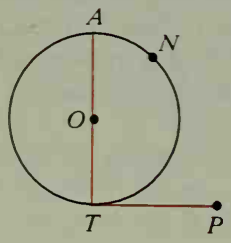
Exercises 13–15 prove the three possible cases of Theorem 9-8. In each case you are given chord $\overline{TA}$ and tangent $\overline{TP}$ of $\odot O$.

13. Supply reasons for the key steps of the proof that $m\angle ATP = \frac{1}{2}m\overset{\frown}{ANT}$ in Case I.

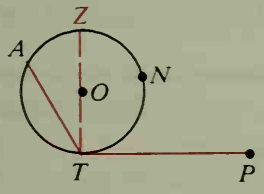


Case I: O lies on $\angle ATP$.

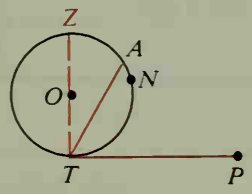
1. $\overline{TP} \perp \overline{TA}$ and $m\angle ATP = 90$.
2. $\overset{\frown}{ANT}$ is a semicircle and $m\overset{\frown}{ANT} = 180$.
3. $m\angle ATP = \frac{1}{2}m\overset{\frown}{ANT}$

In Case II and Case III, $\overline{AT}$ is not a diameter. You can draw diameter $\overline{TZ}$ and then use Case I, Theorem 9-7, and the Angle Addition and Arc Addition Postulates.

B **14.** Case II. O lies inside $\angle ATP$.
Prove $m\angle ATP = \frac{1}{2}m\overset{\frown}{ANT}$



15. Case III. O lies outside $\angle ATP$.
Prove $m\angle ATP = \frac{1}{2}m\overset{\frown}{ANT}$



16. Prove that if one pair of opposite sides of an inscribed quadrilateral are congruent, then the other sides are parallel.

17. Draw an inscribed quadrilateral $ABCD$ and its diagonals intersecting at E. Name two pairs of similar triangles.

18. Draw an inscribed quadrilateral $PQRS$ with shortest side $\overline{PS}$. Draw its diagonals intersecting at T. Extend $\overrightarrow{QP}$ and $\overrightarrow{RS}$ to meet at V. Name two pairs of similar triangles such that each triangle has a vertex at V.

Exercises 19–21 refer to a quadrilateral $ABCD$ inscribed in a circle.

19. $m\angle A = x$, $m\angle B = 2x$, and $m\angle C = x + 20$. Find x and $m\angle D$.

20. $m\angle A = x^2$, $m\angle B = 9x - 2$, and $m\angle C = 11x$. Find x and $m\angle D$.

21. $m\angle D = 75$, $m\overset{\frown}{AB} = x^2$, $m\overset{\frown}{BC} = 5x$, and $m\overset{\frown}{CD} = 6x$. Find x and $m\angle A$.

22. Parallelogram $ABCD$ is inscribed in $\odot O$. Find $m\angle A$.

23. Equilateral $\triangle ABC$ is inscribed in a circle. P and Q are midpoints of $\overset{\frown}{BC}$ and $\overset{\frown}{CA}$, respectively. What kind of figure is quadrilateral $AQPB$? Justify your answer.