Review of 2D Right-Angle Trigonometry

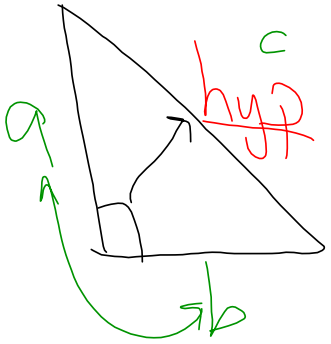
MCR 3U

Review of Pythagorean Theorem

- Pythagorean Theorem is used when there are two known side lengths of a right-angled triangle, and you are solving for the third side length.

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

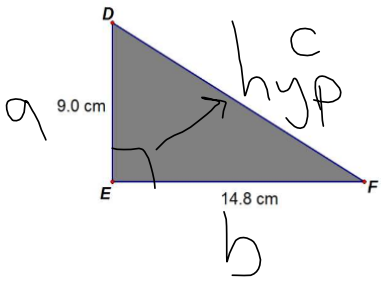
- Where:
  - Side length a and b represent the smaller side lengths of the triangle.
  - Side length c represent the hypotenuse (the longest side length).
  - The hypotenuse is ALWAYS across from the right angle in the triangle.



Example

Solve for the unknown side length.

a)



a
c
hyp
b

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

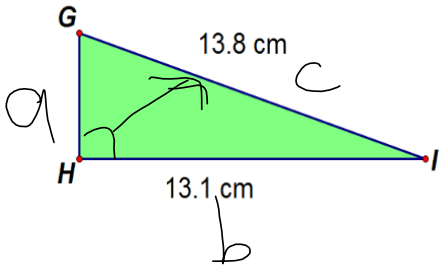
$(9.0)^2+(14.8)^2=c^2$

$300.04=c^2$

$\sqrt{300.04}=\sqrt{c^2}$

$c=17.32\text{ cm}$

b)



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

$a^2 + (13.1)^2 = (13.8)^2$

$a^2 + 171.61 = 190.44$

$\sqrt{a^2} = \sqrt{18.83}$

$a = 4.34$ cm

Review of Primary Trigonometric Ratios

- What are the three trig ratios that we know???
  - Sine
  - Cosine
  - Tangent
- For every angle in a right angled triangle, there is a **hypotenuse**, an **adjacent** side length, and an **opposite** side length.

Reciprocal Trigonometric Ratios

- What is the parent function for a reciprocal?

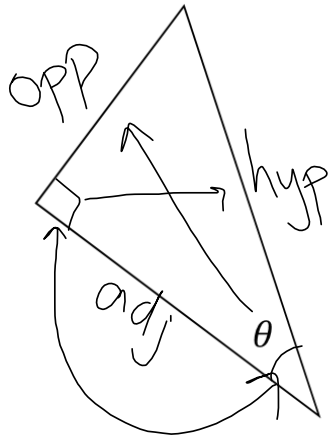
$f(x) = \frac{1}{x}$

- Reciprocal trig ratios just means we flip the ratio and put it in the denominator.

$\underline{csc\theta} = \frac{1}{sin\theta}$ Cosecant $\quad \underline{sec\theta} = \frac{1}{cos\theta}$ Secant $\quad \underline{cot\theta} = \frac{1}{tan\theta}$ Cotangent

Example 2

Label the following triangle by its hypotenuse, adjacent and opposite sides given the marked angle.



NOTE:

- Using the acronym SOH CAH TOA (from grade 10) can be useful to solve problems related to right-angled trigonometry.

$\sin\theta = \frac{opp}{hyp}$

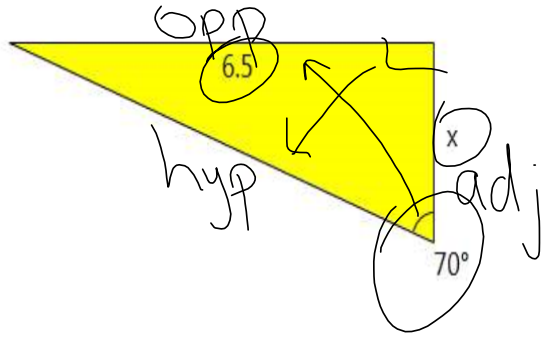
$\cos\theta = \frac{adj}{hyp}$

$\tan\theta = \frac{opp}{adj}$

Example 3

- Solve for the unknown variable:

a)



SOH CAH TOA

opp
hyp
adj

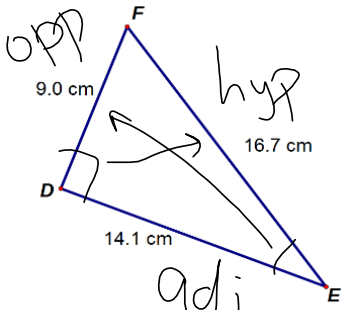
$\tan\theta = \frac{opp}{adj}$

$x(\tan 70^\circ) = \left(\frac{6.5}{x}\right)x$

$\frac{x\tan 70^\circ}{\tan 70^\circ} = \frac{6.5}{\tan 70^\circ}$

$x \doteq 2.37$ units

b) Write ALL six trig ratios first for angle E, then solve for angle E.



opp

hyp

adj

$\sin E = \frac{9.0}{16.7}$ $\quad \csc E = \frac{16.7}{9.0}$

$\cos E = \frac{14.1}{16.7}$ $\quad \sec E = \frac{16.7}{14.1}$

$\tan E = \frac{9.0}{14.1}$ $\quad \cot E = \frac{14.1}{9.0}$

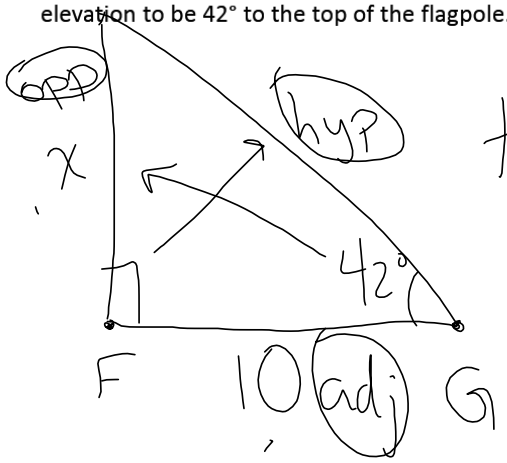
$\cos E = \frac{14.1}{16.7}$

$\cos E = 0.84$

$E = \cos^{-1}(0.84)$ $\quad E = 32.86°$

Example 4

- George is standing 10m away from a flagpole. As he looks up, George measures his angle of elevation to be 42° to the top of the flagpole. How tall is the flagpole?



$\tan 42° = \frac{x}{10}$

$x = 10 \tan 42°$

$x = 9.00\text{m}$

Homework

- Finish prerequisite skills as much as you can!
- Section 4.4, Page 255, #1a,2a,3,4 (try to solve at least one of these using a reciprocal trig ratio).

p. 220 #3-5, 7, 8-12