Name   Ms. Kresovic

Adv Geo   W 1 May 2013

10-8: Power-Chord Theorems

Objective

After studying this section, you will be able to

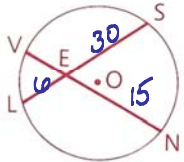■ Apply the power theorems

mult.

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)*

part (part) = part (part)

$VE \cdot EN = LE \cdot SE$

$\dfrac{VE \cdot \cancel{15}}{\cancel{15}} = \dfrac{6 \cdot \cancelto{2}{30}}{\cancelto{1}{15}}$

$VE = 12$

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 tangent segment and a 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)*

$\rightarrow \overline{TP}$ $\rightarrow \overline{RP}$

outside (whole) = outside (whole)

$TP \, (TP) = PQ \, (PR)$

$TP^2 = PQ \, (PR)$

$3^2 = 2(x+2)$

$0 = 2x + 4 - 9$

$0 = 2x - 5$

$\dfrac{5}{2} = x$

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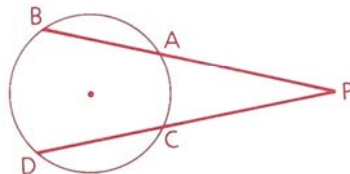$\overline{PT}$ is a tangent segment.

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)*

outside (whole) = outside (whole)

$PC \, (PD) \quad = PA \, (PB)$

Given: Secant segments $\overline{PB}$ and $\overline{PD}$
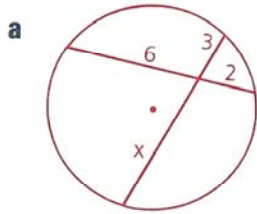
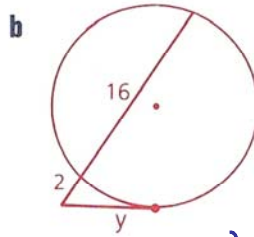Prove: $PB \cdot PA = PD \cdot PC$

Part Two: Sample Problems

Problem 1 Find x, y, and z.
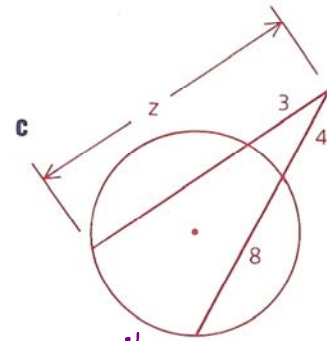
a

$$3x = 2 \cdot 6$$

$$x = \frac{2 \cdot \cancel{6}^{2}}{\cancel{3}_{1}} = 4$$

b

$$2(18) = y(y)$$

$$2 \cdot 2 \cdot 3 \cdot 3 = y \cdot y$$

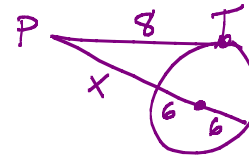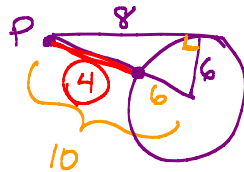$$2 \cdot 3 = y$$

$$6 = y$$

c

$$\frac{4(12)}{3} = \frac{\cancel{3}z}{\cancel{3}}$$

$$16 = z$$

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

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

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

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

$$0 = (x-4)(x+16)$$
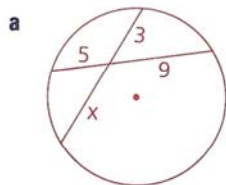
$$x = 4 \quad \& \quad x = 16$$

→ no neg. length this y.

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Adv Geo *5*   W 1 May 2013
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1 Solve for x, y, and z.

a

5 3
9
x

b

12
4
y

c

z
3
5
10

$3x = 9 \cdot 5$

$x = \dfrac{9 \cdot 5}{3} = 15$

$4(16) = y^2$

$2 \cdot 4 = y$

$8 = y$

$\dfrac{5(\cancel{15})}{\cancel{3}} = \dfrac{\cancel{3}z}{\cancel{3}}$
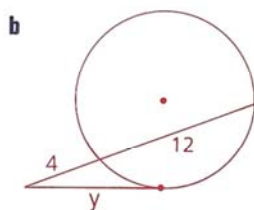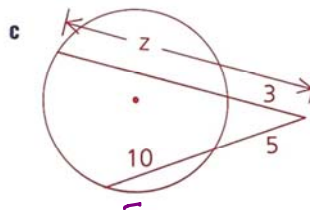
$25 = z$

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

   a Find TR.

   b Find the diameter of $\odot$O.

P
Q   T   S
   •O
R
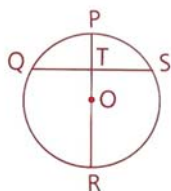
3 **a** If TR = 10 and QR = 5, find PR.

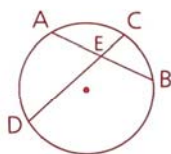   **b** If TR = 10 and QR = 4, find PQ.

   c If TR = 10 and PR = 50, find PQ.

T
P   Q
R
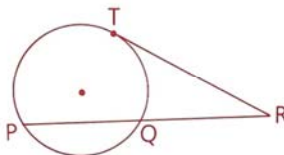
4 **a** If AE = 6.4, AB = 8.9, and CE = 1.6,
      find ED.

   b If AE = 8, AB = 14, and ED = 16,
      find DC.

   c If CE = 2, ED = 18, and $\overline{AE} \cong \overline{EB}$,
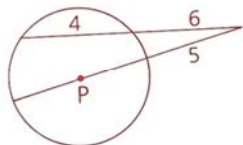   find AB.

A   C
E
B
D

4a.

A   C
6.4 E 1.6
x   2.5   B
D

$\begin{array}{r} AB \quad 8.9 \\ -AE \quad 6.4 \\ \hline EB \quad 2.5 \end{array}$
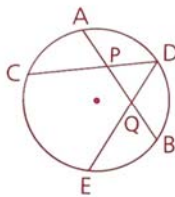
$6.4(2.5) = 1.6x$

$16 = 1.6x$

$10 = x$

5 Find the radius of $\odot$P.

4   6
5
P

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

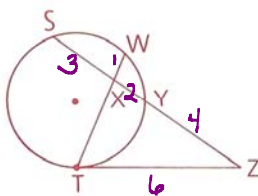**7** Given: TZ = 6, YZ = 4, SX = 3, WX = 1
Find: XT (Hint: Find SZ.)

$\underline{\text{Find } SY:}$

$TZ \cdot TZ = ZY \cdot ZS$

$6^2 = 4(4+SY)$

$9 = 4 + SY$

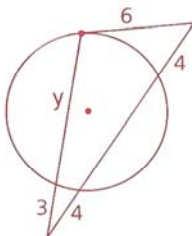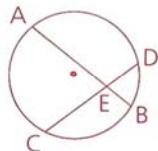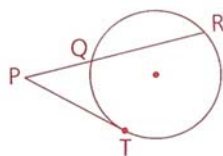$5 = SY$ if $SX = 3$ $XY = 2$

Find XT
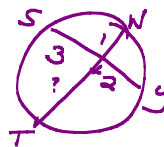
$3(2) = 1(XT)$

$6 = XT$

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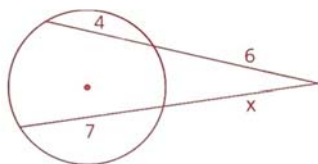**b** Is the triangle acute, right, or obtuse?

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

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

12 Find PQ.

R (9, 20)

y-axis

Q

P (–6, 0) | (4, 0)   x-axis

11 Solve for x.
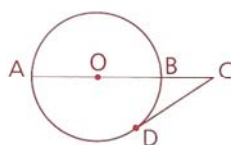

4

6

x

7

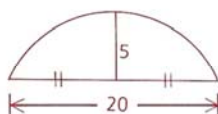$6(10) = x(7+x)$

$60 = 7x + x^2$

$0 = x^2 + 7x - 60$
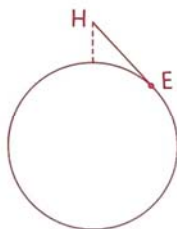
$0 = (x+12)(x-5)$

$x = -12 \quad x = 5$

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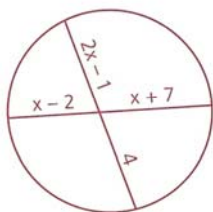Find the radius of the circle.

A   O   B   C

D

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

5

20

15 The diameter of the earth is approxi-
mately 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?

H

E

16 Solve for x.

2x – 1

x – 2   x + 7

4