6.6 Use Proportionality Theorems

Thm 6.4 Triangle Proportionality Theorem
If a line parallel to one side of a triangle intersects the other 2 sides, then
it divides the two sides proportionally

If $TU \parallel QS$, then

\[
\frac{TR}{QT} = \frac{UR}{SU}
\]

Thm 6.5 Converse of the Triangle Proportionality Theorem
If a line divides 2 sides of a triangle proportionally, then it is parallel to the third side.

If $\frac{RT}{QT} = \frac{RU}{SU}$

Hence $TU \parallel QS$
Ex 1  In the diagram, \( \overline{UY} \) is parallel to \( \overline{XV} \), \( UV = 3, UW = 18, \) \( XW = 16 \). What is the length of \( YX? \)

\[
\frac{VW}{UV} = \frac{XW}{YX} \Rightarrow \frac{15}{3} = \frac{16}{X} \Rightarrow 5X = 16 \Rightarrow X = \frac{16}{5} = 3.2
\]

Ex 2  Determine whether \( \overline{PS} \parallel \overline{QR} \).

\[
\frac{RS}{NS} = \frac{40}{72} = \frac{5}{9}
\]

Ex 3: Determine the length of each segment.

a) BC
b) FC
c) GB
d) CD

Homework: Pages 400 – 403  # 1–7, 13, 16, 22
Ex 3: Determine the length of each segment.

a) BC
\[
\frac{AG}{GF} = \frac{AB}{BC}
\]

b) FC
\[
\frac{AE}{FC} = \frac{AE}{ED} = \frac{AF}{FC}
\]

c) GB
\[
\frac{AG}{GB} = \frac{AE}{ED} = \frac{AF}{FC}
\]

d) CD
\[
\frac{GF}{FE} = \frac{BC}{CD}
\]

Ex 4: Find the length of YZ.

Ex 5: Determine whether PS \parallel QR.
6.6 Use Proportionality Theorems Continued

Thm 6.6  If 3 parallel lines intersect 2 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

$$\frac{UW}{WY} = \frac{VX}{XZ}$$

Thm 6.7  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 2 sides.

If $\overrightarrow{CD}$ bisects $\angle ACB$, then,

$$\frac{AD}{DB} = \frac{CA}{CB}$$

Ex 3  Solve for $x$.

$$\frac{9}{8} = \frac{6}{x}$$

$$\frac{6}{9} = \frac{x}{8}$$

$$\frac{2}{3} = \frac{x}{8}$$

$$3x = 16$$

$$x = \frac{16}{3} = \frac{5 \frac{1}{3}}{3}$$
Ex 4  In the diagram, \( \angle LKM \cong \angle MKN \). Find the length of \( MN \).

\[
\frac{LM}{MN} = \frac{KL}{KN}
\]

\[
\frac{15-x}{x} = \frac{3}{17}
\]

\[
3x = 17(15-x)
\]

\[
3x = 255 - 17x
\]

\[
20x = 255
\]

\[
x = 12.75
\]

Ex 5  Find \( x \) and \( y \). \( \overline{FJ} \parallel \overline{GI} \).

\[
\frac{IH}{JI} = \frac{H6}{6H}
\]

\[
\frac{x}{12-x} = \frac{8}{2}
\]

\[
x = 9.6
\]

Ex 6. Find the length of \( AB \).