

Penyelesaian Lengkap

Praktis 8

Praktis Formatif

1 (a) $s = (0)^2 + 3(0) - 4$
 $= -4 \text{ m}$

Zarah berada pada 4 m ke kiri dari titik O.

The particle is located 4 m to the left from point O.

(b) $s = (1)^2 + 3(1) - 4$
 $= 0$

Zarah berada pada titik O.

The particle is located at point O.

(c) $s = (1)^2 + 3(1) - 4$
 $= 6 \text{ m}$

Zarah berada pada 6 m ke kanan dari titik O.

The particle is located 6 m to the right from point O.

2 (a) $2t^2 - 7t + 3 = 0$
 $(2t - 1)(t - 3) = 0$

$$t = \frac{1}{2} \text{ s}, 3 \text{ s}$$

(b) $s = -2$
 $2t^2 - 7t + 3 = -2$

$$2t^2 - 7t + 5 = 0$$

$$(2t - 5)(t - 1) = 0$$

$$t = 1 \text{ s}, \frac{5}{2} \text{ s}$$

(c) $s = 7$
 $2t^2 - 7t + 3 = 7$

$$2t^2 - 7t - 4 = 0$$

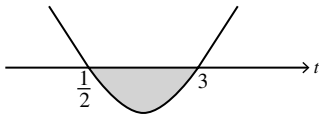
$$(2t + 1)(t - 4) = 0$$

$$t = -\frac{5}{2} \text{ (ditolak/rejected)}, \therefore t = 4 \text{ s}$$

$$s < 0$$

$$2t^2 - 7t + 3 < 0$$

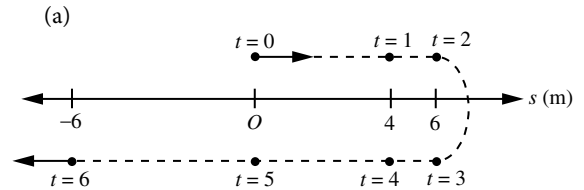
$$(2t - 1)(t - 3) < 0$$



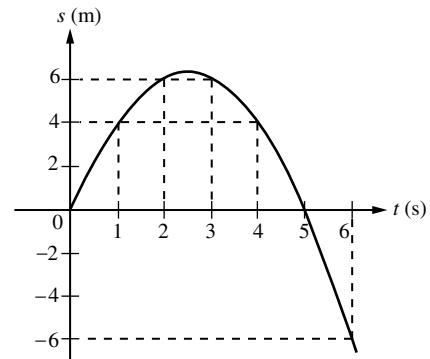
$$\therefore \frac{1}{2} < t < 3$$

3 $s = 5t - t^2$

t	0	1	2	3	4	5	6
s	0	4	6	6	4	0	-6



(b)



4 (a) (i) $v = 6(0) - 10$
 $= -10 \text{ m s}^{-1}$

(ii) $t = 1, v = 6(1) - 10$
 $= -4 \text{ m s}^{-1}$

Zarah bergerak dengan halaju 4 m s^{-1} menuju ke arah kiri.

The particle moves towards the left with velocity 4 m s^{-1} .

Apabila/When $t = 3$,

$$v = 6(3) - 10$$

$$= 8 \text{ m s}^{-1}$$

Zarah bergerak dengan halaju 8 m s^{-1} menuju ke arah kanan.

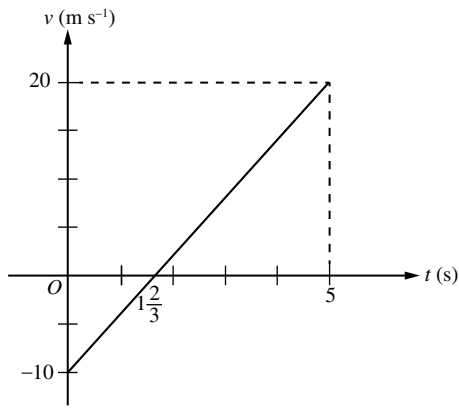
The particle moves towards the right with velocity 8 m s^{-1} .

(iii) $6t - 10 = 0$

$$t = 1\frac{2}{3} \text{ s}$$

(b)

t	0	5
v	-10	20



5 (a) $a = 13 - 6(2)$
 $= 1 \text{ m s}^{-2}$

(b) $a = 0$
 $13 - 6t = 0$
 $t = 2\frac{1}{6} \text{ s}$

(c) (i) $v > 0, a > 0$
 $13 - 6t > 0$
 $t < 2\frac{1}{6}$

$\therefore 0 < t < 2\frac{1}{6}$

(ii) $v > 0, a < 0$
 $13 - 6t < 0$

$t > 2\frac{1}{6}$

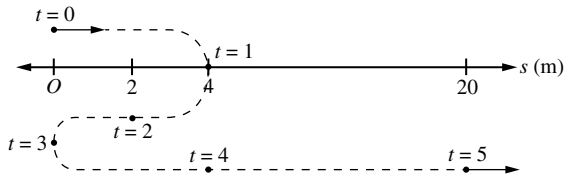
$\therefore 2\frac{1}{6} < t < 4\frac{1}{3}$

6 (a) $s = 2(2 - 3)^2$
 $= 2 \text{ m}$

(b) $s = t(t - 3)^2$

t	0	1	2	3	4	5
s	0	4	2	0	4	20

Jumlah jarak/Total distance = $(4 + 4 + 20) \text{ m}$
 $= 28 \text{ m}$



(c) $s = s_5 - s_4$
 $= (20 - 4) \text{ m}$
 $= 16 \text{ m}$

7 (a) Halaju awal/Initial velocity = 16 m s^{-1}

(b) $v = 0$
 $t = 2 \text{ s}, 8 \text{ s}$

(c) $v > 0$
 $0 < t < 2, t > 8$

(d) $t = 5, v_{\min} = -9 \text{ m s}^{-1}$

8 (a) $s = t^3 - 12t^2 + 36t$

$$v = \frac{ds}{dt}$$

$$= 3t^2 - 24t + 36$$

$$a = \frac{dv}{dt}$$

$$= 6t - 24$$

(b) $v = 0$
 $3t^2 - 24t + 36 = 0$
 $t^2 - 8t + 12 = 0$
 $(t - 2)(t - 6) = 0$
 $t = 2, 6$

$t = 6$
 $a = 6(6) - 24$
 $= 12 \text{ m s}^{-2}$

(c) $a = 6$
 $6t - 24 = 6$
 $6t = 30$
 $t = 5$
 $s = (5)^3 - 12(5)^2 + 36(5)$
 $= 5 \text{ m}$

(d) v minimum apabila/is minimum when

$$\frac{dv}{dt} = 0$$

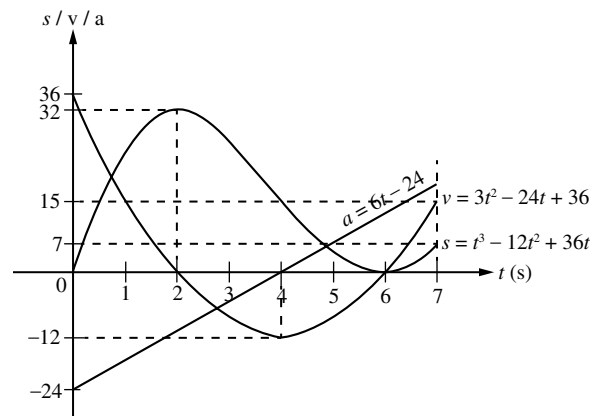
$$6t - 24 = 0$$

$$t = 4$$

$$v = 3(4)^2 - 24(4) + 36$$

$$= -12 \text{ m s}^{-1}$$

(e)



9 (a) $0 \leq t < 3$

(b) $t = 3, s = -9 \text{ m}$

Zarah berada pada jarak maksimum 9 m ke kiri dari titik O.

The particle is at the maximum distance of 9 m to the left from point O.

(c) $a = 0$

(d) $v = 12 \text{ m s}^{-1}$
 $a = 8 \text{ m s}^{-2}$

10 $s = t(t - 6)^2$
 $= t(t^2 - 12t + 36)$
 $= t^3 - 12t^2 + 36t$

$$v = \frac{ds}{dt}$$

$$= 3t^2 - 24t + 36$$

$$a = \frac{dv}{dt}$$

$$= 6t - 24$$

(a) $v = 0$
 $3t^2 - 24t + 36 = 0$
 $t^2 - 8t + 12 = 0$
 $(t - 2)(t - 6) = 0$
 $t = 2, 6$

Berhenti seketika untuk kali pertama pada $t = 2$ s.
First instantaneous rest at $t = 2$ s.

(b) $t = 2, a = 6(2) - 24$
 $= -12 \text{ m s}^{-2}$

(c) $s = 0$
 $t(t - 6)^2 = 0$
 $t = 0, 6$
 $\therefore T = 6 \text{ s}$

(d) $s = s_2 + |s_6 - s_2|$
 $= [2(2 - 6)^2] + |[6(6 - 6)^2 - 2(2 - 6)^2|$
 $= 32 + |0 - 32|$
 $= 64 \text{ m}$

11 $s = (m - 2t)t + n$
 $= mt - 2t^2 + n$

$$v = \frac{ds}{dt}$$

$$= m - 4t$$

(a) Apabila/When $t = 0,$
 $s = 10, \quad v = 8$
 $m(0) - 2(0)^2 + n = 10 \quad m - 4(0) = 8$
 $n = 10 \quad m = 8$

(b) $v = 0$
 $8 - 4t = 0$
 $t = 2 \text{ s}$

(c) $s = 0$
 $8t - 2t^2 + 10 = 0$
 $t^2 - 4t - 5 = 0$
 $(t - 5)(t + 1) = 0$
 $t = 5$ (-1 ditolak/rejected)
 $v = 8 - 4(5)$
 $= -12 \text{ m s}^{-1}$

(d) $t = 2$ zarah tukar arah/particle changes direction
 $s_0 = 10$
 $s_2 = 8(2) - 2(2)^2 + 10$
 $= 18$
 $s_5 = 8t - 2t^2 + 10$
 $= 0$
 Jumlah jarak/The total distance $= (s_2 - s_0) + |s_5 - s_2|$
 $= 18 - 10 + |0 - 18|$
 $= 26 \text{ m}$

12 $v = 2t^2 - 5t - 12$

$$a = \frac{dv}{dt}$$

$$= 4t - 5$$

(a) Halaju awal/The initial velocity, $v = 2(0)^2 - 5(0) - 12$
 $= -12 \text{ m s}^{-1}$

(b) Pecutan awal/The initial acceleration, $a = 4(0) - 5$
 $= -5 \text{ m s}^{-2}$

(c) v_{\min} apabila/when $a = 0$
 $4t - 5 = 0$

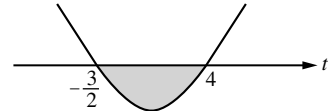
$$t = 1.25 \text{ s}$$

$$v_{\min} = 2(1.25)^2 - 5(1.25) - 12$$

$$= -15 \text{ m s}^{-1}$$

$$= -15 \frac{1}{8} \text{ m s}^{-1}$$

(d) $v < 0$
 $2t^2 - 5t - 12 < 0$
 $(2t + 3)(t - 4) < 0$
 $t \geq 0, \therefore 0 \leq t < 4$



13 $s = 10t - 5t^2$

$$v = \frac{ds}{dt}$$

$$= 10 - 10t$$

(a) $h = |s_5|$
 $= |10(5) - 5(5)^2|$
 $= 75 \text{ m}$

(b) $v = 0$
 $10 - 10t = 0$
 $t = 1 \text{ s}$

(c) $|s_5 - s_4| = |[10(5) - 5(5)^2] - [10(4) - 5(4)^2]|$
 $= |-75 - (-40)|$
 $= 35 \text{ m}$

(d) Apabila $t = 1$ s, zarah bertukar arah gerakan
 When $t = 1$ s, the particle changes its direction of motion
 $s_1 = 10(1) - 5(1)^2$
 $= 5 \text{ m}$
 Jumlah jarak/Total distance $= 5 + 5 + 75$
 $= 85 \text{ m}$

14 $v = 3t(6 - 3t)$
 $= 18t - 9t^2$

$$a = \frac{dv}{dt}$$

$$= 18 - 18t$$

$$s = \int v dt$$

$$= \int 18t - 9t^2 dt$$

$$= 9t^2 - 3t^3 + c$$

$t = 0, s = 0, \therefore c = 0$

$$s = 9t^2 - 3t^3$$

(a) v_{\max} apabila/when $a = 0$
 $18 - 18t = 0$
 $t = 1$

$$\frac{d^2v}{dt^2} = -18$$

$$\frac{d^2v}{dt^2} < 0 \quad \therefore v_{\max} = 18(1) - 9(1)^2$$

$$= 9 \text{ m s}^{-1}$$

(b) $s = |s_4 - s_3|$
 $= |[9(4)^2 - 3(4)^3] - [9(3)^2 - 3(3)^3]|$
 $= |-48 - 0|$
 $= 48 \text{ m}$

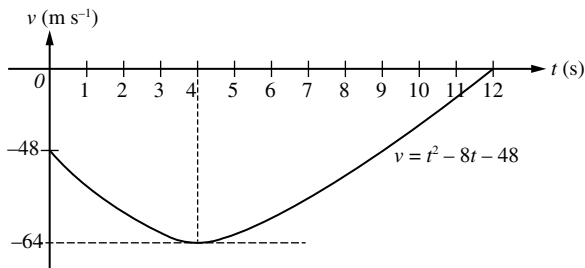
$$\begin{aligned}
 \text{(c)} \quad v &= 0 \\
 18t - 9t^2 &= 0 \\
 9t(2 - t) &= 0 \\
 t &= 0, 2 \\
 t = 2, s &= 9(2)^2 - 3(2)^3 \\
 &= 12 \text{ m}
 \end{aligned}$$

$$\begin{aligned}
 15 \quad a &= 2t - 8 \\
 v &= \int a \, dt \\
 &= \int 2t - 8 \, dt \\
 &= t^2 - 8t + c \\
 t = 0, v &= -48, \quad \therefore c = -48 \\
 v &= t^2 - 8t - 48 \\
 s &= \int v \, dt \\
 &= \int t^2 - 8t - 48 \, dt \\
 &= \frac{1}{3}t^3 - 4t^2 - 48t + c \\
 t = 0, s &= 0, \quad \therefore c = 0 \\
 s &= \frac{1}{3}t^3 - 4t^2 - 48t
 \end{aligned}$$

(a) v minimum apabila/minimum when

$$\begin{aligned}
 a &= 0 \\
 2t - 8 &= 0 \\
 t &= 4 \\
 v &= (4)^2 - 8(4) - 48 \\
 &= -64 \text{ m s}^{-1}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad v &= 0 \\
 t^2 - 8t - 48 &= 0 \\
 (t - 12)(t + 4) &= 0 \\
 t &= 12 \text{ (-4 ditolak/rejected)} \\
 \therefore n &= 12
 \end{aligned}$$



Jumlah jarak/Total distance

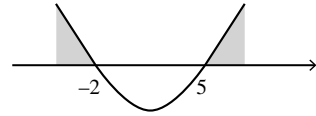
$$\begin{aligned}
 &= \left| \frac{1}{3}(12)^3 - 4(12)^2 - 48(12) \right| \\
 &= 576 \text{ m}
 \end{aligned}$$

$$\begin{aligned}
 16 \quad a &= 2t - 3 \\
 v &= \int a \, dt \\
 &= \int 2t - 3 \, dt \\
 &= t^2 - 3t + c \\
 t = 0, v &= -10, \quad \therefore c = -10 \\
 v &= t^2 - 3t - 10 \\
 s &= \int v \, dt \\
 &= \int t^2 - 3t - 10 \, dt \\
 &= \frac{1}{3}t^3 - \frac{3}{2}t^2 - 10t + c \\
 t = 0, s &= 0, \quad \therefore c = 0 \\
 s &= \frac{1}{3}t^3 - \frac{3}{2}t^2 - 10t
 \end{aligned}$$

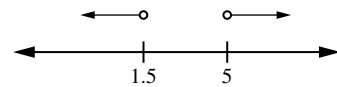
$$\begin{aligned}
 \text{(a)} \quad a &= 0 \\
 2t - 3 &= 0 \\
 t &= 1.5 \text{ s} \\
 v &= (1.5)^2 - 3(1.5) - 10 \\
 &= -12.25 \text{ m s}^{-1}
 \end{aligned}$$

(b) Apabila/When

$$\begin{aligned}
 v &> 0, & a < 0 \\
 t^2 - 3t - 10 &> 0, & 2t - 3 < 0 \\
 (t - 5)(t + 2) &> 0, & t < 1.5
 \end{aligned}$$

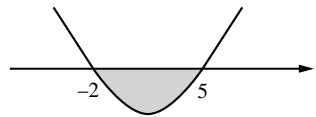


$$t > 5 \text{ (} t < -2 \text{ ditolak/rejected), } t < 1.5$$

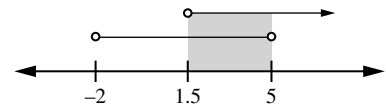


tiada penyelesaian/no solution

$$\begin{aligned}
 v < 0, & a > 0 \\
 t^2 - 3t - 10 < 0, & 2t - 3 > 0 \\
 (t - 5)(t + 2) < 0, & t > 1.5
 \end{aligned}$$



$$0 < t < 5$$



$$1.5 < t < 5$$

\therefore Zarah mengalami nyahpecutan bagi $1.5 < t < 5$.

The particle experiences deceleration for $1.5 < t < 5$.

(c) Arah gerakan bertukar apabila

The direction of motion changes when

$$\begin{aligned}
 v &= 0 \\
 t^2 - 3t - 10 &= 0 \\
 (t - 5)(t + 2) &= 0 \\
 t &= -2 \text{ (ditolak/rejected), } \therefore t = 5
 \end{aligned}$$

$$\begin{aligned}
 s_5 &= \frac{1}{3}(5)^3 - \frac{3}{2}(5)^2 - 10(5) \\
 &= -45\frac{5}{6} \text{ m}
 \end{aligned}$$

$$\begin{aligned}
 s_6 &= \frac{1}{3}(6)^3 - \frac{3}{2}(6)^2 - 10(6) \\
 &= -42 \text{ m}
 \end{aligned}$$

Jumlah jarak/The total distance

$$\begin{aligned}
 &= \left| -45\frac{5}{6} \right| + \left[-42 - \left(-45\frac{5}{6} \right) \right] \\
 &= 49\frac{2}{3} \text{ m}
 \end{aligned}$$

$$17 \quad v = t^2 - 4t - 5$$

$$\text{(a)} \quad a = \frac{dv}{dt}$$

$$= 2t - 4$$

$$s = \int v \, dt$$

$$= \int t^2 - 4t - 5 \, dt$$

$$= \frac{1}{3}t^3 - 2t^2 - 5t + c$$

$$t = 0, s = 5, \quad \therefore c = 5$$

$$s = \frac{1}{3}t^3 - 2t^2 - 5t + 5$$

(b) $v = 0$
 $t^2 - 4t - 5 = 0$
 $(t - 5)(t + 1) = 0$
 $t = 5$ (-1 ditolak/rejected)

$$s_5 = \left[\frac{1}{3}(5)^3 - 2(5)^2 - 5(5) + 5 \right]$$

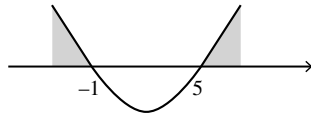
$$= 28\frac{1}{3} \text{ m}$$

(c) Apabila/When

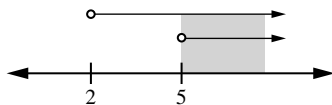
$$v > 0, \quad a > 0$$

$$t^2 - 4t - 5 > 0, \quad 2t - 4 > 0$$

$$(t - 5)(t + 1) > 0, \quad t > 2$$



$$t > 5 \text{ (} t < -1 \text{ ditolak/rejected), } t > 2$$



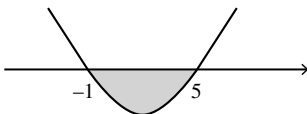
$$\therefore t > 5$$

atau/or

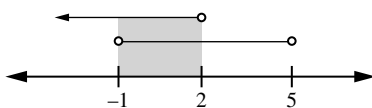
$$v < 0, \quad a < 0$$

$$t^2 - 4t - 5 < 0, \quad 2t - 4 < 0$$

$$(t - 5)(t + 1) < 0, \quad t < 2$$



$$-1 < t < 5$$



$$0 \leq t < 2$$

\therefore Zarah bergerak dengan halaju menokok bagi $0 \leq t < 2$ dan $t > 5$.

The particle moves in increasing velocity for $0 \leq t < 2$ and $t > 5$.

18 (a) $v_s = 15$ $a_c = 3$
 $s_s = \int v \, dt$ $v_c = \int a \, dt$
 $= 15t + c$ $= \int 3 \, dt$
 $t = 0, s_s = 0, \therefore c = 0$ $= 3t + c$
 $s_s = 15t$ $t = 0, v_c = 0, \therefore c = 0$
 $v_c = 3t$
 $s_c = \int v \, dt$
 $= \int 3t \, dt$

$$= \frac{3}{2}t^2 + c$$

$$t = 0, s_c = 0, \therefore c = 0$$

$$s_c = \frac{3}{2}t^2$$

(b) $s_c = s_s$
 $\frac{3}{2}t^2 = 15t$
 $t^2 = 10t$
 $t(t - 10) = 0$
 $t = 0, 10$
 $\therefore t = 10 \text{ s}$

(c) $v_c = 3(10)$
 $= 30 \text{ m s}^{-1}$

(d) $s_s = 15(10)$ $s_c = \frac{3}{2}(10)^2$
 $= 150 \text{ m}$ $= 150 \text{ m}$

19 $v = 5t^2 + kt$

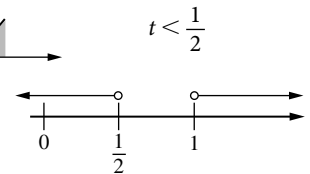
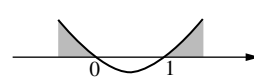
$$a = \frac{dv}{dt}$$

$$= 10t + k$$

(a) $t = 2, \quad a = 15$
 $10(2) + k = 15$
 $k = 15 - 20$
 $= -5$

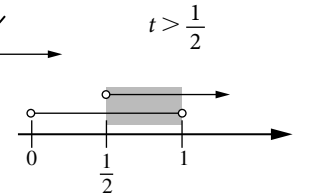
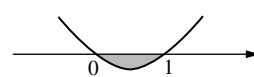
(b) $v = 0$
 $5t^2 - 5t = 0$
 $5t(t - 1) = 0$
 $t = 0, 1$
 $\therefore t = 1 \text{ s}$

(c) Apabila/When $v > 0, \quad a < 0$
 $5t(t - 1) > 0, \quad 10t - 5 < 0$



Tiada penyelesaian/No solution
atau/or

Apabila/When $v < 0, \quad a > 0$
 $5t(t - 1) < 0, \quad 10t - 5 > 0$



$$\frac{1}{2} < t < 1$$

\therefore Zarah bergerak dengan halaju menyusut untuk

$$\frac{1}{2} < t < 1.$$

The particle moves in decreasing velocity for $\frac{1}{2} < t < 1$.

$$(d) s = \int 5t^2 - 5t \, dt$$

$$= \frac{5}{3}t^3 - \frac{5}{2}t^2 + c$$

$$t = 0, s = 0, \quad \therefore c = 0$$

$$s = \frac{5}{3}t^3 - \frac{5}{2}t^2$$

Daripada (b), zarah bertukar arah gerakan pada $t = 1$

From (b), the particle changes its direction of motion at $t = 1$

$$s_1 = \frac{5}{3}(1)^3 - \frac{5}{2}(1)^2 \quad s_3 = \frac{5}{3}(3)^3 - \frac{5}{2}(3)^2$$

$$= -\frac{5}{6} \text{ m} \quad = 22\frac{1}{2} \text{ m}$$

Jumlah jarak dilalui/The total distance travelled

$$= 2\left(\frac{5}{6}\right) + 22\frac{1}{2}$$

$$= 24\frac{1}{6} \text{ m}$$

$$20 \quad v = 4 - 2t$$

$$s = \int 4 - 2t \, dt$$

$$= 4t - t^2 + c$$

$$t = 0, v = 0, \quad \therefore c = 0$$

$$s = 4t - t^2$$

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

$$= -2 \text{ m s}^{-2}$$

$$(b) \quad s = 0$$

$$4t - t^2 = 0$$

$$t(4 - t) = 0$$

$$t = 0, 4$$

$$v_4 = 4 - 2(4)$$

$$= -4 \text{ m s}^{-1}$$

(c) Arah gerakan bertukar apabila

The direction of the motion changes when

$$v = 0$$

$$4 - 2t = 0$$

$$t = 2$$

$$s_2 = 4(2) - (2)^2$$

$$= 4 \text{ m}$$

\therefore Jumlah jarak dilalui/The total distance travelled

$$= 2 \times 4 \text{ m}$$

$$= 8 \text{ m}$$

$$21 \quad v = 12 + 6t$$

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

$$= 6 \text{ m s}^{-2}$$

$$(b) u = 12 + 6(6) = 48 \text{ m s}^{-1}$$

$$(c) s = \int_0^6 v \, dt$$

$$= \int_0^6 12 + 6t \, dt$$

$$= [12t + 3t^2]_0^6$$

$$= 12(6) + 3(6)^2 - 0$$

$$= 180 \text{ m}$$

$$(d) 6 \leq t \leq 8, v = 48, s = \int_6^8 48 \, dt$$

$$= [48t]_6^8$$

$$= 48(8) - 48(6)$$

$$= 96 \text{ m}$$

$$0 \leq t \leq t_B, v = 48 - 7.5t,$$

$$s = 408 - 180 - 96$$

$$\int_0^{t_B} 48 - 7.5t \, dt = 132$$

$$[48t - 3.75t^2]_0^{t_B} = 132$$

$$[48(t_B) - 3.75(t_B)^2] - [0] = 132$$

$$48(t_B) - 3.75(t_B)^2 = 132$$

$$3.75(t_B)^2 - 48t_B + 132 = 0$$

$$t_B = \frac{-(-48) \pm \sqrt{(-48)^2 - 4(3.75)(132)}}{48}$$

$$= 4, 8.8 \text{ s}$$

$$\therefore \text{Jumlah masa/The total time} = 8 + 4$$

$$= 12 \text{ s}$$

22 (a)

$$v_A = v_B$$

$$2t^2 - 9t = 6t - t^2$$

$$3t^2 - 15t = 0$$

$$3t(t - 5) = 0$$

$$t = 0, 5$$

$$t = 5 \text{ s}, v_A = 2(5)^2 - 9(5)$$

$$= 5 \text{ m s}^{-1}$$

$$v_B = 5 \text{ m s}^{-1}$$

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

$$a_A = 4t - 9$$

$$a_B = 6 - 2t$$

$$v_B \text{ min} \rightarrow a_B = 0$$

$$6 - 2t = 0$$

$$t = 3$$

$$a_A = 4(3) - 9$$

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

$$(c) s_A = \int_0^1 v_A \, dt$$

$$= \int_0^1 2t^2 - 9t \, dt$$

$$= \left[\frac{2}{3}t^3 - \frac{9}{2}t^2 \right]_0^1$$

$$= -3\frac{5}{6} \text{ m}$$

$$s_B = \int_0^1 v_B \, dt$$

$$= \int_0^1 6t - t^2 \, dt$$

$$= \left[3t^2 - \frac{1}{3}t^3 \right]_0^1$$

$$= 2\frac{2}{3} \text{ m}$$

Jarak antara A dan B/The distance between A and B

$$= 3\frac{5}{6} + 2\frac{2}{3}$$

$$= 6.5 \text{ m}$$

Praktis Sumatif

Kertas 2

$$1 \quad v = 48t - 6t^2$$

$$a = \frac{dv}{dt}$$

$$= 48 - 12t$$

$$s = \int v \, dt$$

$$= \int 48t - 6t^2 \, dt$$

$$= 24t^2 - 2t^3 + c$$

$$t = 0, s = 0, \quad \therefore c = 0$$

$$s = 24t^2 - 2t^3$$

$$(a) \quad a = 0$$

$$48 - 12t = 0$$

$$t = 4 \text{ s}$$

$$(b) \quad v = 0$$

$$6t(8-t) = 0$$

$$t = 0, 8$$

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

$$(c) \quad s_8 = 24(8)^2 - 2(8)^3$$

$$= 512 \text{ m}$$

$$(d) \quad s = 0$$

$$24t^2 - 2t^3 = 0$$

$$2t^2(12-t) = 0$$

$$t = 0, 12$$

$$v_{12} = 48(12) - 6(12)^2$$

$$= -288 \text{ m s}^{-1}$$

$$2 \quad s = 9 + 4t - 2t^2$$

$$v = \frac{ds}{dt}$$

$$= 4 - 4t$$

$$(a) \quad s_0 = 9 + 4(0) - 2(0)^2$$

$$= 9 \text{ m}$$

$$(b) \quad v = 0$$

$$4 - 4t = 0$$

$$t = 1$$

$$s_1 = 9 + 4(1) - 2(1)^2$$

$$= 11 \text{ m}$$

(c) Ben bertukar arah pada $t = 1$

Ben changes direction at $t = 1$

$$s_0 = 9 \text{ m}$$

$$s_1 = 11 \text{ m}$$

$$s_3 = 9 + 4(3) - 2(3)^2$$

$$= 3$$

Jumlah jarak/*the total distance covered*

$$= (s_1 - s_0) + |s_3 - s_1|$$

$$= 2 + 8$$

$$= 10 \text{ m}$$

$$(d) \quad v_3 = 4 - 4(3)$$

$$= -8 \text{ m s}^{-1}$$

$$a = 8 - t$$

$$v = \int a \, dt$$

$$= \int 8 - t \, dt$$

$$= 8t - \frac{1}{2}t^2 + c$$

$$t = 3, v = -8$$

$$\frac{1}{2}(3)^2 - 8(3) + c = 8$$

$$c = \frac{55}{2}$$

$$v = 8t - \frac{1}{2}t^2 - \frac{55}{2}$$

$$\frac{1}{2}t^2 - 8t + \frac{55}{2} = 0$$

$$t^2 - 16t + 55 = 0$$

$$(t-11)(t-5) = 0$$

$$t = 5, 11$$

$$\therefore t = 5$$

$$3 \quad (a) \quad v = \alpha t - \beta t^2$$

$$a = \frac{dv}{dt}$$

$$= \alpha - 2\beta t$$

Apabila/When $t = 0, a = 5. \therefore \alpha = 5$

v_{\max} apabila/when $a = 0$

$$5 - 2\beta t = 0$$

$$t = \frac{5}{2\beta}$$

$$v = 3.125$$

$$5\left(\frac{5}{2\beta}\right) - \beta\left(\frac{5}{2\beta}\right)^2 = 3.125$$

$$\frac{25}{2\beta} - \frac{25}{4\beta} = 3.125$$

$$50 - 25 = 12.5\beta$$

$$\beta = 2$$

(b) v_{\max} di titik Q/at point Q, $a = 0$

$$5 - 2(2)t = 0$$

$$= \frac{5}{4} \text{ s}$$

(c) $s = \int v \, dt$

$$= \int 5t - 2t^2 \, dt$$

$$= \frac{5}{2}t^2 - \frac{2}{3}t^3 + c$$

$$t = 0, s_p = 0, \quad \therefore c = 0$$

$$s = \frac{5}{2}t^2 - \frac{2}{3}t^3$$

$$t = \frac{5}{4}, s_Q = \frac{5}{2}\left(\frac{5}{4}\right)^2 - \frac{2}{3}\left(\frac{5}{4}\right)^3$$

$$= 2\frac{29}{48} \text{ m}$$

Jarak PQ/Distance of PQ = $2\frac{29}{48} \text{ m}$

$$4 \quad s = 50 + t^2 - \frac{1}{15}t^3$$

(a) $v = 0$

$$\frac{ds}{dt} = 0$$

$$2t - \frac{1}{5}t^2 = 0$$

$$10t - t^2 = 0$$

$$t(10-t) = 0$$

$$t = 0, 10$$

$$\frac{d^2s}{dt^2} = 2 - \frac{2}{5}t$$

$$t = 0, \frac{d^2s}{dt^2} = 2 - \frac{2}{5}(0) > 0 \rightarrow \text{minimum}$$

$$t = 10, \frac{d^2s}{dt^2} = 2 - \frac{2}{5}(10) < 0 \rightarrow \text{maksimum/maximum}$$

$$\therefore s_{\max} = 50 + (10)^2 - \frac{1}{15}(10)^3$$

$$= 83\frac{1}{3} \text{ cm}$$

(b) $a = 0$

$$\frac{dv}{dt} = 0$$

$$2 - \frac{2}{5}t = 0$$

$$10 - 2t = 0$$

$$t = 5$$

$$v = 2(5) - \frac{1}{5}(5)^2$$

$$= 5 \text{ cm s}^{-1}$$

$$t = 5, \frac{d^2v}{dt^2} = -\frac{2}{5} < 0 \rightarrow \text{maksimum/maximum}$$

$$(c) s_5 = 50 + (5)^2 - \frac{1}{15}(5)^3 \\ = 66\frac{2}{3} \text{ cm}$$

$$5 \quad v_z = 2t - 8 \qquad v_e = 13 - 2t \\ s_z = \int 2t - 8 \, dt \qquad s_e = \int 13 - 2t \, dt \\ = t^2 - 8t + c \qquad = 13t - t^2 + c \\ t = 0, s_z = 0, \quad \therefore c = 0 \qquad t = 0, s_e = 50, \quad \therefore c = 50 \\ s_z = t^2 - 8t \qquad s_e = 13t - t^2 + 50$$

$$(a) \quad s_z = 20 \\ t^2 - 8 = 20 \\ t^2 - 8t - 20 = 0 \\ (t - 10)(t + 2) = 0 \\ t = 10 \text{ (tolak/reject -2)} \\ s_e = 20 \\ 13t - t^2 + 50 = 20 \\ t^2 - 13t - 30 = 0 \\ (t - 15)(t + 2) = 0 \\ t = 15 \text{ (tolak/reject -2)}$$

Zac melalui papan tanda arah terlebih dahulu.

Masa yang diambilnya ialah 10 s.

Zac ride past the signpost first. The time taken is 10 s.

$$(b) \quad s_z = s_e \\ t^2 - 8t = 13t - t^2 + 50 \\ 2t^2 - 21t - 50 = 0 \\ (2t - 25)(t + 2) = 0 \\ t = 12.5 \text{ (tolak/reject -2)} \\ \therefore k = 12.5$$

$$(c) \text{ Jarak antara Zac dan Eva} \\ \text{Distance between Zac and Eva} \\ = 13t - t^2 + 50 - (t^2 - 8t) \\ = 50 + 21t - 2t^2$$

Jarak maksimum apabila/Distance is maximum when

$$\frac{ds}{dt} = 0 \\ 21 - 4t = 0 \\ 4t = 21 \\ t = 5.25$$

$$\therefore \text{ Jarak paling jauh/The furthest distance} \\ = 50 + 21(5.25) - 2(5.25)^2 \\ = 105.125 \text{ m}$$