Tangents

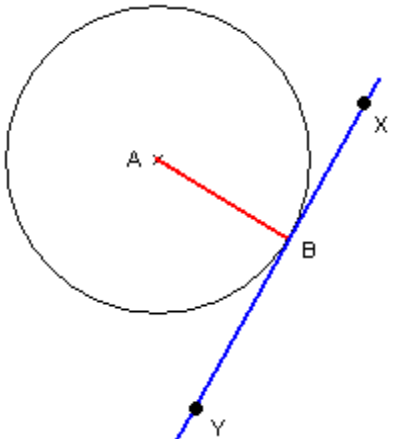
Part 3
Tangent properties

1) The line drawn perpendicular to the end point of a radius is a tangent to the circle

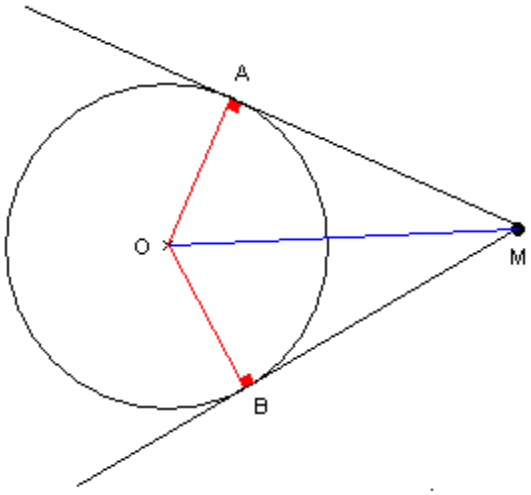
Equivalently

A line drawn perpendicular to a tangent at the point of contact with a circle passes through the center of the circle.

Suppose A is the center of the circle and AB is the radius.
Let XY be a line which is perpendicular to AB at point B
Then XY is the tangent to the circle at point B.



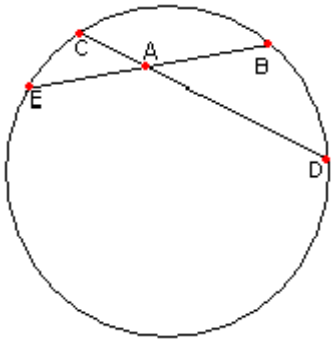
2) Tangents drawn from a point outside the circle are equal in length.



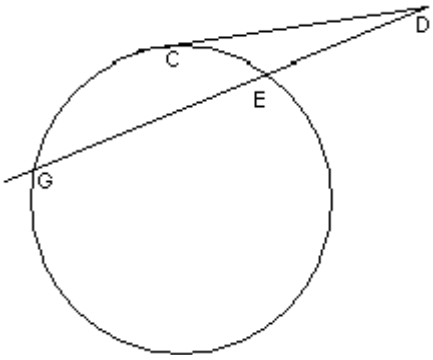
In the figure O is center of the circle, M is any point outside the circle. Note that from any point outside the circle exactly two tangents can be drawn. MA and MB are the two tangents of the circle at the point A and B respectively,
then MA = MB.

Useful properties to remember for problem solving

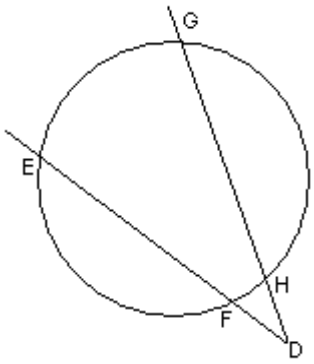
- If two chords, CD and EB, intersect at A, then $CA \times DA = EA \times BA$. (Chord theorem)



- If a tangent from an external point D meets the circle at C and a secant from the external point D meets the circle at G and E respectively, then $DC^2 = DG \times DE$. (tangent–secant theorem)

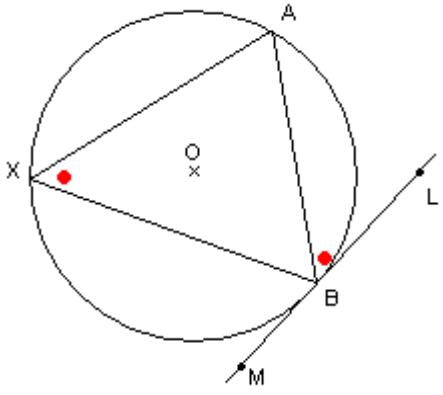


- If two secants, DG and DE, also cut the circle at H and F respectively, then $DH \times DG = DF \times DE$.

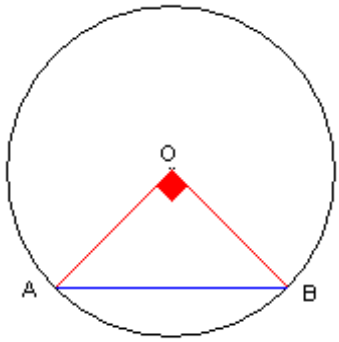


- The angle between a tangent and chord is equal to the subtended angle on the opposite side of the chord.

In the figure LM is the tangent to the circle at point B. AB is the chord of the circle which intersects the tangent LM at B and let $\angle AXB$ be the inscribed angle subtended by chord AB.
Then $\angle AXB = \angle ABL$.



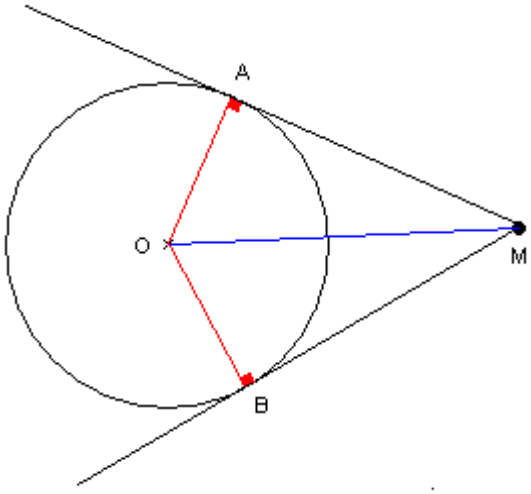
- If the central angle subtended by the chord at the center is 90 degrees, then $L = \sqrt{2}r$,
  where L is the length of the chord
  and r is the radius of the circle.
  In the figure, if $\angle AOB = 90°$,
  then length of AB $= \sqrt{2} \times r$
  if r is the radius of the circle.



Quiz:

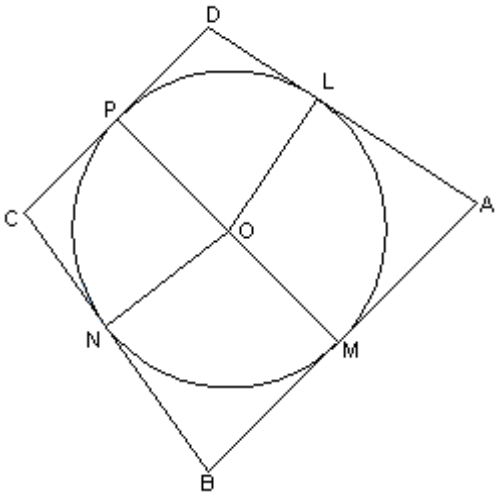
(Send your solutions to support@greedge.com)

1) Consider the circle with center O. Let M be a point out side the circle. Suppose MA and MB be the two tangents of the circle at the point A and B respectively, such that ∟AMB = 45°, then what is the measure of the angle ∟AOB?

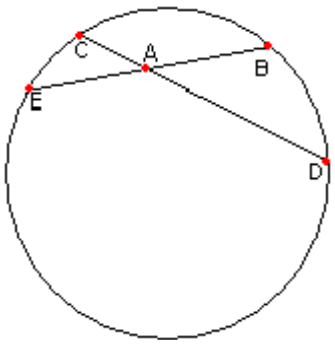


2) Consider the figure. O is the center of the circle. PM is the diameter of the circle. Hence ∟POL + ∟MOL = 180°.If ∟PDL = 110°

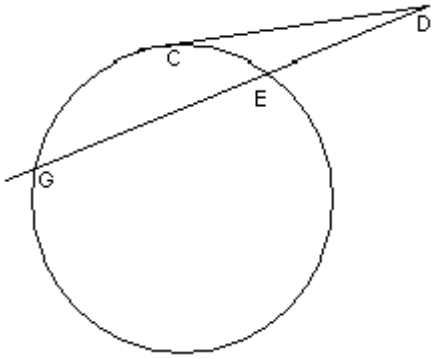
a. Find the measure of the ∟POL
b. Find the measure of ∟LAM
c. Find the measure of ∟LOM.
d. If ∟LOM and ∟MON congruent angles (i.e, ∟LOM and ∟MON have same measure). What can you say about the angles ∟MBN and ∟MAL ?



3) In the figure, if AC = 2 and AB = 4, then AE/AD = ? (hint: what can you say about ΔACE and Δ ABD. Are they similar ?)



4) In the figure if DE = 2 and EG = 6, DC = ?
(hint: use one of the formulas given in this document)



6) If ABL = 40°, then angle AOB = ?
angle AXB = ?
(Hint : OBL = 90°.
Besides what kind of triangle is ΔAOB ?)