Geometry 10.3
Recognize and use relationships between arcs and chords
Recognize and use diameter relationships

arc
   (major arc)
   (minor arc)
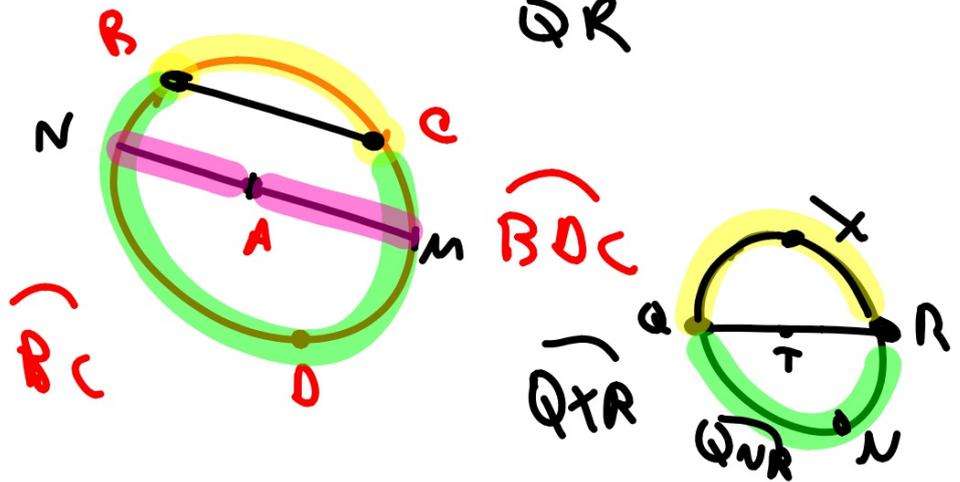chord
diameter
radius
equidistant
  same dist.

QR

B
N
C
A
M
D
$\overset{\frown}{BDC}$
$\overset{\frown}{BC}$

X
Q
T
R
N
$\overset{\frown}{QTR}$
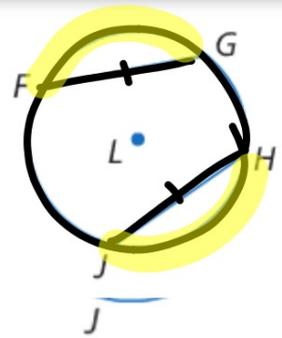$\overset{\frown}{QNR}$

if
f

If chords ≅ then arc
if arc ≅ chord

Theorem 10.2

Words In the same circle or in congruent circles, two minor arcs are congruent if and only if their corresponding chords are congruent.

Example $\overset{\frown}{FG} \cong \overset{\frown}{HJ}$ if and only if $\overline{FG} \cong \overline{HJ}$.
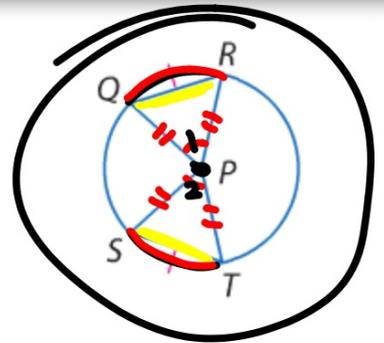
If arcs are = then chords are =
Prove it using SAS

P'11S

Proof Theorem 10.2 (part 1)

Given: $\odot P$; $\overset{\frown}{QR} \cong \overset{\frown}{ST}$

Prove: $\overline{QR} \cong \overline{ST}$

Proof:

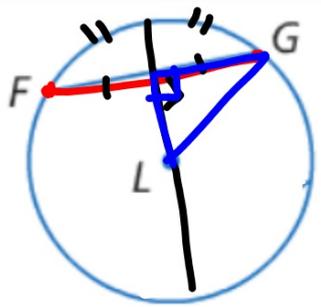| Statements	Reasons
1. $\overset{\frown}{QR} \cong \overset{\frown}{ST}$	1. given
2. $\angle 1 \cong \angle 2$	2. Same arc
3. $PQ = PR = PS = PT$	3. radius of $\odot \cong$
4. $\triangle PRQ \cong \triangle SPT$	4. SAS
5. $\overline{QR} \cong \overline{ST}$	5. CPCTC

R
Q
P
S
T

Real-World Example 1 Use Congruent Chords to Find Arc Measure

CRAFTS In the embroidery hoop, $\overline{AB} \cong \overline{CD}$ and $m\widehat{AB} = 60$. Find $m\widehat{CD}$.
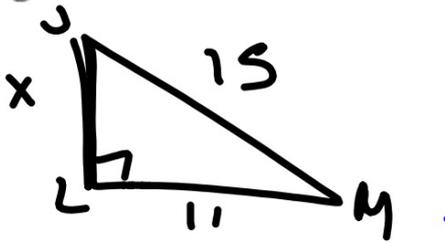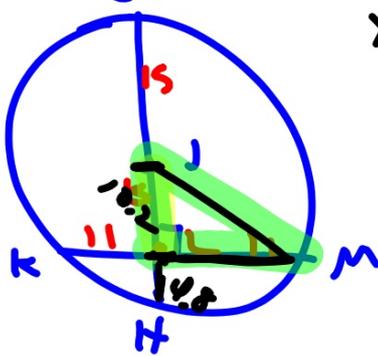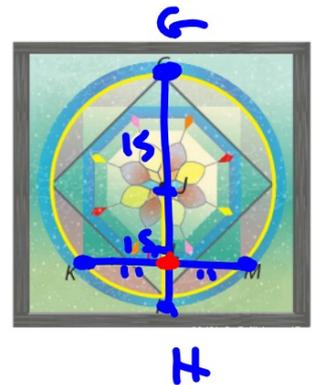
$60°$

$78°$
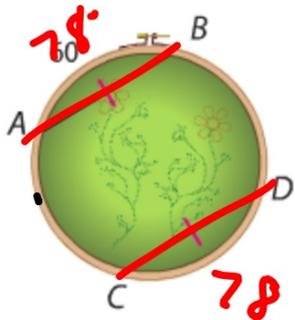
1. If $m\widehat{AB} = 78$ in the embroidery hoop, find $m\widehat{CD}$. $78°$

A diameter perpendicular to a chord bisects the chord (and its arc)

STAINED GLASS In the stained glass window, diameter $\overline{GH}$ is 30 inches long and chord $\overline{KM}$ is 22 inches long. Find JL.

G

15

J

11

K   M

H

J

x

15

$\lfloor$

11

M

$x^2 + 11^2 = 15^2$

$x^2 + 121 = 225$ Do we know the radius of the circle?

$x^2 = 104$ $x = 10.2$

GuidedPractice 18.4

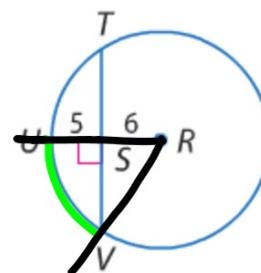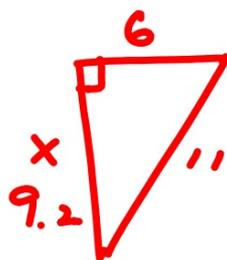**4.** In ⊙R, find TV. Round to the nearest hundredth.
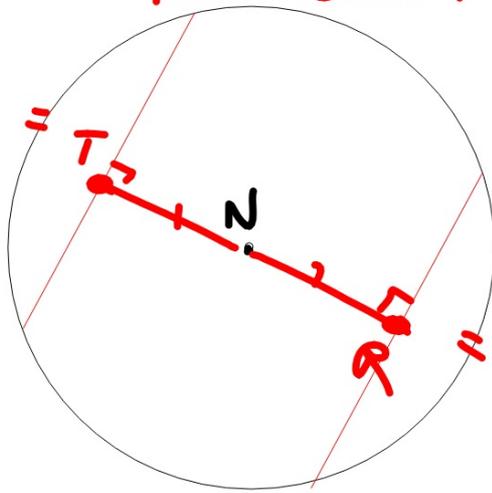
$x^2 + 6^2 = 11^2$

$x^2 + 36 = 121$

$x^2 = 85$

$x = 9.2$

Do we know the radius?

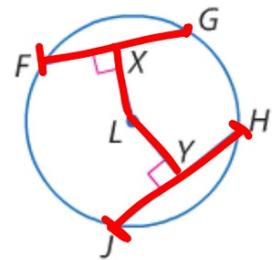if chords ≅ Same dist. from center

Are the segments the same length?

equidistant from center
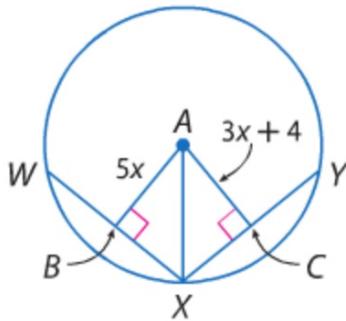
iff

Theorem 10.5

Words

In the same circle or in congruent circles, two chords are congruent if and only if they are equidistant from the center.

Example

$\overline{FG} \cong \overline{JH}$ if and only if $LX = LY$.
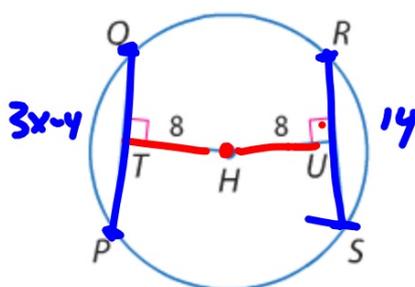
Example 5 Chords Equidistant from Center

ALGEBRA In $\odot A$, $WX = XY = 22$. Find AB. $= 10$

$5x = 3x + 4$

$-3x \quad -3x$

$\dfrac{2x}{2} = \dfrac{4}{2} \qquad x = 2$

5. In $\odot H$, $PQ = 3x - 4$ and $RS = 14$. Find x.

$3x - 4$ 8   8   14

$$3x - 4 = 14$$
$$+4 \quad +4$$
$$\frac{3x}{3} = \frac{18}{3}$$
$$x = 6$$

10.3

7-23 all

41-51 odd