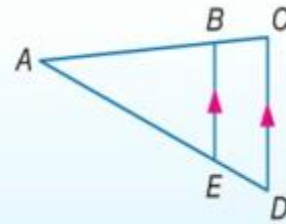


7.4 Parallel lines and Proportional Parts

△ Proportionality Thm:

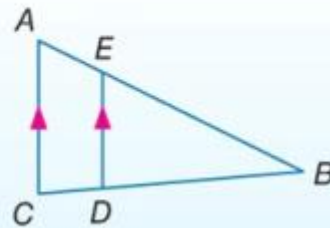
If a line is parallel to one side of a triangle and intersects the other two sides, then it divides the sides into segments of proportional lengths.



Example If $\overline{BE} \parallel \overline{AC}$, then $\frac{AB}{BC} = \frac{AE}{ED}$.

Converse of Triangle Proportionality Theorem

If a line intersects two sides of a triangle and separates the sides into proportional corresponding segments, then the line is parallel to the third side of the triangle.

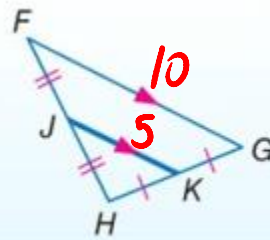


Example If $\frac{AE}{EC} = \frac{BD}{DC}$, then $\overline{ED} \parallel \overline{AB}$.

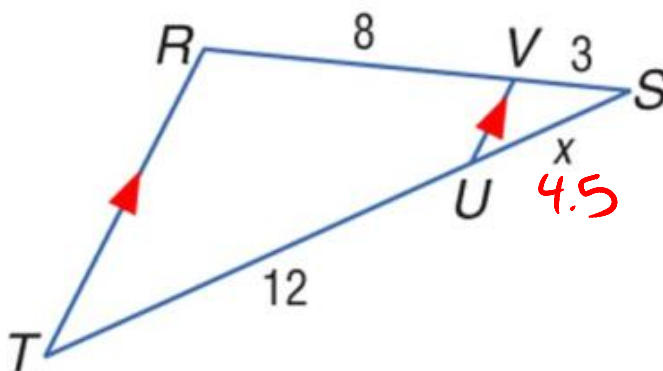
△ Midsegment Thm:

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

Example If J and K are midpoints of \overline{FH} and \overline{HG} , respectively, then $\overline{JK} \parallel \overline{FG}$ and $JK = \frac{1}{2}FG$.



In $\triangle RST$, $\overline{RV} \parallel \overline{TU}$, $SV = 3$, $VR = 8$, and $UT = 12$. Find SU .



$$\frac{8}{12} = \frac{3}{x}$$

$$\frac{8x}{8} = \frac{36}{8}$$

$$x = 4.5$$

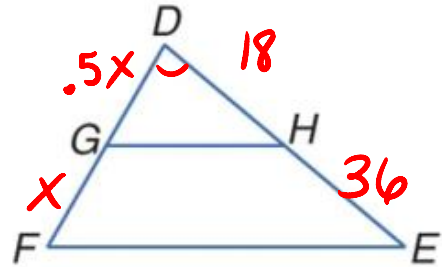
In $\triangle DEF$, $DH = 18$, $HE = 36$, and $DG = \frac{1}{2}GF$.

Determine whether $\overline{GH} \parallel \overline{FE}$. Explain.

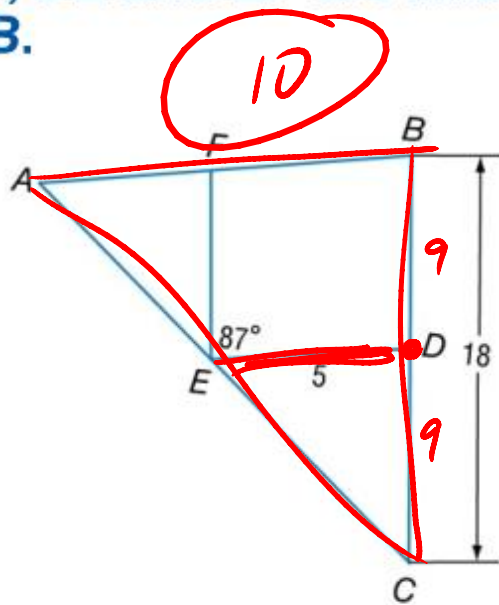
$$\frac{.5x}{x} = \frac{18}{36}$$

$$18x = 18x$$

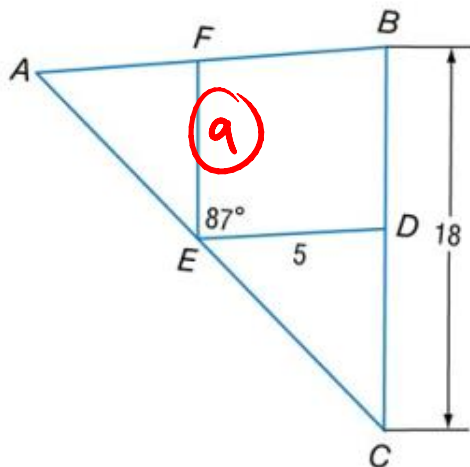
yes \rightarrow sides are proportional



A. In the figure, \overline{DE} and \overline{EF} are midsegments of $\triangle ABC$. Find AB .



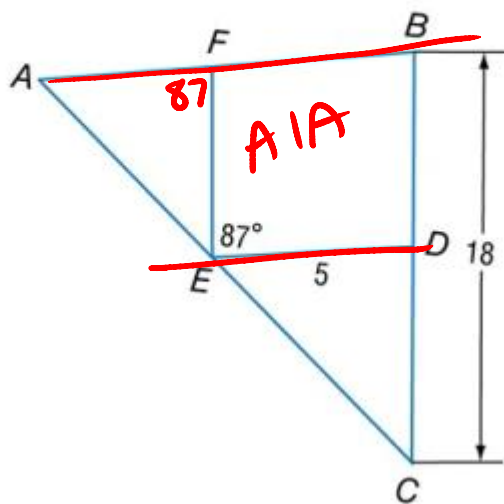
B. In the figure, \overline{DE} and \overline{EF} are midsegments of $\triangle ABC$. Find FE .



$$\frac{1}{2} \cdot 18 = 9$$

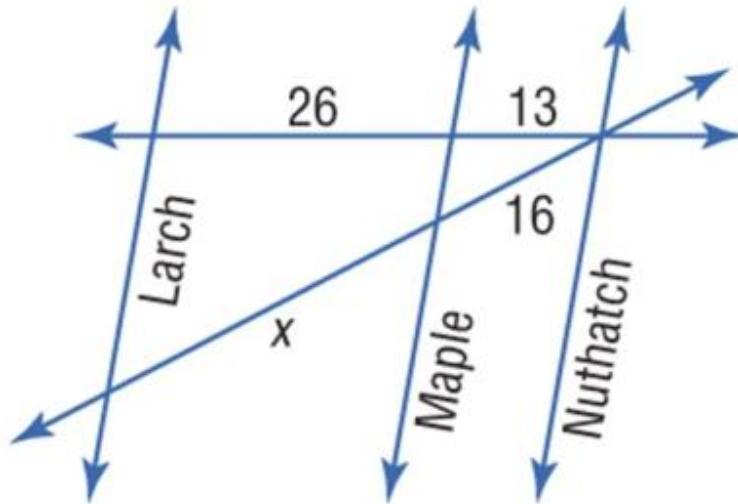
9

C. In the figure, \overline{DE} and \overline{EF} are midsegments of $\triangle ABC$. Find $m\angle AFE$.



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A I A

MAPS In the figure, Larch, Maple, and Nuthatch Streets are all parallel. The figure shows the distances in between city blocks. Find x .



$$\frac{26}{x} = \frac{13}{16}$$

$$416 = 13x$$

$$32 = x$$

ALGEBRA Find x and y .

$$3x - 7 = x + 5$$

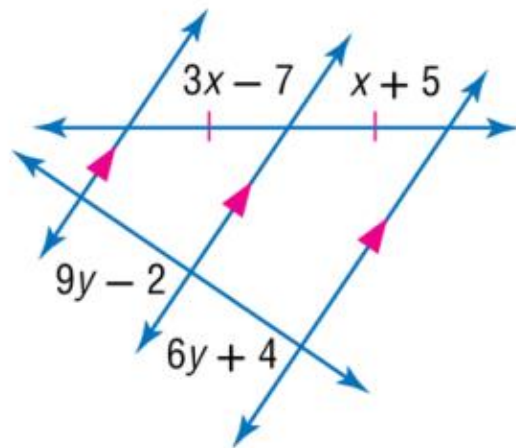
$$2x = 12$$

$$x = 6$$

$$9y - 2 = 6y + 4$$

$$3y = 6$$

$$y = 2$$

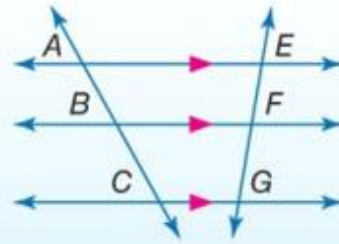


Corollaries

Proportional Parts of Parallel Lines

If three or more parallel lines intersect two transversals, then they cut off the transversals proportionally.

Example If $\overline{AE} \parallel \overline{BF} \parallel \overline{CG}$, then $\frac{AB}{BC} = \frac{EF}{FG}$.



Congruent Parts of Parallel Lines

If three or more parallel lines cut off congruent segments on one transversal, then they cut off congruent segments on every transversal.

Example If $\overline{AE} \parallel \overline{BF} \parallel \overline{CG}$, and $\overline{AB} \cong \overline{BC}$, then $\overline{EF} \cong \overline{FG}$.

