Reminders 9-05-07:

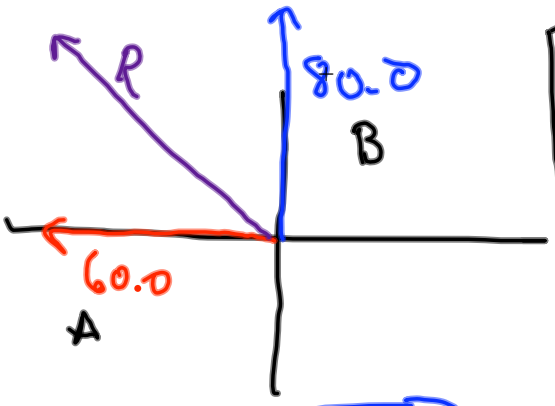
-Webassign Homework Due 9/6!!!

-Use the FORUM on Webassign for help from classmates.
-Log onto Computers in lab!!!
-Please do not save files on our server.
-Save all files onto a USB Stick/Flash Drive.
-Obtain lab software from desktop of computers in lab.
-Check course web page once a week.
-All lab reports require a cover sheet & are worth 20 points.
-All lab reports to be turned in at beginning of lab meeting.
-Log in & Log out when using Tutoring Center or S-107 (lab)
-Read Appendix A, 3.1&3.2 (vectors), 4.1&4.2 (forces)
-Sign up for Physics 2X.
-Conceptual Quiz Wednesday 9/12 on 3.1&3.2, 4.1&4.2.
-Exam 1 Monday 9/24.

Objectives:
-More on Forces & Vectors
-Statics

Example:

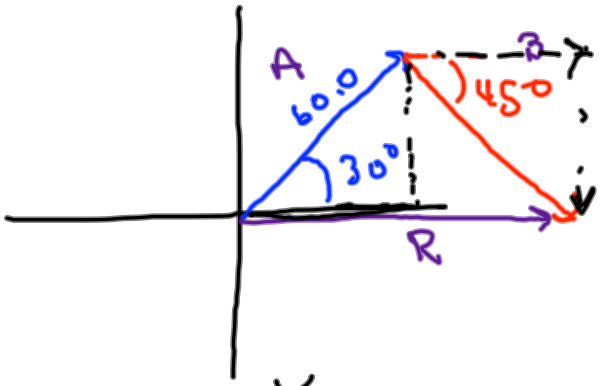
A vector is 60.0 units long and directed along the negative x-axis. A second vector is 80.0 units long and directed along the y-axis. Determine the magnitude and direction of the resultant vector.



	X	Y
A	-60.0	0
B	0	80.0
R	-60.0	80.0

$$R = \sqrt{(-60.0)^2 + (80.0)^2} = 100.0 \text{ units}$$

A vector is 60.0 units long and directed 30.0 degrees above the x-axis. A second vector is 80.0 units long and directed 45 degrees below the x-axis. Determine the magnitude and direction of the resultant vector.



	x	y
A	$60.0\cos 30° = 52.0$	$60\sin 30 = 30.0$
B	$80\cos 45° = 56.5$	$-80\sin 45° = -56.5$
R	108.5	−26.5

$$R = \sqrt{(108.5)^2 + (-26.5)^2} = 112$$

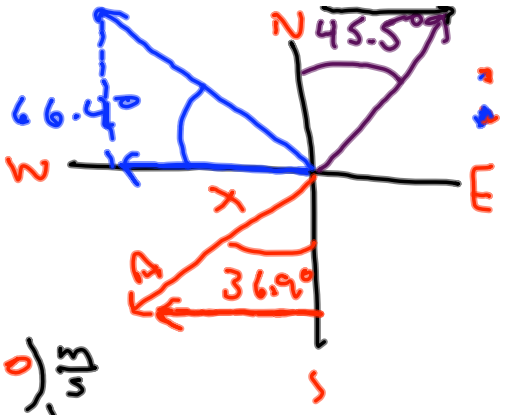
$$\theta = \tan^{-1}\frac{-26.5}{108.5} = -13.7°$$

13.7° below +x-axis

13.7° S of E 346.3° +x-axis

Let's add the following three vectors. Sketch the vectors.

Vector A: 30.0m/s at 36.9° West of South
Vector B: 60.0m/s at 66.4° North of West
Vector C: 90.0m/s at 45.5° East of North



1st step: find the x-component of A: $-(30.0 \sin 36.9^\circ)$ m/s

find the x-component of B: $-(60.0 \cos 66.4^\circ)$ m/s

find the x-component of C: $(90.0 \sin 45.5^\circ)$ m/s

2nd step: find the y-component of A: _____

find the y-component of B: _____

find the y-component of C: _____

3rd step:

Sum the x-components: _____

Sum the y-components: _____

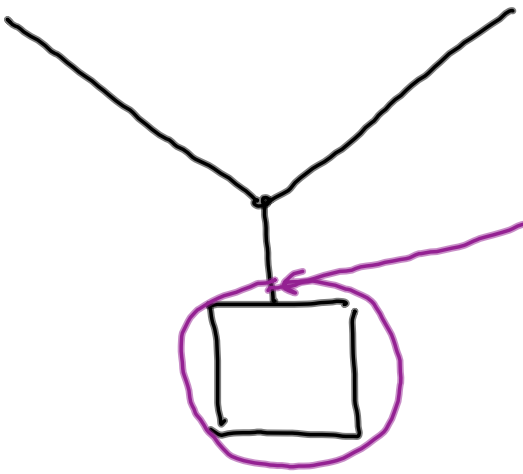
4th step: Use Pythagorean Theorem to find magnitude of resultant

Magnitude: _____

5th step: Calculate direction of resultant vector using $\arctan\left(R_y / R_x\right)$

Angle: _____

Suppose $R_x = -30$, $R_y = 60$ $\quad \theta = \tan^{-1}\frac{60}{-30}$

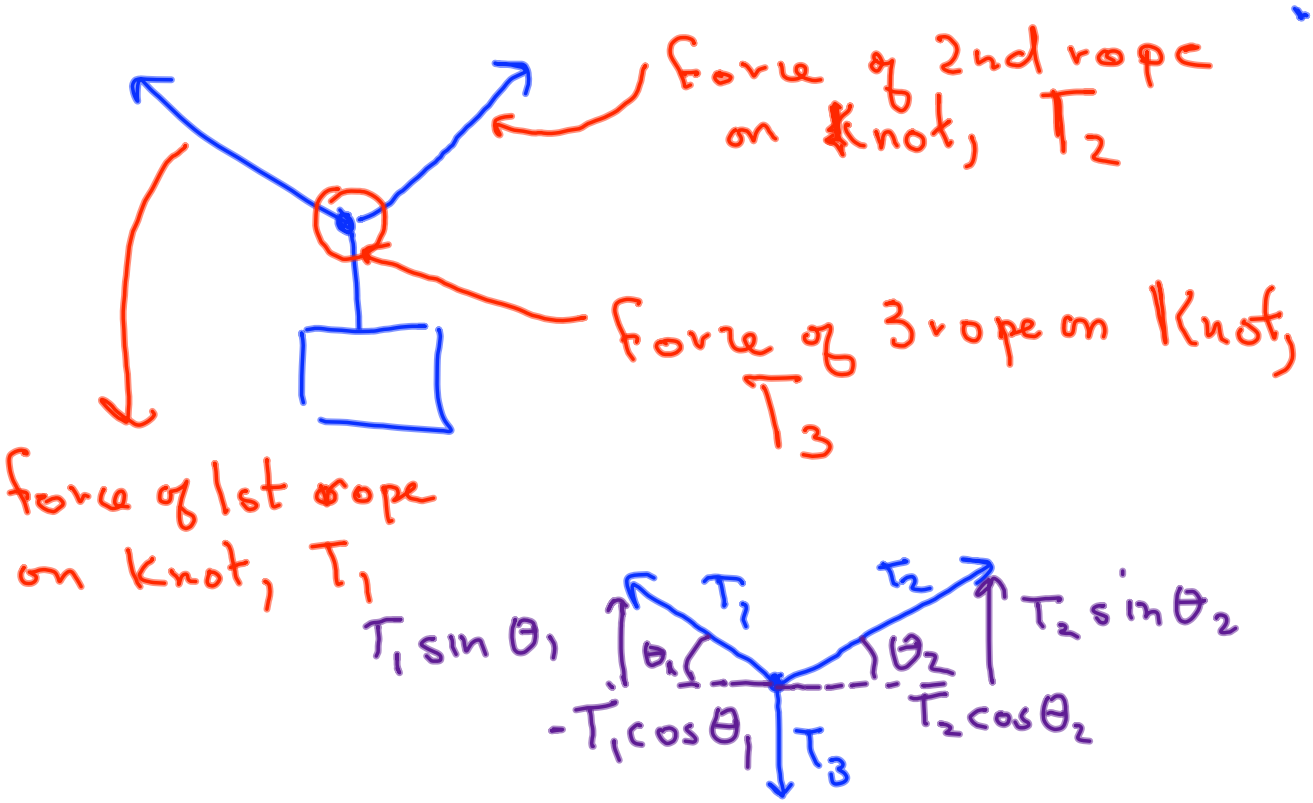


force of string on mass, T

force of Earth on mass, W=mg

T

$\Sigma F_y = T - mg = 0$



$$\sum F_x = -T_1 \cos\theta_1 + T_2 \cos\theta_2 = 0$$

$$\sum F_y = T_1 \sin\theta_1 + T_2 \sin\theta_2 - T_3 = 0$$

What if the angles in the figure are different?

$$\Sigma F_x = T_1\cos\theta_1 - T_2\cos\theta_2 = 0$$

$$\Sigma F_y = T_1\sin\theta_1 + T_2\sin\theta_2 - W = 0$$

let $\theta_1 = 60.0$ and $\theta_2 = 30.0°$
and let m = 16.0 kg

$$T_1 = T_2 \frac{\cos\theta_2}{\cos\theta_1}$$

$$T_2\left(\frac{\cos\theta_2}{\cos\theta_1}\right)\sin\theta_1 + T_2\sin\theta_2 - W = 0$$

$$T_2\left[\cos\theta_2\tan\theta_1 + \sin\theta_2\right] - W = 0$$

$$T_2\left[\cos\theta_2\tan\theta_1 + \sin\theta_2\right] = W$$

$$T_2 = W/[\cos\theta_2\tan\theta_1 + \sin\theta_2]$$

$$T_2 = (16.0\text{kg})(9.80\text{m/s}^2)/[\cos30^o\tan60^o + \sin30^o]$$

$$T_2 = 78.4\text{N}$$