Name: ___________________________

Geometry Lesson 60

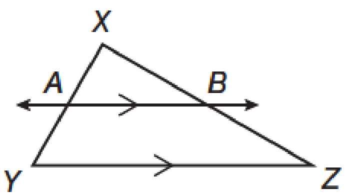
Date: ___________________________

Objective: TSW use proportionality theorems.

Period: ___________________________

Previous lessons have discussed some of the proportional relationships that exist within triangles when they are divided by a midsegment. A similar relationship exists for any line that intersects two sides of a triangle and is parallel to one side.

Theorem 60-1: Triangle Proportionality Theorem - If a line parallel to one side of a triangle intersects the other two sides, it divides those sides proportionally.



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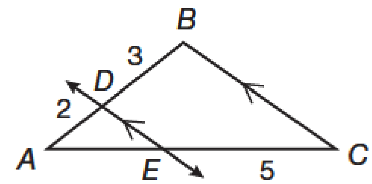
Example 1 Using Triangle Proportionality to Find Unknowns

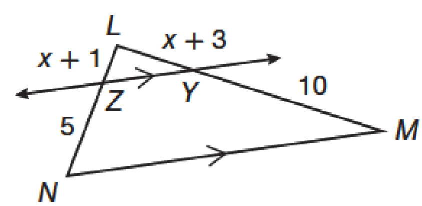
a. Find the length of $\overline{AE}$.

SOLUTION



b. Find the value of *x*.

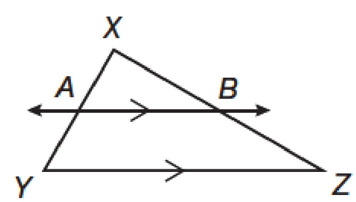
SOLUTION



The Converse of the Triangle Proportionality Theorem is true, and can be used to check whether a line that intersects 2 sides of a triangle is parallel to the triangle's base.

Theorem 60-2: Converse of the Triangle Proportionality Theorem - If a line divides two sides of a triangle proportionally, then it is parallel to the third side.

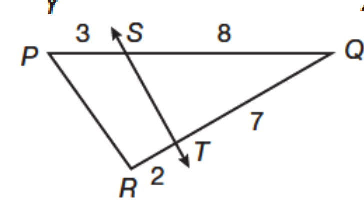
In ΔXYZ, if $\frac{XA}{AY} = \frac{XB}{BZ}$, then _______________



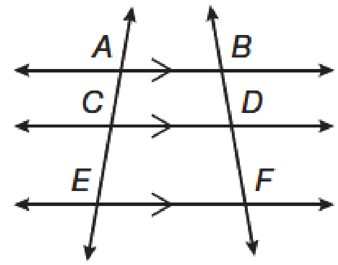
Example 2 Proving Lines Parallel

Is $\overline{ST}$ parallel to $\overline{PR}$?

SOLUTION



The Triangle Proportionality Theorem is closely related to Theorem 60-3, which uses the same proportional relationship to relate the segments of transversals that are intersected by parallel lines.



Theorem 60-3 - If parallel lines intersect transversals, then they divide the transversals proportionally.

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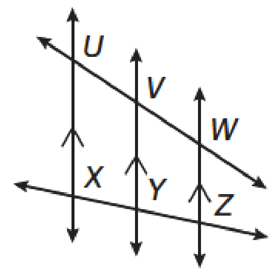
If parallel lines divide a transversal into congruent segments, then the segments are in a 1:1 ratio. By Theorem 60-3, any other transversal cut by the same parallel lines will be divided into segments that also have a 1:1 ratio, so they will also be congruent.



Theorem 60-4 - If parallel lines cut congruent segments on one transversal, then they cut congruent segments on all transversals.

In the diagram, if *UV* = *VW*, then ________________.

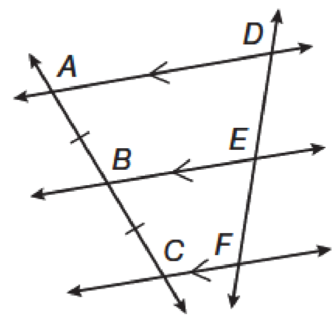
Example 3 Proving Theorem 60-4

Use a paragraph proof to prove Theorem 60-4.

Given: $\overline{AB} \cong \overline{BC}, \overline{AD} \parallel \overline{BE}, \overline{BE} \parallel \overline{CF}$

Prove: $\overline{DE} \cong \overline{EF}$

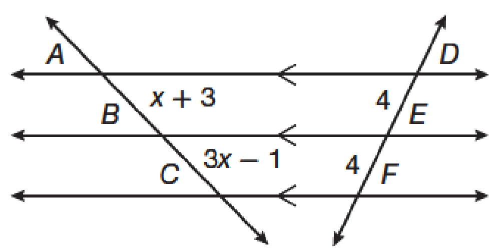
SOLUTION



Example 4 Finding Segment Lengths with Intersecting Transversals

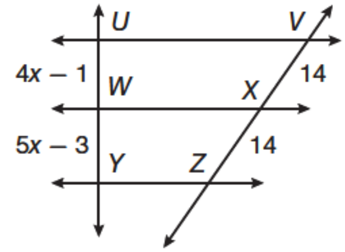
a. Find the length of segment $\overline{AB}$.

SOLUTION



b. Determine whether $\overline{UV}$, $\overline{WX}$, and $\overline{YX}$ are parallel when *x* = 3.

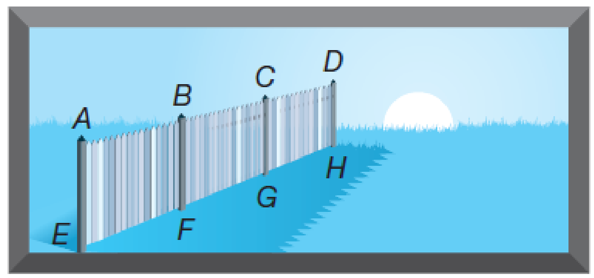
SOLUTION



Example 5 Application: Art

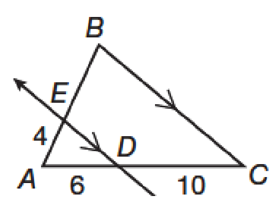
Perspective is a method artists use to make an object appear as if it is receding into the distance. If the fence posts are parallel, then what is the length of $\overline{AB}$ if *EH* = 22, *BC* = 4, *CD* = 6, and *FH* = 18?

SOLUTION

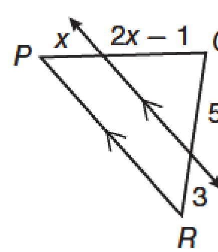


You Try!!!!!

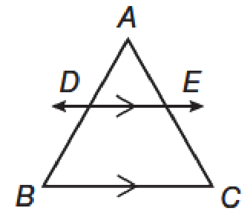
a. Find the length of $\overline{EB}$.



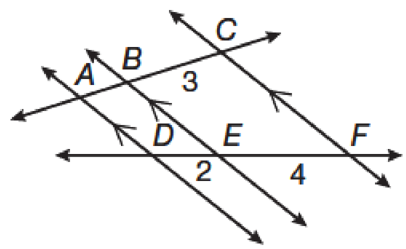
b. Find the length of $\overline{PQ}$.



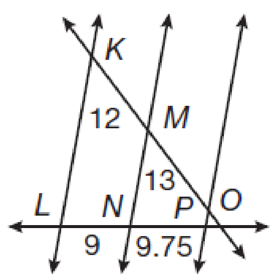
c. Use a paragraph proof to prove the Triangle Proportionality Theorem.
Given: $\overline{DE} \parallel \overline{BC}$
Prove: $\frac{AD}{DB} = \frac{AE}{EC}$



d. Find the length of $\overline{AC}$.



e. Determine whether $\overline{KL}, \overline{MN},$ and $\overline{OP}$ are parallel.



f.Art: A road is drawn with perspective. Find the length of $\overline{AE}$ if *AC* = 10, *BF* = 20, and *BD* = 8.