

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

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

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

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

In Exercises 10–12, M is the midpoint of \overline{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 $F(7, -3)$.

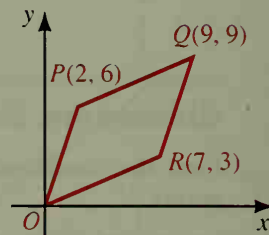
16. Find the length of the longest median of the triangle with vertices $X(-2, 3)$, $Y(6, -3)$, and $Z(4, 7)$.

17. a. Verify that \overline{OQ} and \overline{PR} have the same midpoint.

b. Part (a) shows that the diagonals of $OPQR$ bisect each other. Therefore $OPQR$ is a $\underline{\hspace{1cm}}$.

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).

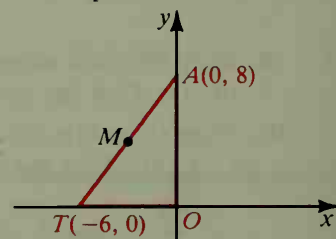
19. In right $\triangle OAT$, M is the midpoint of \overline{AT} .

a. M has coordinates $(\underline{\hspace{1cm}}, \underline{\hspace{1cm}})$.

b. Find, and compare, the lengths MA , MT , and MO .

c. State a theorem from Chapter 5 suggested by this exercise.

d. Find an equation of the circle that circumscribes $\triangle OAT$.



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} .

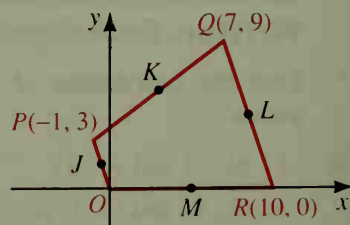
a. Find the coordinates of D and E .

b. Use slopes to show that $\overline{DE} \parallel \overline{BC}$.

c. Use the distance formula to show that $DE = \frac{1}{2}BC$.

21. a. Find the coordinates of the midpoints J , K , L , and M .

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



Ex. 21