

Chapter 8

Similarity

Section 6

Proportions and Similar Triangles

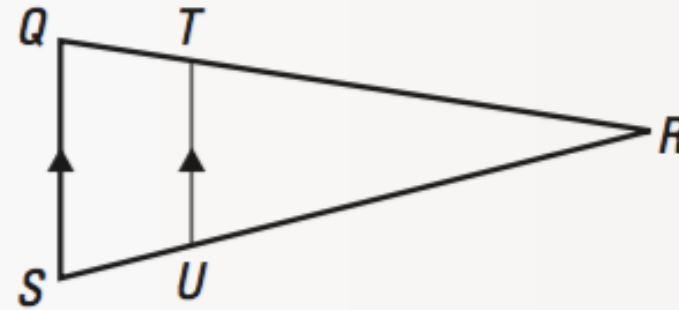
GOAL 1: Using Proportionality Theorems

THEOREMS

THEOREM 8.4 *Triangle Proportionality Theorem*

If a line parallel to one side of a triangle intersects the other two sides, then it divides the two sides proportionally.

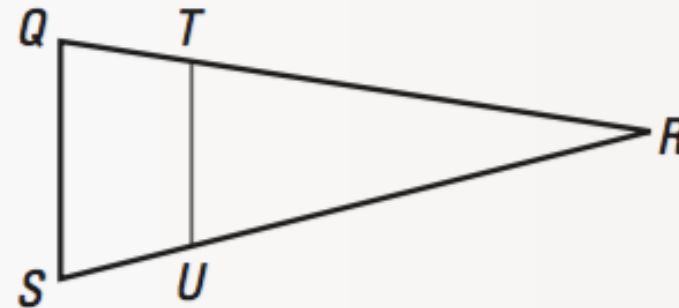
$$\text{If } \overline{TU} \parallel \overline{QS}, \text{ then } \frac{RT}{TQ} = \frac{RU}{US}.$$



THEOREM 8.5 *Converse of the Triangle Proportionality Theorem*

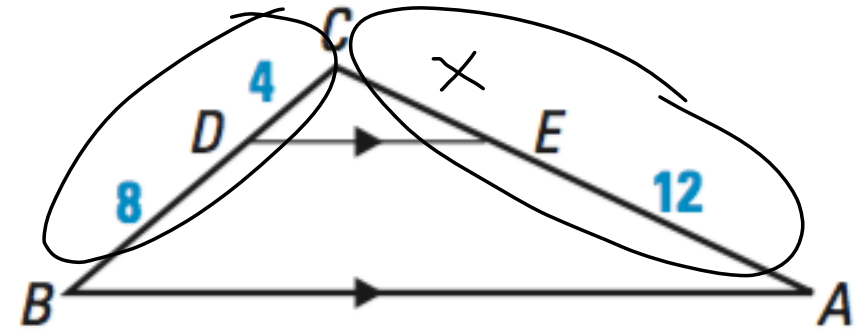
If a line divides two sides of a triangle proportionally, then it is parallel to the third side.

$$\text{If } \frac{RT}{TQ} = \frac{RU}{US}, \text{ then } \overline{TU} \parallel \overline{QS}.$$



Example 1: Finding the Length of a Segment

In the diagram, $AB \parallel ED$, $BD = 8$, $DC = 4$, and $AE = 12$.
What is the length of EC ?



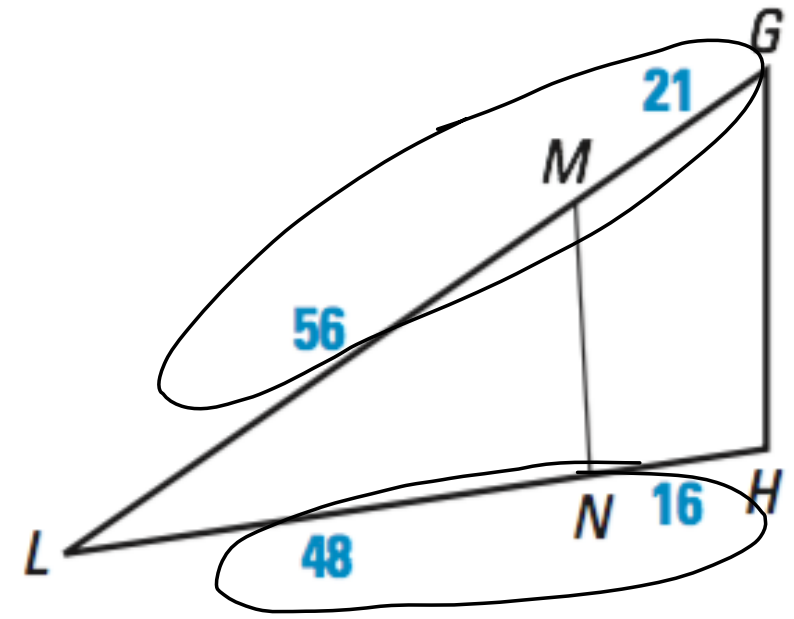
$$\frac{4}{8} \neq \frac{X}{12}$$

$$\cancel{8}X = \frac{48}{\cancel{8}}$$

$$X = 6$$

Example 2: Determining Parallels

Given the diagram, determine whether $MN \parallel GH$.



$$\frac{48}{16} \stackrel{?}{=} \frac{56}{21}$$

$$48 \times 21$$

$$16 \times 56$$

$$1008 \neq 896 \Rightarrow \text{not parallel}$$

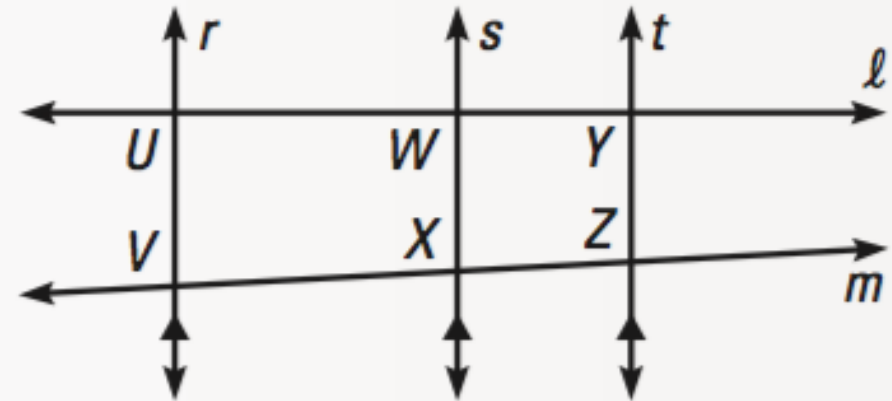
THEOREMS

THEOREM 8.6

If three parallel lines intersect two transversals, then they divide the transversals proportionally.

If $r \parallel s$ and $s \parallel t$, and ℓ and m

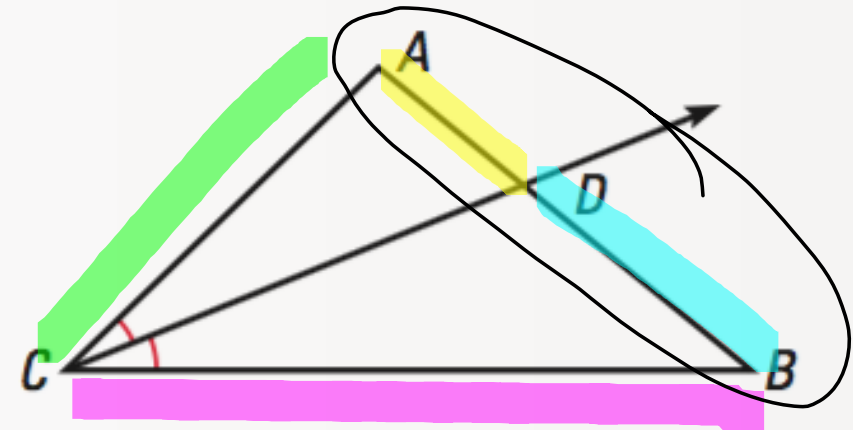
intersect r , s , and t , then $\frac{UW}{WY} = \frac{VX}{XZ}$.



THEOREM 8.7

If a ray bisects an angle of a triangle, then it divides the opposite side into segments whose lengths are proportional to the lengths of the other two sides.

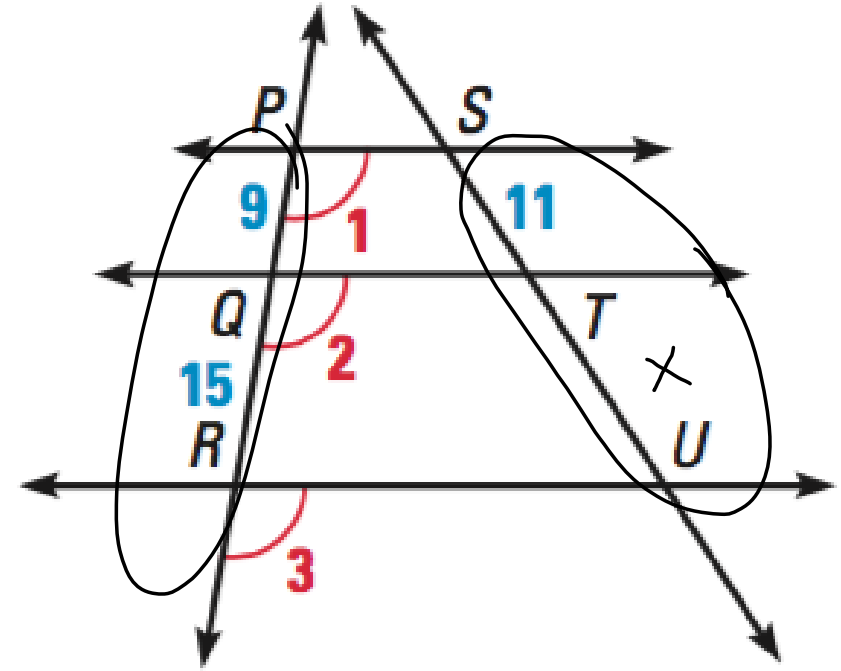
If \overrightarrow{CD} bisects $\angle ACB$, then $\frac{AD}{DB} = \frac{CA}{CB}$.



Example 3: Using Proportionality Theorems

In the diagram, $\angle 1 \cong \angle 2 \cong \angle 3$, and $PQ = 9$, $QR = 15$, and $ST = 11$. What is the length of TU ?

$PS \parallel QT \parallel RU$



$$\frac{9}{15} \neq \frac{11}{x}$$

$$9x = 165$$

$$x = 18.33$$

Example 4: Using Proportionality Theorems

In the diagram, $\angle CAD \cong \angle DAB$. Use the given side lengths to find the length of DC.

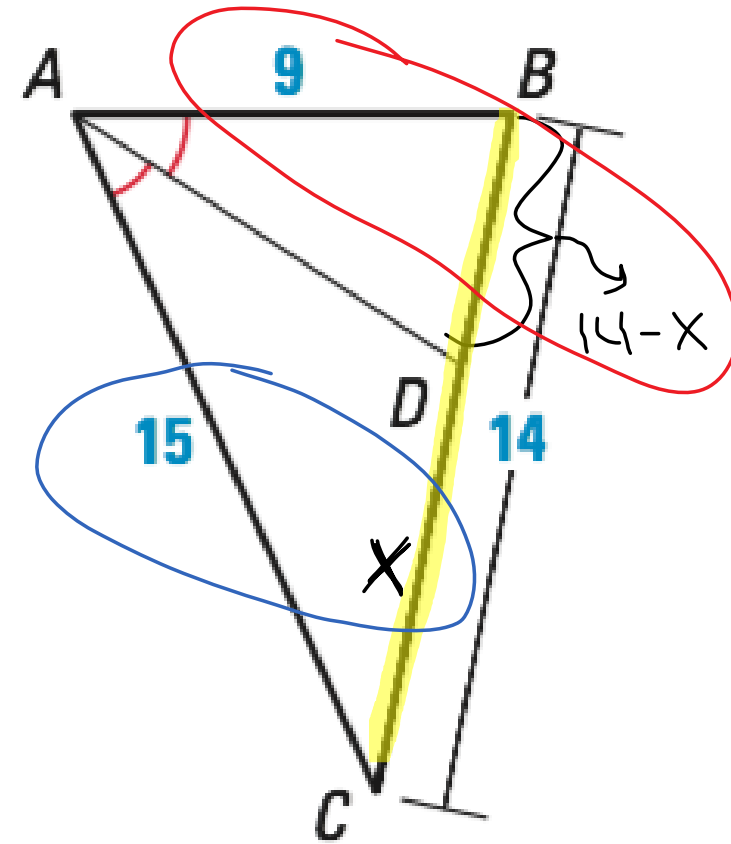
$$\frac{14-x}{x} = \frac{9}{15}$$

$$9x = 15(14-x)$$

$$9x = 210 - 15x$$

$+15x$ $+15x$

$$\frac{24x}{24} = \frac{210}{24} \Rightarrow x = 8.75$$



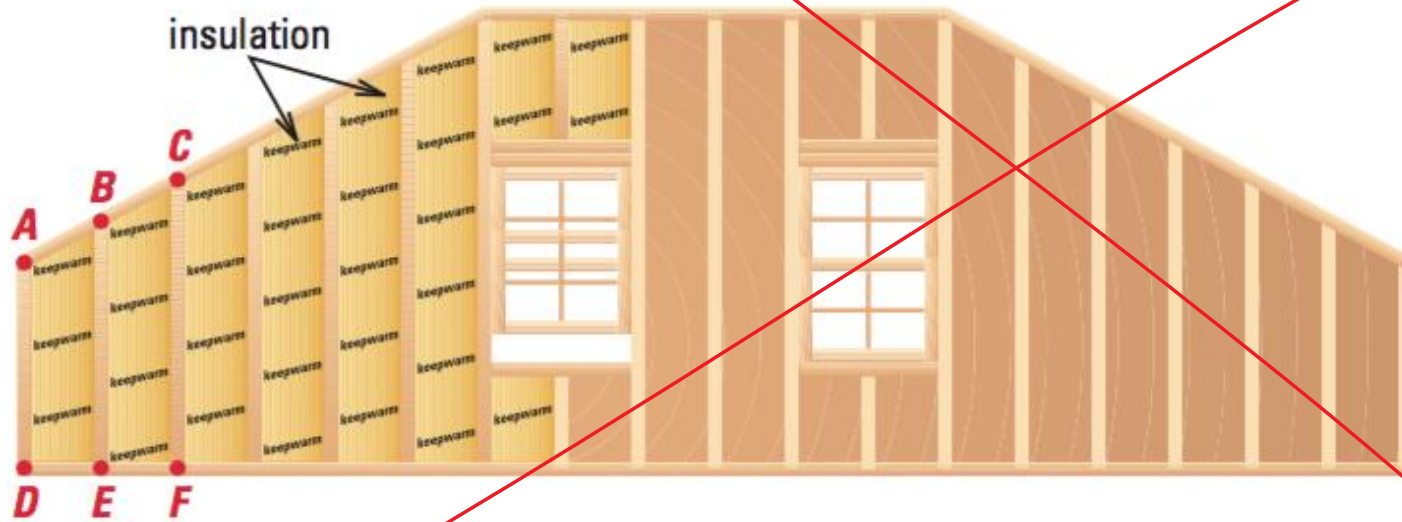
GOAL 2: Using Proportionality Theorems in Real Life

Example 5: Finding the Length of a Segment



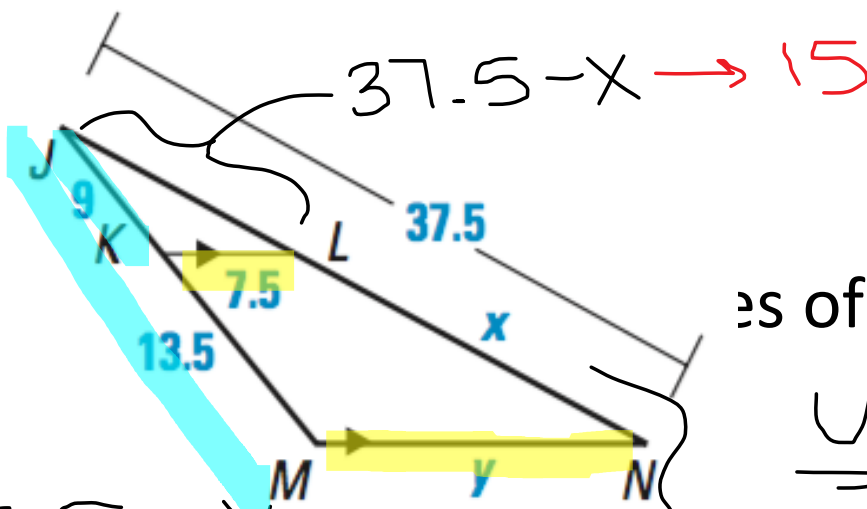
BUILDING CONSTRUCTION

You are insulating your attic, as shown. The vertical 2×4 studs are evenly spaced. Explain why the diagonal cuts at the tops of the strips of insulation should have the same lengths.



Example 6: Fin

In the diagram



es of the variables.

$$\frac{9}{13.5} = \frac{37.5 - x}{x}$$

$$9x = 13.5(37.5 - x)$$

$$9x = 506.25 - 13.5x$$

$$22.5x = 506.25$$

$$x = 22.5$$

$$\frac{y}{7.5} = \frac{9}{22.5}$$

$$9y = 168.75$$

$$y = 18.75$$

EXIT SLIP