Good morning: assessments are being passed back

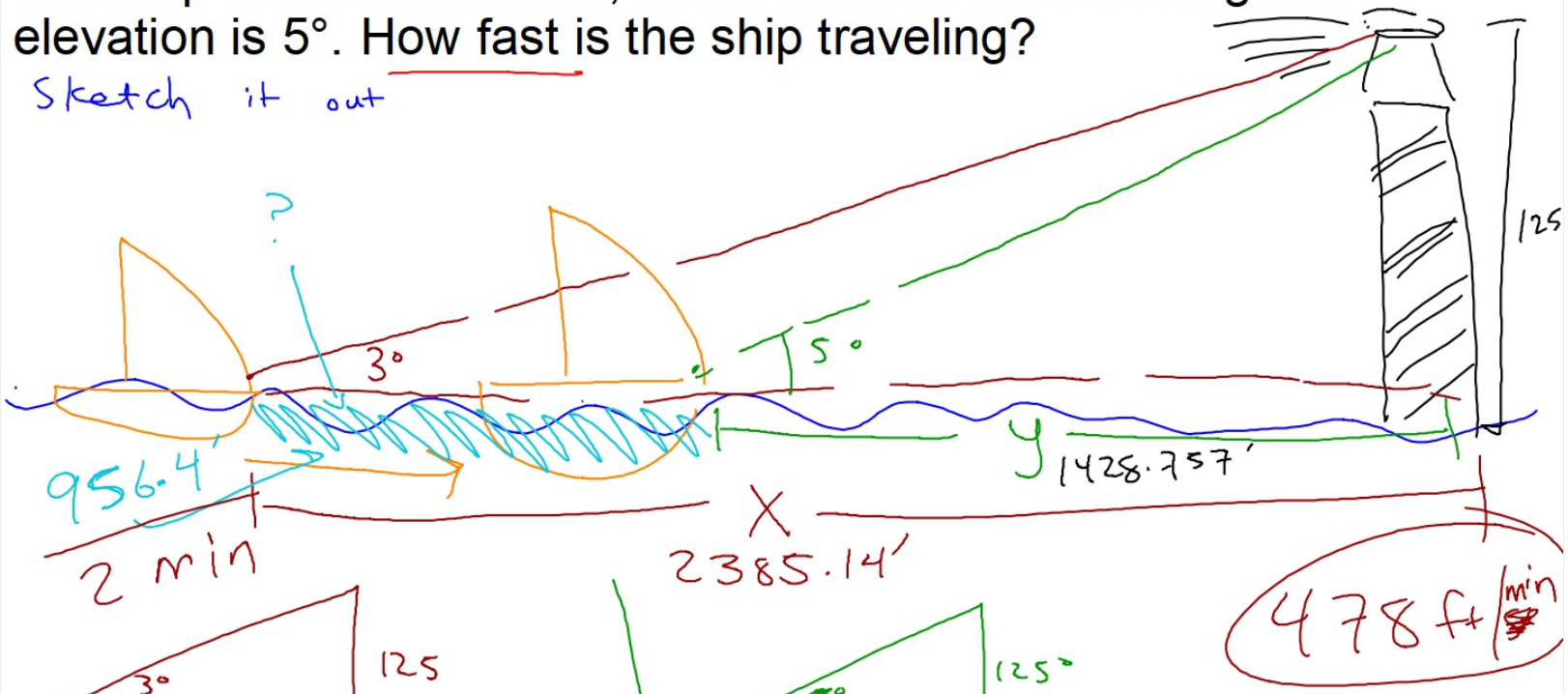
HW needed for retakes:
front: #5-12 on first handout, #5-15 odd on second
back: #1-4 on both handouts

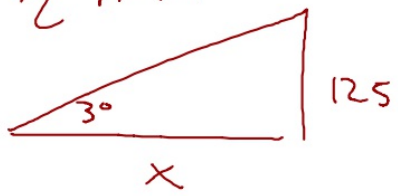
Reminders:
no tutoring today because of SLC
retakes available in DS Thu/Fri: ask for a pass!

Visibly Random Grouping

More Applied Trigonometry

A ship spots a lighthouse in the distance. It is known to be 125 feet tall. The angle of elevation up to the top of the lighthouse is 3°. The ship travels towards it, and 2 minutes later the angle of elevation is 5°. How fast is the ship traveling?

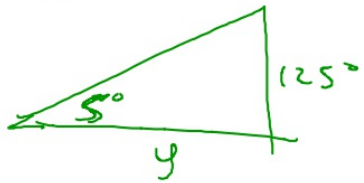




$\tan 3 = \frac{125}{x}$

$x \cdot \tan 3 = 125$

$x = \frac{125}{\tan 3} \approx 2385.14'$



$\frac{\tan 5}{1} = \frac{125}{y}$

$y \cdot \tan 5 = 125$

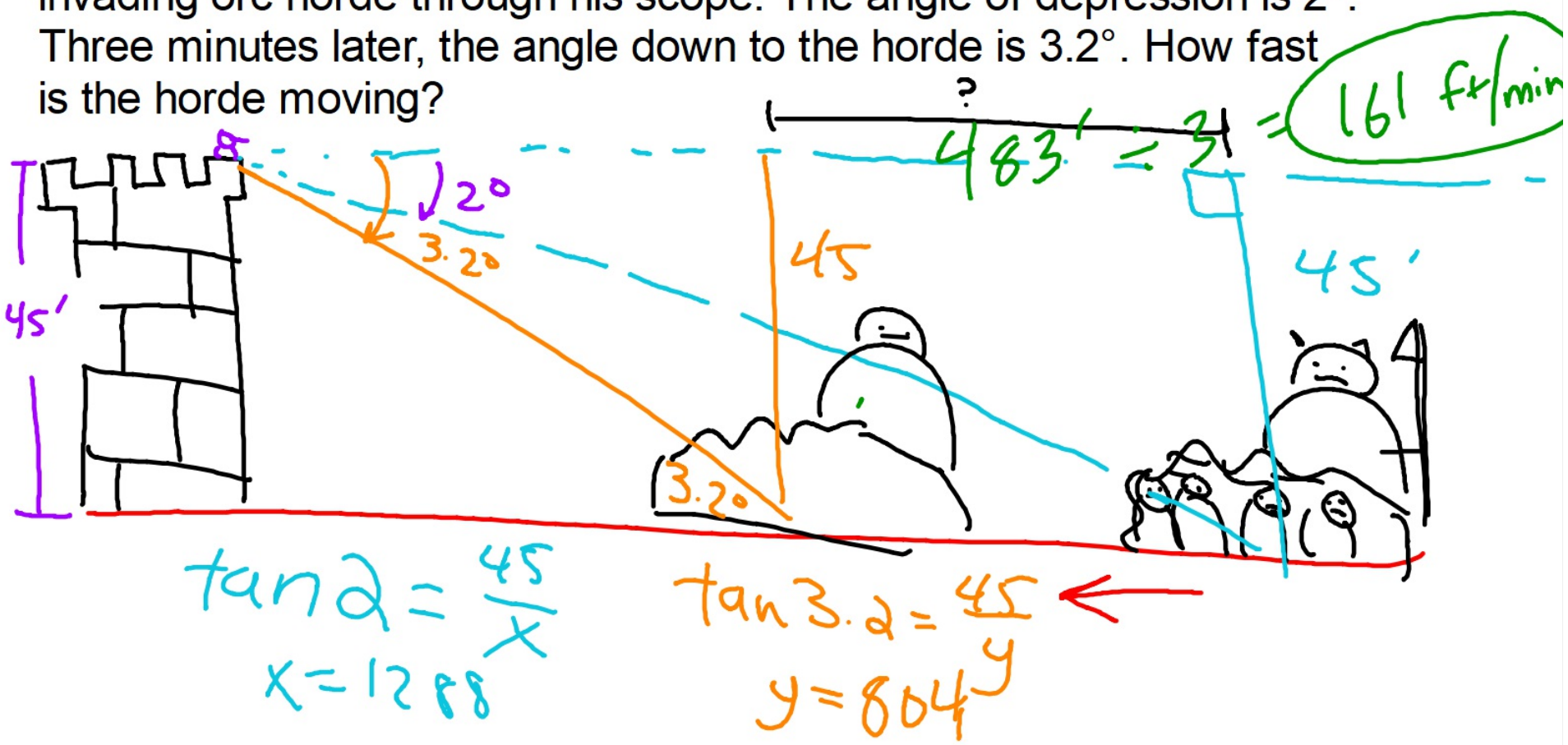
$y = \frac{125}{\tan 5} = 1428.757$

Can you convert 478 ft/min to miles per hour?
5280 feet in 1 mile

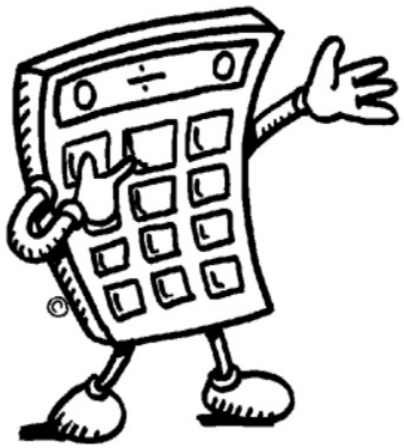
$$\frac{478\ \text{ft}}{1\ \text{min}} \cdot \frac{60\ \text{min}}{1\ \text{hr}} \cdot \frac{1\ \text{mi}}{5280\ \text{ft}}$$

$$= \frac{478 \cdot 60 \cdot 1}{1 \cdot 1 \cdot 5280}\ \frac{\text{mi}}{\text{hr}} = 5\ \text{mph}$$

Atop a castle tower 45 feet above the ground, a scout spots an invading orc horde through his scope. The angle of depression is 2°. Three minutes later, the angle down to the horde is 3.2°. How fast is the horde moving?



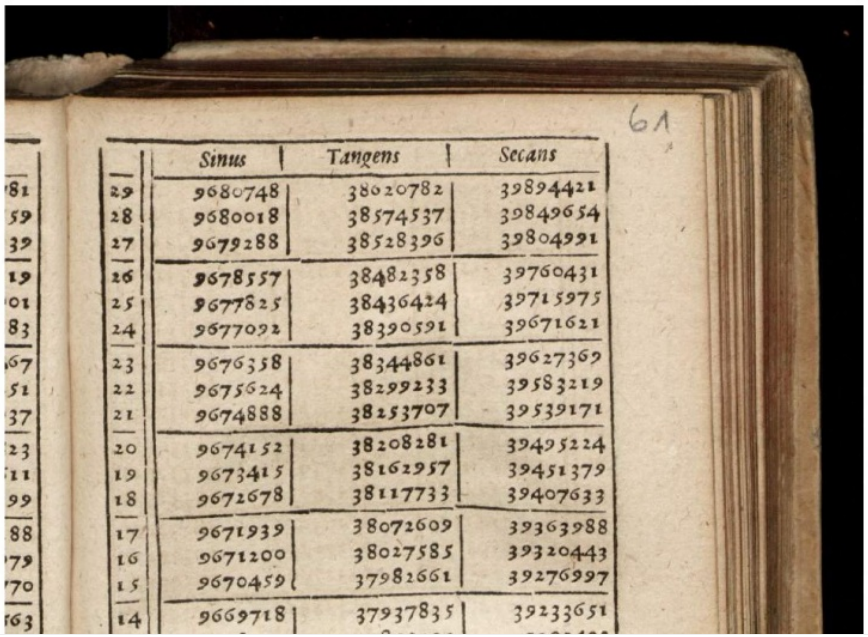
What is the calculator doing when you type in something like:



$$\tan(2)$$

and the calculator says 0.0349207695...??

Before calculators, mathematicians and students alike had to use "trig tables" which were books full of data that others had calculated by hand. Since similar right triangles keep side proportions, these ratios could be used so long as you knew the angle measure.



	Sinus	Tangens	Secans
29	9680748	38020782	39894421
28	9680018	38574537	39849654
27	9679288	38528396	39804991
26	9678557	38482358	39760431
25	9677825	38436424	39715975
24	9677092	38390591	39671621
23	9676358	38344861	39627369
22	9675624	38299233	39583219
21	9674888	38253707	39539171
20	9674152	38208281	39495224
19	9673415	38162957	39451379
18	9672678	38117733	39407633
17	9671939	38072609	39363988
16	9671200	38027585	39320443
15	9670459	37982661	39276997
14	9669718	37937835	39233651

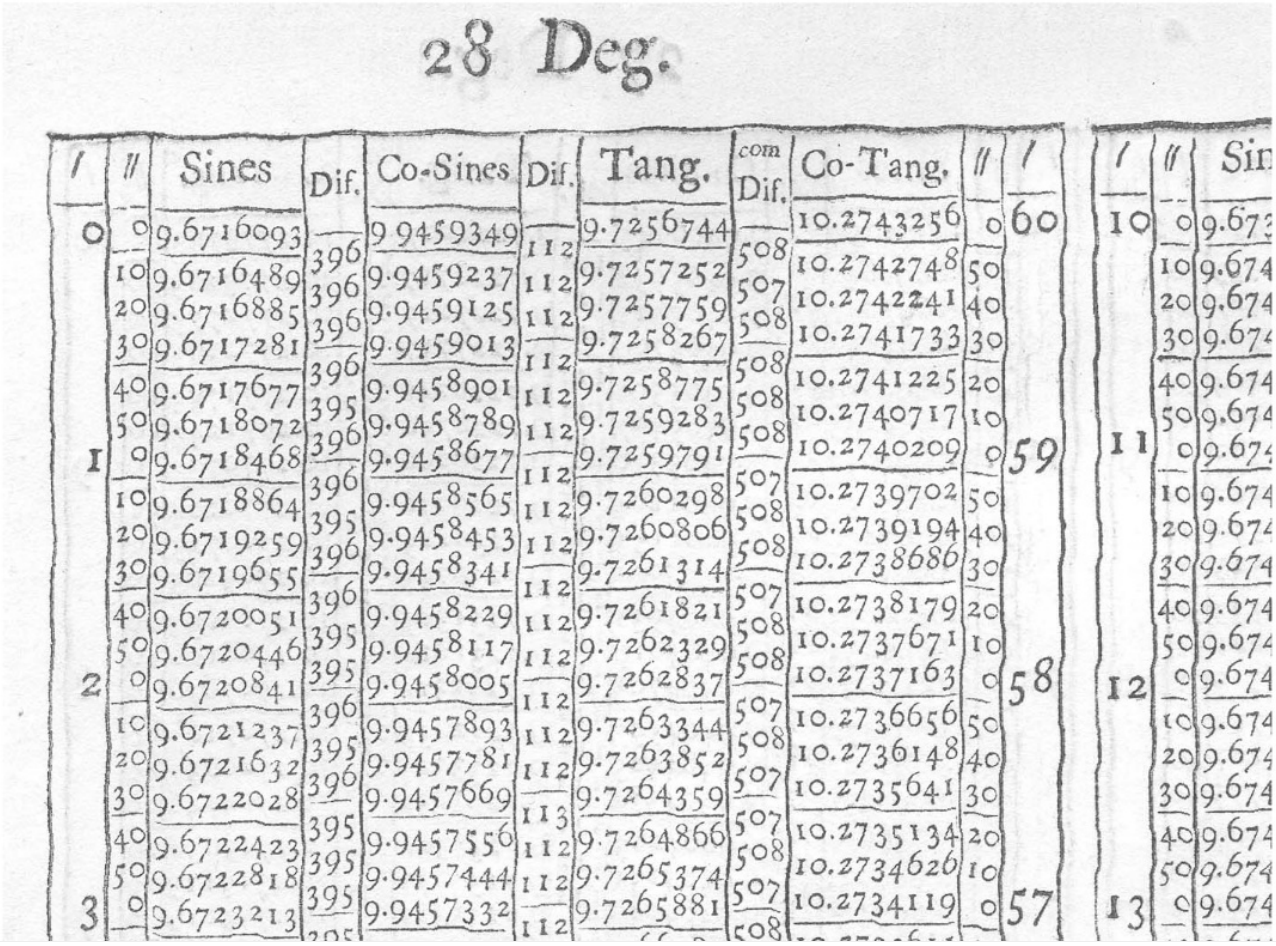
Need the ratio of opposite leg to adjacent for a 2° angle?

Look it up in the table!

The calculator is kind of* doing that.

1619 AD

So trigonometry is based in part on referring to tables of values...



28 Deg.

′	″	Sines	Dif.	Co-Sines	Dif.	Tang.	com Dif.	Co-Tang.	″	′
0	0	9.6716093		9.9459349		9.7256744		10.2743256	0	60
	10	9.6716489	396	9.9459237	112	9.7257252	508	10.2742748	50	
	20	9.6716885	396	9.9459125	112	9.7257759	507	10.2742241	40	
	30	9.6717281	396	9.9459013	112	9.7258267	508	10.2741733	30	
	40	9.6717677	395	9.9458901	112	9.7258775	508	10.2741225	20	
	50	9.6718072	396	9.9458789	112	9.7259283	508	10.2740717	10	
1	0	9.6718468	396	9.9458677	112	9.7259791	508	10.2740209	0	59
	10	9.6718864	395	9.9458565	112	9.7260298	507	10.2739702	50	
	20	9.6719259	396	9.9458453	112	9.7260806	508	10.2739194	40	
	30	9.6719655	396	9.9458341	112	9.7261314	508	10.2738686	30	
	40	9.6720051	395	9.9458229	112	9.7261821	507	10.2738179	20	
	50	9.6720446	395	9.9458117	112	9.7262329	508	10.2737671	10	
2	0	9.6720841	395	9.9458005	112	9.7262837	508	10.2737163	0	58
	10	9.6721237	396	9.9457893	112	9.7263344	507	10.2736656	50	
	20	9.6721632	395	9.9457781	112	9.7263852	508	10.2736148	40	
	30	9.6722028	396	9.9457669	113	9.7264359	507	10.2735641	30	
	40	9.6722423	395	9.9457556	112	9.7264866	507	10.2735134	20	
	50	9.6722818	395	9.9457444	112	9.7265374	508	10.2734626	10	
3	0	9.6723213	395	9.9457332	112	9.7265881	507	10.2734119	0	57

′	″	Sin
10	0	9.673
	10	9.674
	20	9.674
	30	9.674
	40	9.674
	50	9.674
11	0	9.674
	10	9.674
	20	9.674
	30	9.674
	40	9.674
	50	9.674
12	0	9.674
	10	9.674
	20	9.674
	30	9.674
	40	9.674
	50	9.674
13	0	9.674

Tables can work in 2 directions.

RICE BOX
ASIAN CUISINE

Appetizers

A1.	Vegetable Spring Roll (1 pc)	*$1.35*
A2.	Pork Egg Roll (1 pc)	*$1.50*
A3.	Crab Rangoon (8 pcs)	*$6.25*
A4.	Steamed or Fried: Vegetable Gyoza (6pc) 9 Kinds vegetables: Edamame, Green Bean, Yellow Carrot, Carrot, Red Bell Pepper, Onion, Potato, Cabbage and Garlic	*$4.25 / $4.95*
A5.	Steamed or Fried: Pork Potsticker (8pc)	*$5.25 / $5.95*
A6.	Cho Cho Chicken (4 pcs) Marinated in house teriyaki sauce and skewered on sticks	*$6.95*
A8.	Thai Fish Cake (8 pcs) w. Sriracha hot chili sauce	*$4.50*

"I ordered Crab Rangoons...how much did I pay?"

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"I paid $4.50...what did I order?"

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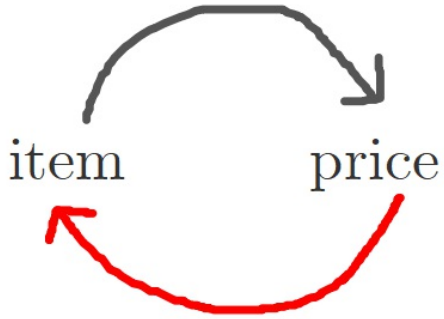
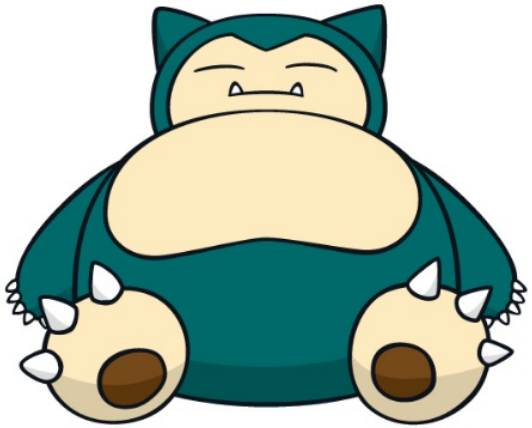
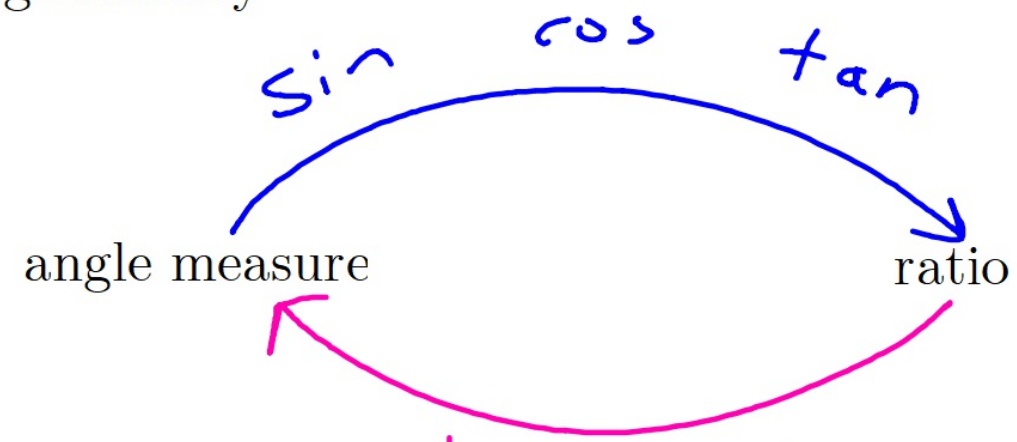


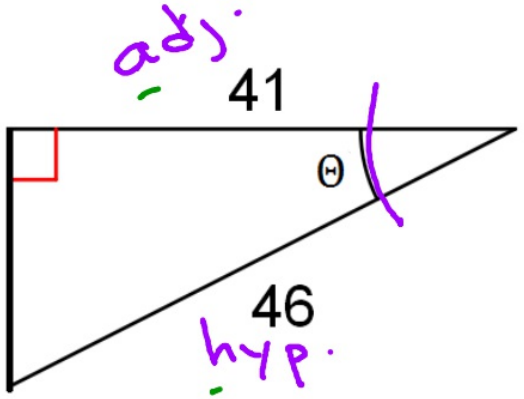
[me after chinese food]



Inverse Trigonometry



aka: arcsin, arccos, arctan



Find the value of Θ to the nearest degree

"theta"

SOH CAH TOA

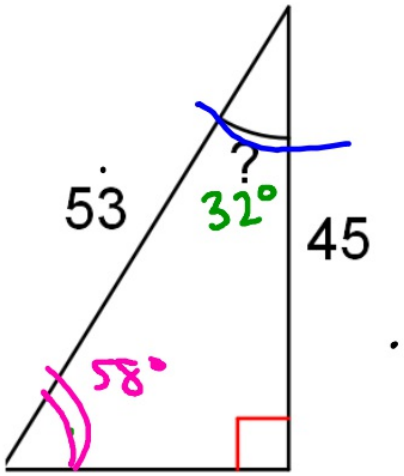
label opp/adj/hyp

- find best trig function
- set up equation
- invert equation, solve

$$\cos\theta = \frac{41}{46}$$

$$\cos^{-1}\frac{41}{46} = \theta$$

$$27^\circ \approx \theta$$



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

Find the angle measure to the nearest degree.

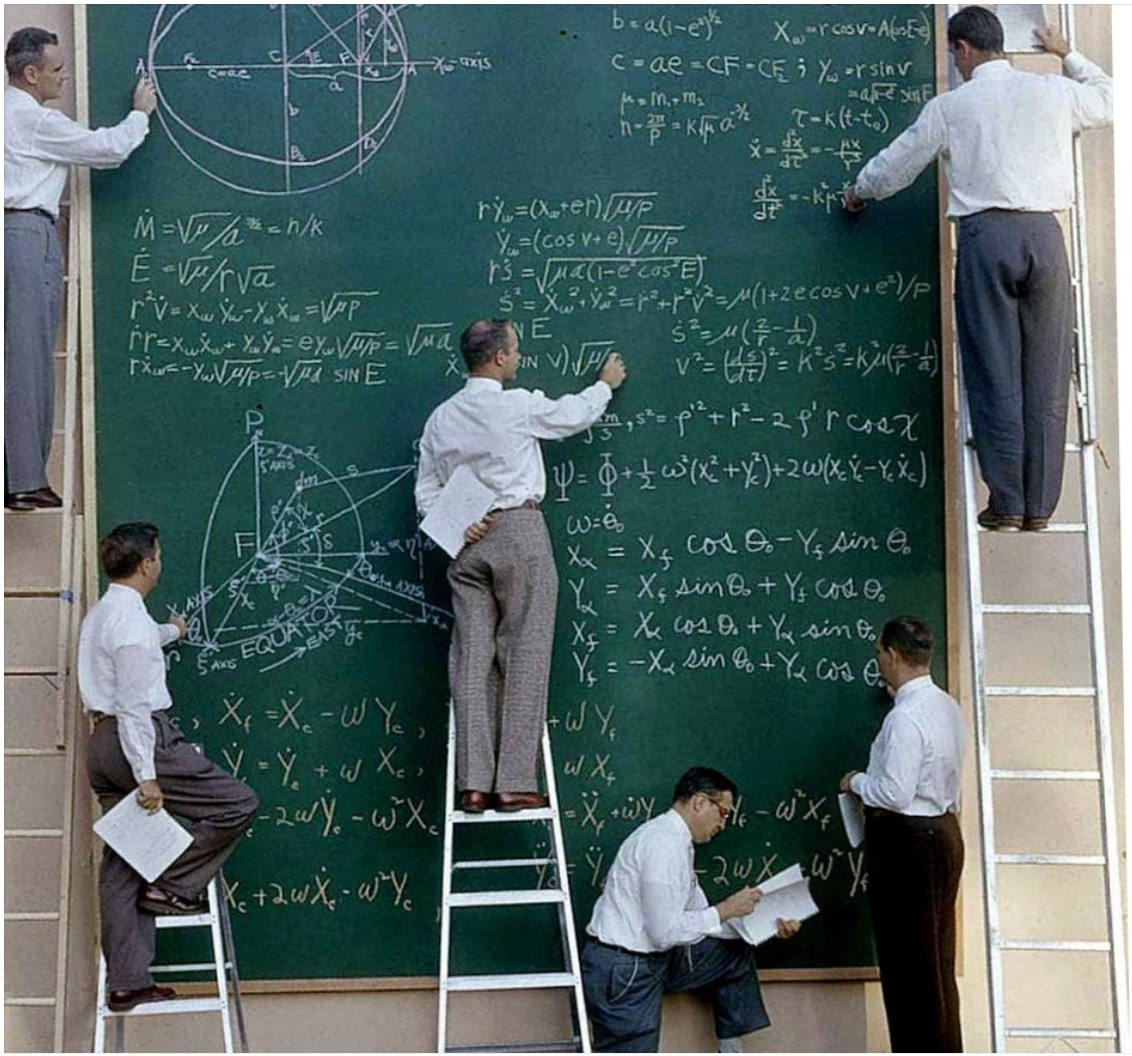
$\sin\theta = \frac{28}{53}$

$\sin^{-1}\left(\frac{28}{53}\right) = \theta$

$32° = \theta$

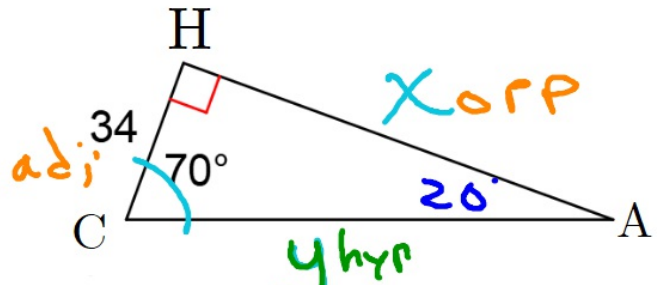
$\cos^{-1}\left(\frac{45}{53}\right) = \theta$

$\tan^{-1}\left(\frac{28}{45}\right)$


$b = a(1-e^2)^{1/2}$
$c = ae = CF = CF_2$; $Y_\omega = r\sin v$
$\mu = m_1 + m_2$
$n = \frac{2\pi}{P} = k\sqrt{\mu}\, a^{-3/2}$
$\tau = k(t - t_0)$
$\dot{M} = \sqrt{\mu/a^3} = n/k$
$\dot{E} = \sqrt{\mu}/r\sqrt{a}$
$r^2\dot{v} = x_\omega \dot{y}_\omega - y_\omega \dot{x}_\omega = \sqrt{\mu p}$
$r\dot{r} = x_\omega \dot{x}_\omega + y_\omega \dot{y}_\omega = e y_\omega \sqrt{\mu/p} = \sqrt{\mu a}\, e \sin E$
$r\dot{x}_\omega = -y_\omega \sqrt{\mu/p} = -\sqrt{\mu a}\sin E$
$r\dot{y}_\omega = (x_\omega + e)\sqrt{\mu/p}$
$\dot{y}_\omega = (\cos v + e)\sqrt{\mu/p}$
$r^2\dot{s} = \sqrt{\mu a(1-e^2\cos^2 E)}$
$\dot{s}^2 = \dot{x}_\omega^2 + \dot{y}_\omega^2 = \dot{r}^2 + r^2\dot{v}^2 = \mu(1 + 2e\cos v + e^2)/p$
$\dot{s}^2 = \mu\left(\frac{2}{r} - \frac{1}{a}\right)$
$v^2 = \left(\frac{ds}{dt}\right)^2 = k^2\dot{s}^2 = k^2\mu\left(\frac{2}{r} - \frac{1}{a}\right)$
$\Psi = \Phi + \frac{1}{2}\omega^2(x_c^2 + y_c^2) + 2\omega(x_c\dot{y}_c - y_c\dot{x}_c)$
$\omega = \dot{\theta}_0$
$X_\alpha = X_f \cos\theta_0 - Y_f \sin\theta_0$
$Y_\alpha = X_f \sin\theta_0 + Y_f \cos\theta_0$
$X_f = X_\alpha \cos\theta_0 + Y_\alpha \sin\theta_0$
$Y_f = -X_\alpha \sin\theta_0 + Y_\alpha \cos\theta_0$
$\ddot{X}_f = \ddot{X}_c - \omega Y_c$,
$\ddot{Y}_f = \ddot{Y}_c + \omega X_c$,
$-2\omega\dot{Y}_c - \omega^2 X_c$
$X_c + 2\omega\dot{X}_c - \omega^2 Y_c$
$+\omega Y_f$
ωX_f
$\ddot{X}_f + \dot{\omega} Y$
$Y_f - \omega^2 X_f$
$-2\omega\dot{X}$
$\omega^2 Y_f$
EQUATOR
EAST
S AXIS
X AXIS

Find all sides/Angles

"Solve" each triangle. Round to thousandths.



$\tan 70 = \frac{x}{34}$

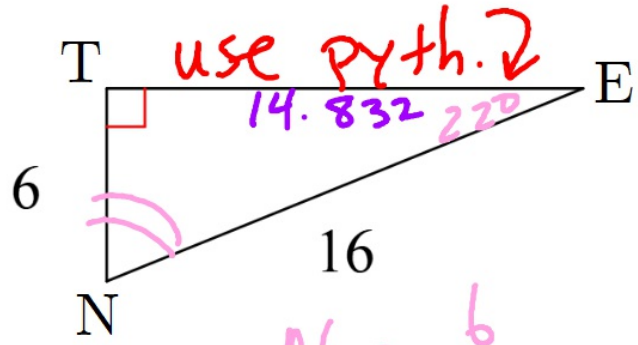
$34 \cdot \tan 70 = x$

$93.414 \approx x$

$\cos 70 = \frac{34}{y}$

$y \cdot \cos 70 = 34$

$y = \frac{34}{\cos 70} \approx 99.409$



$\cos N = \frac{6}{16}$

$\cos^{-1}\left(\frac{6}{16}\right) = N$

$68° = N$

More practice

Each group is assigned 1 problem

Go to a whiteboard: one pen per group

talk it out, work it out! delgate and collaborate

Homework:

complete the remaining 7 problems