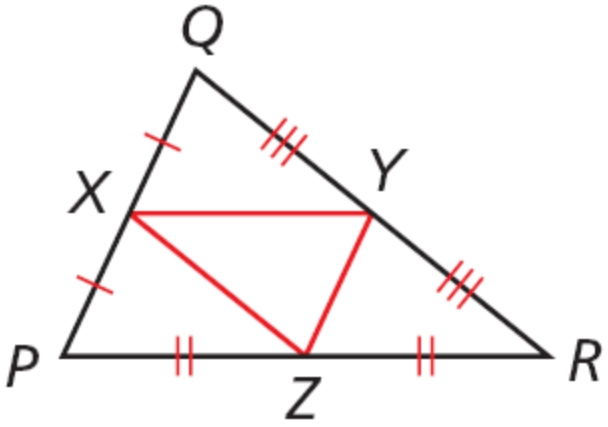
Midsegments of Triangles

A **midsegment of a triangle** is a segment that joins the midpoints of two sides of the triangle. Every triangle has three midsegments, which form the *midsegment triangle*.



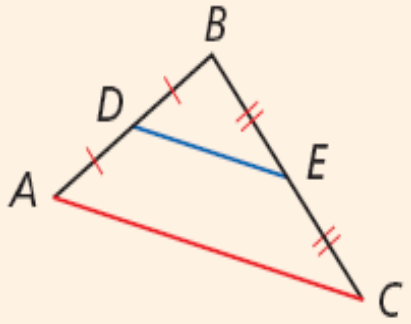
Midsegments: $\overline{XY}$, $\overline{YZ}$, $\overline{ZX}$

Midsegment triangle: $\triangle XYZ$

Theorem 5-4-1 Triangle Midsegment Theorem

A midsegment of a triangle is parallel to a side of the triangle, and its length is half the length of that side.

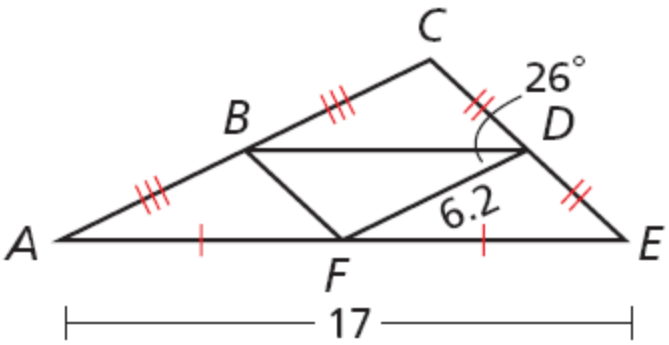
$$\overline{DE} \parallel \overline{AC},\ DE = \frac{1}{2}AC$$



Example 2A: Using the Triangle Midsegment Theorem

Find each measure.

BD



$BD = \frac{1}{2}AE$ *Δ Midsegment Thm.*

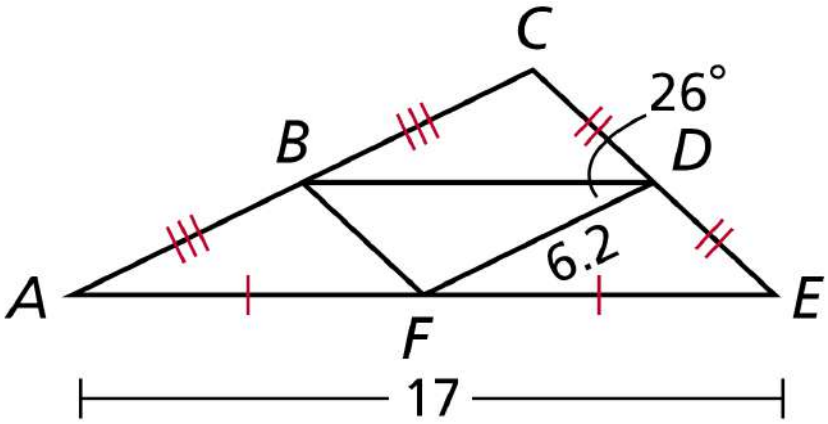
$BD = \frac{1}{2}(17)$ *Substitute 17 for AE.*

$BD = 8.5$ *Simplify.*

Example 2B: Using the Triangle Midsegment Theorem

Find each measure.

m∠*CBD*



$\overline{DF} \parallel \overline{CA}$ *Δ Midsegment Thm.*

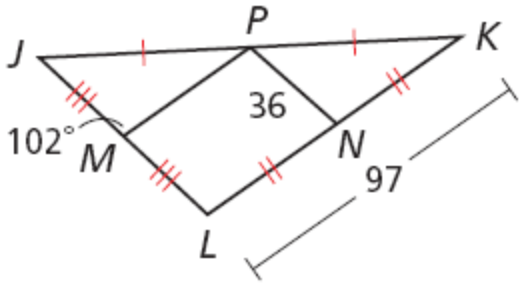
$m\angle CBD = m\angle BDF$ *Alt. Int. ∠s Thm.*

$m\angle CBD = 26°$ *Substitute 26° for m∠BDF.*

Check It Out! Example 2a

Find each measure.

JL



$PN = \frac{1}{2}JL$ *Δ Midsegment Thm.*

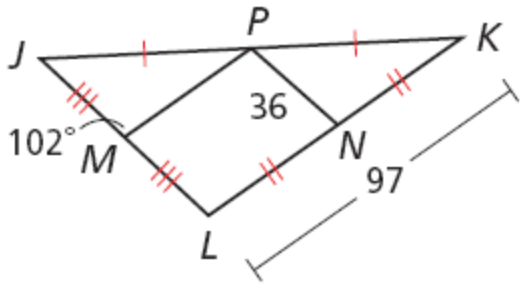
$2(36) = JL$ *Substitute 36 for PN and multiply both sides by 2.*

$72 = JL$ *Simplify.*

Check It Out! Example 2b

Find each measure.

PM



$PM = \frac{1}{2}LK$ *Δ Midsegment Thm.*

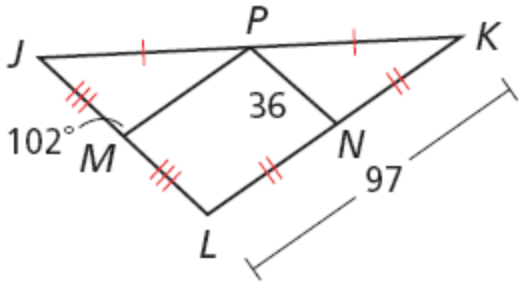
$PM = \frac{1}{2}(97)$ *Substitute 97 for LK.*

$PM = 48.5$ *Simplify.*

Check It Out! Example 2c

Find each measure.

m∠*MLK*



$\overline{MP} \parallel \overline{LK}$ *Δ Midsegment Thm.*

m∠*MLK* = m∠*JMP* *Similar triangles*

m∠*MLK* = 102° *Substitute.*

Example 3: Indirect Measurement Application

In an A-frame support, the distance PQ is 46 inches. What is the length of the support $\overline{ST}$ if S and T are at the midpoints of the sides?

$ST = \frac{1}{2}PQ$ *Δ Midsegment Thm.*

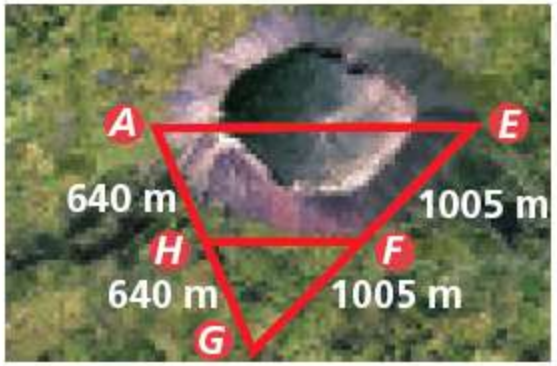
$ST = \frac{1}{2}(46)$ *Substitute 46 for PQ.*

$ST = 23$ *Simplify.*

The length of the support *ST* is 23 inches.

Check It Out! Example 3

What if…? Suppose Anna's result in Example 3 (p. 323) is correct. To check it, she measures a second triangle. How many meters will she measure between *H* and *F*?



$HF = \frac{1}{2}AE$ *Δ Midsegment Thm.*

$HF = \frac{1}{2}(1550)$ *Substitute 1550 for AE.*

$HF = 775$ m *Simplify.*

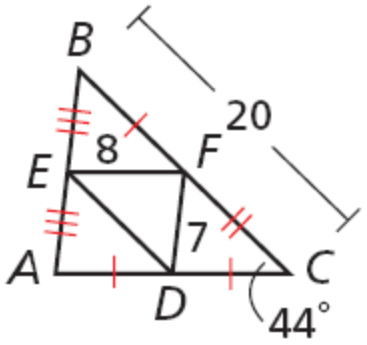
Lesson Quiz: Part I

Use the diagram for Items 1–3. Find each measure.

1. *ED* 10

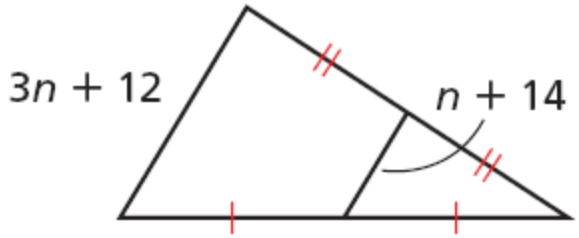
2. *AB* 14

3. m∠*BFE* 44°



Lesson Quiz: Part II

4. Find the value of *n*.



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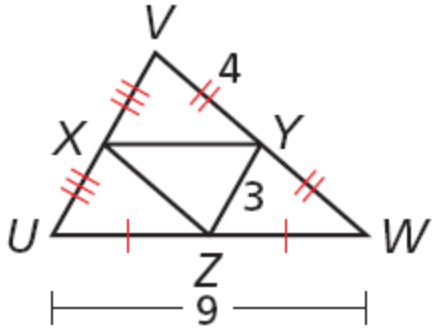
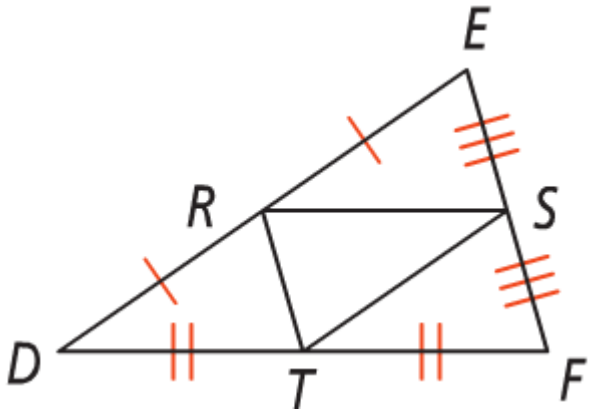
5. ΔXYZ is the midsegment triangle of ΔWUV. What is the perimeter of ΔXYZ?



11.5

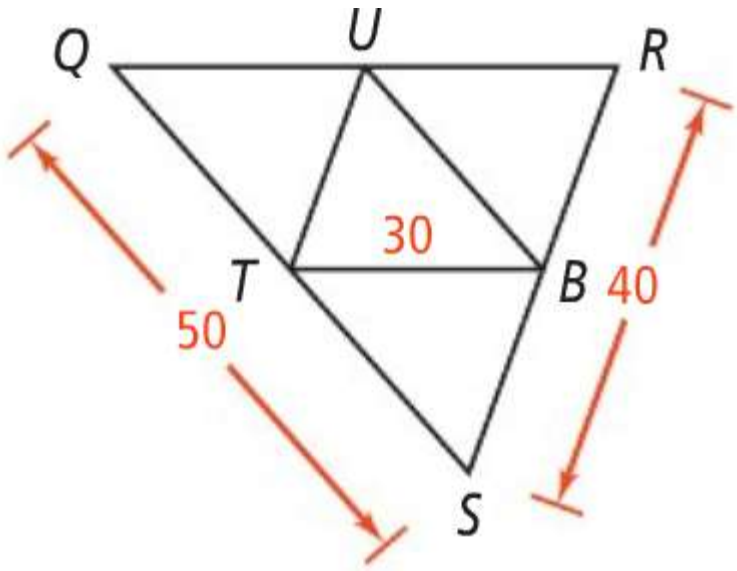
Identifying Parallel Segments

- What are the three pairs of parallel segments in ΔDEF?

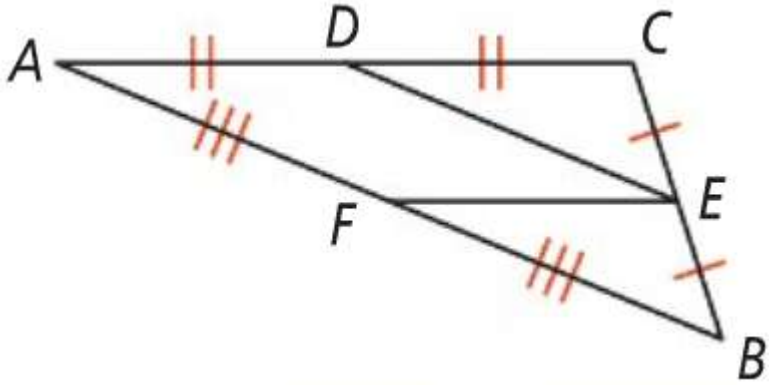


Finding Lengths

- In ΔQRS, T, U, and B are midpoints. What are the lengths of $\overline{TU}$, $\overline{UB}$, and $\overline{QR}$?



In the figure below, $AD = 6$ and $DE = 7.5$. What are the lengths of $\overline{DC}$, $\overline{AC}$, $\overline{EF}$, and $\overline{AB}$?



Using Midpoints to Draw a Triangle

he midpoints of the sides of a triangle are $L(4, 2)$, $M(2, 3)$, and $N(5, 4)$. What are the coordinates of the vertices of the triangle?