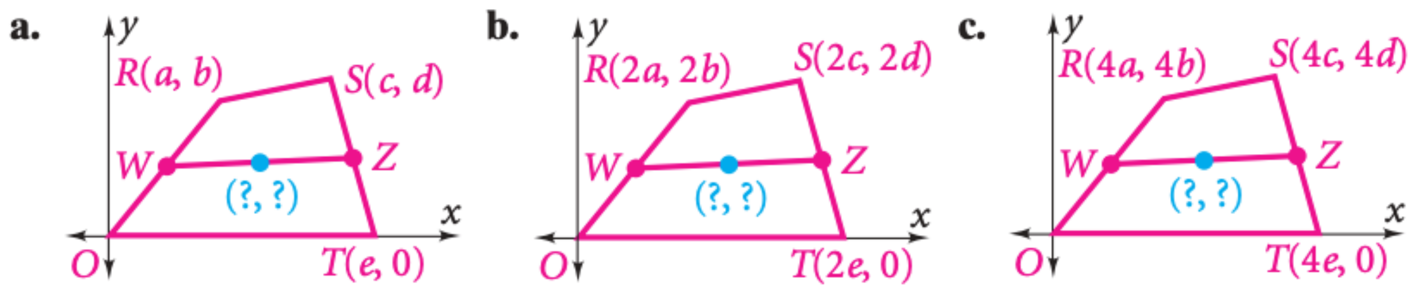
1. W and Z are the midpoints of $\overline{OR}$ and $\overline{ST}$, respectively. In parts (a)–(c), find the coordinates of W and Z.



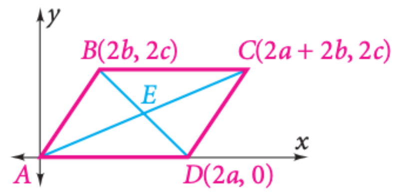
d. You are to plan a coordinate proof involving the midpoint of $\overline{WZ}$. Which of the figures (a)–(c) would you prefer to use? Explain.

Developing Proof **Complete the plan for each coordinate proof.**

2. The diagonals of a parallelogram bisect each other (Theorem 6-3).

Given: Parallelogram $ABCD$

Prove: $\overline{AC}$ bisects $\overline{BD}$, and $\overline{BD}$ bisects $\overline{AC}$.

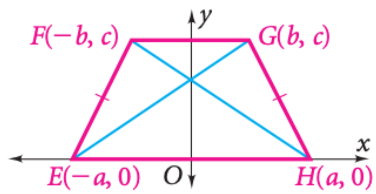


Plan: Place the parallelogram in the coordinate plane with a vertex at the **a.** ? and a side along the **b.** ? . Since midpoints will be involved, use multiples of **c.** ? to name coordinates. To show segments bisect each other, show the midpoints have the same **d.** ? .

3. The diagonals of an isosceles trapezoid are congruent (Theorem 6-16).

Given: Trapezoid $EFGH$ with $\overline{FE} \cong \overline{GH}$

Prove: $\overline{EG} \cong \overline{HF}$

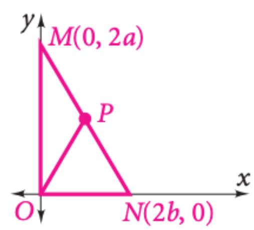


Plan: The trapezoid is isosceles, so place one base on the x-axis so that the **a.** ? bisects its bases. To show the diagonals are congruent, use the **b.** ? Formula.

4. The median to the hypotenuse of a right triangle is half the hypotenuse.

Given: $\triangle MNO$ is a right triangle with right $\angle MON$. P is the midpoint of $\overline{MN}$.

Prove: $OP = \frac{1}{2}MN$

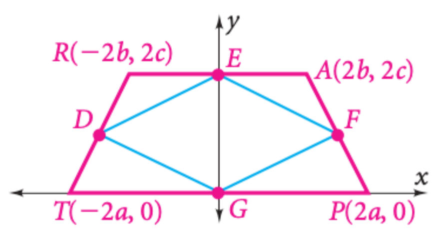


Plan: Place the right triangle in the coordinate plane with the vertex of the **a.** ? at the origin and the **b.** ? along each axis. Since midpoints will be involved, use **c.** ? to name coordinates for points **d.** ? and **e.** ? . Use the **f.** ? Formula to find the coordinates of P. To compare lengths, use the **g.** ? Formula.

5. The segments joining the midpoints of consecutive sides of an isosceles trapezoid form a rhombus.

Given: Trapezoid $TRAP$ with $\overline{TR} \cong \overline{PA}$; D, E, F, and G are midpoints of the indicated sides.

Prove: $DEFG$ is a rhombus.



Plan: The trapezoid is **a.** ? , so place one base on the **b.** ? so that the **c.** ? bisects its bases. Use multiples of 2 to name coordinates since **d.** ? will be involved. A rhombus is a parallelogram with four **e.** ? . To show opposite sides are parallel, show that their **f.** ? are the same. To show sides are congruent, use **g.** ? .

Developing Proof **Follow the plans above to complete the coordinate proofs.**

6. (Exercise 3) The diagonals of an isosceles trapezoid are congruent.

Proof: By the Distance Formula, $EG =$ **a.** ? and $HF =$ **b.** ? . Therefore, $\overline{EG} \cong \overline{HF}$ by the definition of congruence.

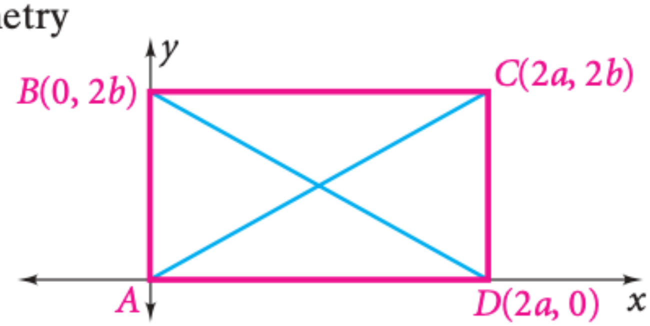
7. (Exercise 4) The median from the vertex of the right angle of a right triangle is half as long as the hypotenuse.

Proof: By the Distance Formula, $OP =$ **a.** ? and $MN =$ **b.** ? . Therefore, $OP = \frac{1}{2}MN$.

8. (Exercise 5) The segments joining the midpoints of consecutive sides of an isosceles trapezoid form a rhombus.

Proof: The midpoints have coordinates **a.** $D(\underline{?}, \underline{?})$, $E(\underline{?}, \underline{?})$, $F(\underline{?}, \underline{?})$, and $G(\underline{?}, \underline{?})$. By the Distance Formula, $DE =$ **b.** $\underline{?}$, $EF =$ **c.** $\underline{?}$, $FG =$ **d.** $\underline{?}$, and $GD =$ **e.** $\underline{?}$. The slope of $DE =$ **f.** $\underline{?}$ and the slope of $FG =$ **g.** $\underline{?}$. The slope of $EF =$ **h.** $\underline{?}$ and that of $GD =$ **i.** $\underline{?}$. Thus, $DEFG$ is a parallelogram with congruent **j.** $\underline{?}$, so **k.** $\underline{?}$ is a rhombus by the definition of rhombus.

9. Developing Proof Use coordinate geometry to prove that the diagonals of a rectangle bisect each other.



Proof: The midpoint of $\overline{AC}$ is **a.** $\underline{?}$.
The midpoint of $\overline{BD}$ is **b.** $\underline{?}$.
The midpoints are **c.** $\underline{?}$,
so the diagonals bisect each other.