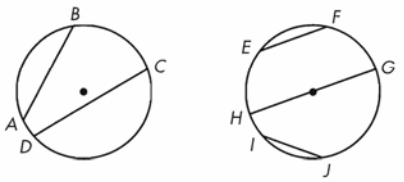
12.1 & 12.2

Parts of Circles, Tangent Lines, & Properties of Arcs

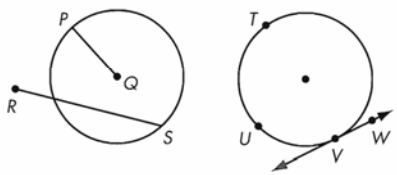
1. Define *chord.*

Chord



$\overline{AB}$, $\overline{CD}$, $\overline{EF}$, $\overline{GH}$, and $\overline{IJ}$ are chords.

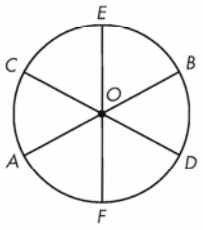
Not a chord



$\overline{PQ}$, $\overline{RS}$, $\overline{TU}$, and $\overleftrightarrow{VW}$ are not chords.

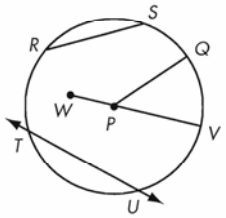
2. Define *diameter.*

Diameter



$\overline{AB}$, $\overline{CD}$, and $\overline{EF}$ are diameters of circle O.

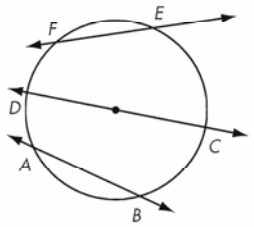
Not a diameter



$\overline{PQ}$, $\overline{RS}$, $\overleftrightarrow{TU}$, and $\overline{VW}$ are not diameters of circle P.

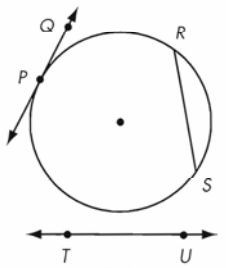
3. Define *secant.*

Secant



$\overleftrightarrow{AB}$, $\overleftrightarrow{CD}$, and $\overleftrightarrow{EF}$ are secants.

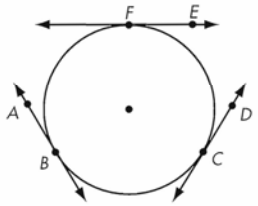
Not a secant



$\overleftrightarrow{PQ}$, $\overline{RS}$, and $\overleftrightarrow{TU}$ are not secants.

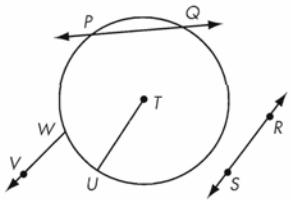
4. Define *tangent.*

Tangent



$\overleftrightarrow{AB}$, $\overleftrightarrow{CD}$, and $\overleftrightarrow{EF}$ are tangents.

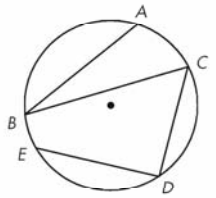
Not a tangent



$\overleftrightarrow{PQ}$, $\overleftrightarrow{RS}$, $\overline{TU}$, and $\overrightarrow{WV}$ are not tangents.

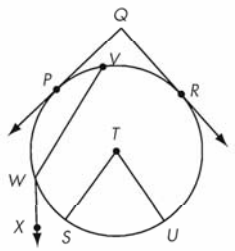
5.* Define *inscribed angle.*

Inscribed angle



$\angle ABC$, $\angle BCD$, and $\angle CDE$ are inscribed angles. They intercept arcs $\overset{\frown}{AC}$, $\overset{\frown}{BD}$, and $\overset{\frown}{EBC}$, respectively.

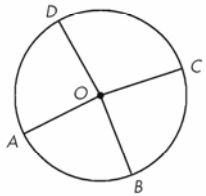
Not an inscribed angle



$\angle PQR$, $\angle STU$, and $\angle VWX$ are not inscribed angles.

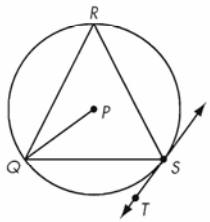
6. Define *central angle.*

Central angle



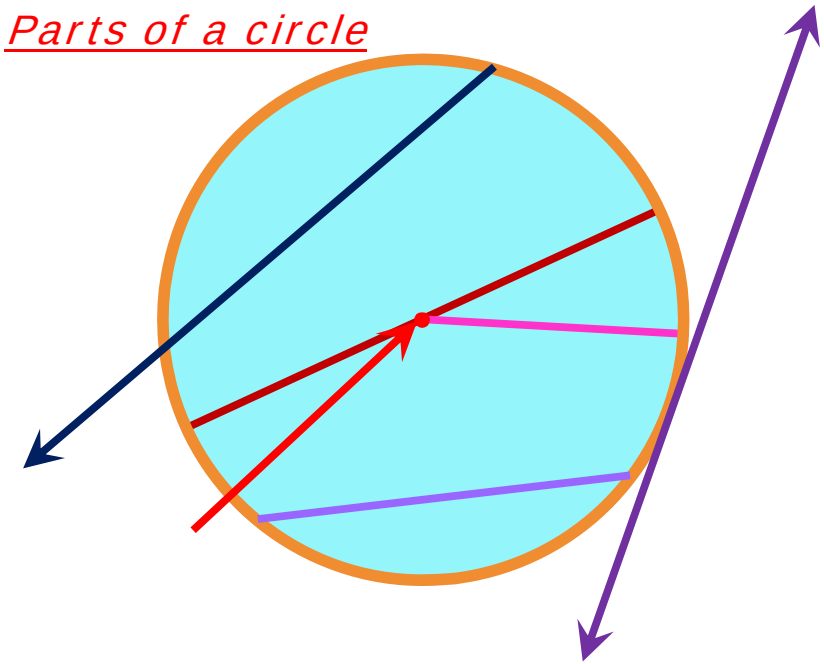
$\angle AOB$, $\angle BOC$, $\angle COD$, and $\angle DOA$ are central angles of circle O.

Not a central angle

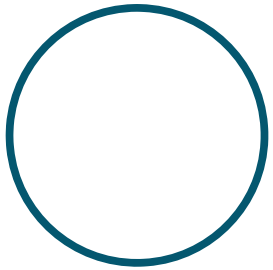


$\angle PQR$, $\angle PQS$, $\angle RQS$, and $\angle QST$ are not central angles of circle P.

Parts of a circle

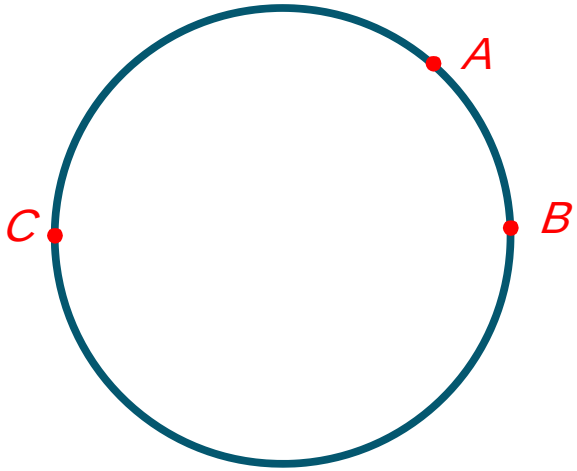


Concentric Circles



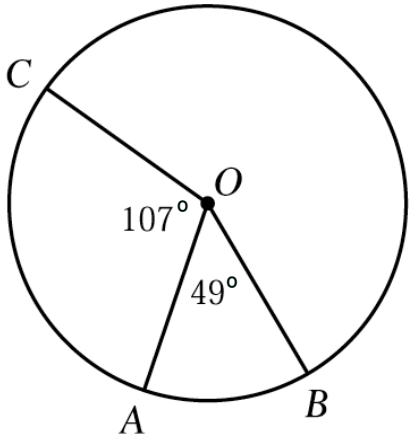
Circles that have the _____.

Arcs



Minor arcs are the _____ arc between two points.
Major arc is the _____ arc between two points.

Arc Measures



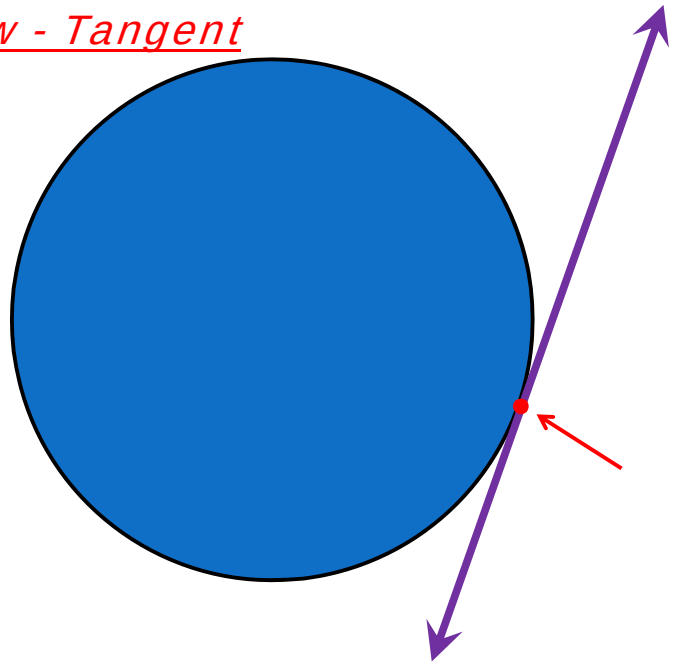
$m\overset{\frown}{AB} =$

$m\overset{\frown}{ABC} =$

$m\overset{\frown}{BAC} =$

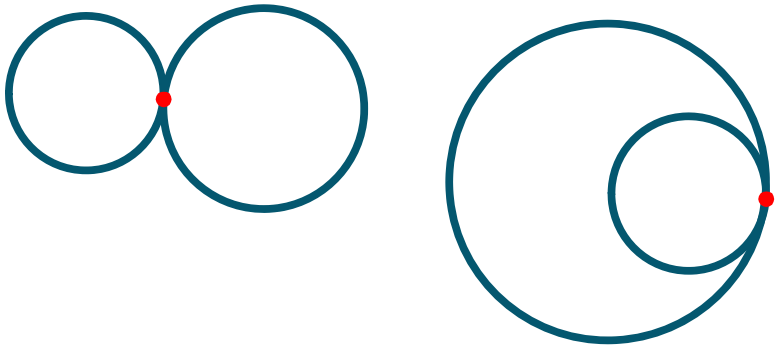
$m\overset{\frown}{ACB} =$

Review - Tangent



Tangent Circles

These are circles that touch each other at only one point.



Observations...

Investigation 1 (Tangent Properties 1)

1) **Move point C close and close to point B.**

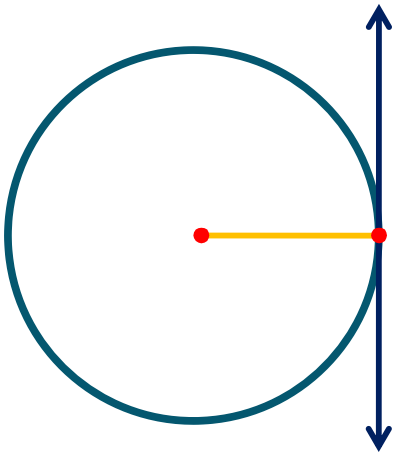
2) **What would you call that line if point C coincides with point B? Why?**

3) **What kind of angle do you believe is formed from radius AB and that line?**

Investigation 2 (Tangent Properties 2)

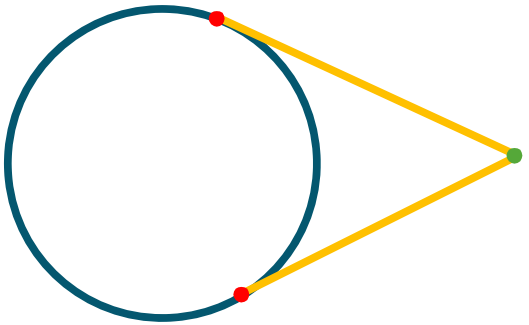
Tangent segments are segments that are tangent to a circle and intersect at one point outside the circle.

4) **What do you think is the relationship between the two tangent segments illustrated?**



© Tangent Conjecture

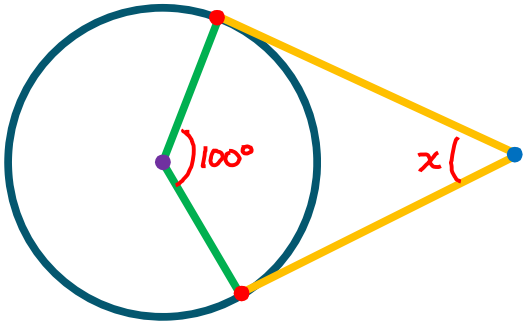
A tangent to a circle is _____ to the radius drawn to the _____.



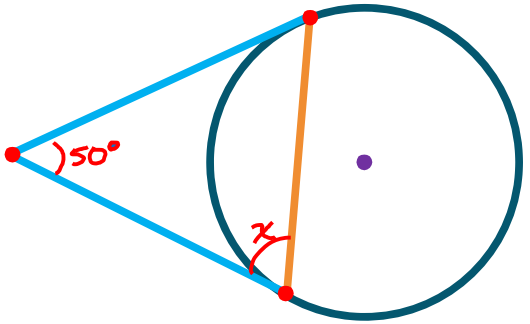
© Tangent Segments Conjecture

Tangent segments to a circle from a point outside the circle are _____ .

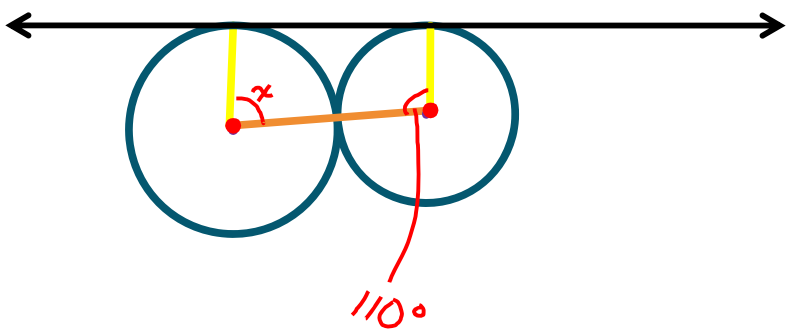
Practice #1



Practice #2



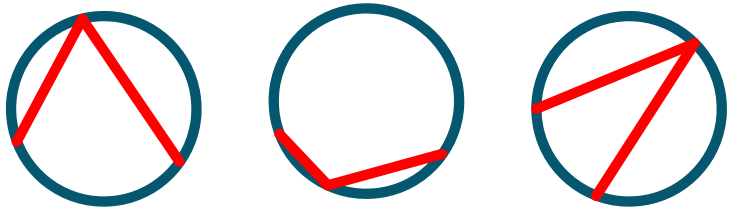
Practice #3



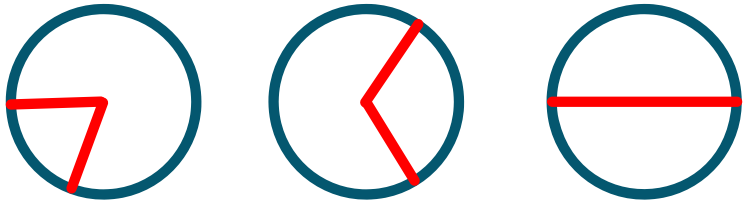
12.3 & 12.4

Properties of Chords & Inscribed Angles

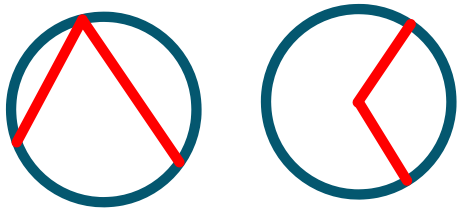
Review - Inscribed Angles



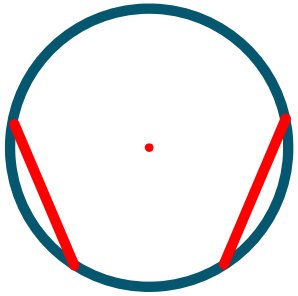
Review - Central Angles



Intercepted Arcs



Chord Properties



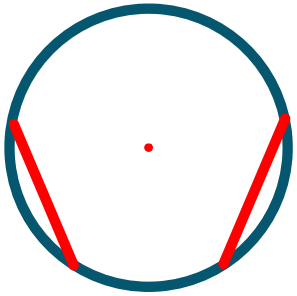
Investigation: Chord Properties 1

What's the relationship between congruent chords and the central angles formed using their endpoints?

If two chords in a circle are congruent, then they determine

_____

Chord Properties



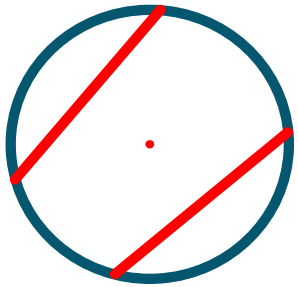
Investigation: Chord Properties 2

What's the relationship between congruent chords and the arcs formed between their endpoints (intercepted arcs)?

If two chords are congruent, then their intercepted arcs are

_____

Chord Properties



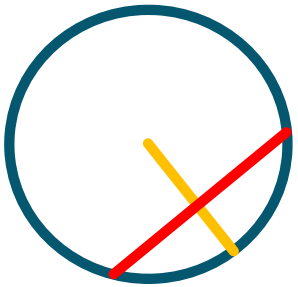
Investigation: Chord Properties 3

What's the relationship between congruent chords and their distance from the center?

Two congruent chords in a circle _____

_____

Chord Properties



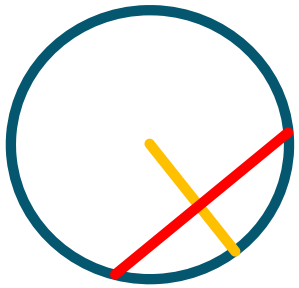
Investigation: Chord Properties 4

What does a perpendicular from the center of a circle do to an intersecting chord?

The perpendicular from the center of a circle to a chord

_____

Chord Properties



Investigation: Chord Properties 4

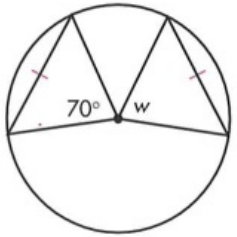
If a segment is coming from the center of a circle and bisects a chord, what relationship do they have with each other?

A segment coming from the center and bisects a chord

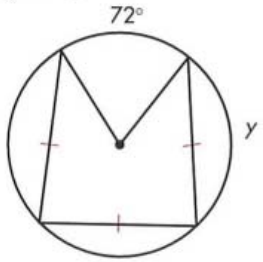
_____

Chord Properties

1) $w = -?-$

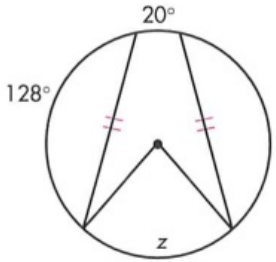


2) $y = -?-$

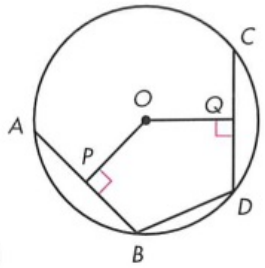


Chord Properties

3) $z = -?-$

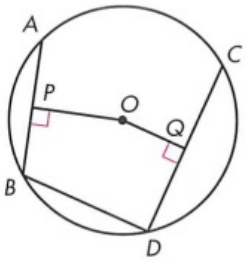


4) $AB = CD$
$PO = 8$ cm
$OQ = -?-$

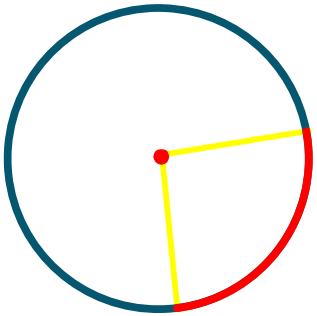


Chord Properties

5) $AB = 6$ cm $\quad OP = 4$ cm
$CD = 8$ cm $\quad OQ = 3$ cm
$BD = 6$ cm
What is the perimeter of $OPBDQ$?

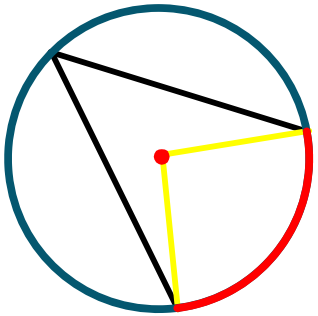


Relationship between central angles and intercepted arcs



The measure of a central angle and the arc made from its endpoints (intercepted arc) are the _____.

Relationship between inscribed angles and central angles



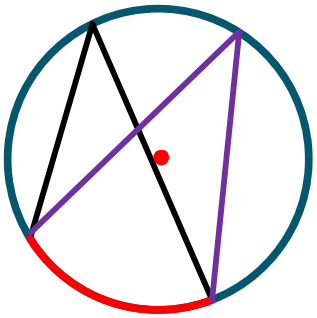
Investigation: Inscribed Angles 1

POK

Inscribed Angle Theorem

The measure of an _____ angle is half the measure of the _____ angle that shares the same _____ arc

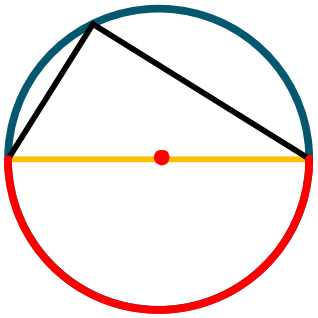
Relationship between inscribed angles that share the same arc.



Investigation: Inscribed Angles 2

Inscribed angles that share the same _____ arc are _____.

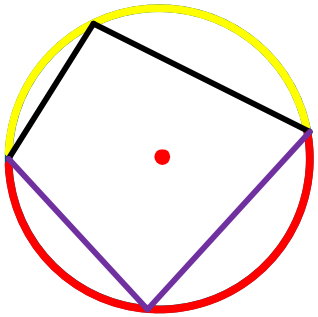
Observations of a right inscribed angle



Investigation: Inscribed Angles 3

Angles inscribed in a semicircle are ____ _____.

Quadrilaterals inscribed in a Circle...



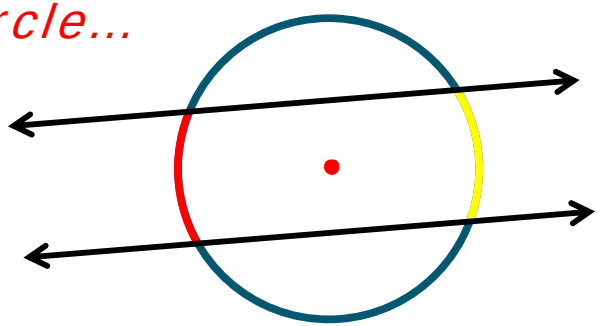
Investigation: Inscribed Angles 4

POK

Cyclic Quadrilateral Theorem

_____ angles in a cyclic quadilateral are _____.

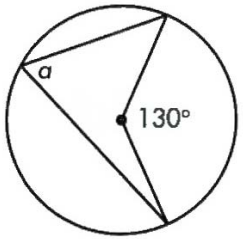
Parallel Lines Intersecting a Circle...



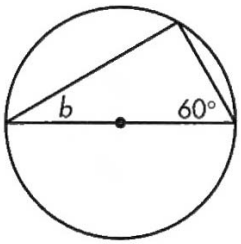
Parallel lines intercept _____ arcs on a circle.

Inscribed Angle Properties

6) $a = -?-$

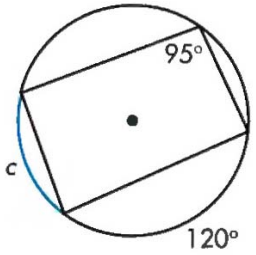


7) $b = -?-$

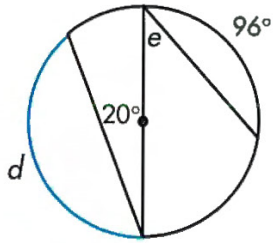


Inscribed Angle Properties

8) $c = -?-$



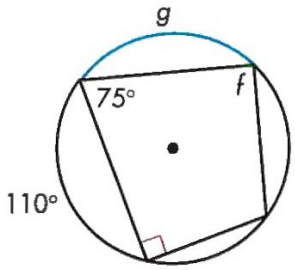
9) $d = -?-$
$e = -?-$



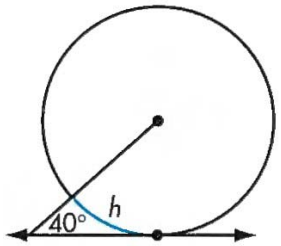
Inscribed Angle Properties

10) f = –?–

g = –?–



11)

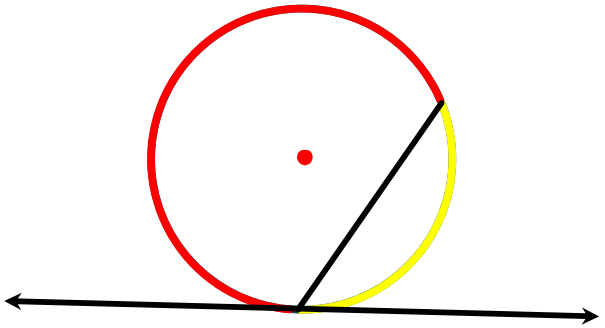


DOWN is a kite.

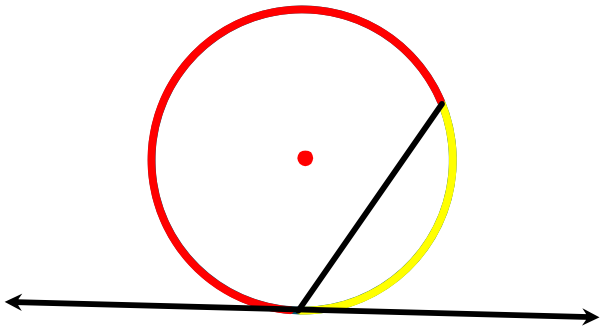
y = –?–

12.5
Angles of Chords, Secants, and Tangents

Tangent/Chord Theorem



Tangent/Chord Theorem



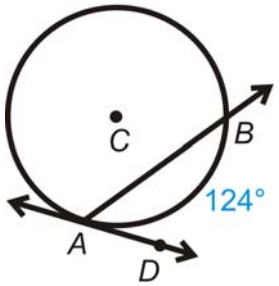
POK

Tangent/Chord Theorem

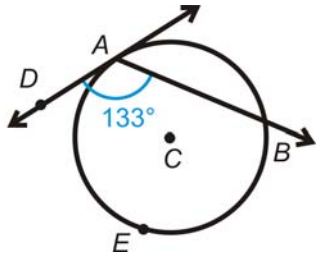
If a tangent and chord _____ at a point on a circle, then the measure of each angle formed is _____ the measure of the _____ arc.

Practice

1) Find $m\angle BAD$

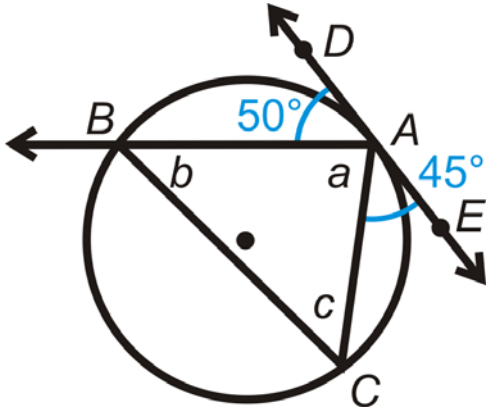


2) Find $m\overset{\frown}{AEB}$

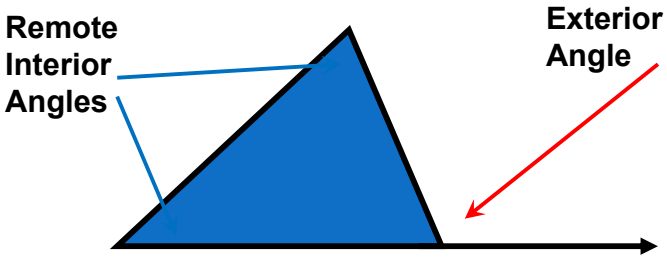


Practice

3)

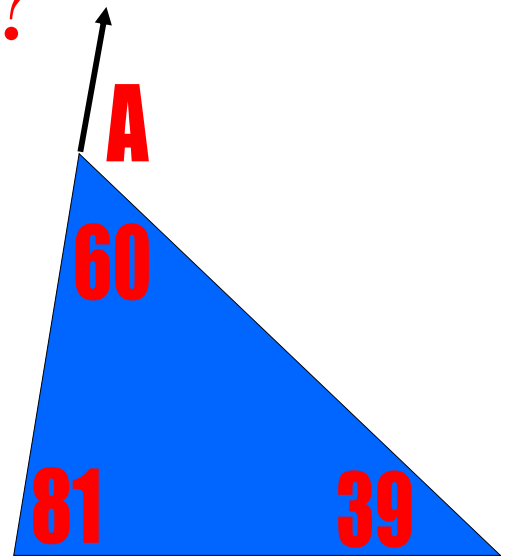


Exterior Angle

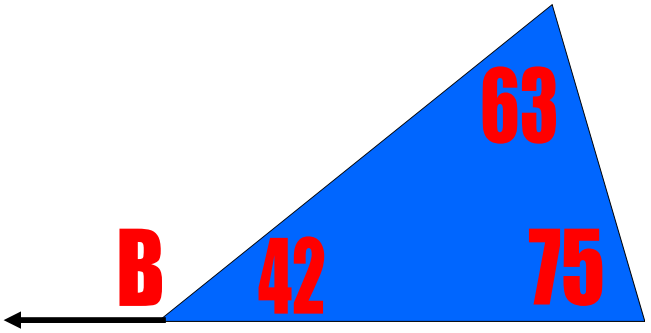


If you extend one side of a triangle from the vertex, you form an exterior angle.

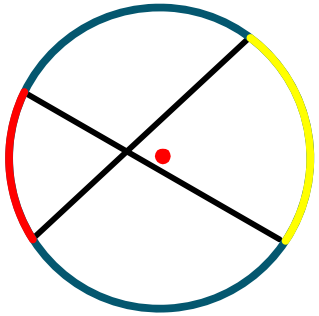
$m\angle A = ?$



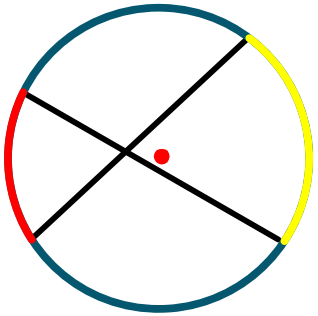
$m\angle B = ?$



Angle/Chord Theorem



Angle/Chord Theorem



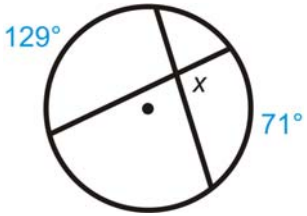
POK

Angle/Chord Theorem

If two chords intersect _____ a circle, then the measure of each angle is _____ the sum of the intercepted arcs.

Practice

4)



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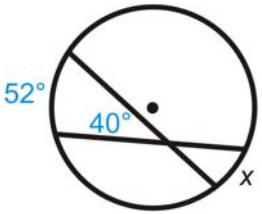
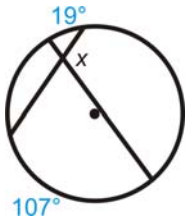
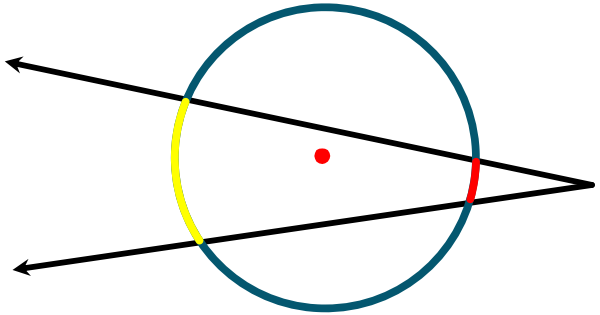


Practice

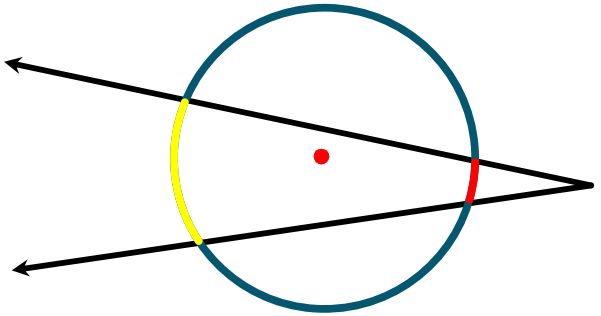
6)



Angle/Secant Theorem



Angle/Secant Theorem

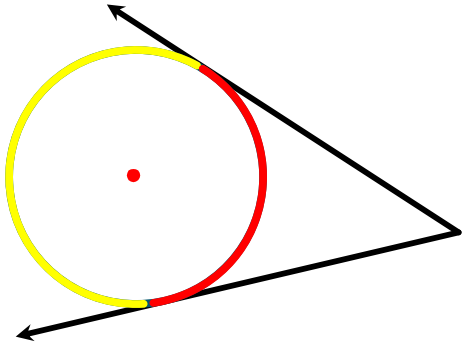


POK

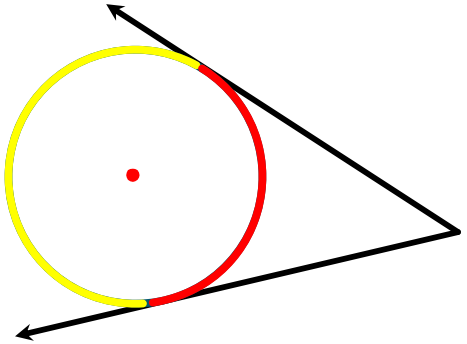
Angle/Secant Theorem

If secants intersect outside a circle, then the measure of the angle formed outside the circle is _____ the _____ of the intercepted arcs

Angle/Tangents Theorem



Angle/Tangents Theorem

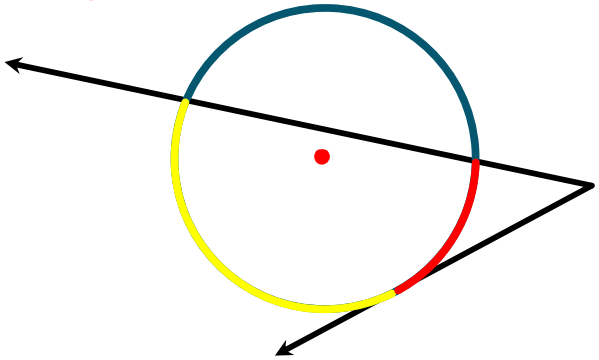


POK

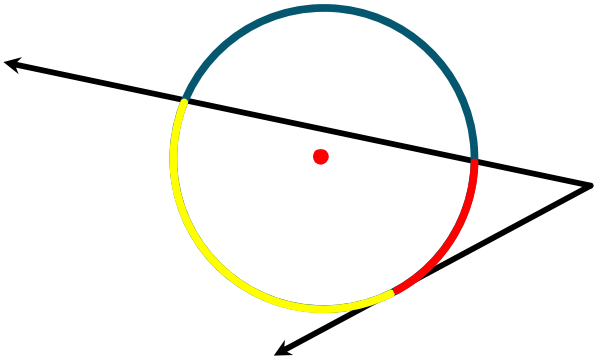
Angle/Tangents Theorem

If tangents intersect outside a circle, then the measure of the angle formed outside the circle is _____ the difference of the intercepted arcs

Tangent/Secant Theorem



Tangent/Secant Theorem



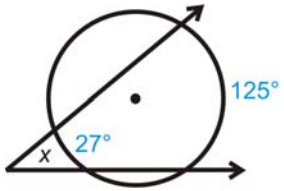
POK

Tangent/Secant Theorem

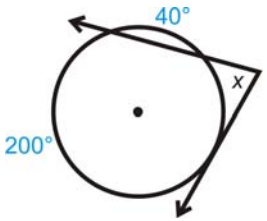
If tangents or secants intersect outside a circle, then the measure of the angle formed outside the circle is _____ the difference of the intercepted arcs

Practice

7)

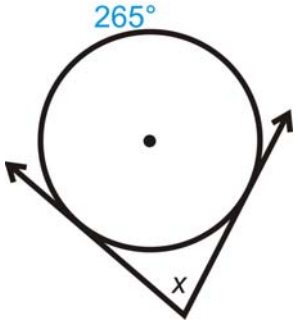


8)

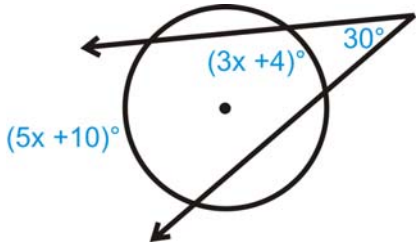


Practice

9)

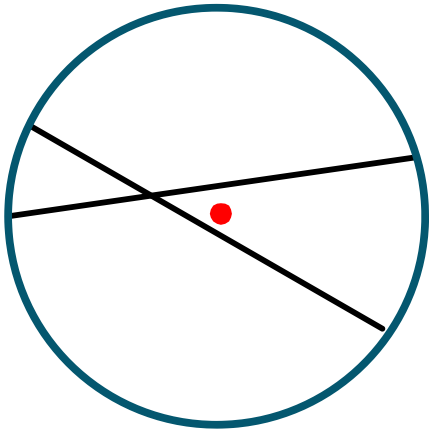


10)

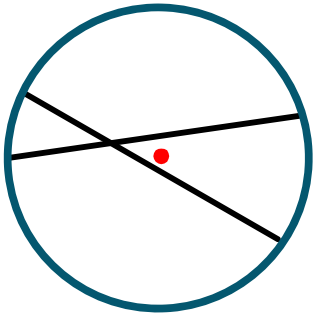


12.6
Segments of Chords, Secants, and Tangents

Segments of Chord Theorem



Segments of Chord Theorem



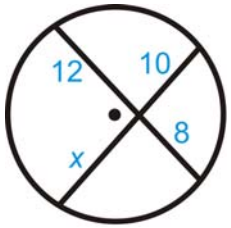
POK

Segments of Chords Theorem

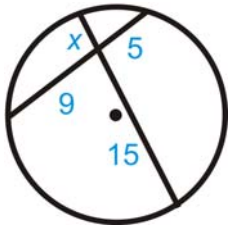
If two chords intersect in a circle then the _____ of the lengths of the segments of one chord is equal in measure to the _____ of the segments in the other chord.

Practice

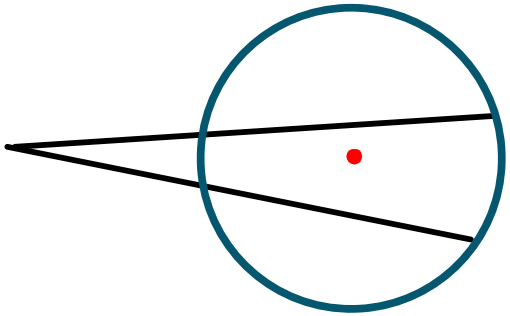
1)



2)



Secant Length Theorem

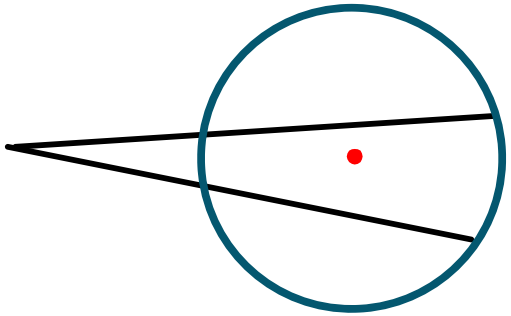


POK

Secant Length Theorem

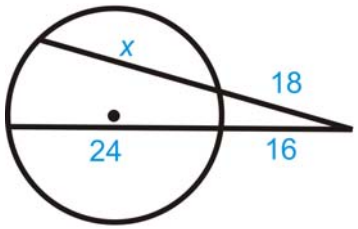
If two secant segments share the same endpoint outside a circle, then the _____ of the lengths of one secant and its external part is equal to the _____ of the other secant and its external part.

Secant Length Theorem

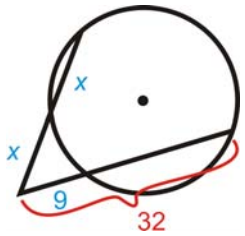


Practice

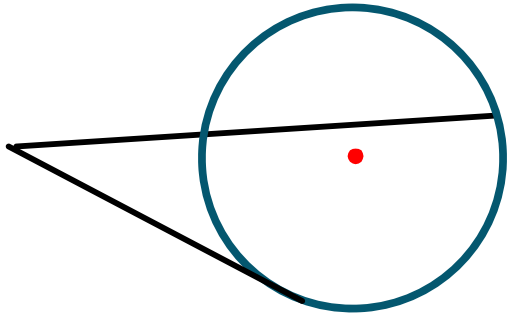
3)



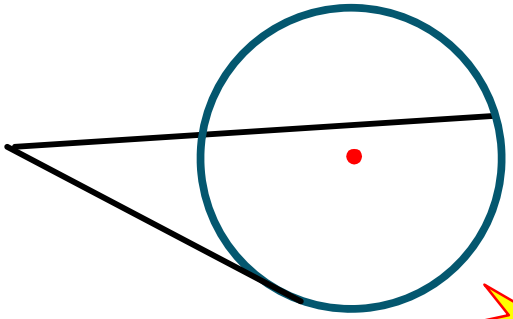
4)



Secants/Tangent Lengths Theorem



Secants/Tangent Lengths Theorem



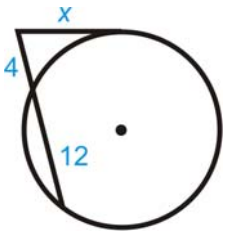
POK

Secants/Tangents Lengths Theorem

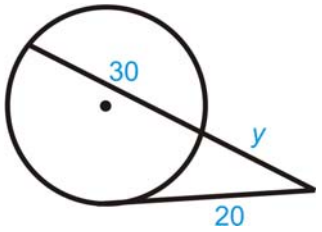
If a secant and a tangent segment share the same endpoint outside a circle, then the _____ of the lengths of the secant and its external part is equal to the _____ of the tangent segment

Practice

5)



6)



12.7

COMPLETING THE SQUARE REVIEW

Hmmm.....

1) $(x+5)^2$

2) $(a-9)^2$

3) $(2a+3)^2$

4) $(4s-5t)^2$

Formula (Pattern)

$$(a+b)^2 = a^2 + 2ab + b^2$$

$$(a-b)^2 = a^2 - 2ab + b^2$$

Factoring Perfect Squares

$$a^2 + 2ab + b^2 = (a+b)^2$$
$$a^2 - 2ab + b^2 = (a-b)^2$$

1) Is the first term a square?
2) Is the last term a square?
3) Is the middle term (ignore sign) twice the product of the roots of the first and last terms

5) $x^2 - 4x + 4$

Factoring Perfect Squares

$$a^2 + 2ab + b^2 = (a+b)^2$$
$$a^2 - 2ab + b^2 = (a-b)^2$$

1) Is the first term a square?
2) Is the last term a square?
3) Is the middle term (ignore sign) twice the product of the roots of the first and last terms

6) $p^2 - 14p + 49$

Review – Perfect Squares

Example 1

$$(x+3)^2 = x^2 + 6x + 9$$

Special Relationship

- Take half of it
- Square it

Review – Perfect Squares

Example 2

$$(x-5)^2 = x^2 - 10x + 25$$

- Take half of it
- Square it

Review – Perfect Squares

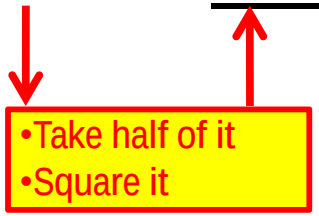
Example 3

$$(x-8)^2 = x^2 - 16x + 64$$

- Take half of it
- Square it

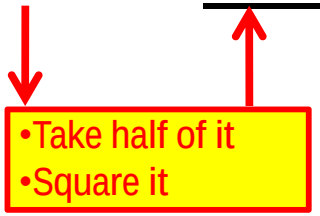
Completing the Square

$$x^2 - 20x + \_\_\_\_$$



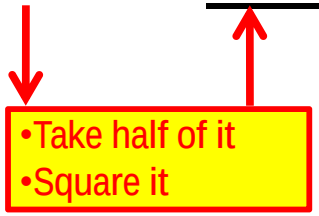
Completing the Square

$$x^2 + 11x + \_\_\_\_$$



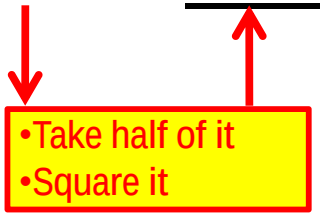
Completing the Square

$$x^2 + 14x + \_\_\_\_$$



Completing the Square

$$x^2 - 9x + \_\_\_\_$$



REVIEW: COMPLETING THE SQUARE

Complete the square, and then factor it.

1) $x^2 + 10x$ _____ $=$

2) $a^2 - 6a$ _____ $=$

3) $m^2 - 14m$ _____ $=$

Solving by completing the square

Complete the square, and then factor it.

4) $y^2 - 24y + 23 = 0$

Solving by completing the square

Complete the square, and then factor it.

5) $x^2 + 6x + 7 = 0$

REVIEW: COMPLETING THE SQUARE

Complete the square, and then factor it. Don't try to solve.

6) $n^2 - 12n + 35 = 0$

REVIEW: COMPLETING THE SQUARE

Complete the square, and then factor it. Don't try to solve.

7) $k^2 - 2k - 35 = 0$

COMPLETING THE SQUARE

1) Gather like terms
2) Complete the square, and then factor it. Don't try to solve.

8) $x^2 + y^2 - 4x + 2y = 20$

COMPLETING THE SQUARE

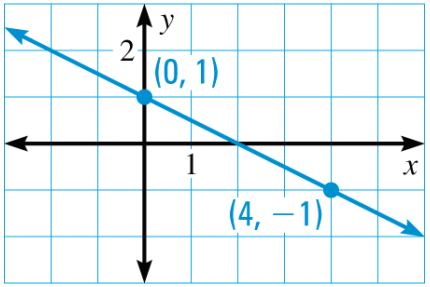
1) Gather like terms
2) Complete the square, and then factor it. Don't try to solve.

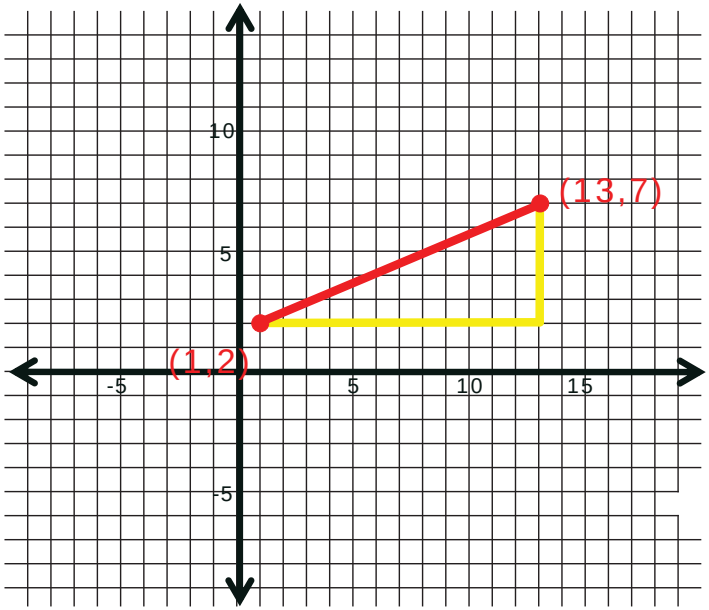
9) $x^2 + y^2 + 2x - 4y - 11 = 0$

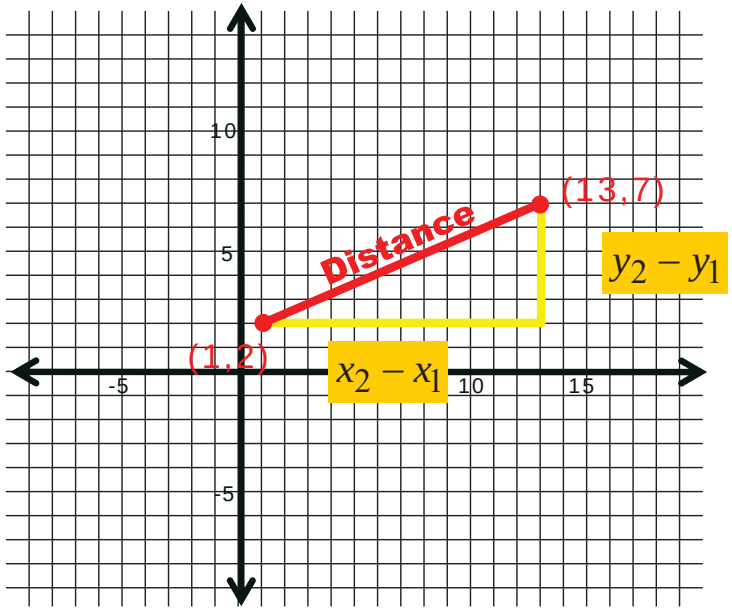
12.7 Equation of Circles

Review

1) Write an equation of the line shown.







$$(x_2 - x_1)^2 + (y_2 - y_1)^2 = \text{distance}^2$$

Observations...

Investigation 1 (Equation of Circles 1)

1) Make sure both boxes are check on the top-left hand side

2) From the figure formed, what do the green and red line segments represent?

3) What does $\overline{AB}$ represent in that figure?

4) How does the equation at the top relate to $\overline{AB}$?

5) Write the original equation:

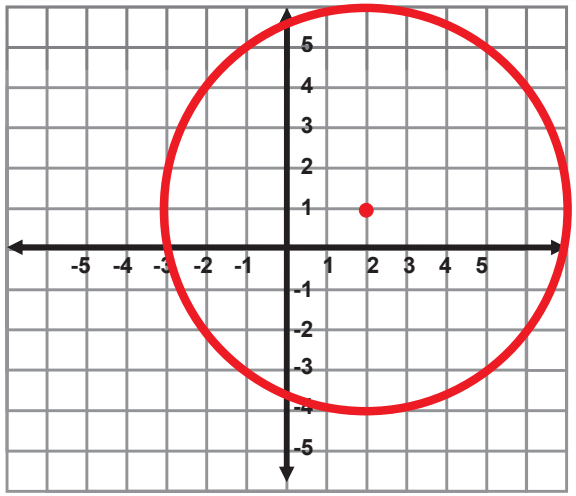
6) What does x and y represent?

Observations...

7) What do the other numbers in the parenthesis represent?

8) What does the number 25 represent?

EQUATION OF A CIRCLE

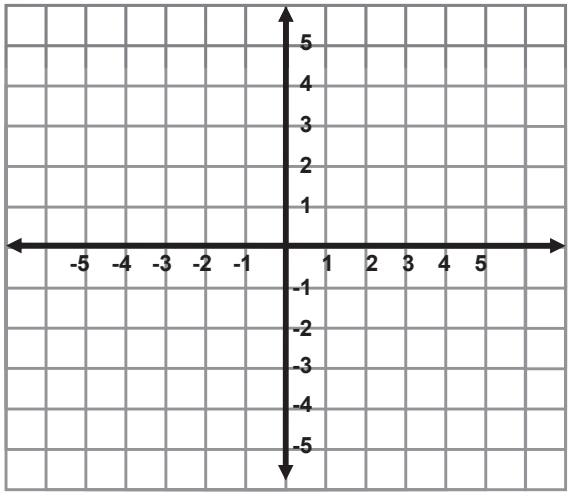


$$(x-2)^2+(y-1)^2=25$$

Equation of a circle

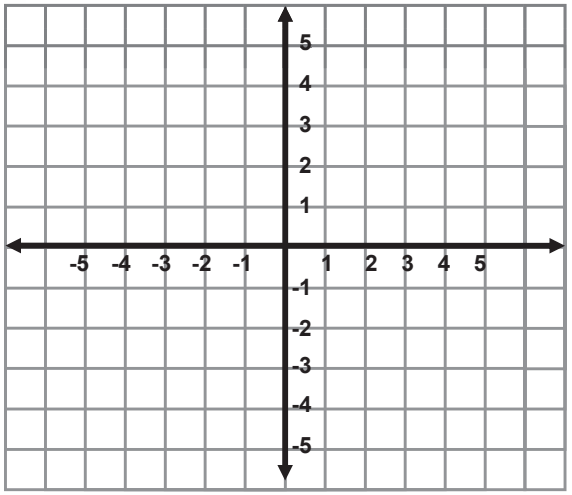
- (h,k) is the center of the circle
- r is the radius

GRAPHING A CIRCLE



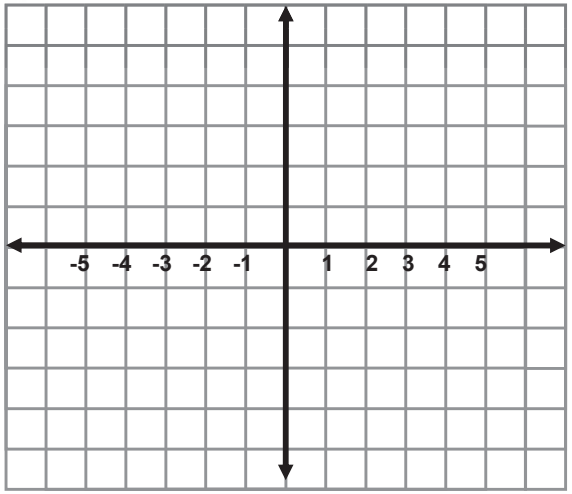
$(x-3)^2+(y-2)^2=4$

GRAPHING A CIRCLE



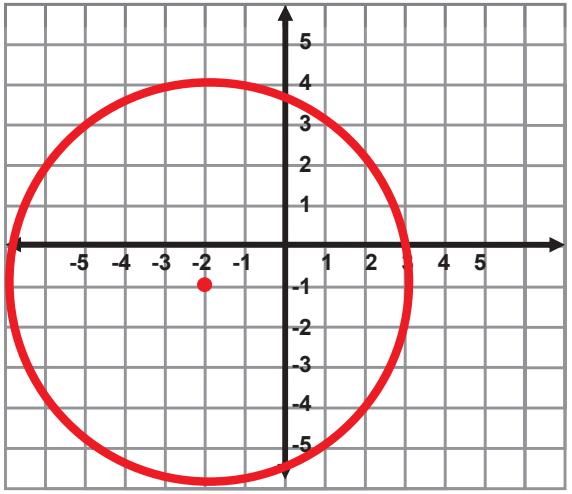
$x^2+y^2=16$

GRAPHING A CIRCLE

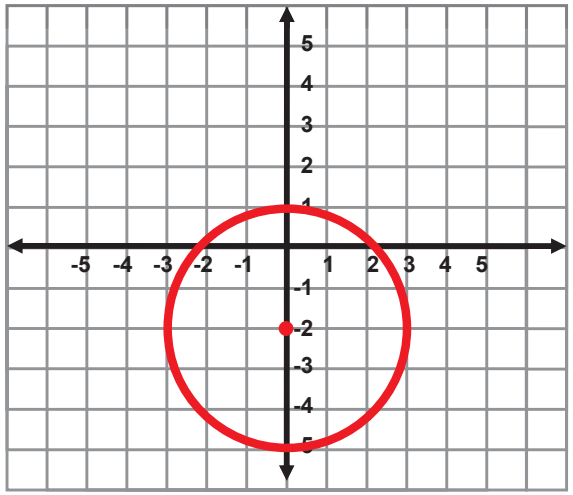


$(x+2)^2+(y-3)^2=9$

DETERMINING THE EQUATION OF A CIRCLE



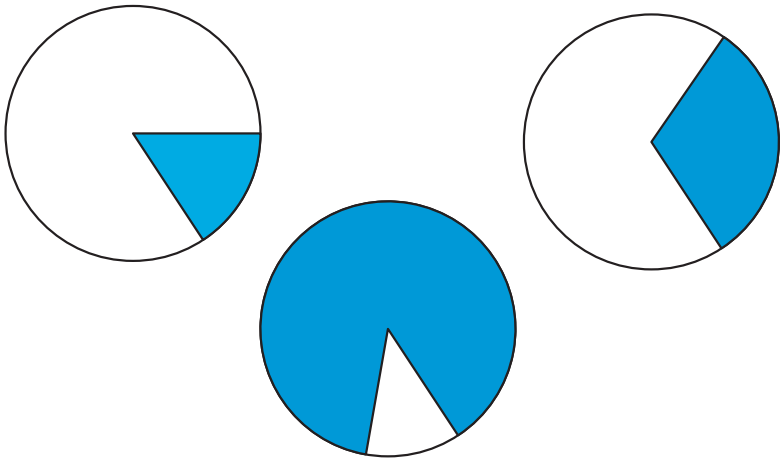
DETERMINING THE EQUATION OF A CIRCLE



12.75
Areas of Parts of a Circle

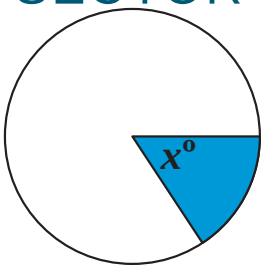
Parts of a Circle

SECTOR OF A CIRCLE



Parts of a Circle

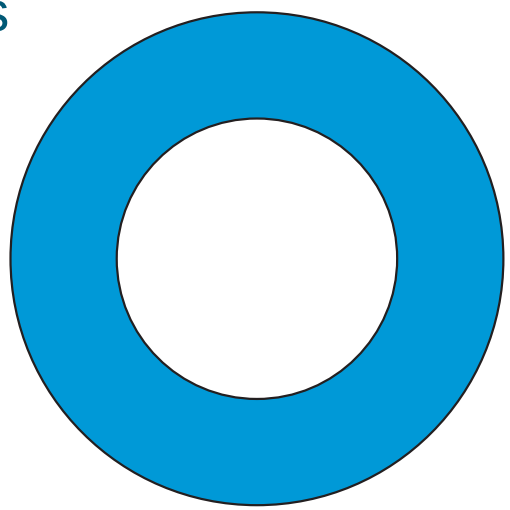
AREA OF A SECTOR OF A CIRCLE



Area of a Sector =

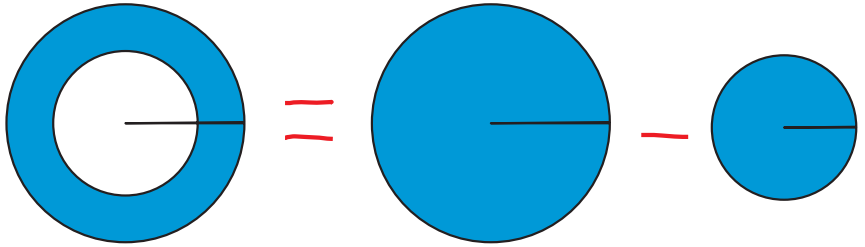
Parts of a Circle

Annulus



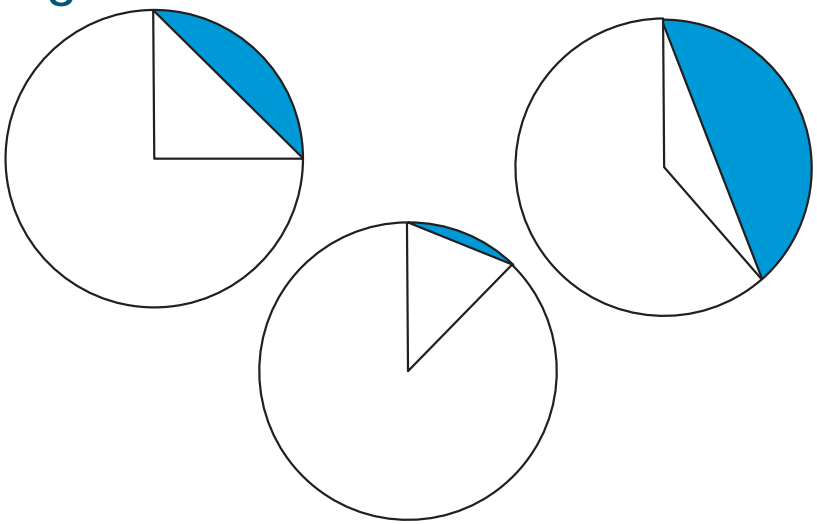
Parts of a Circle

Area of an Annulus



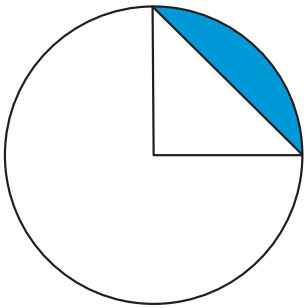
Parts of a Circle

Segment



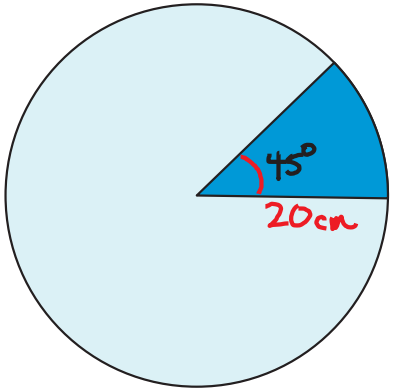
Parts of a Circle

Area of a Segment



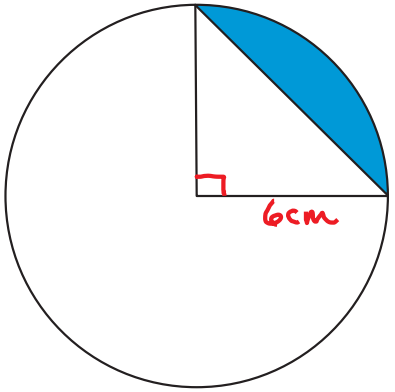
PRACTICE

Example 1



PRACTICE

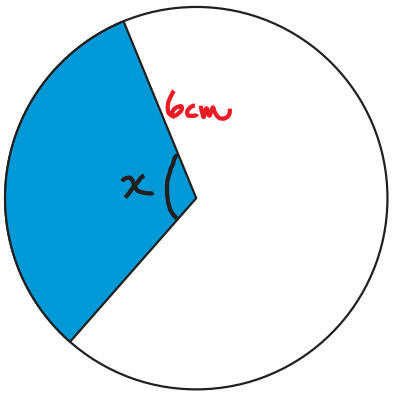
Example 2



PRACTICE

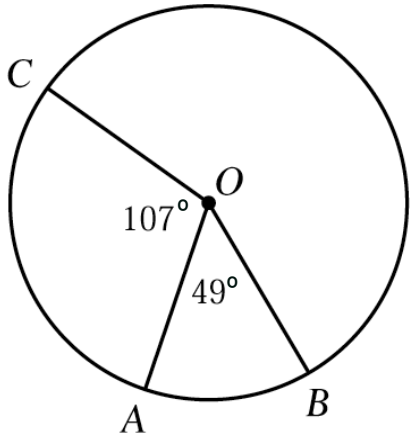
Example 3

Sector Area = 14π cm^2



Chapter 12 Review

Arc Measures

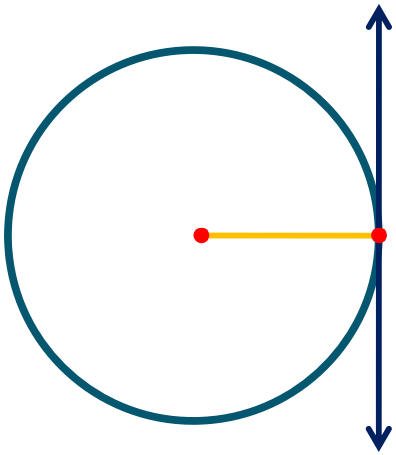


$m\overset{\frown}{AB} =$

$m\overset{\frown}{ABC} =$

$m\overset{\frown}{BAC} =$

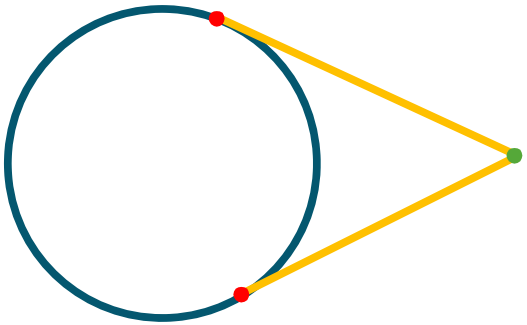
$m\overset{\frown}{ACB} =$



POK

Tangent Theorem

A tangent to a circle is _____ to the radius drawn to the _____.

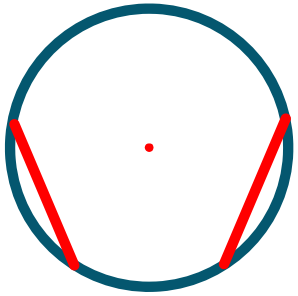


POK

Tangent Segments Theorem

Tangent segments to a circle from a point outside the circle are _____ .

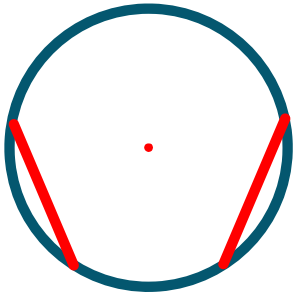
Chord Properties



If two chords in a circle are congruent, then they determine

_____

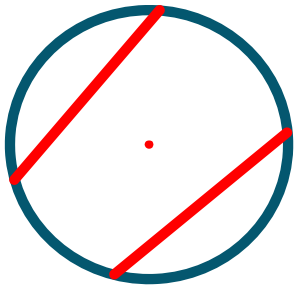
Chord Properties



If two chords are congruent, then their intercepted arcs are

_____

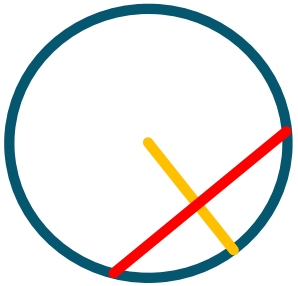
Chord Properties



Two congruent chords in a circle _____

_____

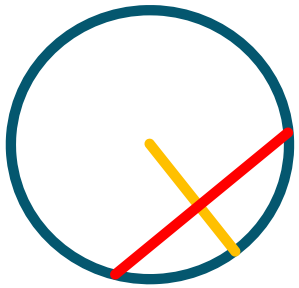
Chord Properties



The perpendicular from the center of a circle to a chord

_____

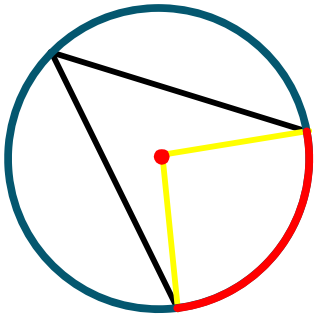
Chord Properties



A segment that bisects a chord _____

_____

Relationship between inscribed angles and central angles

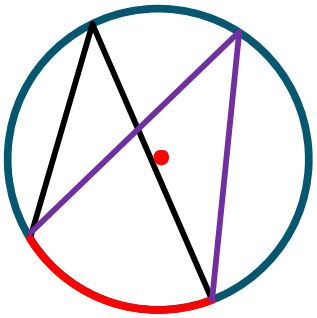


POK

Inscribed Angle Theorem

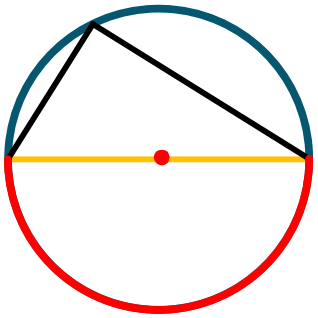
The measure of an _____ angle is half the measure of the _____ angle that shares the same _____ arc

Relationship between inscribed angles that share the same arc.



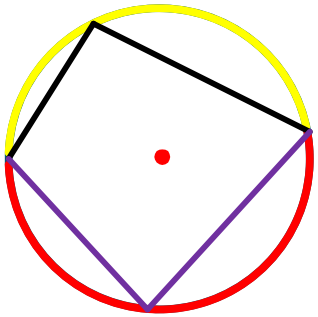
Inscribed angles that share the same _____ arc are _____.

Observations of a right inscribed angle



Angles inscribed in a semicircle are _____ _____.

Quadrilaterals inscribed in a Circle...

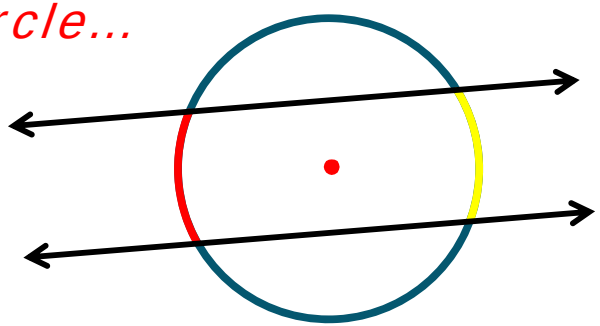


POK

Cyclic Quadrilateral Theorem

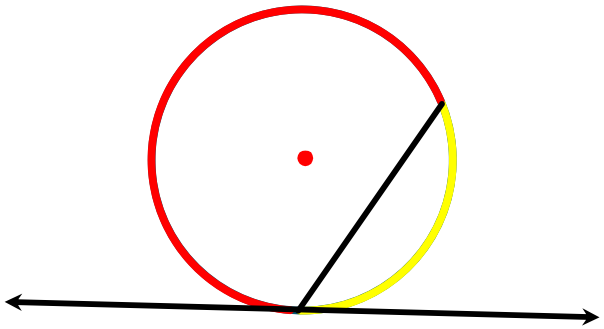
_____ angles in a cyclic quadilateral are _____.

Parallel Lines Intersecting a Circle...



Parallel lines intercept _____ arcs on a circle.

Tangent/Chord Theorem

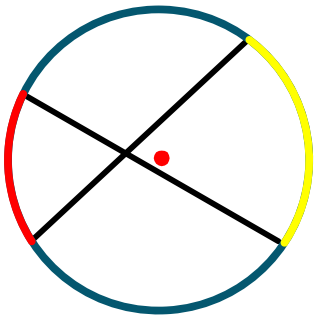


POK

Tangent/Chord Theorem

If a tangent and chord _____ at a point on a circle, then the measure of each angle formed is _____ the measure of the _____ arc.

Angle/Chord Theorem

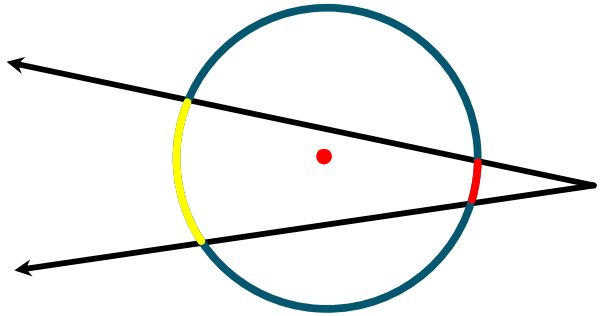


POK

Angle/Chord Theorem

If two chords intersect _____ a circle, then the measure of each angle is _____ the sum of the intercepted arcs.

Angle/Secant Theorem

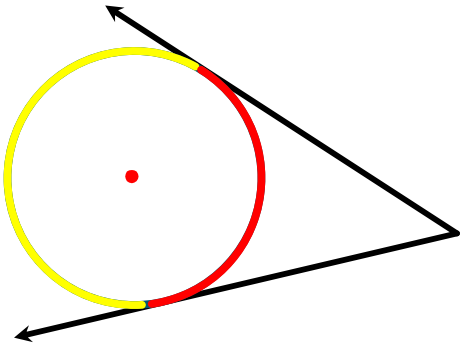


POK

Angle/Secant Theorem

If secants intersect outside a circle, then the measure of the angle formed outside the circle is _____ the _____ of the intercepted arcs

Angle/Tangents Theorem

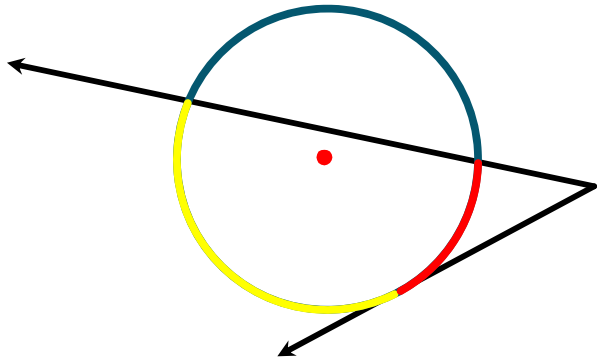


POK

Angle/Tangents Theorem

If tangents intersect outside a circle, then the measure of the angle formed outside the circle is _____ the difference of the intercepted arcs

Tangent/Secant Theorem

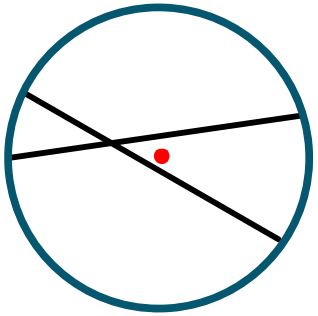


POK

Tangent/Secant Theorem

If tangents or secants intersect outside a circle, then the measure of the angle formed outside the circle is _____ the difference of the intercepted arcs

Segments of Chord Theorem

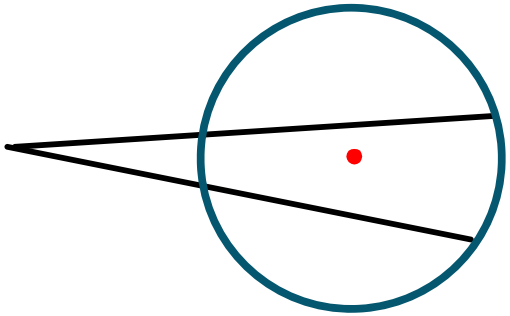


POK

Segments of Chords Theorem

If two chords intersect in a circle then the _____ of the lengths of the segments of one chord is equal in measure to the _____ of the segments in the other chord.

Secant Length Theorem

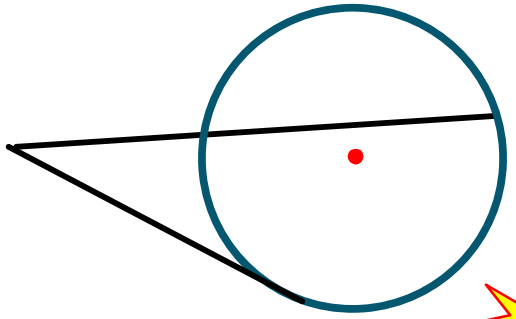


POK

Secant Length Theorem

If two secant segments share the same endpoint outside a circle, then the _____ of the lengths of one secant and its external part is equal to the _____ of the other secant and its external part.

Secants/Tangent Lengths Theorem



POK

Secants/Tangents Lengths Theorem

If a secant and a tangent segment share the same endpoint outside a circle, then the _____ of the lengths of the secant and its external part is equal to the _____ of the tangent segment

Equation of a circle

- (h,k) is the center of the circle
- r is the radius