

(1) 4s and 8s

(2)  $\text{dist} = 35\text{m} + 50\text{m} + 65 = \frac{150}{20} = \boxed{7.5\text{m/s}}$   
time

(3)  $\text{disp @ } 20\text{s} = 50\text{m}$

$v_{\text{avg}} = \frac{50\text{m}}{20\text{s}} = \boxed{2.5\text{m/s}}$

(4) 3s and 10s (5)  $a = \text{slope} = \frac{v_f - v_o}{t}$   
rise/run

$a = \frac{-35 - 20}{5 - 2} = -\frac{55}{3} = \boxed{-18.3\text{ m/s}^2}$

(6)  $\text{dist} = A_1 + A_2 + A_3$   
Areas

$= \frac{1}{2}(3)(20) + \frac{1}{2}(35)(7+3) + \frac{1}{2}(20)(10+9)$

$= 30\text{m} + 175\text{m} + 190\text{m} = 395\text{m}$

$v_{\text{sp}} = \frac{\text{dist}}{\text{time}} = \frac{395\text{m}}{20\text{s}} = \boxed{19.75\text{m/s}}$

(7)  $v_{\text{avg}} = ?$

$v_{\text{avg}} = \frac{\text{Disp}}{\text{time}}$

$\rightarrow \text{Disp} = \underbrace{A_1 + A_3}_{\text{TOP}} - \underbrace{A_2}_{\text{Bottom}}$

$\text{Disp} = \underbrace{30}_{A_1} + \underbrace{190}_{A_3} - \underbrace{175}_{A_2} = 45$

$v_{\text{avg}} = \frac{45\text{m}}{20\text{s}} = \boxed{2.25\text{m/s}}$

$$8a) \text{ dist} = 32 + 15 + 10 + 25 = 82\text{m}$$

$$v_{sp} = \frac{d}{t} = \frac{82\text{m}}{38\text{s}} = 2.16\text{ m/s}$$

$$b) v_{avg} = \frac{\text{disp}}{\text{time}} = \frac{32 - 25 + 15 - 10}{38} = \frac{12}{38} = \boxed{0.32\text{ m/s}}$$

$$9a) v_0 = 51\text{ m/s}$$

west

$$v_f = -25\text{ m/s}$$

$$t = 47\text{ s}$$

$$a = ?$$

$$a = \frac{v_f - v_0}{t}$$

$$a = \frac{-25 - 51}{47}$$

$$a = -\frac{76}{47} = \boxed{-1.62\text{ m/s}^2}$$

$$b) d_f = ? \quad d_f = d_0 + v_0 t + \frac{1}{2} a t^2$$

$$d_0 = 0\text{ m}$$

$$d_f = 0 + (51)(47) + \frac{1}{2}(-1.62)(47)^2$$

$$d_f = 2397 + \frac{1}{2}(-1.62)(2209)$$

$$= 2397 - 1789$$

$$\boxed{d_f = 608\text{ m}}$$

10a)  $a = -9.81 \text{ m/s}^2$   
 $v_0 = 22.1$   
 $t = ?$   
 $d_0 = 175 \text{ m}$   
 $v_f = 0 \text{ m/s}$  @ max height

$$a = \frac{v_f - v_0}{t}$$

$$-9.81 = \frac{0 - 22.1}{t} \rightarrow -9.81t = -22.1$$

$$-9.81t = -22.1$$

$$t = \frac{-22.1}{-9.81}$$

$$t = 2.25 \text{ s}$$

b)  $v_f = ?$  when  $d_f = 55 \text{ m}$   
 $d_0 = 175 \text{ m}$   $v_0 = 22.1 \text{ m/s}$   $a = -9.81 \text{ m/s}^2$

$$v_f^2 = v_0^2 + 2a(d_f - d_0)$$

$$v_f^2 = (22.1)^2 + 2(-9.81)(55 - 175)$$

$$v_f^2 = 488.41 + 2354.4$$

$$v_f = \sqrt{2843}$$

$$v_f = \pm 53.3 \text{ m/s}$$

$$v_f = -53.3 \text{ m/s} \text{ falling down}$$

c)  $v_0 = 22.1$   
 $d_0 = 175 \text{ m}$   
 $d_f = 100 \text{ m}$   
 $a = -9.81$   
 $t = ?$

$$d_f = d_0 + v_0 t + \frac{1}{2} a t^2$$

$$v_f = ? \text{ at } d_f = 100 \text{ m}$$

$$v_f^2 = v_0^2 + 2a(d_f - d_0)$$

$$v_f^2 = (22.1)^2 + 2(-9.81)(100 - 175)$$

$$v_f^2 = 488 + 1471.5$$

$$v_f = \sqrt{1959.5}$$

$$v_f = \pm 44.3 \text{ m/s} \rightarrow -44.3 \text{ m/s}$$

object moving down

$$a = \frac{v_f - v_0}{t}$$

$$-9.81 = \frac{-44.3 - 22.1}{t}$$

$$-9.81 = \frac{-66.4}{t}$$

$$-9.81t = -66.4$$

$$t = \frac{-66.4}{-9.81}$$

$$t = 6.8 \text{ s}$$