Lesson 8-5: Proportions in Triangles

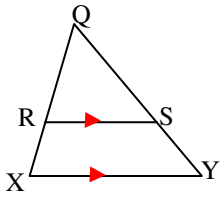
Generalizing the triangle midsegment theorem

Do you remember the triangle midsegment theorem? It says that if a segment bisects two legs of a triangle it is parallel to the third leg and ½ its length. What would happen if that segment was parallel to the third leg but didn't bisect the other two?

Theorem 8-4 Side-Splitter Theorem

If a line (or segment) is parallel to a leg of the triangle and intersects the other two legs, it divides the other legs proportionally.

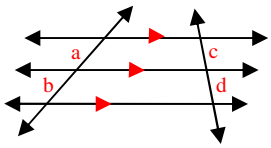
If $\overline{RS} \parallel \overline{XY}$ then $\frac{XR}{RQ} = \frac{YS}{SQ}$



Corollary to Theorem 8-4

If three parallel lines intersect two transversals, then the transversal segments formed by the intersecting parallel lines are proportional.

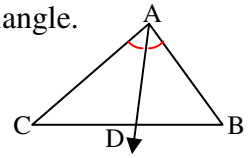
$\frac{a}{b} = \frac{c}{d}$



Theorem 8-5 Triangle-Angle-Bisector Theorem

If a ray bisects an angle of a triangle, then it divides the opposite side into two segments that are proportional to the other two sides of the triangle.

If $\overrightarrow{AD}$ bisects $\angle CAB$ then $\frac{CD}{DB} = \frac{CA}{BA}$

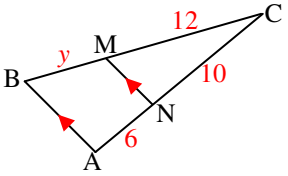


Examples

1. Find y.

   Using the side-splitter theorem we can say:

   $\frac{BM}{MC} = \frac{AN}{NC}; \frac{y}{12} = \frac{6}{10}; y = \frac{12 \cdot 6}{10} = \frac{36}{5} = 7.2$

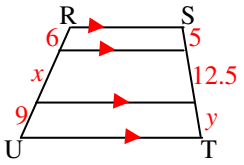


2. Solve for x and y.

   Given the multiple parallel lines, we'll use the Corollary to the Side-Splitter Theorem:

   $\frac{x}{6} = \frac{12.5}{5}; x = \frac{6 \cdot 12.5}{5} = \frac{75}{5} = 15$

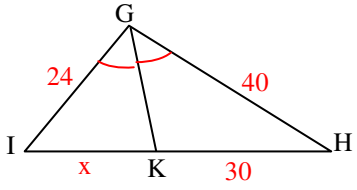
   $\frac{y}{12.5} = \frac{9}{x} = \frac{9}{15} = \frac{3}{5}; y = \frac{12.5 \cdot 3}{5} = \frac{37.5}{5} = 7.5$



3. Find the value of x.

   Applying the triangle-angle-bisector theorem we have:

   $\frac{x}{24} = \frac{30}{40} = \frac{3}{4}; x = \frac{24 \cdot 3}{4} = 18$



Homework Assignment

Pg 448 - #1-16, 25-27, 29, 31-33, 36, 48-50