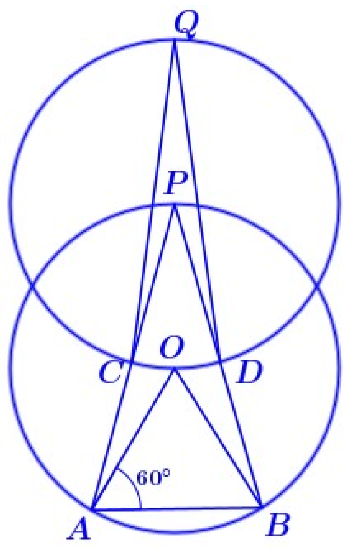

a) *What is the measure of* < QPR ?

b) *What is the measure of* < PQR ?

c) *What is the measure of* < POQ ?

d) *What is the measure of* < PRQ ?

4. *In the figure O and P are the centres of the circles* .< OAB = 60 º




a) *What is the measure of* < OBA ?

b) *What is the measure of* < AOB ?

c) *What is the measure of* < CPD ?

d) *What is the measure of* < CQD ?

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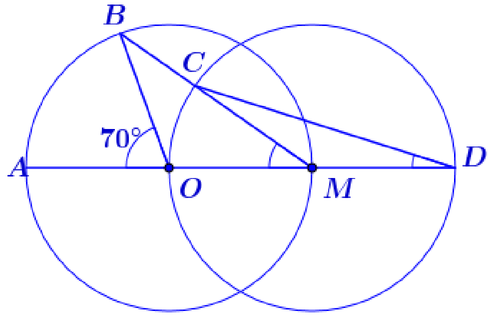
# ONLINE MATHS CLASS - X - 26 ( 08 / 09 /2020 )

## WORKSHEET

1. *In the figure O and M are the centres of the circles . < AOB =* 70 °




a) *What is the measure of* < AMB ?

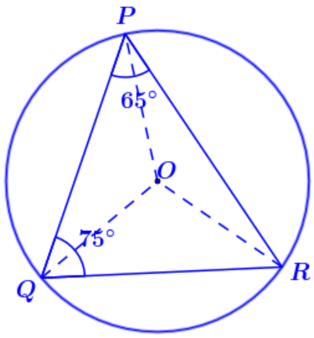
b) *What is the measure of* < CDO ?

c) *Draw an angle of size* $32\frac{1}{2}^\circ$ ?

d) *Draw an angle of size* $16\frac{1}{4}^\circ$ ?

2. *In the figure O is the centre of the circle . < PQR* = 75 °

*and < QPR* = 65 °

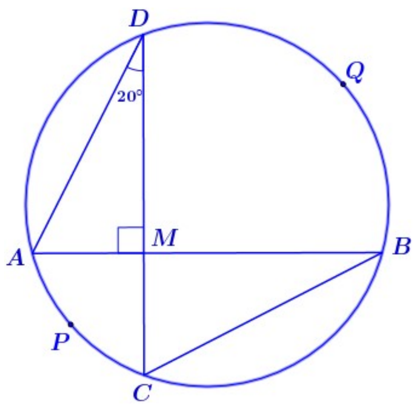



a) *What is the measure of* < QOR ?

b) *What is the measure of* < POR ?

c ) *Draw a triangle of circumradius 3 cm and two of the angles are* 80 ° *and* 70 ° ?

3. *In the figure AB and CD are two perpendicular chords of a circle and they intersect at M* . < ADM = 20 °




a) *What is the measure of* < ABC ?

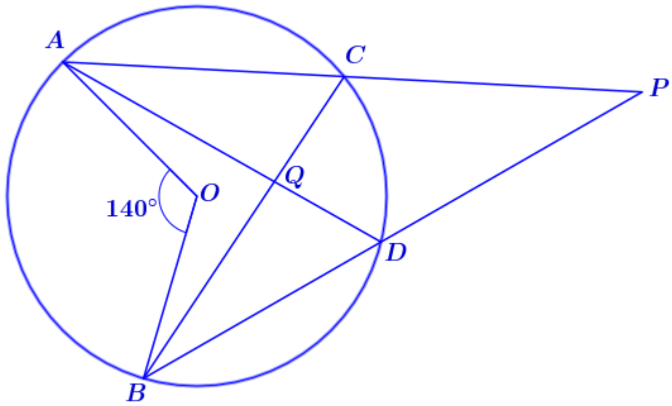
b) *What is the central angle of the chord APC* ?

c) *What is the measure of* < BCM ?

d ) *What is the sum of the central angles of the chords APC and BQD* ?

4. *In the figure O is the centre of the circle .*

<AOB = 140 °




a) *What is the measure of* < ACB ?

b) *What is the measure of* < ADB ?

c) *What is the measure of* < QCP ?

d) *What is the measure of* < QDP ?

e) < CPD + < CQD = 360 - ......... = ..........

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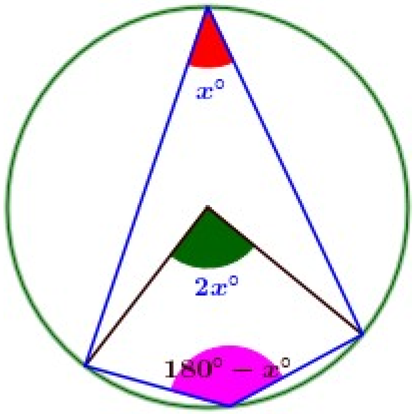
# ONLINE MATHS CLASS - X - 27 ( 11 / 09 /2020 )

*What did we learn in the previous classes ?*




*An arc makes three types of angles in a circle .*

1. *Angle made by an arc at the centre of the circle*
2. *Angle on an arc .*
3. *Angle on its complementary arc .*

*What is relation among them ?*

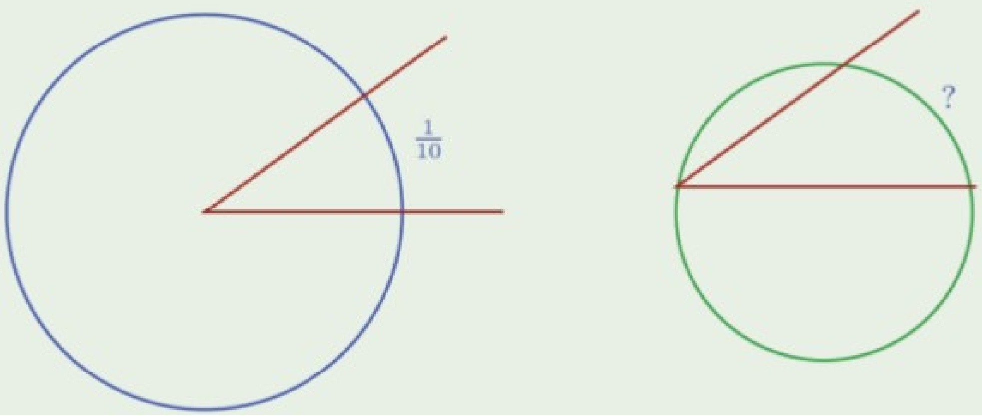
*The angle made by an arc of a circle on the alternate arc is half the angle made at the centre .*

*A pair of an angles on an arc and its alternate are supplementary .*

*Now let's discuss some problems related to these ideas*

1.

A rod bent into an angle is placed with its corner at the centre of a circle and it is found that $\frac{1}{10}$ of the circle lies within it. If it is placed with its corner on another circle, what part of the circle would be within it?

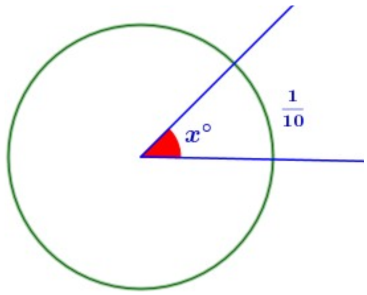



Answer .

$$\frac{\text{Arc length}}{\text{Perimeter of the circle}} = \frac{\text{central angle of the arc}}{360}$$

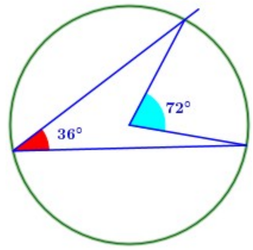
$$\frac{1}{10} = \frac{x}{360}$$

$$x = \frac{360}{10} = 36$$




*Angle on the alternate arc* = 36 °

*Central angle of the arc* = 2 x 36 = 72 °



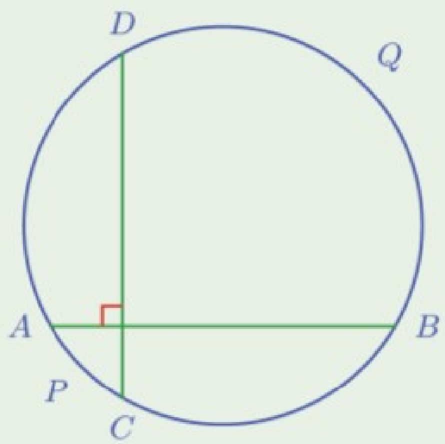

$$\frac{\textit{Arc length}}{\textit{Perimeter of the circle}} = \frac{\textit{central angle of the arc}}{360}$$

$$= \frac{72}{360} = \frac{1}{5}$$

*If the rod is placed with its corner on another circle ,* $\frac{1}{5}$ *th part of the circle would be within it .*

2.

In the picture, $AB$ and $CD$ are mutually perpendicular chords of the circle. Prove that the arcs $APC$ and $BQD$ joined together would make half the circle.



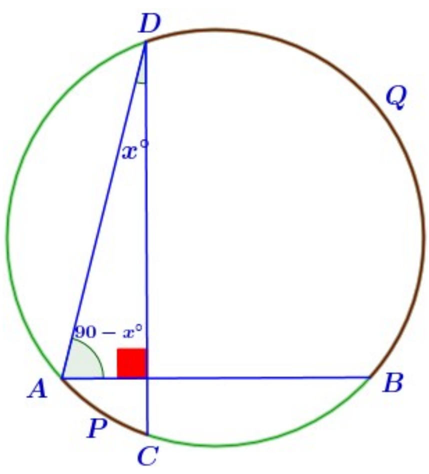

*Answer .*

*Take* , < *ADC* = $x°$

< *DAB* = 90 - $x°$

*Central angle of the arc APC* = 2 x < *ADC*

= 2 $x°$



*( The angle made by an arc of a circle on the alternate arc is half the angle made at the centre )*

*Central angle of the arc BQD* = 2 x < *BAD*

= 2 ( 90 - $x^o$ ) = 180 - 2 $x^o$

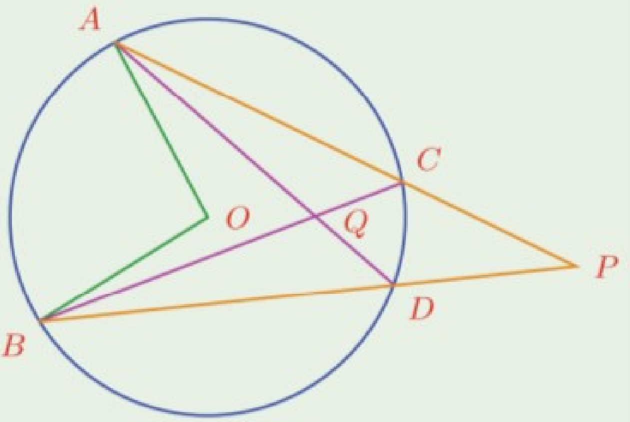
*Central angle of the arc APC + Central angle of the arc BQD* = 2 $x^o$ + 180 - 2 $x^o$

= 180 °

*That is the arcs APC and BQD joined together make a semicircle .*

3.

In the picture, $A, B, C, D$ are points on a circle centred at $O$. The lines $AC$ and $BD$ are extended to meet at $P$. The lines $AD$ and $BC$ intersect at $Q$. Prove that the angle which the small arc $AB$ makes at $O$ is the sum of the angles it makes at $P$ and $Q$.




*Answer .*

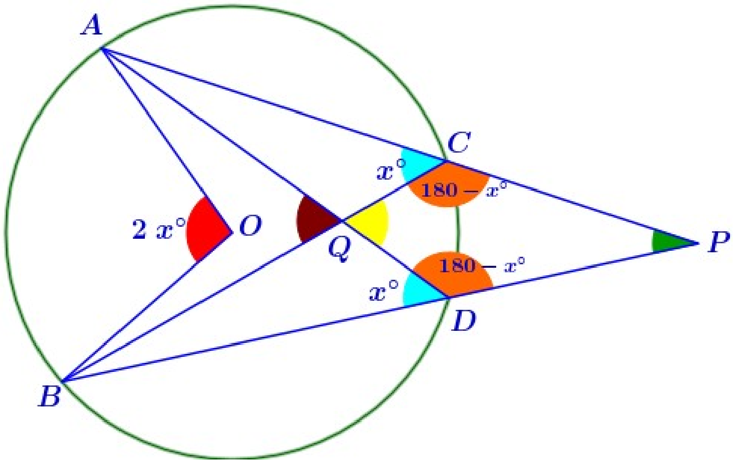
*Take* , < AOB = 2 $x^o$

< ACB = < ADB = $x^o$

*( The angle made by an arc of a circle on the alternate arc is half the angle made at the centre )*

< *QCP* = 180 - $x^o$ ( < *ACB* = $x^o$ , *linear pair* )

< *QDP* = 180 - $x^o$ ( < *ADB* = $x^o$ , *linear pair* )



*In quadrilateral CPDQ ,*

< *CQD* + < *CPD* = 360 - ( 180 - $x^o$ + 180 - $x^o$ ) ( *Sum of the angles of a quadrilateral is* 360 º )

= 360 – ( 360 - 2 $x^o$ )

= 360 – 360 + 2 $x^o$

= 2 $x^o$

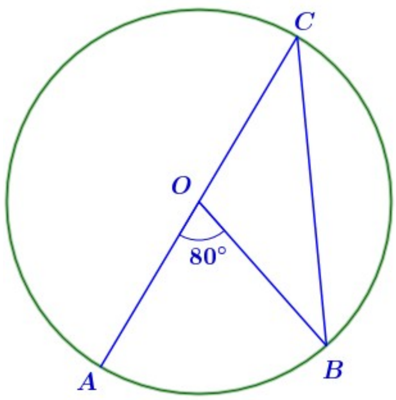
< *AQB* = < *CQD* ( *Opposite angles* )

< *AQB* + < *CPD* =< *CQD* + < *CPD* = 2 $x^o$ = < *AOB*

*More activity*

*In the figure O is the centre of the circle . If* < *AOB* = 80 º

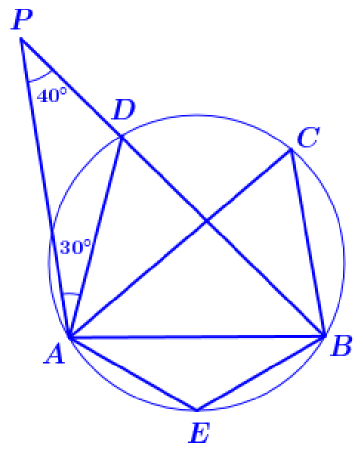
*Find the measures of* < *OCB* *and* < *OBC* ?



# ONLINE MATHS CLASS - X - 27 ( 09 / 09 /2020 )

## WORKSHEET

1. *In the figure* $< APD = 40^{\circ}$ *and* $< PAD = 30^{\circ}$




a) *What is the measure of* $< ADP$ ?

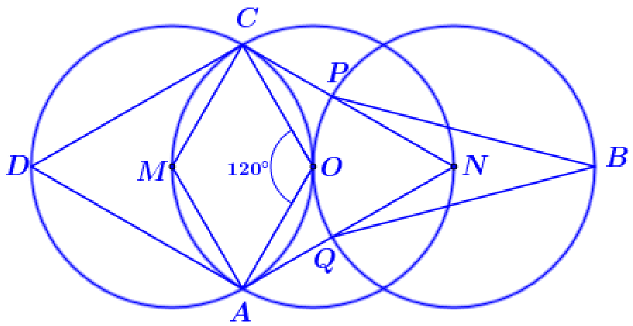
b) *What is the measure of* $< ADB$ ?

c) *What is the measure of* $< ACB$ ?

d) *What is the measure of* $< AEB$ ?

2. *In the figure* $M$ , $O$ *and* $N$ *are the centres of the circles* .

$< AOC = 120^{\circ}$




a) *What is the measure of* $< ANC$ ?

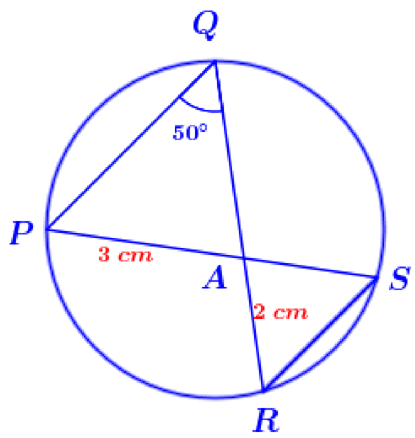
b) *What is the measure of* $< PBQ$ ?

c) *What is the measure of* $< AMC$ ?

d) *What is the measure of* $< ADC$ ?

3. *In the figure chords* $PQ$ *and* $RS$ *are parallel* .

$< PQR = 50^{\circ}$ , $AP = 3$ *cm* *and* , $AR = 2$ *cm*



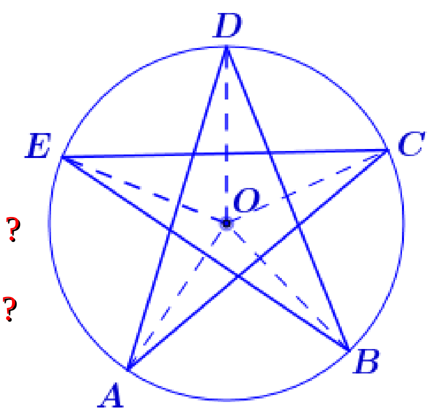

a) *What is the measure of* $<$ PSR ?

b) *What is the measure of* $<$ QRS ?

c) *What is the measure of* $<$ QPS ?

d) *What is the length of the chord* $QR$ ?

4. *In the figure* $O$ *is the centre of the circle* .




a) *What is the measure of the angle around the point* $O$ ?

b) *What is the relation between the measures of* $< D$ *and* $< AOB$ ?

c) *What is the relation between the measures of* $< C$ *and* $< AOE$ ?

d) *Prove that* $< A + < B + < C + < D + < E = 180^{\circ}$ ?

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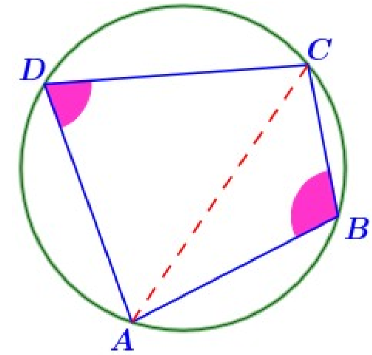
# ONLINE MATHS CLASS - X - 28 ( 11 / 09 /2020 )

## Quadrilateral wuth all vertices are on a circle

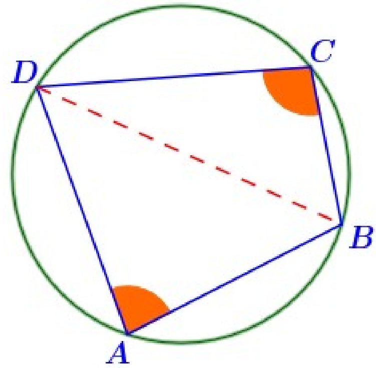
*In the figure A, B , C , D and are four points on the circle .*




*Consider the quadrilateral ABCD .*

*Draw the diagonal AC .*

< B + < D = 180 ° ( *The angles made by a chord on either side of it are supplementary or a pair of an angles on an arc and its alternate are supplementary* )




*Draw the diagonal BD .*

< A + < C = 180 ° ( *The angles made by a chord on either side of it are supplementary* )

> *If all four vertices of a quadrilateral are on a circle , then its opposite angles are supplementary*

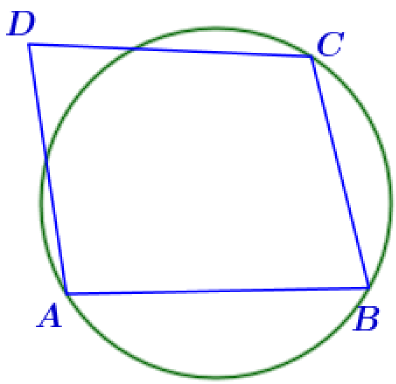
## Circle passes through the vertices of a quadrilateral

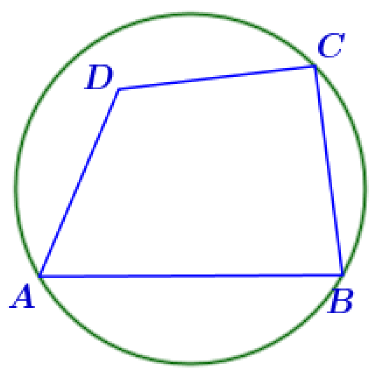
*Can we draw a circle through all four vertices of a quadrilateral ?*

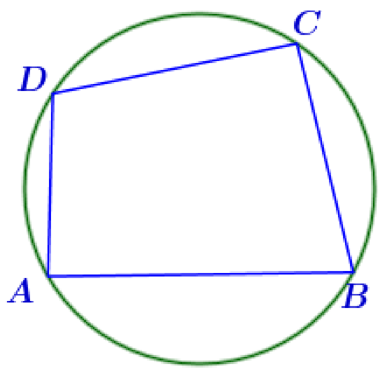
*We can draw a circle through three vertices of a quadrilateral . ( Since we can draw a circle through three vertices of a quadrilateral by forming a triangle using these vertices )*

*( circumcircle of a triangle )*

*Three situations may arise .*

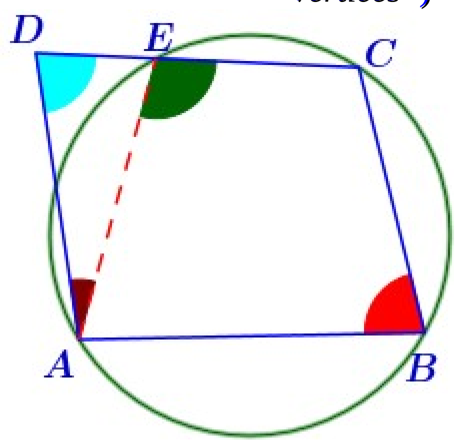


Case 1 ( One vertex of a quadrilateral is outside the circle drawn through the other three vertices )

The side CD cuts the circle at E .




Join AE .

In the quadrilateral ABCE ,

$< B + <AEC = 180^\circ$ (If all four vertices of a quadrilateral are on a circle , then its opposite angles are supplementary )

In the triangle ADE , $<AEC = < D + < DAE$ ( The outer angle at a vertex of a triangle is the sum of the inner angles at the other vertices )

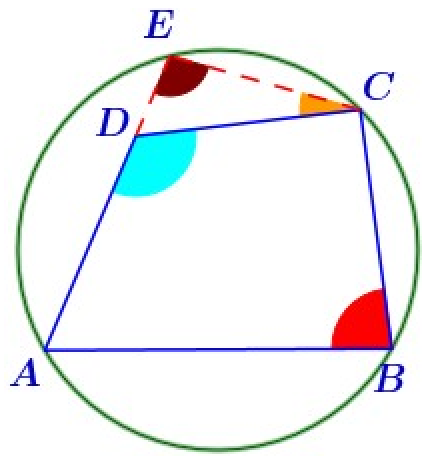
That is , the measure of $< D$ is less than that of $<AEC$ .

So $< B + < D$ is less than $180^\circ$ . ( $< B + <AEC = 180^\circ$ )

| |
|---|
| If one vertex of a quadrilateral is outside the circle drawn through the other three vertices , then the sum of the angles at this vertex and its opposite vertex is less than $180^\circ$ |

Case 2 ( One vertex of a quadrilateral is inside the circle drawn through the other three vertices )

The side AD is extended and meets the circle at E .




Join AE and CE .

In the quadrilateral ABCE ,

$< B + < E = 180^\circ$ ( If all four vertices of a quadrilateral are on a circle , then its opposite angles are supplementary )

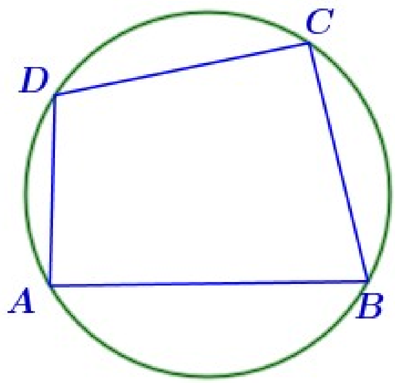
In the triangle DEC , $<ADC = < E + < DCE$ ( The outer angle at a vertex of a triangle is the sum of the inner angles at the other vertices )

*That is the measure of $\angle ADC$ is more than that of $\angle E$ .*

$\angle B + \angle ADC$ *is more than* $180^\circ$ . ( $\angle B + \angle AEC = 180^\circ$ )

*If one vertex of a quadrilateral is inside the circle drawn through the other three vertices , then the sum of the angles at this vertex and its opposite vertex is more than 180°*

*Case 3* ( *All vertices are on the circle drawn through the vertices of a quadrilateral* )




$\angle B + \angle D = 180^\circ$ ( *If all four vertices of a quadrilateral are on a circle , then its opposite angles are supplementary* )

*If all four vertices of a quadrilateral are on a circle , then its opposite angles are supplementary*

*NB :*

*Now suppose in quadrilateral ABCD , we have* $\angle B + \angle D = 180^\circ$ . *Draw the circle through A , B , C .*

*Can D be outside the circle , inside the circle or on the circle ?*

*If D is outside the circle , we must have the sum of* $\angle B$ *and* $\angle D$ *less than* $180^\circ$ . *So D is not outside the circle .*

*If D is inside the circle , we must have the sum of* $\angle B$ *and* $\angle D$ *greater than* $180^\circ$ .

*So D is not inside the circle .*

*Since it is neither outside the circle nor inside the circle , D must be on the circle .*

*If opposite angles of a quadrilateral are supplementary , we can draw a circle passing through all four of its vertices .*

## Cyclic quadrilateral

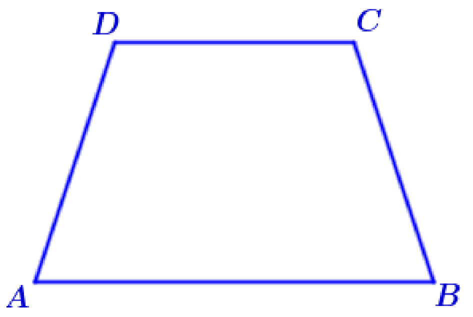
*Cyclic quadrilaterals are those quadrilaterals with opposite angles supplementary .*

*All rectangles are cyclic .* *( Since each angle of a rectangle is $90^o$ , opposite angles are supplementary )*

## More activity

1. *In the figure ABCD is an isosceles trapezium .*

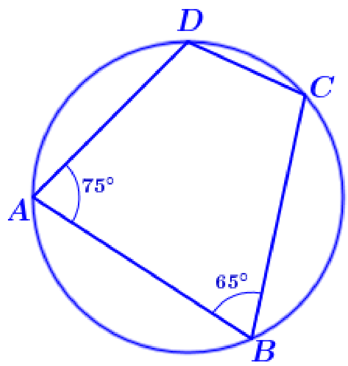
   *Prove that ABCD is cyclic ?*



# ONLINE MATHS CLASS - X - 28 ( 11 / 09 /2020 )

## WORKSHEET

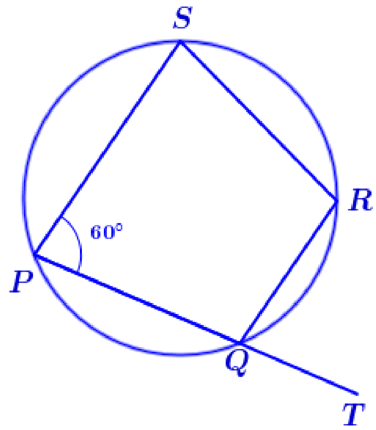
1. *In the figure* < *A* = 75 ° *and* < *B* = 65 °




a) *What is the measure of* < C ?

b) *What is the measure of* < D ?

2. *In the figure* <*P* = 60° , *PS is parallel to QR*



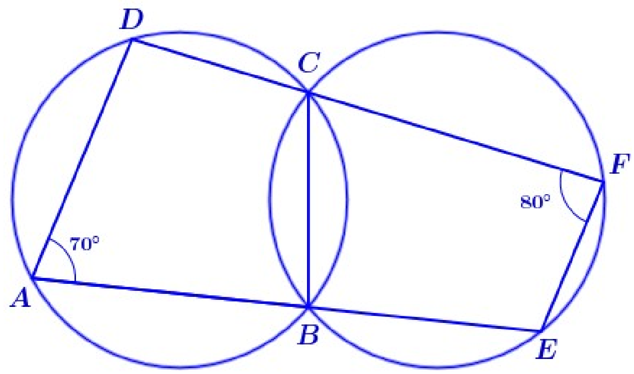

a) *What is the measure of* < *R* ?

b) *What is the measure of* < *RQT* ?

c) *What is the measure of* < *PQR* ?

d) *What is the measure of* < *S* ?

3. *In the figure* <A = 70 ° , < F = 80 °




a) *What is the measure of* < *BCD* ?

b) *What is the measure of* < *BCF* ?

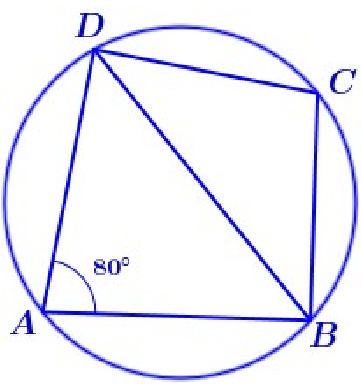
c) *What is the measure of* < *E* ?

d) *What is the measure of* < *CBE* ?

e) *What is the measure of* < *ABC* ?

f) *What is the measure of* < *D* ?

4. *In the figure* < *A* = 80 ° . *AD* = *AB and BC* = *CD*




a) *What is the measure of* < *C* ?

b) *What is the measure of* < *ADB* ?

c) *What is the measure of* < *BDC* ?

d) *What is the measure of* < *ABC* ?

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# ONLINE MATHS CLASS - X - 29 ( 14 / 09 /2020 )

*What did we learn in the last class ?*

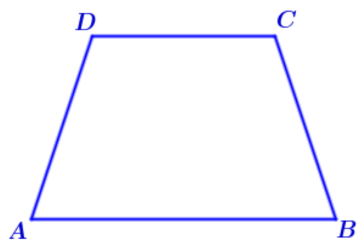
*Cyclic quadrilateral*

*Cyclic quadrilaterals are those quadrilaterals with opposite angles supplementary .*

- *If one vertex of a quadrilateral is outside the circle drawn through the other three vertices , then the sum of the angles at this vertex and its opposite vertex is less than 180°*
- *If one vertex of a quadrilateral is inside the circle drawn through the other three vertices , then the sum of the angles at this vertex and its opposite vertex is more than 180 °*
- *If all four vertices of a quadrilateral are on a circle , then its opposite angles are supplementary*
- *If opposite angles of a quadrilateral are supplementary , we can draw a circle passing through all four of its vertices .*

NB : *In the figure ABCD is an isosceles trapezium .*

*Prove that < A = < B ?*



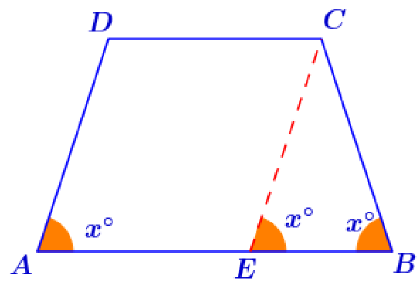

*Answer*

*In the given isosceles trapezium ABCD*

AD = B C . *Also AB is parallel to DC .*

*A line drawn through C parallel to AD cuts AB at E .*

*ADCE is a parallelogram . ( AE is parallel to DC and AD is parallel to CE )*



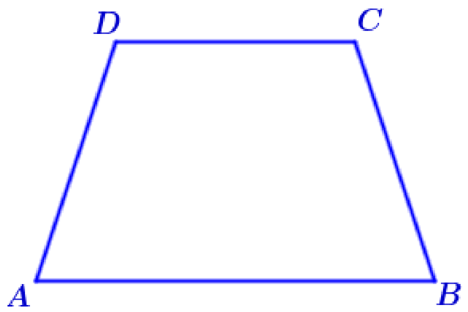

*< A = < BEC* = $x^\circ$

*In triangle BCE , < BEC = < B* = x° ( *CE = BC , AD = BC* )

*That is , < A = < BEC = < B ===> < A = < B*

1. *In the figure ABCD is an isosceles trapezium .*

*Prove that ABCD is cyclic ?*




*Answer*

*[ In the given isosceles trapezium ABCD*

*AD = B C*

*AB is parallel to DC . Also < A = < B ]*

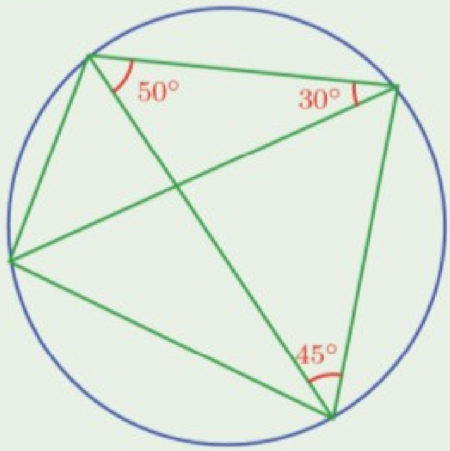
*< A + < D = 180 ° ( AB is parallel to DC , co-interior angles are supplementary )*

*< B + < D = 180 ° ( < A = < B )*

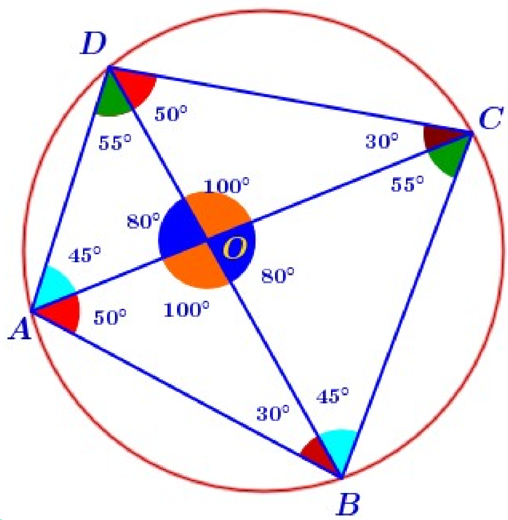
*Since the opposite angles are supplementary , ABCD is cyclic .*

2.

Calculate the angles of the quadrilateral in the picture and also the angles between their diagonals:




*Answer*




*< BDC = < BAC = 50 ° ( All angles made by an arc on the alternate arc are equal )*

*< ACD = < ABD = 30 °*

*< CBD = < CAD = 45 °*

*< ADB = 55 ° ( < ABC + < ADC = 180 ° , A pair of*

*angles on an arc and its alternate arc are supplementary )*

$< ADB = < ACB = 55°$

*In triangle AOB*, $< AOB = 180 - (50 + 30) = 180 – 80 = 100°$ *( Sum of the angles of a triangle is 180° )*

$< AOB = < COD = 100°$ *( opposite angles )*

$< AOD = 180 - < AOB = 180 – 100 = 80°$ *( linear pair )*

< AOD = < BOC = 80° *( opposite angles )*

*__Angles ofthe quadrilateral__*

< DAB = 45 + 55 = 95°

< ABC = 30 + 45 = 75°

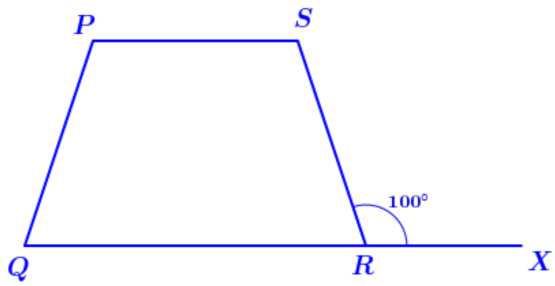
< BCD = 55 + 30 = 85°

< CDA = 50 + 55 = 105°

*__More activities__*

1. *In the figure PQRS is an isosceles trapezium and QR is extended to X .*

*If < SRX = 100°, find all angles of PQRS ?*

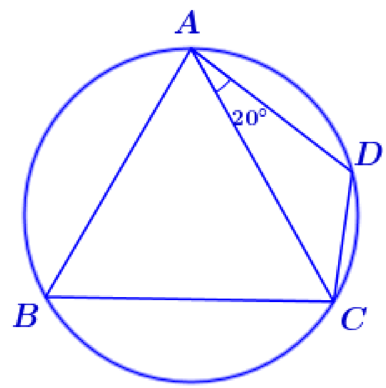



2. *Prove that any non- isosceles trapezium is not cyclic ?*

# ONLINE MATHS CLASS - X - 29 ( 14 / 09 /2020 )

## WORKSHEET

1. *In the figure ABC is an equilateral triangle . < CAD = 20 º*




a) *What is the measure of < B ?*

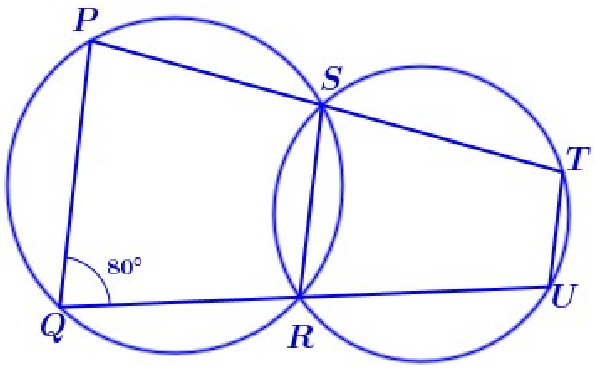
b) *What is the measure of < D ?*

c) *What is the measure of < BAD ?*

d) *What is the measure of < BCD ?*

2. *In the figure two circles intersect at the points S and R . PQ is parallel to RS and*

< Q = 80 º




a) *What is the measure of < PSR ?*

b) *What is the measure of < RST ?*

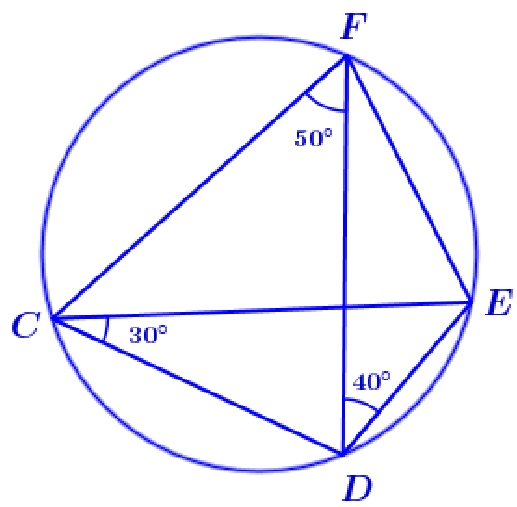
c) *What is the measure of < U ?*

d) *What is the measure of < SRU ?*

e) *What is the measure of < T ?*

f) *What is the measure of < P ?*

3. *In the figure < DCE = 30 º , < CFD = 50 º and < EDF = 40 º*




a ) *What is the measure of < DFE ?*

b) *What is the measure of < CED ?*

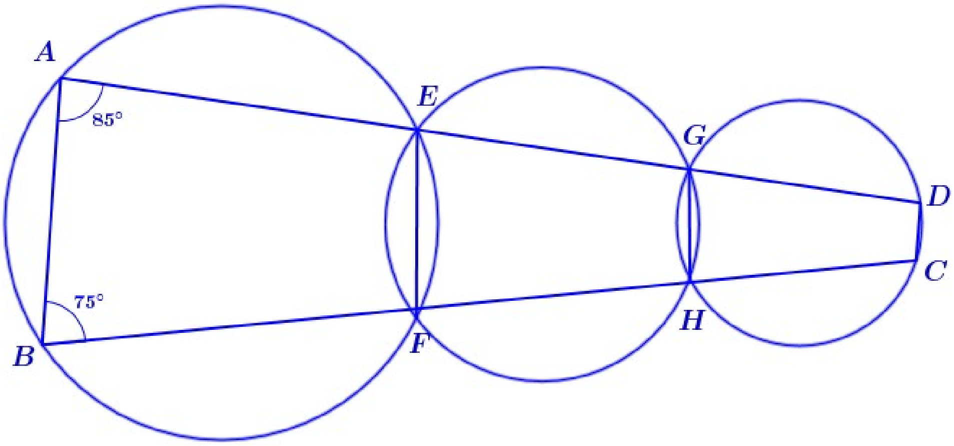
c) *What is the measure of < ECF ?*

d) *What is the measure of < CDF ?*

e) *What is the measure of < DEF ?*

f) *What is the measure of < CEF ?*

4.




4. *In the figure three circles intersect at the points E , F, G and H .*

< A = 85 ° , < B = 75 °

a) *What is the measure of < AEF ?*

b) *What is the measure of < FEG ?*

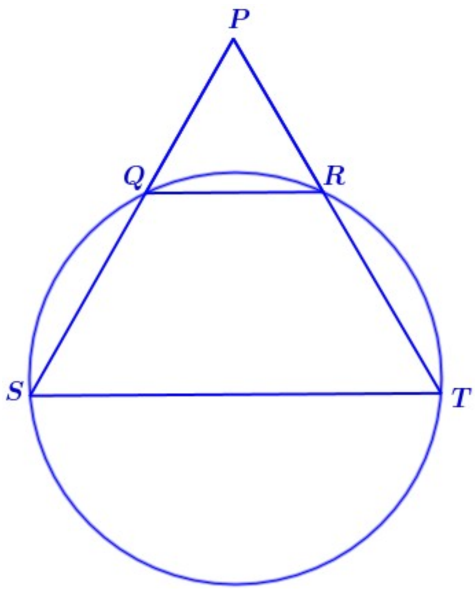
c) *What is the measure of < FHG ?*

d) *What is the measure of < D ?*

e) *What is the measure of < BFE ?*

f) *What is the measure of < C ?*

5. *In the figure PQR is an equilateral triangle .*




a) *What is the measure of < P ?*

b) *What is the measure of < SQR ?*

c) *What is the measure of < T ?*

d) *What is the measure of < QRT ?*

e) *Prove that PST is an equilateral triangle ?*

# ONLINE MATHS CLASS - X - 30 ( 15 / 09 /2020 )

*What did we learn in the last class ?*

***Cyclic quadrilateral***

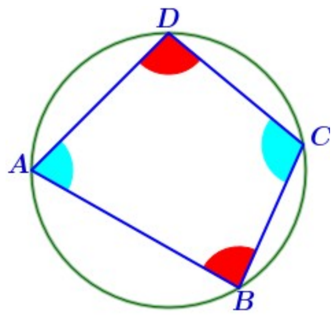
*If all the four vertices of a quadrilateral are on the circle , then it is called a cyclic quadrilateral .*

*Opposite angles of a cyclic quadrilateral are supplementary .*

*In the cyclic quadrilateral ABCD ,*

$< A + < C = 180^\circ$

$< B + < D = 180^\circ$




*If opposite angles of a quadrilateral are supplementary , then it is cyclic*

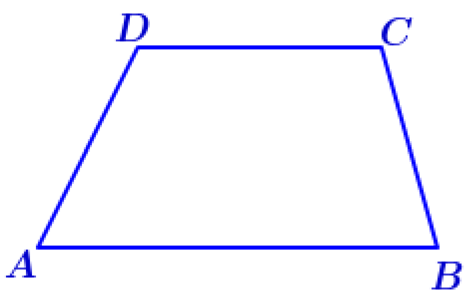
***Cyclic quadrilaterals which we have already learned***

*Rectangle , Square , isosceles trapezium*

***Let's solve some problems related to these ideas .***

1. *Prove that any non- isosceles trapezium is not cyclic ?*

***Answer .***




*In the figure ABCD is a non - isosceles trapezium*

$< A + < D = 180^\circ$ ( *AB is parallel to DC* , co-interior angles are supplementary )

*Also*

$$< A \neq < B$$

$$< B + < D \neq 180^\circ$$

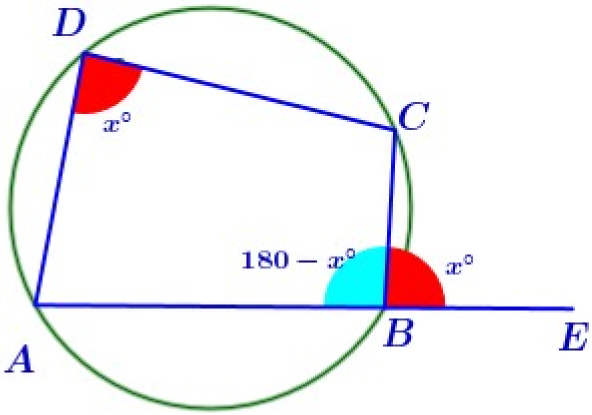
*Since the opposite angles are not supplementary , ABCD is not cyclic .*

*That is , any non- isosceles trapezium is not cyclic*

**1** Prove that any outer angle of a cyclic quadrilateral is equal to the inner angle at the opposite vertex.

*Answer .*

*In the figure < CBE is an outer angle at the vertex B of a cyclic quadrilateral ABCD .*




*Take , < CBE = $x^{\circ}$*

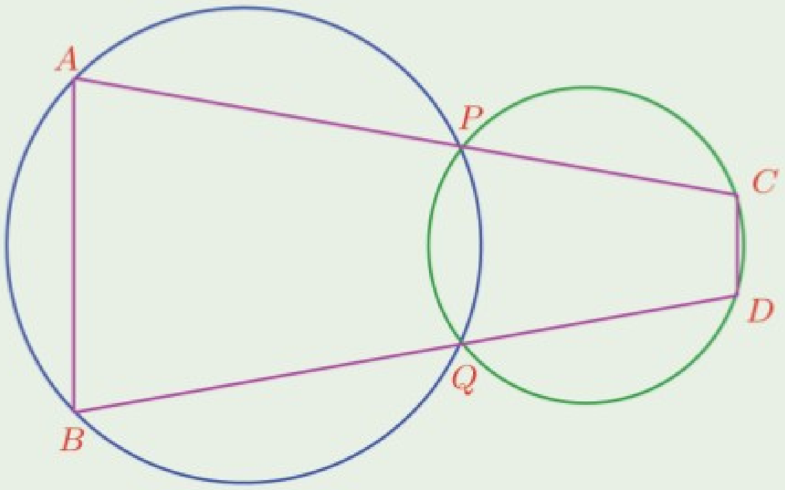
*< ABC = 180 - $x^{\circ}$ ( linear pair )*

*< ADC = 180 - ( 180 - $x^{\circ}$ )*

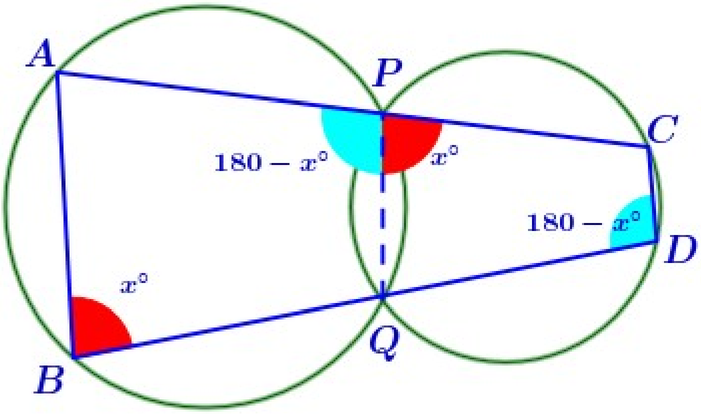
*= 180 – 180 + $x^{\circ}$ = $x^{\circ}$ = < CBE*

*( < ABC + < ADC = 180 , Opposite angles of a cyclic quadrilateral are supplementary )*

**2** The two circles below intersect at $P$, $Q$ and lines through these points meet the circles at $A, B, C, D$. The lines $AC$ and $BD$ are not parallel. Prove that if these lines are of equal length, then $ABDC$ is a cyclic quadrilateral.



Answer .




Join PQ

Take , < ABQ = $x$ °

< APQ = 180 - $x$ °

( ABQP is a cyclic quadrilateral )

< QPC = $x$ ° ( < APQ = 180 - $x$ ° , linear pair )

< CDQ = 180 - $x$ ° ( PQDC is a cyclic quadrilateral )

AB is parallel to CD ( < ABQ = $x$ ° , < CDQ = 180 - $x$ ° , co-interior angles are supplementary )

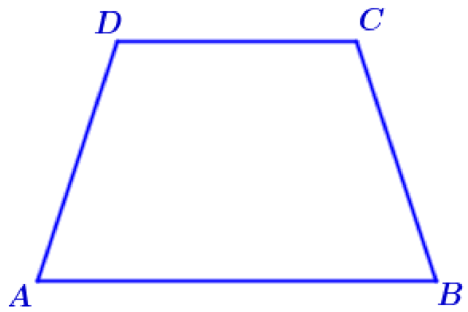
ABCD is an isosceles trapezium ( AB is parallel to CD and AC = BD )

So ABCD is a cyclic quadrilateral ( Any isosceles trapezium is cyclic )

NB : ( To remember )

In the figure ABCD is an isosceles trapezium .

Prove that ABCD is cyclic ?




Answer

[ In the given isosceles trapezium ABCD

AD = B C

AB is parallel to DC . Also < A = < B ]

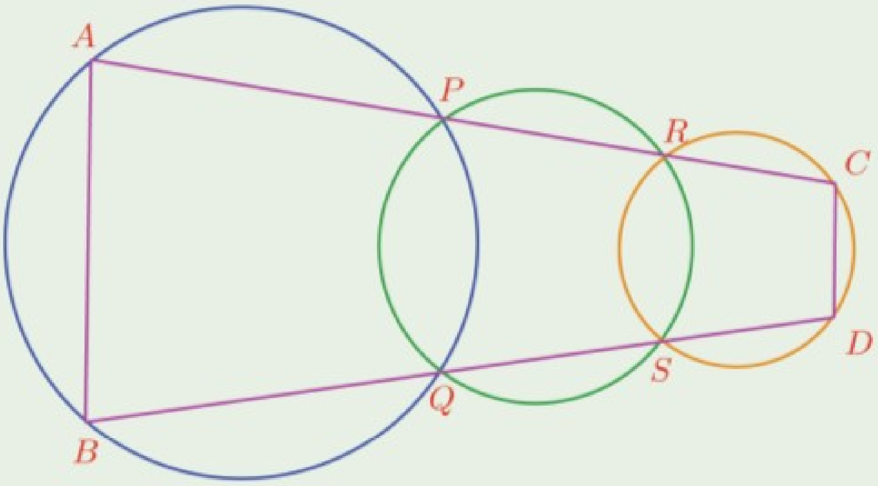
< A + < D = 180 ° ( AB is parallel to DC , co-interior angles are supplementary )

< B + < D = 180 ° ( < A = < B )

Since the opposite angles are supplementary , ABCD is cyclic .

***More activity***

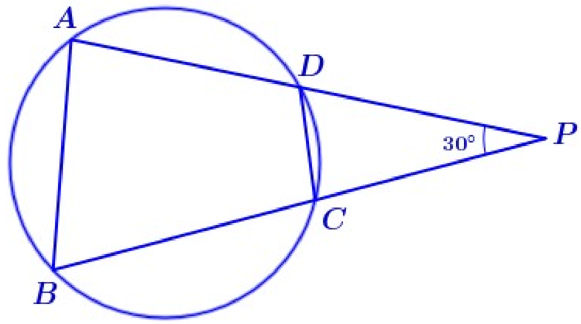
In the picture, the circles on the left and right intersect the middle circle at $P, Q, R, S$; the lines joining them meet the left and right circles at $A, B, C, D$. Prove that $ABDC$ is a cyclic quadrilateral.



# ONLINE MATHS CLASS - X - 30 ( 15 / 09 /2020 )

## WORKSHEET

1. *In the figure DP = CP , < CPD = 30°*




a) *What is the measure of < PCD ?*

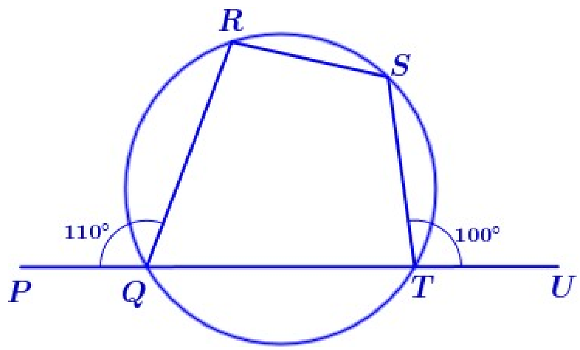
b) *What is the measure of < BCD ?*

c) *What is the measure of < A ?*

d) *What is the measure of < ADC ?*

e) *What is the measure of < B ?*

2. *In the figure < PQR = 110° , < STU = 100°*



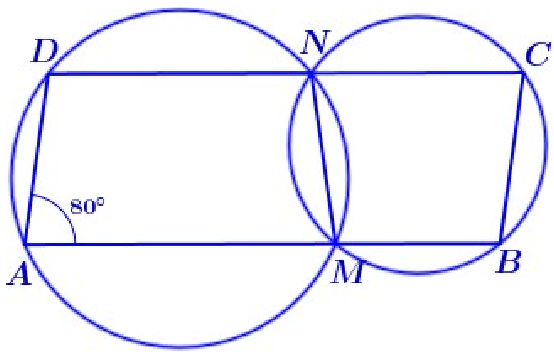

a) *What is the measure of < RQT ?*

b) *What is the measure of < S ?*

c) *What is the measure of < STQ ?*

d) *What is the measure of < R ?*

3. *In the figure lines AB and DC are parallel .< A = 80°*




a) *What is the measure of < DNM ?*

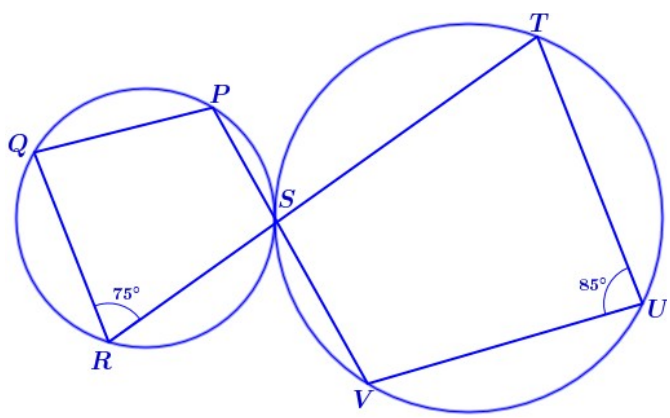
b) *What is the measure of < D ?*

c) *What is the measure of < AMN ?*

d) *What is the measure of < B ?*

e) *What is the measure of < C ?*

4. *In the figure lines QR and TU are parallel . < R = 75° , < U = 85°*




a) *What is the measure of < P ?*

b) *What is the measure of < T ?*

c) *What is the measure of < V ?*

d) *What is the measure of < VST ?*

e) *What is the measure of < Q ?*

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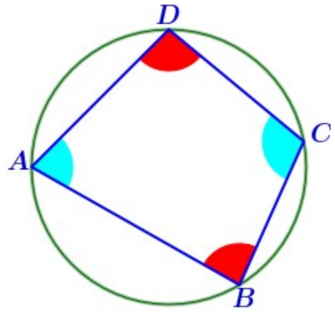
# ONLINE MATHS CLASS - X - 31 ( 17 / 09 /2020 )

*What did we learn in the last classes ?*

*Cyclic quadrilateral*

*If all the four vertices of a quadrilateral are on the circle , then it is called a cyclic quadrilateral . Opposite angles of a cyclic quadrilateral are supplementary .*

*In the cyclic quadrilateral ABCD ,*



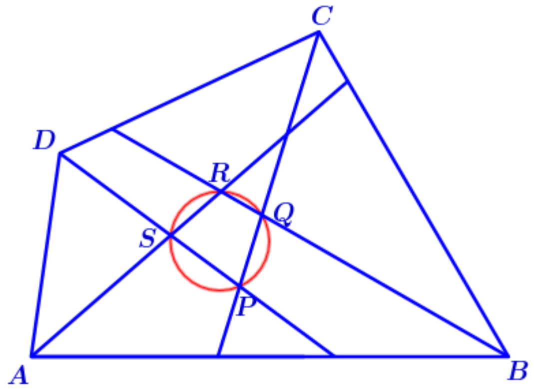

$< A + < C = 180^\circ$

$< B + < D = 180^\circ$

*If opposite angles of a quadrilateral are supplementary , then it is cyclic*

*Let's solve some problems related to these ideas .*

1. *In the picture bisectors of adjacent angles of the quadrilateral ABCD intersect at P, Q , R , S . Prove that PQRS is a cyclic quadrilateral .*



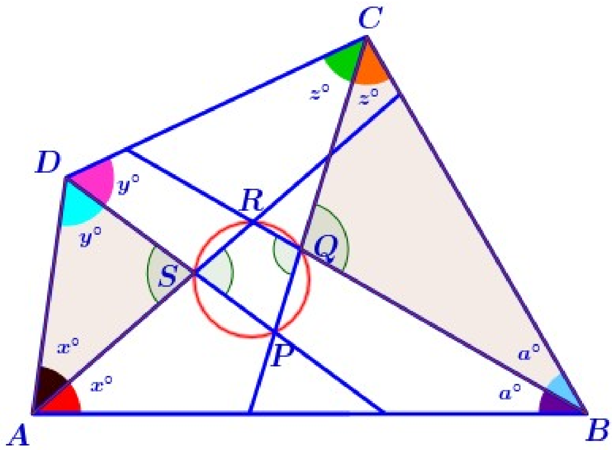

*Answer .*

*Take ,*

$< BAS = < DAS = x^\circ$ ( *AS is the bisector of* $< DAB$ )

$< ADS = < CDS = y^\circ$ ( *DS is the bisector of* $< ADC$ )

$< DCQ = < BCQ = z^\circ$ ( *CQ is the bisector of* $< BCD$ )




$< CBQ = < ABQ = a^\circ$ ( *BQ is the bisector of* $< ABC$ )

$(x+x)+(y+y)+(z+z)+(a+a) = 360°$ ( *Sum o the angles of the quadrilateral ABCD* )

$2x+2y+2z+2a = 360°$

$2(x+y+z+a) = 360°$

$x+y+z+a = \frac{360°}{2} = 180°$

*In the triangle ADS*, $<ASD = 180 - (x+y)$ ( *Sum of the angles of a triangle is* 180°)

$<ASD = <PSR = 180 - (x+y)$ ( *Opposite angles are equal* )

*In the triangle BQC*, $<BQC = 180 - (z+a)$ (*Sum of the angles of a triangle is* 180°))

$<BQC = <PQR = 180 - (z+a)$ ( *Opposite angles are equal* )

$<PSR + <PQR = 180 - (x+y) + 180 - (z+a)$

$= 180 - x - y + 180 - z - a$

$= 180 + 180 - (x+y+z+a)$

$= 360 - (x+y+z+a)$

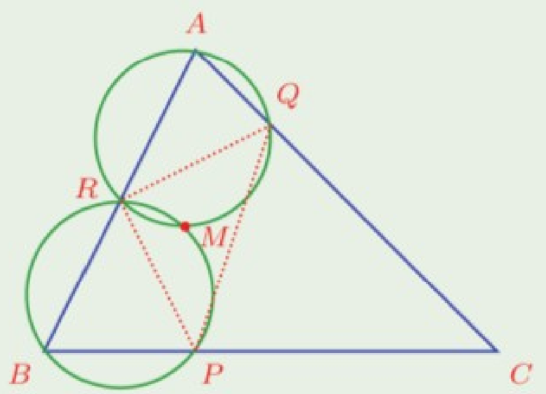
$= 360 – 180 = 180°$

*Since the opposite angles are supplementary , PQRS is a cyclic quadrilateral .*

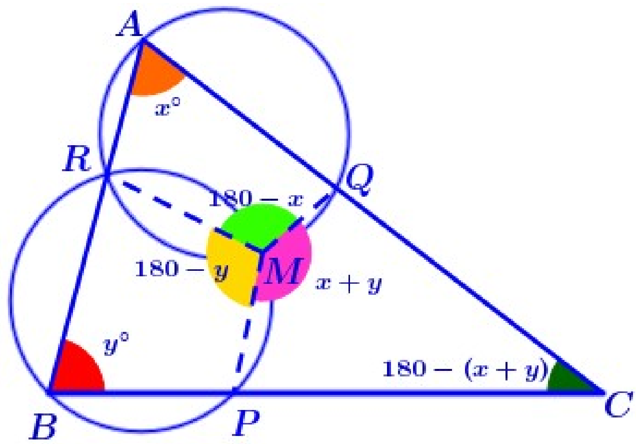
2.

In the picture, points $P, Q, R$ are marked on the sides $BC$, $CA$, $AB$ of $\Delta ABC$ and the circumcircles of $\Delta AQR$ and $\Delta BRP$ are drawn. M is a point where these circles intersect.

Prove that the circumcircle of $\Delta CPQ$ also passes through $M$.



Answer .




Draw the lines PM , QM , RM .

Take $\angle A = x^\circ$ , $\angle B = y^\circ$

In triangle ABC ,

$\angle C = 180 - (x + y)$

In the cyclic quadrilateral AQMR ,

$\angle QMR = 180 - x$ ( Opposite angles of a cyclic quadrilateral are supplementary )

In the cyclic quadrilateral BPMR ,

$\angle PMR = 180 - y$ ( Opposite angles of a cyclic quadrilateral are supplementary . )

$\angle PMQ = 360 - ( 180 - x + 180 - y )$ ( Angle around a point is $360^\circ$ )

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

$= 360 - 360 + x + y$

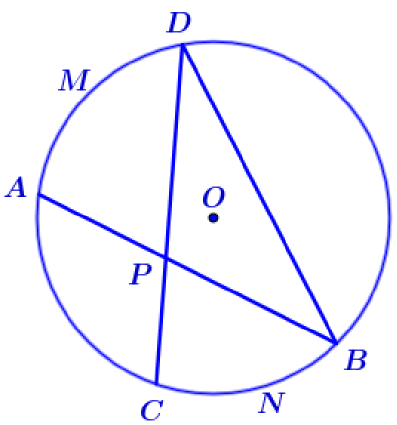
$= x + y$

$\angle PCQ + \angle PMQ = 180 - ( x + y ) + x + y = 180^\circ$

Since the opposite angles are supplementary , PCQM is a cyclic quadrilateral .

That is , the circumcircle of triangle CPQ passes through M .

More activity




In the figure the length of the arc CNB is $\frac{1}{5}$ of the perimeter of the circle and the length of the arc AMD is $\frac{1}{6}$ of the perimeter of the circle .

a) What is the measure of the central angle of the arc CNB ?

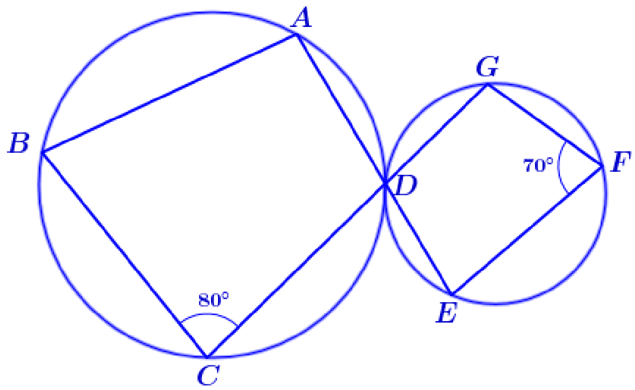
b) Find the measures of $\angle CDB$ , $\angle ABD$ and $\angle APD$ ?

# ONLINE MATHS CLASS- X - 31 ( 17 / 09 /2020 )

## WORKSHEET

1. *In the figure two circle intersect at D*

   *<BCD = 80°, < EFG = 70°*



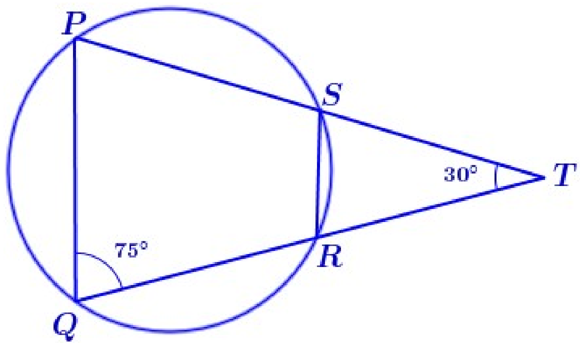

 a) *What is the measure of < BAD ?*

 b) *What is the measure of < EDG ?*

 c) *What is the measure of < ADC ?*

 d) *What is the measure of < ABC ?*

2. *In the figure < PQR = 75°, < STR = 30°*



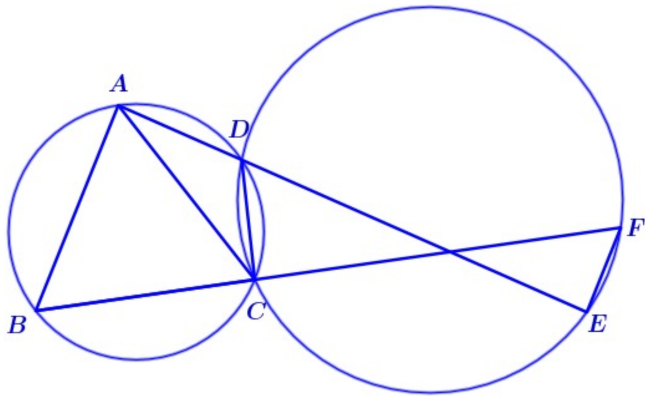

 a) *What is the measure of < PSR ?*

 b) *What is the measure of < QPS ?*

 c) *What is the measure of < QRS ?*

 d) *Prove that STR is an isosceles triangle ?*

3. *In the figure ABC is an equilateral triangle . AD = CD*




 a) *What is the measure of < ABC ?*

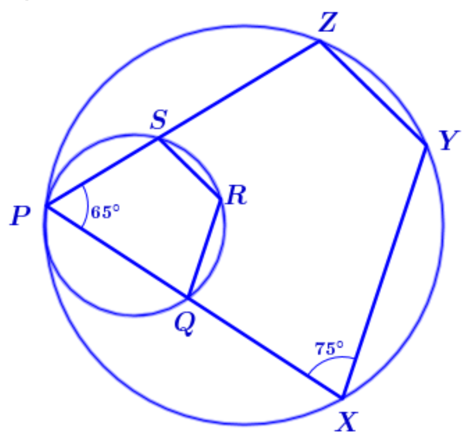
 b) *What is the measure of < ADC ?*

 c) *What is the measure of < CFE ?*

 d) *What is the measure of < DEF ?*

4. *In the figure two circles intersect at P .*

 *Lines QR and XY are parallel . < SPQ = 65° , < PXY = 75°*




 a) *What is the measure of < SRQ ?*

 b) *What is the measure of < PQR ?*

 c) *What is the measure of < PSR ?*

 d) *What is the measure of < XYZ ?*

 e) *What is the measure of < PZY ?*