HW-1

Answer the following questions
- **Dimensional Analysis**
1. Which of the following equations are dimensionally 22correct?

(a) $v_f = v_i + ax$
(b) $y = (2\ \text{m})\cos(kx)$, where $k = 2\ \text{m}^{-1}$.

a) $\quad v_f = v_i + ax$

$$\frac{L}{T} = \frac{L}{T} + \frac{L}{T^2}\,L$$

$$\frac{L}{T} = \frac{L}{T} + \frac{L^2}{T^2}$$

$$\text{LHS} \neq \text{RHS}$$

This equation is not dimensionally correct

b) $y = 2m\cos kx$

$[L] = [L]$

$[L]$ مسافة :y
$[L]$ مسافة :m
بلا وحدة sin , cos

$\text{LHS} = \text{RHS}$

This equation is dimensionally

Correct

2. The position of a particle moving under uniform acceleration is some function of time and the acceleration. Suppose we write this position $s = ka^m t^n$, where k is a dimensionless constant. Show by dimensional analysis that this expression is satisfies if m=1 and n=2. Can this analysis give the value of k ?

$$S = k\, a^m\, t^n$$

$$[L] = \left[\frac{L}{T^2}\right]^1 [T^2]$$

$$S = \text{الموضع} = m = [L]$$
$$a = \text{تسارع} = m/s^2 = \left[\frac{L}{T^2}\right]$$
$$t = \text{زمن} = S = [T]$$

$$[L] = [L]$$

$n = 2 \qquad\qquad m = 1 \qquad$ نفس تحققت المعادلة عند ص . م

$$LHS = RHS$$

k is dimensionless constant
Cann't be obtianed by analysis

- Conversion of Units

3. Arectangular building lot is 100 ft by 150 ft . Determine the area of this lot in m^2 ? $1m = 3.281 ft$

150 ft

100 ft
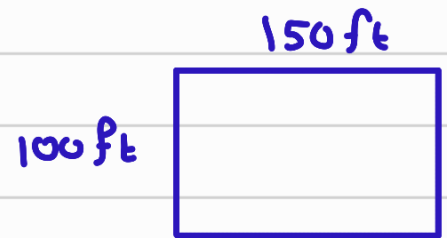
تحويل الطول

$$L = \frac{150}{3.281} \ m$$

$$W = \frac{100}{3.281} \ m$$

$$Area = L \ W$$

$$Area = \frac{150}{3.281} \times \frac{100}{3.281} = 1393.4 \ m^2$$

$$= 1.3934 \times 10^3 \ m^2$$

$$= 1.39 \times 10^3 \ m^2$$