12-4 Angle Measures and Segment Lengths

Vocabulary

Review

1. Underline the correct word(s) to complete the sentence.

The student went off on a *tangent* when he did / did not stick to the subject.

2. A *tangent* to a circle intersects the circle at exactly _?_ point(s).

3. From a point outside a circle, there are _?_ *tangent(s)* to the circle.

Vocabulary Builder

secant (noun) SEEK unt

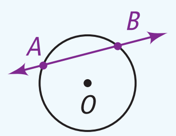
Related Word: tangent (noun)

Definition: A **secant** is a line that intersects a circle at two points.

Source: The word **secant** comes from the Latin verb *secare*, which means "to cut."

Examples: In the diagram at the right, $\overleftrightarrow{AB}$ is a **secant**, $\overrightarrow{AB}$ and $\overrightarrow{BA}$ are **secant** rays, and $\overline{AB}$ is a **secant** segment.

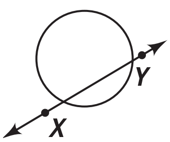
secant



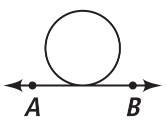
Use Your Vocabulary

Write *secant* or *tangent* to identify each line.

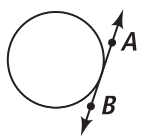
4.



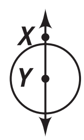
5.



6.



7.

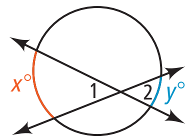


8. Is a chord a *secant*? Explain.

take note — Theorems 12-13, 12-14, and 12-15

Theorem 12-13 The measure of an angle formed by two lines that intersect inside a circle is half the sum of the measures of the intercepted arcs.

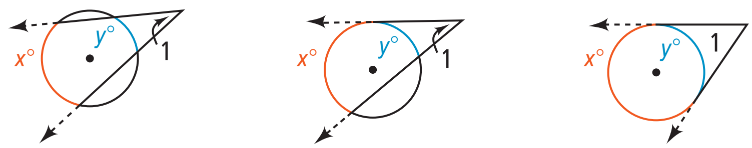
$m\angle 1 = \frac{1}{2}(x + y)$



9. In the diagram at the right, does $m\angle 2 = \frac{1}{2}(x + y)$? Explain.

Theorem 12-14 The measure of an angle formed by two lines that intersect outside a circle is half the difference of the measures of the intercepted arcs.

$m\angle 1 = \frac{1}{2}(x - y)$



10. In the first diagram, the sides of the angle are a secant and a __?__.

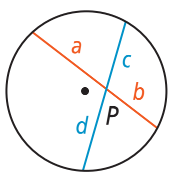
11. In the second diagram, the sides of the angle are a secant and a __?__.

12. In the third diagram, the sides of the angle are a tangent and a __?__.

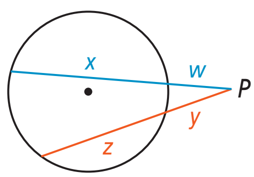
13. Is $m\angle 1 = \frac{1}{2}(y - x)$ equivalent to $m\angle 1 = \frac{1}{2}(x - y)$? Yes / No

Theorem 12-15 For a given point and circle, the product of the lengths of the two segments from the point to the circle is constant along any line through the point and the circle.

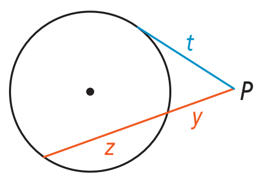
I.



II.



III.



Complete each case of Theorem 12-15.

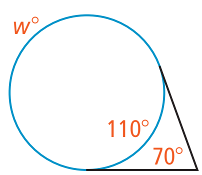
14. Case I $a \cdot b = c \cdot$ ____

15. Case II $(w + x)\, w = ($ ____ $+ z)$ ____

16. Case III $(y + z)$ ____ $= t^2$

Problem 1 Finding Angle Measures

Got It? What is the value of w?



17. Use Theorem 12-14 to complete the equation.

____ $= \frac{1}{2}(w -$ ____ $)$

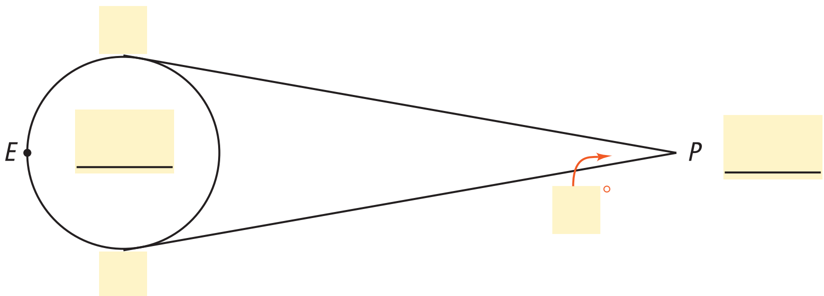
18. Now solve the equation.

19. The value of w is ______.

Problem 2 Finding an Arc Measure

Got It? **A departing space probe sends back a picture of Earth as it crosses Earth's equator. The angle formed by the two tangents to the equator is 20°. What arc of the equator is visible to the space probe?**

20. Use 20, F, G, and the words *Earth* and *probe* to complete the diagram below.



21. Complete the flow chart below.

Let $m\widehat{FG} = x$. Then $m\widehat{FEG} = \square - x$.

The sum of the arc measures is 360°.

$m\angle FPG = \frac{1}{2}(m\widehat{FEG} - m\square)$

Theorem 12-14

$20 = \frac{1}{2}(\square - \square)$

Substitute.

$20 = \frac{1}{2}(\square)$

Simplify.

$20 = \square$

Use the Distributive Property.

$\square = \square x$

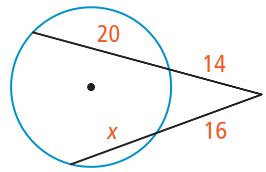
Subtract 180 from each side.

$\square = x$

Divide each side by –1.

22. A ______° arc of the equator is visible to the space probe.

Problem 3 Finding Segment Lengths



Got It? **What is the value of the variable to the nearest tenth?**

Underline the correct word to complete each sentence.

23. The segments intersect inside / outside the circle.

24. Write a justification for each statement.

$(14 + 20)14 = (16 + x)16$ ______

$476 = 256 + 16x$ ______

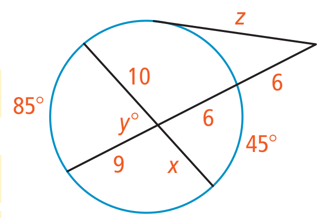
$220 = 16x$ ______

$13.75 = x$ ______

25. To the nearest tenth, the value of x is ______.

Lesson Check • Do you UNDERSTAND?

In the diagram at the right, is it possible to find the measures of the unmarked arcs? Explain.



26. You can use intercepted arcs to find the value of y. Yes / No

27. You can use supplementary angles to find the measures of the angles adjacent to $y°$. Yes / No

28. You can find the sum of the unmarked arcs. Yes / No

29. Is it possible to find the measure of each unmarked arc? Explain.

______

______

Math Success

Check off the vocabulary words that you understand.

☐ chord ☐ circle ☐ secant ☐ tangent

Rate how well you can *find the lengths of segments associated with circles.*

Need to review | 0 | 2 | 4 | 6 | 8 | 10 | Now I get it!