Notes on Lessons 7.4 and 7.5

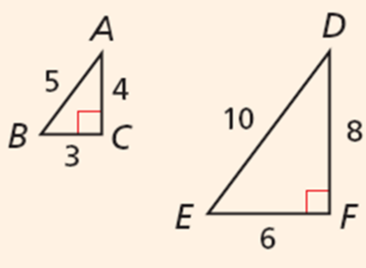
Applying Properties of Similar Triangles.

Objectives

Use properties of similar triangles to find segment lengths.

Apply proportionality and triangle angle bisector theorems.

Similar Triangles | **Similarity, Perimeter, and Area Ratios**

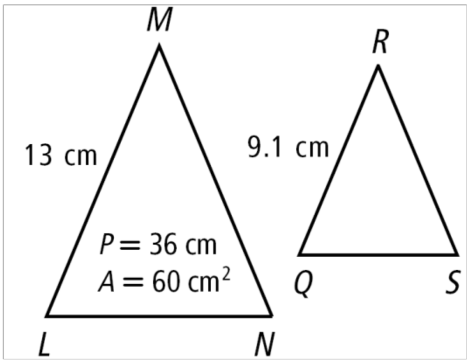
STATEMENT	RATIO
$\triangle ABC \sim \triangle DEF$ 	Similarity ratio: $\frac{AB}{DE} = \frac{AC}{DF} = \frac{BC}{EF} =$ Perimeter ratio: $\frac{\text{perimeter } \triangle ABC}{\text{perimeter } \triangle DEF} =$ Area ratio: $\frac{\text{area } \triangle ABC}{\text{area } \triangle DEF} =$

Theorem 7-5-1 | **Proportional Perimeters and Areas Theorem**

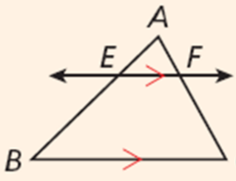
If the similarity ratio of two similar figures is $\frac{a}{b}$, then the ratio of their perimeters is $\frac{a}{b}$, and the ratio of their areas is $\frac{a^2}{b^2}$, or $\left(\frac{a}{b}\right)^2$.

Example 1

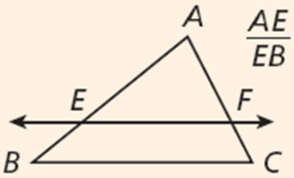
Given that ΔLMN:ΔQRT, find the perimeter *P* and area *A* of ΔQRS.



Theorem 7-4-1 Triangle Proportionality Theorem

THEOREM	HYPOTHESIS	CONCLUSION
If a line parallel to a side of a triangle intersects the other two sides, then it divides those sides proportionally.	 $\overline{EF} \parallel \overline{BC}$	$\frac{AE}{EB} = \frac{AF}{FC}$

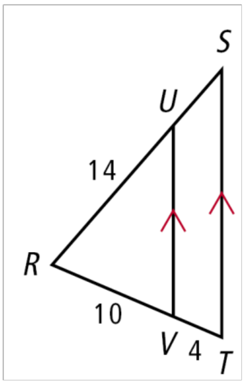
Theorem 7-4-2 Converse of the Triangle Proportionality Theorem

THEOREM	HYPOTHESIS	CONCLUSION
If a line divides two sides of a triangle proportionally, then it is parallel to the third side.	 $\frac{AE}{EB} = \frac{AF}{FC}$	$\overleftrightarrow{EF} \parallel \overline{BC}$

Example 2

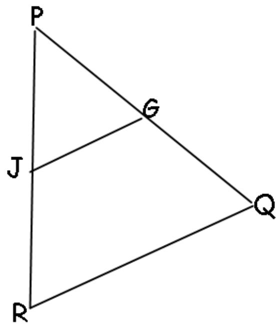
Find *US*.

It is given that $\overline{ST} \parallel \overline{UV}$, so $\frac{US}{RU} = \frac{VT}{RV}$ by the Triangle Proportionality Theorem.



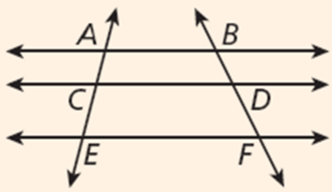
Example 3

In ΔPQR, find x and y so that $\overline{JG} \parallel \overline{RQ}$.



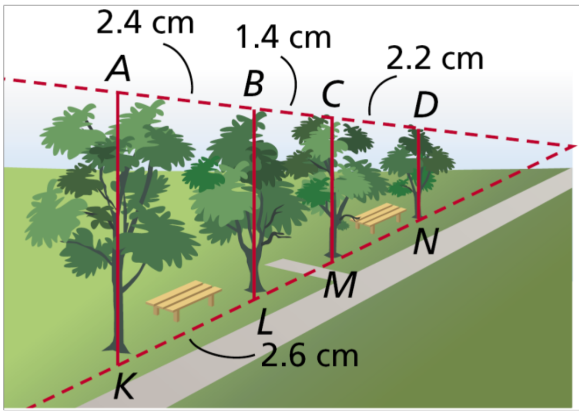
RQ = 10	PG = 3y+2	PJ = 8x-5
JG = 8	GQ = y	JR = x

Corollary 7-4-3 Two-Transversal Proportionality

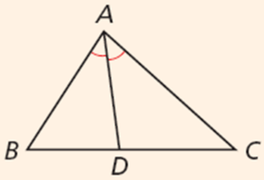
THEOREM	HYPOTHESIS	CONCLUSION
If three or more parallel lines intersect two transversals, then they divide the transversals proportionally.		$\frac{AC}{CE} = \frac{BD}{DF}$

Example 4

Use the diagram to find *LM* and *MN* to the nearest tenth.

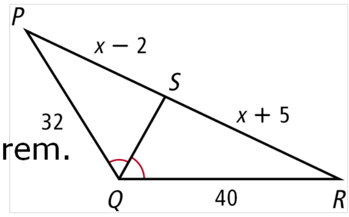


Theorem 7-4-4 Triangle Angle Bisector Theorem

THEOREM	HYPOTHESIS	CONCLUSION
An angle bisector of a triangle divides the opposite side into two segments whose lengths are proportional to the lengths of the other two sides. (△ ∠ Bisector Thm.)		$\frac{BD}{DC} = \frac{AB}{AC}$

Example 5

Find *PS* and *SR*.



$\frac{PS}{SR} = \frac{QP}{QR}$ by the Δ ∠ Bisector Theorem.