Name ______________________________ Date __________ Class __________

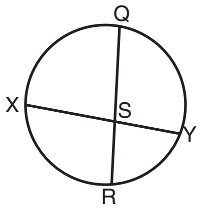
LESSON 11-6

Reading Strategies

Use a Model

The models below show segment relationships in circles.

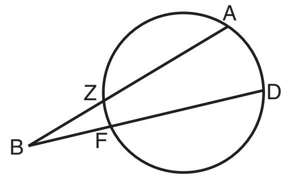
Chord-Chord



Chords $\overline{XY}$ and $\overline{QR}$ intersect at S.

$RS \cdot SQ = XS \cdot SY$

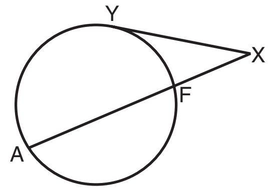
Secant-Secant



Secants $\overline{AB}$ and $\overline{DB}$ intersect at B.

$AB \cdot ZB = DB \cdot FB$

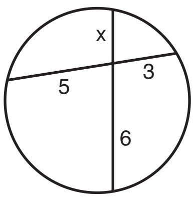
Secant-Tangent



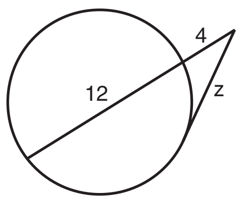
Secant $\overline{AX}$ and tangent $\overline{YX}$ intersect at X.

$AX \cdot FX = YX^2$

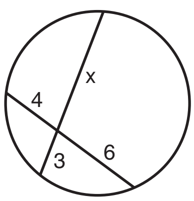
Find the value of each variable.



1. __________



2. __________



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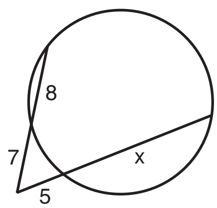
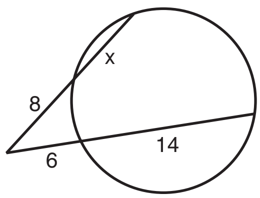
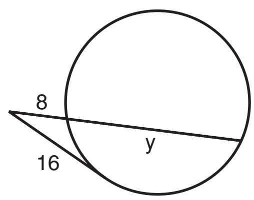


4. __________



5. __________



6. __________

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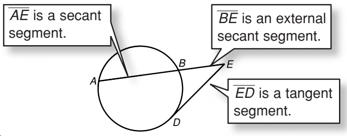
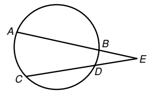
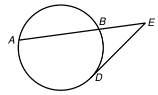
LESSON 11-6 Review for Mastery
Segment Relationships in Circles continued

- A **secant segment** is a segment of a secant with at least one endpoint on the circle.
- An **external secant segment** is the part of the secant segment that lies in the exterior of the circle.
- A **tangent segment** is a segment of a tangent with one endpoint on the circle.

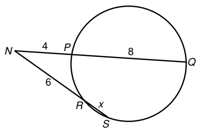


If two segments intersect outside a circle, the following theorems are true.

Secant-Secant Product Theorem The product of the lengths of one secant segment and its external segment equals the product of the lengths of the other secant segment and its external segment. whole • outside = whole • outside $AE \cdot BE = CE \cdot DE$	
Secant-Tangent Product Theorem The product of the lengths of the secant segment and its external segment equals the length of the tangent segment squared. whole • outside = tangent^2 $AE \cdot BE = DE^2$	

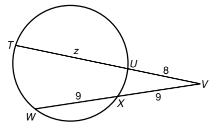
Find the value of the variable and the length of each secant segment.

5.



$x = 2$; $NQ = 12$; $NS = 8$

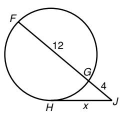
6.



$z = 12.25$; $TV = 20.25$; $WV = 18$

Find the value of the variable.

7.



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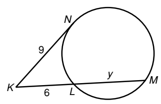
8.



7.5

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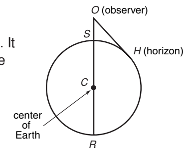
LESSON 11-6 Challenge
Finding the Distance to the Horizon

For an observer at a point *O* above Earth, the horizon is the place where Earth appears to "meet the sky." The higher above Earth's surface the observer is, the farther away the horizon appears to be. It may surprise you to learn that you can calculate this distance to the horizon by applying your knowledge of tangents and secants.



Refer to the diagram of Earth at right.

1. Name the segment that represents each measure.
   a. the diameter of Earth $\overline{RS}$
   b. the observer's altitude above Earth's surface $\overline{OS}$
   c. the distance the observer can see to the horizon $\overline{OH}$

2. Justify the following equation: $(OH)^2 = OR \cdot OS$

   $\overline{OH}$ is a tangent segment of circle *C*, $\overline{OR}$ is a secant segment, and $\overline{OS}$ is its external secant segment. So $(OH)^2 = OR \cdot OS$.

When the observer's altitude above Earth's surface is small relative to the diameter of Earth, you can replace *OR* with *RS* in the equation from Exercise 2. Then, since the diameter of Earth is approximately 7920 miles, you obtain the formula for *OH* shown at right. In this formula, the unit for both *OH* and *OS* is miles.

$$(OH)^2 = OR \cdot OS$$
$$(OH)^2 \approx RS \cdot OS$$
$$(OH)^2 \approx 7920 \cdot OS$$
$$OH \approx \sqrt{7920 \cdot OS}$$

Use the formula above to find the distance to the horizon for each altitude. Assume that it is a clear day and that the view is not obstructed. Round answers to the nearest tenth of a mile.

3. 2.5 miles 140.7 mi
4. 30,000 feet 212.1 mi

5. Rewrite the formula above so that you can input *OS* as a number of feet and find the distance to the horizon in *miles*.
   $\left(\textit{Hint: } OH \text{ miles} = \sqrt{7920 \text{ miles} \cdot \frac{1 \text{ mile}}{? \text{ feet}} \cdot OS \text{ feet}}\right)$ $OH \approx \sqrt{1.5 \cdot OS}$

Use your formula from Exercise 5 to find the distance to the horizon for each altitude. Assume that it is a clear day and that the view is not obstructed. Round answers to the nearest tenth of a mile.

6. 10 feet 3.9 mi
7. 200 feet 17.3 mi

Find the altitude above Earth's surface that an observer must attain in order to see the given distance to the horizon. Round answers to the nearest tenth.

8. 1 mile 0.7 ft, or about 8 in.
9. 300 miles 11.4 mi

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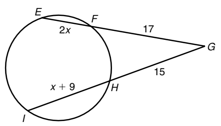
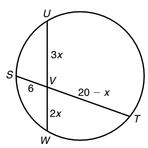
LESSON 11-6 Problem Solving
Segment Relationships in Circles

1. Find *EG* to the nearest tenth.



24.5

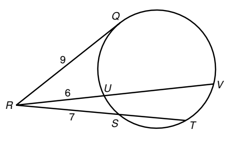
2. What is the length of $\overline{UW}$?



20

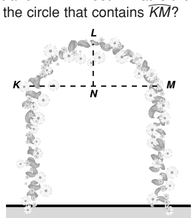
Choose the best answer.

3. Which of these is closest to the length of $\overline{ST}$?

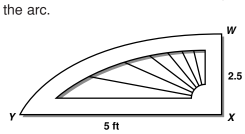


   (A) 4.6 C 7.5
   B 5.4 D 11.6

4. Floral archways like the one shown below are going to be used for the prom. $\overline{LN}$ is the perpendicular bisector of $\overline{KM}$. $KM = 6$ feet and $LN = 2$ feet. What is the diameter of the circle that contains $\widehat{KM}$?
   F 4.5 ft
   G 5.5 ft
   (H) 6.5 ft
   J 8 ft

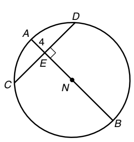


5. The figure is a "quarter" wood arch used in architecture. $\overline{WX}$ is the perpendicular bisector of the chord containing $\overline{YX}$. Find the diameter of the circle containing the arc.



   A 5 ft C 10 ft
   B 8.5 ft (D) 12.5 ft

6. In ⊙*N*, $CD = 18$. Find the radius of the circle to the nearest tenth.



   (F) 12.1 H 20.3
   G 16.3 J 24.3

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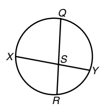
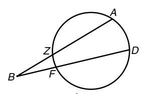
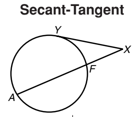
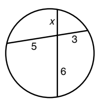
LESSON 11-6 Reading Strategies
Use a Model

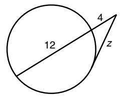
The models below show segment relationships in circles.

Chord-Chord	Secant-Secant	Secant-Tangent
		
Chords $\overline{XY}$ and $\overline{QR}$ intersect at *S*.	Secants $\overline{AB}$ and $\overline{DB}$ intersect at *B*.	Secant $\overline{AX}$ and tangent $\overline{YX}$ intersect at *X*.
$RS \cdot SQ = XS \cdot SY$	$AB \cdot ZB = DB \cdot FB$	$AX \cdot FX = YX^2$

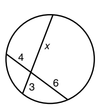
Find the value of each variable.



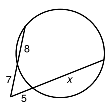
1. 2.5



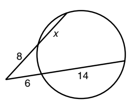
2. 8



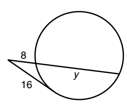
3. 8



4. 16



5. 7



6. 24

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