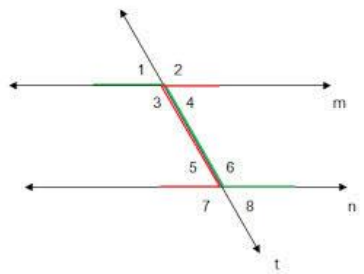
Math III Geometry Unit – Study Guide

Lines, Transversals and Angles

Parallel



Congruent Angles

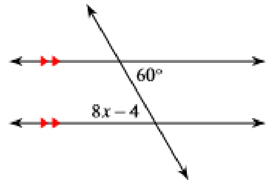
Vertical: 1 and 4, 2 and 3, 5 and 8, 6 and 7

Alternate Interior: 3 and 6, 4 and 5

Alternate Exterior: 2 and 7, 1 and 8

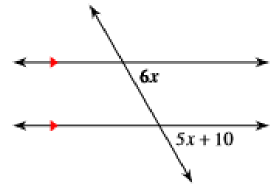
Corresponding: 2 and 6, 4 and 8, 1 and 5, 3 and 7.

Find the angle measures. *Create an equation setting appropriate angles equal to each other.*



Use $8x - 4 = 60$ and solve for x.

1.



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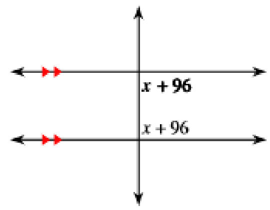

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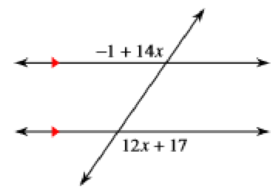
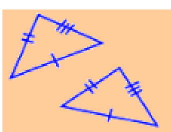


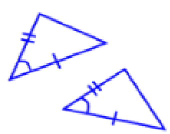
Congruent Triangles ≅

Triangles can be declared congruent if one of the following conditions are true.

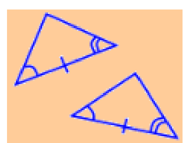
SSS



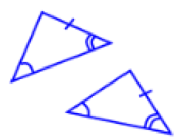
SAS



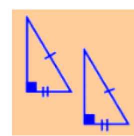
ASA



AAS

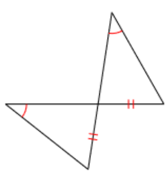


HL



State which congruency theorem applies to the triangle pictured.

4.



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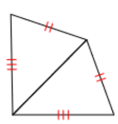

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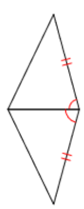

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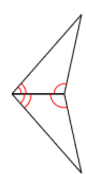

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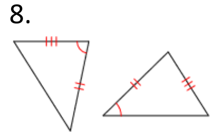

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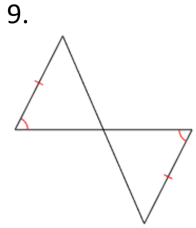
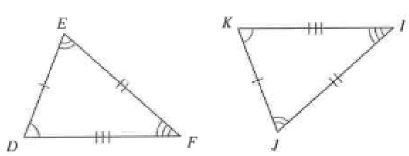


Write the congruency statement for the triangle pairs pictured below.

10.



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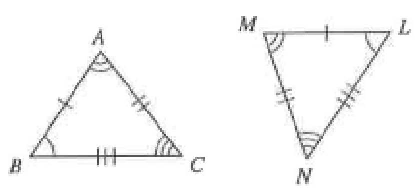

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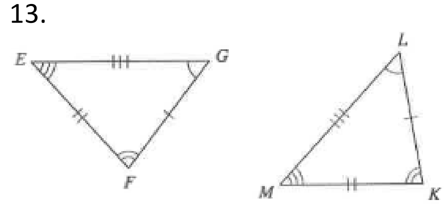
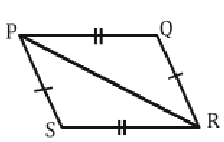


14.

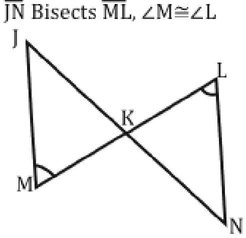
Given: $\overline{PS} \cong \overline{QR}$, $\overline{PQ} \cong \overline{SR}$



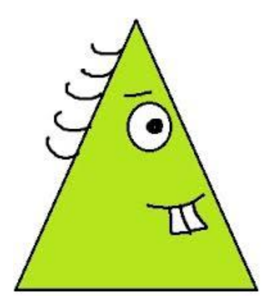
Prove: $\triangle PRS \cong \triangle RPQ$

15.

Given: $\overline{JN}$ Bisects $\overline{ML}$, $\angle M \cong \angle L$



Prove: $\triangle MJK \cong \triangle LNK$



Similar Triangles ~

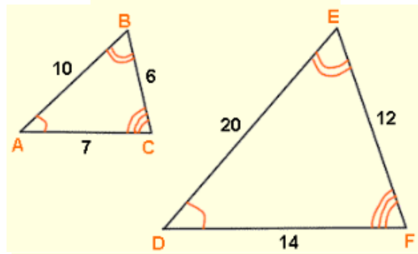
Triangles are similar if their corresponding (matching) angles are congruent and the **ratio** of their corresponding sides are in proportion. The following Similarity Theorems can be used to prove similarity.

SSS, SAS and AAA (or AA)

Facts about similar triangles:

$\angle A \cong \angle D$	$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$
$\angle B \cong \angle E$	
$\angle C \cong \angle F$	

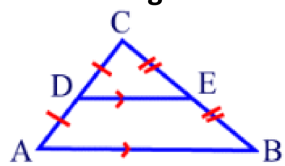
$\Delta ABC \sim \Delta DEF$



$$\frac{6}{12} = \frac{7}{14} = \frac{10}{20}$$

$\frac{1}{2}$ The ratio of the corresponding sides is called the ratio of similitude or scale factor.

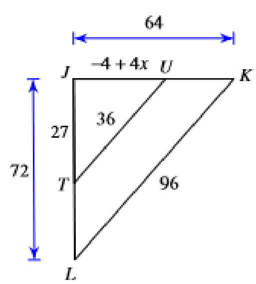
Mid-segment



D is the midpoint of $\overline{AC}$, E is the midpoint of $\overline{BC}$. The mid-segment $\overline{DE}$; $\overline{DE} \parallel \overline{AB}$; $DE = \frac{1}{2}AB$.

Given the folliowing sets of triangles are congruent, find the value of x.

16.



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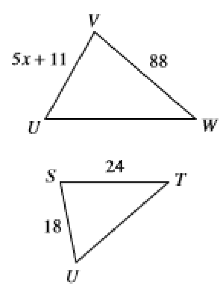

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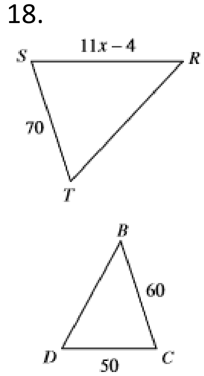

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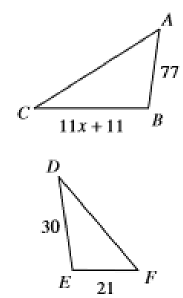

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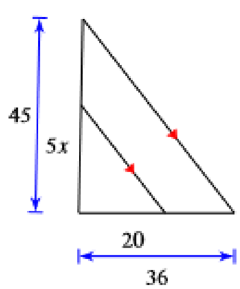

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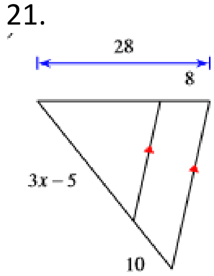
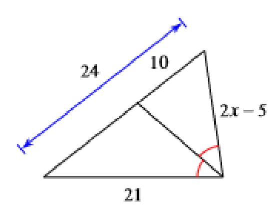


22.

23.



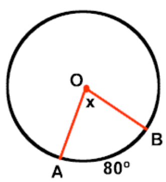
Math III Geometry Unit – Study Guide

CIRCLES: Angle Measures

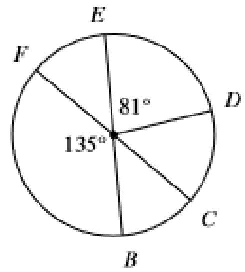
Central Angle = Intercepted Arc

$m\angle AOB = m\overset{\frown}{AB}$

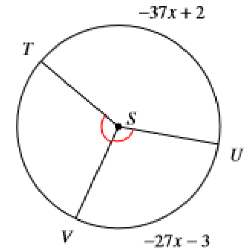
$<AOB$ is a central angle.
Its *intercepted arc* is the minor arc from A to B.
$m<AOB = 80°$



24. Find $m\overset{\frown}{CFD}$



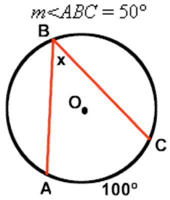
25.. Find $m\angle VST$



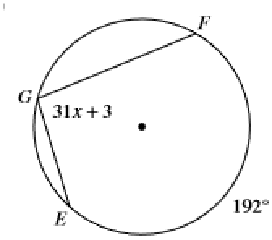
Inscribed Angle = $\frac{1}{2}$ Intercepted Arc

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

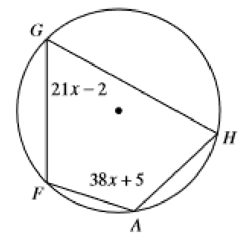
$<ABC$ is an inscribed angle.
Its *intercepted arc* is the minor arc from A to C.
$m<ABC = 50°$



26.Find x



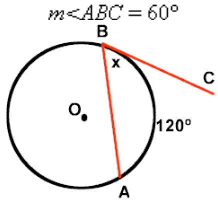
27. Find $m\overset{\frown}{FGH}$



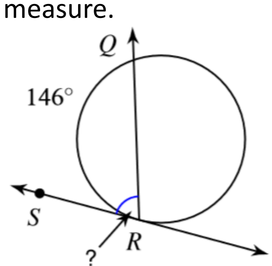
Tangent Chord Angle = $\frac{1}{2}$ Intercepted Arc

$m\angle ABC = \frac{1}{2} m\overset{\frown}{AB}$

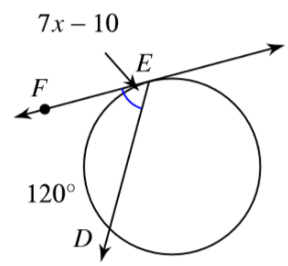
$<ABC$ is an angle formed by a tangent and chord.
Its *intercepted arc* is the minor arc from A to B.
$m<ABC = 60°$



28. Find the indicated angle measure.



29. Solve for x.

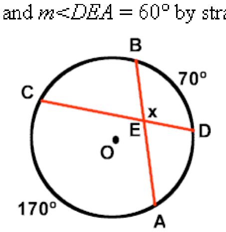


Angle Formed Inside by Two Chords = $\frac{1}{2}$ Sum of Intercepted Arcs

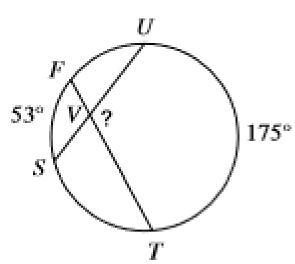
$m\angle BED = \frac{1}{2}\left(m\overset{\frown}{AC} + m\overset{\frown}{BD}\right)$

$m<BED = \frac{1}{2}(70+170) = \frac{1}{2}(240) = 120°$

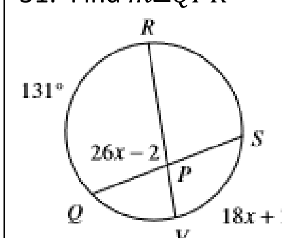
also, $m<CEA = 120°$ (vetical angle)
$m<BEC$ and $m<DEA = 60°$ by straight line.



30. Find the indicated angle.



31. Find $m\angle QPR$



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The formulas for all THREE of these situations are the same:

Angle Formed Outside = $\frac{1}{2}$ Difference of Intercepted Arcs

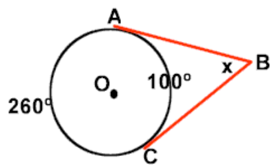
(When subtracting, start with the larger arc.)

Two Tangents:

$\angle ABC$ is formed by two tangents intersecting outside of circle O.

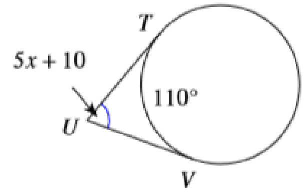
The *intercepted arcs* are minor arc $\overset{\frown}{AC}$ and major arc $\overset{\frown}{AC}$. These two arcs together comprise the entire circle.

$m\angle ABC = \frac{1}{2}(260 - 100) = 80°$

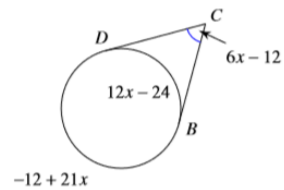


$m\angle ABC = \frac{1}{2}\left(\overset{\text{major}}{m\overset{\frown}{AC}} - \overset{\text{minor}}{m\overset{\frown}{AC}}\right)$

32. Solve for x.



33. Find $m\angle BD$

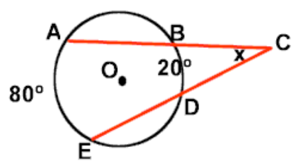


Two Secants:

$\angle ACE$ is formed by two secants intersecting outside of circle O.

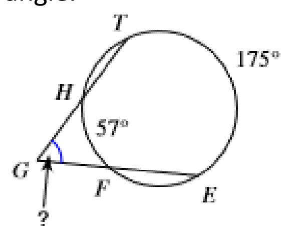
The *intercepted arcs* are minor arcs $\overset{\frown}{BD}$ and $\overset{\frown}{AE}$.

$m\angle ACE = \frac{1}{2}(80 - 20) = 30°$

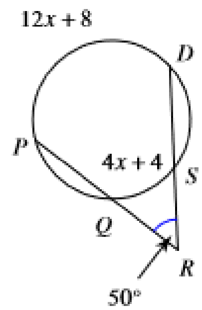


$m\angle ACE = \frac{1}{2}\left(m\overset{\frown}{AE} - m\overset{\frown}{BD}\right)$

34. Find the measure of the indicated angle.



35. Solve for x.

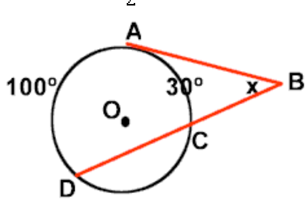


a Tangent and a Secant:

$\angle ABD$ is formed by a tangent and a secant intersecting outside of circle O.

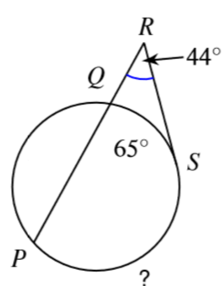
The *intercepted arcs* are minor arcs $\overset{\frown}{AC}$ and $\overset{\frown}{AD}$.

$m\angle ABD = \frac{1}{2}(100 - 30) = 35°$

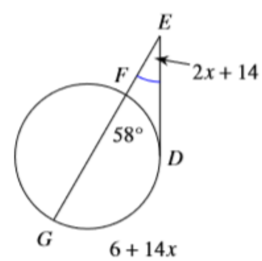


$m\angle ABD = \frac{1}{2}\left(m\overset{\frown}{AD} - m\overset{\frown}{AC}\right)$

36. Find $m\overset{\frown}{PS}$



37 . Find $m\angle DEG$



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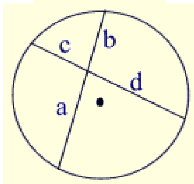
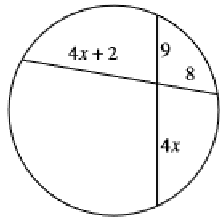
CIRCLES: Chord and Segment Lengths

Intersecting Chords Rule:
(segment piece)×(segment piece) = (segment piece)×(segment piece)

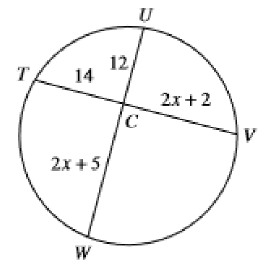
$$a \cdot b = c \cdot d$$



38. Solve for x.

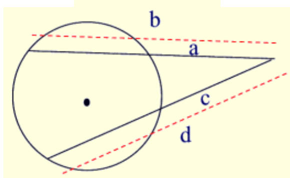


39. Find UW

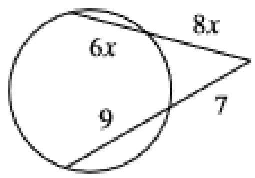


Secant-Secant Rule:
(whole secant)×(external part) = (whole secant)×(external part)

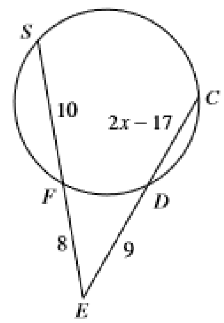
$$a \cdot b = c \cdot d$$



40. Solve for x.

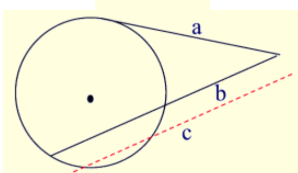


41. Find CE

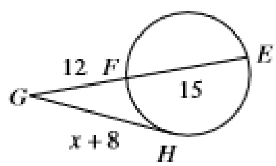


Secant-Tangent Rule:
(whole secant)×(external part) = $(\text{tangent})^2$

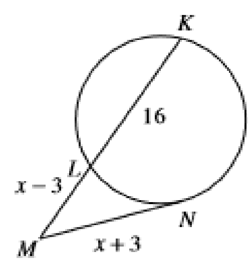
$$b \cdot c = a^2$$



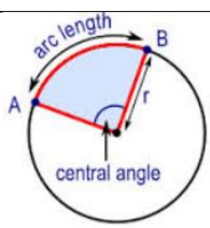
42. Find HG



43. Find NM



Parts of a Circle



Two circle formulas you should already know:

$$\boldsymbol{Circumference = 2\pi r}$$
$$\boldsymbol{Area = \pi r^2}$$

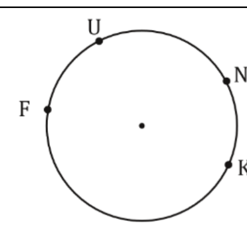
An **ARC** is a portion of the circumference of a circle. It can be referred to by its length or measure. Arcs with a measure less that 180° are minor arcs. Arcs with a measure greater than 180° and considered the major arc.

ARC MEASURE is equal to the central angle that intercepts the ARC.

ARC LENGTH is a portion of the circumference of a circle.

$$L = \frac{n}{360} 2\pi r$$

44. Given $m\widehat{FKN} = 168°, m\widehat{UF} = 34°$.
Find $m\widehat{UN}$



AREA OF A SECTOR: Portion of the area of a circle.

$$A = \frac{n}{360} \pi r^2$$

where n is the number of degrees in the central angle of the sector.

45. Find the area of a sector with a central angle of 60° and a radius of 10.

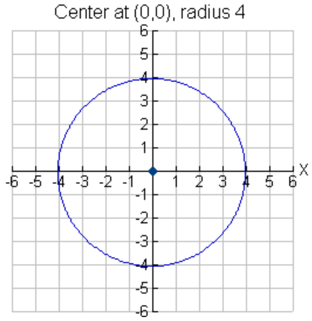
46. Find the area of a sector with an arc length of 75.

Math III Geometry Unit – Study Guide

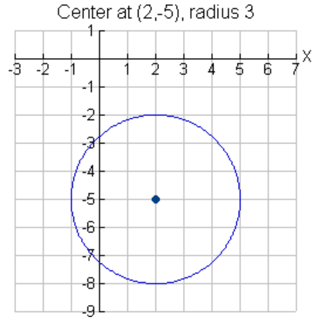
Equations of Circles

Circle whose center is at the origin	Circle whose center is at (h,k) (This will be referred to as the "center-radius form". It may also be referred to as "standard form".)
Equation: $x^2+y^2=r^2$	Equation: $(x-h)^2+(y-k)^2=r^2$
Example: Circle with center (0,0), radius 4 $x^2+y^2=16$	Example: Circle with center (2,-5), radius 3 $(x-2)^2+(y+5)^2=9$
Graph:	Graph:

Center at (0,0), radius 4

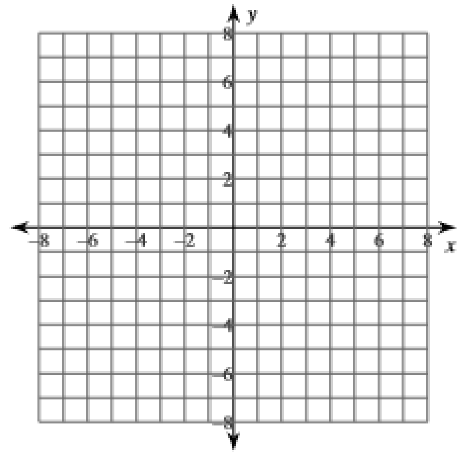


Center at (2,-5), radius 3



47. Find the cener and radius of this circle. Then graph.

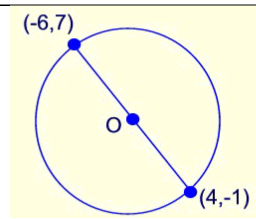
$$(x-1)^2+(y+4)^2=9$$



Finding Equations of Circles

Writing the equation of a circle from the endpoint of the diameter; find the center by using the midpoint formula, find the radius by using the distance formula. Substitute this information into the formula for a circle.

Example: Find the equation of the circle whose diameter has endpoints (-6,7) and (4,-1)



Find the center by using the midpoint formula.

$$\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right)=\left(\frac{-6+4}{2},\frac{7+(-1)}{2}\right)$$
$$=(-1,3)$$

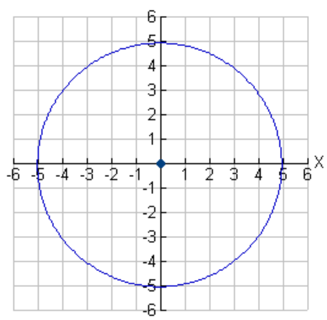
Find the radius by using the distance formula.

Points (-6,7) and (-1,3) were used here. (d = distance, or radius)

$$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$
$$=\sqrt{(-6-(-1))^2+(7-3)^2}$$
$$=\sqrt{(-5)^2+(4)^2}=\sqrt{25+16}=\sqrt{41}$$

48. Write the equation of a circle whose endpoints of a diameter are (18, -13) and (4,-3).

Example: Write the equation for the circle shown below if it shifted 3 units to the right and 4 units up.



A shift of 3 units to the right and 4 units up places the center at the point (3, 4). The radius of the circle can be seen from the graph to be 5.

Equation: $(x-3)^2+(y-4)^2=25$

49. Write the equation of the circle pictured at the left if it is shifted left 7 and down 4.

50. Write the equation of a circle whose center is the point (-13,-16) with a point on the circle at (-10,-16).