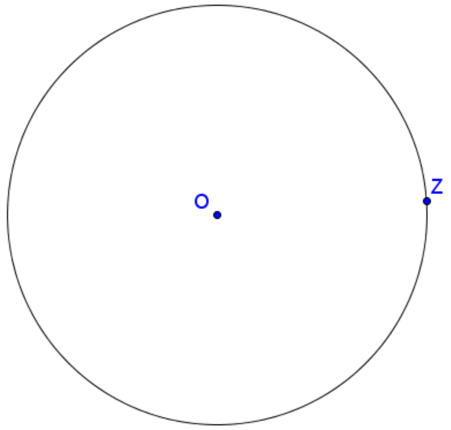
Task A: Angle at Centre and Angle at Circumference

<u>Step 1</u>

Create a circle.

Rename the centre as O and the point on the circumference as Z.

Hide point Z.

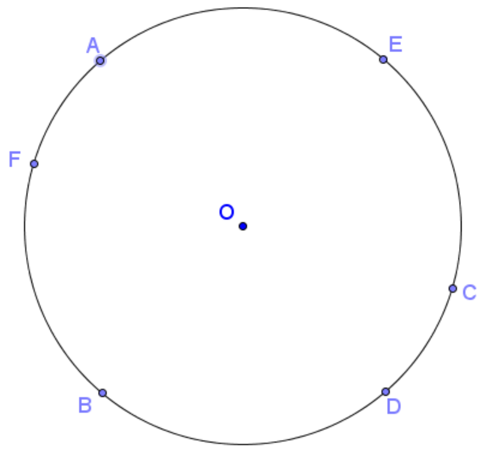


<u>Step 2</u>

Create points A, B and C on the circumference.

Create their opposite points by using "Reflect Object about Point" .

Rename the points A', B' and C' as D, E and F respectively.



Step 3

To create a point P that act as a "phantom" of A and snap to the point F, we use the command "DynamicCoordinates".

The format of the command is **DynamicCoordinates[<Point A>, <Number X>, <Number Y>]**

When the new point moves, A moves with it and the coordinates of the new point are (X, Y) and usually X and Y depends on the coordinates of A.

At the **input** area at the bottom of the screen, type

P= DynamicCoordinates[

A,

If[Distance[A, F] < 0.2, x(F), x(A)],

If[Distance[A, F] < 0.2, y(F), y(A)]

P depends on A

x-coordinate of P

y-coordinate of P

]

Step 4

To create a point P that act as a phantom of A and snap to **points E and F**, we replace the x(A) and y(A) in the original definition of P by

If[Distance[A, E] < 0.2, x(E), x(A)] and If[Distance[A, E] < 0.2, y(E), y(A)] respectively.

If[Distance[A, E] < 0.2, y(E), y(A)]

Right click on P and edit its definition as

DynamicCoordinates[

If[Distance[A, E] < 0.2, x(E), x(A)]

A,

If[Distance[A, F] < 0.2, x(F), ~~x(A)~~],

If[Distance[A, F] < 0.2, y(F), ~~y(A)~~]

]

Step 5

Create a point Q that act as a phantom of C and snap to points E.

At the **input** area, type Q =

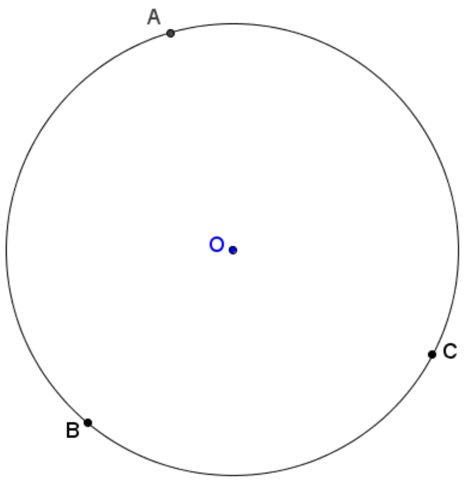
DynamicCoordinates[C, If[Distance[C, E] < 0.2, x(E), x(C)], If[Distance[C, E] < 0.2, y(E), y(C)]]

Step 6

Hide points A, C, D, E and F.

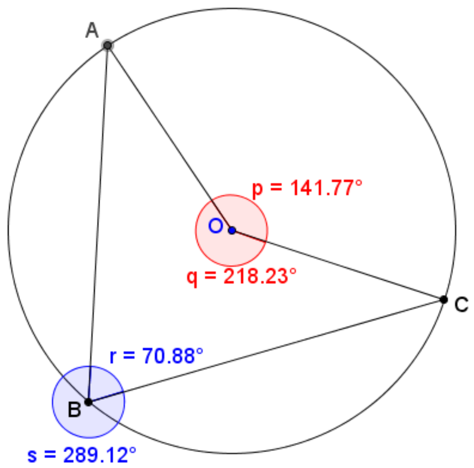
Rename P as A and Q as C.

Change the color of A, B, and C to black.



Step 7

Refer to the figure, draw the line segments and create ∠AOC , ∠ABC and their reflex angles.



Rename the angles as p, q, r and s as in the figure.

Set the colour of the angles at centre as red and the angles at circumference as blue.

Step 8

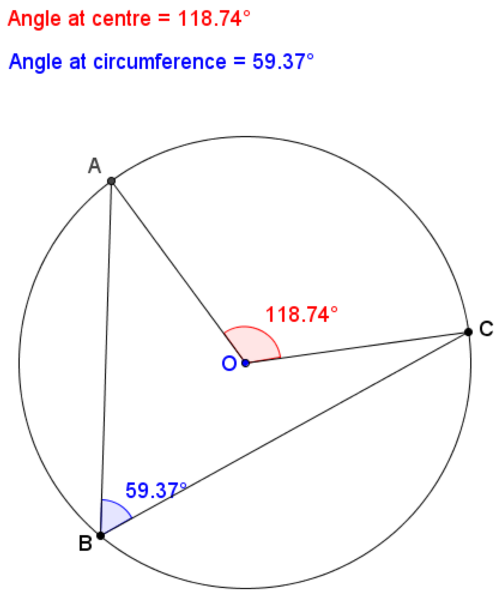
We want to show the pair p and r if r < s, otherwise show the pair q and s.

Right click on r, select object properties and choose the “Advanced” panel.
In the field “Condition to Show Object”, type “r<s”, do the same for the angle p

Right click on s, select object properties and choose the “Advanced” panel.
In the field “Condition to Show Object”, type “s<r”, do the same for the angle q

Step 9

Insert text  to show the sizes of ∠ABC and ∠AOC.

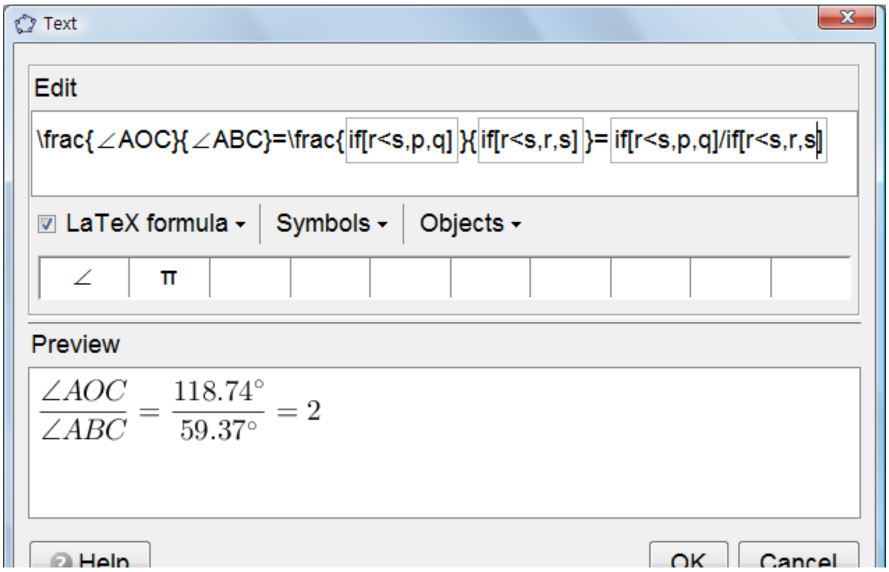


The size of ∠ABC is r if r < s , otherwise it is s.
This can be written as if[r<s, r, s].

The size of ∠AOC is the corresponding “partner” of r and s. If r < s , it is p, otherwise it is q, i.e. if[r<s, p, q].

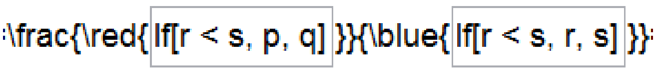
Step 10

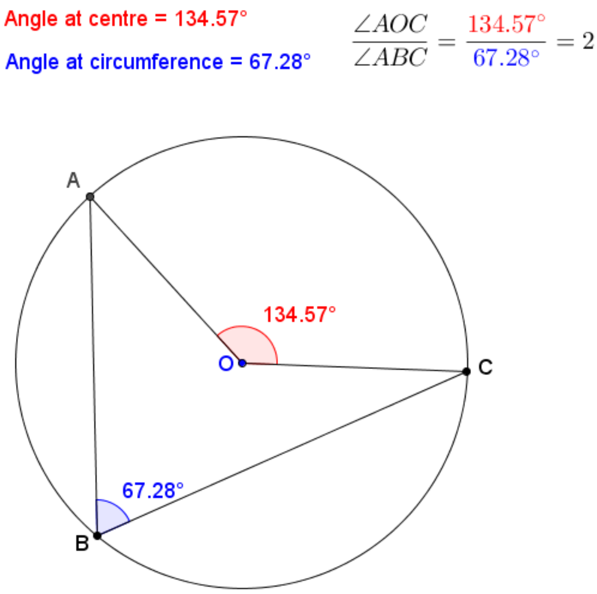
Insert text  to show the ratio between ∠ABC and ∠AOC. To create a fraction, we use the LaTeX command **\frac{numerator}{denominatior}**



<u>Step 11</u>

To change the colour of the numerator and denominator, we enclose the numerator by \red{ } and the denominator by \blue{ }.





~ End of Task A ~

Task A-1: Angle at Centre and Angle NOT at Circumference

Step 1

Repeat Step 1 of Task A.

Step 2

Create a free point D on the plane. Then, create a line passing through the centre O and D. Mark one of the points of intersection of the line and the circle as E.

Hide the points D, E and the line.

Step 3

Create a point B with the dynamic coordinates depending on point D, while snapping to point E. **(Exercise)**

Step 4

Follow the rest of steps in Task A to complete the dynamic worksheet to show one constraint of the theorem by the counter-examples.

~ End of Task A-1 ~

Task A-2: Angle at Centre and Angle at Circumference of an ELLIPSE

Step 1

Create an ellipse. Label the mid-point of the foci as O.

Repeat all the other steps in Task A.

~ End of Task A-2 ~

Task A-3: Angle at Centre and Angle at "Circumference" of a SQUARE

Step 1

Create a square by using the "Regular Polygon" tool. Label the centre of the square as O.

Step 2

Create s as a list of item holding the four segments of the square using the bracket "{}". Define points A, B, C as "point[s]".

Repeat all the other steps in Task A.

~ End of Task A-3 ~