

LESSON
5.1**Study Guide**

For use with pages 294–301

GOAL Use properties of midsegments and write coordinate proofs.**Vocabulary**

A **midsegment of a triangle** is a segment that connects the midpoints of two sides of the triangle.

A **coordinate proof** involves placing geometric figures in a coordinate plane. When you use variables to represent the coordinates of a figure in a coordinate proof, the results are true for all figures of that type.

Theorem 5.1 Midsegment Theorem: The segment connecting the midpoints of two sides of a triangle is parallel to the third side and is half as long as that side.

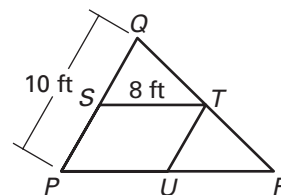
EXAMPLE 1 Use the Midsegment Theorem to find lengths

In the diagram, \overline{ST} and \overline{TU} are midsegments of $\triangle PQR$. Find PR and TU .

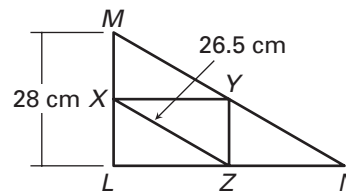
Solution

$$PR = 2 \cdot ST = 2(8 \text{ ft}) = 16 \text{ ft}$$

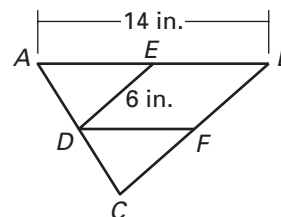
$$TU = \frac{1}{2} \cdot QP = \frac{1}{2}(10 \text{ ft}) = 5 \text{ ft}$$

**Exercises for Example 1**

- In the diagram, \overline{XZ} and \overline{ZY} are midsegments of $\triangle LMN$. Find MN and ZY .



- In the diagram, \overline{ED} and \overline{DF} are midsegments of $\triangle ABC$. Find DF and BC .

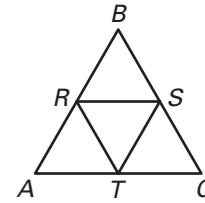


LESSON
5.1**Study Guide** *continued*
For use with pages 294–301**EXAMPLE 2** Use the Midsegment Theorem

In the diagram at the right, $\overline{SB} \cong \overline{SC}$, $\overline{RS} \parallel \overline{AC}$, and $RS = \frac{1}{2}AC$. Show that R is the midpoint of \overline{BA} .

Solution

Because $\overline{SB} \cong \overline{SC}$, S is the midpoint of \overline{BC} . Because $\overline{RS} \parallel \overline{AC}$ and $RS = \frac{1}{2}AC$, \overline{RS} is a midsegment of $\triangle ABC$ by definition. By the Midsegment Theorem, R is the midpoint of \overline{BA} .

**EXAMPLE 3** Place a figure in a coordinate plane

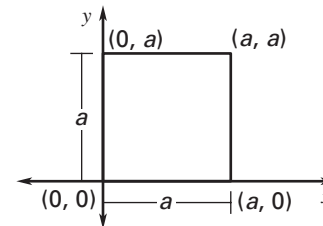
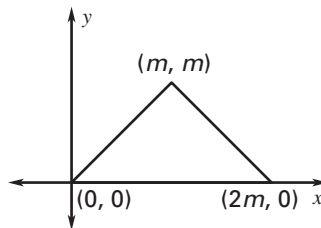
Place each figure in a coordinate plane in a way that is convenient for finding side lengths. Assign coordinates to each vertex.

- a. An isosceles triangle b. A square

Solution

It is easy to find lengths of horizontal and vertical segments and distances from $(0, 0)$, so place one vertex at the origin and one or more sides on an axis.

- a. Let $2m$ represent the length of the base of the isosceles triangle. The coordinates of the vertex opposite the base is (m, m) , which makes each of the legs congruent.
- b. Let a represent the side length of the square.

**Exercises for Examples 2 and 3**

3. In Example 2, if T is the midpoint of \overline{AC} , what do you know about \overline{ST} ?
4. A rectangle has vertices $(0, 0)$, $(j, 0)$, and (j, k) . Find the fourth vertex.