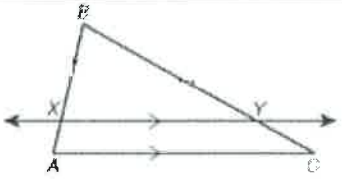
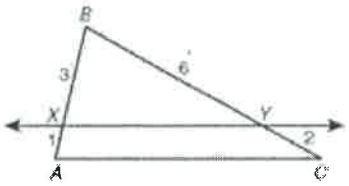
Geometry H
Lesson 6.6: Use Proportionality Theorems

Name: Key
Date: _____ Period: _____

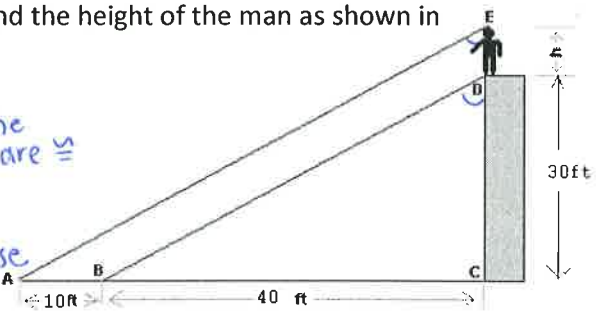
LEARNING TARGETS

- I can use proportions with a triangle or with parallel lines.

Triangle Proportionality Theorem	Example
If a line parallel to one side of a triangle intersects the other two sides, then it divides those sides proportionally.	 $\overline{XY} \parallel \overline{AC}$, so $\frac{BX}{XA} = \frac{BY}{YC}$
Converse of the Triangle Proportionality Theorem	**Example**
If a line divides two sides of a triangle proportionally, then it is parallel to the third side.	 $\frac{3}{1} = \frac{6}{2}$, so $\overleftrightarrow{XY} \parallel \overleftrightarrow{AC}$

✓ **We can use the Triangle Proportionality Theorem to find lengths of segments in triangles.**

1) A building height is 30 ft. A man is standing on the building with a height of *h* ft. The shadow of the building is 40 ft and the shadow of the man is 10 ft. Find the height of the man as shown in the figure.



- Are the triangles similar? Explain.

  Yes, share $\angle C$ and $\angle E \cong \angle D$ since the angles from the shadows are $\cong$

- Can we determine that $\overline{AE} \parallel \overline{BD}$? Explain.

  Yes, suns rays will always make the liner // Since $\angle E \cong \angle D$, $\overline{AE} \parallel \overline{BD}$ by corresponding angles converse

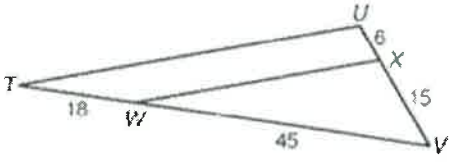
- Find the height of the man.

$\frac{40}{10} = \frac{30}{h} \Rightarrow 40h = 300$

$h = 7.5$ ft or 7 ft 6 in

✓ **We can use the Triangle Proportionality Theorem to determine if lines are parallel.**

2) A surveyor proposes that a walkway be added to a park so that it is parallel to one side of the park ($\overline{TU}$). He draws up the following proposal for the location of the walkway ($\overline{WX}$). Will the two walkways be parallel? Explain.



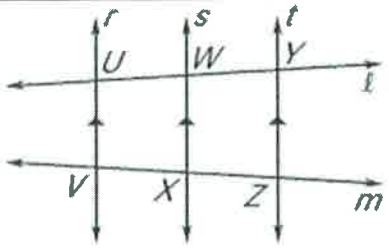
$\frac{VX}{XU} \stackrel{?}{=} \frac{VW}{WT}$

$\frac{16}{6} \stackrel{?}{=} \frac{46}{18}$

$\frac{5}{2} \stackrel{?}{=} \frac{5}{2}$

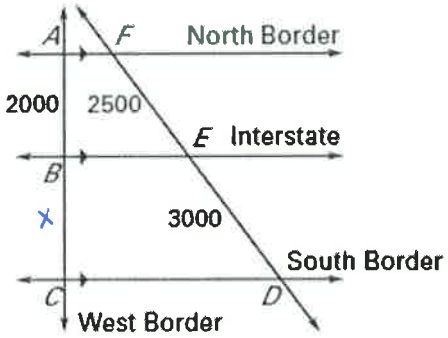
since $\frac{VX}{XU} = \frac{WV}{WT}$

then $\overline{WX} \parallel \overline{TU}$

Two Transversal Proportionality Theorem	Example
If three parallel lines intersect two transversals, then they divide the transversals proportionally.	 If $r \parallel s \parallel t$, then $\frac{UW}{WY} = \frac{VX}{XZ}$

✓ **We can use the Two Transversal Proportionality Theorem to find lengths of segments.**

3) A farmer's land is divided by a newly constructed interstate. The distances shown are in meters. Find the distance *CA* between the north border and the south border of the farmer's land.



$\frac{AB}{BC} = \frac{FE}{ED} \Rightarrow \frac{2000}{x} = \frac{2500}{3000}$

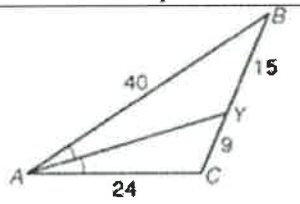
$2500x = 6000000$

$x = 2400$

$BC = 2400$

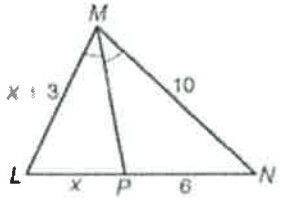
$AC = 2000 + 2400$

$AC = 4400\text{m}$

Triangle Angle Bisector Theorem	Example
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 $\overline{AY}$ bisects $\angle BAC$, then $\frac{BY}{YC} = \frac{AB}{AC}$

✓ **We can use the Triangle Angle Bisector Theorem to find segment lengths.**

4) Find the lengths of *LP* and *LM*.



$\frac{NP}{PL} = \frac{MN}{ML}$

$\frac{6}{x} = \frac{10}{x+3}$

$10x = 6(x+3)$

$10x = 6x + 18$

$4x = 18$

$x = 4.5$

$LP = 4.5$

$LM = 7.5$