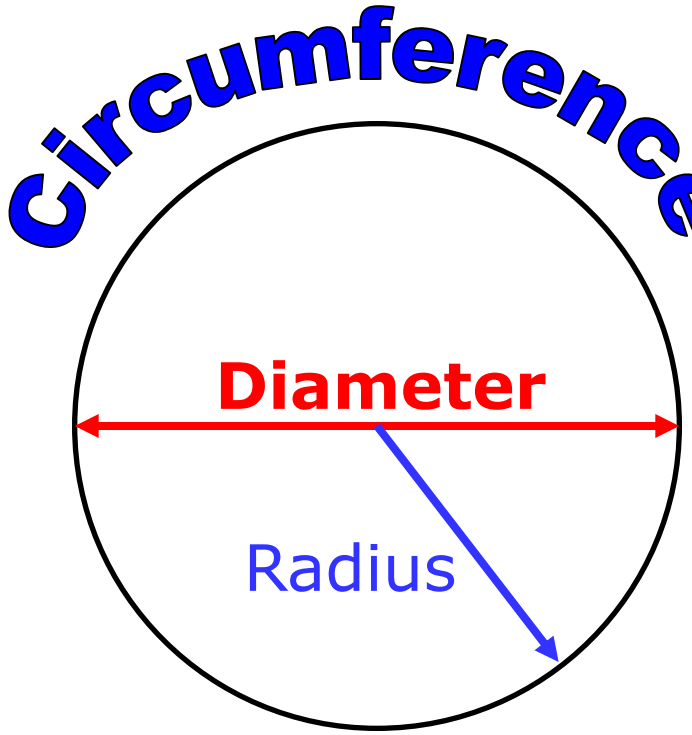
Circle Theorems

A Circle features……



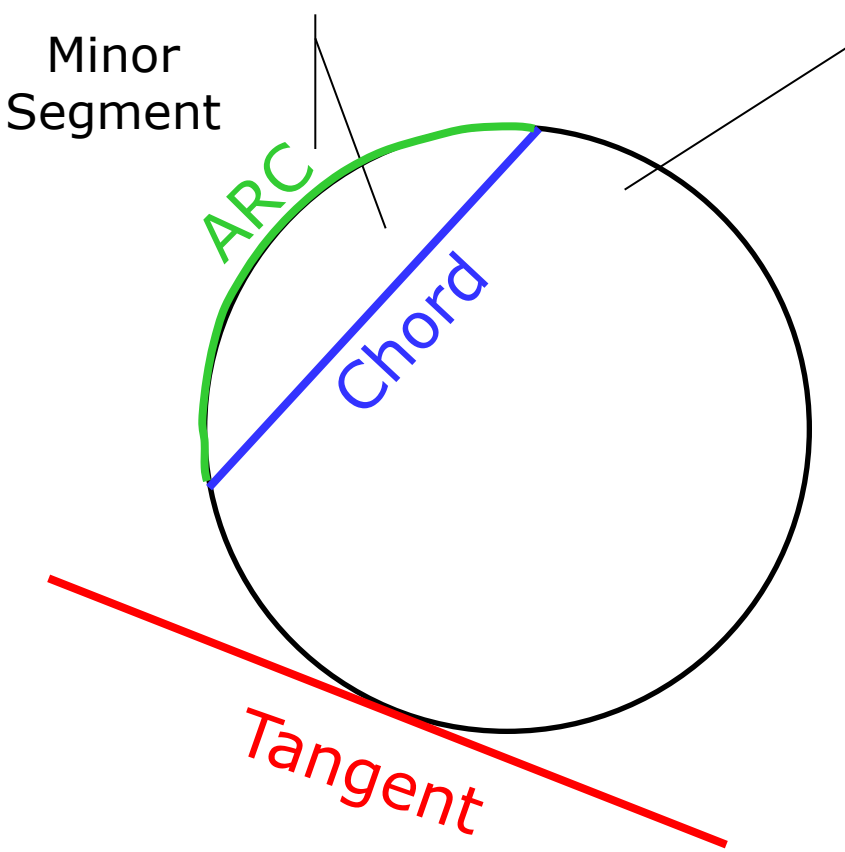
… the distance around the edge of the circle

… the distance across the circle, passing through the centre

… any line from the centre to the circumference

… PERIMETER

A Circle features……



… a line joining two points on the circumference

… part of the circumference

… a line which touches the circle at one point only.

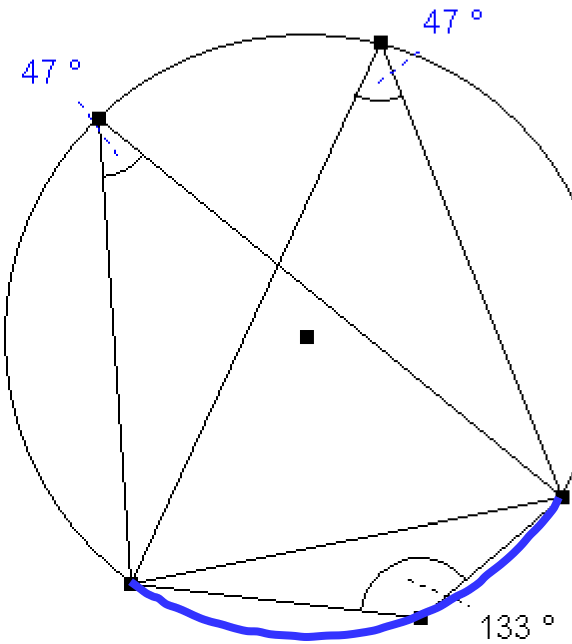
A chord divides a circle into two segments

From Italian *tangere*, to touch

Properties of circles

- When angles, triangles and quadrilaterals are constructed in a circle, the angles have certain properties
- We are going to look at 4 such properties before trying out some questions together

An ANGLE on a chord



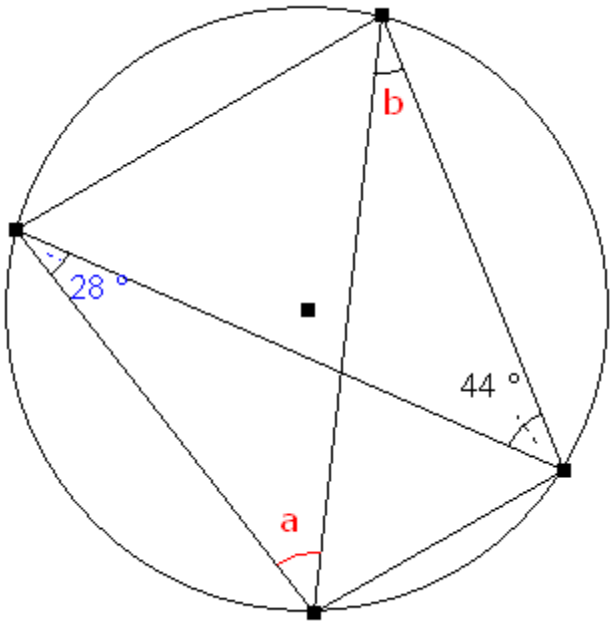
An angle that 'sits' on a chord does not change as the APEX moves around the circumference

Alternatively: "Angles subtended by a chord in the same segment are equal"

… as long as it stays in the same segment

From now on, we will only consider the CHORD, not the ARC

Typical examples



Find angles a and b

Very often, the exam tries to confuse you by drawing in the Chords

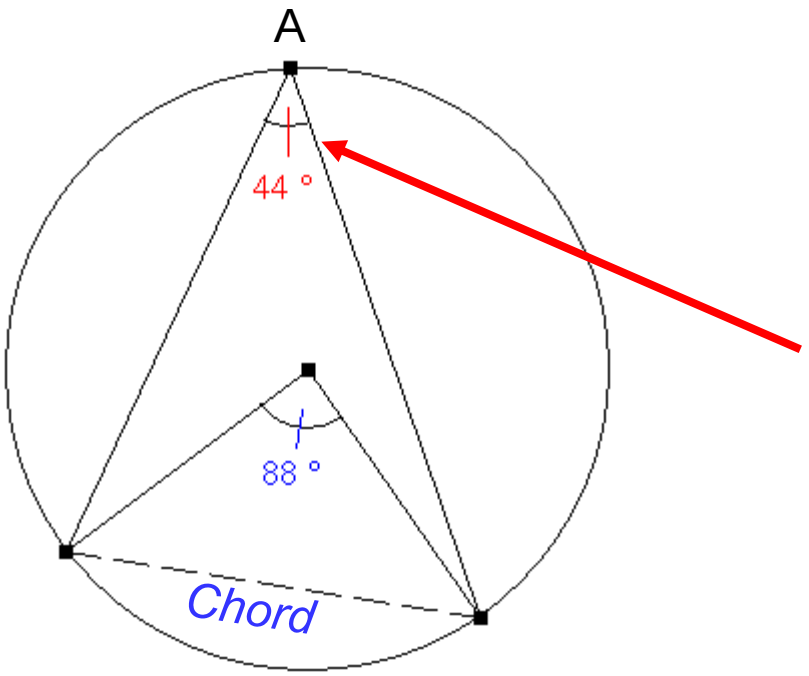
Angle b = 44º

YOU have to see the Angles on the same chord for yourself

agine the Chord

Angle b = 28º

Angle at the centre



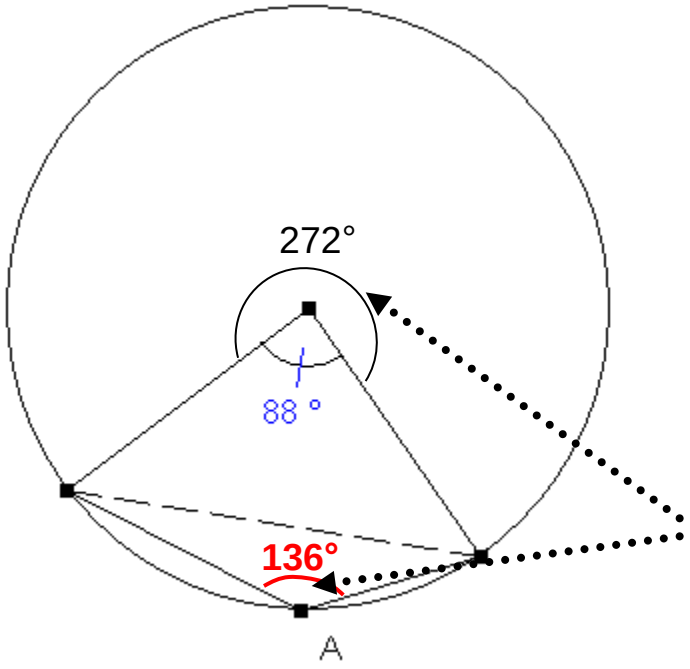
Consider the two angles which stand on this same chord

What do you notice about the angle at the circumference?

It is half the angle at the centre

We say "*If two angles stand on the same chord, then the angle at the centre is twice the angle at the circumference*"

Angle at the centre



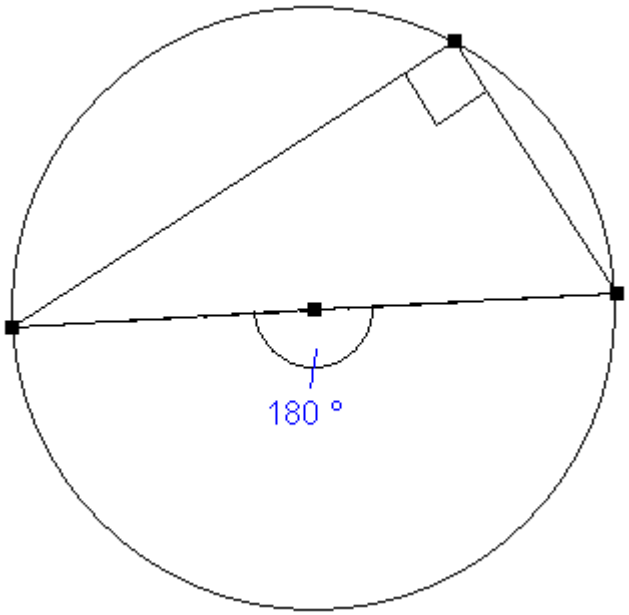
It's still true when we move The apex, A, around the circumference

As long as it stays in the same segment

Of course, the reflex angle at the centre is twice the angle at circumference too!!

We say "*If two angles stand on the same chord, then the angle at the centre is twice the angle at the circumference*"

Angle at Centre



A Special Case

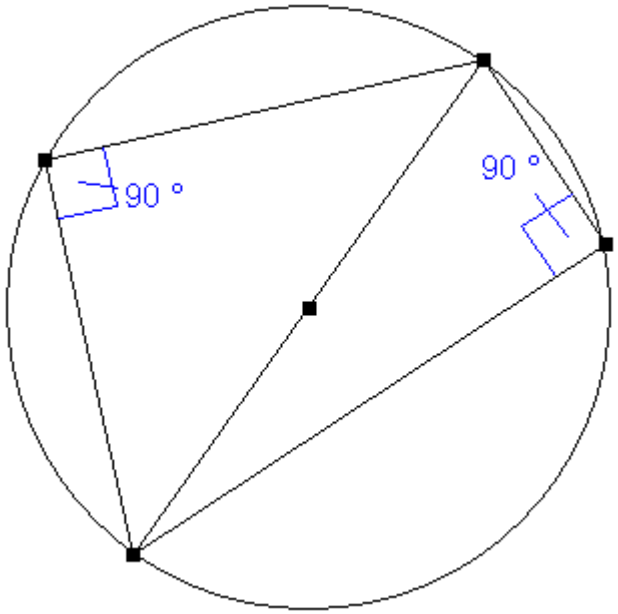
When the angle stands on the diameter, what is the size of angle a?

The diameter is a straight line so the angle at the centre is 180°

Angle a = 90°

We say *"The angle in a semi-circle is a Right Angle"*

A Cyclic Quadrilateral



…is a Quadrilateral whose vertices lie on the circumference of a circle

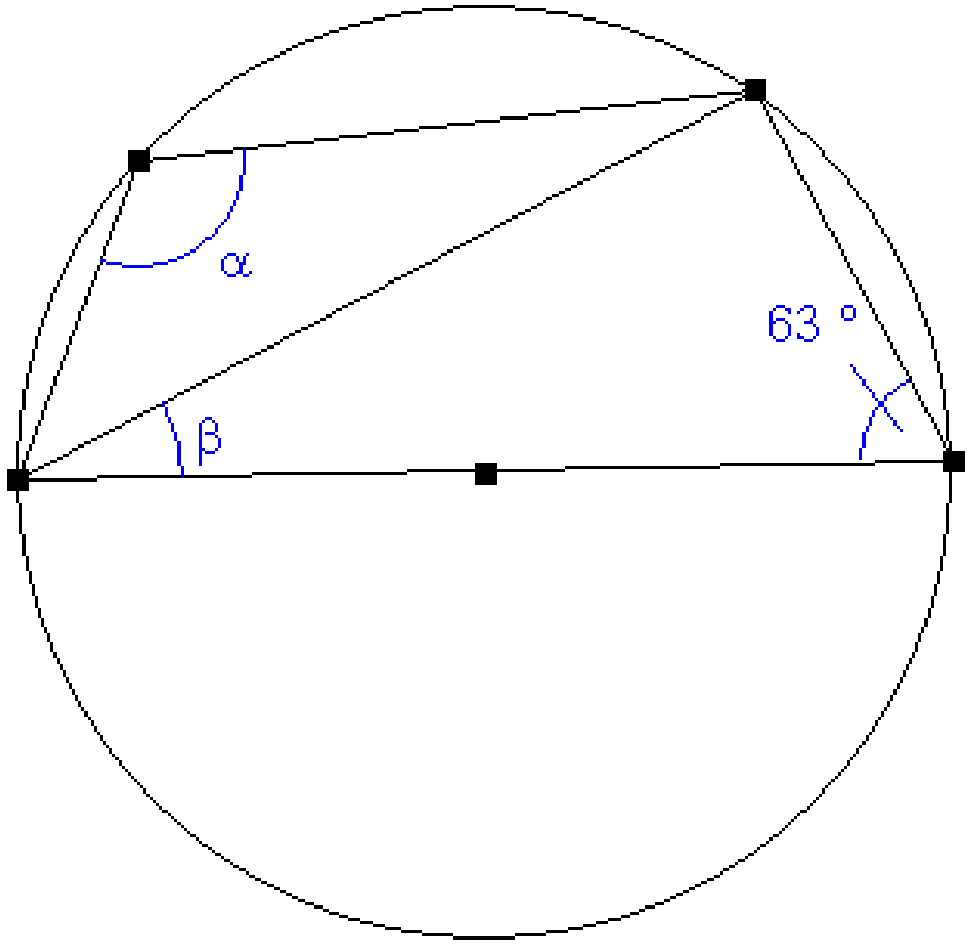
Opposite angles in a Cyclic Quadrilateral Add up to 180°

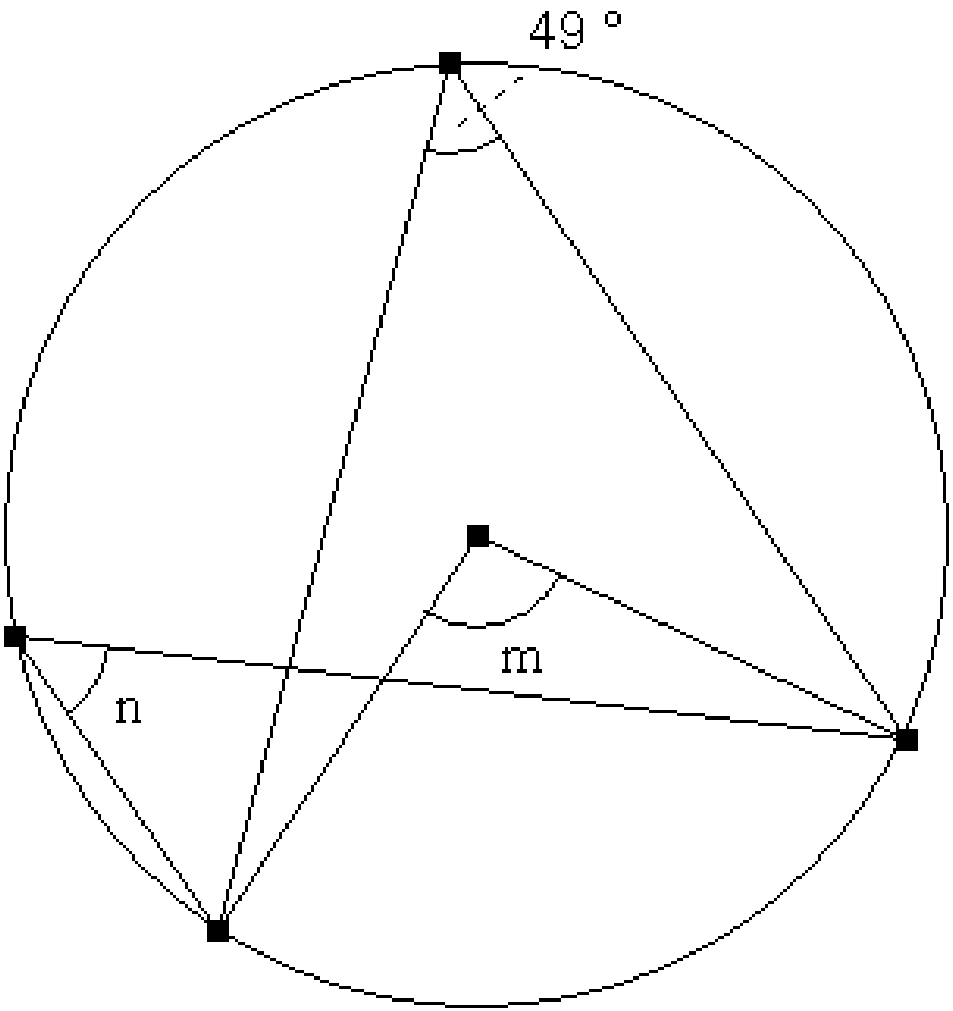
They are *supplementary*

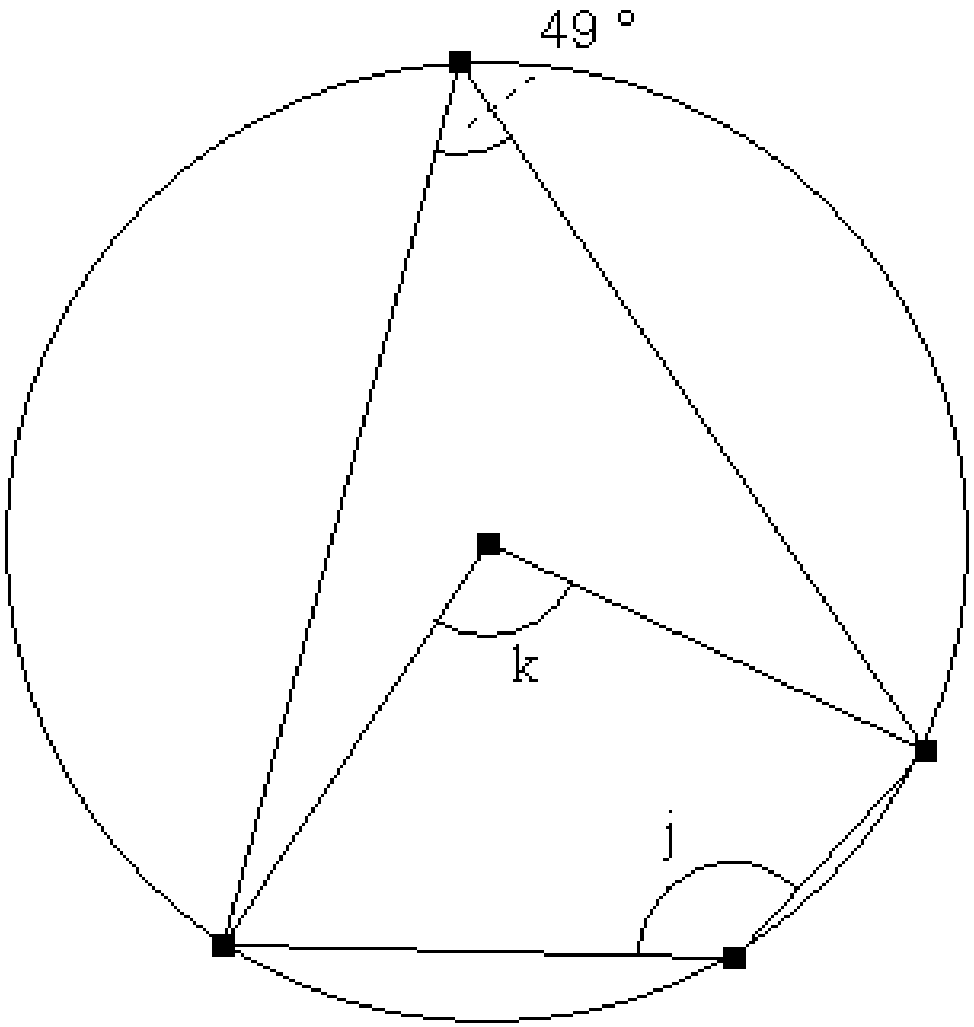
We say

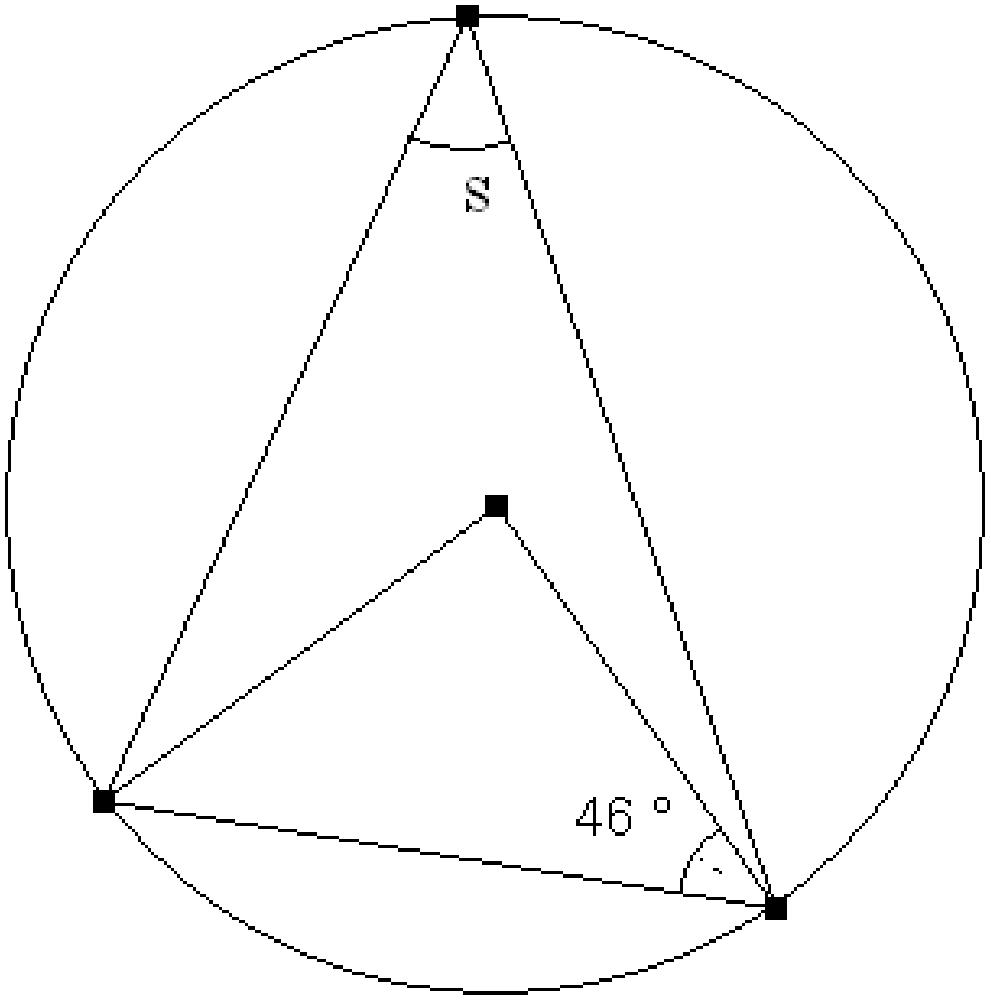
"Opposite angles in a cyclic quadrilateral add up to 180°"

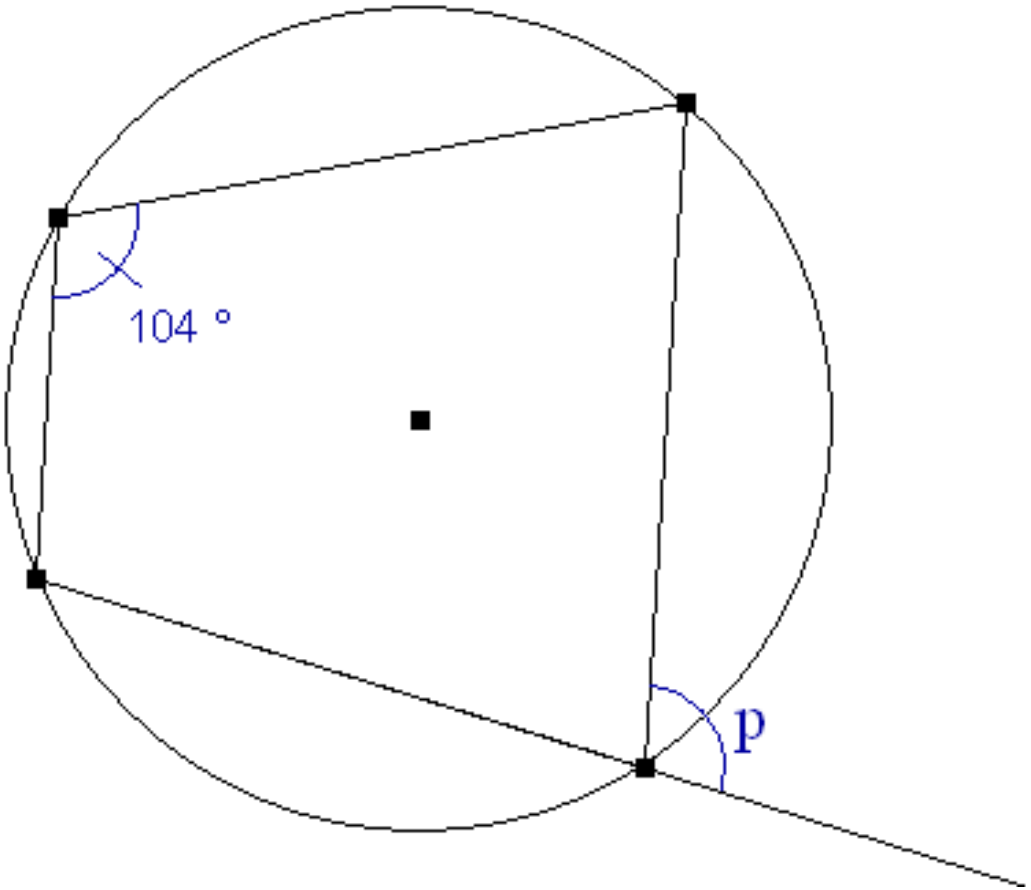
Questions




49 °
m
n


49 °
k
j


s
46 °

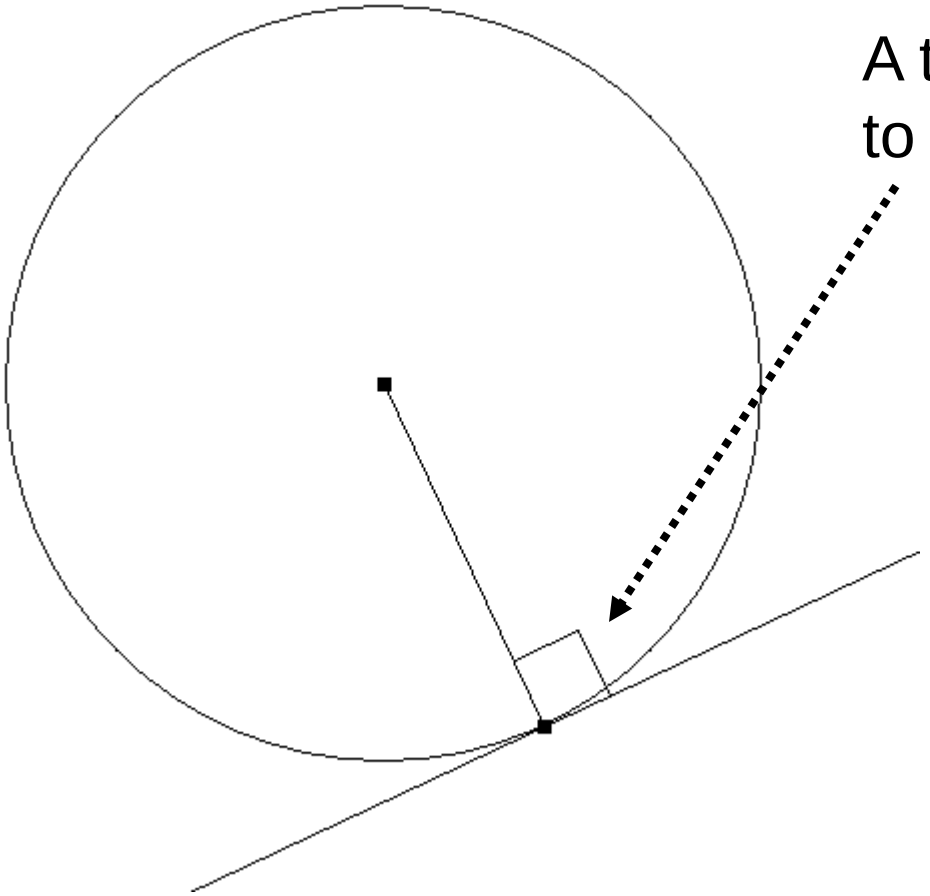


Could you define a rule for this situation?

Tangents

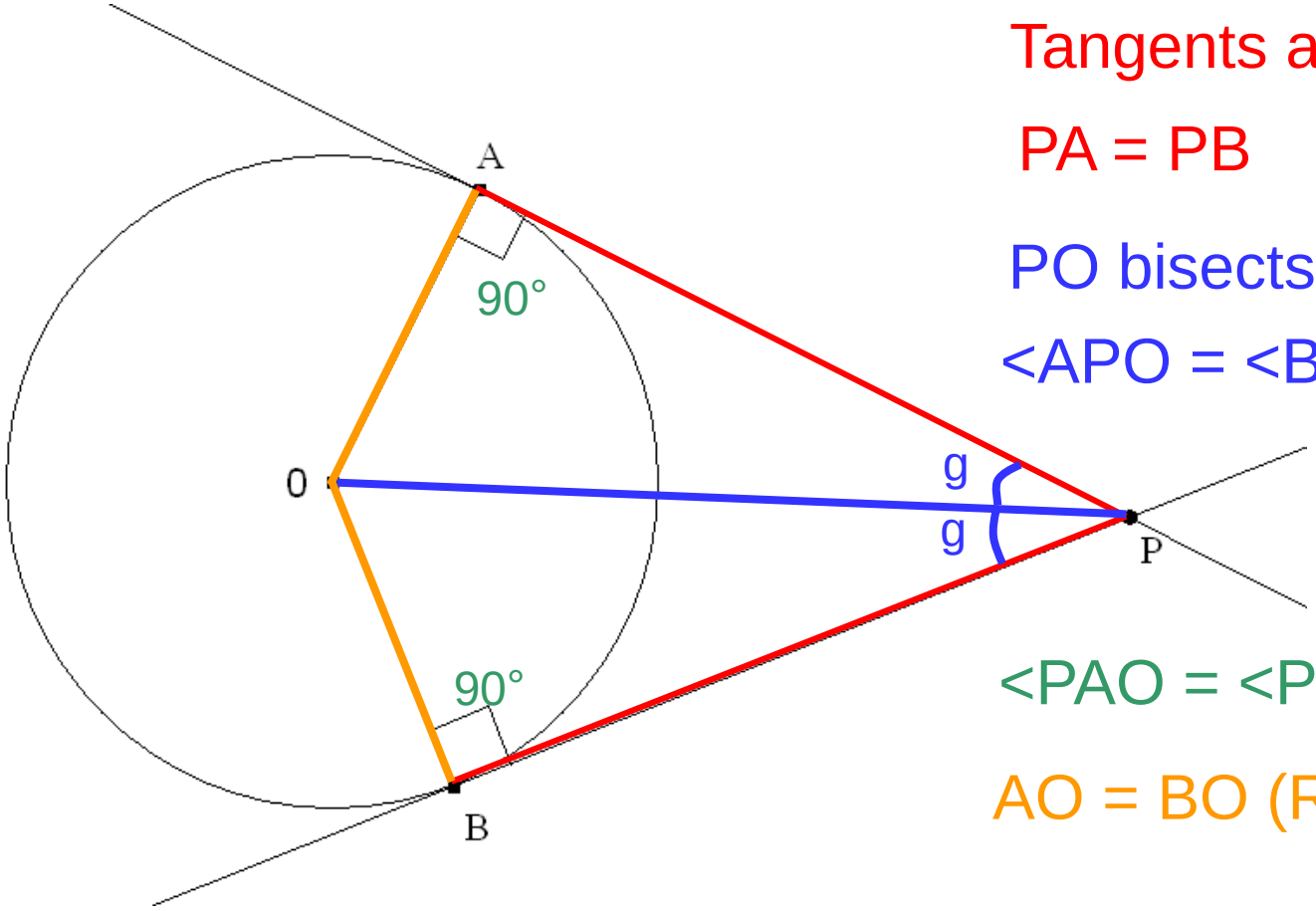
- When a tangent to a circle is drawn, the angles inside & outside the circle have several properties.

1. Tangent & Radius



A tangent is perpendicular to the radius of a circle

2. Two tangents from a point outside circle



Tangents are equal

PA = PB

PO bisects angle APB

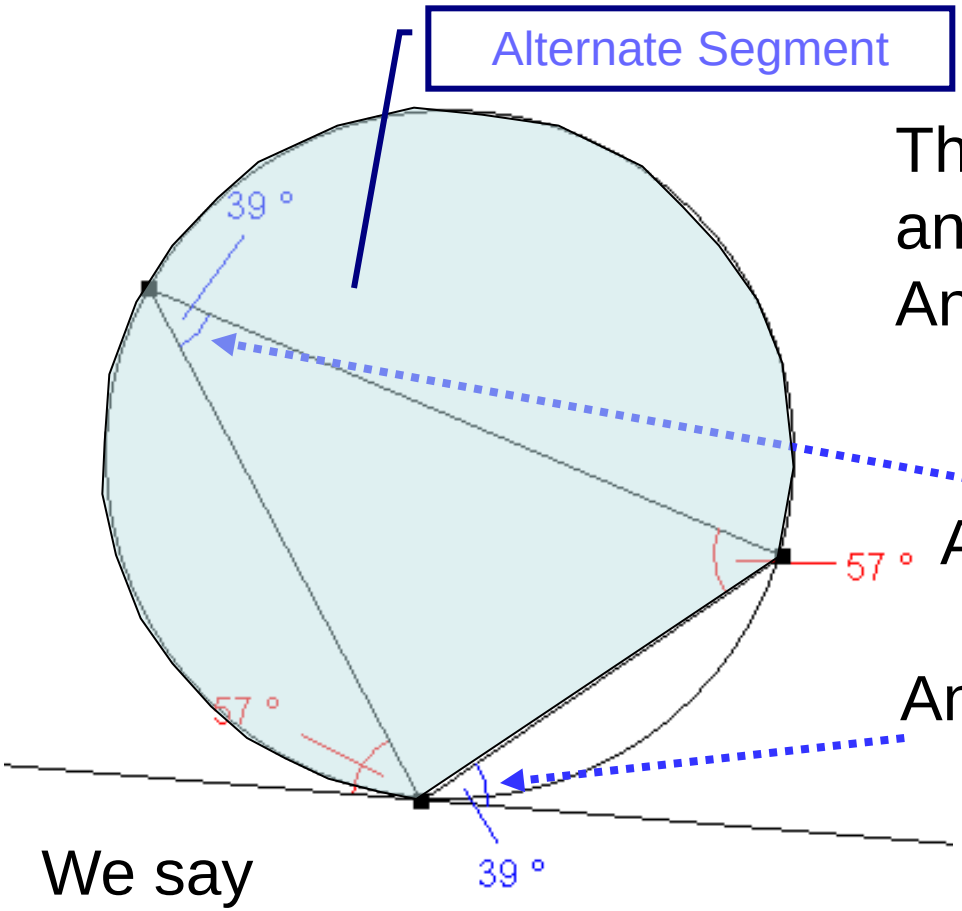
<APO = <BPO

<PAO = <PBO = 90°

AO = BO (Radii)

The two Triangles APO and BPO are Congruent

3 Alternate Segment Theorem



The angle between a tangent and a chord is equal to any Angle in the alternate segment

Angle in Alternate Segment

Angle between tangent & chord

We say

"The angle between a tangent and a chord is equal to any Angle in the alternate (opposite) segment"