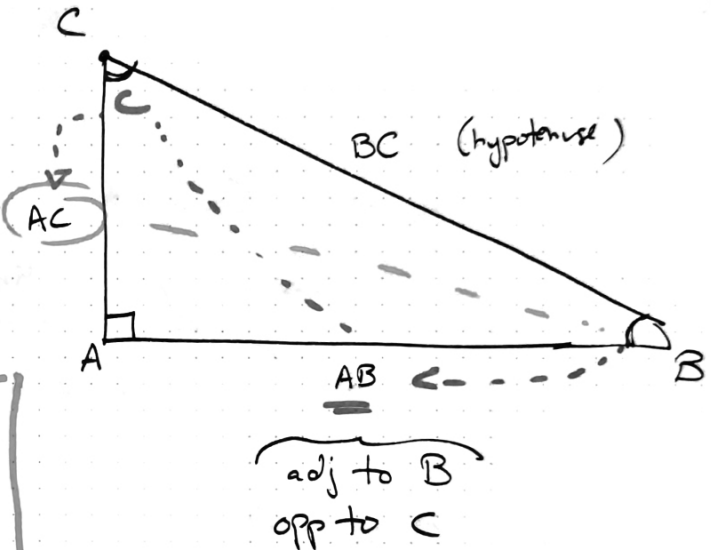
# Class #43 - Tuesday Dec 14

- go thru Exam #3 exercises (WebWork set!)
  - → written solutions (submit on BlackBoard)
    - ↳ outline what to submit
- Trigonometry ("Solving Right Triangles")
  - "Trigonometry Ratio"

"TrigRatios" #2

Given triangle:




$$\sin(B) = \frac{\text{opp}}{\text{hyp}} = \frac{AC}{BC}$$

$$\cos(B) = \frac{\text{adj}}{\text{hyp}} = \frac{AB}{BC}$$

$$\tan(B) = \frac{\text{opp}}{\text{adj}} = \frac{AC}{AB}$$

$$\sin(C) = \frac{\text{opp}}{\text{hyp}} = \frac{AB}{BC}$$

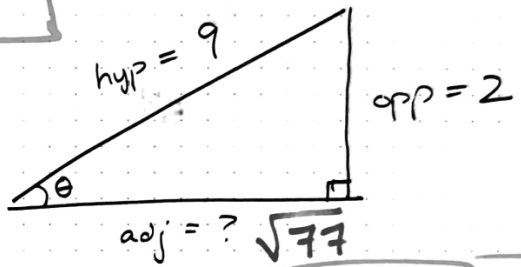
$$\cos(C) = \frac{\text{adj}}{\text{hyp}} = \frac{AC}{BC}$$

$$\tan(C) = \frac{\text{opp}}{\text{adj}} = \frac{AB}{AC}$$

# Trig Ratios : Problem 4

Given : $\sin\theta = \frac{2}{9} = \frac{opp}{hyp}$

Hint : sketch a triangle




find "adj" using Pythagorean Thm

$(adj)^2 + 2^2 = 9^2$

$(adj)^2 = 77 \Rightarrow adj = \sqrt{77}$

$\sin\theta = \frac{2}{9} \Rightarrow \csc\theta = \frac{9}{2}$

$\cos\theta = \frac{\sqrt{77}}{9} \Rightarrow \sec\theta = \frac{9}{\sqrt{77}}$

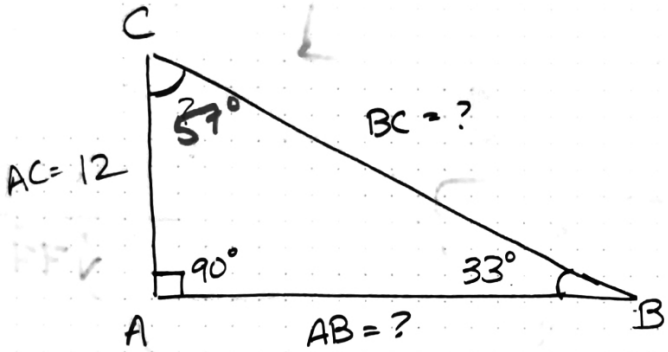
$\tan\theta = \frac{2}{\sqrt{77}} \Rightarrow \cot\theta = \frac{\sqrt{77}}{2}$

↑ "reciprocals"

(flip the basic 3 trig ratios!)

Examples from "Solving Right Triangles"

#1




(1) Angle C? Use that the angles in any triangle sum to 180°

$\angle A + \angle B + \angle C = 180°$

$90° + 33° + \angle C = 180°$

$\angle C = 180° - 90° - 33° = 90° - 33° = 57°$

$\boxed{\angle C = 57°}$

(2) $\overline{AB} = ?$ Use trig ratio, e.g. $\tan(33°) = \frac{AC}{AB} = \frac{12}{AB}$ (tan(B))

(3) $\overline{BC} = ?$ $\sin(33°) = \frac{12}{BC}$ $\Rightarrow BC = \frac{12}{\sin(33°)}$ or $\tan(C) = \tan(57°) = \frac{AB}{AC} = \frac{AB}{12}$ $\Rightarrow AB = 12 \cdot \tan(57°)$

# Class #44 - Thurs, Dec 16

today: finish up this - "Trig Applications"

↑

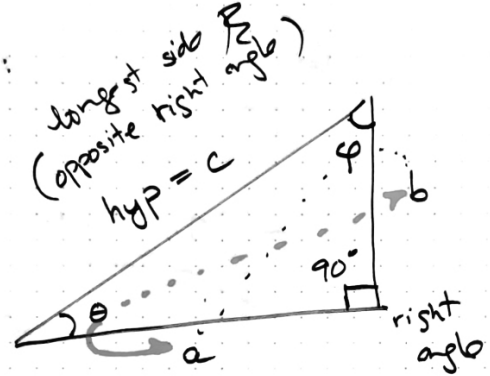
WebWork examples

(most of this WW will be extra credit!)

tomorrow: last meeting

- review for Final Exam
  - examples (primarily from Exam #3 exercises)
- post "Final Exam" WebWork set - after class tomorrow
  - submit written solutions on Blackboard - by Monday

# Trig Ratios:




3 angles (in any triangle) add up to 180°

$\theta + \varphi + 90^\circ = 180^\circ$

$\theta + \varphi = 90^\circ$

Pythagorean Thm: (for any right triangle)

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

## Defns of trig ratios:

$\sin\theta = \frac{\text{opp}}{\text{hyp}} = \frac{b}{c}$ $\Rightarrow$ "cosecant" $\csc\theta = \frac{1}{\sin\theta} = \frac{c}{b}$

$\cos\theta = \frac{\text{adj}}{\text{opp}} = \frac{a}{c}$ $\Rightarrow$ "secant" $\sec\theta = \frac{1}{\cos\theta} = \frac{c}{a}$

$\tan\theta = \frac{\text{opp}}{\text{adj}} = \frac{b}{a}$ $\Rightarrow$ "cotangent" $\cot\theta = \frac{1}{\tan\theta} = \frac{a}{b}$

basic trig ratios

"reciprocal" trig ratios

$\sin\varphi = \frac{a}{c}$

$\cos\varphi = \frac{b}{c}$

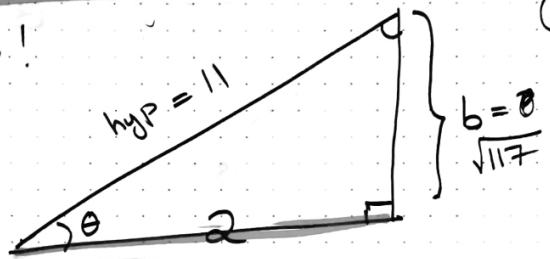
# Trig Ratios #5

Given a right triangle w/ angle $\theta$ such that

$$\cos\theta = \frac{2}{11} = \frac{\text{adj to } \theta}{\text{hyp}}$$

① sketch a right triangle!

(use the given trig ratio to label 2 of the sidelengths)




$$\cos\theta = \frac{\text{adj (to } \theta)}{\text{hyp}} = \frac{2}{11}$$

② Use the Pythagorean Thm to figure out the missing side length.

$$2^2 + b^2 = 11^2$$
$$4 + b^2 = 121$$
$$b^2 = 117 \Rightarrow b = \sqrt{117}$$

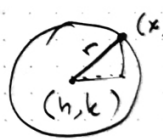
③ Write down all the other trig ratios:

$$\sin\theta = \frac{\sqrt{117}}{11} \Rightarrow \csc\theta = \frac{11}{\sqrt{117}}$$

$$\cos\theta = \frac{2}{11} \Rightarrow \sec\theta = \frac{11}{2}$$

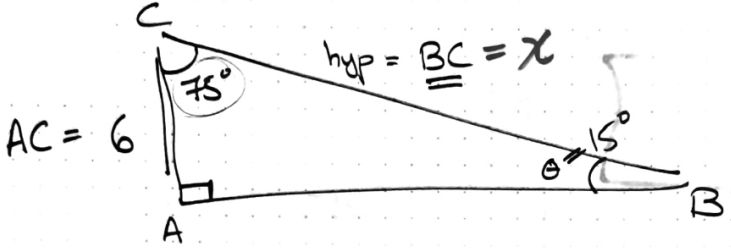
$$\tan\theta = \frac{\sqrt{117}}{2} \Rightarrow \cot\theta = \frac{2}{\sqrt{117}}$$

recall: equation of a circle come from the Pythagorean Thm!




$$(x-h)^2 + (y-k)^2 = r^2$$

# Solving Right Triangles: #2




3 angles sum to 180°:

$90° + 75° + \theta = 180°$

$\Rightarrow 75° + \theta = 90°$

$\Rightarrow \theta = 15°$

$\overline{AB} = ?$

$\overline{BC} = ?$

$\cos 75° = \frac{\text{adj}}{\text{hyp}} = \frac{(AC)}{(BC)} = \frac{6}{(BC)}$

Now solve for BC: $\cos(75°) = \frac{6}{BC}$

this is a #

this is what we need to solve for!

$(BC)\cos(75°) = 6$

$$BC = \frac{6}{\cos(75°)} \approx 23.1822$$

Alternatively — to solve for the hypotenuse BC using the other angle $\theta = 15°$:

$\sin(15°) = \frac{6}{BC}$

$\Rightarrow BC = \frac{6}{\sin(15°)}$