Answers– Week 2

2-1. S = 60 mph

1 mile = 5280 ft, 1h = 3600 sec.

$$S = \frac{60 x 5280}{3600} = 88 \text{ft/sec}$$

They are equal

2-3. 65mph = 29.06 m/sec

Track length = 300km

Time allowed for qualifying

$$\Delta t = \frac{300}{0.029} = 1.03 \times 10^4 \text{ secs}$$

Speed for 1st 150 km

55mph = 24.59 m/sec

Time taken $\Delta t_{1/2} = \frac{150}{0.025} = 6 \times 10^3 \text{secs}$

Time available for second half

$$\Delta t - \Delta t_{1/2} = (10.3 \times 10^3 - 6 \times 10^3) \text{ sec}$$

$$= 4.3 \times 10^3 \text{ sec}$$

So speed required for 2nd half

$$S = \frac{150 x 10^3}{4.3 x 10^3} = 34.88 \text{m/sec}$$

$$= 78 \text{mph}$$

2-5. $r_1 = \sqrt{3^2 + 4^2} = 5\text{m}$

$r_2 = \sqrt{3^2 + 4^2} = 5\text{m}$

$r_3 = \sqrt{1 + 8 + 16} = 5\text{m}$

$r_4 = \sqrt{1 + 16 + 8} = 5\text{m}$

2-7. Av. Speed = $\frac{\text{distance travelled}}{\text{time taken}}$

$$= \frac{2\pi x 100}{5 x 60} = 2.1 \text{ m/sec}$$

Av. Vel <V> = $\frac{\textit{Displacement vector}}{\textit{time elapsed}}$

$$= 0$$

2-9. $\underrightarrow{V}_{AB}$ positive

$\underrightarrow{V}_{BC} = 0$

$\underrightarrow{V}_{CD}$ negative

2-11. 55mph = 24.6 m/sec

Yes, you miss the deer.

Distance travelled in $\frac{1}{3}$ sec = 8.2m

Distance travelled before stopping = $\frac{0-(24.6)^2}{-2x2}$

= 151.3m

Total distance = 159.5m

2-13. $V^2 = V_i^2 + 2a(X - X_i)$

$\underset{\rightarrow}{V} = 200\text{mph}\,\hat{x} = 89.5\text{ m/sec}\,\hat{x}$

$\underset{\rightarrow}{V_i} = 0$

$(X - X_i) = 1100\text{m}$

So $a = \frac{(89.5)^2}{2x1100} = 3.6\text{ m/s}^2$

$\underset{\rightarrow}{a} = 3.6\text{ m/s}^2\,\hat{x}$