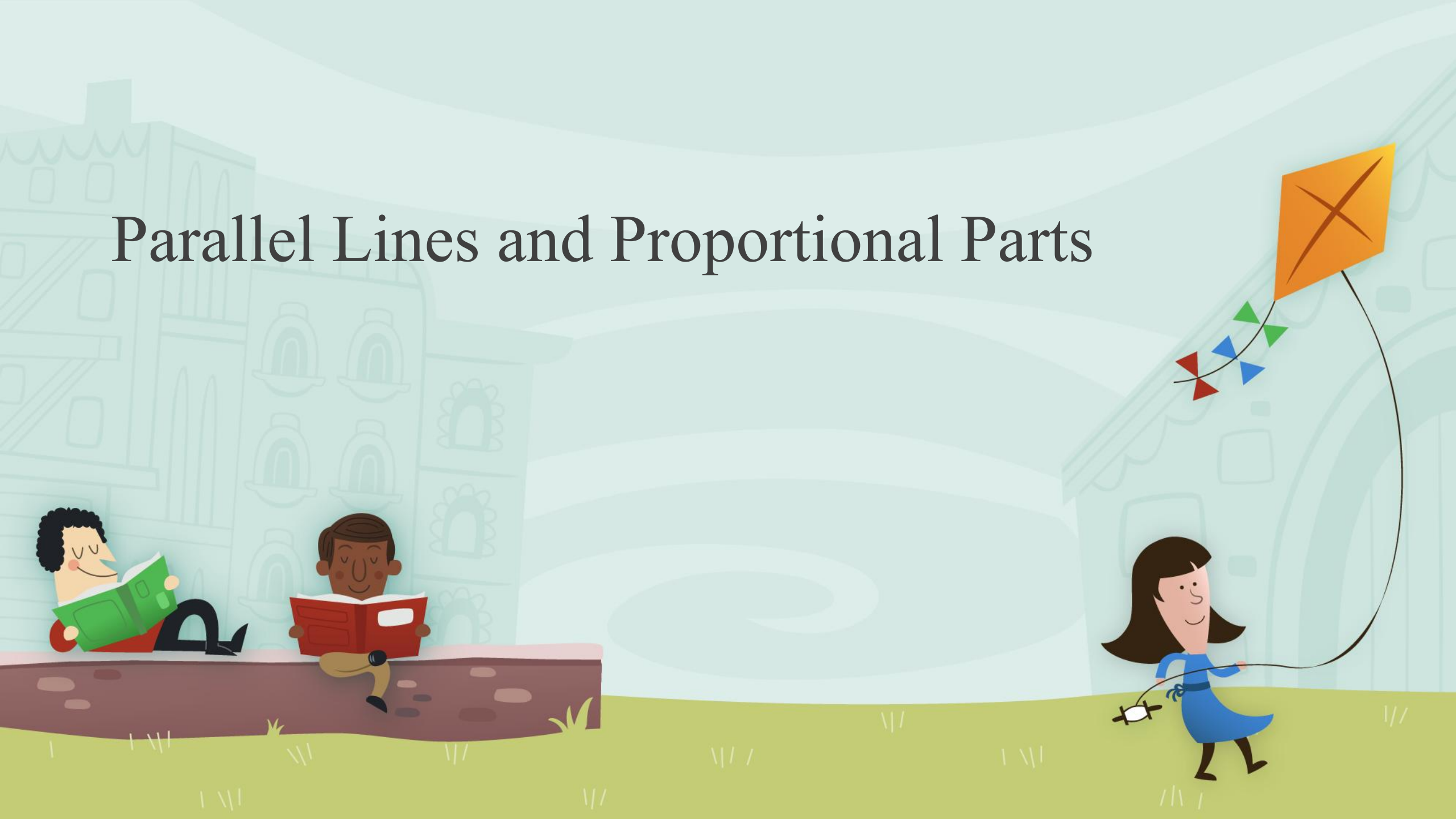
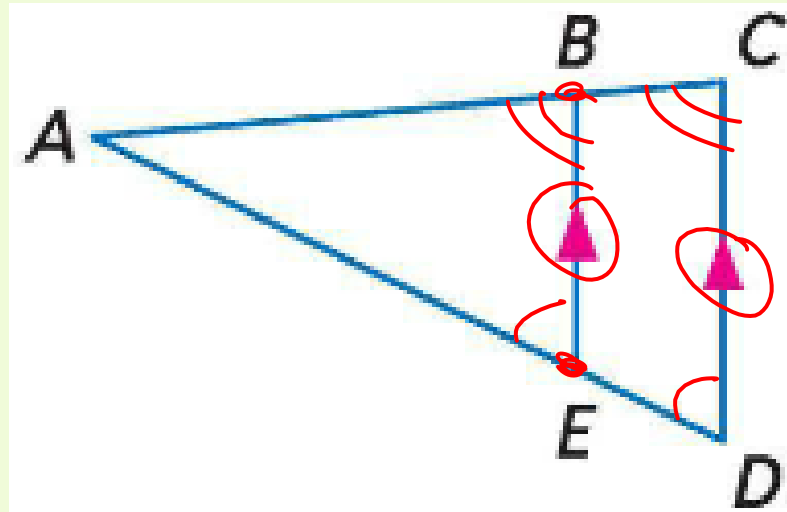


Parallel Lines and Proportional Parts



Triangle Proportionality Theorem

- If a line is parallel to one side of a triangle and intersects the other two sides, then it divides the sides into segments of proportional lengths.

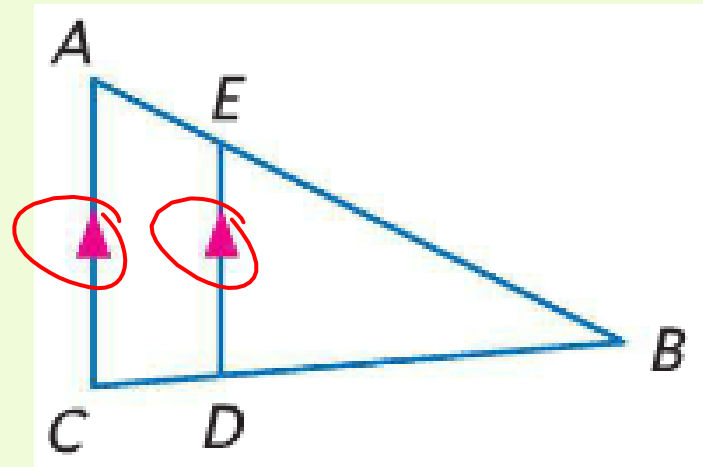


$$\text{If } \overline{BE} \parallel \overline{CD}, \text{ then } \frac{AB}{BC} = \frac{AE}{ED}.$$



Converse of Triangle Proportionality Theorem

- If a line intersects two sides of a triangle and separates the sides into proportional corresponding segments, then the line is parallel to the third side of the triangle.

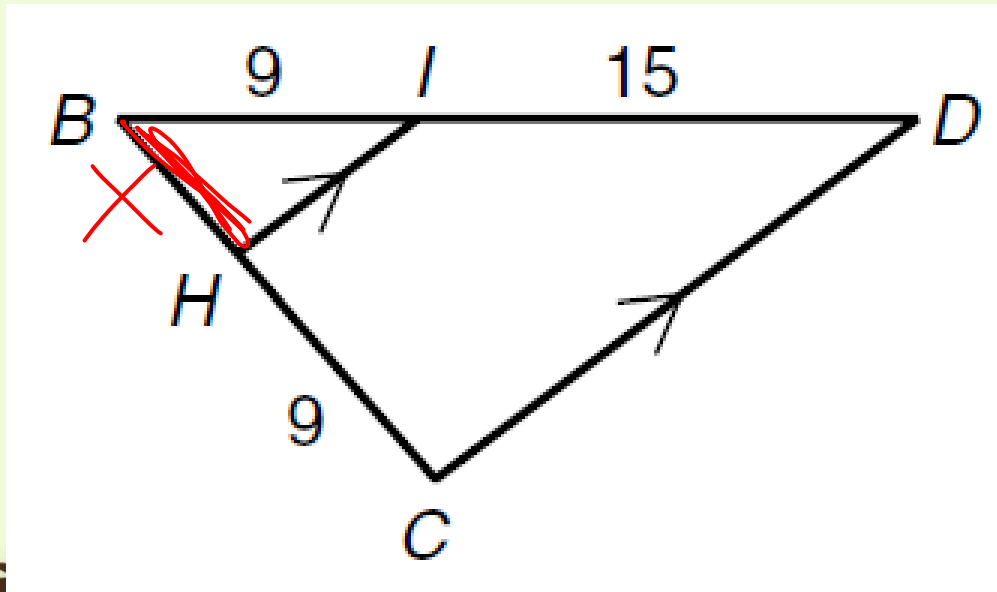


$$\text{If } \frac{AE}{EB} = \frac{CD}{DB}, \text{ then } \overline{AC} \parallel \overline{ED}.$$



Examples

- Find the length of BH.

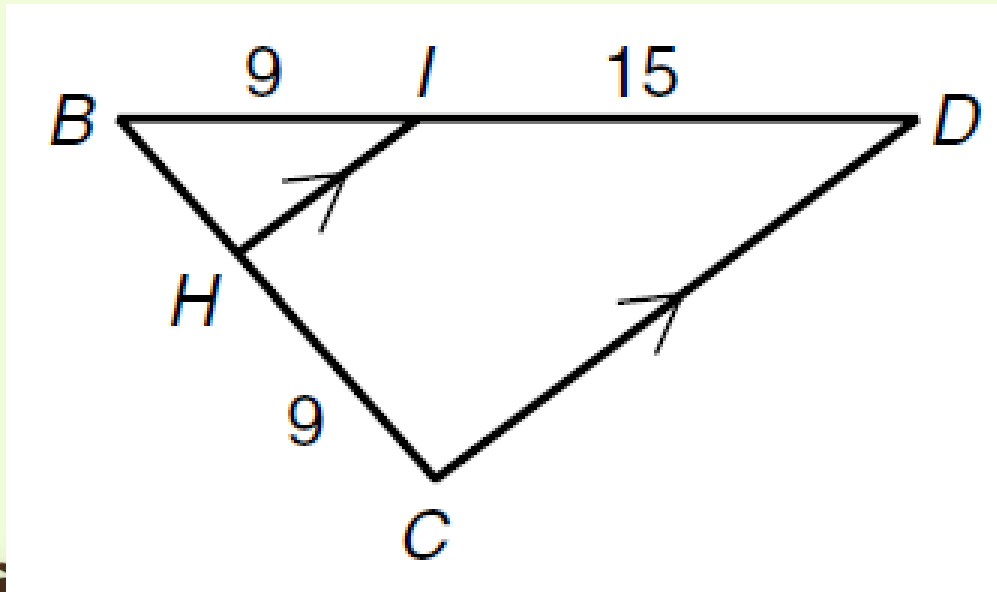


$$\frac{9}{15} = \frac{X}{9}$$
$$\frac{81}{15} = \frac{15X}{15}$$
$$5.4 = X$$



Examples

- Find the length of BH.



$$\frac{x}{9} = \frac{9}{15}$$

$$15x = 81$$

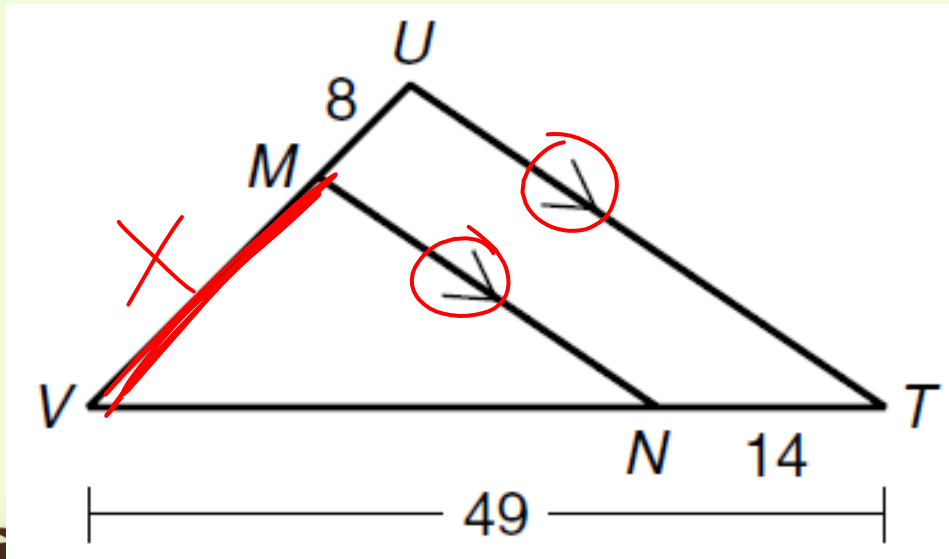
$$x = \frac{81}{15}$$

$$x = 5.4$$



Examples

- Find the length of MV.



$$\frac{X}{8} = \frac{35}{14}$$

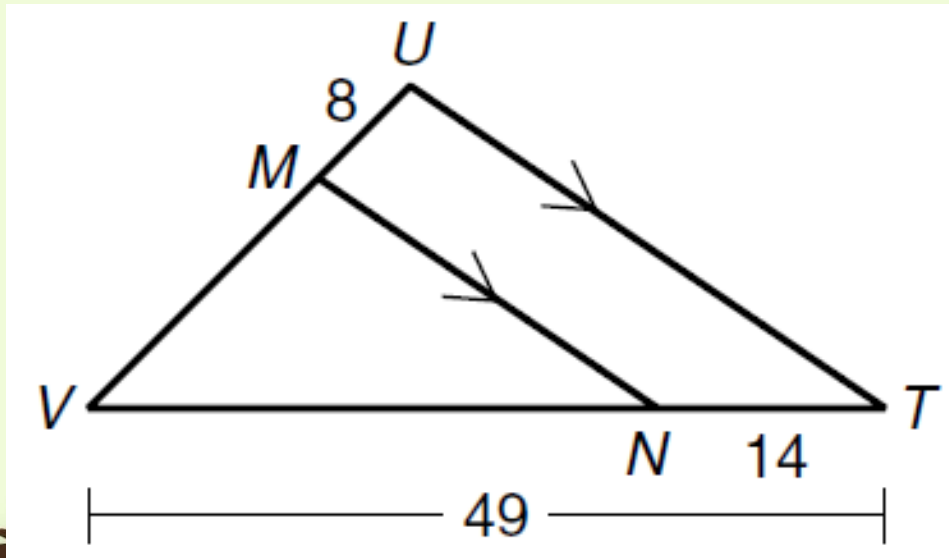
$$\frac{280}{14} = \frac{14X}{14}$$

$$20 = X$$



Examples

- Find the length of MV.



$$\frac{x}{8} = \frac{35}{14}$$

$$14x = 280$$

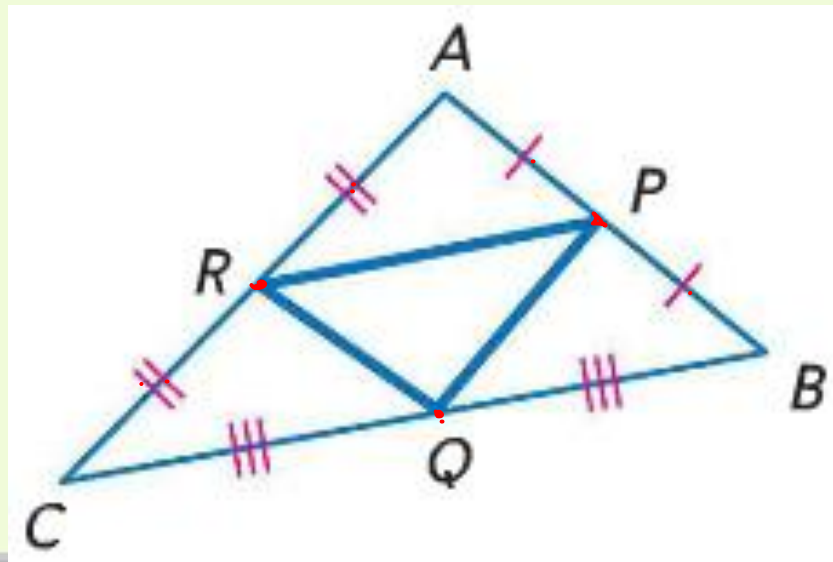
$$x = \frac{280}{14}$$

$$x = 20$$



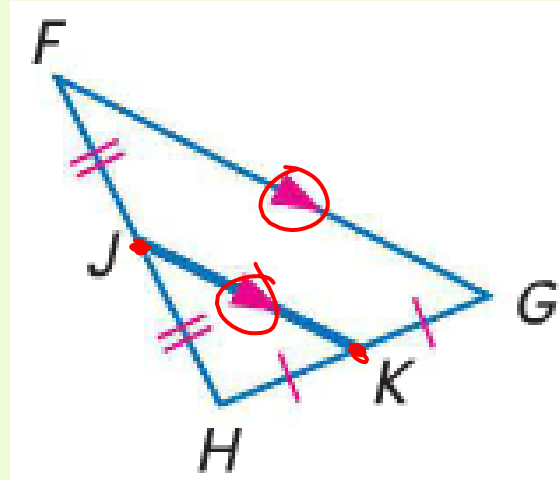
Midsegment

- A midsegment of a triangle is a segment with endpoints that are the midpoints of two sides of the triangle.
- Every triangle has three midsegments.



Triangle Midsegment Theorem

- A midsegment of a triangle is parallel to one side of the triangle, and its length is one half the length of that side.



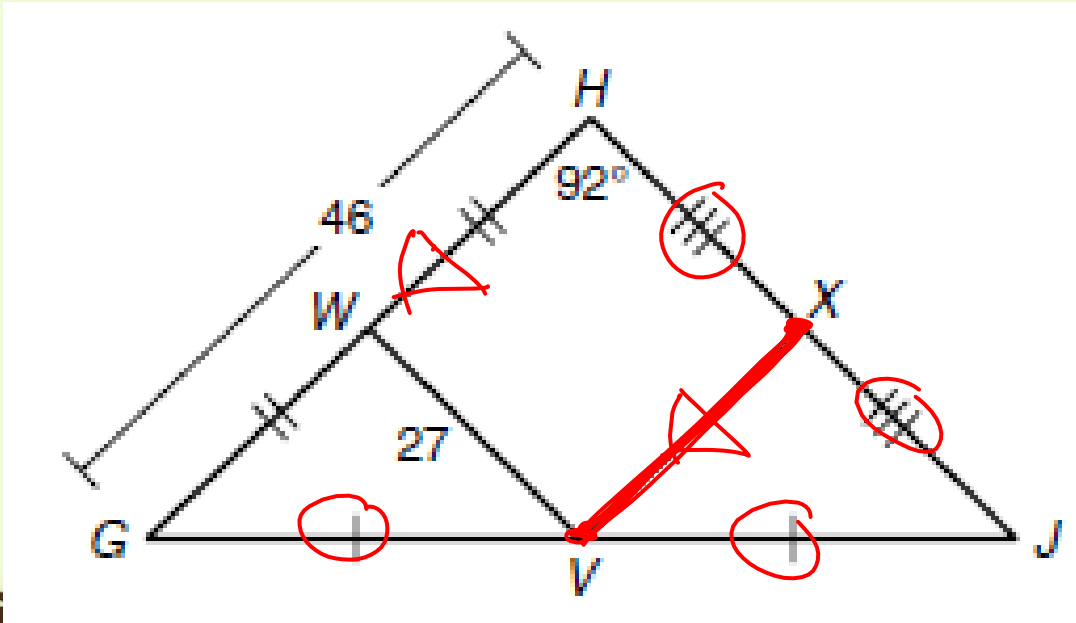
If J and K are midpoints of \overline{FH} and \overline{HG} , respectively, then $\overline{JK} \parallel \overline{FG}$ and $JK = \frac{1}{2}FG$.



Examples

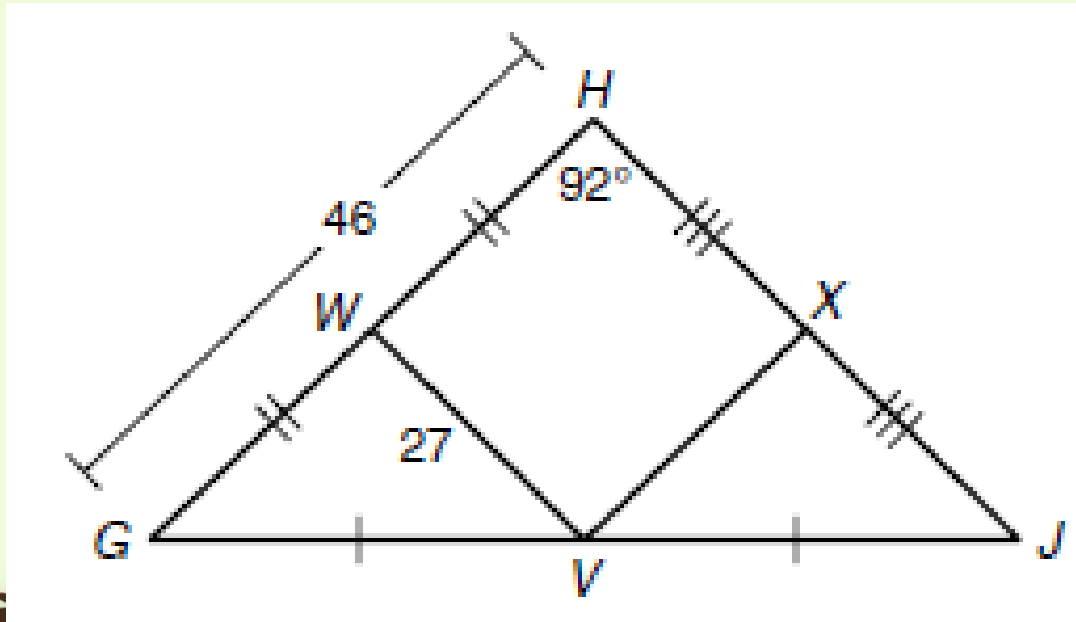
- Find the measure of VX .

$$VX = 23$$



Examples

- Find the measure of VX.



$$VX = \frac{1}{2}GH$$

$$VX = \frac{1}{2}(46)$$

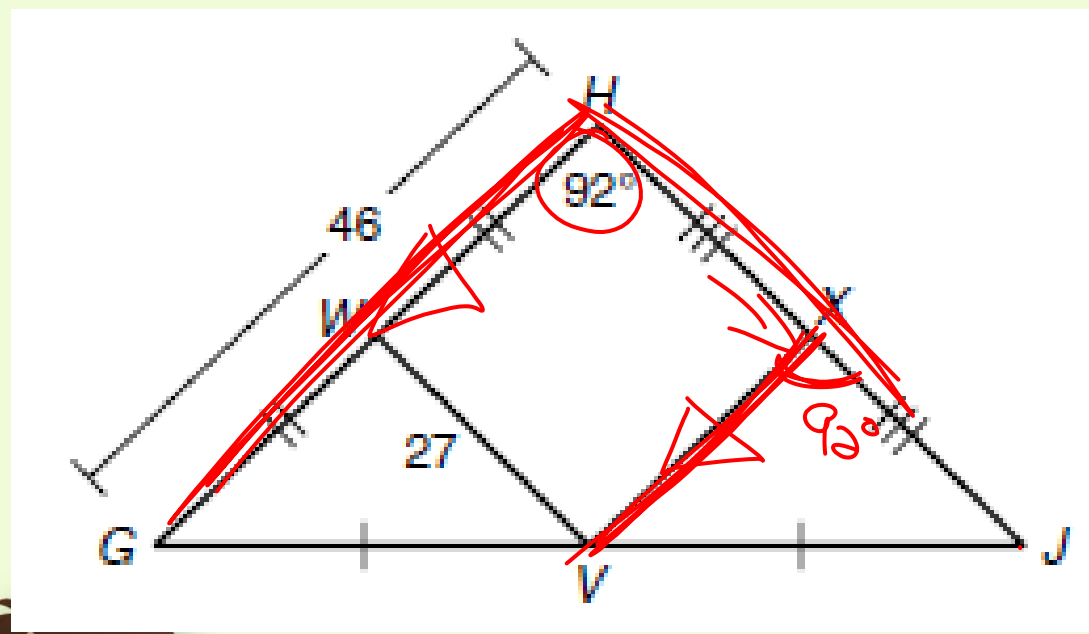
$$VX = 23$$



$$\angle VXJ = 92$$

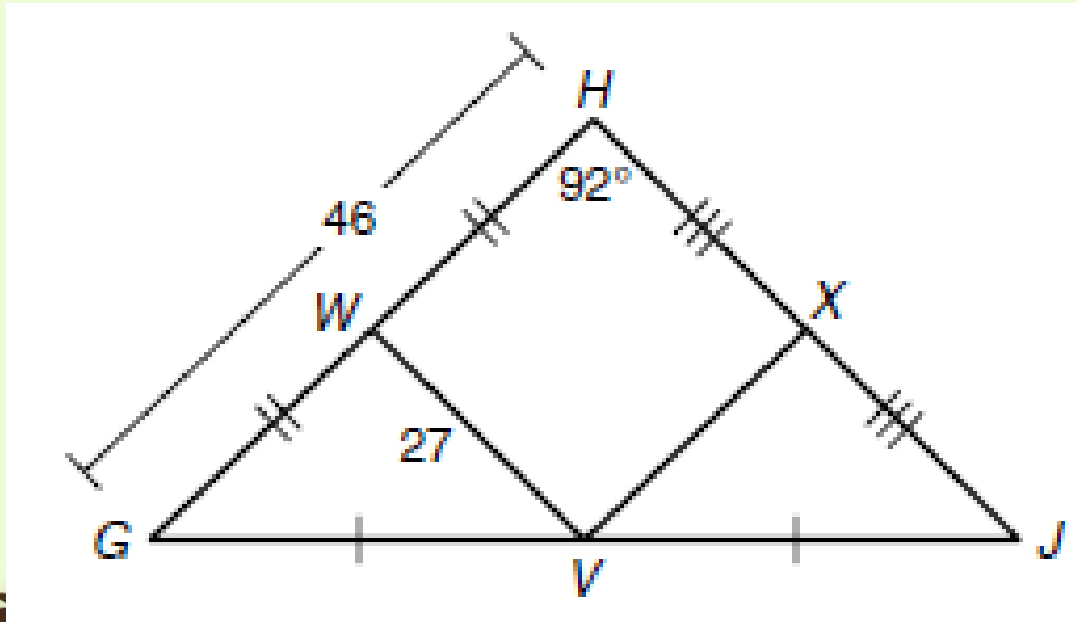
Examples

- Find the measure of $m\angle VXJ$.



Examples

- Find the measure of $m\angle VXJ$.

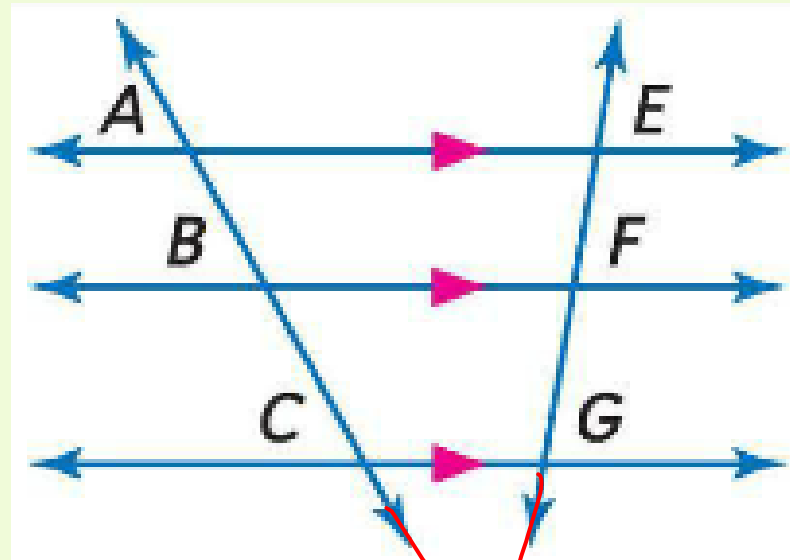


Since midsegments are parallel to the sides of the triangle, then $m\angle VXJ$ has to be equal to $m\angle WHX$ since they are corresponding angles.



Proportional Parts of Parallel Lines

- If three or more parallel lines intersect two transversals, then they cut off the transversals proportionally.

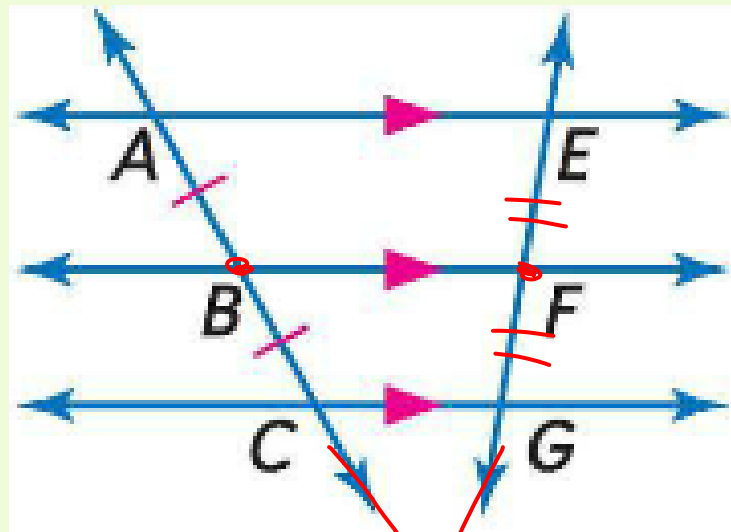


$$\text{If } \overline{AE} \parallel \overline{BF} \parallel \overline{CG}, \text{ then } \frac{AB}{BC} = \frac{EF}{FG}$$



Congruent Parts of Parallel Lines

- If three or more parallel lines cut off congruent segments on one transversal, then they cut off congruent segments on every transversal.

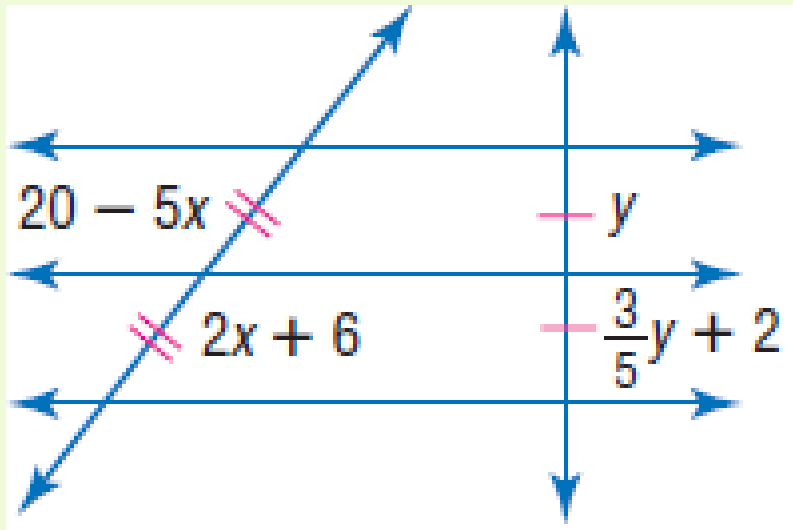


If $\overline{AE} \parallel \overline{BF} \parallel \overline{CG}$, and $\overline{AB} \cong \overline{BC}$,
then $\overline{EF} \cong \overline{FG}$.



Examples

- Find x and y.



$$\begin{aligned} 20 - 5x &= 2x + 6 \\ + 5x &+ 5x \end{aligned}$$

$$\begin{aligned} 20 &= 7x + 6 \\ - 6 &- 6 \end{aligned}$$

$$\frac{14}{7} = \frac{7x}{7}$$

$$2 = x$$

$$5 \left[y = \frac{3}{5}y + 2 \right]$$

$$\begin{aligned} 5y &= \frac{3}{5}y + 10 \\ - \frac{3}{5}y &- \frac{3}{5}y \end{aligned}$$

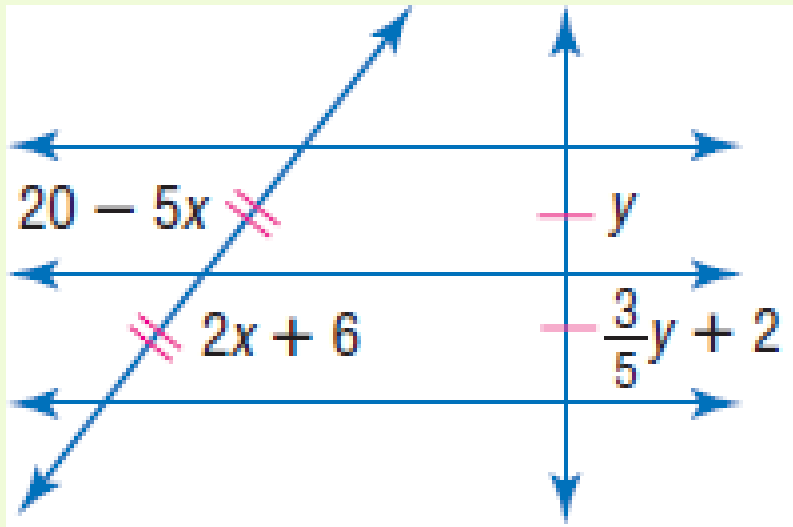
$$\frac{2y}{2} = \frac{10}{2}$$

$$y = 5$$



Examples

- Find x and y .



Since the segments are congruent, simply set them equal to each other.

$$20 - 5x = 2x + 6$$

$$y = \frac{3}{5}y + 2$$

$$14 = 7x$$

$$\frac{2}{5}y = 2$$

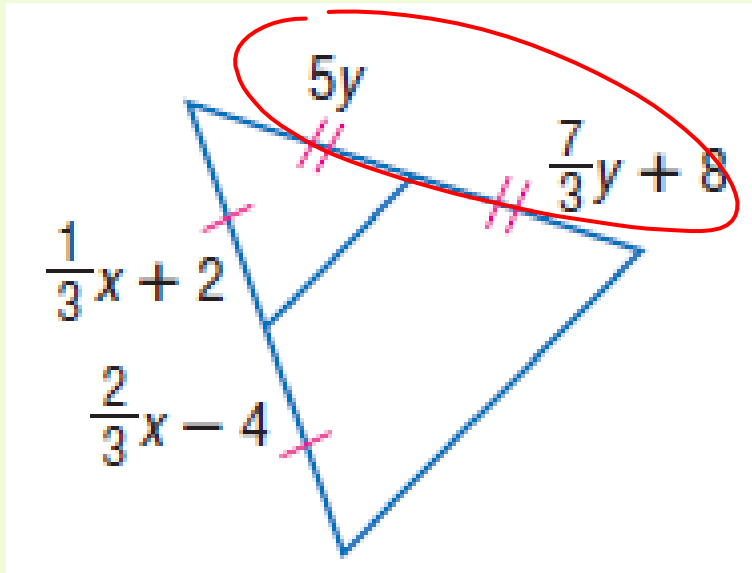
$$2 = x$$

$$y = 5$$



Examples

- Find x and y .

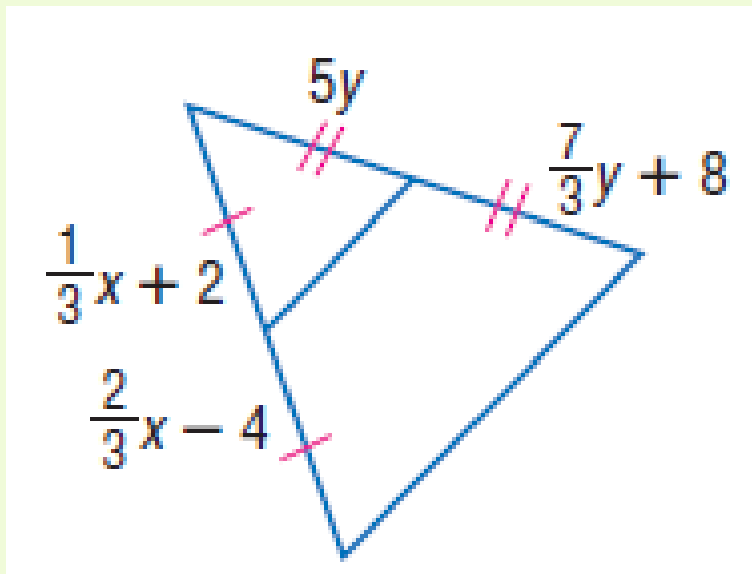


$$3 \left[5y = \frac{7}{3}y + 8 \right] \quad \left[\frac{1}{3}x + 2 = \frac{2}{3}x - 4 \right] 3$$
$$15y = 7y + 24$$
$$-7y \quad +7y$$
$$\frac{8y}{8} = \frac{24}{8}$$
$$y = 3$$
$$x + 6 = 2x - 12$$
$$-x + 12 - x + 12$$
$$18 = x$$



Examples

Find x and y.



Since the segments are congruent, simply set them equal to each other.

$$\frac{1}{3}x + 2 = \frac{2}{3}x - 4$$

$$5y = \frac{7}{3}y + 8$$

$$6 = \frac{1}{3}x$$

$$\frac{8}{3}y = 8$$

$$18 = x$$

$$y = 3$$

