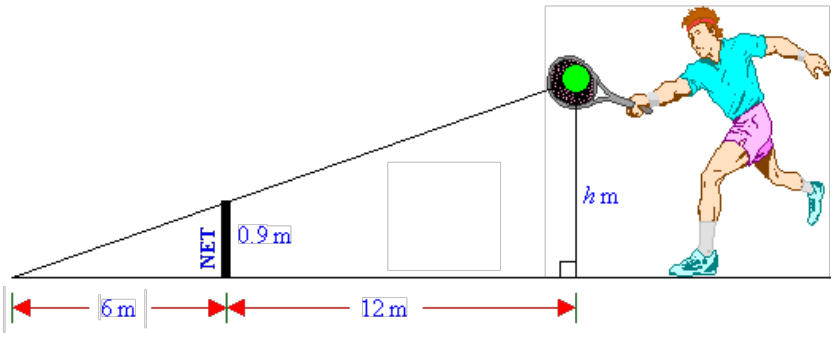
Chapter 9 Similar Triangles (2)

Application

Example 1: Find the value of the height, *h* m, in the following diagram at which the tennis ball must be hit so that it will just pass over the net and land 6 metres away from the base of the net.



Solution:

ΔADE and ΔABC are similar as they are equiangular.

$$\therefore \frac{h}{0.9} = \frac{18}{6}$$

$$\frac{h}{0.9} = 3 \qquad \text{(Multiply both sides by 0.9)}$$

$$0.9 \times \frac{h}{0.9} = 0.9 \times 3$$

$$h = 2.7$$

So, the height at which the ball should be hit is 2.7 m.

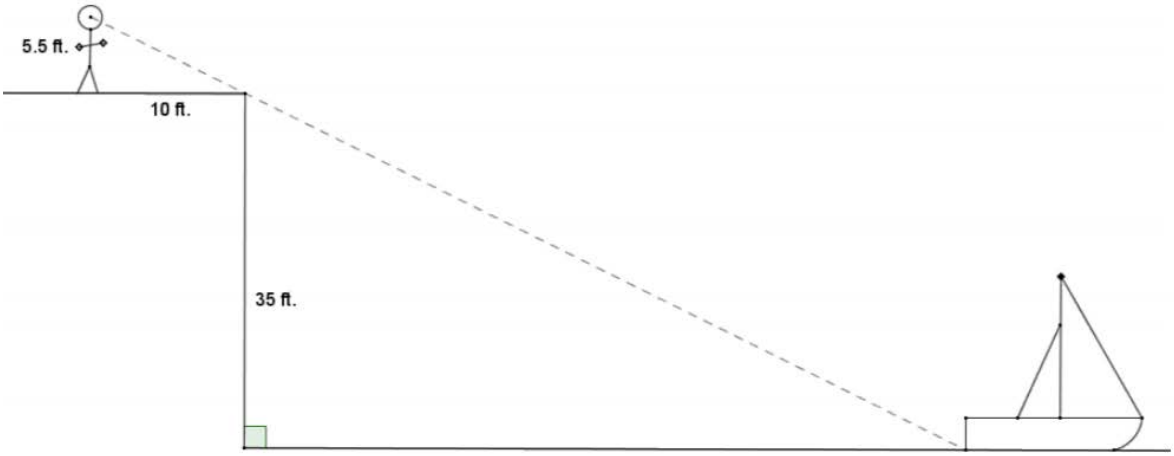
Example 2: Catarina's boat has come untied and floated away on the lake. She is standing on top of a cliff that is 35 feet above the water in a lake. If she stands 10 feet from the edge of the cliff, she can visually align the top of the cliff with the water at the back of her boat. Her eye level is 5½ feet above the ground. Approximately how far out from the cliff is Catarina's boat?

Solution:
The triangles are similar by AA~.
Let x be the distance.

$$\frac{5.5}{10} = \frac{35}{x}$$

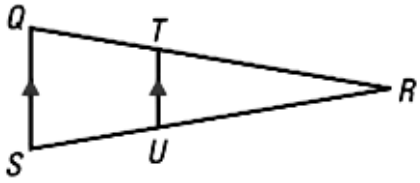
$5.5x = 350$

x = 63.64



Theorem 1: Triangle Proportionality Theorem

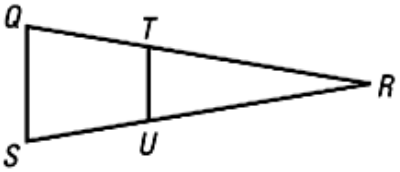
If a line parallel to one side of a triangle intersects the other two sides, then it divides the two sides proportionally.



If $\overline{TU} \parallel \overline{QS}$, then $\frac{RT}{TQ} = \frac{RU}{US}$.

Theorem 2: Converse of the Triangle Proportionality Theorem

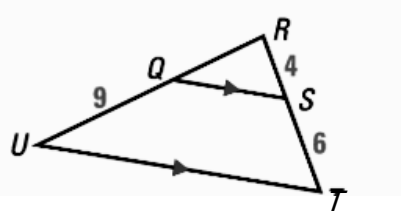
If a line divides two sides of a triangle proportionally, then it is parallel to the third side.



If $\frac{RT}{TQ} = \frac{RU}{US}$, then $\overline{TU} \parallel \overline{QS}$.

Example:

1) In the diagram, $\overline{QS} \parallel \overline{UT}$, RS = 4, ST = 6, and QU = 9. What is the length of $\overline{RQ}$?



Solution:

Since $\overline{QS} \parallel \overline{UT}$

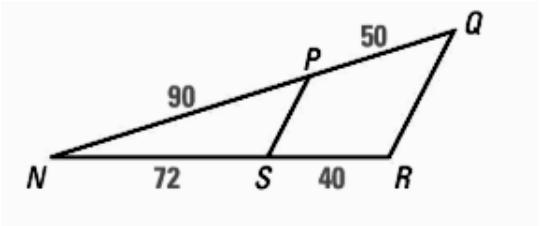
$\frac{RQ}{QU} = \frac{RS}{ST}$ by Triangle Proportionality Theorem

$\frac{RQ}{9} = \frac{4}{6}$

$6RQ = 36$

RQ = 6

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



Solution:

$\frac{90}{50} = \frac{9}{5}$ and $\frac{72}{40} = \frac{9}{5}$

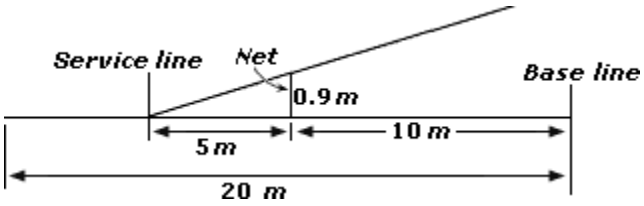
Since $\frac{NP}{PQ} = \frac{NS}{SR}$

$\overline{PS} \parallel \overline{QR}$. By Converse of the Triangle Proportionality Theorem

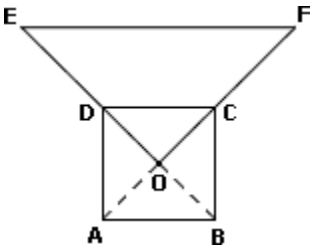
Class Practice:

1. D is a point on side BC of ΔABC such that $m\angle ADC = m\angle BAC$. If CA = 20 cm and CB = 25 cm, then what is the length of CD?

2. On a given tennis court, the distance between the base line and the net is 10 m and the distance between the service line and the net is 5 m. The net is 0.9 m high. A player serves the ball directly above the base line. (Assume the ball travels in a straight line.) What is the minimum height that the ball can be hit at so as to ensure the ball lands in the service area?



3. ABCD is a square with each side 2 cm long. BD and AC are extended to E and F such that EF|| DC. EF = 8 cm. Find the area of CDEF.



4. Determine the length of each segment.

1) $\overline{AG}$ 2) $\overline{FC}$

3) $\overline{ED}$ 4) $\overline{AE}$