

1979 ml

a. $mgh = \frac{1}{2}mv^2$

$$v = \sqrt{2gh}$$

b. $| \Delta x | = | \Delta y |$

$$\sqrt{2gh}t = \frac{1}{2}gt^2$$

$$\frac{2}{g}\sqrt{2gh} = t$$

$$t = 2\sqrt{\frac{2h}{g}}$$

c. $\Delta y = \frac{1}{2}g \left[2\sqrt{\frac{2h}{g}} \right]^2$

$$= 2g \left[\frac{2h}{g} \right]$$

$$= 4h$$

$$L = \sqrt{2} \cdot 4h$$

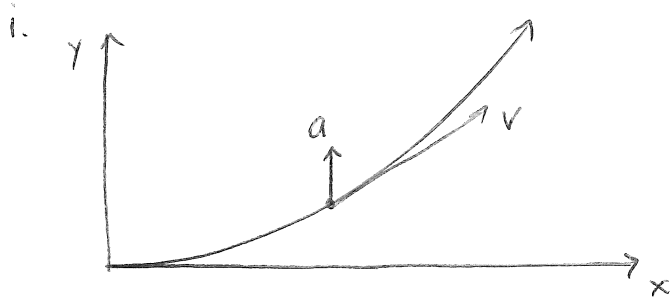
d. $mg[h + \Delta y] = \frac{1}{2}mv^2$

$$g \cdot 5h = \frac{1}{2}v^2$$

$$v = \sqrt{10gh}$$

1983 M1

a.



ii.

$$v_y = \frac{dy}{dt} = \frac{dy}{dx} \cdot \frac{dx}{dt}$$

$$= x \cdot c$$

iii.

$$v_y = x \cdot c = (ct) \cdot c = c^2 t$$

$$a_y = \frac{dv_y}{dt} = c^2$$

b. i.

$$v_x = \frac{c}{\sqrt{1+x^2}} \quad v_y = \frac{dy}{dt} = \frac{dy}{dx} \cdot \frac{dx}{dt}$$

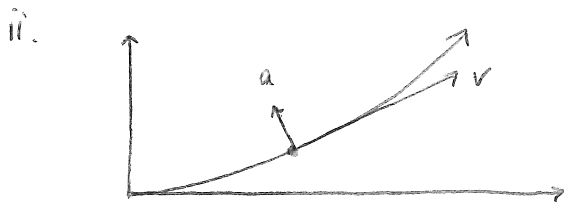
$$= x \cdot v_x$$

$$= \frac{x c}{\sqrt{1+x^2}}$$

$$v^2 = v_x^2 + v_y^2 = \frac{c^2}{1+x^2} + \frac{x^2 c^2}{1+x^2}$$

$$= \frac{c^2(1+x^2)}{1+x^2} = c^2$$

$$v = c$$



VELOCITY IS TANGENT TO THE PART OF MOTION. IF SPEED IS FIXED, ACCELERATION MUST BE NORMAL TO THE VELOCITY VECTOR.

1985 m1

a. $v_f^2 = v_i^2 + 2 a \Delta s$

$$v_f^2 = (50 \sin 37^\circ)^2 + 2(-10)(-35)$$

$$v_f = -40 \text{ m/s}$$

$$\Delta t = \frac{v_f - v_i}{a} = \frac{-40 - 50 \sin 37^\circ}{-10} = 7 \text{ sec}$$

b. $\Delta x = v_x \cdot t$

$$= (50 \cos 37^\circ)(7)$$

$$= 280 \text{ m}$$

c. $v_A = 50 \cos 37^\circ = 40 \text{ m/s}$

$$v_B = 50 \text{ m/s}$$

$$v_c = \sqrt{40^2 + (50 \sin 37^\circ)^2}$$

$$= 56.6 \text{ m/s}$$

d. $R_{cm} = \frac{(m_1)(R_1) + (m_2)(R_2)}{\Sigma m} = 0$

$$\frac{(6)(-x) + (6)(30)}{16} = 0$$

$$x = 18 \text{ m}$$

1992 m1

a. $V_f^2 = V_i^2 + 2(a)(\Delta s)$

$$V_f^2 = 0 + 2(-9.8)(-5)$$

$$V_f = -10 \text{ m/s}$$

b. $S = \Delta S_{\text{CLAY}} + \Delta S_{\text{BALL}}$

$$S = \frac{1}{2}gt^2 + [V_i t - \frac{1}{2}gt^2]$$

$$S = V_i \cdot t$$

$$S = 10t$$

$$t = 0.5 \text{ s}$$

c. $\Delta S_{\text{BALL}} = (10)(0.5) - \frac{1}{2}(9.8)(0.5^2)$
 $= 3.75 \text{ m}$

d. $V_{\text{CLAY}} = -gt$
 $= -5 \text{ m/s}$

$$V_{\text{BALL}} = V_i - gt$$
$$= 5 \text{ m/s}$$

e. $(9m)(5) + (m)(-5) = (10m)v$

$$v = 4 \text{ m/s UPWARDS}$$

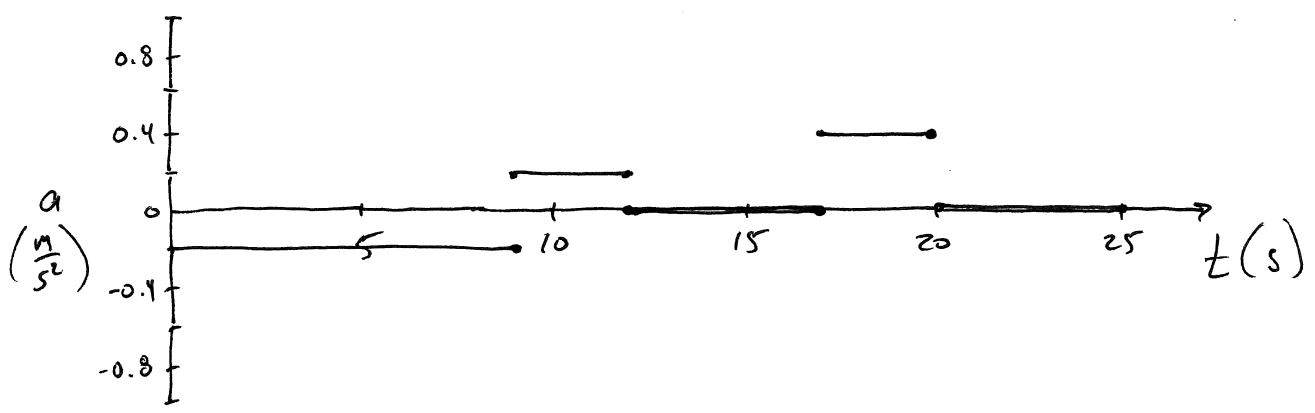
2000 B1

a. 4 SECONDS AND 18 SECONDS

b. 4-9 SECONDS AND 18-20 SECONDS

c. $\Delta S (0 \text{ TO } 4\text{s}) = 1.6 \text{ m}$
 $\Delta S (4 \text{ TO } 8\text{s}) = -1.6 \text{ m}$
 $\Delta S (8 \text{ TO } 9\text{s}) = -0.9 \text{ m}$ } $\Sigma \Delta S = -0.9 \text{ m}$

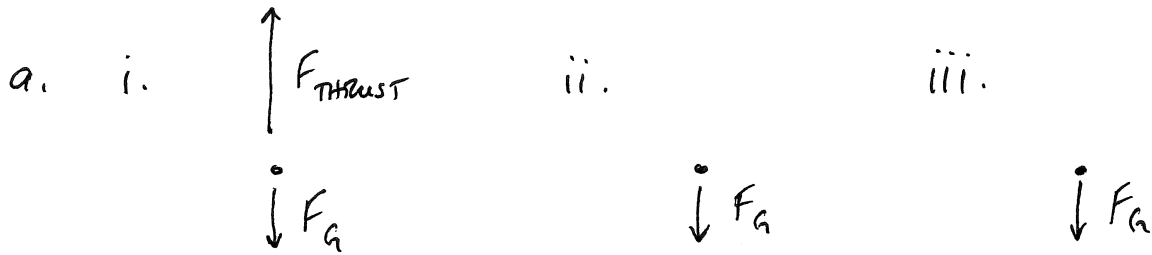
d.



e. i. $t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \cdot 0.4}{10}} = 0.283 \text{ s}$

ii. $\Delta S_x = v_x \cdot t = (0.8)(0.283) = 0.226 \text{ m}$

2002 B1



b.
$$a = \frac{\Sigma F}{m} = \frac{F_T - mg}{m} = \frac{14.6 - 3.5}{0.35} = 31.7 \text{ m/s}^2$$

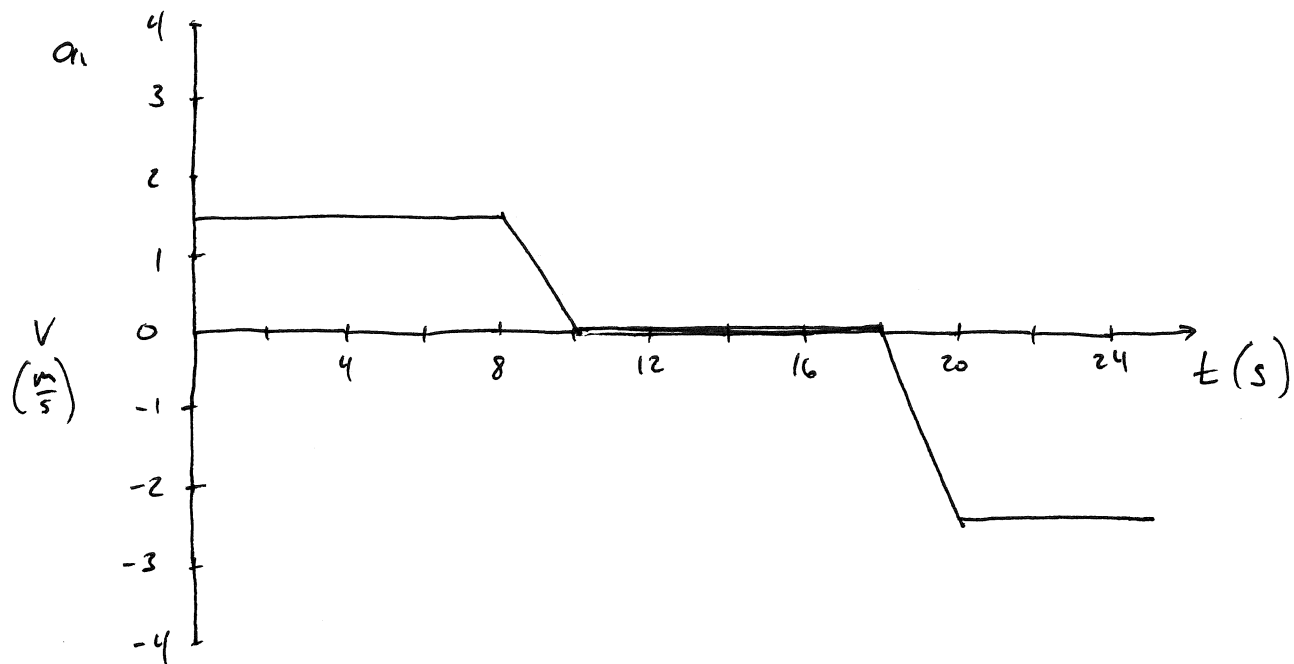
c.
$$v = v_0 + a \cdot t = 0 + (31.7)(2.5) = 79.3 \text{ m/s}$$

d. GREATER THAN

$$ma = F_{\text{SCALE}} - mg$$

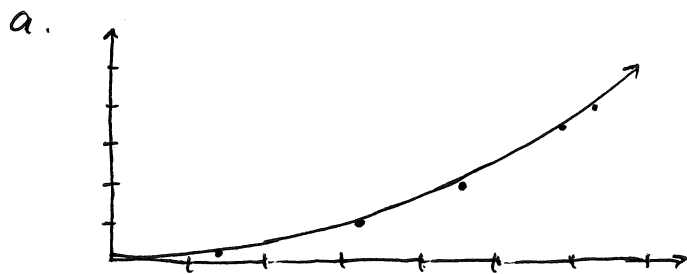
$$F_{\text{SCALE}} = mg + ma > mg$$

2005 B1



b.
$$\bar{a} = \frac{v_f - v_i}{\Delta t} = \frac{0 - 1.5}{2} = -0.75 \text{ m/s}^2$$

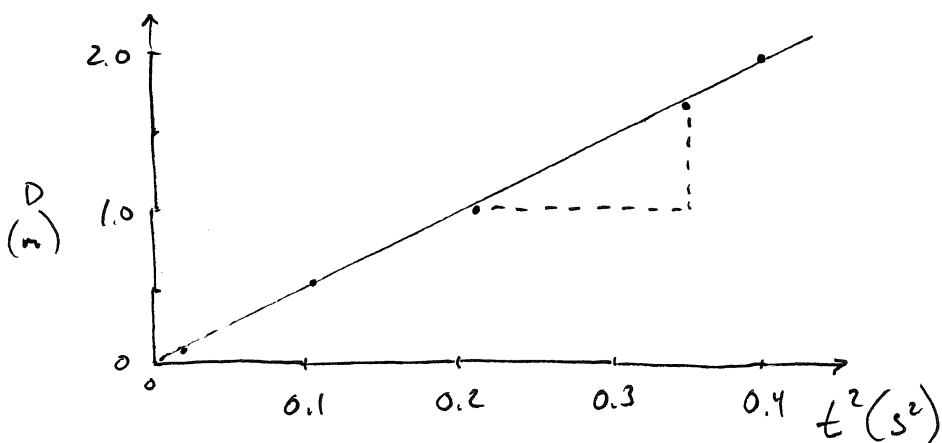
2006 B1



b. D vs t^2

c.

D	t^2
0.1	0.0196
0.5	0.1024
1.0	0.2116
1.7	0.3481
2.0	0.3969



d. $\text{SLOPE} = \frac{0.75 \text{ m}}{0.15 \text{ s}^2} = 5 \text{ m/s}^2$

$$D = \frac{1}{2} a t^2 \text{ so } a = 2 \left[\frac{D}{t^2} \right] = 2 [\text{SLOPE}] = 10 \text{ m/s}^2$$

e. MULTIPLE TRIALS WOULD AVERAGE -OUT RANDOM ERROR