Math 9 Date: ________________

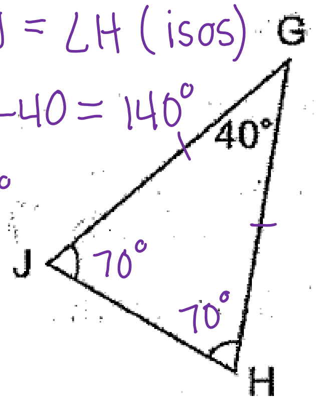
Section 8.4: Similar Triangles

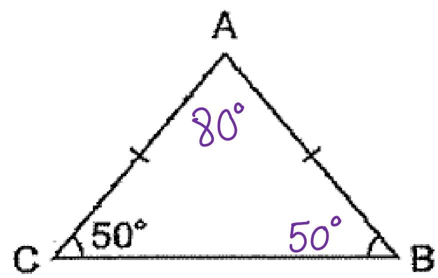
In any triangle, the sum of the angle measures is __180°__. So, to find the measure of any unknown angle start with 180° and __subtract__ the known measures.

$\angle J = \angle H$ (isos)

$180 - 40 = 140°$

$140 \div 2 = 70°$





$\angle A = 180 - 50 - 50$

$\angle A = 80°$

Properties of Similar Triangles

Triangles are a special type of polygon. Two triangles are similar when:

- the measures of the corresponding angles __are equal__; **OR**
- the ratios of the lengths of corresponding sides __are equal__.

The order in which similar triangles are named gives us information on the triangles.

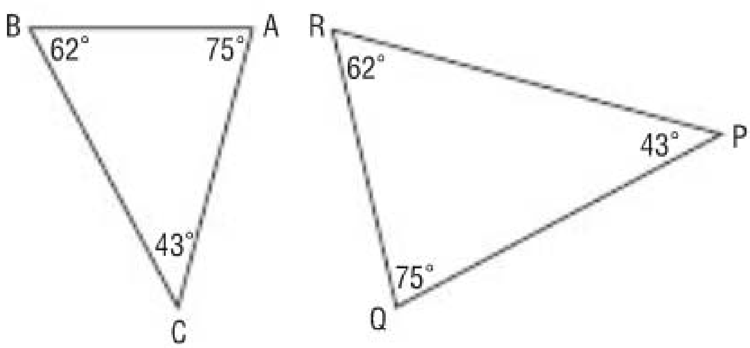
(The symbol Δ means triangle and the symbol ~ means similar to)

For example, **ΔABC ~ ΔQRP**

angles: $\angle A = \angle Q = 75°$

$\angle B = \angle R = 62°$

$\angle C = \angle P = 43°$



line segments:

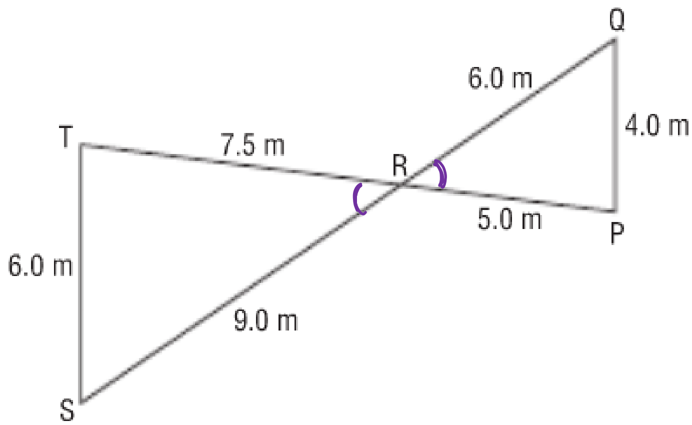
AB matches QR

BC matches RP

AC matches QP

Example 1

Identify the similar triangles. Justify your answers.



$\triangle TSR \sim \triangle PQR$

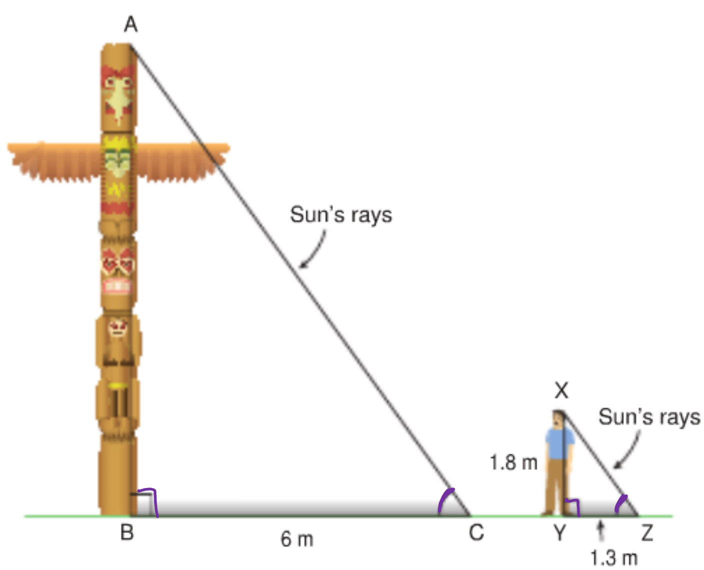
$\frac{TS}{PQ} = \frac{6}{4} = \frac{3}{2}$

$\frac{TR}{PR} = \frac{7.5 \div 2.5}{5 \div 2.5} = \frac{3}{2}$

$\frac{SR}{QR} = \frac{9}{6} = \frac{3}{2}$

Example 2

At a certain time of the day, a person who is 1.8 m tall has a shadow 1.3 m long. At the same time, a shadow of a totem pole is 6 m long. The sun's rays intersect the ground at equal angles. How tall is the totem pole to the nearest tenth of a meter?



$\triangle ABC \sim \triangle XYZ$

$\angle B = \angle Y = 90°$

$\angle C = \angle Z$

$\angle A = \angle X$

Solve for AB:

$SF = \frac{BC}{YZ} = \frac{6}{1.3}$

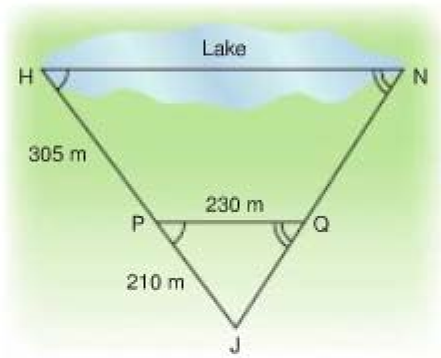
$\frac{6}{1.3} = \frac{AB}{XY}$

$\frac{6}{1.3} = \frac{AB}{1.8}$

$\boxed{AB = 8.3m}$

Example 3

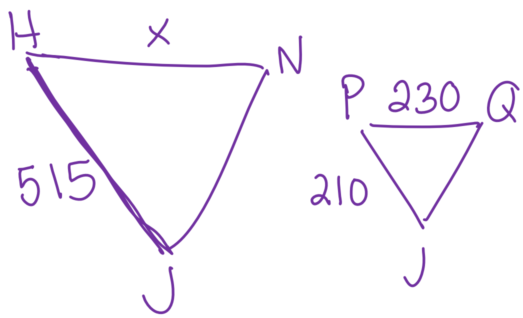
A surveyor wants to determine the width of a lake at two points on opposite sides of the lake. She measures distances and angles on land, and then sketches this diagram. How can the surveyor determine the length of HN to the nearest meter?



$\Delta HNJ \sim \Delta PQJ$

$\angle J$ is the common angle.

$305 + 210 = 515$

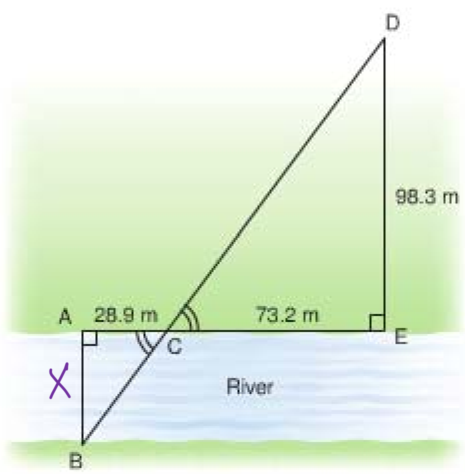


$SF = \frac{HJ}{PJ} = \frac{515}{210}$

$SF = \frac{HN}{PQ}$ $\quad \frac{515}{210} = \frac{HN}{230}$ $\quad \boxed{HN = 564 \text{ m}}$

Example 4

A surveyor used this scale diagram to determine the width of a river. The measurements he made and the equal angles are shown. What is the width, AB, to the nearest tenth of a meter?



$\angle A = \angle E = 90^\circ$

$\angle C$ is the common angle

$\angle B = \angle D$

$\Delta ABC \sim \Delta EDC$

$SF = \frac{AC}{CE} = \frac{28.9}{73.2}$

$SF = \frac{AB}{DE}$ $\quad \frac{28.9}{73.2} = \frac{AB}{98.3}$

Marsh $\quad$ pg 349 # 4-7, 9-12.

$\boxed{AB = 38.8 \text{ m}}$