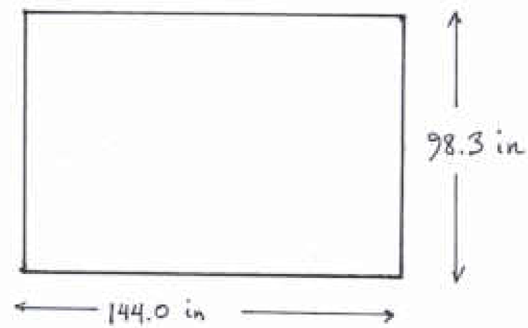
Name L. J. Silver

Phys 121 — Section 2

Quiz #1

1. A rectangle has a length of 144.0 in and a width of 98.3 in.

Find the area of the rectangle in units of m^2 (meters squared).



Area in (in^2) is:

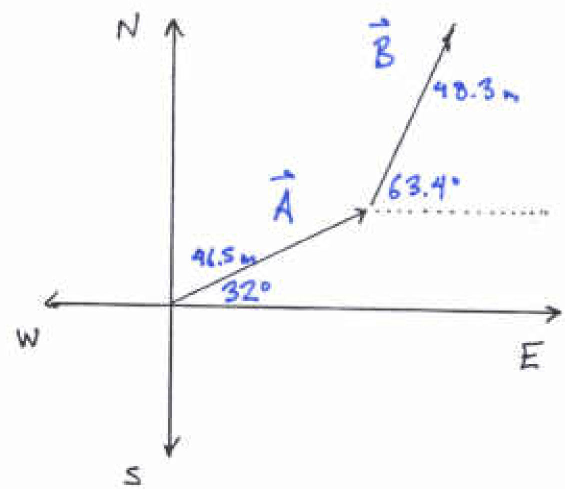
$$A = (144.0\text{ in})(98.3\text{ in}) = 1.42 \times 10^4\ in^2$$

Convert:

$$(1.42 \times 10^4\ in^2)\left(\frac{1\text{ m}}{39.37\text{ in}}\right)^2 = \boxed{9.13\ m^2}$$

2. A polite pirate starts from the origin and walks 46.5 m in a direction 32° North of East. Then he walks 48.3 m in a direction 63.4° North of East.

What is his net displacement (from the origin)? Give the magnitude and direction. Arrh.



$$A_x = A\cos\theta = (46.5\text{m})\cos 32° = 39.4\text{ m}$$

$$A_y = A\sin\theta = (46.5\text{m})\sin 32° = 24.6\text{ m}$$

$$B_x = B\cos\theta = (48.3\text{m})\cos 63.4° = 21.6\text{ m}$$

$$B_y = B\sin\theta = (48.3\text{m})\sin 63.4° = 43.2\text{ m}$$

Resultant vector has components

$$C_x = A_x + B_x = 61.1\text{ m}$$

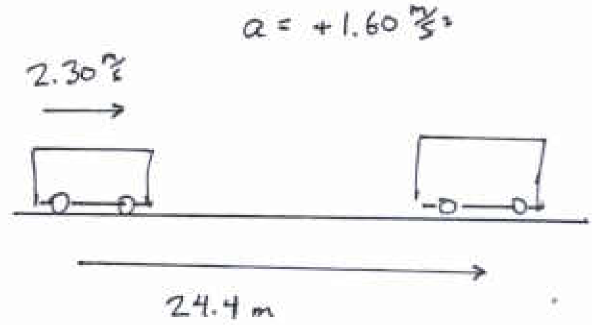
$$C_y = A_y + B_y = 67.8\text{ m}$$

Magnitude is

$$C = \sqrt{C_x^2 + C_y^2} = \boxed{91.3\text{ m}}$$

Direction is

$$\theta = \tan^{-1}\left(\frac{C_y}{C_x}\right) = \tan^{-1}(1.11) = \boxed{48.0°}$$



3. A car is traveling at a speed of $2.30\,\frac{\text{m}}{\text{s}}$. It moves in a straight line and accelerates at a rate of $1.60\,\frac{\text{m}}{\text{s}^2}$. What is its speed after it has traveled 24.4 m?

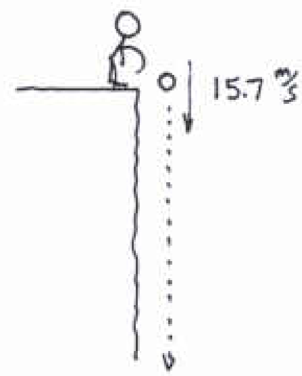
We know v_0, a and x. Use:

$$v^2 = v_0^2 + 2ax$$

$$= (2.30\,\tfrac{\text{m}}{\text{s}})^2 + 2(1.60\,\tfrac{\text{m}}{\text{s}^2})(24.4\,\text{m})$$

$$= 83.4\,\tfrac{\text{m}^2}{\text{s}^2}$$

$$v = \sqrt{83.4\,\tfrac{\text{m}^2}{\text{s}^2}} = \boxed{9.13\,\tfrac{\text{m}}{\text{s}}}$$



4. We stand at the edge of a cliff and throw a rock straight down with a speed of $15.7\,\frac{\text{m}}{\text{s}}$. How far has it fallen after 3.00 s?

$v_0 = -15.7\,\frac{\text{m}}{\text{s}}$ $\qquad a = -g = -9.8\,\frac{\text{m}}{\text{s}^2}$

At $t = 3.00\,\text{s}$, y has the value

$$y = v_0 t + \tfrac{1}{2}at^2$$

$$= (-15.7\,\tfrac{\text{m}}{\text{s}})(3.00\,\text{s}) + \tfrac{1}{2}(-9.80\,\tfrac{\text{m}}{\text{s}^2})(3.00\,\text{s})^2$$

$$= -91.3\,\text{m}$$

The rock has fallen $\boxed{91.3\,\text{m}.}$

You must show all your work!

$1\text{ m} = 39.37\text{ in}$ $\qquad 1\text{ in} = 2.54\text{ cm}$ $\qquad 1\text{ yd} = 0.9144\text{ m}$

$v = v_0 + at$ $\qquad x = v_0 t + \frac{1}{2}at^2$ $\qquad v^2 = v_0^2 + 2ax$ $\qquad x = \frac{1}{2}(v + v_0)t$

$g = 9.80\,\frac{\text{m}}{\text{s}^2}$ $\qquad 1\text{ mi} = 5280\text{ ft}$ $\qquad A_x = A\cos\theta$, $A_y = A\sin\theta$

$A = \sqrt{A_x^2 + A_y^2}$ $\qquad \theta = \tan^{-1}\left(\frac{A_y}{A_x}\right)$