Find the length, slope, and midpoint of \overline{PO} .

7.
$$P(3, -8), Q(-5, 2)$$
 8. $P(-3, 4), Q(7, 8)$

8.
$$P(-3, 4), Q(7, 8)$$

9.
$$P(-7, 11), Q(1, -4)$$

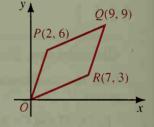
In Exercises 10–12, M is the midpoint of AB, where the coordinates of A are given. Find the coordinates of B.

10.
$$A(4, -2)$$
; $M(4, 4)$

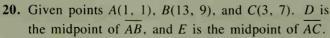
11.
$$A(1, -3)$$
; $M(5, 1)$

12.
$$A(r, s)$$
; $M(0, 2)$

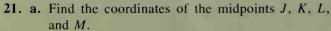
- **B** 13. Given points A(0, 0) and B(8, 4), show that P(2, 6) is on the perpendicular bisector of \overline{AB} by using both of the methods in Example 2.
 - 14. a. Given points R(1, 0), S(7, 4), and T(11, -2), show that $\triangle RST$ is isosceles.
 - **b.** The altitude from the vertex meets the base at K. Find the coordinates of K.
 - 15. Find the midpoints of the legs, then the length of the median of the trapezoid with vertices C(-4, -3), D(-1, 4), E(4, 4), and F(7, -3).
 - 16. Find the length of the longest median of the triangle with vertices X(-2, 3), Y(6, -3), and Z(4, 7).
 - 17. a. Verify that OQ and PR have the same midpoint.
 - b. Part (a) shows that the diagonals of OPQR bisect each other. Therefore *OPQR* is a ?
 - c. Use slopes to verify that the opposite sides of OPQR are parallel.
 - **d.** Use the distance formula to verify that the opposite sides are congruent.



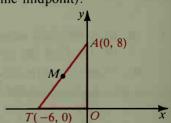
- **18.** Graph the points A(-5, 0), B(3, 2), C(5, 6), and D(-3, 4). Then show that ABCD is a parallelogram by two different methods.
 - a. Show that one pair of opposite sides are both congruent and parallel.
 - **b.** Show that the diagonals bisect each other (have the same midpoint).
- 19. In right $\triangle OAT$, M is the midpoint of AT.
 - **a.** M has coordinates $(\underline{?},\underline{?})$.
 - b. Find, and compare, the lengths MA, MT, and MO.
 - c. State a theorem from Chapter 5 suggested by this
 - d. Find an equation of the circle that circumscribes $\triangle OAT$.

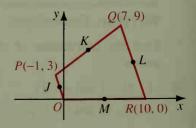


- **a.** Find the coordinates of D and E.
- **b.** Use slopes to show that $\overline{DE} \parallel \overline{BC}$.
- c. Use the distance formula to show that $DE = \frac{1}{2}BC$.



b. What kind of figure is *JKLM*? Prove it.





Ex. 21