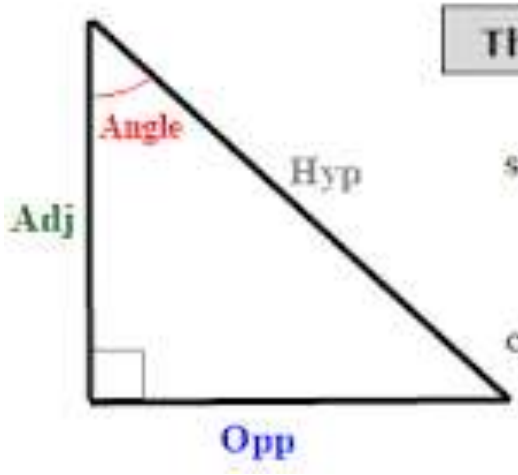
14.3 Right Triangles and Trig Ratios **Algebra 2** **THOMPSON**



The Six Trigonometric Functions

$\sin A = \frac{opp}{hyp}$ $\cos A = \frac{adj}{hyp}$ $\tan A = \frac{opp}{adj}$

$\csc A = \frac{hyp}{opp}$ $\sec A = \frac{hyp}{adj}$ $\cot A = \frac{adj}{opp}$

* flip sin *flip cos *flip tan

1) Find the values of the six trigonometric functions for the angle in standard position determined by the point $(-5, -12)$.

* plot the point (-5,-12)

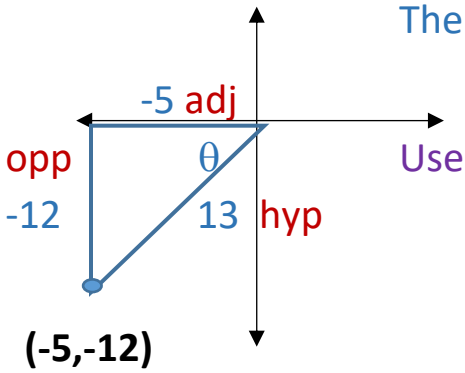
The -5 is the horizontal and the -12 is the vertical

the angle is always at the origin **labeled** θ

Use Pythagorean theorem to find the hypotenuse

$a^2 + b^2 = c^2$ $(-5)^2 + (-12)^2 = x^2$

$169 = x^2$ then $x = 13$



(-5,-12)

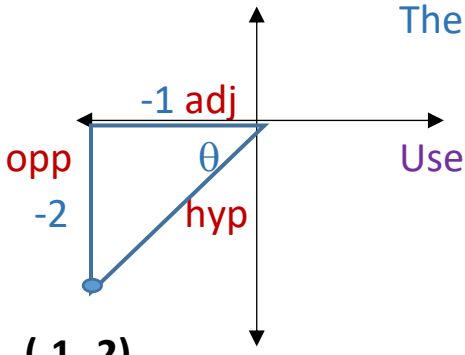
Sin = $\frac{opp}{hyp} = \frac{-12}{13}$ Cos = $\frac{adj}{hyp} = \frac{-5}{13}$ Tan = $\frac{opp}{adj} = \frac{12}{5}$

Csc = flip sin = $\frac{13}{-12}$ Cos = flip cos = $\frac{13}{-5}$ Tan = flip tan = $\frac{5}{12}$

2) Find the values of the six trigonometric functions for the angle in standard position determined by the point $(-1,-2)$.

* plot the point (-1,-2)

The -1 is the horizontal and the -2 is the vertical



the angle is always at the origin **labeled θ**

Use Pythagorean theorem to find the hypotenuse

$a^2 + b^2 = c^2$ $\quad (-1)^2 + (-2)^2 = x^2$

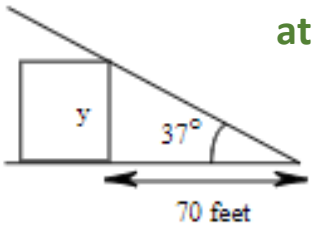
$146 = x^2$ $\quad$ then $x = \sqrt{5}$

Sin θ= $\frac{opp}{hyp} = \frac{-2}{\sqrt{5}}$ $\quad$ Cos θ= $\frac{adj}{hyp} = \frac{-1}{\sqrt{5}}$ $\quad$ Tan = $\frac{opp}{adj} = \frac{2}{1} = 2$

Csc = flip sin= $\frac{\sqrt{5}}{-2}$ $\quad$ Sec = flip cos = $\frac{\sqrt{5}}{-1}$ $\quad$ Cot = flip tan = $\frac{1}{2}$

3) An aerial photograph is taken of a building. The photograph is made when the angle of elevation of the sun is 37°. The shadow is determined to be 70 feet long. How tall is the building?

Diagram not given:



Make sure calculator is in degrees, you will see deg at the bottom of your screen. If not press DRG

y = opp $\quad$ tan 37° = $\frac{y}{70}$

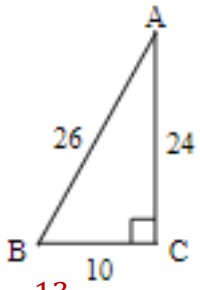
70 = adj $\quad$ multiply when x is on top

$70 \cdot \tan 37° = 52.75$

4) In ΔABC, find each value.

a. sin A $\quad$ **b.** sec A $\quad$ **c.** cot A

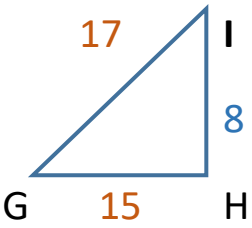
d. csc B $\quad$ **e.** sec B $\quad$ **f.** tan B



Sin A = $\frac{opp}{hyp} = \frac{10}{26} = \frac{5}{13}$ $\quad$ Sec A = $\frac{hyp}{adj} = \frac{26}{24} = \frac{13}{12}$ $\quad$ Cot A = $\frac{adj}{opp} = \frac{24}{10} = \frac{12}{5}$

Csc B = $\frac{hyp}{opp} = \frac{26}{24} = \frac{13}{12}$ sec B = $\frac{hyp}{adj} = \frac{26}{10} = \frac{13}{5}$ Tan B = $\frac{opp}{adj} = \frac{24}{10} = \frac{12}{5}$

5) In ΔGHI, $\angle H$ is a right angle, GH = 15, and cos G = $\frac{15}{17}$.



$X^2 + 15^2 = 17^2$ $x = \sqrt{17^2 - 15^2}$ =8

a) Find Sin G in fraction and decimal form $\frac{8}{17} = .471$

b) Find Sin I in fraction and decimal form $\frac{15}{17} = .882$

c) Find cos G in fraction and decimal form $\frac{15}{17} = .882$

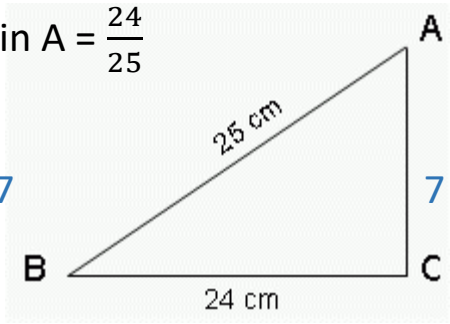
d) Find csc G in fraction and decimal form $\frac{172}{8} = 2.125$ flip sin G

e) Find cos I in fraction and decimal form $\frac{8}{17} = .471$

f) Find sec G In fraction and decimal form $\frac{17}{15} = 1.133$ flip cos G

6) In $\triangle ABC$, $\angle C$ is a right angle, AC = 24 and sin A = $\frac{24}{25}$

Find all other 5 trig functions of A.



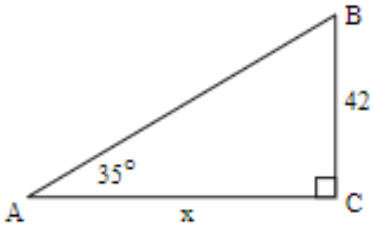
$X^2 + 24^2 = 25^2$ $x = \sqrt{25^2 - 24^2}$ =7

Sin A = $\frac{opp}{hyp} = \frac{24}{25}$ Cos A = $\frac{adj}{hyp} = \frac{7}{25}$ Tan A = $\frac{opp}{adj} = \frac{24}{7}$

Csc A =flip sin = $\frac{25}{24}$ sec A = flip cos = $\frac{25}{7}$ Cot A = flip tan = $\frac{7}{24}$

7) Find the length x.

Label given sides first



opp

Tan 35° = $\frac{42}{x}$

x = ☐ (Round to the nearest tenth as needed.) Adj

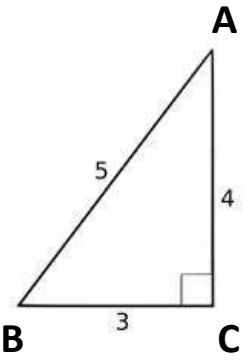
divide when x is on bottom

42 ÷ tan 35° = 59.98

8) In ΔABC, ∠C is a right angle. Find the remaining side and angles.

b = 4, c = 5

a = ☐ (Round to the nearest tenth as needed.)

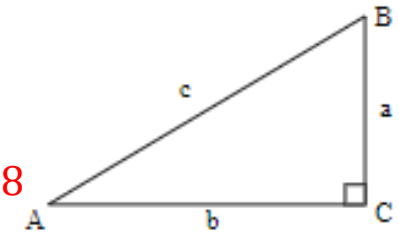


$a^2 + b^2 = c^2$ $\quad x^2 + 4^2 = 5^2 \rightarrow \sqrt{5^5 - 4^2} = 3$

9) In ΔABC, ∠C is a right angle. Find the remaining side and angles. Round to the nearest tenth.

b = 1.4 c = 3.1

$a^2 + b^2 = c^2$ $\quad x^2 + 1.4^2 = 3.1^2 \rightarrow \sqrt{3.1^5 - 1.4^2} = 2.8$

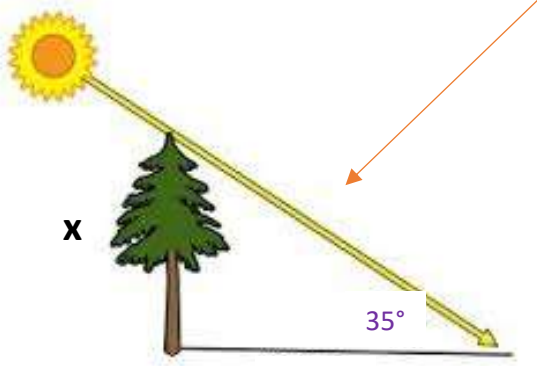


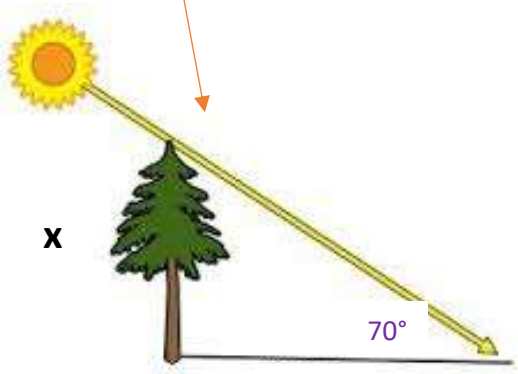
a = ☐ (Round to the nearest tenth as needed.)

10) A 140-ft redwood tree casts a shadow. Express the length x of the shadow as a function of the angle of elevation of the sun θ. Then find x when θ = 35° and θ = 70°.

Express x as a function of θ.

x = ☐ (Simplify your answer.)





$\tan 35° = \frac{x}{140}$

multiply when x is on top

$140 \cdot \tan 35° = 98$ ft

$\tan 70° = \frac{x}{140}$

multiply when x is on top

$140 \cdot \tan 70° = 384.6$ ft