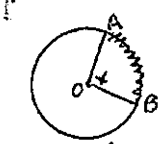
# Circles

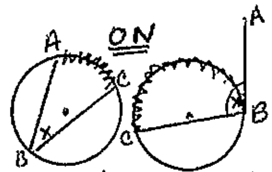
## ANGLES




Central Angle

$m\angle ACB = m\widehat{AB}$

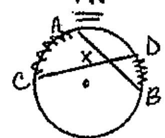
**ON**




Inscribed ∠ Tangent & chord

$m\angle ABC = \frac{1}{2} m\widehat{AC}$

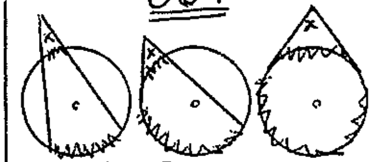
**IN**




2 Chords

$m\angle x = \frac{1}{2}(m\widehat{AC} + m\widehat{DB})$

**OUT**

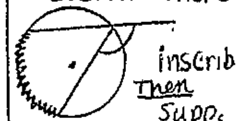



2secants Tan & Sec 2 tang.

$m\angle x = \frac{1}{2}(\text{difference})$

WATCH OUT ✗

Secant & chord



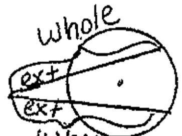
inscrib Then supp.


2 tangents ∡ formed supp. to 1st arc.

## SEGMENTS

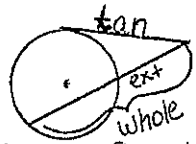

2 Chords

$P_1 \cdot P_2 = P_3 \cdot P_4$




2 secants

$w \cdot e = w \cdot e$




Tangent & Secant

$w \cdot e = t^2$


2 tangents

tan = tan

## PROOFS

- Types of proof

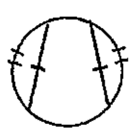
<u>Congruent triangles</u>
SAS, ASA, AAS, SSS, HL
*Then*-CPCTC

<u>Similar triangles</u>
AA
*Then* - Corresponding sides of ~ Δ's are proportional. CSSTP
*Then* - In a proportion, product of the means = product of the extremes.

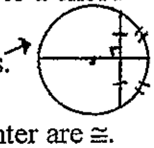
Reasons used in circle proofs

1. ≅ central angles have ≅ arcs.
2. ≅ arcs have ≅ central angles.
3. Inscribed angles intercepting the same arcs (or ≅ arcs) are ≅.

4. ≅ inscribed angles intercept ≅ arcs.
5. ≅ chords intercept ≅ arcs.
6. ≅ arcs intercept ≅ chords.



7. A diameter (or radius) that is ⊥ to a chord BISECTS the chord and its arcs.

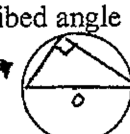


8. Chords equidistant from the center are ≅.
9. All radii are congruent.
10. The angle formed by a tangent and a diameter (radius) is a right angle.

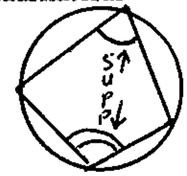
11. A line drawn ⊥ to a radius (at its endpoint) is tangent to the circle.

12. Tangents drawn from an external point are ≅.
13. If 2 tangents are drawn to a circle from an external point, the line drawn from the center bisects the angle formed by the tangents.

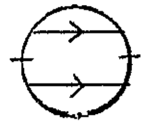
14. An inscribed angle in a semicircle is a right angle.



15. Opposite angles of an inscribed quadrilateral are supplementary.




16. Parallel lines intercept ≅ arcs.



# Equations of Circles:

$(x - h)^2 + (y - k)^2 = r^2$

(h, k) = center * change sign *

r = radius

All circles are similar:
* Translate Center $T\langle\ ,\ \rangle$
* Dilate w/ center and Scale factor $D$

Given center and radius: substitute center and radius directly into equation.

Given center and point on circle:

- Use distance formula $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ to find radius
- Substitute center and radius into equation.

Given endpoints of diameter:

- Use midpoint formula to find center $(\frac{x+x}{2}, \frac{y+y}{2})$
- Use distance formula $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ to find radius
- Substitute center and radius into equation.

Using Completing the Square to turn GENERAL FORM into Center/Radius Form

$$x^2 + y^2 + Cx + Dy + E = 0$$
*General Form*

**Circle with Center at Point (*h*, *k*)**
(Known as "center-radius form" or "standard form".)

$$(x - h)^2 + (y - k)^2 = r^2$$
with the center at $(h, k)$
and the radius $r$

- Start by grouping the $x$-related terms together and the $y$-related terms together. Move any numerical constants (plain numbers) to the other side.
- Get ready to insert the needed values for creating perfect square trinomials. Remember to balance both sides of the equation.
- Find the missing value by taking half of the "middle term" (the linear coefficient) of the trinomial and squaring it. This value will always be positive as a result of the squaring process.
- Rewrite in factored form.