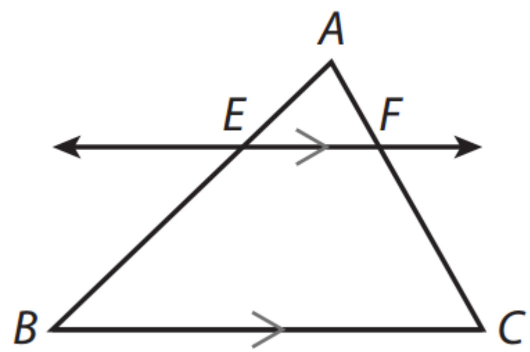
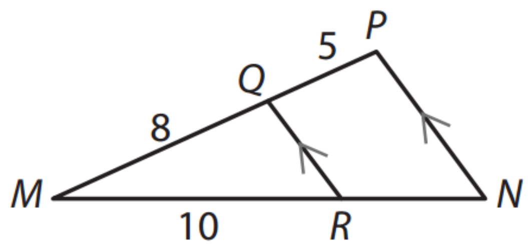
12.1 Triangle Proportionality Theorem 2/21/23

Triangle Proportionality Theorem or Side Splitter 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.	 $\overline{EF} \parallel \overline{BC}$	$\frac{AE}{EB} = \frac{AF}{FC}$

(use when you are given that a line cutting two sides of a triangle is parallel to the third side and you want to prove that it cuts the sides proportionally)



Ex: Find the length of $\overline{RN}$.

Since RQ and NP are parallel, the sides are proportional so set up a proportion.

$$\frac{MR}{RN} = \frac{MQ}{QP}$$

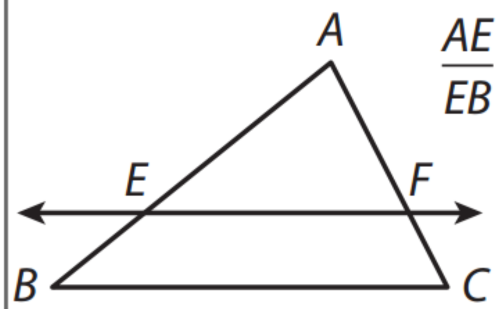
Substitute the lengths.

$$\frac{10}{RN} = \frac{8}{5}$$

Solve for $\overline{RN}$

$$8RN = 50$$

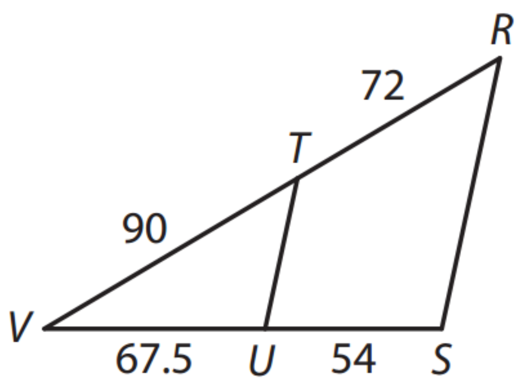
$$RN = \frac{50}{8} = \frac{25}{4} = 6\,\frac{1}{4}$$

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.	 $\frac{AE}{EB} = \frac{AF}{FC}$	$\overleftrightarrow{EF} \parallel \overline{BC}$

(use then you are given a line that cuts two sides proportionally and you want to prove that it is parallel to the third side)

Ex:

Verify that $\overline{TU}$ and $\overline{RS}$ are parallel.



See if the sides are proportional.

$$\frac{VT}{TR} \overset{?}{=} \frac{VU}{US}$$

$$\frac{90}{72} = \frac{67.5}{54}$$

Either check cross products or check if both sides are equal.

4860=4860 or $\frac{5}{4} = \frac{5}{4}$

$\overline{RS} \parallel \overline{TU}$