GEOMETRY PACKET CHAPTER 10 – CIRCLES

Defn: **Circle** – the set of points in a plane that are equidistant from a common point called the <u>center</u>.
(*note*: we name a circle by its center)

Defn: **Radius** – the segment joining the center of a circle to any point <u>on</u> the circle.
(*note*: plural of radius is radii and all radii in a given circle are ≅)

Defn: **Concentric Circles** – 2 or more coplanar circles with the <u>same center</u>.

Defn: **Congruent Circles** – 2 or more circles are ≅ if they have ≅ radii.

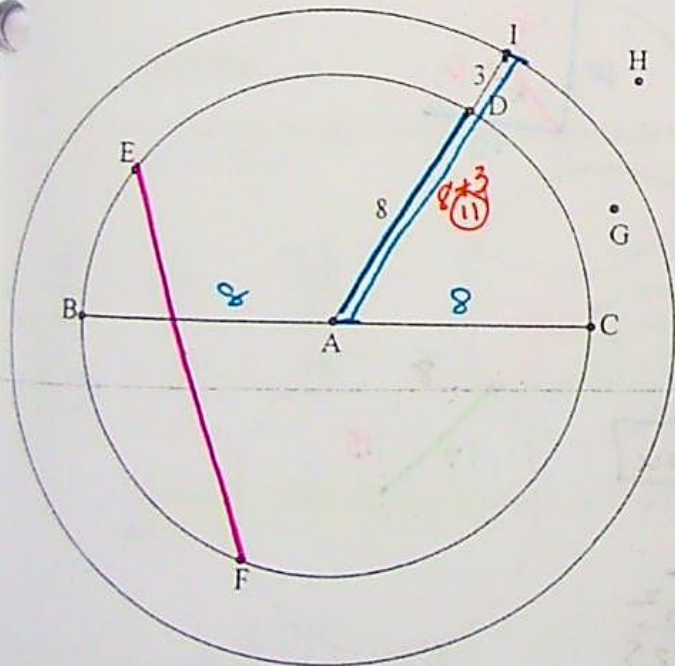*Defn:* **Interior/Exterior/On** – the 3 regions related to a circle.

Defn: **Chord** – a segment joining any 2 points on a circle.

Defn: **Diameter** – a chord that passes through the center.
(*note*: the diameter is the longest chord that can be drawn in a circle and diameter = radius x 2)

Special Formulas:

$$A = \pi r^2 \quad \text{and} \quad C = 2\pi r = \pi d$$

Use the diagram below to answer questions 1 – 14.

1. Name the center of the smaller circle. A
2. Name the center of the larger circle. A
3. Since both the smaller and larger circles share the same center, what word from above *best* describes the circles? Concentric
4. Name a radius of the smaller circle. AD
5. Name a radius of the larger circle. AI
6. Name a point in the interior region of the smaller circle. A
7. Name a point that is in the exterior region of both circles. H
8. Name a point that is in the exterior region of the smaller circle, but the interior region of the larger circle. G
9. Name a chord. EF   BC
10. Name a diameter. BC
11. What is the length of the diameter of the smaller circle? 2(8) = 16u
12. What is the length of the diameter of the larger circle? 2(11) = 22u
13. What is the area of the larger circle?
14. What is the circumference of the smaller circle?

13) $(11)^2 \pi$
$121\pi u^2$

14) $16\pi u$

1

Theorem: If a radius (or part of a radius) is ⊥ to a chord, then it bisects the chord.
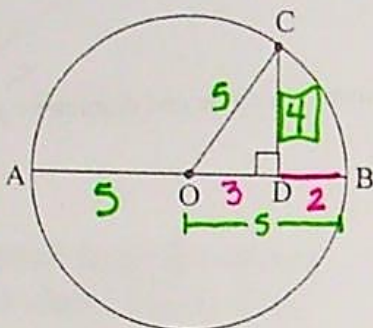**Theorem:** If a radius (or part of a radius) bisects a chord, then it is ⊥ to the chord.
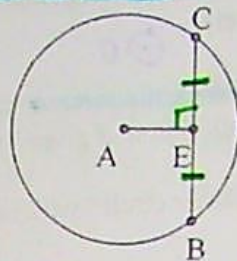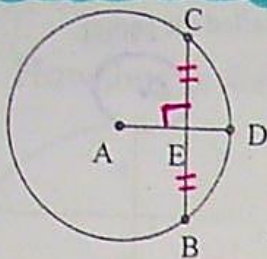
Complete: If $\overline{AD} \perp \overline{BC}$, then
___$\overline{EC}$___ ≅ ___$\overline{EB}$___ .

Complete: If $\overline{CE} \cong \overline{BE}$, then
___$\overline{AE}$___ ⊥ ___$\overline{CB}$___ .

$3 - \boxed{4} - 5$

1. Given: ⊙O
   AO = 5
   DB = 2

   Find: OC **5u**
   OD **3u**
   CD **4u**

   5   5   O 3 D 2   B
        ⊢—5—⊣

2. Given: ⊙O; chord shown = 12
   radius = 10

   Find: How far is the chord from center? **8u**

   $$\frac{6}{2} \quad \frac{x}{2} \quad \frac{10}{2}$$
   $$3 \quad 4 \quad 5$$

   $\frac{x}{2} = 4$
   $\boxed{x = 8}$
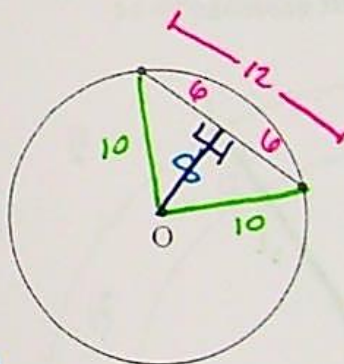
3. Given: ⊙O; the chord shown is 15 units form the center.
   Radius = 17.

   Find: Find the length of the chord. $2(8) = \boxed{16u}$
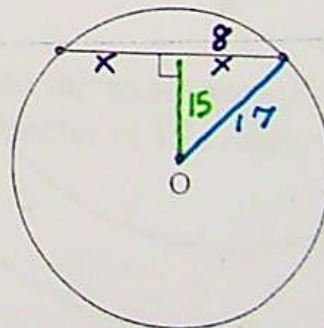
   family

   $8 - 15 - 17$
   $x - 15 - 17$

   $\boxed{8}$

   ~or~ $x = \sqrt{17^2 - 15^2}$
   $\sqrt{289 - 225}$
   $\sqrt{64}$
   $\underline{}$
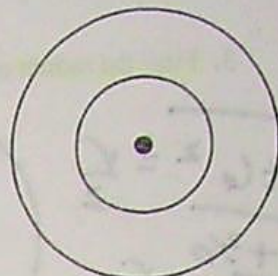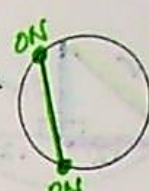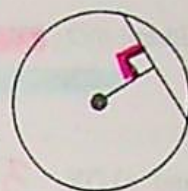 2

Geometry: 10-1 Definitions and Theorems

<u>Concentric Circles</u> – Two or more coplanar circles with the same center.

A *chord* of a circle is a segment joining two points on a circle.

The **distance** from the center of a circle to a chord is the length of the **perpendicular segment** joining the two.
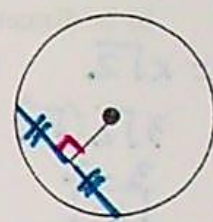
Theorem: *reversible!*

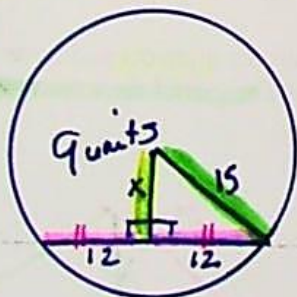Radius is $\perp$ to a chord $\longleftrightarrow$ Radius bisects the chord.

Examples:

1. Find the distance from the center of a circle to a chord 24 m long if the **diameter of the circle is 30m.**

$$\frac{x}{3} \quad \frac{12}{3} \quad \frac{15}{3}$$

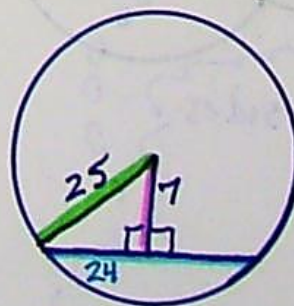$$\boxed{3} \qquad 4 \qquad 5$$

9 units

$D = 30\,m$

$r = 15\,m$

$$\frac{x}{3} = 3$$

$$\boxed{x = 9}$$

2. Find the length of a chord that is 7 km from the center of a circle with a radius of 25 km.

family!

$$7 - \underline{24} - 25$$

$$chord = 2(24) = \boxed{48u}$$

3
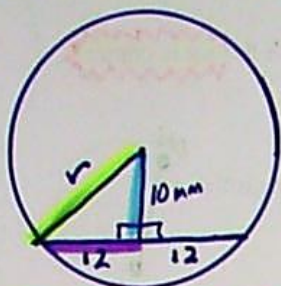
3. Find the radius of a circle whose center is 10 mm from a chord 24 mm long.

$$\sqrt{5^2 + 6^2} = \frac{r}{2}$$

$$\sqrt{25 + 36}$$

$$\sqrt{61} = \frac{r}{2}$$

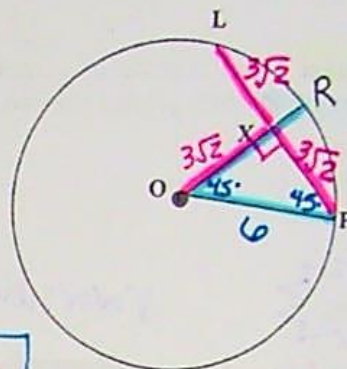$$\begin{array}{cccc} \frac{10}{2} & \frac{12}{2} & \frac{r}{2} & \frac{r}{2} = \sqrt{61} \\ 5 & 6 & \boxed{61} & \boxed{r = 2\sqrt{61}} \end{array}$$

10mm   12   12

4. Given: $\odot O$; PX = $3\sqrt{2}$, LX = $3\sqrt{2}$
$\angle OPX = 45°$

Find: a) OX $3\sqrt{2}$ u

b) the diameter

$$OP = x\sqrt{2} \qquad x = 3\sqrt{2}$$
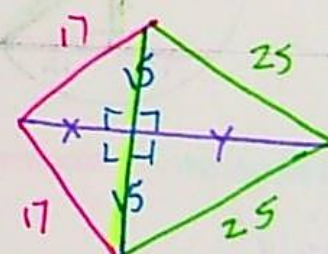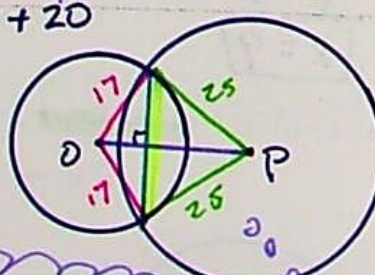$$3\sqrt{2}(\sqrt{2}) \qquad 2(6) = \boxed{12u}$$
$$\frac{3 \cdot 2}{\boxed{6}}$$

c) RX $(6 - 3\sqrt{2}) = RX$

L $3\sqrt{2}$ R

$3\sqrt{2}$ X $3\sqrt{2}$

O   45°   45°   P

6

5. Tough one!! (Oooohh, aaaaaahh....) Two circles intersect and have a common chord 30 ft long. The radius of one circle is 17 ft and the radius of the other circle is 25. How far apart are the centers?

$$x + y$$
$$8 + 20$$

$$\boxed{OP = 28u}$$

17   25
O   P
17   25

17   25
L
17   25

2 pairs disjoint ≅ sides in a quad means KITE!

If kite, then ⊥ diagonals !!

4

X   15   17
$\boxed{8}$
8 - 15 - 17
Family

$$\frac{15}{5} \quad \frac{y}{5} \quad \frac{25}{5}$$

3 - 4 - 5 Family

$$\frac{y}{5} = 4 \quad \boxed{y = 20}$$