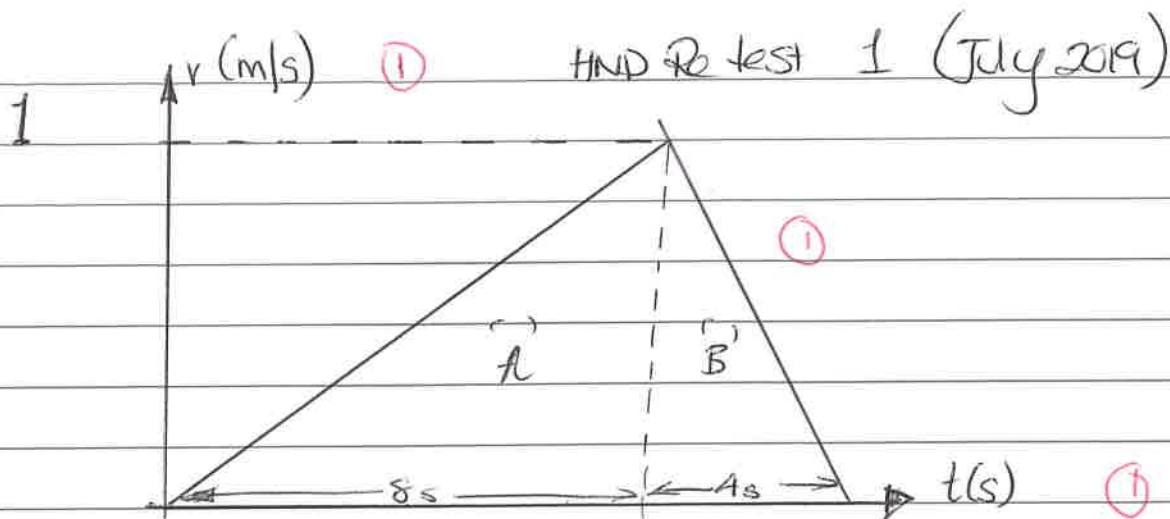




Working @ 'A':

$$u = 0$$

$$v = ?$$

$$a = 1.6\text{ m/s}^2$$

$$t = 8\text{ s}$$

$$v = u + at$$

$$v = (1.6 \times 8)$$

$$v = 12.8\text{ m/s}$$

$$s = ut + \frac{1}{2}at^2 = \frac{1}{2} \times 1.6 \times 8^2 = 51.2\text{ m}$$

Total distance

$$= \text{Area of graph} = \frac{1}{2} \text{ base} \times \text{height}$$

$$= \frac{1}{2} \times 12 \times 12.8$$

$$= 76.8\text{ m}$$

2.

a) $m = 4.5\text{ kg}$

$$k = 0.15\text{ m}$$

$$\omega = \frac{2500\text{ rpm} \times 2\pi}{60} = 261.80 \text{ (2dp) rad/s}$$

$$I = mk^2$$

$$I = 4.5 \times 0.15^2$$

$$I = 0.10\text{ kgm}^2$$

$$KE = \frac{1}{2} I \omega^2 = 0.5 \times 0.1 \times 261.8^2$$

$$= 6854.42\text{ J}$$

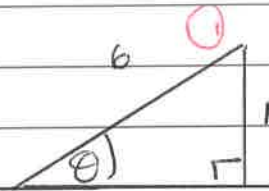
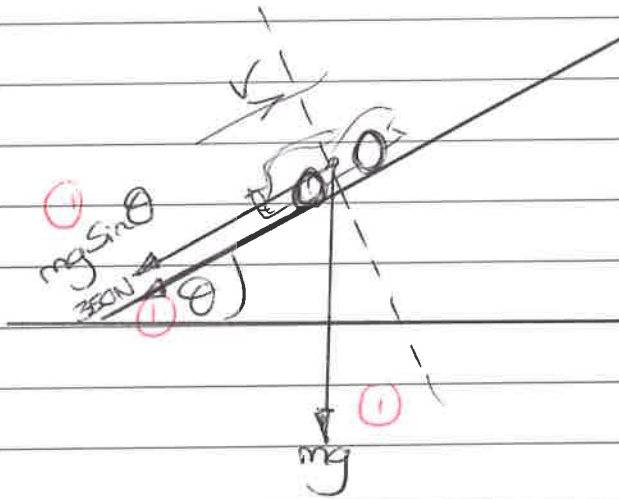
b) $m = 85 \text{ kg}$
 $v = 45 \text{ km/h} \times \frac{1000}{3600} = 12.5 \text{ m/s}$

$$KE = \frac{1}{2} mv^2 = \frac{1}{2} \times 85 \times 12.5^2 = 6640.63 \text{ J}$$

c) Total Energy = $6854.42 + 6640.63$
 $= 13495.05 \text{ J}$

d) Change in PE = $mgh_2 - mgh_1$
 $= (85 \times 9.81 \times 1) - (85 \times 9.81 \times 0.3)$
 $= 583.70 \text{ J}$

3.



$$\sin \theta = \frac{\text{Opp}}{\text{Hyp}}$$

$$\sin \theta = \frac{1}{6}$$

Total Forces acting downhill

$$= mg \sin \theta + 350$$

$$= \left(850 \times 9.81 \times \frac{1}{6} \right) + 350$$

$$= 1739.75 \text{ N}$$

Power minus 30%

$$P = 45000 - (0.3 \times 45000)$$

$$P = 31500 \text{ W}$$

$$P = F \times v$$

$$v = \frac{P}{F} = \frac{315000}{1739.75} = 18.11 \text{ m/s}$$

$$\begin{aligned}
 A. \quad m &= 1.5 \text{ kg} \\
 x &= 0.025 \text{ m} \\
 v &= 25 \text{ m/s} \\
 l &= 0.06 \text{ m}
 \end{aligned}$$

$$a) \quad A = \frac{l}{2} = \frac{0.06}{2} = 0.03 \text{ m}$$

$$b) \quad v = \omega \sqrt{A^2 - x^2}$$

$$\omega = \frac{v}{\sqrt{A^2 - x^2}} = \frac{25}{\sqrt{0.03^2 - 0.025^2}} = 1507.56 \text{ rad/s}$$

$$c) \quad n = \frac{\omega}{2\pi} = \frac{1507.56}{2\pi} = 239.94 \text{ Hz}$$

$$d) \quad F = m\omega^2 A$$

$$F = 1.5 \times 1507.56^2 \times 0.03$$

$$F = 102273.17 \text{ N}$$

$$F = 10.23 \text{ kN}$$