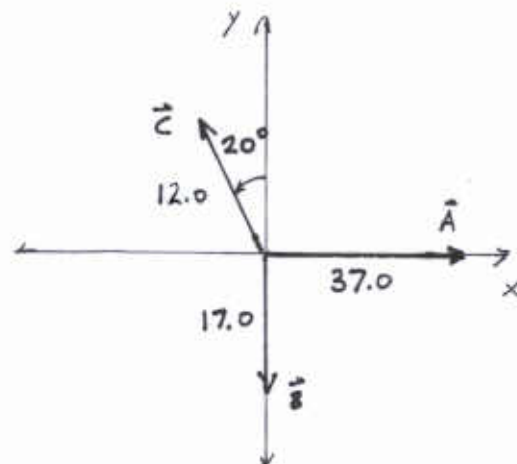Units?
Units?

Phys 2010, Section 2
Quiz #1 — Fall 2003

1. Three vectors are shown at the right; vector **A** has magnitude 37.0 and points in the $+x$ direction. Vector **B** has magnitude 17.0 and points in the $-y$ direction. Vector **C** has magnitude 12.0 and points in the direction shown.

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

Components of the vectors are:

$A_x = 37.0$ $A_y = 0$

$B_x = 0$ $B_y = -17.0$

$C_x = -(12.0) \sin 20° = -4.10$

$C_y = (12.0) \cos 20° = 11.28$

Add up respective components to get R_x and R_y

$R_x = A_x + B_x + C_x = +32.9$
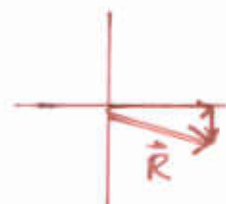
$R_y = A_y + B_y + C_y = -5.72$

The magnitude of $\vec{R}$ is:

$R = \sqrt{R_x^2 + R_y^2} = \sqrt{(32.9)^2 + (-5.72)^2} = \boxed{33.4}$

The direction of $\vec{R}$ is found from:

$\tan \theta = \frac{R_y}{R_x} = -0.174$ ➡ $\boxed{\theta = -9.87°}$

OK because $\vec{R}$
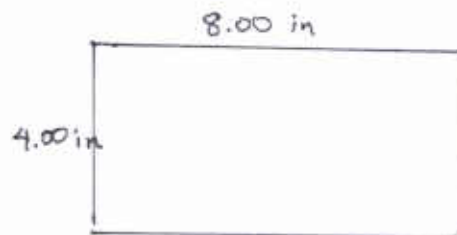is in quadrant IV

$\vec{R} = \vec{A} + \vec{B} + \vec{C}$

2. A rectangle has sides of 8.00 in and 4.00 in. Find the area of the rectangle; express the result in units of cm².

$A = (8.00 \text{ in})(4.00 \text{ in}) = 32.0 \text{ in}^2$

$= (32.0 \text{ in}^2)\left(\frac{2.54 \text{ cm}}{\text{in}}\right)^2 = \boxed{206 \text{ cm}^2}$

8.00 in

4.00 in

3. A ball is thrown horizontally from the edge of a 20.0 m
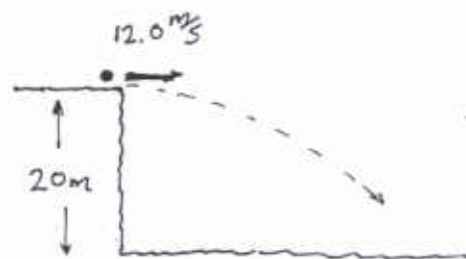–high cliff with a speed of $12.0\frac{m}{s}$.

a) How long is the ball in flight?

$12.0\,^{m}\!/_{s}$

20m

Here, $V_{ox} = 12.0\,^{m}\!/_{s}$ and $V_{oy} = 0$

(and $a_x = 0$, $a_y = -g$).

Find the time at which $y = -20.0\,m$ (that's when ball hits ground):

$y = V_{oy}t + \frac{1}{2}a_y t^2 \longrightarrow -20m = \frac{1}{2}(-9.8\frac{m}{s^2})t^2$

$t^2 = \frac{2(20.0m)}{(9.8\,^{m}\!/_{s^2})} = 4.08\ s^2 \longrightarrow \boxed{t = 2.02\ s}$

b) When it strikes the (flat) ground, what horizontal distance
has it travelled?

Find the value of x at the time found in (a):

$x = V_{ox}t + \frac{1}{2}a_x t^2 = V_{ox}t$

$x = (12.0\,^{m}\!/_{s})(2.02s) = \boxed{24.2\ m}$

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

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

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

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