Applying the Trig Ratios and Solving Triangles

When we calculate the measures of all the angles and all the lengths in a right triangle, we **solve the triangle**.

A. Methods of Solving Right Triangles

- Trigonometry SOH CAH TOA
- Pythagorean Theorem $a^2 + b^2 = c^2$
- Sum of Angles in a Triangle (180° Rule)

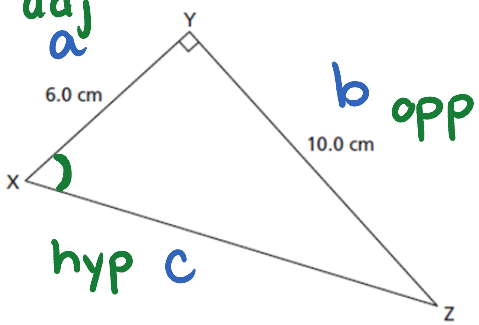
B. Solving a Right Triangle

Steps:

1) Sketch and label triangle.
2) Fill in known values.
3) Write a list of missing values.
4) Solve for missing side.
   a) Trig for missing side.
   b) Pythagoras for third side.
5) Solve for missing angle.
   a) First angle always 90°.
   b) 180° Rule for third angle.

Examples: Solve the following right triangles, sides to a tenth and angles to nearest degree.

1)



XZ: $a^2 + b^2 = c^2$

$6.0^2 + 10.0^2 = c^2$

$36 + 100 = c^2$

$136 = c^2$ $c = \sqrt{136} = 11.7$ cm

LX: $\tan X = \frac{10.0}{6.0}$ $X = \tan^{-1}\left(\frac{10.0}{6.0}\right)$

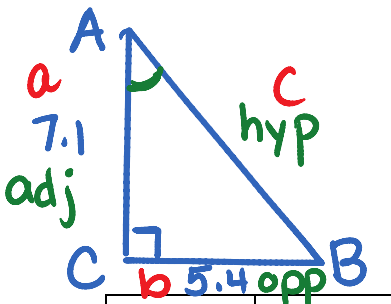
$X = 59°$

LZ: $180 - 90 - 59 = 31°$

XZ	11.7 cm
LX	59°
LZ	31°

triangle

2) In ΔABC, ∠C = 90°, BC = 5.4 and AC = 7.1. Solve ΔABC.



AB	8.9
∠A	37°
∠B	53°

$\angle A: \tan A = \frac{5.4}{7.1}$

$A = \tan^{-1}\left(\frac{5.4}{7.1}\right) = 37°$

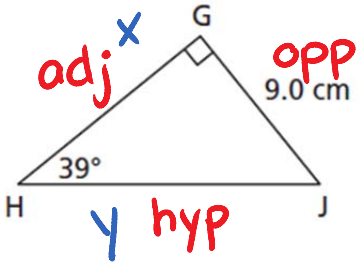
$\angle B: 180 - 90 - 37 = 53°$

$AB: a^2 + b^2 = c^2$

$7.1^2 + 5.4^2 = c^2$

$AB = 8.9$

3)



$\angle J = 180 - 90 - 39$

$GH: \tan 39 = \frac{9.0}{x}$

$x = \frac{9.0}{\tan 39}$

$GH = x = 11.1 \text{ cm}$

GH	11.1 cm
HJ	14.3 cm
∠J	51°

$HJ: \sin 39 = \frac{9.0}{y}$

$HJ = y = 14.3 \text{ cm}$

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