LESSON MAKER PRO

Circle Length Lab

Use circle relationships to find missing lengths.

HIGH SCHOOL · MA.912.GR.6.1

MA.912.GR.6.1 "Solve mathematical and real-world problems involving the length of a secant, tangent, segment or chord in a given circle."

NAME _____ DATE _____

CIRCLE LENGTH RULES

When two chords cross inside a circle, multiply the two pieces of one chord and set that product equal to the product of the two pieces of the other chord. From a point outside a circle, a tangent length squared equals the external secant piece times the whole secant, and two secants have equal external-times-whole products. A radius perpendicular to a chord cuts the chord in half, so use the Pythagorean theorem to find half the chord.

WORKED EXAMPLE

Two chords intersect inside a circle. One chord is split into lengths 4 and 15. The other chord is split into lengths 6 and x. Find x.

1. 4 * 15 = 6 * x
2. 60 = 6x
3. x = 10

Answer: x = 10 units

PRACTICE 6 problems

1 Two chords intersect inside a circle. One chord has segments of lengths 2 and x. The other chord has segments of lengths 9 and 8. Find x.

ANSWER _____

2 From point P outside a circle, tangent PA has length x. A secant from P has an external segment of 8 units and a whole length of 18 units. Find x.

ANSWER _____

3 Two secants start at the same point outside a circle. The first has an external segment of 2 units and a whole length of 21 units. The second has an external segment of 3 units and a whole length of x. Find x.

ANSWER _____

4 A circle has radius 13 units. The perpendicular distance from the center to a chord is 5 units. Find the chord length x.

ANSWER _____

5 Two chords intersect inside a circle. One chord has segments of lengths x and 7. The other chord has segments of lengths 9 and 14. Find x.

ANSWER _____

6 From point P outside a circle, a tangent has length 14 units. A secant from P has an external segment of length x and an inside-circle segment of 21 units. Find x.

ANSWER _____

APPLY IT Show your work

1 At a music festival, a straight path from gate P just touches a circular plaza. This tangent path is 24 m long. Another straight path from P crosses the plaza, and its outside portion before entering the plaza is 9 m. How far is it from P to where this path leaves the plaza?

WORK SPACE

ANSWER _____

2 A media club makes a circular backdrop with radius 29 cm. A straight LED strip forms a chord, and the shortest distance from the center to the strip is 21 cm. How long is the LED strip?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Two chords intersect inside a circle. One chord has segment lengths x and x + 7. The other chord has segment lengths 5 and 12. Find x. Then explain in one sentence why the other solution does not represent a segment length.

_____

_____

ANSWER KEY

Circle Length Lab

HIGH SCHOOL · MA.912.GR.6.1

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Two chords intersect inside a circle. One chord has segments of lengths 2 and x. The other chord has segments of lengths 9 and 8. Find x.	**x = 36 units**
2	From point P outside a circle, tangent PA has length x. A secant from P has an external segment of 8 units and a whole length of 18 units. Find x.	**x = 12 units**
3	Two secants start at the same point outside a circle. The first has an external segment of 2 units and a whole length of 21 units. The second has an external segment of 3 units and a whole length of x. Find x.	**x = 14 units**
4	A circle has radius 13 units. The perpendicular distance from the center to a chord is 5 units. Find the chord length x.	**x = 24 units**
5	Two chords intersect inside a circle. One chord has segments of lengths x and 7. The other chord has segments of lengths 9 and 14. Find x.	**x = 18 units**
6	From point P outside a circle, a tangent has length 14 units. A secant from P has an external segment of length x and an inside-circle segment of 21 units. Find x.	**x = 7 units**

PART 2 · APPLY IT

1. **64 m** Let w be the whole secant length. Use 24 * 24 = 9w, so w = 64.
2. **40 cm** The perpendicular from the center bisects the chord. Half the chord is sqrt(29 * 29 - 21 * 21) = 20 cm, so the full chord is 40 cm.

CHALLENGE

x = 5; x = -12 is rejected because a segment length cannot be negative.

Accept correct units when students include them. In the challenge, accept x = 5 only if the student explains that the negative solution is not a possible length.