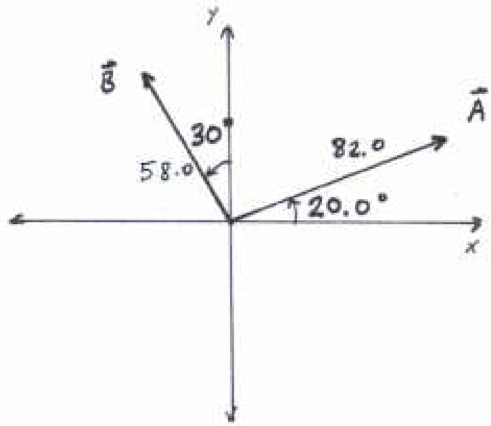
Units? Units?

Name________________________

Phys 2010, Section 3
Quiz #1 — Fall 2003



1. Three vectors are shown at the right; vector **A** has magnitude 82.0 and points in the direction shown. Vector **B** has magnitude 58.0 and points in direction shown.

Find the magnitude and direction of the sum of the two vectors.

Components of the vectors are:

$A_x = (82.0)\cos 20° = 77.1$

$A_y = (82.0)\sin 20° = 28.0$

$B_x = -(58.0)\sin 30° = -29.0$

$B_y = (58.0)\cos 30° = 50.2$

Add up respective components to get R_x and R_y:

$R_x = A_x + B_x = 48.1$

$R_y = A_y + B_y = 78.3$

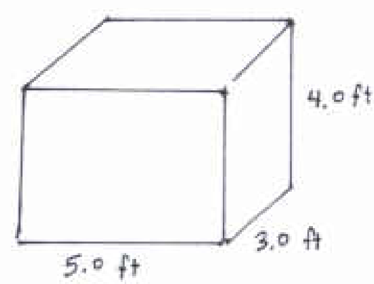
Magnitude of $\vec{R}$ is

$R = \sqrt{R_x^2 + R_y^2} = \sqrt{(48.1)^2 + (78.3)^2} = \boxed{91.8}$

Direction of $\vec{R}$ is found from

$\tan\theta = R_y/R_x = 1.63 \longrightarrow \boxed{\theta = 58.5°}$

2. A box has sides of 3.00 ft, 4.00 ft and 5.00 ft. Find the volume of the box; express the result in units of cm^3.



Volume of the box is

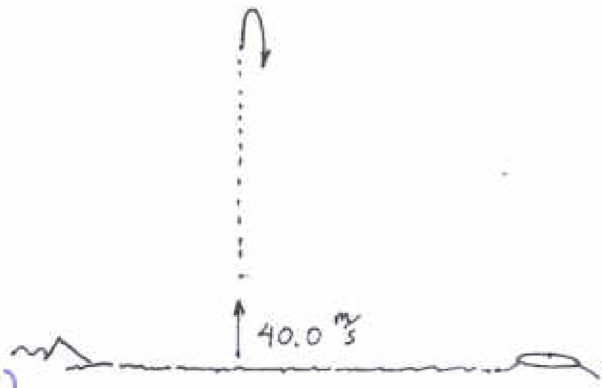
$V = (3.00\,ft)(4.00\,ft)(5.00\,ft) = 60.0\,ft^3$

Convert to cm^3:

$(60.0\,ft^3)\left(\frac{12\,in}{1\,ft}\right)^3\left(\frac{2.54\,cm}{1\,in}\right)^3$

$= \boxed{1.70 \times 10^6\ cm^3}$

3. A rock is thrown vertically upward with speed $40.0\frac{\text{m}}{\text{s}}$ from ground level on the Moon, where the value of g is $1.60\frac{\text{m}}{\text{s}^2}$.



a) What is the maximum height attained by the rock?

Here $v_0 = 40.0\frac{m}{s}$ and $a = -g_{moon} = -1.60\frac{m}{s^2}$

At the top of the flight $v = 0$. Solve for y there:

$v^2 = v_0^2 + 2ay \quad \rightarrow \quad 0 = (40\frac{m}{s})^2 + 2(-1.60\frac{m}{s^2})y$

$y = \frac{(40\frac{m}{s})^2}{2(1.60\frac{m}{s^2})} = \boxed{500\ m}$

b) How long does it take the rock to get to maximum height?

Solve for t at top of flight:

$v = v_0 + at \quad \rightarrow \quad 0 = 40\frac{m}{s} + (-1.60\frac{m}{s^2})t$

$t = \frac{(40.0\frac{m}{s})}{(1.60\frac{m}{s^2})} = \boxed{25.0\ s}$

You must show all your work and include the right units with your answers!

1 in = 2.54 cm   1 m = 3.281 ft   1 mi = 5280 ft   1 yd = 36 in $g_{\text{Earth}} = 9.80\frac{\text{m}}{\text{s}^2}$

$$v_x = v_{0x} + a_x t \qquad x = v_{0x}t + \tfrac{1}{2}a_x t^2 \qquad v_x^2 = v_{0x}^2 + 2a_x x \qquad x = \tfrac{1}{2}(v_{0x} + v_x)t$$

$$v_y = v_{0y} + a_y t \qquad y = v_{0y}t + \tfrac{1}{2}a_y t^2 \qquad v_y^2 = v_{0y}^2 + 2a_y y \qquad y = \tfrac{1}{2}(v_{0y} + v_y)t$$