

10-8: Power-Chord Theorems

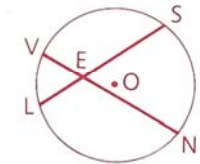
Objective

After studying this section, you will be able to

- Apply the power theorems

Theorem 95 If two chords of a circle intersect inside the circle, then the product of the measures of the segments of one chord is equal to the product of the measures of the segments of the other chord. (Chord-Chord Power Theorem)

$VE \cdot EN = LE \cdot ES$

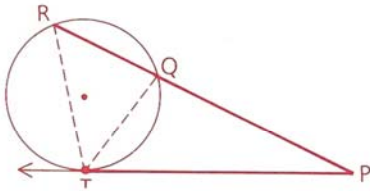


Given: Chords \overline{VN} and \overline{LS} intersect at point E inside circle O.

Prove: $EV \cdot EN = EL \cdot SE$

Theorem 96 If a ^{TP}tangent segment and a ^{PR}secant segment are drawn from an external point to a circle, then the square of the measure of the tangent segment is equal to the product of the measures of the entire secant segment and its external part. (Tangent-Secant Power Theorem)

outside (whole) = outside (whole)
 $TP^2 = PR \cdot PQ$



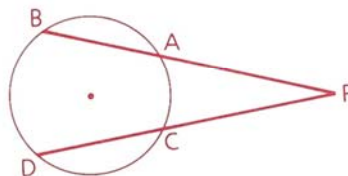
Given: \overline{PR} is a secant segment.
 \overline{PT} is a tangent segment.

Prove: $(TP)^2 = (PR)(PQ)$

Theorem 97 If two secant segments are drawn from an external point to a circle, then the product of the measures of one secant segment and its external part is equal to the product of the measures of the other secant segment and its external part. (Secant-Secant Power Theorem)

Given: Secant segments \overline{PB} and \overline{PD}

Prove: $PB \cdot PA = PD \cdot PC$

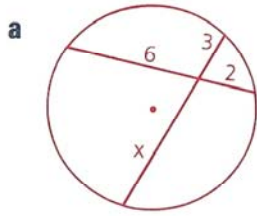


outside (whole) = outside (whole)
 $AP \cdot PB = CP \cdot PD$

Part Two: Sample Problems

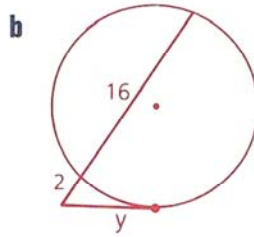
Problem 1

Find x , y , and z .



$$\cancel{3}x = \cancel{6}^2 \cdot \cancel{2}_1$$

$$x = 4$$

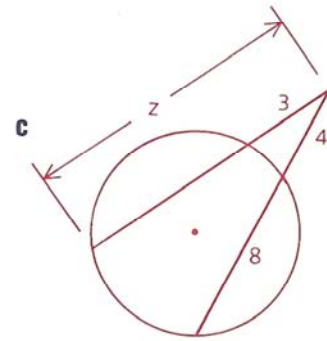


$$\sqrt{2(18)} = \sqrt{y \cdot y}$$

$$\sqrt{2 \cdot 2 \cdot 9} = \sqrt{y^2}$$

$$2 \cdot 3 = y$$

$$6 = y$$



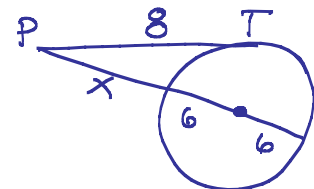
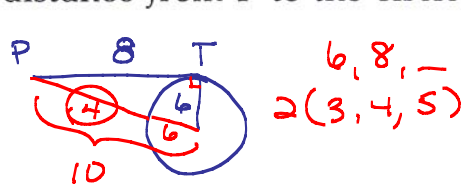
$$\cancel{3}(z) = \cancel{4}^4(\cancel{8}_1)$$

$$z = 16$$

Problem 2

Tangent segment PT measures 8 cm. The radius of the circle is 6 cm. Find the distance from P to the circle.

n



outside (whole) = out (whl.)

$$8 \cdot 8 = x(x + 12)$$

$$64 = x^2 + 12x$$

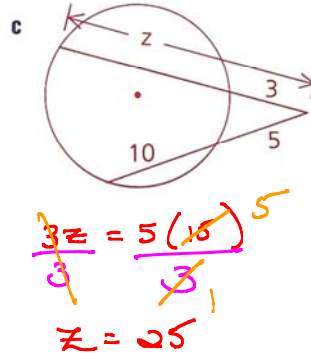
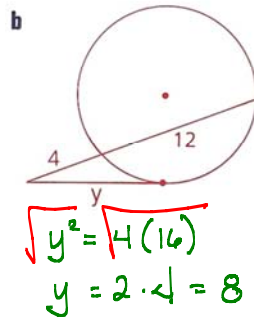
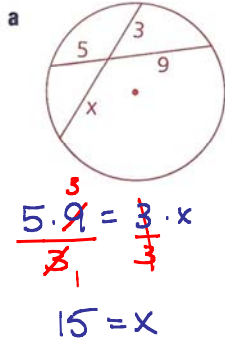
$$0 = x^2 + 12x - 64$$

$$0 = (x - 4)(x + 16)$$

$$x = 4 \text{ or } -16$$

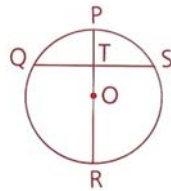
no neg length
this yr.

1 Solve for x, y, and z.

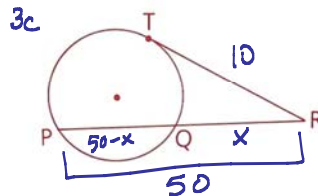


2 T is the midpoint of \overline{QS} , $PT = 8$, and $QS = 40$.

- a Find TR.
b Find the diameter of $\odot O$.



- 3 a If $TR = 10$ and $QR = 5$, find PR.
b If $TR = 10$ and $QR = 4$, find PQ.
c If $TR = 10$ and $PR = 50$, find PQ.



$$x(50) = 100$$

$$x = 2$$

$$50 - x = PQ = 48$$

3a

$$out(whl) = out(whl)$$

$$10^2 = 5(PR)$$

$$100 = 5(PR)$$

$$20 = (PR)$$

3b

$$out(whl) = out(whl)$$

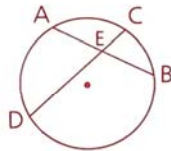
$$4(x+4) = 100$$

$$x+4 = 25$$

$$x = 21$$

$$PQ = 21$$

- 4 a If $AE = 6.4$, $AB = 8.9$, and $CE = 1.6$, find ED.
b If $AE = 8$, $AB = 14$, and $ED = 16$, find DC.
c If $CE = 2$, $ED = 18$, and $\overline{AE} \cong \overline{EB}$, find AB.



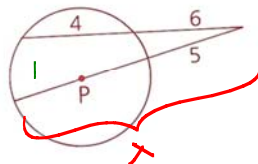
5 Find the radius of $\odot P$.

$$6(12) = 5(x)$$

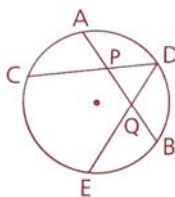
$$72 = x$$

$$diam = 12 - 5 = 7$$

$$radius = \frac{7}{2}$$



- 6 Given: $AP = 3$, $PQ = 5$, $QB = 7$, $CP = 2$,
 $QD = 14$
 Find: PD and EQ

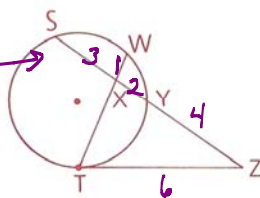


- 7 Given: $TZ = 6$, $YZ = 4$, $SX = 3$, $WX = 1$
 Find: XT (Hint: Find SZ .)

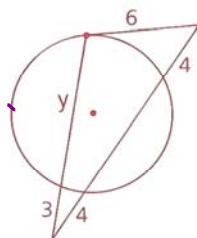
Find SZ : $6 \cdot 6 = 4 \cdot SZ$

$$\frac{36}{4} = SZ = 9 \therefore SZ = 9 - 4 = 5$$

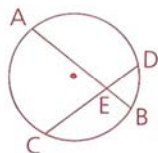
Find XT : $SX(XY) = WX(XT)$
 $3 \cdot 2 = 1(XT)$
 $6 = 1(XT)$



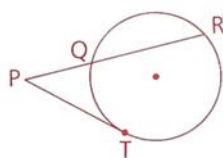
- 8 a Find y .
 b Is the triangle acute, right, or obtuse?



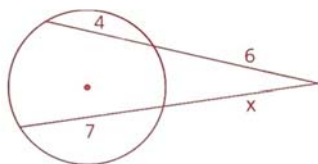
- 9 Given: $AB = 7$, $CD = 5$, $ED = 2$
 Find: AE



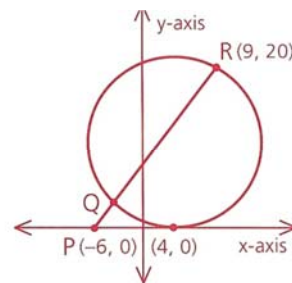
- 10 Given: $PT = 3$, $QR = 8$
 Find: PQ



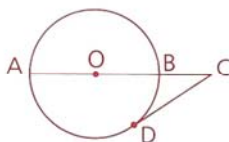
- 11 Solve for x .



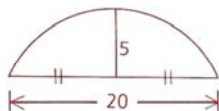
- 12 Find PQ .



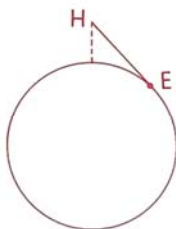
- 13 \overline{AB} is a diameter of $\odot O$.
 \overline{CD} is tangent at D , $CD = 6$, and $BC = 4$.
 Find the radius of the circle.



- 14 An arch supports a pipeline across a river 20 m wide. Midway, the suspending cable is 5 m long. Find the radius of the arch.



- 15 The diameter of the earth is approximately 8000 mi. Heavenly Helen, in a spaceship 100 mi above the earth, sights Earthy Ernest coming over the horizon. Approximately how far apart are Helen and Ernest?



- 16 Solve for x .

