

1

$$\textcircled{L} \quad A_x = 15 \cos 80 = 2.6$$
$$A_y = 15 \sin 80 = 14.77$$

$$\vec{A} = 2.6 \hat{i} + 14.77 \hat{j}$$

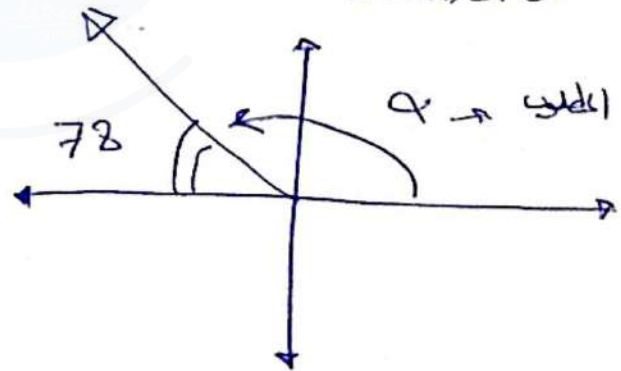
$$\textcircled{a} \quad 3\vec{A} = 3(2.6 \hat{i} + 14.77 \hat{j})$$
$$= 7.8 \hat{i} + 44.3 \hat{j}$$
$$-2\vec{B} = -24 \hat{i} + 32 \hat{j}$$

$$3\vec{A} - 2\vec{B} = -16.2 \hat{i} + 76.3 \hat{j}$$

$$|3\vec{A} - 2\vec{B}| = \sqrt{(-16.2)^2 + (76.3)^2} = \boxed{78}$$

$$\theta = \tan^{-1} \left(\frac{76.3}{-16.2} \right) = \underline{\underline{-78}} \rightarrow \begin{array}{l} \text{الزاوية بين المتجه} \\ \text{وأقرب جزء} \\ \text{من المحور } x \end{array}$$

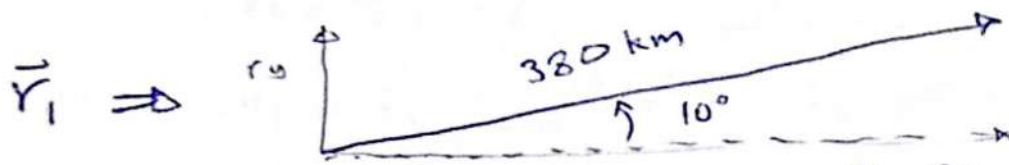
$$\alpha = (180 - 78)$$
$$= \boxed{102^\circ}$$



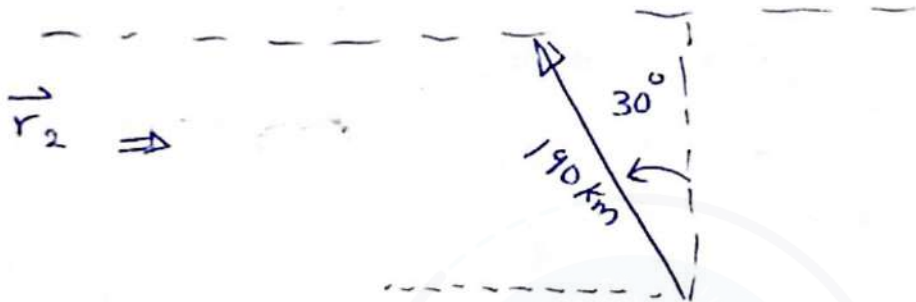
$$\textcircled{b} \quad \vec{A} \cdot \vec{B} = (2.6)(12) + (14.77)(-16) = \boxed{-205.12}$$

$$\textcircled{c} \quad \vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2.6 & 14.77 & 0 \\ 12 & -16 & 0 \end{vmatrix} = (0 - 0) \hat{i} + (0 - 0) \hat{j} + (-41.6 - 177.2) \hat{k}$$
$$= \boxed{-218.84 \hat{k}}$$

2



$$\begin{aligned}\vec{r}_1 &= (380 \cos 10^\circ) \hat{i} + (380 \sin 10^\circ) \hat{j} \\ &= 374.2 \hat{i} + 66 \hat{j}\end{aligned}$$

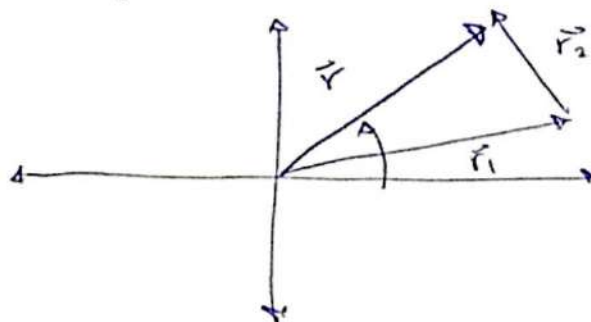


$$\begin{aligned}\vec{r}_2 &= (-190 \sin 30^\circ) \hat{i} + (190 \cos 30^\circ) \hat{j} \\ &= -95 \hat{i} + 164.5 \hat{j}\end{aligned}$$

$$\begin{aligned}\vec{r} &= \vec{r}_1 + \vec{r}_2 \\ &= 279.2 \hat{i} + 230.5 \hat{j}\end{aligned}$$

$$|\vec{r}| = \sqrt{(279.2)^2 + (230.5)^2} = \underline{\underline{362}}$$

$$\theta = \tan^{-1} \left(\frac{230.5}{279.2} \right) = \underline{\underline{39.5^\circ}}$$



$$\boxed{3} \mid (\vec{A} + 2\vec{B}) + (\vec{A} - 2\vec{B}) = 2\vec{A}$$

$$2\vec{A} = (3\hat{i} + 3\hat{j}) + (-7\hat{i} + 5\hat{j})$$

$$\boxed{2\vec{A} = -4\hat{i} + 8\hat{j} \mid \Rightarrow \vec{A} = -2\hat{i} + 4\hat{j} \mid}$$

$$\vec{A} + 2\vec{B} = 3\hat{i} + 3\hat{j}$$

$$2\vec{B} = 3\hat{i} + 3\hat{j} - \vec{A} = (3\hat{i} + 3\hat{j}) - (-2\hat{i} + 4\hat{j})$$

$$2\vec{B} = 5\hat{i} - \hat{j}$$

$$\boxed{\vec{B} = \frac{5}{2}\hat{i} - \frac{1}{2}\hat{j} \mid}$$

$$\begin{array}{l} \vec{A} \\ \vec{B} \end{array} \left| \begin{array}{ccc} \hat{i} & \hat{j} & \hat{k} \\ -2 & 4 & 0 \\ \frac{5}{2} & -\frac{1}{2} & 0 \end{array} \right| = (0)\hat{i} + (0)\hat{j} + (-9)\hat{k} = -9\hat{k}$$

[4]

$$v(t) = \frac{dx}{dt}$$

$$\textcircled{a} \quad v(t) = -8t + 13, \quad v \text{ @ } t=2 = -8(2) + 13 = \underline{\underline{-3 \text{ m/s}}}$$

$$a(t) = \frac{dv}{dt}$$

$$\textcircled{b} \quad = (-8), \quad a \text{ @ } t=5 = \underline{\underline{-8 \text{ m/s}^2}}$$

$$\textcircled{c} \quad v_{\text{avg}} = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$$

$$x_f \text{ @ } t=8 = 12 + 13(8) - 4(8)^2 = -140 \text{ m}$$

$$x_i \text{ @ } t=2 = 22 \text{ m}$$

$$v_{\text{avg}} = \frac{-140 - 22}{8 - 2} = \underline{\underline{-27 \text{ m/s}}}$$

\textcircled{d} When change direction $\Rightarrow v=0$

$$v = -8t + 13 \Rightarrow 0 = -8t + 13$$

$$t = \underline{\underline{1.625 \text{ sec}}}$$

$$x \text{ @ } t=1.625 = 12 + 13(1.625) - 4(1.625)^2 = \underline{\underline{22.56 \text{ m}}}$$

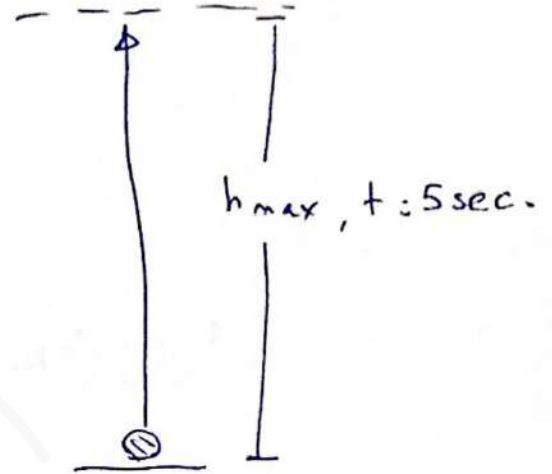
5

$$\text{@ } h_{\max} \Rightarrow v_2 = 0$$

$$\text{a) } v_2 = v_1 + gt$$

$$0 = v_1 + (-9.8)(5)$$

$$v_1 = 49 \text{ m/s}$$



$$\text{b) } \Delta y = v_1 t + \frac{1}{2} g t^2$$

$$= (49)(5) + \frac{1}{2} (-9.8)(5)^2$$

$$= 122.5 \text{ m}$$

6

$$V_{avg} = \frac{\Delta X}{\Delta t}$$

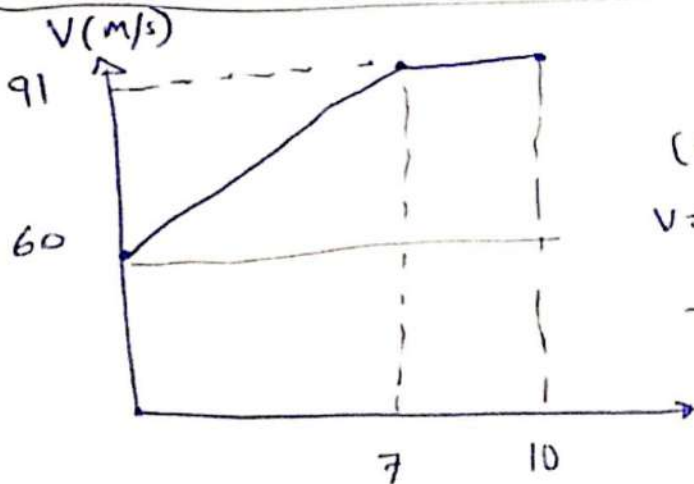
first period \Rightarrow $V_2 = V_1 + at$
 $91 = 60 + a(7)$
 $a = 4.43 \text{ m/s}^2$

$$\Delta X_1 = V_1 t_1 + \frac{1}{2} a t^2$$
$$= 60(7) + \frac{1}{2} (4.43) (7)^2$$
$$= \underline{528.53 \text{ m}}$$

Second period \Rightarrow $\Delta X_2 = V_2 t_2$ ($a=0$)
 $= 91(3) = 273$

$$\Delta X = \Delta X_1 + \Delta X_2, \Delta t = t_1 + t_2 = 10 \text{ sec.}$$
$$= \underline{801.53 \text{ m}}$$

$$V_{avg} = \frac{\Delta X}{\Delta t} = \frac{801.53}{10}$$
$$= \boxed{80 \text{ m/s}}$$



طريقة اخرى

نسب سرعة تحت تأثير التسارع (ΔX)
وهي $V = \frac{\Delta X}{\Delta t}$

بالتالي $\Delta t = 10 \text{ s}$

$$\Delta X = (60 \times 7) + (3 \times 91)$$
$$+ (0.5 \times 31 \times 7)$$
$$= 801.5 \text{ m}$$

$$V = \frac{\Delta X}{\Delta t} = 80 \text{ m/s}$$

7

$\Delta x \Rightarrow$ المسافة التي قطعها

$$\begin{aligned}\Delta x &= (0.5 \times 2 \times 3.6) + (8 \times 3.6) \\ &\quad + (0.5 \times 2 \times 3.6) \\ &= 36\end{aligned}$$

$$\Delta t = 12$$

$$V_{\text{avg}} = \frac{\Delta x}{\Delta t} = \frac{36}{12} = \boxed{3 \text{ m/s}}$$

اسألني
2020
عن الهندسة

8 |

$$v_i = 10 \text{ m/s}, t = 5 \text{ sec.}$$

$$\Delta x = v_i t + \frac{1}{2} a t^2$$

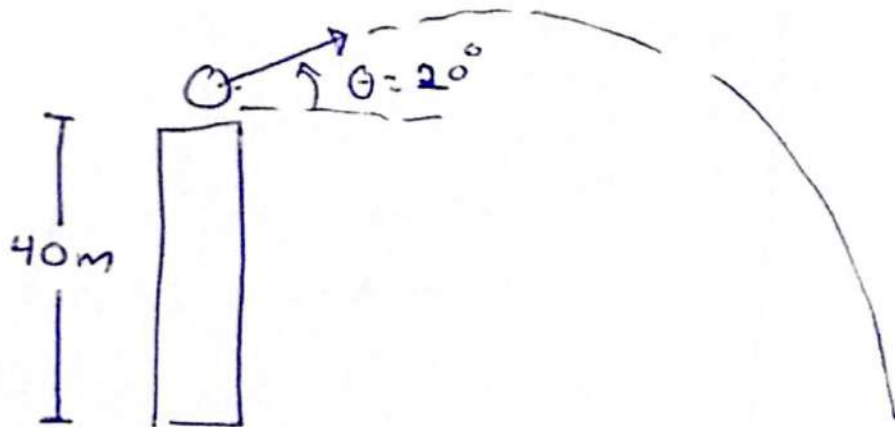
$$\Delta x = x_f - x_i = -20 - 10 = -30 \text{ m}$$

$$\Delta -30 = 10(5) + \frac{1}{2}(a)(5)^2$$

$$a = \underline{\underline{-6.4 \text{ m/s}^2}}$$

(9)

$$v_i = 32 \text{ m/s}$$



$$v_{iy} = v_i \sin \theta = 32 \sin 20 = 11 \text{ m/s}$$

$$v_x = v_i \cos \theta = 32 \cos 20 = 30 \text{ m/s}$$

$$\Delta y = v_{iy} t + \frac{1}{2} g t^2$$

$$-40 = 11t + \frac{1}{2} (-9.8) t^2$$

$$-4.9t^2 + 11t + 40 = 0 \Rightarrow \underline{\underline{t = 4.2 \text{ sec.}}}$$

$$\textcircled{a} \quad v_{2y} = v_{iy} + g(t)$$

$$= 11 + (-9.8)(4.2) = -30.16 \text{ m/s}$$

$$v_{2x} = 30 \text{ m/s}$$

$$\vec{v}_2 = 30\hat{i} - 30\hat{j} \Rightarrow |\vec{v}_2| = \sqrt{(30)^2 + (-30)^2} \\ = 42.426 \text{ m/s}$$

$$\textcircled{b} \quad \Delta x = v_x \Delta t$$

$$= 30(4.2) = \underline{\underline{126 \text{ m}}}$$

10

x-axis

$$V_{x1} = 0$$

$$x_1 = 0$$

$$a_x = 3 \text{ m/s}^2$$

$$x_2 = 23 \text{ m}$$

y-axis

$$V_{y1} = 10 \text{ m/s}$$

$$y_1 = 0$$

$$a_y = -3 \text{ m/s}^2$$

$$y_2 = ??$$

$$\Delta x = V_{x1}t + \frac{1}{2}a_x t^2$$

$$x_2 - 0 = V_{x1}t + \frac{1}{2}a_x t^2$$

$$23 = 0 + \frac{1}{2}(3)t^2$$

$$t = 3.9 \text{ sec}$$

$$\textcircled{a} V_{x2} = V_{x1} + a_x t$$

$$= 0 + (3)(3.9) = 11.7 \text{ m/s}$$

$$V_{y2} = V_{y1} + a_y t$$

$$= 10 + (-3)(3.9) = -1.7 \text{ m/s}$$

$$S = \sqrt{(11.7)^2 + (-1.7)^2} = 11.82 \text{ m/s}$$

$$\textcircled{b} \Delta y = y_2 - 0 = V_{y1}t + \frac{1}{2}a_y t^2$$

$$= 10(3.9) + \frac{1}{2}(-3)(3.9)^2$$

$$= \underline{\underline{16 \text{ m}}}$$

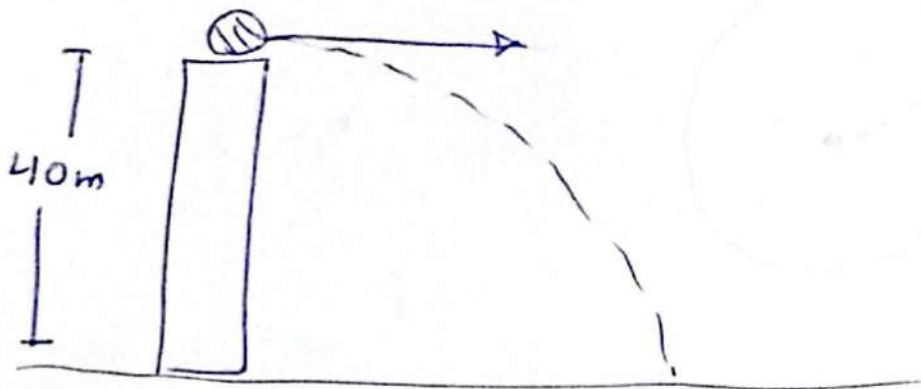
$$\textcircled{c} r = \sqrt{x_2^2 + y_2^2}$$

$$= \sqrt{(23)^2 + (16)^2} = \underline{\underline{28 \text{ m}}}$$

(11)

$$v_1 = 32 \text{ m/s}$$

$$\theta = 0$$



$$v_{1y} = 32 \sin 0 = 0$$

$$v_{1x} = 32 \cos 0 = 32 \text{ m/s}$$

$$\Delta y = v_{1y}t + \frac{1}{2}gt^2$$

$$-40 = 0 + \frac{1}{2}(-9.8)t^2$$

$$t = 2.857 \text{ sec}$$

$$v_{2y} = v_{1y} + gt$$

$$= 0 + (-9.8)(2.857)$$

$$= -28 \text{ m/s}$$

$$v_{2x} = 32 \text{ m/s}$$

$$S = \sqrt{(32)^2 + (-28)^2}$$

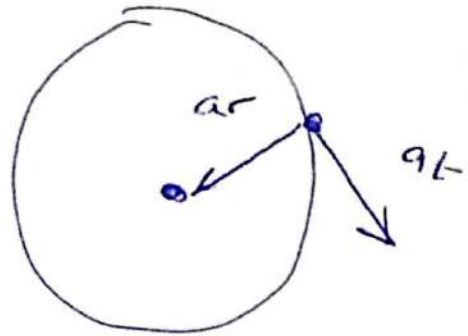
$$= \underline{\underline{42.52 \text{ m/s}}}$$

12 |

$$a_t = 4.4 \text{ m/s}^2$$

$$r = 4 \text{ m}$$

$$a_{\text{Total}} = 6 \text{ m/s}^2$$



$$a_{\text{Total}}^2 = a_t^2 + a_r^2$$

$$a_r^2 = a_{\text{Total}}^2 - a_t^2$$

$$a_r = \sqrt{(6)^2 - (4.4)^2} = 4 \text{ m/s}^2$$

$$a_r = \frac{v^2}{r} \Rightarrow v = \sqrt{a_r \cdot r}$$

$$= \sqrt{(4)(4)} = \underline{\underline{4 \text{ sec.}}}$$

13

$$\vec{r} = (20 + 3t + t^2)\hat{i} + (3t^2 - 2t + 3)\hat{j}$$

$$\vec{v} = \frac{d\vec{r}}{dt}$$

$$\vec{v} = (2t + 3)\hat{i} + (6t - 2)\hat{j}$$

$$\vec{v}_{@t=9} = 21\hat{i} + 52\hat{j}$$

$$s = \sqrt{(21)^2 + (52)^2}$$
$$= 56 \text{ m/s}$$

14

$$t_1 = 35 \text{ min} \left(\frac{1}{60}\right)$$
$$= \left(\frac{35}{60}\right) \text{ hours}$$

$$\Delta y_1 = v_y t + \frac{1}{2} a_y t^2$$
$$= 85 \left(\frac{35}{60}\right)$$
$$= 49.6 \text{ km}$$

[$a_y = 0$]
لأنه الحركة ثابتة بحيث تكون
في اتجاه 85 km/h
طول الفترة

$$\Delta y_2 = 150 \text{ km}$$

$$\Delta y = \Delta y_1 + \Delta y_2$$
$$= 150 + 49.6 \approx 200 \text{ km}$$