

Circle Length Lab

Choose a circle relationship and justify the length.

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 _____

PIECE OR WHOLE?

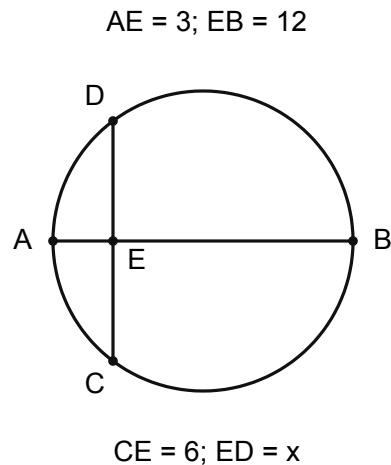
Crossing chords: $AE \cdot EB = CE \cdot ED$. Outside the circle: $PT^2 = PB \cdot PC$ for a tangent and secant; $PB \cdot PC = PD \cdot PE$ for two secants. Whole secants include their outside pieces. A perpendicular radius bisects a chord. Show equations; use positive lengths. Diagrams are not for measuring.

WORKED EXAMPLE

Chords AB and CD cross at E. Find $ED = x$.

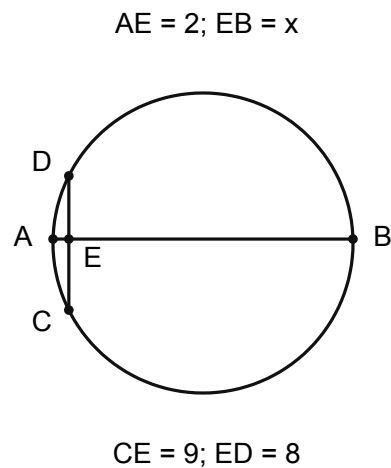
1. Use $AE \cdot EB = CE \cdot ED$: $3(12) = 6x$.
2. $36 = 6x$, so $x = 6$.

Answer: ED = 6 units.



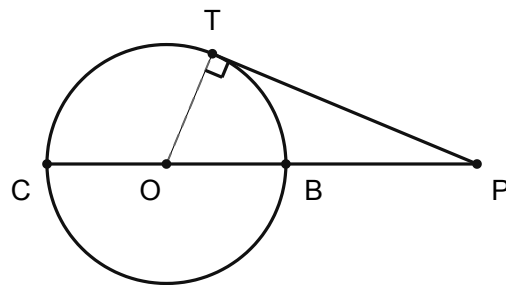
PRACTICE 4 problems

- 1** Use the intersecting chords to find $EB = x$.



- 2** PT is tangent. $PB = 8$ and $PC = 18$. Find $PT = x$. Explain why 18, not 10, is used.

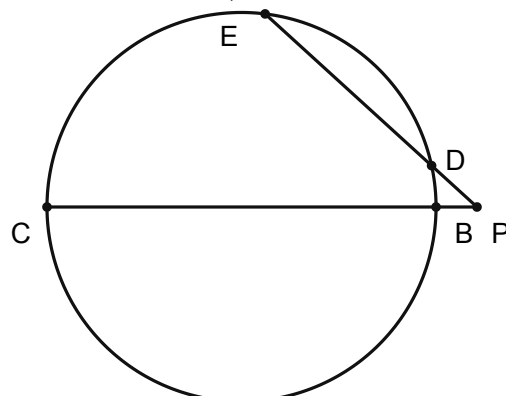
$$PT = x; PB = 8$$



$$PC = 18 \text{ (whole secant)}$$

- 3** P-B-C and P-D-E are secants. Find $PE = x$. Both whole lengths begin at P.

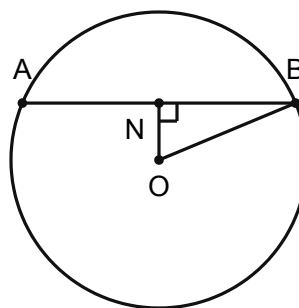
$$PB = 2; PC = 21$$



$$PD = 3; PE = x$$

- 4** Find chord AB. Explain why your square-root result must be doubled.

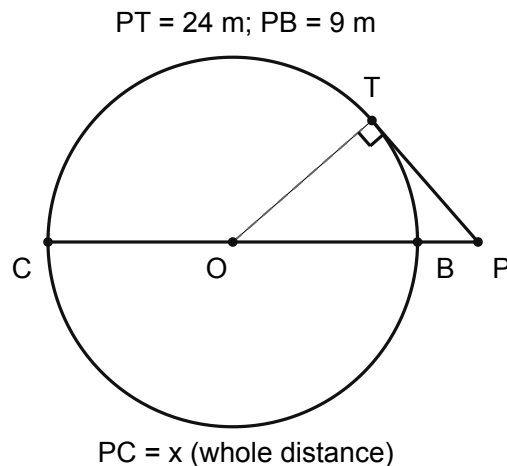
$$OB = 13; ON = 5$$



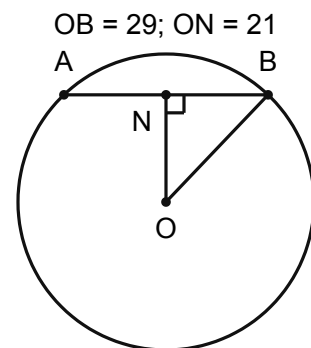
Find the whole chord AB.

APPLY IT Show your work

- 1** A path PT from a gate is tangent to a circular plaza. A crossing path enters at B and exits at C . $PT = 24$ m and $PB = 9$ m. Find the whole distance PC .



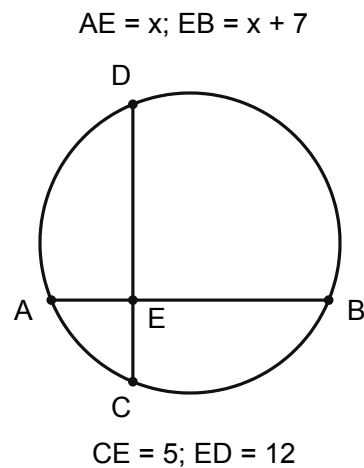
- 2** An LED strip AB crosses a circular backdrop. Radius $OB = 29$ cm; the perpendicular center-to-strip distance $ON = 21$ cm. Find the strip length.



Find the whole chord AB .

CHALLENGE One step up

Crossing chords have $AE = x$, $EB = x + 7$, $CE = 5$, $ED = 12$.
Find x . Explain why one algebraic solution is invalid.



PRACTICE 1

$$2x = 9(8); x = 36 \text{ units.}$$

PRACTICE 2

$$x^2 = 8(18) = 144; x = 12. PC = 18 \text{ is the whole secant; } 10 \text{ is only BC.}$$

PRACTICE 3

$$2(21) = 3x; x = 14 \text{ units.}$$

PRACTICE 4

$$NB = \sqrt{13^2 - 5^2} = 12; AB = 24 \text{ units. ON bisects AB.}$$

APPLY IT 1

$$PC = 64 \text{ m.}$$

$$24^2 = 9(PC), \text{ so } PC = 576/9 = 64 \text{ m.}$$

APPLY IT 2

$$AB = 40 \text{ cm.}$$

$$\text{Half the chord is } \sqrt{29^2 - 21^2} = 20 \text{ cm. Double this to get } 40 \text{ cm.}$$

CHALLENGE

$$x(x + 7) = 60; (x - 5)(x + 12) = 0. x = 5; \text{ reject } -12 \text{ because a length cannot be negative.}$$

Require the external-times-whole distinction and positive lengths. Accept equivalent equations.