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

7. $P(3, -8)$, $Q(-5, 2)$ **8.** $P(-3, 4)$, $Q(7, 8)$ **9.** $P(-7, 11)$, $Q(1,$
    $2\sqrt{41}$; $-\frac{5}{4}$; $(-1, -3)$ $2\sqrt{29}$; $\frac{2}{5}$; $(2, 6)$ 17; $-\frac{15}{8}$; $\left(-\right.$

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

$(-r, 4$

10. $A(4, -2)$; $M(4, 4)$ **(4, 10)**   **11.** $A(1, -3)$; $M(5, 1)$ **(9, 5)**   **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. $RS = ST = 2\sqrt{13}$
    b. The altitude from the vertex meets the base at K. Find the coordinates of K. **(6, -1)**

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 $Z(4, 7)$. $\sqrt{89}$ **(med. from Y)**

17. **a.** Verify that $\overline{OQ}$ and $\overline{PR}$ have the same midpoint. $\left(\frac{9}{2}, \frac{9}{2}\right)$
    b. Part (a) shows that the diagonals of $OPQR$ bisect each other. Therefore $OPQR$ is a __?__. **parallelogram**
    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.
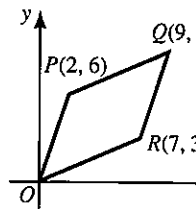
18. Graph the points $A(-5, 0)$, $B(3, 2)$, $C(5, 6)$, and $D(-3, 4)$. Then show that $ABCD$ is a parallelogram by two different methods.
    a. Show that one pair of opposite sides are both congruent and parallel.
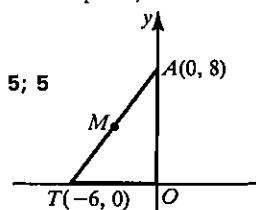   **b.** Show that the diagonals bisect each other (have the same midpoint).

19. In right $\triangle OAT$, M is the midpoint of $\overline{AT}$.
    a. M has coordinates $(\underline{\ ?\ }, \underline{\ ?\ })$. **-3, 4**
    b. Find, and compare, the lengths MA, MT, and MO. **5; 5; 5**
    c. State a theorem from Chapter 5 suggested by this exercise. **See below.**
    d. Find an equation of the circle that circumscribes $\triangle OAT$. $(x + 3)^2 + (y - 4)^2 = 25$

20. Given points $A(1, 1)$, $B(13, 9)$, and $C(3, 7)$. D is the midpoint of $\overline{AB}$, and E is the midpoint of $\overline{AC}$.
    a. Find the coordinates of D and E. **(7, 5); (2, 4)**
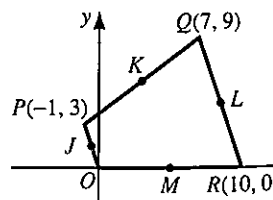   **b.** Use slopes to show that $\overline{DE} \parallel \overline{BC}$.
    c. Use the distance formula to show that $DE = \frac{1}{2}BC$. **$DE = \sqrt{26}$, $BC = 2\sqrt{26}$**

21. **a.** Find the coordinates of the midpoints J, K, L, and M.
    b. What kind of figure is $JKLM$? Prove it. **rhombus**

19c. The midpt. of the hyp. of a rt. $\triangle$ is equidist. from the vertices.

Ex. 21