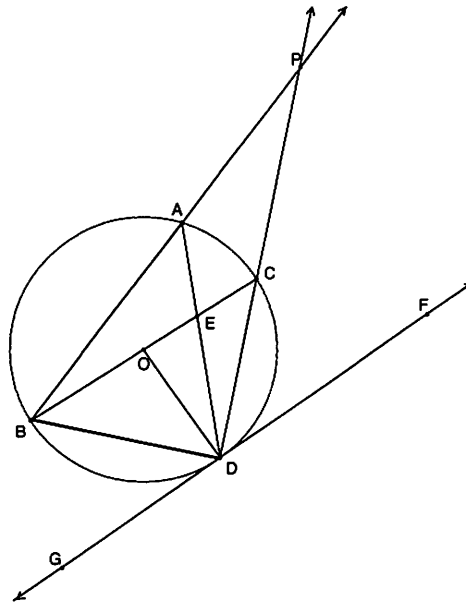


In 1-6, secants $\overline{BAP}$ and $\overline{DCP}$ are drawn to circle O from P. Chords $\overline{BC}$ and $\overline{AD}$ intersect at E. Line $\overline{GF}$ is tangent to the circle at D. Chord $\overline{BOC}$ is a diameter and $\overline{OD}$ is a radius.



1. Express each of the following in terms of the measures of intercepted arcs. (In words)

- a) $m\angle COD$ b) $m\angle ABC$ c) $m\angle BEA$ d) $m\angle P$ e) $m\angle CDF$

2. Name an angle congruent to each of the following.

- a) $\angle ABC$ b) $\angle BAD$ c) $\angle CED$ d) $\angle CDB$ e) $\angle PAD$

3. If $m\widehat{AB} = 140$, find $m\angle ABC$.

4. If $m\widehat{BD} = 80$ and $m\widehat{AC} = 30$, find:

- a) $m\angle P$ b) $m\angle AEC$ c) $m\angle COD$ d) $m\angle CDF$ e) $m\angle BOD$

5. If $m\widehat{BD} = m\widehat{CD}$ and $m\widehat{BA} : m\widehat{AC} = 4 : 1$, find:

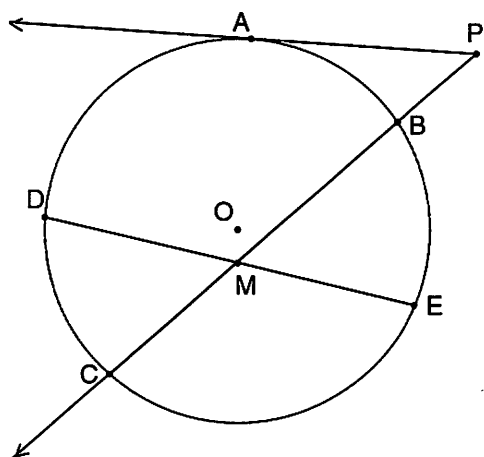
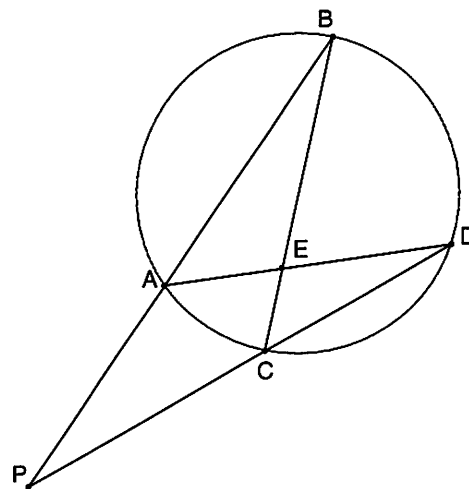
- a) $m\widehat{BD}$ b) $m\widehat{AC}$ c) $m\widehat{AB}$ d) $m\angle P$ e) $m\angle ADF$ f) $m\angle AEB$ g) $m\angle ADC$

6. If $m\angle AEB = 130$ and $m\widehat{AB} = 150$, find:

- a) $m\widehat{CD}$ b) $m\widehat{AC}$ c) $m\widehat{BD}$ d) $m\angle COD$ e) $m\angle BCD$
 f) $m\angle P$ g) $m\angle CDA$ h) $m\angle PAD$ i) $m\angle CDF$

7. In the diagram, secants $\overline{PAB}$ and $\overline{PCD}$ are drawn to a circle from P. Chords $\overline{AD}$ and $\overline{BC}$ intersect at E, with $BE > EC$. If $PA = 14$, $AB = 10$, $PC = 16$, $AE = 4$, $ED = 4$, and $BC = 10$ find:

- | | |
|---------|---------|
| a) PD | b) CD |
| c) CE | d) EB |

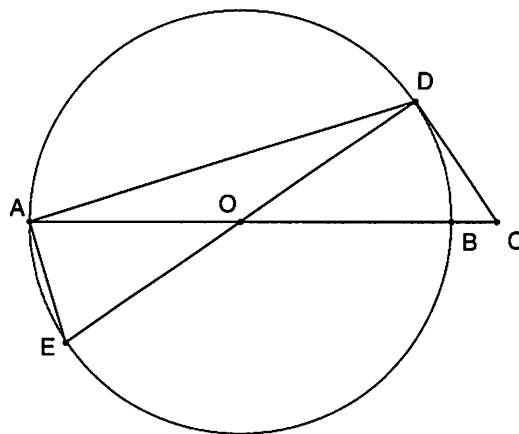


8. In the diagram, $\overline{PA}$ is tangent to circle O at A. $\overline{PBC}$ intersects the circle at B and C, chord $\overline{DE}$ bisects chord $\overline{BC}$ at M, $PA = 9$, $PB = 3$, and $DE = 30$ find:

- | | |
|---------|------------------------|
| a) PC | b) BC |
| c) CM | d) EM when $EM < DM$ |

9. In the diagram, diameter $\overline{AOB}$ is extended to point C, $\overline{CD}$ is tangent to the circle at D, $\overline{DOE}$ is a diameter and $m\widehat{BD} : m\widehat{AD} = 2 : 7$. Find:

- | | |
|--------------------|--------------------|
| a) $m\widehat{BD}$ | b) $m\widehat{AD}$ |
| c) $m\angle E$ | d) $m\angle C$ |
| e) $m\widehat{AE}$ | f) $m\widehat{EB}$ |
| g) $m\angle CDE$ | h) $m\angle ADC$ |



Key #1

1a) $m\angle COD = m\widehat{CD}$

b) $m\angle ABC = \frac{1}{2}m\widehat{AC}$

c) $m\angle BEA = \frac{1}{2}(m\widehat{AB} + m\widehat{CD})$

d) $m\angle P = \frac{1}{2}(m\widehat{BD} - m\widehat{AC})$

e) $m\angle CDF = \frac{1}{2}m\widehat{CD}$

2a) $\angle ABC \cong \angle ADC$ Inscribed $\angle$'s intercepting the same arc.

b) $\angle BAD \cong \angle DCB$ Inscribed $\angle$'s intercepting the same arc.

c) $\angle CED \cong \angle AEB$ Vertical $\angle$'s

d) $\angle CDB \cong \angle ODF$ Radii intercepting a tangent at point of tangency

e) $\angle PAD \cong \angle PCB$ $\triangle PBC \cong \triangle PDA$

3. $m\widehat{AC} = 40$

$$m\angle ABC = \frac{1}{2}m\widehat{AC} = \frac{1}{2}(40) = 20$$

Key #2

$$4a) m\angle P = \frac{1}{2}(80 - 30) \\ = \frac{1}{2}(50) = 25^\circ$$

$$b) m\angle AEC = \frac{1}{2}(80 + 30) \\ = \frac{1}{2}(110) = 55^\circ$$

$$c) m\widehat{CD} = 100 \rightarrow m\angle COD = 100^\circ$$

$$d) m\angle CDF = \frac{1}{2}(100) = 50^\circ$$

$$e) m\angle BOD = 80^\circ$$

$$5a) m\widehat{BD} = 90$$

$$b) \begin{aligned} 4x + 1x &= 180 \\ 5x &= 180 \\ x &= 36 \end{aligned} \quad m\widehat{AB} = 11(36) = 36$$

$$c) m\widehat{AB} = 4(36) = 144$$

$$d) m\angle P = \frac{1}{2}(90 - 36) = 27^\circ$$

$$e) m\angle ADF = \frac{1}{2}(36 + 90) = 63^\circ$$

$$f) m\angle AEB = \frac{1}{2}(144 + 90) = 117^\circ$$

$$g) m\angle ADC = \frac{1}{2}(36) = 18^\circ$$

Key #3

$$\begin{aligned} 6a) m\angle AEB &= \frac{1}{2}(m\widehat{AB} + m\widehat{CD}) \\ 130 &= \frac{1}{2}(150 + m\widehat{CD}) \\ m\widehat{CD} &= 110 \end{aligned}$$

$$b) m\widehat{AC} = 180 - 150 = 30$$

$$c) m\widehat{BD} = 180 - 110 = 70$$

$$d) m\angle COD = 110^\circ$$

$$e) m\angle BCD = \frac{1}{2}(70) = 35^\circ$$

$$f) m\angle P = \frac{1}{2}(70 - 30) = 20^\circ$$

$$g) m\angle CDA = \frac{1}{2}(30) = 15^\circ$$

$$h) m\angle PAD = 180 - 20 - 15 = 145^\circ$$

$$i) m\angle CDF = \frac{1}{2}(110) = 55^\circ$$

$$\begin{aligned} 7a) (PA)(PB) &= (PC)(PD) \\ (4)(24) &= (16)(16 + CD) \\ 336 &= 256 + 16\overline{CD} \\ 80 &= 16\overline{CD} \\ 5 &= \overline{CD} \\ PD &= 21 \end{aligned}$$

$$b) \overline{CD} = 5$$

Key #4

$$c) (AE)(DE) = (BE)(CE)$$

$$4 \cdot 4 = x(10-x)$$

$$16 = 10x - x^2$$

$$x^2 - 10x + 16 = 0$$

$$(x-8)(x-2) = 0$$

$$x=8 \quad x=2$$

$$CE=2$$

$$d) EB=8$$

$$8a) (AP)^2 = (PB)(PBC)$$

$$9^2 = 3(3+2x)$$

$$81 = 9 + 6x$$

$$72 = 6x$$

$$12 = x$$

$$PC = 3 + 12 + 12 = 27$$

$$b) BC = 24$$

$$c) CM = 12$$

$$d) (CM)(BM) = (DM)(EM)$$

$$12 \cdot 12 = x(30-x)$$

$$144 = 30x - x^2$$

$$x^2 - 30x + 144 = 0$$

$$(x-6)(x-24) = 0$$

$$x=6 \quad x=24$$

$$EM=6$$

Key #6

$$7a) 2x + 7x = 180$$

$$9x = 180$$

$$x = 20$$

$$m\widehat{BD} = 2(20) = 40$$

$$b) m\widehat{AD} = 7(20) = 140$$

$$c) m\angle E = \frac{1}{2}(140) = 70^\circ$$

$$d) m\angle C = \frac{1}{2}(140 - 40) = 50^\circ$$

$$e) m\widehat{AE} = 180 - 140^\circ = 40$$

$$f) m\widehat{EB} = 140$$

$$g) m\angle CDE = \frac{1}{2}(180) = 90^\circ$$

$$h) m\angle ADC = \frac{1}{2}(220) = 110^\circ$$