


TOC ← **9.4 Inscribed Angles**

EQ: Can you find measures of inscribed angles?

How are you doing? Write answer next to Essential Question

1. I don't understand the material
2. I understand a little.
3. I understand this material.
4. I could teach this to someone



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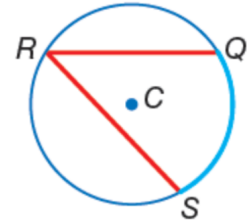
Summary: At least 3 sentences...

## 9.4 Examples Geo

odd page

### KEY TERMS

**Inscribed Angle** - An angle that has a vertex on a circle and sides that contain chords of a circle. In circle  $C$ ,  $\angle QRS$  is an inscribed angle.



**Intercepted Arc** - An arc with endpoints on the sides of an inscribed angle and lies in the interior of the inscribed angle. In circle  $C$ , minor arc  $QS$  is intercepted by  $\angle QRS$ .

Case 1	Case 2	Case 3
Center $P$ is on a side of the inscribed angle.	Center $P$ is inside the inscribed angle.	The center $P$ is in the exterior of the inscribed angle.

### Vocabulary Link

#### inscribed

##### Everyday Use:

written on or in a surface, such as inscribing the inside of a ring with an inscription

##### Math Use:

touching only the sides (or interior) of another figure

### StudyTip

#### Inscribed Polygons

Remember that for a polygon to be an inscribed polygon, all of its vertices must lie on the circle.

### StudyTip

#### Quadrilaterals

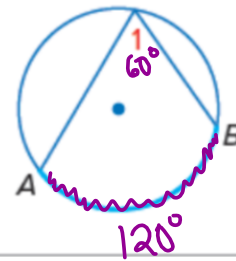
Theorem 10.9 can be verified by considering that the arcs intercepted by opposite angles of an inscribed quadrilateral form a circle.

## 9.4 Examples Geo

### Theorem 9.6 Inscribed Angle Theorem

**Words** If an angle is inscribed in a circle, then the measure of the angle equals one half the measure of its intercepted arc.

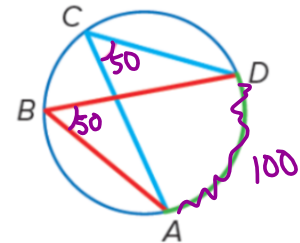
**Example**  $m\angle 1 = \frac{1}{2}m\widehat{AB}$  and  $m\widehat{AB} = 2m\angle 1$



### Theorem 9.7

**Words** If two inscribed angles of a circle intercept the same arc or congruent arcs, then the angles are congruent.

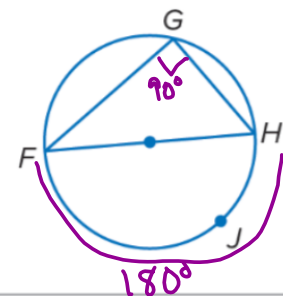
**Example**  $\angle B$  and  $\angle C$  both intercept  $\widehat{AD}$ . So,  $\angle B \cong \angle C$ .



### Theorem 9.8

**Words** An inscribed angle of a triangle intercepts a diameter or semicircle if and only if the angle is a right angle.

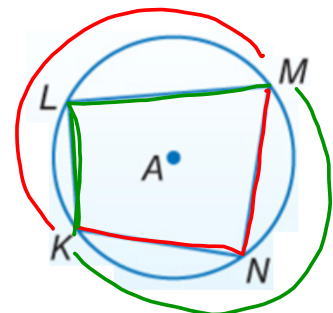
**Example** If  $\widehat{FJH}$  is a semicircle, then  $m\angle G = 90$ . If  $m\angle G = 90$ , then  $\widehat{FJH}$  is a semicircle and  $\overline{FH}$  is a diameter.



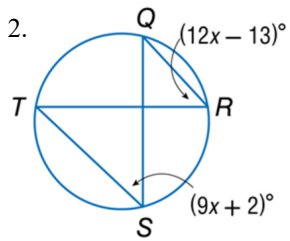
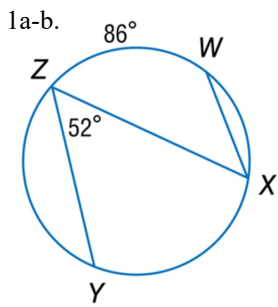
### Theorem 9.9

**Words** If a quadrilateral is inscribed in a circle, then its opposite angles are supplementary.

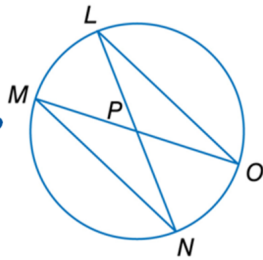
**Example** If quadrilateral  $KLMN$  is inscribed in  $\odot A$ , then  $\angle L$  and  $\angle N$  are supplementary and  $\angle K$  and  $\angle M$  are supplementary.  
Sum 180



## 9.4 Examples Geo

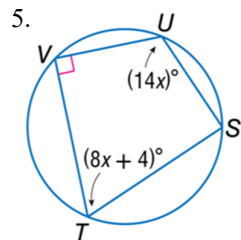
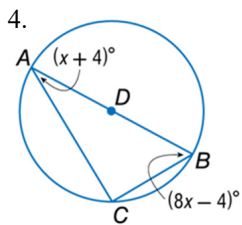


3.  
**Given:**  $\widehat{LO} \cong \widehat{MN}$   
**Prove:**  $\triangle MNP \cong \triangle LOP$



**Proof:**

Statements	Reasons

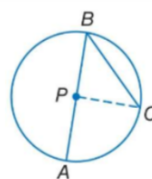


## 9.4 Examples Geo

### Proof Inscribed Angle Theorem (Case 1)

**Given:**  $\angle B$  is inscribed in  $\odot P$ .

**Prove:**  $m\angle B = \frac{1}{2}m\widehat{AC}$



**Proof:**

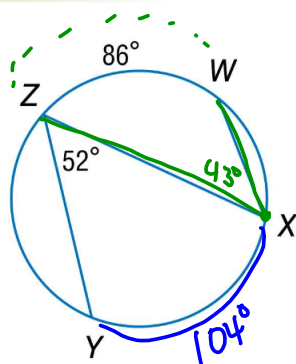
Statements	Reasons
1. Draw an auxiliary radius $\overline{PC}$ .	1. Two points determine a line.
2. $\overline{PB} \cong \overline{PC}$	2. All radii of a circle are $\cong$ .
3. $\triangle PBC$ is isosceles.	3. Definition of isosceles triangle
4. $m\angle B = m\angle C$	4. Isosceles Triangle Theorem
5. $m\angle APC = m\angle B + m\angle C$	5. Exterior Angle Theorem
6. $m\angle APC = 2m\angle B$	6. Substitution (Steps 4, 5)
7. $m\widehat{AC} = m\angle APC$	7. Definition of arc measure
8. $m\widehat{AC} = 2m\angle B$	8. Substitution (Steps 6, 7)
9. $2m\angle B = m\widehat{AC}$	9. Symmetric Property of Equality
10. $m\angle B = \frac{1}{2}m\widehat{AC}$	10. Division Property of Equality

## 9.4 Examples Geo

### Example 1 Use Inscribed Angles to Find Measures

A. Find  $m\angle X$ .

B. Find  $m\widehat{YX}$ .



① Find  $m\angle X$

②

$$m\angle X = \frac{86}{2} = 43^\circ$$

①b Find  $m\widehat{YX}$

$$m\widehat{YX} = 52(2) = 104^\circ$$

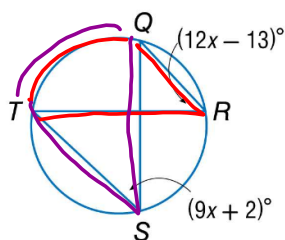
## 9.4 Examples Geo

### Example 2

Use Inscribed Angles to Find Measures

**ALGEBRA** Find  $m\angle R$ .

② Find  $m\angle R$



$$\begin{aligned} m\angle R &= 12(5) - 13 \\ &= 60 - 13 \\ m\angle R &= 47^\circ \end{aligned}$$

$$\begin{aligned} m\angle R &= m\angle S \\ 12x - 13 &= 9x + 2 \\ -9x &\quad -9x \\ \hline 3x - 13 &= 2 \\ +13 &\quad +13 \\ \hline 3x &= 15 \\ \frac{3x}{3} &= \frac{15}{3} \\ x &= 5 \end{aligned}$$

## 9.4 Examples Geo

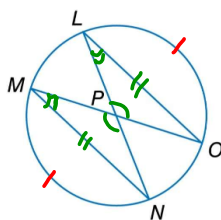
### Example 3

### Use Inscribed Angles in Proofs

Write a two-column proof.

Given:  $\widehat{LO} \cong \widehat{MN}$

Prove:  $\triangle MNP \cong \triangle LOP$



Proof:

Statements	Reasons
① $\widehat{LO} \cong \widehat{MN}$	① Given
② $\overline{LO} \cong \overline{MN}$	② $\cong$ arcs have $\cong$ chords
③ $\angle MPN \cong \angle LPO$	③ Vert $\angle$ s $\cong$
④ $\angle M \cong \angle L$	④ Inscribed $\angle$ s with same intercepted arc are $\cong$ .
⑤ $\triangle MNP \cong \triangle LOP$	⑤ AAS $\cong$



## 9.4 Examples Geo

### Example 4 Find Angle Measures in Inscribed Triangles

ALGEBRA Find  $m\angle B$ .

④ Find  $m\angle B$

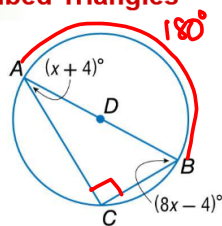
$$m\angle A + m\angle B + m\angle C = 180$$

$$x+4 + 8x-4 + 90 = 180$$

$$\underline{x+4 + 8x-4 = 90}$$

$$\frac{9x}{9} = \frac{90}{9}$$

$$x = 10$$



$$m\angle B = 8(10) - 4$$

$$= 80 - 4$$

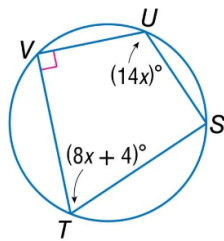
$$m\angle B = 76^\circ$$

## 9.4 Examples Geo

### Real-World Example 5

### Find Angle Measures

**INSIGNIAS** An insignia is an emblem that signifies rank, achievement, membership, and so on. The insignia shown is a quadrilateral inscribed in a circle. Find  $m\angle S$  and  $m\angle T$ .



$$\begin{aligned} m\angle T &= 8x + 4 \\ &= 8(8) + 4 = 64 + 4 \\ m\angle T &= 68^\circ \end{aligned}$$

⑤ Quadrilateral USTV is inscribed in the circle. Find  $m\angle S$  &  $m\angle T$

Opp  $\angle$ s are supp

$$m\angle V = 90 \quad \underline{m\angle S = 90}$$

$$m\angle U + m\angle T = 180$$

$$14x + 8x + 4 = 180$$

$$\begin{array}{r} 22x + 4 = 180 \\ \underline{-4 \quad -4} \\ 22x = 176 \\ \underline{22 \quad 22} \end{array}$$

$$x = 8$$

TOC **9.4 Inscribed Angles**

EVEN  
PAGE

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Write 3 Questions for this section on the left page

1. How are you doing?

Write answer next to the Summary

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Summary: At least 3 sentences...

Write this now.

## 9.4 Multiple Choice (& 9.3 Rev)

## Example 1

## Guided Practice

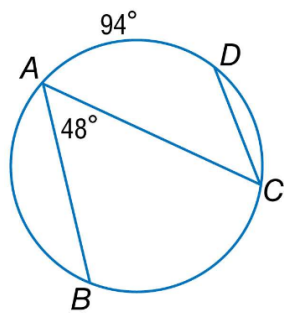
A. Find  $m\angle C$ .

A. 47

B. 54

C. 94

D. 188



**Example 1**

**Guided Practice**

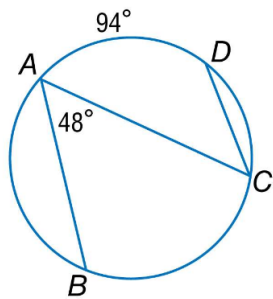
**B.** Find  $m\widehat{BC}$ .

**A.** 47

**B.** 64

**C.** 94

**D.** 96



**Example 2**

**Guided Practice**

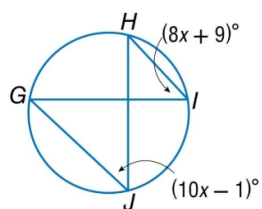
**ALGEBRA** Find  $m\angle I$ .

A. 4

B. 25

C. 41

D. 49



## 9.4 Examples Geo

### Example 3

### Guided Practice

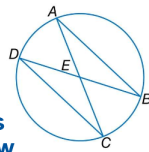
Write a two-column proof.

Given:  $\widehat{AB} \cong \widehat{CD}$

Prove:  $\triangle ABE \cong \triangle DCE$

Select the appropriate reason that goes in the blank to complete the proof below.

Proof:



Statements	Reasons
$\widehat{AB} \cong \widehat{CD}$	1. Given
$\overline{AB} \cong \overline{DC}$	2. If minor arcs are congruent, then corresponding chords are congruent.
$\angle D$ intercepts $\widehat{BC}$ and $\angle A$ intercepts $\widehat{BC}$ .	3. Definition of intercepted arc
$\angle D \cong \angle A$	4. Inscribed angles of the same arc are congruent.
$\angle DEC \cong \angle BEA$	5. Vertical angles are congruent.
$\triangle DCE \cong \triangle ABE$	6. _____

A. SSS Congruence Theorem

B. AAS Congruence Theorem

C. Definition of congruent triangles

D. Definition of congruent arcs



## Example 4

## Guided Practice

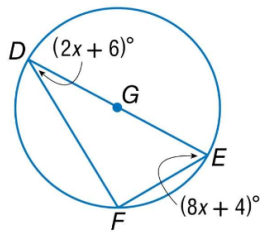
**ALGEBRA** Find  $m\angle D$ .

A. 8

B. 16

C. 22

D. 28



## 9.4 Examples Geo

### Real-World Example 5

### Guided Practice

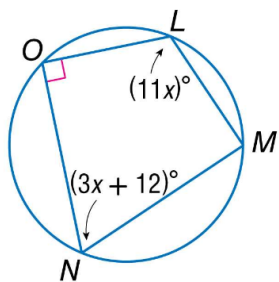
**INSIGNIAS** An insignia is an emblem that signifies rank, achievement, membership, and so on. The insignia shown is a quadrilateral inscribed in a circle. Find  $m\angle N$ .

A. 48

B. 36

C. 32

D. 28



## 5-Minute Check

Over Lesson 9-3

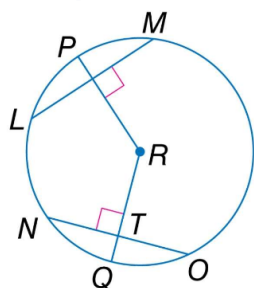
- 1 The radius of  $\odot R$  is 35,  $m\widehat{LM} = 80$ ,  $LM = 45$ , and  $\overline{LM} \cong \overline{NO}$ . Find  $m\widehat{NO}$ .

A. 60

B. 70

C. 80

D. 90



## 5-Minute Check

Over Lesson 9-3

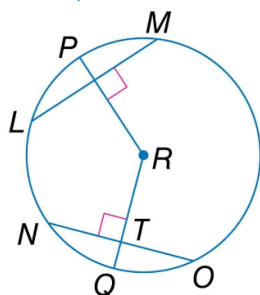
- 2 The radius of  $\odot R$  is 35,  $m\widehat{LM} = 80$ ,  $LM = 45$ , and  $\overline{LM} \cong \overline{NO}$ . Find  $m\widehat{NQ}$ .

A. 40

B. 45

C. 50

D. 55



## 5-Minute Check

Over Lesson 9-3

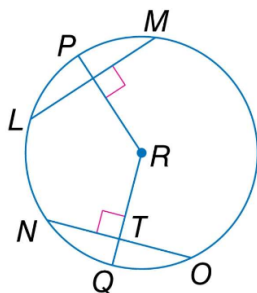
- 3 The radius of  $\odot R$  is 35,  $m\widehat{LM} = 80$ ,  $LM = 45$ , and  $\overline{LM} \cong \overline{NO}$ . Find  $NO$ .

A. 40

B. 45

C. 50

D. 55



## 5-Minute Check

Over Lesson 9-3

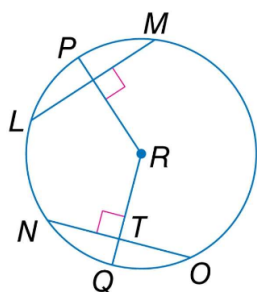
- 4 The radius of  $\odot R$  is 35,  $m\widehat{LM} = 80$ ,  $LM = 45$ , and  $\overline{LM} \cong \overline{NO}$ . Find  $NT$ .

A. 40

B. 30

C. 25

D. 22.5



## 5-Minute Check

Over Lesson 9-3

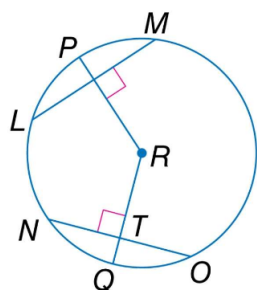
- 5 The radius of  $\odot R$  is 35,  $m\widehat{LM} = 80$ ,  $LM = 45$ , and  $\overline{LM} \cong \overline{NO}$ . Find  $RT$ .

A. 24.6

B. 26.8

C. 28.4

D. 30.2



## 5-Minute Check

Over Lesson 9–3

- 6 In  $\odot J$ , radius  $\overline{JK}$  intersects chord  $\overline{NM}$  at point  $P$  so that  $\overline{MP} \cong \overline{PN}$ . Which statement is true?
- A.  $\overline{JK} \cong \overline{NM}$
  - B.  $\overline{JK} \perp \overline{NM}$
  - C.  $\overline{JK} \parallel \overline{NM}$
  - D.  $\overline{PM}$  is a radius.



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