

## Homework 2

①

1) The time of flight = 2 x time to fall

$$a = 9.8$$

$$u = 0$$

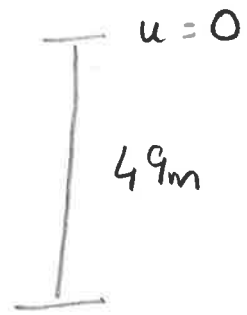
$$s = 49$$

$$t = ?$$

$$s = ut + \frac{1}{2} at^2$$

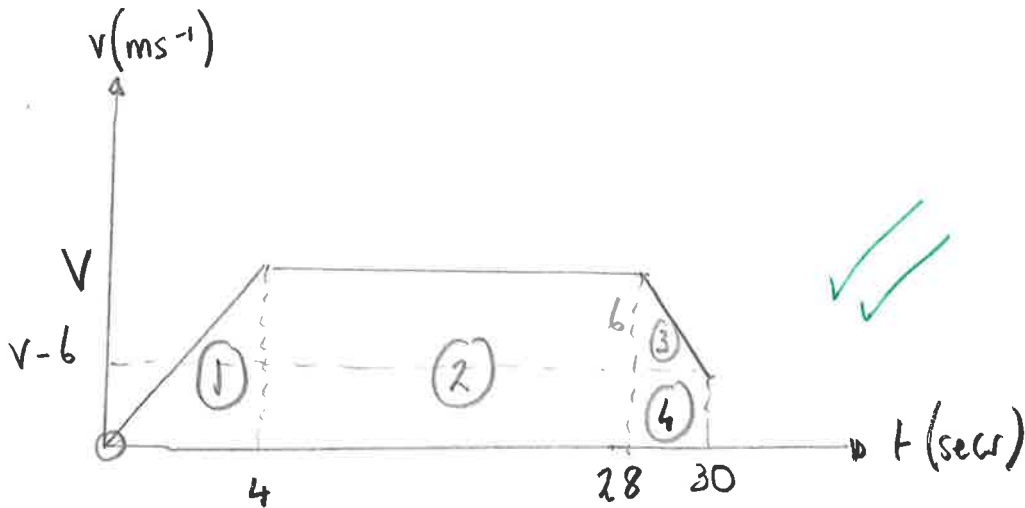
$$49 = \frac{1}{2} \times 9.8 t^2$$

$$t = \sqrt{10} \text{ sec}$$



so total time =  $2\sqrt{10} \text{ sec}$  (= 6.32s) ✓ [probably would only get 3 marks]

2)



Total distance = 200m

$$\text{so area (1) + area (2) + area (3) + area (4) = 200} \checkmark$$

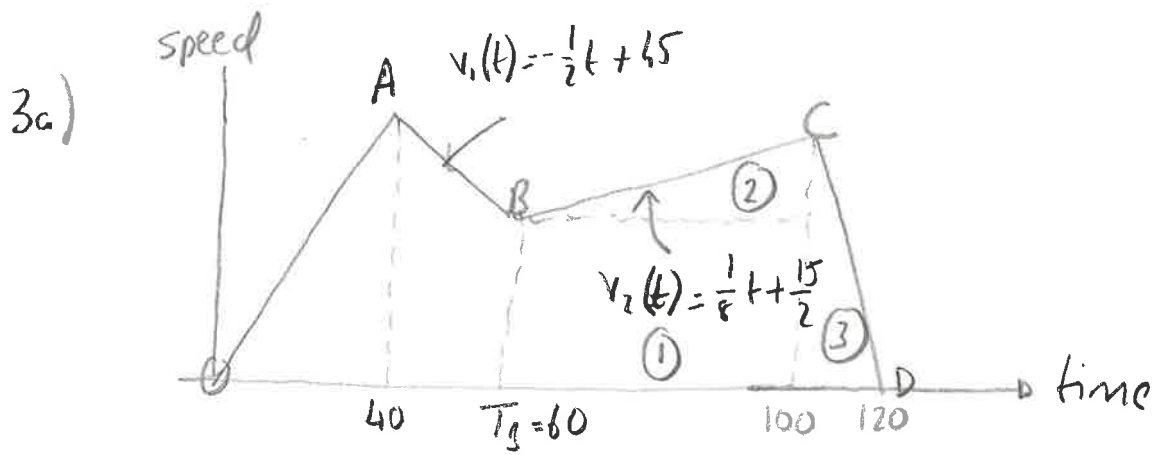
$$\frac{1}{2} \times 4 \times v + 24 \times v + \frac{1}{2} \times 2 \times 6 + 2 \times (v-6) = 200 \checkmark$$

$$2v + 24v + 6 + 2v - 12 = 200$$

$$28v - 6 = 200 \checkmark$$

$$28v = 206$$

$$v = \underline{7.36 \text{ ms}^{-1}} \checkmark$$



at B  $v_1(t) = v_2(t)$  [interseccion of straight lines]

$$-\frac{1}{2}t + 45 = \frac{1}{8}t + \frac{15}{2} \quad \checkmark$$

$$-4t + 360 = t + 60$$

$$5t = 300$$

$$\underline{t = 60 \text{ secs}} \quad \checkmark \Rightarrow v_1(t) = -\frac{1}{2}t + 45$$

$$= -\frac{1}{2} \times 60 + 45 = \underline{15 \text{ ms}^{-1}} \quad \checkmark$$

b)  $v_2(t) = \frac{1}{8}t + \frac{15}{2}$

$\Rightarrow$  speed at C is  $v = \frac{1}{8} \times 100 + \frac{15}{2}$

$$\underline{v = 20 \text{ ms}^{-1}} \quad \checkmark$$

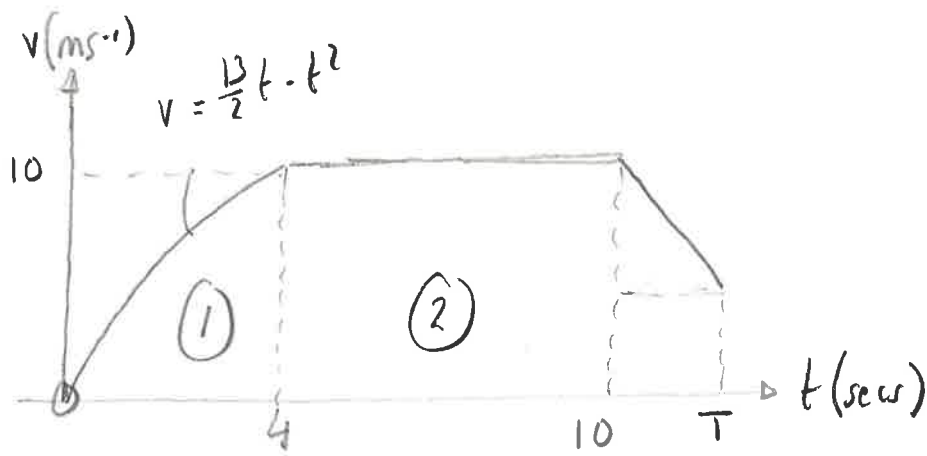
distance travelled between B and D

$$= \text{area ①} + \text{area ②} + \text{area ③}$$

$$= 40 \times 15 + \frac{1}{2} \times 40 \times 5 + \frac{1}{2} \times 20 \times 20 \quad \checkmark$$

$$= \underline{900 \text{ m}} \quad \checkmark$$

4)



(2)

$$\text{distance (1)} = \int_0^4 \left( \frac{13}{2}t - t^2 \right) dt$$

$$= \left[ \frac{13t^2}{4} - \frac{t^3}{3} \right]_0^4 = 30 \frac{2}{3} \text{ m}$$

$$\text{distance (2)} = 6 \times 10 = 60 \text{ m}$$

$$\text{remaining distance} = 100 - 60 - 30 \frac{2}{3} = \underline{9 \frac{1}{3} \text{ m}}$$

$$a = -0.4$$

$$s = 9 \frac{1}{3}$$

$$u = 10$$

$$t = ?$$

$$s = ut + \frac{1}{2}at^2$$

$$9 \frac{1}{3} = 10t - 0.2t^2$$

$$0.2t^2 - 10t + 9 \frac{1}{3} = 0$$

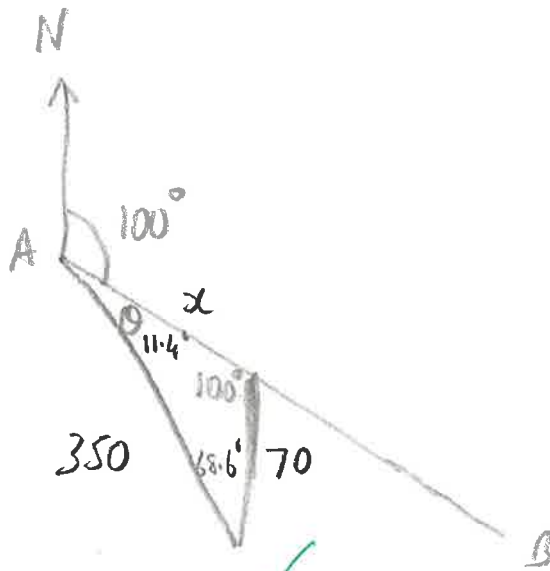
$$t = \frac{10 \pm \sqrt{10^2 - 4 \times 0.2 \times 9 \frac{1}{3}}}{2 \times 0.2}$$

$$t = \frac{10 \pm 9.62}{0.4}$$

$$t = 0.95, \quad \cancel{49.0}$$

$$\Rightarrow \text{Total time} = \underline{10.95 \text{ secs}}$$

5)



$$\frac{\sin \theta}{70} = \frac{\sin 100^\circ}{350}$$

$$\theta = \sin^{-1} \left( \frac{70 \sin 100^\circ}{350} \right) = 11.4^\circ$$

so bearing  $100 + 11.4 = \underline{111.4^\circ}$

b)

$$\frac{x}{\sin 68.6} = \frac{350}{\sin 100}$$

$$\underline{x = 331 \text{ km/h}}$$

$$t = \frac{d}{s}$$

$$t = \frac{500}{331}$$

$$t = 1.51 \text{ hours}$$

time = 1 hour 31 minutes