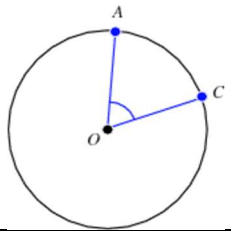
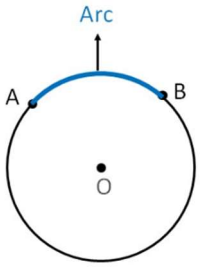
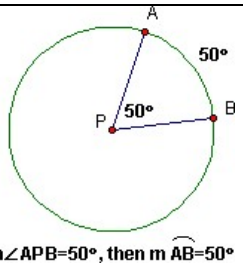
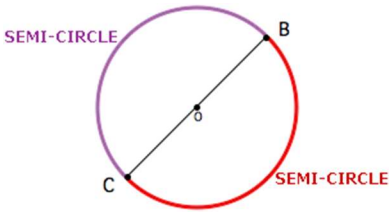
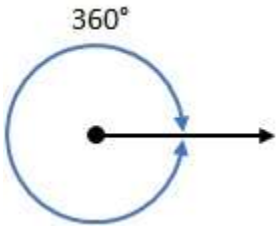
# 10.1 Notes: Arc and Central Angles in Circles

**Objectives:**

- **Students will be able to find missing central angles in a circle.**
- **Students will be able to find the measure of arcs in a circle.**

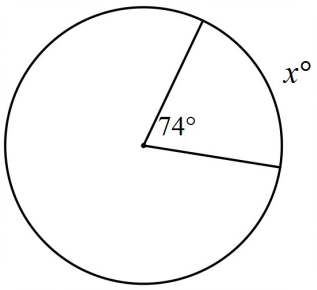
| | | |
|---|---|---|
| **Central Angle of a Circle** | **A central angle of a circle has its vertex on the _____ of the circle, and its rays are the _____ of the circle.** |   |
| **Arc of a Circle** | **An arc of a circle is a _____ of the circumference of the circle. In other words, it is part of the curved outer portion of the circle.** |   |

**Exploration:** Use the following link to explore the relationship between a central angle and its arc: https://www.geogebra.org/m/pwa6zQtq Move points B and C around, and watch how the measures of the central angle and the enclosed arc change. Make a conjecture about the relationship between a central angle and its arc:

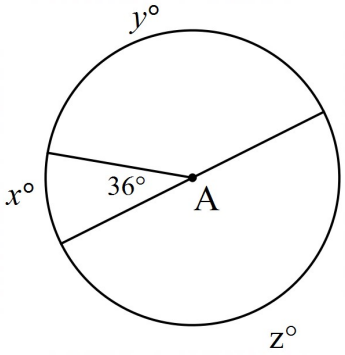
| | | |
|---|---|---|
| **Measure of an arc** | **The measure of an arc is _____ to the measure of its central angle.** |   If m∠APB=50°, then m $\overset{\frown}{AB}$=50° |
| **Measure of a semi-circle** | **A semicircle is an arc formed by the _____ of a circle, and its measure is _____ degrees.** |   |
| **Total number of degrees in a circle** | **Any circle has a total measure of _____ degrees.** |   |

**For #1 – 6: Find the measure of the variable(s) for each diagram. Assume a segment that looks like a diameter is a diameter.**

1)

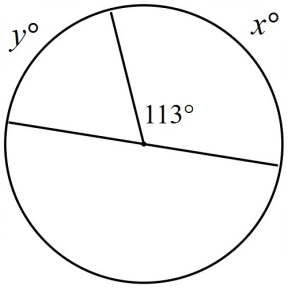



2)

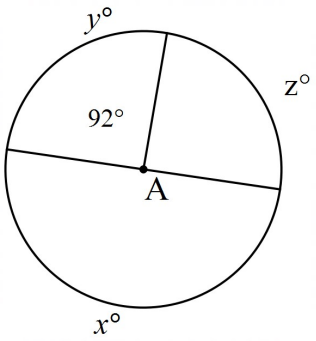



**You try #3 – 6!**

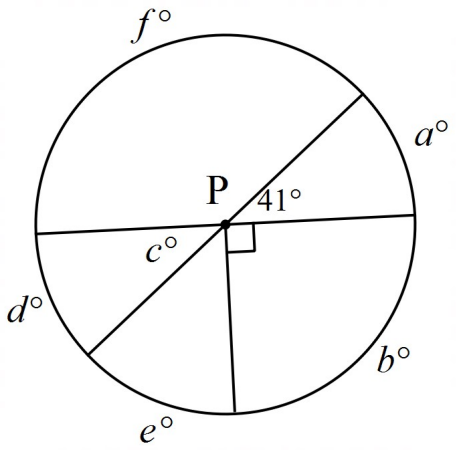
3)



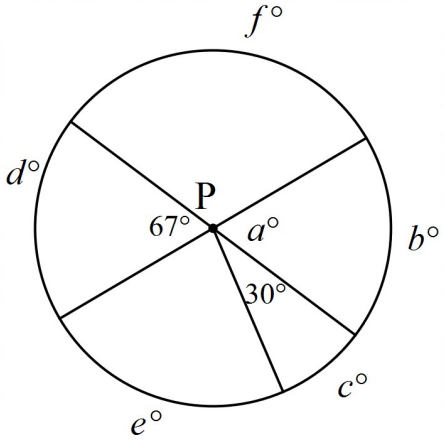

4)

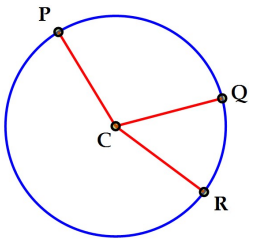
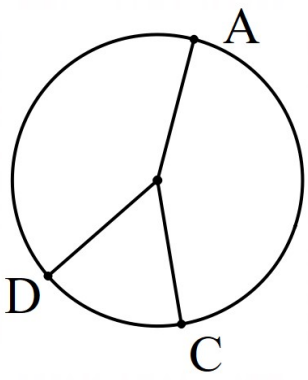



5)




**You try!** 6)



| | | |
|---|---|---|
| **Arc Addition Postulate** | **The Arc Addition Postulate states that arcs that are adjacent can be _____ to find the measure of a larger arc.** |  $m\overset{\frown}{PQR} = m\overset{\frown}{PQ} + m\overset{\frown}{QR}$ |
| **Minor Arc** | **An arc with a measure _____ than 180°** |  |
| **Major Arc** | **An arc with a measure _____ than 180°.**<br><br>**To name a major arc _____ letters are used. *Follow the order in which they are written to calculate measure.*** | |

7) **Find the measure of each arc or angle (assuming $\overline{KN}$ and $\overline{QT}$ are diameters).**
**Note:** If an arc is named with three letters, it is called a **major arc**. The measure is calculated the *long way around* the circle. Follow the order of the letters.

A. measure of $\overset{\frown}{QN}$

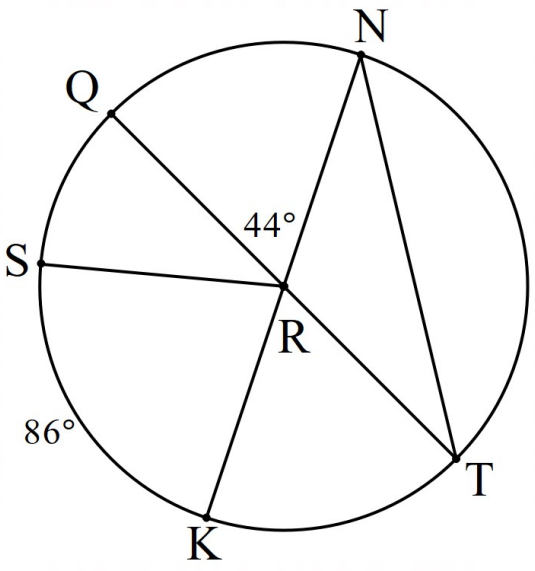
B. measure of $\overset{\frown}{SQ}$

C. measure of $\angle SRN$

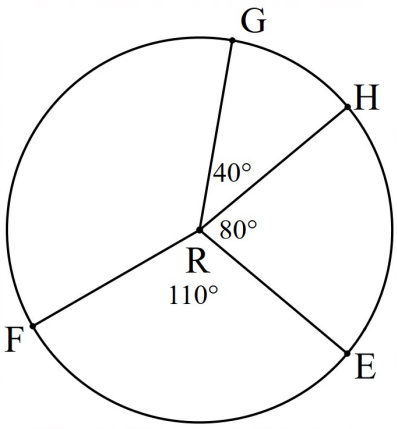
D. measure of $\overset{\frown}{QNK}$

E. measure of $\angle TRN$

F. measure of $\overset{\frown}{QNS}$



**You Try!** 8) Find the measure of each arc.



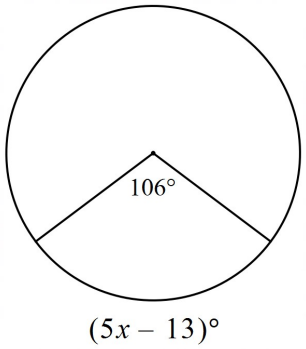

A. measure of $\overset{\frown}{GE}$

B. measure of $\overset{\frown}{GEF}$

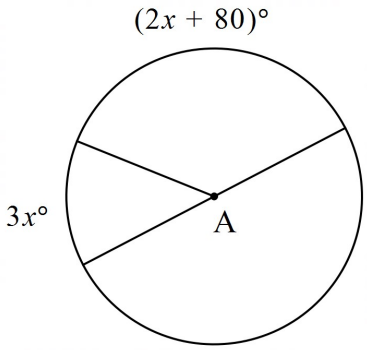
C. measure of $\overset{\frown}{GF}$

**For #9-10: Find the value of the variable.**

9)




10)



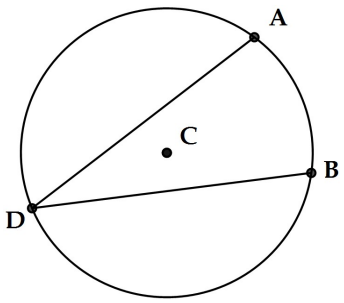
# 10.2 Notes: Inscribed Angles

**Objectives:**

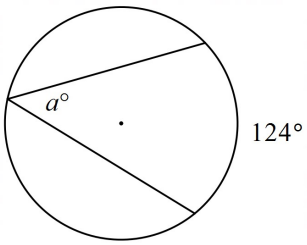
- **Students will be able to use the relationship between inscribed angles and arcs to find missing measures.**

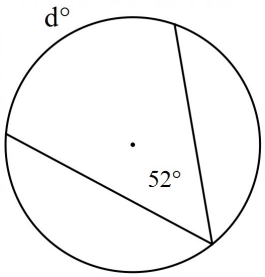
**Exploration:** Use the given link to explore the relationship between inscribed angles and their enclosed arcs: https://www.geogebra.org/m/yX6FgbPA

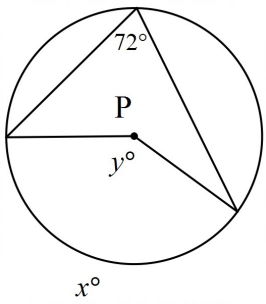
- ✓ Click on "Inscribed Angle", and move around points B and C.
- ✓ Make a conjecture comparing the measure of an inscribed angle and its arc.

| | | |
|---|---|---|
| **Inscribed Angle of a Circle** | **An inscribed angle of a circle has its _____ _____ the circle.** | $\angle ADB = \frac{1}{2}\overset{\frown}{AB}$   |
| **Measure of an Inscribed Angle** | **The measure of an inscribed angle is equal to _____ of the measure of its enclosed arc.** | |

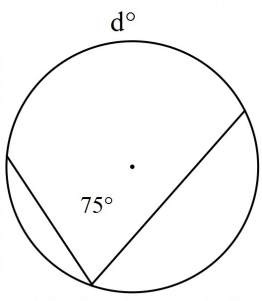
**For #1 – 6: Find the measure of each variable.**

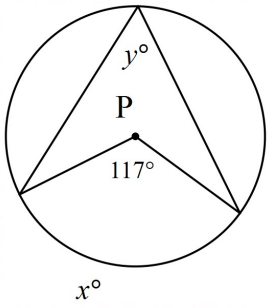
1) 

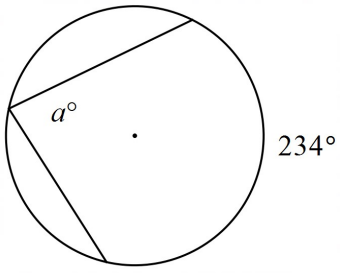

2) 


3) 


**You try #4 – 6!**

4) 


5) 


6) 

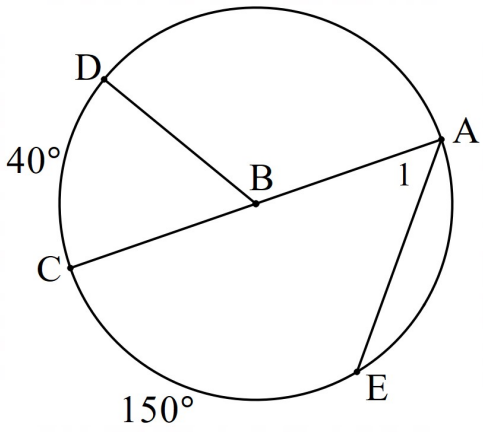
7) Find the requested measures for circle B, as shown.

A) measure of $\angle 1$

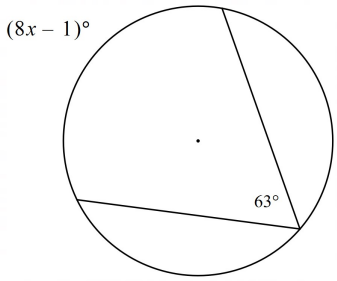
B) measure of $\overset{\frown}{AE}$

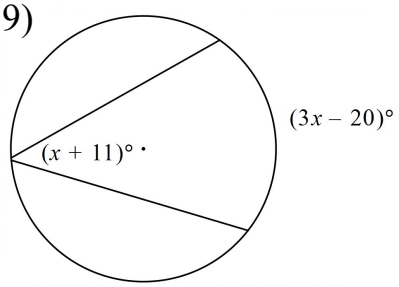
C) measure of $\overset{\frown}{DA}$

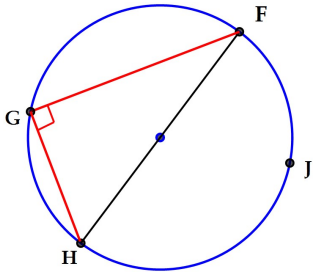
D) measure of $\overset{\frown}{DEA}$



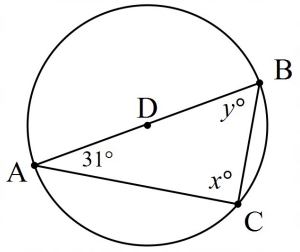

**For #8 – 9, find the value of *x*.**

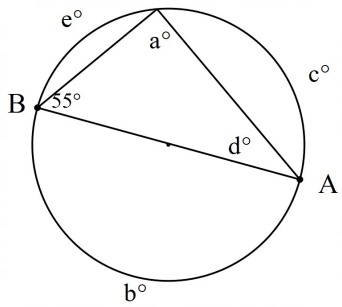
8) 


**You try!** 9) 

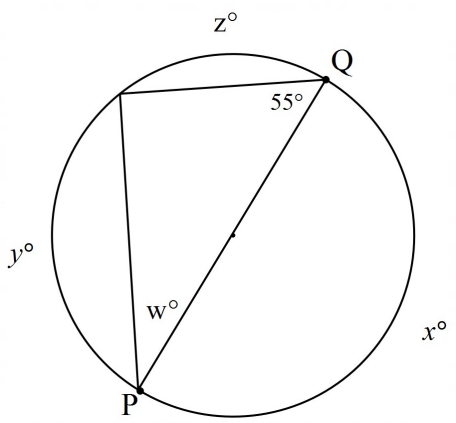

| | | |
|---|---|---|
| **Angle Inscribed in a Semicircle** | **An angle inscribed in a semi-circle has a measure of _____ degrees.** |   |

**For #10 – 11: Find each variable, given that AB is a diameter.**

10) 

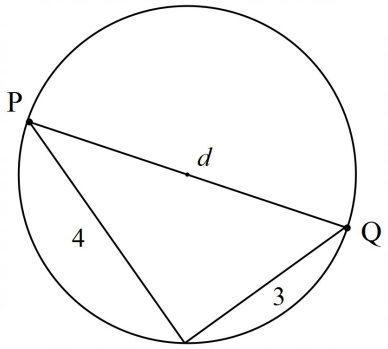

11) 

**You try!** 12) Find the measure of each variable, given that $\overline{PQ}$ is a diameter.

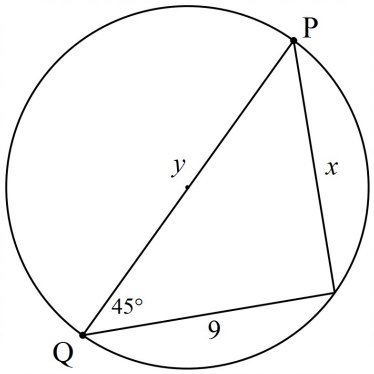



**For #13 – 16: Find each variable, given that PQ is a diameter.**

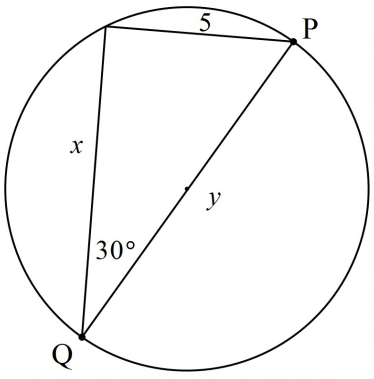
13)



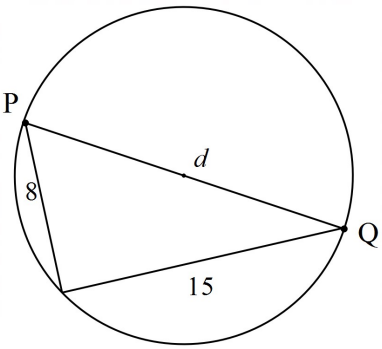

14)




15)



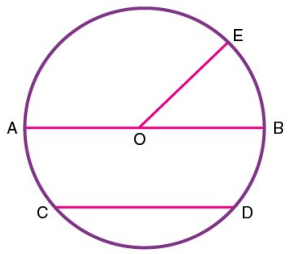

16)



# 10.3 Notes: Chords and Tangent Segments in Circles

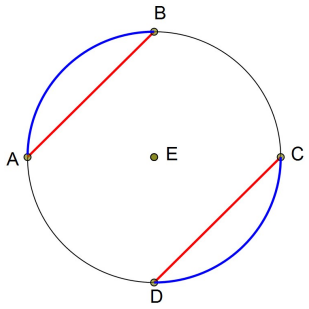
**Objectives:**

- **Students will be able to solve problems using chords in circles.**
- **Students will be able to solve problems involving tangent segments with circles.**

| | | |
|---|---|---|
| **Chord** | **A chord is a segment whose endpoints lie _____ a circle.**<br><br>**A diameter is a special type of chord that goes through the _____ of a circle.** |  |

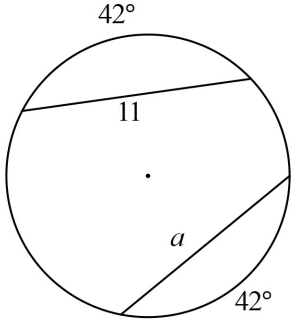
**Exploration:** Use this link to explore relationships between central angles, chords, and arcs: https://www.geogebra.org/m/U76G7TtB

- ✓ Click on the boxes for ANGLES, CHORDS, and ARCS.
- ✓ Move points A, B, C, and D around the circle.
- ✓ **Write a conjecture about the relationships between chords and arcs that have the same central angle.**

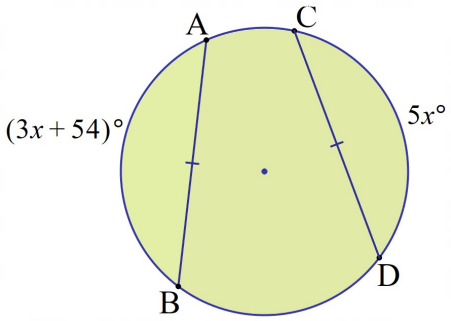
| | | |
|---|---|---|
| **Chord-Arc Property** | **In one circle (or two congruent circles), if two chords are _____, then their intercepted arcs are also _____.**<br><br>**In one circle (or two congruent circles), if two arcs are _____, then their chords are also _____.** |  |

**For #1–2: Find each variable.**

1)

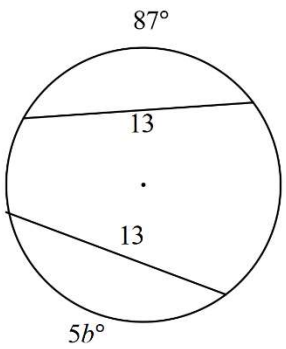



2)

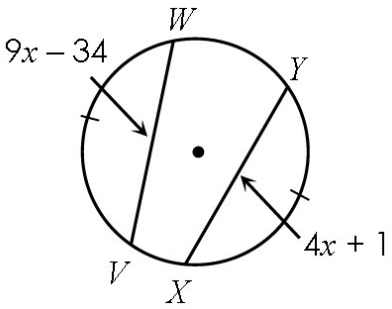


**You try #3 – 4! Find each variable.**

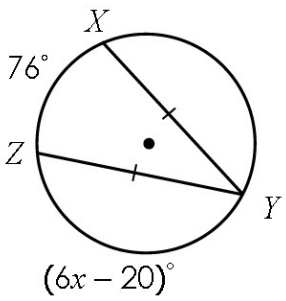
3)



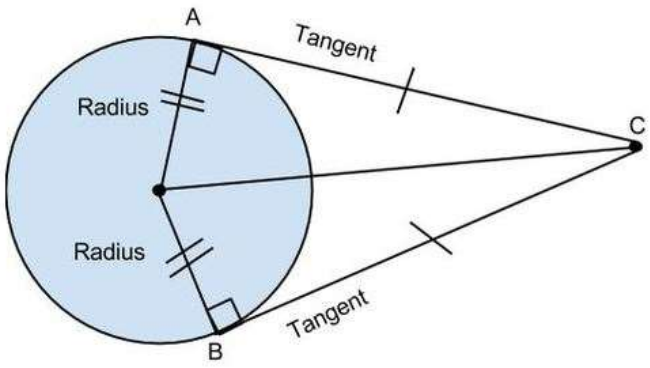

4)




5) Find $x$.



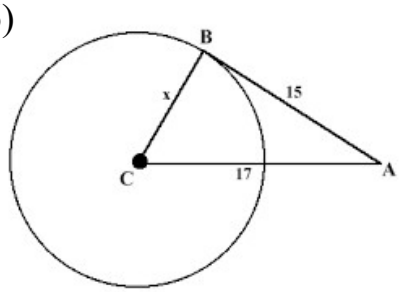

| | |
|---|---|
| **Tangent to a Circle** | **A tangent segment will intersect a circle at exactly _____ _____.** |
| **Tangent Segments and Radii** | **A tangent segment is always _____ to the radius drawn from the center of the circle to the point of tangency.** |
| **Tangents Drawn from the Same Point** | **Two tangent segments drawn from the same external point are _____ to each other.** |



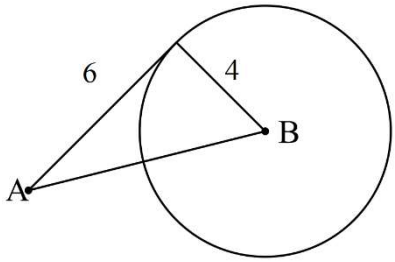

**Demonstration of the relationship between tangent segments and radii:**
https://www.geogebra.org/m/xbAwK5Pd

**For #6–11: Find the variable or segment. Assume that segments that appear to be tangent are tangent.**

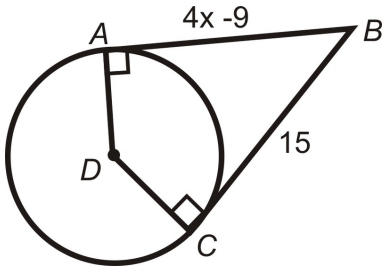
6)




7) Find AB.

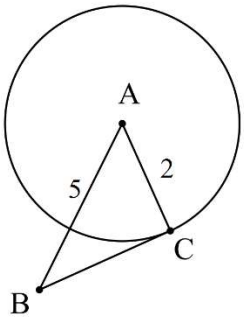



8)

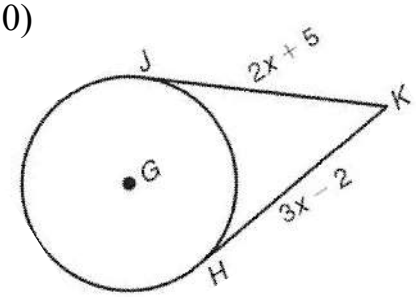



**You try #9-11!**

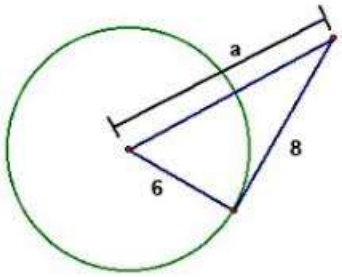
9) Find BC.



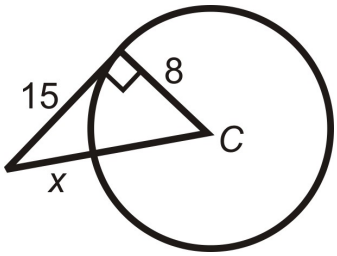

10)




11)



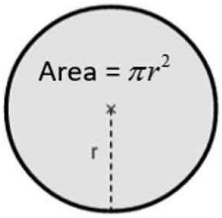

**Challenge!** 12) Find *x*.



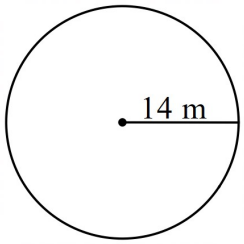
# 10.4 Notes: Area of Circles and Sectors

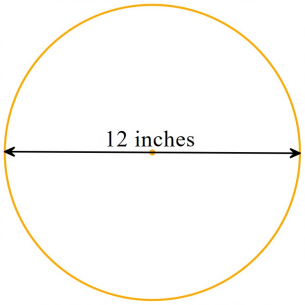
**Objectives:**

- **Students will be able to find the area of circles and sectors.**
- **Students will be able to find the area of shaded regions.**

| | | |
|---|---|---|
| **Area of a Circle** | **Reminder: the area of a circle can be found by using:** $A = \pi r^2$ | **Area of Circle**   |

**For #1–2: Find the area for each circle shown. Write your answers in terms of pi.**

1) 

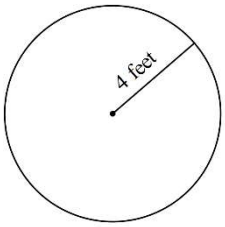

2) 


3) A circle has an area of $49\pi\ in^2$. Find the length of the radius and diameter of the circle.

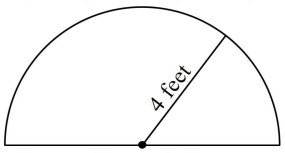
**You try!** 4) A circle has an area of $121\pi\ cm^2$. Find the length of the radius of the circle.

**Exploration:** Amy is buying a rug with a radius of 4 feet, as shown.

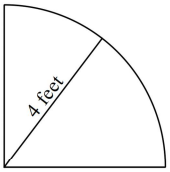
A) What is the area of the rug?

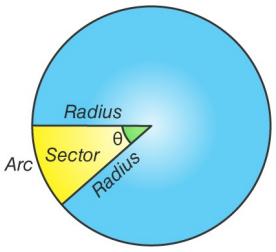



B) Amy finds another rug with the same radius but that is exactly half of a circle (called a semi-circle). What is the area of this rug?



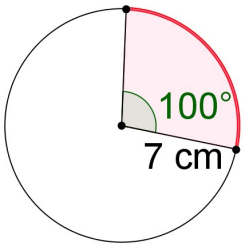

C) Amy now finds a rug with the same radius, but it is only a quarter of a circle. What is the area of this rug?



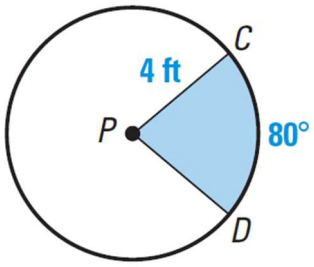

| | | |
|---|---|---|
| **Sector of a Circle** | **A sector of a circle is a pie-shaped slice of a circle. It is between two _____ and an arc of a circle.** |   |
| **Area of a Sector** | **The area of a sector can be found by finding a _____ of the area of a circle.** | $A = \frac{m}{360} \cdot \pi r^2$ |

**For #5–6: Find the area of each sector, to the nearest tenth.**

5)

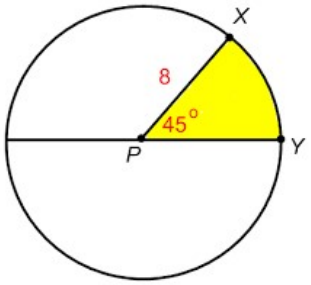



6)

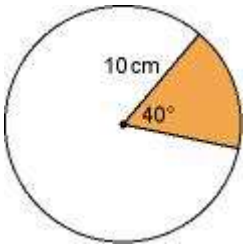


**You try #7–8! Find the area of each sector, to the nearest tenth.**

7)

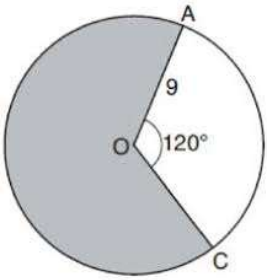



8)

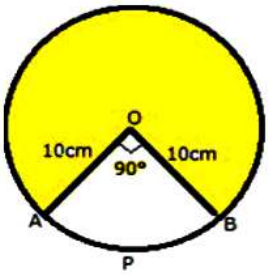



**For #9–10: Find the area of each shaded sector, to the nearest tenth.**

9)



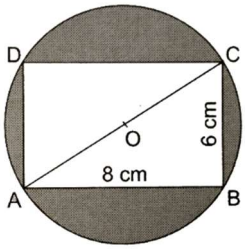

**You try!** 10)



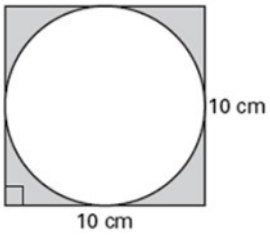

11) A sector has a measure of 60 degrees, and a radius of 9. Find the area of the sector *as an exact answer in terms of pi.*

**For #12 – 13: Give an *exact answer in terms of pi.***

12) Find the area of the shaded region.



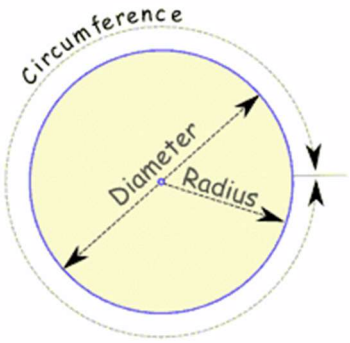

13) Find the area of the shaded region.



# 10.5 Notes: Circumference and Arc Length

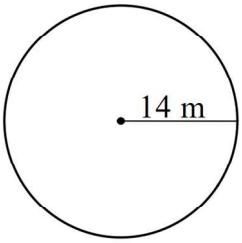
**Objectives:**

- **Students will be able to use the circumference of circles to solve problems.**
- **Students will be able to find the length of an arc.**

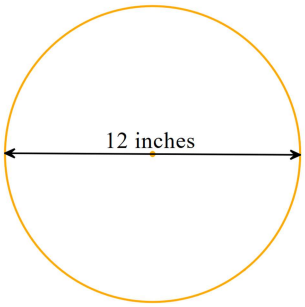
| | | |
|---|---|---|
| **Circumference of a Circle** | **Reminder: the circumference of a circle can by found by using:** $C = 2\pi r$ or $C = d\pi$ |   |

**For #1–2: Find the circumference of each circle shown. Write your answers in terms of pi.**

1)

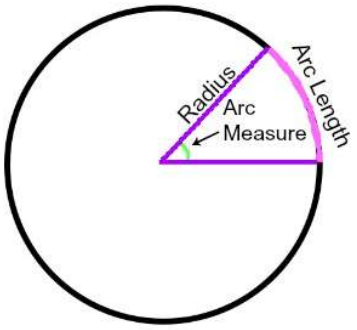



2)



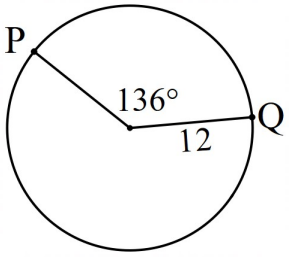

3) A circle has a circumference of $36\pi\ in.$ Find the area of the circle.

**You try!** 4) A circle has a circumference of $12\pi\ m.$ Find the area of the circle.

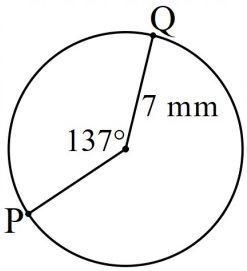
| | | |
|---|---|---|
| **Length of an Arc** | **The length of an arc is a distance of a curve between two points on a circle. It is part of the _____ of a circle.**<br><br>Note: The length of an arc is NOT the same as the measure of an arc. |  |
| **Arc Length Formula** | **The length of an arc (arc length) can be found by finding a _____ of the circumference of a circle.** | $\ell = \frac{m}{360} \cdot 2\pi r$<br>or<br>$\ell = \frac{m}{360} \cdot d\pi$ |

**For #5–8: Find the length of $\overset{\frown}{PQ}$. Round answer to the nearest tenth.**

5)

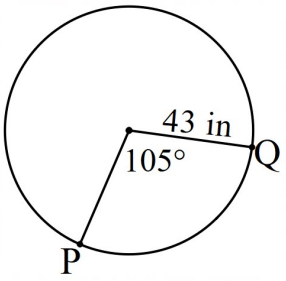



6)

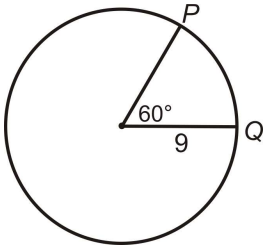



**You try #7 – 8!**

7)




8)



9) An arc has a measure of 90 degrees, and a *diameter* of 16. Find the length of the arc *as an exact answer in terms of pi.*

**You try!** 10) An arc has a measure of 60 degrees, and a *radius* of 9. Find the length of the arc *as an exact answer in terms of pi.*

11) An arc has a length of $10\pi$ cm and a radius of 20 cm. Find the measure of the arc.

**You try!** 12) An arc has a length of $12\pi$ cm and a radius of 48 cm. Find the measure of the arc.