JAWAPAN

Tingkatan 4

Bab 1 Fungsi *Functions*

1 (a) 16
(b) 6

2 (a) $y = 4x + 3$

$x = \dfrac{y-3}{4}$

$g^{-1}(x) = \dfrac{x-3}{4}$

$g^{-1}(7) = \dfrac{7-3}{4}$

$g^{-1}(7) = 1$

(b) $hg(x) = (4x+3)^2 - 2(4x+3) + 5$
$= 16x^2 + 16x + 8$
$hg(7) = 16(7)^2 + 16(7) + 8$
$= 904$

3 $y = m - 5x$

$x = \dfrac{m-y}{5}$

$h^{-1}(x) = \dfrac{m-x}{5}$

Bandingkan dengan persamaan $2 - px$.
Compare with equation $2 - px$.

$\dfrac{m}{5} = 2 \quad , -p = -\dfrac{1}{5}$

$m = 10 \quad , \ p = \dfrac{1}{5}$

4 (a) $h[g(x)] = 3x$

$\dfrac{9}{g(x)} = 3x$

$g(x) = \dfrac{9}{3x}$

$g(x) = \dfrac{3}{x}, x \neq 0$

(b) $gh(x) = \dfrac{3}{\left(\frac{9}{x}\right)}$

$\dfrac{3}{\frac{9}{x}} = 6$

$x = 18$

5 (a) $y = \dfrac{3}{5-x}$

$5 - x = \dfrac{3}{y}$

$x = \dfrac{5y-3}{y}$

$w^{-1}(x) = \dfrac{5x-3}{x}, x \neq 0$

(b) $w^{-1}(6) = \dfrac{5(6)-3}{6}$

$w^{-1}(6) = \dfrac{9}{2}$

6 (a) Fungsi kerana garis mencancang hanya memotong graf pada satu titik.
A function because the vertical line cuts the graph at only one point.
(b) Tiada fungsi songsang kerana garis mengufuk memotong graf pada lebih daripada satu titik.
No inverse function because the horizontal line cuts the graph at more than one point.

7 (a) $f(x) = |x - 3|$
(b) $|x - 3| = 6$
$x - 3 = 6 \quad , \quad x - 3 = -6$
$x = 9 \qquad\quad x = -3$

8 $g(2) = \dfrac{2-p}{2}$

$-4 = \dfrac{2-p}{2}$

$p = 10$

9 (a) (i) 2, 4
(ii) {2, 4, 6, 8}
(b) {(1, 2), (1, 4), (2, 6), (3, 8)}

10 $a(ax + b) + b = 4x - 18$
$a^2x + ab + b = 4x - 18$
$a^2 = 4 \quad , \quad 2b + b = -18$
$a = 2 \quad , \qquad b = -6$

11 (a) $ff(2) = f(0)$
$= -1$
(b) $f^{-1}(3) = 1$

12 $(30 - x)(20 - y) = 450$

$20 - y = \dfrac{450}{30-x}$

$y = 20 - \dfrac{450}{30-x}$

$= \dfrac{20(30-x) - 450}{30-x}$

$= \dfrac{150 - 20x}{30-x}$

$y = \dfrac{20x - 150}{x - 30}$

13 (a) (i) $k = -\dfrac{3}{2}$

(ii) $hg(x) = \dfrac{8(2x+m)}{2(2x+m)+3}$

$= \dfrac{16x + 8m}{4x + 2m + 3}$

(b) $(hg)(x) = (hg)^{-1}(x)$

$(hg)(x) = \dfrac{16x + 8\left(-\frac{19}{2}\right)}{4x + 2\left(-\frac{19}{2}\right) + 3}$

$(hg)(x) = \dfrac{16x - 76}{4x - 16}$

$$(hg)^{-1}(x) = \frac{16x-76}{4x-16}$$

$$\frac{16x-76}{4x-16} = y$$

$$x = \frac{-16y+76}{-4y+16}$$

$$(hg)^{-1} = \frac{16x-76}{4x-16} \text{ (Terbukti/}\textit{Proven}\text{)}$$

14 (a) $g^{-1}(mx-2) = x+1$

(b) $g(x+1) = m(x+1) - 2$

$g(x) = mx + m - 2$

(c) $f(x+1) = \frac{4-2x}{3}$

$$\frac{4-2(x+1)}{3} = 6x+1$$

$$\frac{2-2x}{3} = 6x+1$$

$$x = -\frac{1}{20}$$

15 (a) $x = 12-k$

$M = 4+\sqrt{12-k}$

(b) $M = 4+\sqrt{12-3}$

$= \text{RM}7$

16 (a) (i) $V(t) = 60+8t$

(ii) $V = \frac{1}{3}\pi j^2 h$

$h = \frac{3V}{\pi j^2}$

(iii) $hV(t) = \frac{3(60+8t)}{\pi j^2}$

Apabila jejari ialah 10 cm,
When the radius is 10 cm,

$hV(t) = \frac{3(60+8t)}{\pi(10)^2}$

$hV(t) = \frac{45+6t}{25\pi}$

(b) Apabila $t = 30$ saat
When $t = 30$ *seconds*

$h(30) = \frac{45+6(30)}{25\pi}$

$h(30) = 2.864$ cm

Bab 2 Fungsi Kuadratik *Quadratic Functions*

1 $f(x) = x^2 - kx + 2k + 5$

$a = 1, b = -k, c = 2k+5$

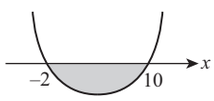
$b^2 - 4ac < 0$

$(-k)^2 - 4(1)(2k+5) < 0$

$k^2 - 8k - 20 < 0$

$(k+2)(k-10) < 0$

$-2 < k < 10$



2 $(2x-5)^2 > 8(x-1)$

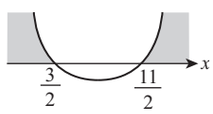
$(2x-5)(2x-5) - 8(x-1) > 0$

$4x^2 - 20x + 25 - 8x + 8 > 0$

$4x^2 - 28x + 33 > 0$

$(2x-11)(2x-3) > 0$

$x = \frac{11}{2}$, $x = \frac{3}{2}$



3 $f(x) = 2x^2 + 7x - 2$

$f(x) = 2\left(x^2 + \frac{7}{2}x - 1\right)$

$f(x) = 2\left[x^2 + \frac{7}{2}x + \left(\frac{\frac{7}{2}}{2}\right)^2 - \left(\frac{\frac{7}{2}}{2}\right)^2 - 1\right]$

$f(x) = 2\left[x^2 + \frac{7}{2}x + \left(\frac{7}{4}\right)^2 - \left(\frac{7}{4}\right)^2 - 1\right]$

$f(x) = 2\left[\left(x+\frac{7}{4}\right)^2 - \frac{49}{16} - 1\right]$

$f(x) = 2\left[\left(x+\frac{7}{4}\right)^2 - \frac{65}{16}\right]$

$f(x) = 2\left(x+\frac{7}{4}\right)^2 - \frac{65}{8}$

Bandingkan dengan/*Compare with* $f(x) = a(x+b)^2 + c$

Maka/*Thus*, $a = 2$, $b = \frac{7}{4}$, $c = -\frac{65}{8}$

4 Diberi titik maksimum $(-3, 14)$, maka $y = m(x+3)^2 + 14$.
Gantikan titik $(0, -4)$ ke dalam $y = m(x+3)^2 + 14$, maka
Given the maximum point $(-3, 14)$, *then* $y = m(x+3)^2 + 14$.
Substitute point $(0, -4)$ *into* $y = m(x+3)^2 + 14$, *then*

$-4 = m(0+3)^2 + 14$

$9m = -18$

$m = -2$

Oleh itu/*Therefore,*

$y = -2(x+3)^2 + 14$

$y = -2(x^2 + 6x + 9) + 14$

$y = -2x^2 - 12x - 4$

Bandingkan dengan/*Compare with*

$y = ax^2 + bx + c$

Maka/ *Therefore*,

$a = -2$, $b = -12$, $c = -4$

Persamaan lengkung/*Equation of the curve*,

$y = -2(x+3)^2 + 14$

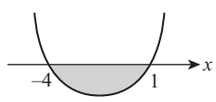
5 $x(x+3) < 4$

$x^2 + 3x - 4 < 0$

$(x+4)(x-1) < 0$

$-4 < x < 1$

$x = \{-3, -2, -1, 0\}$



6 (a) (i) $f(x) = hx^2 + kx - 6$

$f(x) = h\left(x^2 + \frac{k}{h}x\right) - 6$

$f(x) = h\left[x^2 + \frac{k}{h}x + \left(\frac{\frac{k}{h}}{2}\right)^2 - \left(\frac{\frac{k}{h}}{2}\right)^2\right] - 6$

$f(x) = h\left[x^2 + \frac{k}{h}x + \left(\frac{k}{2h}\right)^2 - \left(\frac{k}{2h}\right)^2\right] - 6$

$f(x) = h\left[\left(x+\frac{k}{2h}\right)^2 - \frac{k^2}{4h^2}\right] - 6$

$f(x) = h\left(x+\frac{k}{2h}\right)^2 - \frac{k^2}{4h} - 6$

(ii) Diberi titik maksimum (3, 12), maka
Given the maximum point (3, 12), *then*

$-\frac{k}{2h} = 3$

$k = -6h$ ... ①

$-\frac{k^2}{4h} - 6 = 12$ ... ②

Gantikan ① dalam ②
Substitute ① *into* ②

$-\frac{(-6h)^2}{4h} - 6 = 12$

$-\frac{36h^2}{4h} - 6 = 12$

$-9h = 18$
$h = -2$
$k = -6(-2)$
$k = 12$

(b) $y = 4t$ ...①
$y = -2x^2 + 12x + 6$ ...②

Gantikan ① dalam ②
Subtitute ① into ②

$-2x^2 + 12x - 6 = 4t$
$2x^2 - 12x + 4t + 6 = 0$

$b^2 - 4ac = 0$ kerana bersilang hanya pada satu titik.
$b^2 - 4ac = 0$ *because intersects at only one point.*

$(-12)^2 - 4(2)(4t + 6) = 0$
$144 - 32t - 48 = 0$
$96 - 32t = 0$
$t = 3$

7 (a) $x = -3$

(b) $3k - 1 = 7$
$3k = 8$
$k = \frac{8}{3}$

Persamaan lengkung apabila dipantulkan pada paksi-x:
The equation of the curve when reflected on the x-axis:
$y = (x + 3)^2 - 7$
$y = x^2 + 6x + 2$

8 $f(x) = -x^2 + 4kx + 6k$
$f(x) = -(x^2 - 4kx - 6k)$
$f(x) = -\left[x^2 - 4kx + \left(\frac{-4k}{2}\right)^2 - \left(\frac{-4k}{2}\right)^2 - 6k\right]$
$f(x) = -[x^2 - 4kx + (-2k)^2 - (-2k)^2 - 6k]$
$f(x) = -[(x - 2k)^2 - 4k^2 - 6k]$
$f(x) = -(x - 2k)^2 + 4k^2 + 6k$

Apabila nilai maksimum ialah 10, maka
When the maximum value is 10*, then*
$4k^2 + 6k = 10$
$2k^2 + 3k - 5 = 0$
$(2k + 5)(k - 1) = 0$
$k = -\frac{5}{2}, k = 1$

9 (a) $\alpha = \frac{-3}{2}, \beta = 3$

$\alpha + \beta = \frac{-3}{2} + 3$
$= \frac{3}{2}$
$\alpha\beta = \frac{-3}{2} \times 3$
$= \frac{-9}{2}$
$2x^2 - 3x - 9 = 0$
$(2x + 3)(x - 3) > 0$
$2x^2 - 6x + 3x - 9 > 0$
$2x^2 - 3x - 9 > 0$

(b) $x^2 + px + 9 = 0$

Hasil tambah punca/ *Sum of root*:
$n + 6 - n = -p$
$-p = 6$
$p = -6$

Hasil darab punca/ *Product of root*:
$n(6 - n) = 9$
$6n - n^2 - 9 = 0$
$n^2 - 6n + 9 = 0$
$(n - 3)^2 = 0$
$n = 3$

10 (a) Daripada graf, paksi simetri ialah $x = -3$
From the graph, the axis of symmetry is $x = -3$
Daripada persamaan, paksi simetri ialah $x = p$, maka $p = -3$
From the equation, the axis of symmetry is $x = p$, *then* $p = -3$

$q - 1 = -4$
$q = -3$

(b) $(x + 3)^2 - 4 = 0$
$x^2 + 6x + 5 = 0$
$(x + 1)(x + 5) = 0$
$x = -1, x = -5$
$B(-1, 0)$

(c) $(-3, -4)$

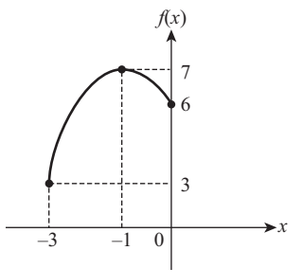
11 $x(3x + 1) - x^2 \leqslant x^2 + 12$
$3x^2 + x - x^2 - x^2 - 12 \leqslant 0$
$x^2 + x - 12 \leqslant 0$
$(x - 3)(x + 4) \leqslant 0$
$-4 \leqslant x \leqslant 3$

Nilai x yang mungkin ialah 1, 2, 3
The possible values of x *are* 1, 2, 3

12 (a) $A(0, 6)$

(b) $f(x) = -x^2 + px + 6$
$f(x) = -(x^2 - px - 6)$
$f(x) = -\left[x^2 - px + \left(-\frac{p}{2}\right)^2 - \left(-\frac{p}{2}\right)^2 - 6\right]$
$f(x) = -\left[\left(x - \frac{p}{2}\right)^2 - \frac{p^2}{4} - 6\right]$
$f(x) = -\left(x - \frac{p}{2}\right)^2 + \frac{p^2}{4} + 6$
$\frac{p}{2} = -1$
$p = -2$
$\frac{p^2}{4} + 6 = k$
$\frac{(-2)^2}{4} + 6 = k$
$k = 7$

(c)



13 (a) (i) Graf akan bergerak ke bawah secara mencancang.
The graph moves down vertically.
(ii) Graf akan bergerak ke kanan secara mengufuk.
The graph moves to the right horizontally.

(b) $f(x) = -2(x - k)^2 + h$

14 (a) $f(x) = \frac{2}{5}x^2 - 12x + 50$

Anggap permukaan lantai sebagai paksi-x,
Let the floor surface as x-axis,

$\frac{2}{5}x^2 - 12x + 50 = 0$

$2x^2 - 60x + 250 = 0$

$x^2 - 30x + 125 = 0$

$(x - 5)(x - 25) = 0$

$x = 5, x = 25$

Lebar kolam ialah/*The width of the pool is*
$25 - 5 = 20$

(b) $f(x) = \frac{2}{5}x^2 - 12x + 50$

$f(x) = \frac{2}{5}[x^2 - 30x + 125]$

$f(x) = \frac{2}{5}[x^2 - 30x + (-15)^2 - (-15)^2 + 125]$

$f(x) = \frac{2}{5}[(x - 15)^2 - 225 + 125]$

$f(x) = \frac{2}{5}[(x - 15)^2 - 100]$

$f(x) = \frac{2}{5}(x - 15)^2 - 40$

Kedalaman maksimum kolam tersebut ialah 40.
The maximum depth of the pool is 40.

15 (a) $f(x) = px^2 + 4x + q$

$f(x) = p\left(x^2 + \frac{4}{p}x + \frac{q}{p}\right)$

$f(x) = p\left[x^2 + \frac{4}{p}x + \left(\frac{\frac{4}{p}}{2}\right)^2 - \left(\frac{\frac{4}{p}}{2}\right)^2 + \frac{q}{p}\right]$

$f(x) = p\left[x^2 + \frac{4}{p}x + \left(\frac{2}{p}\right)^2 - \left(\frac{2}{p}\right)^2 + \frac{q}{p}\right]$

$f(x) = p\left[\left(x + \frac{2}{p}\right)^2 - \frac{4}{p^2} + \frac{q}{p}\right]$

$f(x) = p\left[\left(x + \frac{2}{p}\right)^2 - \frac{4}{p^2} + \frac{pq}{p^2}\right]$

$f(x) = p\left(x + \frac{2}{p}\right)^2 + \frac{pq - 4}{p}$

(b) $-\frac{2}{p} = -4$

$p = \frac{1}{2}$

$\frac{pq - 4}{p} = 2$

$\frac{1}{2}q - 4 = 1$

$q = 10$

16 (a) $\alpha + \alpha + 2 = -q$

$2\alpha + 2 = -q$

$\alpha = \frac{-q - 2}{2}$

$\alpha(\alpha + 2) = r$

$\alpha^2 + 2\alpha = r$

$r = \left(\frac{-q - 2}{2}\right)^2 + 2\left(\frac{-q - 2}{2}\right)$

$r = \frac{q^2 + 4q + 4 - 4q - 8}{4}$

$r = \frac{q^2 - 4}{4}$

(b) $3x^2 - px + 5 = 0$

$3\left(\frac{5}{3}\right)^2 - p\left(\frac{5}{3}\right) + 5 = 0$

$p = 8$

Bab 3 Sistem Persamaan
System of Equations

1 $2x - y + z = -3$ ...①

$2x + 2y + 3z = 2$ ...②

$3x - 3y - z = -4$ ...③

② – ① : $3y + 2z = 5$ ...④

① × 3 : $6x - 3y + 3z = -9$ ...⑤

③ × 2 : $6x - 6y - 2z = -8$ ...⑥

⑥ – ⑤ : $-3y - 5z = 1$ ...⑦

⑦ + ④ : $-3z = 6$

$z = -2$

Gantikan $z = -2$ dalam ④
Substitute $z = -2$ *into* ④

$3y + 2(-2) = 5$

$y = 3$

Gantikan $z = -2$ dan $y = 3$ dalam ⑤
Substitute $z = -2$ *and* $y = 3$ *into* ⑤

$6x - 3(3) + 3(-2) = -9$

$x = 1$

Maka, $x = 1$, $y = 3$, $z = -2$ ialah penyelesaian bagi sistem persamaan linear ini.
Therefore, $x = 1$, $y = 3$, $z = -2$ *are the solutions for the system of linear equations.*

2 $9x - 2y = 6$ ...①

$4y - 2x - z = -8$ ...②

$3x + 6z - y = 2$ ...③

Daripada persamaan ①,
From equation ①,

$x = \frac{6 + 2y}{9}$ ...④

Gantikan ④ dalam ②
Substitute ④ *into* ②

$4y - 2\left(\frac{6 + 2y}{9}\right) - z = -8$

$z = \frac{32y + 60}{9}$ ...⑤

Gantikan ④ dalam ③
Substitute ④ *into* ③

$3\left(\frac{6 + 2y}{9}\right) + 6z - y = 2$

$2 + \frac{2y}{3} + 6z - y = 2$

$6z = \frac{y}{3}$

$z = \frac{y}{18}$ ...⑥

Gantikan ⑤ dalam ⑥
Substitute ⑤ *into* ⑥

$\frac{32y + 60}{9} = \frac{y}{18}$

$576y + 1\,080 = 9y$

$567y = -1\,080$

$y = -\frac{40}{21}$

Gantikan $y = -\frac{40}{21}$ dalam ⑤

Substitute $y = -\frac{40}{21}$ *into* ⑤

$$z = \frac{32\left(-\frac{40}{21}\right) + 60}{9}$$

$$z = -\frac{20}{189}$$

Gantikan $y = -\frac{40}{21}$ dalam ④

Substitute $-\frac{40}{21}$ *into* ④

$$x = \frac{6 + 2\left(-\frac{40}{21}\right)}{9}$$

$$x = \frac{46}{189}$$

Maka, $x = \frac{46}{189}$, $y = -\frac{40}{21}$, $z = -\frac{20}{189}$ ialah penyelesaian bagi sistem persamaan linear ini.

Therefore, $x = \frac{46}{189}$, $y = -\frac{40}{21}$, $z = -\frac{20}{189}$ *are the solutions for the system of linear equations.*

3 $x + 4y - 3z = 5$ ...①
$-4x - 2y + z = -4$ ...②
$-3x + 2y - 2z = -1$ ...③

Daripada ①,
From ①,
$x = 5 - 4y + 3z$ ...④

Gantikan ④ dalam ②
Substitute ④ *into* ②

$$-4(5 - 4y + 3z) - 2y + z = -4$$
$$14y - 11z - 20 = -4$$
$$y = \frac{11z + 16}{14} \quad ...⑤$$

Gantikan ④ dalam ③
Substitute ④ *into* ③

$$-3(5 - 4y + 3z) + 2y - 2z = -1$$
$$14y - 11z - 15 = -1 \quad ...⑥$$

Gantikan ⑤ dalam ⑥
Substitute ⑤ *into* ⑥

$$14\left(\frac{11z + 16}{14}\right) - 11z - 15 = -1$$
$$1 = -1$$

Maka, sistem persamaan linear ini tiada penyelesaian kerana $1 \neq -1$.
Therefore, the system of linear equations has no solution because $1 \neq -1$.

4 $-6x - 10y + 4z = -26$ ...①
$5x + 2y + 4z = -20$ ...②
$14x + 17y - 2z = 19$ ...③

Daripada ①,
From ①,

$$-6x - 10y + 4z = -26$$
$$x = \frac{13 - 5y + 2z}{3} \quad .....④$$

Gantikan ④ dalam ②
Substitute ④ *into* ②

$$5\left(\frac{13 - 5y + 2z}{3}\right) + 2y + 4z = -20$$
$$\frac{-19y + 22z + 65}{3} = -20$$
$$y = \frac{22z + 125}{19} \quad ...⑤$$

Gantikan ④ dalam ③
Substitute ④ *into* ③

$$14\left(\frac{13 - 5y + 2z}{3}\right) + 17y - 2z = 19$$
$$\frac{-19y + 22z + 182}{3} = 19 \quad ...⑥$$

Gantikan ⑤ dalam ⑥
Substitute ⑤ *into* ⑥

$$\frac{-19\left(\frac{22z + 125}{19}\right) + 22z + 182}{3} = 19$$

$$\frac{-22z - 125 + 22z + 182}{3} = 19$$
$$19 = 19$$

Maka, sistem persamaan linear ini mempunyai penyelesaian tak terhingga kerana 19 = 19.
Therefore, the system of linear equations has infinity solution because 19 = 19.

5 $2x + y = 4$ ...①
$x^2 - y - 4 = 0$ ...②

Persamaan ① + ②
Equation ① + ②

$$2x + y + (x^2 - y - 4) = 4 + 0$$
$$x^2 + 2x - 8 = 0$$
$$(x - 2)(x + 4) = 0$$
$$x = 2 \text{ , } x = -4$$

Gantikan $x = 2$ dalam ①
Substitute $x = 2$ *into* ①

$$2(2) + y = 4$$
$$y = 0$$

Gantikan $x = -4$ dalam ①
Substitute $x = -4$ *into* ①

$$2(-4) + y = 4$$
$$y = 12$$

Maka, $x = 2$, $y = 0$ dan $x = -4$, $y = 12$ ialah penyelesaian bagi persamaan serentak ini.
Therefore, $x = 2$, $y = 0$ *and* $x = -4$, $y = 12$ *are the solutions for the simultaneous equations.*

6 $\frac{x}{2} + \frac{y}{3} = -2$ ...①
$2x^2 - xy = -1$ ...②

Daripada ①,
From ①,

$$x = -4 - \frac{2y}{3} \quad ...③$$

Gantikan ② dalam ②
Substitute ③ *into* ②

$$2\left(-4 - \frac{2y}{3}\right)^2 - y\left(-4 - \frac{2y}{3}\right) = -1$$
$$14y^2 + 132y + 297 = 0$$
$$y = \frac{-132 \pm \sqrt{132^2 - 4(14)(297)}}{2(14)}$$

$y = -3.709$, $y = -5.719$

Gantikan $y = -3.709$ dalam ③
Substitute $y = -3.709$ *into* ③

$$x = -4 - \frac{2(-3.709)}{3}$$
$$= -1.527$$

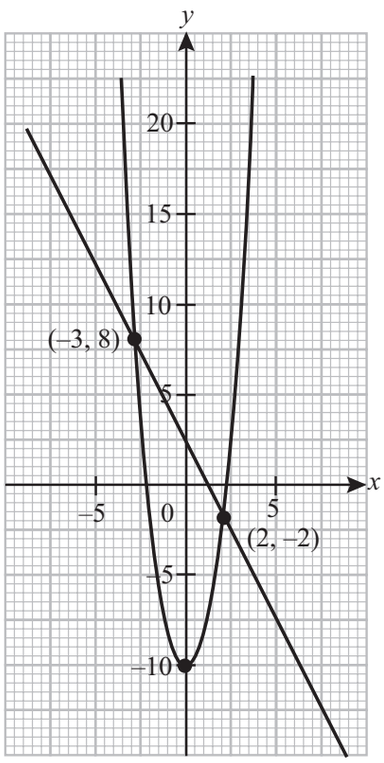
Gantikan $y = -5.719$ dalam ③
Substitute $y = -5.719$ into ③

$$x = -4 - \frac{2(-5.719)}{3}$$
$$= -0.1873$$

Maka, $x = -1.527$, $y = -3.709$ dan $x = -0.1873$, $y = -5.719$ ialah penyelesaian bagi persamaan serentak ini.
Therefore, $x = -1.527$, $y = -3.709$ and $x = -0.1873$, $y = -5.719$ are the solutions for the simultaneous equation.

7 Jadual nilai untuk persamaan linear dan persamaan tak linear.
The table of values for linear equation and non-linear equation.

x	–3	–2	–1	0	1	2
Nilai y ***Value of y*** **$2x + y = 2$**	8	6	4	2	0	–2
Nilai y ***Value of y*** **$2x^2 - y = 10$**	8	–2	–8	–10	–8	–2



Maka, $x = 2$, $y = -2$ dan $x = -3$, $y = 8$ ialah penyelesaian bagi persamaan serentak ini.
Therefore, $x = 2$, $y = -2$ and $x = -3$, $y = 8$ are the solutions for the simultaneous equations.

8 x = Bilangan kanak-kanak
The number of children
y = Bilangan lelaki
The number of males
z = Bilangan wanita
The number of females

$x + y + z = 400$ ...①
$2z = y$ ...②
$50 + y = x$ ...③

Daripada ②,
From ②,

$$z = \frac{y}{2} \text{ ...④}$$

Gantikan ④ dalam dalam ①
Substitute ④ into ①

$$x + y + \frac{y}{2} = 400$$
$$x + \frac{3y}{2} = 400 \text{ ...⑤}$$

Daripada ③,
From ③,

$y = x - 50$ ...⑥

Gantikan ⑥ dalam ⑤
Substitute ⑥ into ⑤

$$x + \frac{3(x - 50)}{2} = 400$$
$$5x - 150 = 800$$
$$x = 190$$

Gantikan $x = 190$ dalam ⑥
Substitute $x = 190$ into ⑥

$y = 190 - 50$
$y = 140$

Gantikan $y = 140$ dalam ④
Substitute $y = 140$ into ④
$z = 70$
$x = 190$, $y = 140$, $z = 70$

9 x = nombor terkecil/*smallest number*
y = nombor tengah/*middle number*
z = nombor terbesar/*largest number*

$x + y + z = 108$ ...①

$$x = \frac{z}{2} \text{ ...②}$$

$$y = \frac{75}{100} z$$

$$y = \frac{3}{4} z \text{ ...③}$$

Gantikan ③ dalam ①
Substitute ③ into ①

$$x + \frac{3}{4} z + z = 108$$

$$x + \frac{7}{4} z = 108 \text{ ....④}$$

Gantikan ② dalam ④
Substitute ② into ④

$$\frac{z}{2}+\frac{7}{4}z = 108$$
$$\frac{9z}{4} = 108$$
$$z = 48$$

Gantikan $z = 48$ dalam ②
Substitute $z = 48$ *into* ②

$$x = \frac{48}{2}$$
$$x = 24$$

Gantikan $z = 48$ dalam ③
Substitute $z = 48$ *into* ③

$$y = \frac{3}{4}(48)$$
$$y = 36$$

$x = 24$, $y = 36$, $z = 48$

Bab 4 Indeks, Surd dan Logaritma
Indices, Surds and Logarithms

1 $\dfrac{49^{x+1}}{343^{y-2}} = 1$

$$\frac{(7^2)^{x+1}}{(7^3)^{y-2}} = 1$$
$$7^{2x+2} = 7^{3y-6}$$
$$2x + 2 = 3y - 6$$
$$3y = 2x + 8$$
$$y = \frac{2x+8}{3}$$

2 (a) $\dfrac{(8x^5y^3)^2}{4x^6y^5} = \dfrac{64x^{10}y^6}{4x^6y^5}$

$$= 16x^{10-6}y^{6-5}$$
$$= 16x^4y$$

(b) $8(2^{3x-2}) = 1$
$$2^3(2^{3x-2}) = 2^0$$
$$2^{3+3x-2} = 2^0$$
$$3x + 1 = 0$$
$$x = -\frac{1}{3}$$

3 (a) $\dfrac{5^{3n+1} \times 25^n}{125^{n-1}} = \dfrac{5^{3n+1} \times 5^{2n}}{5^{3(n-1)}}$

$$= 5^{3n+1+2n-3n+3}$$
$$= 5^{2n+4}$$

Buat perbandingan,
Make a comparison,
$5^{2n+4} = 5^{hn+k}$
$h = 2$
$k = 4$

(b) $27^x(3^{x-1}) = 9^x$
$$(3^3)^x3^{x-1} = 3^{2x}$$
$$3^{3x+x-1} = 3^{2x}$$
$$4x - 1 = 2x$$
$$x = \frac{1}{2}$$

4 (a) $4^{x+2} - 4^x = \dfrac{15}{64}$

Katakan/*Let* $U = 4^x$
$$4^x \times 4^2 - 4^x = \frac{15}{64}$$
$$16U - U = \frac{15}{64}$$
$$15U = \frac{15}{64}$$
$$U = \frac{1}{64}$$
$$4^x = 4^{-3}$$
$$x = -3$$

(b) $3^{3x} = 54 + 3^{3x-1}$

Katakan/*Let* $A = 3^{3x}$
$$3^{3x} = 54 + 3^{3x} \times 3^{-1}$$
$$A = 54 + \frac{1}{3}A$$
$$\frac{2}{3}A = 54$$
$$A = 81$$
$$3^{3x} = 3^4$$
$$3x = 4$$
$$x = \frac{4}{3}$$

5 $36^n \times \dfrac{1}{216^{\frac{n}{2}}} \times 6^{\frac{3n}{2}} = 6^{2n} \times (6^3)^{\left(-\frac{n}{2}\right)} \times 6^{\frac{3n}{2}}$

$$= 6^{2n-\frac{3n}{2}+\frac{3n}{2}}$$
$$= 6^{2n}$$
$$= (6^n)^2$$

$(6^n)^2$ sentiasa positif.
$(6^n)^2$ *is always positive.*

6 (a) $9^m \times 3^{2(m+1)} \times 9^{m+1}$
$= 3^{2m+2m+2+2m+2}$
$= 3^{6m+4}$
$= 3^{6m} \times 3^4$
$= 81(3^{6m})$ boleh dibahagi tepat dengan 81
$81(3^{6m})$ *is divisible by* 81

(b) $\left(\dfrac{8}{54}\right)^x = \left(\dfrac{4}{27}\right)^x$

$$= \left(\frac{2^2}{3^3}\right)^x$$

Diberi $p = 2^x$, $q = 3^x$, maka
Given $p = 2^x$, $q = 3^x$, *then*

$$\left(\frac{2^2}{3^3}\right)^x = \frac{2^{2x}}{3^{3x}}$$
$$= \frac{(2^x)^2}{(3^x)^3}$$
$$= \frac{p^2}{q^3}$$

7 (a) $\dfrac{5}{\sqrt{7}+\sqrt{2}} = \dfrac{5}{\sqrt{7}+\sqrt{2}} \times \dfrac{\sqrt{7}-\sqrt{2}}{\sqrt{7}-\sqrt{2}}$

$$= \frac{5(\sqrt{7}-\sqrt{2})}{(\sqrt{7}+\sqrt{2})(\sqrt{7}-\sqrt{2})}$$
$$= \frac{5(\sqrt{7}-\sqrt{2})}{7-\sqrt{14}+\sqrt{14}-2}$$
$$= \frac{5(\sqrt{7}-\sqrt{2})}{5}$$
$$= \sqrt{7}-\sqrt{2}$$

(b) $\sqrt{3+4x}+2x=0$
$3+4x=(-2x)^2$
$4x^2-4x-3=0$
$(2x+1)(2x-3)=0$
$x=-\frac{1}{2}, x=\frac{3}{2}$

8 $x-3\sqrt{x}-4=0$
Katakan/*Let* $m=\sqrt{x}$
$(\sqrt{x})^2-3\sqrt{x}-4=0$
$m^2-3m-4=0$
$(m+1)(m-4)=0$
$m=-1, \quad m=4$
$\sqrt{x}=-1, \sqrt{x}=4$
$x=1 \quad , \quad x=16$

9 Kuasa dua kedua-dua belah,
Squared for both sides,
$\sqrt{x+2}=\sqrt{7-x}-3$
$x+2=7-x-6\sqrt{7-x}+9$
$2x-14=-6\sqrt{7-x}$
$4x^2-56x+196=36(7-x)$
$4x^2-56x+196=252-36x$
$4x^2-20x-56=0$
$x^2-5x-14=0$
$(x-7)(x+2)=0$
$x=7 \quad , \quad x=-2$

10 (a) $\log_3(x+1)=\log_3 x+3$
$\log_3(x+1)-\log_3 x=3$
$\log_3\frac{x+1}{x}=3$
$\frac{x+1}{x}=3^3$
$x+1=27x$
$x=\frac{1}{26}$

(b) $\log_m(2x-1)=\log_m(x+2)+\log_m(x-2)$
$\log_m(2x-1)=\log_m(x+2)(x-2)$
$2x-1=x^2-4$
$x^2-2x-3=0$
$(x-3)(x+1)=0$
$x=3, \quad x=-1$

11 (a) $\log_a t=\log_a p+\log_a q$
$\log_a t=\log_a pq$
$t=pq$
$p=\frac{t}{q}$

(b) $\log_5(x+3)=2+\log_5(x-1)$
$\log_5(x+3)=\log_5 5^2+\log_5(x-1)$
$\log_5(x+3)=\log_5 25(x-1)$
$x+3=25(x-1)$
$x+3=25x-25$
$x=\frac{7}{6}$

12 Diberi/*Given*, $\log_m p=x$,
$\log_{\sqrt{m}} p^3m^2=\frac{\log_m p^3m^2}{\log_m m^{\frac{1}{2}}}$
$=\frac{\log_m p^3+\log_m m^2}{\frac{1}{2}}$
$=2(3\log_m p+2)$
$=2(3x+2)$
$=6x+4$

13 (a) $6^{n+3}-6^n-36(6^{n-1})=6^n\times 6^3-6^n-6^2\times 6^n\times 6^{-1}$
$=6^n(6^3-1-6)$
$=209(6^n)$
Maka/*Therefore* $p=209$

(b) $\log_{10}(x^2+21x-6)=1+2\log_{10}x$
$\log_{10}(x^2+21x-6)=\log_{10}10+\log_{10}x^2$
$\log_{10}(x^2+21x-6)=\log_{10}10x^2$
$x^2+21x+6=10x^2$
$9x^2-21x-6=0$
$3x^2-7x+2=0$
$(3x-1)(x-2)=0$
$x=\frac{1}{3}, \ x=2$

14 Diberi $x=5^p$ dan $y=5^q$,
Given $x=5^p$ *and* $y=5^q$,
$\log_{25}x-\log_5 y=\frac{\log_5 5^p}{\log_5 5^2}-\log_5 5^q$
$=\frac{p}{2}-q$

15 $2\log_2\frac{y}{x}=2+2\log_2 x$
$\log_2\left(\frac{y}{x}\right)^2=\log_2 2^2+2\log_2 x$
$\log_2\frac{y^2}{x^2}=\log_2 4x^2$
$\frac{y^2}{x^2}=4x^2$
$y^2=4x^4$
$y=2x^2$

Maka/*Then*,
$2y^2-6y=20x^2$
$2(2x^2)^2-6(2x^2)=20x^2$
$8x^4=32x^2$
$x^2=4$
$x=2$
$y=2(2)^2$
$y=8$

16 (a) $N=2\,000(1.03)^t$
$N=2\,000(1.03)^5$
$N=2\,318.55$
Nilai gelang emas/*Value of gold bracelet*
= RM2 319

(b) $2\,000(1.03)^t\leq 8000$
$(1.03)^t\leq 4$
$t\leq\frac{\log_{10}4}{\log_{10}1.03}$
$t\leq 46.89$
$t=46$

17 $\frac{1}{2} \times BC \times (\sqrt{5} + \sqrt{3}) = \sqrt{12}$

$BC \times (\sqrt{5} + \sqrt{3}) = 2\sqrt{12}$

$$BC = \frac{2\sqrt{12}}{\sqrt{5} + \sqrt{3}}$$

$$BC = \frac{2\sqrt{12}}{\sqrt{5} + \sqrt{3}} \times \frac{\sqrt{5} - \sqrt{3}}{\sqrt{5} - \sqrt{3}}$$

$$BC = \frac{2\sqrt{60} - 2\sqrt{36}}{5 - 3}$$

$$BC = \frac{4\sqrt{15} - 12}{2}$$

$$BC = 2\sqrt{15} - 6$$

18 (a) $\log_3 17 = \frac{\log_{10} 17}{\log_{10} 3}$

$= 2.579$

(b) $a^{\log_a x} = 8$

$\log_a a^{\log_a x} = \log_a 8$

$(\log_a x)\log_a a = \log_a 8$

$\log_a x = \log_a 8$

$x = 8$

(c) Diberi $a = 5^x$ dan $b = 7^x$

Given $a = 5^x$ *and* $b = 7^x$

$$\frac{35^x}{25^{x+2}} = (5 \times 7)^x \, 5^{2(-x-2)}$$

$$= 5^x \times 7^x \times 5^{-2x} \times 5^{-4}$$

$$= 5^{x-2x-4} \times 7^x$$

$$= \frac{7^x}{5^{x+4}}$$

$$= \frac{7^x}{5^4(5^x)}$$

$$= \frac{b}{625a}$$

19 (a) $2^y = 3$

$2 = 3^{\frac{1}{y}}$

$2^3 = 3^x$

$\left(3^{\frac{1}{y}}\right)^3 = 3^x$

$3^{\frac{3}{y}} = 3^x$

$\frac{3}{y} = x$

$xy = 3$

(b) $2\log_2(x - y) - \log_2 x = 4 + \log_2 y$

$\log_2 \frac{(x-y)^2}{x} = \log_2 16y$

$\frac{(x-y)^2}{x} = 16y$

$(x - y)^2 = 16xy$

$x^2 - 2xy + y^2 = 16xy$

$x^2 + y^2 = 18xy$ (Tertunjuk/*Shown*)

Bab 5 Janjang / *Progressions*

1 (a) Beza sepunya/*Common difference*

$= 11 - 4$

$= 7$

(b) Hasil tambah/*Sum*

$= S_{47} - S_5$

$= \frac{47}{2}[2(4) + 46(7)] - \frac{5}{2}[2(4) + 4(7)]$

$= 7\,755 - 90$

$= 7\,665$

2 (a) $S_n = \frac{n}{2}(5n - 3)$

$S_8 = \frac{8}{2}[5(8) - 3]$

$= \frac{8}{2}(37)$

$= 148$

(b) $T_8 = 148 - \frac{7}{2}[5(7) - 3]$

$= 148 - 112$

$= 36$

3 (a) $T_1 = 2 \times \pi \times \frac{10}{2}$

$= 10\pi$

$T_2 = 2 \times \pi \times \frac{38}{2}$

$= 38\pi$

$T_3 = 2 \times \pi \times \frac{66}{2}$

$= 66\pi$

$T_4 = 2 \times \pi \times \frac{94}{2}$

$= 94\pi$

(b) $d = T_2 - T_1$

$= 38\pi - 10\pi$

$= 28\pi$

4 $d = 6$,

$T_{11} = a + 10(6)$

$a + 60 = 2 + 6p$

$a = 6p - 58$ ...①

$S_6 = \frac{6}{2}[2a + 5(6)]$

$6a + 90 = 5p - 8$

$6a = 5p - 98$ ...②

Gantikan ① ke dalam ②,

Substitute ① *into* ②,

$6(6p - 58) = 5p - 98$

$36p - 348 = 5p - 98$

$31p = 250$

$p = \frac{250}{31}$

5 (a) $r = \dfrac{-12}{6}$
$= -2$

(b) $a = 6, r = -2$
$S_n = -8\ 190$
$\dfrac{a(1-r^n)}{1-r} = -8\ 190$
$\dfrac{6(1-(-2)^n)}{1-(-2)} = -8\ 190$
$1-(-2)^n = -4\ 095$
$(-2)^n = 4\ 096$
$(-2)^n = (-2)^{12}$
$n = 12$

6 (a) $r = \dfrac{x^2}{1}$
$= x^2$

(b) $S_\infty = \dfrac{a}{1-r}$
$18 = \dfrac{1}{1-x^2}$
$18 - 18x^2 = 1$
$18x^2 = 17$
$x^2 = \dfrac{17}{18}$
$x = \sqrt{\dfrac{17}{18}}$
$= 0.9718$

7 (a) $\dfrac{-15}{x} = \dfrac{45}{-15}$
$x = \dfrac{-15}{45} \times -15$
$= 5$

(b) $r = \dfrac{45}{-15}$
$= -3$
$S_6 = \dfrac{5(1-(-3)^6)}{1+3}$
$= -910$
$S_3 = 5 - 15 + 45$
$= 35$
Hasil tambah/ *Sum* $= -910 - 35$
$= -945$

8 (a) $T_5 = 15$
$ar^4 = 15$ ...①
$T_5 + T_6 = 10$
$15 + ar^5 = 10$
$ar^5 = -5$ ...②
② ÷ ①,
$\dfrac{ar^5}{ar^4} = \dfrac{-5}{15}$
$r = -\dfrac{1}{3}$
Gantikan $r = -\dfrac{1}{3}$ ke dalam ①,
Substitute $r = -\dfrac{1}{3}$ *into* ①,
$a\left(-\dfrac{1}{3}\right)^4 = 15$
$a = 1\ 215$

(b) $S_\infty = \dfrac{a}{1-r}$
$= \dfrac{1\ 215}{1-\left(-\frac{1}{3}\right)}$
$= 1\ 215 \times \dfrac{3}{4}$
$= 911\dfrac{1}{4}$

9 (a) (i) Masa (dalam saat) untuk setiap kilometer yang seterusnya:
Time (in seconds) for each subsequence kilometre:
225, 237, 249, …
$a = 225, d = 237 - 225 = 12$
$T_{10} = 225 + (10-1)(12)$
$= 333$ saat/*seconds*
$= 5$ minit/*minutes* 33 saat/*seconds*

(ii) $S_{12} = \dfrac{12}{2}[2(225) + (12-1)(12)]$
$= 3\ 492$ saat/*seconds*
$= 58$ minit/*minutes* 12 saat/*seconds*

(b) (i) $\dfrac{6p+q}{2p+q} = \dfrac{14p+q}{6p+q}$
$28p^2 + 16pq + q^2 = 36p^2 + 12pq + q^2$
$4pq = 8p^2$
$q = 2p$

(ii) $r = \dfrac{6p+q}{2p+q}$
$= \dfrac{6p+2p}{2p+2p}$
$= \dfrac{8p}{4p}$
$= 2$

(iii) $T_{n+1} = (2p+q)2^{(n+1)-1}$
$T_{n+1} = 4p\,(2^n)$ ...①
$S_n = \dfrac{(2p+q)(2^n-1)}{2-1}$
$= 4p(2^n - 1)$
$= 4p(2^n) - 4p$ ...②
① – ②
$T_{n+1} - S_n = 4p(2)^n - 4p(2^n) - 4p$
$= 4p$ (Tertunjuk/*Shown*)

Bab 6 Hukum Linear
Linear Law

1 (a) $y = px^3$
$\log_{10} y = \log_{10} p + 3(\log_{10} x)$
$\log_{10} y = 3(\log_{10} x) + \log_{10} p$

(b) (i) $\log_{10} p =$ pintasan-*y*/*y-intercept* $= 3$
(ii) $\log_{10} y = 3(2) + 3$
$= 9$
$q = \log_{10} y$
$= 9$

2 (a) (i) $\dfrac{x}{a} + \dfrac{y}{b} = 1$
$\dfrac{\log x}{-6} + \dfrac{\log y}{3} = 1$
$-\log x + 2\log y = 6$
$2\log y = \log x + 6$
$\log y = \dfrac{1}{2}\log x + 3$

(ii) $\log y = \frac{1}{2}\log x + 3$

$\log y = \log x^{\frac{1}{2}} + \log 10^3$

$\log y = \log 1\,000\, x^{\frac{1}{2}}$

$y = 1\,000\, x^{\frac{1}{2}}$

(iii) $\log x = 2$

$x = 100$

$y = 1\,000 \times 100^{\frac{1}{2}}$

$= 1\,000 \times 10$

$= 10\,000$

(b) $py = q^x$

$\log_{10}(py) = \log_{10} q^x$

$\log_{10} p + \log_{10} y = x \log_{10} q$

$\log_{10} y = (\log_{10} q)x - \log_{10} p$

Satu garis lurus dapat dilukis dengan memplotkan $\log_{10} y$ melawan x.

Nilai $-\log_{10} p$ ialah pintasan pada paksi-$\log_{10} y$.

Katakan $-\log_{10} p = k$, maka

A straight line can be drawn by plotting $\log_{10} y$ *against x.*

The value of $-\log_{10} p$ *is the intercept at* $\log_{10} y$*-axis.*

Let $-\log_{10} p = k$*, then*

$-\log_{10} p = k$

$\log_{10} \frac{1}{p} = \log_{10} 10^k$

$\frac{1}{p} = 10^k$

$p = \frac{1}{10^k}$

Nilai $\log_{10} q$ ialah kecerunan garis lurus daripada persamaan linear. Katakan, kecerunan garis lurus daripada graf ialah m.

The value of $\log_{10} q$ *is the gradient of straight line from the linear equation. Let, the gradient of the straight line of graph is m.*

Maka/*Thus* $\log_{10} q = m$

$q = 10^m$

Oleh sebab nilai-nilai k dan m boleh diperoleh daripada graf garis lurus yang dilukis itu, maka nilai-nilai p dan q boleh diperoleh dengan menggantikan nilai-nilai k dan m ke dalam $p = \frac{1}{10^k}$ dan $q = 10^m$.

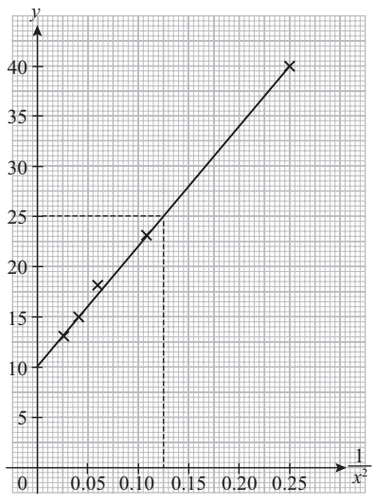
Since the values of k and m can be obtained from the graph of straight line drawn, therefore the values of p and q can be obtained by substituting the values of k and m into $p = \frac{1}{10^k}$ *and* $q = 10^m$.

3 (a)

$\frac{1}{x^2}$	0.25	0.11	0.06	0.04	0.03
y	40	23	18	15	13

$x^2y = s + tx^2$

$y = \frac{1}{x^2} s + t$



(b) (i) Kecerunan/*Gradient*, $m = \frac{40 - 10}{0.25 - 0}$

$m = 120$

$s = 120$

(ii) Pintasan-y/*y-intercept* $= 10$

$t = 10$

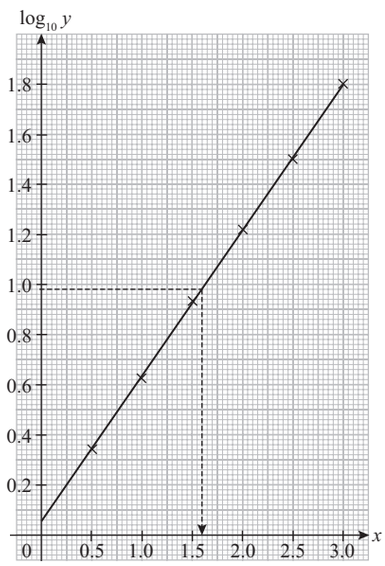
(iii) Daripada graf/ *From graph,* $\frac{1}{x^2} = 0.125$

$x = 2.83$

4 (a)

x	0.5	1.0	1.5	2.0	2.5	3.0
$\log_{10} y$	0.34	0.62	0.91	1.22	1.50	1.80

(b)



(c) $y = ab^{3x}$

$\log_{10} y = \log_{10} a + 3x \log_{10} b$

$= (3 \log_{10} b)x + \log_{10} a$

(i) $y = 9.5$

$\log_{10} y = 0.98$

$x = 1.6$

(ii) $\log_{10} a$ = pintasan-*y*/*y-intercept*

$= 0.06$

$a = 1.148$

(iii) $3 \log_{10} b$ = kecerunan/*gradient*

$= \dfrac{1.8 - 0.06}{3 - 0}$

$= 0.58$

$\log_{10} b = 0.1933$

$b = 1.561$

Bab 7 Geometri Koordinat *Coordinate Geometry*

1 $\dfrac{2p - 4t}{3} = p \quad , \quad \dfrac{2t + 2h}{3} = t$

$-4t = p \quad , \quad 2h = t$

$p = -8h$

2 $3\sqrt{(x-1)^2 + (y-4)^2} = 2\sqrt{(x-0)^2 + (y-6)^2}$

$5x^2 + 5y^2 - 18x - 24y + 9 = 0$

3 $m_{JK} = p \quad , \quad m_{RT} = k + 2$

$p(k + 2) = -1$

$p = -\dfrac{-1}{k+2}$

4 (a) $\dfrac{x}{5} + \dfrac{y}{3} = 1$

(b) $\sqrt{(x-5)^2 + (y-0)^2} = 3$

$x^2 + y^2 - 10x + 16 = 0$

5 (a) $y = \dfrac{x}{3} + 2, m = \dfrac{1}{3}$

(b) Koordinat titik tengah/*Coordinates of midpoint*

$\left(\dfrac{-6+0}{2}, \dfrac{0+2}{2}\right) = (-3, 1)$

$y - 2 = -3(x + 3)$

$y = -3x - 7$

6 $m_1 = \dfrac{1}{2} \quad , \quad m_2 = \dfrac{h+2}{2}$

$\dfrac{1}{2} = \dfrac{h+2}{2}$

$h = -1$

7 (a) $y = \dfrac{p}{q}x + \dfrac{1}{q}$

$m = \dfrac{p}{q}$

(b) $\dfrac{p}{q} \times m_2 = -1$

$m_2 = -\dfrac{q}{p}$

8 $y = -\dfrac{3}{h}x + \dfrac{k+4}{h}$

$\dfrac{k+4}{h} = \dfrac{7}{k}$

$k^2 + 4k = 7h$

$h = \dfrac{k^2 + 4k}{7}$

9 $x\left(\dfrac{3x+1}{4}\right) = 28x - 27\left(\dfrac{3x+1}{4}\right)$

$3x^2 - 30x + 27 = 0$

$x^2 - 10x + 9 = 0$

$(x - 9)(x - 1) = 0$

$x = 9, x = 1$

$y = \dfrac{3x+1}{4}$

$y = \dfrac{3(9)+1}{4}$

$= 7$

$B(9, 7)$

$m_{AB} = \dfrac{7-1}{9-1} = \dfrac{3}{4}$

Koordinat titik tengah/*Coordinates of midpoint*

$\left(\dfrac{1+9}{2}, \dfrac{1+7}{2}\right) = (5, 4)$

$m_2 = -\dfrac{4}{3}$

$y = mx + c$

$4 = \dfrac{-4}{3}(5) + c$

$c = \dfrac{32}{3}$

$y = -\dfrac{4}{3}x + \dfrac{32}{3}$

$-\dfrac{4}{3}x + \dfrac{32}{3} = 4x$

$\dfrac{16}{3}x = \dfrac{32}{3}$

$x = 2$

$x = 2, y = -\dfrac{4}{3}(2) + \dfrac{32}{3}$

$y = 8$

$C(2, 8)$

Luas *ABC*/*Area of ABC*

$= \dfrac{1}{2}\begin{vmatrix} 1 & 9 & 2 & 1 \\ 1 & 7 & 8 & 1 \end{vmatrix}$

$= \dfrac{1}{2}|[(1)(7) + (9)(8) + (2)(1)] - [(1)(9) + (7)(2) + (8)(1)]|$

$= 25 \text{ unit}^2$

10 (a) (i) $M = \left(\dfrac{-1+3}{2}, \dfrac{2+4}{2}\right)$

$= (1, 3)$

(ii) $m_{AC} = \dfrac{4-2}{3-(-1)} = \dfrac{1}{2}$

$m_{BD} = -2$

$c = y - mx$

$= 3 - (-2)(1)$

$= 5$

$y = -2x + 5$

(iii) $-2 = \frac{k-3}{0-1}$

$k = 5$

(b) (i) $\frac{0+p}{4} = 1$, $\frac{15+q}{4} = 3$

$p = 4$, $q = -3$

(ii) Luas/*Area*

$= \frac{1}{2}\begin{vmatrix} -1 & 0 & 3 & 4 & -1 \\ 2 & 5 & 4 & -3 & 2 \end{vmatrix}$

$= \frac{1}{2}|[(-1)(5) + (0)(4) + (3)(-3) + (4)(2)]$

$- [(0)(2) + (3)(5) + (4)(4) + (-1)(-3)]$

$\frac{1}{2}|-6 - 34| = \frac{1}{2}|-40| \; \frac{1}{2}|40|$

$= 20 \text{ unit}^2$

11 (a) $-\frac{4}{3} \times \frac{k}{12} = -1$

$k = 9$

(b) $3\left(\frac{3}{4}x + \frac{50}{12}\right) = -4x$

$x = -2,$

$y = \frac{-4}{3}(-2)$

$y = \frac{8}{3}$

$B\left(-2, \frac{8}{3}\right)$

(c) $T(0, y)$

$y = \frac{9}{12}(0) + \frac{25}{6}$

$y = \frac{25}{6}$

$T\left(0, \frac{25}{6}\right)$

$\frac{-10+x}{6} = 0$, $\frac{\frac{40}{3}+y}{6} = \frac{25}{6}$

$x = 10$, $y = \frac{35}{3}$

$C\left(10, \frac{35}{3}\right)$

$m_{CD} = -\frac{4}{3}$

$y = mx + c$

$\frac{35}{3} = -\frac{4}{3}(10) + c$

$c = 25$

$y = -\frac{4}{3}x + 25$

12 (a) (i) $m_{AD} = \frac{3}{5}$

$y = mx + c$

$4 = \frac{3}{5}(-2) + c$

$c = \frac{26}{5}$

Persamaan *AD*: $y = \frac{3}{5}x + \frac{26}{5}$

Equation of AD

$m_{CD} = -\frac{5}{3}$

$y - 2 = -\frac{5}{3}(x - 6)$

$y = -\frac{5}{3}x + 12$

(ii) $\frac{3}{5}x + \frac{26}{5} = -\frac{5}{3}x + 12$

$x = 3$

$y = -\frac{5}{3}(3) + 12$

$y = 7$

$D(3, 7)$

(b) $|AC| = |CD|$

$\sqrt{(-2-6)^2 + (4-2)^2} = \sqrt{(-2-3)^2 + (4-7)^2} + \sqrt{(3-6)^2 + (7-2)^2}$

$(-5)^2 + (-3)^2 + (-3)^2 + (5)^2 = (-8)^2 + (2)^2$

$68 = 68$

Terbukti *ACD* ialah segi tiga sama kaki kerana panjang sisi sama.

Proven that ACD is an isosceles triangle because the length of sides are equal.

13 (a) $m_{AD} = -2$

$c = y - mx$

$c = 6 - (-2)(2)$

$= 10$

$y = -2x + 10$

(b) $2(3x - 15) = x$

$x = 6$

$y = \frac{6}{2}$

$y = 3$

$C(6, 3)$

$m_{AB} = \frac{1}{2}$

$c = y - mx$

$c = 6 - \left(\frac{1}{2}\right)(2)$

$c = 5$

Persamaan *AB*: $y = \frac{1}{2}x + 5$

Equation of AB

$\frac{1}{2}x + 5 = 3x - 15$

$x = 8$

$y = \frac{1}{2}(8) + 5$

$y = 9$

$B(8, 9)$

(c) Perimeter = $|OA| + |AB| + |BC| + |CO|$

$P = \sqrt{(0-2)^2 + (0-6)^2} + \sqrt{(8-2)^2 + (9-6)^2} + \sqrt{(8-6)^2 + (9-3)^2} + \sqrt{(0-3)^2 + (0-6)^2}$

$P = 26.07$ cm

Bab 8 Vektor *Vector*

1 (a) $\overrightarrow{OM} = 2\underset{\sim}{i} - 2\underset{\sim}{j}$

$\overrightarrow{ON} = 7\underset{\sim}{i} + 3\underset{\sim}{j}$

$\overrightarrow{MN} = \overrightarrow{MO} + \overrightarrow{ON}$

$= -2\underset{\sim}{i} + 2\underset{\sim}{j} + 7\underset{\sim}{i} + 3\underset{\sim}{j}$

$= 5\underset{\sim}{i} + 5\underset{\sim}{j}$

$\overrightarrow{MN} = h\underset{\sim}{v} + k\underset{\sim}{w}$

$h(2\underset{\sim}{i} + 3\underset{\sim}{j}) + k(-2\underset{\sim}{i} + \underset{\sim}{j}) = 5\underset{\sim}{i} + 5\underset{\sim}{j}$

$(2h - 2k)\,\underset{\sim}{i} + (3h + k)\,\underset{\sim}{j} = 5\underset{\sim}{i} + 5\underset{\sim}{j}$

Selesaikan persamaan serentak:
Solve the simultaneous equations:

$2h - 2k = 5$

$3h + k = 5$

$h = \frac{15}{8}, k = -\frac{5}{8}$

(b) $|\overrightarrow{MN}| = \sqrt{5^2 + 5^2}$

$|\overrightarrow{MN}| = \sqrt{50}$

$= 5\sqrt{2}$

$\overrightarrow{MN} = \frac{1}{5\sqrt{2}}(5\underset{\sim}{i} + 5\underset{\sim}{j})$

$\overrightarrow{MN} = \frac{1}{\sqrt{2}}(\underset{\sim}{i} + \underset{\sim}{j})$

2 (a) $\overrightarrow{PS} = \overrightarrow{PQ} + \overrightarrow{QS}$

$\overrightarrow{PS} = -\underset{\sim}{y} + 4\underset{\sim}{x}$

$\overrightarrow{PK} = \frac{1}{3}\overrightarrow{PS}$

$\overrightarrow{PK} = -\frac{1}{3}\underset{\sim}{y} + \frac{4}{3}\underset{\sim}{x}$

$\overrightarrow{QK} = \overrightarrow{QP} + \overrightarrow{PK}$

$= \underset{\sim}{y} - \frac{1}{3}\underset{\sim}{y} + \frac{4}{3}\underset{\sim}{x}$

$= \frac{2}{3}\underset{\sim}{y} + \frac{4}{3}\underset{\sim}{x}$

$\overrightarrow{JS} = \overrightarrow{JP} + \overrightarrow{PS}$

$\overrightarrow{JS} = \frac{2}{3}\overrightarrow{RP} + \overrightarrow{PS}$

$= \frac{2}{3}(\overrightarrow{RQ} + \overrightarrow{QP}) + (-\underset{\sim}{y} + 4\underset{\sim}{x})$

$= -\frac{2}{3}\underset{\sim}{x} + \frac{1}{3}\underset{\sim}{y} - \underset{\sim}{y} + 4\underset{\sim}{x}$

$= \frac{10}{3}\underset{\sim}{x} - \frac{1}{3}\underset{\sim}{y}$

(b) $\overrightarrow{QJ} = \lambda\overrightarrow{QK}$

$\overrightarrow{QP} + \overrightarrow{PJ} = \lambda\left(\frac{2}{3}\underset{\sim}{y} + \frac{4}{3}\underset{\sim}{x}\right)$

$\underset{\sim}{y} + \frac{2}{3}(-\underset{\sim}{y} + \underset{\sim}{x}) = \lambda\left(\frac{2}{3}\underset{\sim}{y} + \frac{4}{3}\underset{\sim}{x}\right)$

$\frac{2}{3}\underset{\sim}{x} + \frac{1}{3}\underset{\sim}{y} = \frac{4}{3}\lambda\underset{\sim}{x} + \frac{2}{3}\lambda\underset{\sim}{y}$

$\frac{4}{3}\lambda = \frac{2}{3}$

$\lambda = \frac{1}{2}$

$\overrightarrow{QJ} = \frac{1}{2}\overrightarrow{QK}$

Maka, Q, J dan K adalah segaris.
Therefore, Q, J and K are collinear.

3 (a) $\overrightarrow{PQ} = \overrightarrow{PO} + \overrightarrow{OQ}$

$= \begin{pmatrix} 3 \\ -2 \end{pmatrix} + \begin{pmatrix} 12 \\ 7 \end{pmatrix}$

$= \begin{pmatrix} 15 \\ 5 \end{pmatrix}$

(b) $\overrightarrow{PR} = \frac{3}{5}\overrightarrow{PQ}$

$\overrightarrow{PR} = \frac{3}{5}\begin{pmatrix} 15 \\ 5 \end{pmatrix}$

$\overrightarrow{PR} = \begin{pmatrix} 9 \\ 3 \end{pmatrix}$

$\overrightarrow{PR} = \overrightarrow{PO} + \overrightarrow{OR}$

$\overrightarrow{OR} = \overrightarrow{PR} - \overrightarrow{PO}$

$= \begin{pmatrix} 9 \\ 3 \end{pmatrix} - \begin{pmatrix} 3 \\ -2 \end{pmatrix}$

$= \begin{pmatrix} 6 \\ 5 \end{pmatrix}$

$|\overrightarrow{OR}| = \sqrt{6^2 + 5^2}$

$|\overrightarrow{OR}| = \sqrt{61}$

4 (a) $\overrightarrow{BP} = \overrightarrow{BO} + \overrightarrow{OP}$

$= -\underset{\sim}{b} + \frac{1}{2}\underset{\sim}{a}$

(b) $\overrightarrow{BR} = \frac{m}{m+1}\overrightarrow{BP}$

$\overrightarrow{BP} = \frac{m+1}{m}\overrightarrow{BR}$

$\overrightarrow{BP} = \frac{m+1}{m}\left(\frac{1}{3}\underset{\sim}{a} - \frac{2}{3}\underset{\sim}{b}\right)$

$\overrightarrow{BP} = \frac{m+1}{3m}\underset{\sim}{a} - \frac{2(m+1)}{3m}\underset{\sim}{b}$

Bandingkan dengan (a)
Compare with (a)

$\frac{1}{2} = \frac{m+1}{3m}$

$3m = 2m + 2$

$m = 2$

5 (a) $\overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB}$

$= -6\underset{\sim}{a} + k\underset{\sim}{b}$

$\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP}$

$= \overrightarrow{OA} + \frac{1}{3}\overrightarrow{AB}$

$= 6\underset{\sim}{a} + \frac{1}{3}(-6\underset{\sim}{a} + k\underset{\sim}{b})$

$= 6\underset{\sim}{a} - 2\underset{\sim}{a} + \frac{1}{3}k\underset{\sim}{b}$

$= 4\underset{\sim}{a} + \frac{1}{3}k\underset{\sim}{b}$

(b) Apabila OP dipanjangkan, O, P dan Q ialah segaris, maka
When O is extended, P and Q are collinear, then

$\overrightarrow{OP} = \lambda\overrightarrow{PQ}$

$4\underset{\sim}{a} + \frac{1}{3}k\underset{\sim}{b} = \lambda(20\underset{\sim}{a} + 15\underset{\sim}{b})$

$4\underset{\sim}{a} + \frac{1}{3}k\underset{\sim}{b} = 20\lambda\underset{\sim}{a} + 15\lambda\underset{\sim}{b}$

$20\lambda = 4 \quad , \quad 15\lambda = \frac{1}{3}k$

$\lambda = \frac{1}{5} \quad , \quad k = 9$

6 (a) (i) $\overrightarrow{AC} = \overrightarrow{AD} + \overrightarrow{DC}$

$= 4\underset{\sim}{y} + \underset{\sim}{x}$

$\overrightarrow{BD} = \overrightarrow{BA} + \overrightarrow{AD}$

$= -5\underset{\sim}{x} + 4\underset{\sim}{y}$

(b) (i) $\overrightarrow{AP} = h\overrightarrow{AC}$

$\overrightarrow{AP} = h(4\underset{\sim}{y} + \underset{\sim}{x})$

$\overrightarrow{AP} = h\underset{\sim}{x} + 4h\underset{\sim}{y}$

(ii) $\overrightarrow{BP} = k\overrightarrow{BD}$

$\overrightarrow{BA} + \overrightarrow{AP} = k\overrightarrow{BD}$

$\overrightarrow{AP} = k\overrightarrow{BD} - \overrightarrow{BA}$

$\overrightarrow{AP} = k(-5\underset{\sim}{x} + 4\underset{\sim}{y}) - (-5\underset{\sim}{x})$

$\overrightarrow{AP} = (5 - 5k)x + 4k\underset{\sim}{y}$

Buat perbandingan pekali $\underset{\sim}{y}$ bagi $\overrightarrow{AP}$ di (i) dan (ii)
Make a comparison of coefficient $\underset{\sim}{y}$ for $\overrightarrow{AP}$ in (i) and (ii)

$4k = 4h$

$k = h$

7 (a) $|\underset{\sim}{n}| = \sqrt{6^2 + (-8)^2}$

$= 10$

(b) $\underset{\sim}{m} + \underset{\sim}{n} = \begin{pmatrix} k \\ 3 \end{pmatrix} + \begin{pmatrix} 6 \\ -8 \end{pmatrix}$

$= \begin{pmatrix} k+6 \\ -5 \end{pmatrix}$

Oleh sebab $m + n$ adalah selari dengan paksi-y, maka
Since $m + n$ is parallel to y-axis, then

$\begin{pmatrix} k+6 \\ -5 \end{pmatrix} = \begin{pmatrix} 0 \\ y \end{pmatrix}$

$k + 6 = 0$

$k = -6$

8 (a) $\overrightarrow{MN} = \frac{1}{2}\overrightarrow{RP}$

$= -\frac{1}{2}\underset{\sim}{u}$

$\overrightarrow{PM} = \overrightarrow{PR} + \frac{1}{2}\overrightarrow{RQ}$

$\overrightarrow{PM} = \underset{\sim}{u} + \frac{1}{2}\underset{\sim}{v}$

$\overrightarrow{SQ} = \overrightarrow{SR} + \overrightarrow{RQ}$

$\overrightarrow{NR} = \overrightarrow{NP} + \overrightarrow{PR}$

$\overrightarrow{NR} = \frac{1}{2}\overrightarrow{QP} + \overrightarrow{PR}$

$= \frac{1}{2}(-\underset{\sim}{v} - \underset{\sim}{u}) + \underset{\sim}{u}$

$= \frac{1}{2}\underset{\sim}{u} - \frac{1}{2}\underset{\sim}{v}$

Diberi/ *Given* $RN = \frac{3}{4}RS$,

$\overrightarrow{SQ} = \frac{4}{3}\overrightarrow{NR} + \overrightarrow{RQ}$

$= \frac{4}{3}\left(\frac{1}{2}\underset{\sim}{u} - \frac{1}{2}\underset{\sim}{v}\right) + \underset{\sim}{v}$

$= \frac{2}{3}\underset{\sim}{u} + \frac{1}{3}\underset{\sim}{v}$

(b) $\overrightarrow{PM} = \underset{\sim}{u} + \frac{1}{2}\underset{\sim}{v}$

$\overrightarrow{SQ} = \frac{2}{3}\underset{\sim}{u} + \frac{1}{3}\underset{\sim}{v}$

$\overrightarrow{SQ} = \frac{2}{3}\left(\underset{\sim}{u} + \frac{1}{2}\underset{\sim}{v}\right)$

$\overrightarrow{SQ} = \frac{2}{3}\overrightarrow{PM}$

Maka, $\overrightarrow{SQ}$ adalah selari dengan $\overrightarrow{PM}$.

Therefore, $\overrightarrow{SQ}$ is parallel to $\overrightarrow{PM}$

$\frac{PM}{SQ} = \frac{3}{2}$

$PM : SQ = 3 : 2$

9 (a) (i) $\overrightarrow{DB} = \overrightarrow{DA} + \overrightarrow{AB}$

$= -40\underset{\sim}{y} + 24\underset{\sim}{x}$

(ii) $\overrightarrow{CE} = \overrightarrow{CD} + \overrightarrow{DE}$

$= -30\underset{\sim}{x} + 30\underset{\sim}{y} + (-30\underset{\sim}{y})$

$= -30\underset{\sim}{x}$

(b) $\overrightarrow{DF} = \overrightarrow{DC} + \overrightarrow{CF}$

$= 30\underset{\sim}{x} - 30\underset{\sim}{y} + \frac{2}{5}CE$

$= 30\underset{\sim}{x} - 30\underset{\sim}{y} + \frac{2}{5}(-30\underset{\sim}{x})$

$= 18\underset{\sim}{x} - 30\underset{\sim}{y}$

Daripada/*From* (a)(i)

$\overrightarrow{DB} = -40\underset{\sim}{y} + 24\underset{\sim}{x}$

$\overrightarrow{DB} = 8(-5\underset{\sim}{y} + 3\underset{\sim}{x})$

$-5\underset{\sim}{y} + 3\underset{\sim}{x} = \frac{1}{8}\overrightarrow{DB}$

Daripada/ *From* (b)

$\overrightarrow{DF} = 18\underset{\sim}{x} - 30\underset{\sim}{y}$

$\overrightarrow{DF} = 6(3\underset{\sim}{x} - 5\underset{\sim}{y})$

$\overrightarrow{DF} = 6\left(\frac{1}{8}\overrightarrow{DB}\right)$

$\overrightarrow{DF} = \frac{3}{4}(\overrightarrow{DB})$

Maka D, F dan B adalah segaris.
Therefore D, F and B are collinear.

(c) $|\overrightarrow{DB}| = \sqrt{80^2 + 72^2}$

$|\overrightarrow{DB}| = 107.63$

Bab 9 Penyelesaian Segi Tiga
Solution of Triangles

1 (a) $\angle UST = 180° - 94° - 25° = 61°$

$$\frac{SU}{\sin 94°} = \frac{14}{\sin 61°}$$

$SU = 15.97$ cm

(b) $6^2 = 12^2 + 15.97^2 - 2(12)(15.97) \cos \angle RUS$

$$\cos\angle RUS = \frac{12^2 + 15.97^2 - 6^2}{2(12)(15.97)}$$

$= 18.70°$

(c) $\angle RUT = 43.70°$

$RT^2 = 12^2 + 14^2 - 2(12)(14) \cos 43.70°$

$RT = 9.853$ cm

(d) Luas/*Area of RSTU*

= Luas/*Area of RSU* + Luas/*Area of STU*

$$= \frac{1}{2}(12)(15.97)\sin 18.70° + \frac{1}{2}(15.97)(14)\sin 25°$$

$= 77.97$ cm^2

2 (a) (i) $\frac{\sin \angle ABC}{12.3} = \frac{\sin 40.5}{9.5}$

$\angle ABC = 57.23°$

(ii) $12.3^2 = 9.8^2 + 5.2^2 - 2(9.8)(5.2) \cos \angle ADC$

$$\cos \angle ADC = \frac{9.8^2 + 5.2^2 - 12.3^2}{2(9.8)(5.2)}$$

$\angle ADC = 106.07°$

(iii) Luas/ *Area of* $\Delta ACD = \frac{1}{2}(9.8)(5.2)\sin 106.07°$

$= 24.48$ cm^2

atau/ *or*

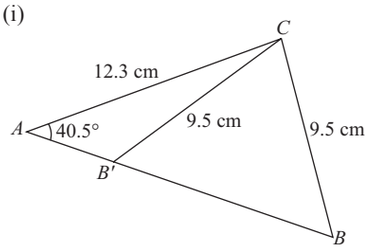
$$S = \frac{9.8 + 5.2 + 12.3}{2}$$

Luas/ *Area of* ΔACD

$= \sqrt{13.65(13.65 - 12.3)(13.65 - 5.2)(13.65 - 9.8)}$

$= 24.48$ cm^2

(b) (i)



(ii) $\frac{\sin \angle AB'C}{12.3} = \frac{\sin 40.5°}{9.5}$

$\angle AB'C = 57.23°$

3 (a) $11^2 = 7^2 + 6.5^2 - 2(7)(6.5) \cos \angle QSP$

$$\cos \angle QSP = \frac{7^2 + 6.5^2 - 11^2}{2(7)(6.5)}$$

$\angle QSP = 109.08°$

(b) $\angle PSR = 180° - 109.08° = 70.92°$

$\angle RPS = 180° - 70.92° - 62° = 47.08°$

$$\frac{SR}{\sin 47.08°} = \frac{6.5}{\sin 62°}$$

$SR = 5.391$ cm

(c) $$\frac{PR}{\sin 70.92°} = \frac{6.5}{\sin 62°}$$

$PR = 6.957$ cm

Luas/*Area of* $\Delta PQR = \frac{1}{2}(6.957)(7 + 5.391)\sin 62°$

$$= \frac{1}{2}(6.957)(12.391)\sin 62°$$

$= 38.06$ cm^2

4 (a) $BC^2 = 13^2 + 10^2 - 2(13)(10) \cos 50°$

$BC = 10.09$ cm

(b) $$\frac{\sin\angle BCD}{15} = \frac{\sin 20°}{10.09}$$

$\angle BCD = 30.56°$

Oleh sebab $\angle BCD$ ialah sudut cakah, maka
Since $\angle BCD$ *is an obtuse angle, then*

$\angle BCD = 180° - 30.56°$

$= 149.44°$

(c) Luas/*Area of BCD* $= \frac{1}{2}(10.09)(15)\sin 10.56°$

$= 13.869$ cm^2

5 (a) (i) $\frac{\sin\angle LNM}{8} = \frac{\sin 31°}{6}$

$\angle LNM = 43.37°$ (sudut tirus/*acute angle*)

Maka/*Then*

$\angle LNM = 180° - 43.37° = 136.63°$

$\angle LNK = 43.37°$

$\angle LKN = 43.37°$

(ii) $\angle KLN = 180° - 2(43.37°) = 93.26°$

$$\frac{KN}{\sin 93.26°} = \frac{6}{\sin 43.37°}$$

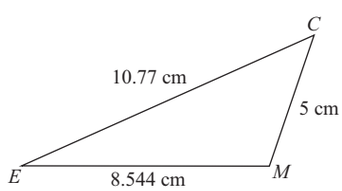
$KN = 8.723$ cm

(b) $CM = \sqrt{4^2 + 3^2} = 5$

$ME = \sqrt{8^2 + 3^2} = 8.544$

$CE^2 = \sqrt{10^2 + 4^2}$

$CE = 10.77$ cm



(i) $10.77^2 = 8.544^2 + 5^2 - 2(8.544)(5) \text{ kos } \angle CME$
$\angle CME = 102.16°$

(ii) Luas/*Area of* $\Delta CME = \frac{1}{2}(8.544)(5) \sin 102.16°$
$= 20.88 \text{ cm}^2$

6 (a) $\frac{1}{2}(10)(BD) \sin 60° = 30$
$BD = 6.928 \text{ cm}$
$AD^2 = 10^2 + 6.928^2 - 2(10)(6.928) \text{ kos } 60°$
$AD = 8.872 \text{ cm}$
$FD = \frac{8.872}{2}$
$= 4.436 \text{ cm}$

(b) $\frac{\sin \angle CFD}{3.464} = \frac{\sin 60°}{4.436}$
$\angle CFD = 42.55°$
$\angle CDF = 180° - 60° - 42.55°$
$= 77.45°$
$\angle FDE = 180° - 77.45°$
$= 102.55°$

(c) $\frac{\sin \angle DEF}{4.436} = \frac{\sin 102.55}{8}$
$\angle DEF = 32.77°$
$\angle DFE = 180° - 102.55° - 32.77°$
$= 44.68°$
Luas/ *Area of* $\Delta DEF = \frac{1}{2}(4.436)(8) \sin 44.68°$
$= 12.48 \text{ cm}^2$

Bab 10 Nombor Indeks
Index Numbers

1 (a) (i) $\frac{3.12}{x} \times 100 = 130$
$x = 2.40$
$\frac{4.20}{3.00} \times 100 = y$
$y = 140$
$\frac{z}{2.80} \times 100 = 110$
$z = 3.08$
$m = 100 - 20 - 25 - 30$
$= 25$

(ii) $\bar{I} = \frac{130(20) + 140(25) + 118(25) + 110(30)}{100}$
$= 123.5$

(b) $\frac{120x + 80y}{x + y} = 110$, $\frac{120x + 155z}{x + z} = 125$
$120x + 80y = 110x + 110y$
$10x = 30y$
$x = 3y$
$120x + 155z = 125x + 125z$
$30z = 5x$
$6z = x$
$x : y : z = 1 : 3 : 6$

2 (a) (i) $\frac{500 - 360}{2} = 70$
$500 - 70 = 430$

(ii) $\frac{430}{500} \times 100 = 86$
Menurun sebanyak 14%/*Decreases by* 14%

(b) (i) $\frac{130}{100} \times 100 = 130$

(ii) $\frac{130}{100} \times 200 = \text{RM}260$
$\frac{130}{100} \times 260 = \text{RM}338$

(c) (i) $\frac{3\,500}{2\,500} \times 100 = 140$
$\frac{180}{100} \times 140 = 252$
$\frac{Q_{2021}}{2\,500} \times 100 = 252$
$Q_{2021} = \text{RM}6\,300$

(ii) $\frac{6\,300}{3\,500} \times 100 = 180$

3 (a) (i) $\frac{70}{x} \times 100 = 175$
$x = \text{RM}40$

(ii) $\frac{y}{20} \times 100 = 100$
$y = \text{RM}20$

(iii) $\frac{18}{15} \times 100 = z$
$z = \text{RM}120$

(b) $\bar{I} = \frac{175(8) + 150(12) + 125(10) + 100(24) + 120(46)}{100}$
$= 123.7$

(c) $\frac{x}{500} \times 100 = 123.7$
$x = \text{RM}618.50$

(d) $\frac{120}{100} \times 123.7 = 148.44$

4 (a) (i) $\frac{Q_{2021}}{18} \times 100 = 110$
$Q_{2021} = \text{RM}19.80$

(ii) $I = \frac{Q_{2018}}{Q_{2021}} \times \frac{Q_{2021}}{Q_{2016}} \times 100$
$I = \frac{120}{105} \times 100$
$= 114.29$

(b) (i) $\frac{105(5) + 110(10) + x(5) + 110(3)}{5 + 10 + 5 + 3} = 125$
$x = 184$

(ii) $\frac{90}{Q_{2018}} \times 100 = 125$
$Q_{2018} = \text{RM}72$

5 (a) $x = \frac{2.60}{2.00} \times 100$
$x = 130$
$\frac{0.40}{y} \times 100 = 125$
$y = 0.32$

(b) $\bar{I} = \dfrac{150(35) + 130(40) + 125(13) + 125(12)}{100}$

$= 135.75$

$\dfrac{Q_{2020}}{10.60} \times 100 = 137.75$

$x = \text{RM}14.60$

(c) $\bar{I}_{2020} = \dfrac{125}{100} \times 137.75$

$= 172.19$

$\bar{I} = \dfrac{172.19}{137.75} \times 100$

$= 125$

6 (a) $\dfrac{4.00}{a} \times 100 = 125$

$a = 3.20$

(b) $\dfrac{b + 0.50}{b} \times 100 = 125$

$b = 2.00$

$c = 2.00 + 0.50$

$= 2.50$

(c) (i) $\dfrac{11.20}{Q_{2019}} \times 100 = 128.7$

$x = \text{RM}8.70$

(ii) $\dfrac{125(6) + 110(2) + 125(h) + 160(3)}{6 + 2 + h + 3} = 128.7$

$h = 9.27$

Bundar kepada integer terhampir, $h = 9$.
Round off to the nearest integer, $h = 9$.

7 (a) $I_{2020/2017} = I_{2020/2015} \times I_{2015/2017}$

$= \dfrac{120}{108} \times 100$

$= 111.11$

(b) (i) $\dfrac{28.60}{22} \times 100 = x$

$x = 130$

(ii) $Q_{2017} = \dfrac{117 \times 22}{100}$

$= \text{RM}25.74$

(c) $\dfrac{108(2) + 125(k) + 117(3)}{2 + k + 3} = 119.2$

$k = 5$

(d) $Q_{2015} = \dfrac{59.60}{119.20} \times 100$

$= \text{RM}50.00$

Tingkatan 5

Bab 1 Sukatan Membulat
Circular Measure

1 Sudut dicakupi/ *Subtends angle* $= 148°$

$148° \times \dfrac{\pi}{180} = 2.583$ rad.

Panjang lengkok/*Arc length* $= r\theta$

$8 = r \times 2.583$

$r = \dfrac{8}{2.583}$

$= 3.097$ cm

Diameter bulatan/*Diameter of the circle*
$= 2r$
$= 2 \times 3.097$
$= 6.194$ cm

2 (a) Panjang lengkok/*Arc length QR* $= r\theta$

$20 = (9 + 8.5)\theta$

$\theta = \dfrac{20}{17.5}$

$= 1.1429$ rad

(b) Panjang lengkok/*Arc length PS*
$= r\theta$
$= 9 \times 1.1429$
$= 10.29$ cm

Perimeter rantau berlorek
Perimeter of the shaded region
$20 + 10.29 + 8.5 + 8.5 = 47.29$ cm

3 Luas sektor/ *Area of sector* $= \dfrac{1}{2}r^2\theta$

$459 = \dfrac{1}{2}(30)^2\theta$

$459 = 450\theta$

$\theta = \dfrac{459}{450}$

$= 1.02$ rad.

$= 1.02 \times \dfrac{180°}{\pi}$

$= 58.44°$

$= 58° 26'$

4 Luas sektor/ *Area of sector* $= \dfrac{1}{2}r^2\theta$

$580 = \dfrac{1}{2}r^2(2.9)$

$580 = 1.45r^2$

$r^2 = \dfrac{580}{1.45}$

$= 400$

$r = 20$ cm

5 (a) kos/*cos* $\angle QOR = \frac{12}{15}$

$= 0.8$

$\angle QOR = 36.87°$

$\theta = 36.87 \times \frac{\pi}{180}$

$= 0.6435$ rad.

(b) Luas sektor/*Area of sector OPQ*

$= \frac{1}{2}r^2\theta$

$= \frac{1}{2}(15)^2(0.6435)$

$= 72.39$ cm^2

Luas segi tiga/*Area of triangle ORQ*

$= \frac{1}{2} \times 9 \times 12$

$= 54$ cm^2 $\quad R = \sqrt{15^2 - 12^2} = 9$

Luas rantau berlorek/*Area of shaded region*

$72.39 - 54 = 18.39$ cm^2

6 (a) $\sin \angle AOC = \frac{8.5}{12} = 0.7083$

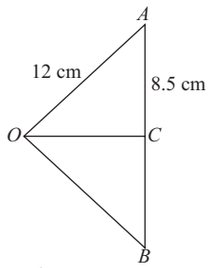
$\angle AOC = 45.1°$

$= 45.1 \times \frac{\pi}{180°}$

$= 0.7871$ rad.

$\angle AOB = 2 \times 0.7871$

$= 1.5742$ rad.



(b) Luas sektor/*Area of sector AOB* $= \frac{1}{2}r^2\theta$

$= \frac{1}{2}(12)^2(1.5742)$

$= 113.34$ cm^2

$OC = \sqrt{12^2 - 8.5^2}$

$= 8.47$ cm

Luas segi tiga/*Area of triangle OAB*

$\frac{1}{2} \times 8.47 \times 17 = 72$ cm^2

Luas rantau berlorek/*Area of shaded region*

$113.34 - 72 = 41.34$ cm^2

7 (a) $\angle COB = \text{kos}^{-1}/cos^{-1}\left(\frac{2}{4}\right)$

$= 60°$

$= 60 \times \frac{\pi}{180}$

$= 1.0473$ rad.

(b) Luas sektor/*Area of sector AOB*

$= \frac{1}{2}r^2\theta$

$= \frac{1}{2} \times (4)^2 \times 1.0473$

$= 8.378$ cm^2

Luas segi tiga/*Area of triangle OBC*

$\frac{1}{2} \times 2 \times 4 \times \sin 60° = 3.464$ cm^2

Luas rantau berlorek/*Area of shaded region*

$8.378 - 3.464 = 4.914$ cm^2

8 (a) Panjang lengkok/*length of arc BC*

$= 28 \times 2.3812$

$= 66.674$ cm

(b) Luas sektor/*Area of sector OBC*

$\frac{1}{2}(28)^2(2.3812) = 933.43$ cm^2

Luas sektor/*Area of sector OAD*

$= \frac{1}{2}ab \sin C$

$= \frac{1}{2} \times 14 \times 14 \times \sin 2.3812$

$= 67.542$ cm^2

Luas rantau berlorek/*Area of shaded region*

$933.43 - 67.542$

$= 865.888$ cm^2

9 (a) $\angle ABD = 90°$

$\angle BAD = \frac{\pi}{3}$ rad $= 60°$

kos/*cos* $60° = \frac{r}{10}$

$r = 10 \times \frac{1}{2}$

$= 5$ cm

(b) Panjang lengkok major/*Major arc length BE*

$s = r\theta$

$= 5\left(2\pi - \frac{\pi}{3}\right)$

$= 8\frac{1}{3}\pi$ cm

$= 26.183$ cm

(c) Luas sektor/*Area of sector CAD*

$\frac{1}{2} \times 10^2 \times \frac{\pi}{3} = \frac{50}{3}\pi = 52.37$ cm^2

Luas segi tiga/*Area of triangle ABD*

$\frac{1}{2} \times 5 \times 8.66 = 21.65$ cm^2 $\quad BD = \sqrt{10^2 - 5^2}$

$= 8.66$

Luas rantau berlorek/*Area of shaded region*

$52.37 - 21.65 = 30.72$ cm^2

10 (a) $\angle XOY = 2(\angle XAY)$

$= 120°/\frac{2}{3}\pi$ rad

Luas sektor/*Area of sector XOYP*

$\frac{1}{2} \times \left(\frac{2\sqrt{3}}{3}\right)^2 \times \frac{2}{3}\pi = \frac{4}{9}\pi$ cm^2

(b) Panjang lengkok/*Arc length XPY*

$$\frac{2\sqrt{3}}{3} \times \frac{2}{3}\pi = \frac{4\sqrt{3}}{9}\pi \text{ cm}$$

Panjang lengkok/*Arc length XQY*

$$2 \times \frac{\pi}{3} = \frac{2\pi}{3}$$

Panjang lengkok/*Arc length XPY*: Panjang lengkok/ *Arc length XQY*

$$\frac{4\sqrt{3}}{9}\pi : \frac{2\pi}{3}$$

$$2\sqrt{3} \quad : \quad 3$$
$$2 \quad : \sqrt{3}$$

Bab 2 Pembezaan *Differentiation*

1 Biarkan/*Let*

$$y = \frac{3x^3 + x^4}{x}$$
$$= 3x^2 + x^3$$
$$\frac{dy}{dx} = 6x + 3x^2$$

2 Langkah/*Step* 1:
Biar δx menjadi tokokan kecil pada x dan δy menjadi tokokan yang sepadan pada y.
Let δx be a small increment in x and δy be the corresponding small increment in y.

Langkah/*Step* 2:
$y = -3x^3 + 6$ .....①
$y + \delta y = -3(x + \delta x)^3 + 6$
$y + \delta y = -3(x^3 + 3x^2(\delta x) + 3x(\delta x)^2 + (\delta x)^3) + 6$
$y + \delta y = -3x^3 - 9x^2(\delta x) - 9x(\delta x)^2 - 3\delta x^3 + 6$ .....②

Langkah/*Step* 3:
② − ①,
$\delta y = -9x^2(\delta x) - 9x(\delta x)^2 - 3(\delta x)^3$

Langkah/*Step* 4:

$$\frac{\delta y}{\delta x} = -9x^2 - 9x(\delta x) - 3(\delta x)^2$$

$$\frac{dy}{dx} = \lim_{\delta x \to 0} \frac{\delta y}{\delta x}$$
$$= \lim_{\delta x \to 0} [-9x^2 - 9x(\delta x) - 3(\delta x)^2]$$
$$= -9x^2$$

Maka,
Therefore,

$$\frac{dy}{dx} = -9x^2$$

3 (a) $y = -4x^2 - 5x - 4$

$$\frac{dy}{dx} = -8x - 5$$

When $x = -2$

$$\frac{dy}{dx} = -8(-2) - 5$$
$$= 11$$

(b) $\delta x = (-2 + k) + 2$
$= k$

$$\delta y = \frac{dy}{dx} \times \delta x$$
$$= 11k$$

4 $g(x) = 4x^{-2} - 3x^{-1} - 3x^2$
$g'(x) = -8x^{-3} + 3x^{-2} - 6x$
$g''(x) = 24x^{-4} - 6x^{-3} - 6$

$$= \frac{24}{x^4} - \frac{6}{x^3} - 6$$

$$g''(-4) = \frac{24}{(-4)^4} - \frac{6}{(-4)^3} - 6$$

$$= -5\frac{13}{16}$$

5 $y = x^2 - 32x - 82$

$$\frac{dy}{dx} = 2x - 32$$

Apabila y adalah minimum/*When y is minimum*,

$$\frac{dy}{dx} = 0$$

$2x - 32 = 0$
$x = 16$
$\therefore k = 16$

6 $y = x^2 - 18x - 39$

$$\frac{dy}{dx} = 2x - 18$$

Kecerunan normal/*Gradient of normal* $= \frac{1}{22}$

Kecerunan tangen/*Gradient of tangent* $= -22$

$$\frac{dy}{dx} = -22$$

$2x - 18 = -22$
$x = -2$
$y = (-2)^2 - 18(-2) - 39$
$= 1$
$\therefore P = (-2, 1)$

Persamaan/*Equation*:

$$y - 1 = \frac{1}{22}(x + 2)$$
$$y = \frac{1}{22}x + \frac{12}{11}$$

7 (a) $y = \frac{5}{x^3}$
$= 5x^{-3}$

$$\frac{dy}{dx} = \frac{-15}{x^4}$$

(b) Biarkan/*Let* $y = \frac{5}{(3)^3}$
$= 0.1852$

$$y \approx \frac{5}{(2.95)^3}$$

$$\frac{\delta y}{\delta x} \approx \frac{dy}{dx}$$

$$\delta y \approx \frac{dy}{dx} \times \delta x$$
$$= \frac{-15}{x^4} \times \delta x$$
$$= \frac{-15}{(3)^4} \times (-0.05)$$
$$= 0.009259$$

$\frac{5}{(2.95)^3} \approx y + \delta y$

$= 0.1852 + 0.009259$

$= 0.194459$

$= 0.1945$

8 $\lim\limits_{x \to 3} (x - 3)(x + 3)$

$= (3 - 3)(3 + 3)$

$= 0$

9 (a) $y = x^3 - 12x + 1$

$\frac{dy}{dx} = 3x^2 - 12$

Kecerunan pada/*Gradient at M*(4, 17)

$= 3(4)^2 - 12$

$= 36$

(b) Kecerunan normal/*Gradient of normal* $= -\frac{1}{36}$

Persamaan/*Equation*:

$y - 17 = -\frac{1}{36}(x - 4)$

$y = -\frac{1}{36}x + \frac{154}{9}$

(c) $\frac{dy}{dx} = 0$

$3x^2 - 12 = 0$

$(x + 2)(x - 2) = 0$

$x = -2$ or $x = 2$

Apabila/*When* $x = -2$

$y = (-2)^3 - 12(-2) + 1$

$= 17$

$S = (-2, 17)$

$\frac{d^2y}{dx^2} = 6x$

At $S(-2, 17)$,

$\frac{d^2y}{dx^2} = 6(-2)$

$= -12 < 0$

$S = (-2, 17)$ ialah titik maksimum.

$S = (-2, 17)$ *is the maximum point.*

10 (a) $AB + BCD + DE + EFA = 400$

$AB + \frac{1}{2}[2\pi(2x)] + DE + \frac{1}{2}[2\pi(2x)] = 400$

$AB + 2\pi x + AB + 2\pi x = 400$

$2AB + 4\pi x = 400$

$AB + 2\pi x = 200$

$AB = 200 - 2\pi x$

Luas/*Area* $= (200 - 2\pi x)4x$

$= 800x - 8\pi x^2$ (tertunjuk/*proven*)

(b) Luas maksimum/*Maximum area*, $\frac{dL}{dx} = 0$

$\frac{dL}{dx} = 800 - 16\pi x$

$800 - 16\pi x = 0$

$x = \frac{800}{16\pi}$

$= \frac{50}{\pi}$

Luas maksimum/*Maximum area*

$L = 800\left(\frac{50}{\pi}\right) - 8\pi\left(\frac{50}{\pi}\right)^2$

$= 6\,365.37$

Bab 3 Pengamiran *Integration*

1 (a) $2k - 6 = 0$

$k = 3$

(b) $y = \frac{3}{2}x^2 - 6x + c$

$1 = 6 - 12 + c$

$c = 7$

$y = \frac{3}{2}x^2 - 6x + 7$

2 (a) $f(x) = x^3 + \frac{3}{x} + c$

$7 = 2^3 + \frac{3}{2} + c$

$c = -\frac{5}{2}$

$f(x) = x^3 + \frac{3}{x} - \frac{5}{2}$

(b) (i) $p = 2$

(ii) $2x^3 + x + c = 13$

$2(1)^3 + 1 + c = 13$

$c = 10$

3 (a) $-4 + 8 = 4$

(b) $2(4) + [3x]_1^6 = 8 + [3(6) - 3(1)]$

$= 23$

4 (a) Guna/*Use*

$L = \pi\int_1^k y\,dx$

$127{\cdot}5 = \pi\int_1^k 2x^3\,dx$

$127{\cdot}5 = \left[\frac{2x^4}{4}\right]_1^k$

$127{\cdot}5 = \left[\frac{k^4}{2} - \frac{1}{2}\right]$

$k = 4$

(b) (i) $A(1, 1)$, $B(0, 2)$

(ii) $I = \pi\int_0^1 y\,dy + \pi\int_1^2 (2 - y)^2\,dy$

$= \pi\left[\frac{y^2}{2}\right]_0^1 + \pi\left[4y - \frac{4y^2}{2} + \frac{y^3}{3}\right]_1^2$

$= \pi\left[\frac{1}{2} - 0\right] + \pi\left[\left(8 - 8 + \frac{8}{3}\right) - \left(4 - 2 + \frac{1}{3}\right)\right]$

$= \frac{5}{6}\pi$

5 (a) $x = 5 - y$

$y = \frac{4}{5 - y}$

$5y - y^2 = 4$

$y^2 - 5y + 4 = 0$

$(y - 4)(y - 1) = 0$

$y = 1, 4$

Apabila/*When*

$y = 1, x = 4$ $\quad y = 4, x = 1$

$A(1, 4)$, $B(4, 1)$

(b) Isi padu/*Volume*

$= \pi\int_1^4 (5-x)^2\,dx - \pi\int_1^4 \left(\frac{4}{x}\right)^2 dx$

$= \pi\int_1^4 (25-10x+x^2)\,dx - \pi\int_1^4 (16x^{-2})dx$

$= \pi\left[25x-5x^2+\frac{x^3}{3}\right]_1^4 - \pi\left[\frac{16x^{-1}}{-1}\right]_1^4$

$= \pi\left[100-80+\frac{64}{3}-25+5-\frac{1}{3}\right] - \pi\left[-\frac{16}{4}+16\right]$

$= 21\pi - 12\pi$

$= 9\pi$

6 (a) $-2x = -2$

$h = 1$

$k = 2$

(b) Luas/*Area* $= \frac{1}{2}(1)(2+4) - \int_0^1 3 - x^2\,dx$

$= 3 - \left(3x - \frac{x^3}{3}\right)_0^1$

$= 3 - \left[3(1) - \frac{1^3}{3} - 0\right]$

$= \frac{1}{3}$

(c) Isi padu/*Volume* $= \frac{1}{3}\pi(1)^2(2) - \pi\int_2^3 (3-y)dy$

$= \frac{1}{2}\pi$

7 (a) (i) $\frac{dy}{dx} = 2x - 6$

$y = x^2 - 6x + c$

$0 = (4)^2 - 6(4) + c$

$c = 8$

$y = x^2 - 6x + 8$

(ii) $3 = 2(h) + 1$

$h = 1$

(iii) Luas/*Area*

$= \int_0^1 x^2 - 6x + 8\,dx - \int_0^1 2x + 1\,dx$

$= \left(\frac{x^3}{3} - 3x^2 + 8x\right)_0^1 - [x^2 + x]_0^1$

$= \left[\left(\frac{1^3}{3} - 3(1)^2 + 8(1) - 0\right)\right] - \left[(1^2+1) - 0\right]$

$= 5\frac{1}{3} - 2$

$= \frac{10}{3}$

(b) $\pi\int_0^k 4 - y\,dy = 6\pi$

$\pi\left[4y - \frac{y^2}{2}\right]_0^k = 6\pi$

$4k - \frac{k^2}{2} = 6$

$k^2 - 8k + 12 = 0$

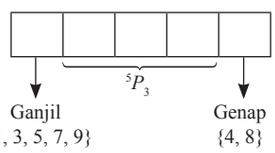
$k = 6,\ k = 2$

$k = 2$

Bab 4 Pilih Atur dan Gabungan
Permutation and Combination

1 (a) Bilangan kod/*Number of code* $= {}^7P_5 = 2\,520$

(b)



Bilangan cara/*Number of ways* $= 5 \times {}^5P_3 \times 2$

$= 600$

2 (a) Bilangan cara/*Number of ways* $= {}^{12}C_5$

$= 792$

(b) Bilangan cara/*Number of ways*

$= {}^{12}C_{10} + {}^{12}C_{11} + {}^{12}C_{12}$

$= 66 + 12 + 1$

$= 79$

3 (a) Bilangan cara/*Number of ways* $= 8!$

$= 40\,320$

(b) Bilangan cara/*Number of ways* $= {}^3C_2 \times {}^5C_3$

$= 3 \times 10$

$= 30$

4 (a) Bilangan cara/*Number of ways* $= {}^8C_6$

$= 28$

(b) Bilangan cara/*Number of ways*

$= {}^9C_5 \times {}^8C_1 + {}^9C_6 \times {}^8C_0$

$= 126 \times 8 + 84 \times 1$

$= 1\,092$

5 (a) Bilangan susunan/*Number of arrangements* $= {}^5P_5$

$= 120$

(b) Bilangan susunan/*Number of arrangements* $= 2! \times 4!$

$= 48$

6 (a) Bilangan kod/*Number of codes* $= {}^6P_4$

$= 360$

(b) Bilangan susunan/*Number of arrangements* $= 3! \times 6!$

$= 4\,320$

(c) Bilangan susunan/*Number of arrangements* $= {}^3P_2 \times 5!$

$= 720$

7 (a) Bilangan cara/*Number of ways* $= 5!$

$= 120$

(b) Bilangan cara/*Number of ways* $= (9-1)!$

$= 8!$

$= 40\,320$

(c) Bilangan susunan/*Number of arrangements* $= \frac{(8-1)!}{2}$

$= 2\,520$

8 (a) Bilangan susunan/*Number of arrangements* $= \frac{{}^7P_4}{4}$

$= 210$

(b) Bilangan susunan/*Number of arrangements* $= \frac{7!}{2!2!}$

$= 1\,260$

9 (a) Bilangan cara/*Number of ways* $= {}^2C_2 \times {}^9C_2$

$= 36$

(b) Bilangan cara/*Number of ways* $= {}^6C_4$

$= 15$

10 (a) Bilangan cara/*Number of ways* $= {}^{13}C_5$

$= 1\,287$

(b) Bilangan cara/*Number of ways* $= {}^4C_2 \times {}^6C_2 \times {}^3C_1$

$= 270$

11 (a) Bilangan cara/*Number of ways* $= {}^6C_3 \times {}^9C_5$

$= 2\,520$

(b) Bilangan cara/*Number of ways*

$= {}^6C_6 \times {}^9C_2 + {}^6C_5 \times {}^9C_3$

$= 540$

12 (a) ${}^nC_2 = 36$

$\frac{n!}{2!(n-2)!} = 36$

$$\frac{n(n-1)\,(n-2)!}{2!(n-2)!} = 36$$
$$\frac{n(n-1)}{2} = 36$$
$$n^2 - n - 72 = 0$$
$$(n+8)(n-9) = 0$$
$$n = -8\,,\ n = 9$$

Maka, bilangan kambing ialah 9 ekor.
Therefore, the number of goats is 9.

(b) Bilangan cara/*Number of ways*
$= {}^{12}C_4 \times {}^{8}C_4 \times {}^{4}C_4$
$= 34\,650$

13 (a) Bilangan pilihan/*Number of choices* $= {}^{15}C_5 \times {}^{7}C_3$
$= 105\,105$

(b) Bilangan cara/*Number of choices*
$= {}^{15}C_4 \times {}^{7}C_4 + {}^{15}C_3 \times {}^{7}C_5 + {}^{15}C_2 \times {}^{7}C_6 + {}^{15}C_1 \times {}^{7}C_7$
$= 58\,080$

14 (a) Bilangan cara/*Number of ways* $= (7-1)!$
$= 6!$
$= 720$

(b) Bilangan cara/*Number of ways*
$= 3! \times (4-1)!$
$= 36$

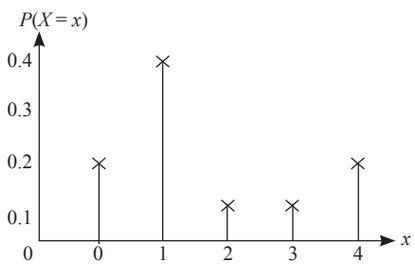
15 (a) ${}^{7}C_4 = 35$
(b) $5 \times 3! \times 4! = 720$

Bab 5 Taburan Kebarangkalian
Probability Distribution

1 (a) $\sum_{i=5}^{4} P(X = r_i) = 0.2 + 0.4 + 0.1 + 0.1 + 0.2$
$= 1$

Maka, $\sum_{i=5}^{4} P(X = r_i) = 1$ ialah pemboleh ubah rawak diskret.
Therefore, $\sum_{i=5}^{4} P(X = r_i) = 1$ *is a discrete random variable.*

(b)



2 $0.5 - 0.2730 = 0.2270$
$P(z > k) = 0.2270$

3 $P(X = 7) = {}^{10}\mathrm{C}_7(0.56)^7(0.44)^3$
$= 0.1765$

4 (a) $Z = \dfrac{8.7 - 8.4}{1.6}$
$= 0.1875$

(b) $P\left(\dfrac{8.4 - 8.4}{1.6} \leqslant Z \leqslant \dfrac{8.7 - 8.4}{1.6}\right)$
$= P(0 \leqslant Z \leqslant 0.1875)$
$= 0.07437$

5 (a) $0.5 = \dfrac{X - 150}{12}$
$X = 156$ cm

(b) $P(X > 170) = P\left(Z > \dfrac{170 - 150}{12}\right)$
$= P(Z > 1.6667)$
$= 0.0478$
Peratus/*Percentage*
$= 0.0478 \times 100\%$
$= 4.78\%$

6 (a) $P(X = 4) = {}^{7}C_4(0.25)^4(0.75)^3$
$= 0.05768$

(b) ${}^{n}C_n(0.25)^n(0.75)^0 = \dfrac{1}{64}$
$(1)\,(0.25)^n(1) = \dfrac{1}{64}$
$(0.25)^n = \dfrac{1}{64}$
$n = \dfrac{\log_{10}\frac{1}{64}}{\log_{10} 0.25}$
$= 3$

7 (a) $P\left(Z < \dfrac{37.2 - \mu}{8}\right) = 0.08851$
$\dfrac{37.2 - \mu}{8} = -1.34999$
$\mu = 26.40$

(b) $P(z < k) = 0.8708$
$\dfrac{k - 26.40}{8} = 1.130$
$k = 35.44$

8 (a) $2h = 1 - \dfrac{1}{8} - \dfrac{3}{16} - \dfrac{3}{16}$
$2h = \dfrac{1}{2}$
$h = \dfrac{1}{4}$

(b) $P(X \geqslant 1) = 1 - P(0)$
$= 1 - \dfrac{1}{8}$
$= \dfrac{7}{8}$

9 (a) $\mu = 37$
(b) $P(17 < X < 57)$
(c) $P(X < 17) = P(X > 57)$
$= \dfrac{1 - 0.2014}{2}$
$= 0.3993$

10 (a) $\sigma = \sqrt{8\left(\frac{1}{5}\right)\left(\frac{4}{5}\right)}$
$= 1.131$

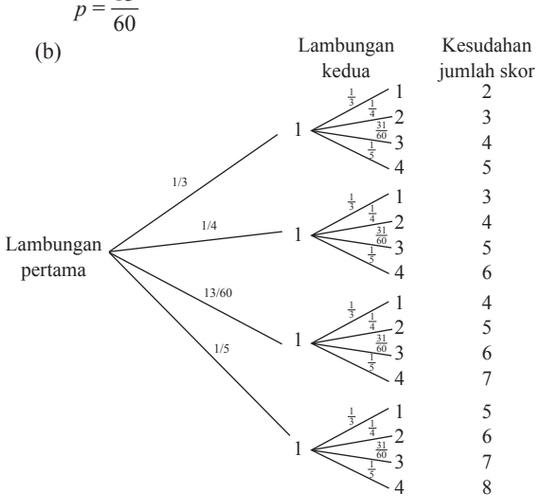
(b) $P(X = 0) = {}^{8}C_0\left(\dfrac{1}{5}\right)^0\left(\dfrac{4}{5}\right)^8$
$= 0.1678$

11 $\mu = 2.5$
$\sigma = \sqrt{0.64}$
$= 0.8$

12 (a) Min/*Mean* = 35
(b) $P(X < 25)$, $P(X > 45)$
(c) $P(X > 45) = 1 - 0.7270$
$= 0.2730$
$P(25 < x < 45) = 1 - (0.2730 \times 2)$
$= 1 - 0.5460$
$= 0.4540$

13 (a) $p = 1 - \frac{1}{3} - \frac{1}{4} - \frac{1}{5}$
$p = \frac{13}{60}$

(b)



(c) $\left(\frac{1}{3}\right)\left(\frac{13}{60}\right) + \left(\frac{1}{4}\right)\left(\frac{1}{4}\right) + \left(\frac{13}{60}\right)\left(\frac{1}{3}\right) = 0.2069$

14 (a) $P(X \geqslant 5) = {}^7C_5(0.80)^5(0.2)^2 + {}^7C_6(0.8)^5(0.2)^1 + {}^7C_7(0.8)(0.2)^7$
$= 0.851968$
(b) $n(0.8)(0.2) = 960$
n = 6 000 orang penduduk/*residents*

15 $P\left(\frac{60-64}{5.5} \leqslant Z \leqslant \frac{69-64}{5.5}\right) = P(-0.727 \leqslant Z \leqslant 0.909)$
$= 1 - 0.2337 - 0.1818$
$= 0.5845$
$0.5845 \times n = 150$
$n = 256.63$
$\approx$ 257 orang pekerja/*workers*

16 (a) (i) $P(X = 2) = {}^{10}C_2(0.20)^2(0.80)^8$
$= 0.3020$
(ii) $P(X < 2)$
$= P(X = 0) + P(X = 1)$
$= {}^{10}C_0(0.20)^0(0.80)^{10} + {}^{10}C_1(0.20)^1(0.80)^9$
$= 0.3758$

(b) (i) $P(X \leqslant 2) = P\left(Z \leqslant \frac{2.2-1.8}{0.5}\right)$
$= P(Z \leqslant 0.8)$
$= 0.7881$
(ii) $P(X > m) = 0.695$
$P\left(Z > \frac{m-1.8}{0.5}\right) = 0.695$
$\frac{m-1.8}{0.5} = -0.51$
$m = 1.545$ kg

17 (a) (i) $123(1-p) = 88$
$p = 0.2846$
(ii) $P(X > 2)$
$= P(X = 0) + P(X = 1)$
$= {}^7C_0(0.7154)^0(0.2846)^7 + {}^7C_1(0.7154)^1(0.2846)^6$
$= 0.002812$

(b) (i) $P(X > 2.5) = P\left(Z > \frac{2.5-2.3}{0.3}\right)$
$= P(Z > 0.667)$
$= 0.2524$

(ii) $P\left(\frac{1.8-2.3}{0.3} < Z \leqslant \frac{2.5-2.3}{0.3}\right)$
$= P(-1.667 < Z \leqslant 0.667)$
$= 0.6999$

Anggaran bilangan
Estimated number
$= 0.69999 \times 200$
$= 139.98$
$\approx$ 140 biji durian/*durians*

(iii) $P(X > y) = 0.98$
$P\left(Z > \frac{y-2.3}{0.3}\right) = 0.98$
$\frac{y-2.3}{0.3} = -2.054$
$y = 1.684$ kg

18 (a) (i) $\frac{1}{4} \times 50 = 12.5$
$n \approx 13$
(ii) $\sigma = \sqrt{50(0.25)(0.75)}$
$= 3.062$

(b) (i) $P(X = 7) = {}^{15}C_7(0.25)^7(0.75)^8$
$= 0.0393$
(ii) $P(X > 12)$
$= 1 - P(X = 13) - P(X = 14) - P(X = 15)$
$= 1 - {}^{15}C_{13}(0.25)^{13}(0.75)^2 - {}^{15}C_{14}(0.25)^{14}(0.75)^1 - {}^{15}C_{15}(0.25)^{15}(0.75)^0$
$= 0.999999$

19 (a) ${}^{10}C_{10}(h)^{10}(1-h)^0 = 0.3814$
$h^{10} = 0.3814$
$h = 0.9081$

(b) (i) $P(X > k) = 0.277$
$P\left(\frac{k-35}{25}\right) = 0.277$
$\frac{k-35}{25} = 0.592$
$k = 49.8$
$\approx$ 50 tahun/*years*

(ii) $P\left(\frac{20-35}{25} < Z < \frac{55-35}{25}\right)$
$= P(-0.6 < Z < 0.8)$
$= 0.5139$

Peratus usia
Percentage of gas
$= 0.5139 \times 100$
$= 51.39\%$

Bab 6

Fungsi Trigonometri
Trigonometric Functions

1 (a) $\dfrac{1}{\text{kos } 2\theta} = \dfrac{1}{2\text{ kos}^2\,\theta - 1}$

$\dfrac{1}{\cos 2\theta} = \dfrac{1}{2\cos^2\theta - 1}$

$= \dfrac{1}{2k^2 - 1}$

(b) $\sin(90° - \theta) = \sin 90° \text{ kos } \theta - \text{kos } 90° \sin \theta$

$sin(90° - \theta) = sin\ 90°\ cos\ \theta - cos\ 90°\ sin\ \theta$

$= (1)(k) - (0)\left(\dfrac{\sqrt{1-k^2}}{1}\right)$

$= k$

2 $2\text{ sek}^2\,A - 7\text{ sek } A + 6 = 0$

$2\ sec^2 A - 7\ sec\ A + 6 = 0$

Sek $A = 2, \dfrac{3}{2}$

Sec A

$\dfrac{1}{\text{kos } A} = 2$

$\dfrac{1}{\cos A} = 2$

$\text{Kos } A = \dfrac{1}{2}$

$\cos A$

$A = 60°$

I → 60°

IV → 360° – 60° = 300°

$\dfrac{1}{\text{kos } A} = \dfrac{3}{2}$

$\cos A$

$\text{Kos } A = \dfrac{2}{3}$

$\cos A$

$A = 48.19°$

I 48.19,

IV 360° – 48.19° = 311.81°

A = 48.19°, 60°, 300°, 311.81°

3 $4 - \sin x = 4(1 - 60° \sin^2 x)$

$4\sin^2 x - \sin x = 0$

$\sin x = \dfrac{1}{4}$, $\sin x = 0$

$x = 14.48°$, $x = 0°$

x = 0°, 14.48°, 165.52°, 180°

4 $2(2 \sin x \text{ kos } x) = \dfrac{\sin x}{\text{kos } x}$

$2(2\ sin\ x\ cos\ x) = \dfrac{\sin x}{\cos x}$

$4\text{ kos}^2\,x - 1 = 0$

$4\ cos^2 x - 1 = 0$

$\text{kos}/cos\ x = \dfrac{1}{2}$, $\text{kos}/cos\ x = -\dfrac{1}{2}$

kos/*cos* x = 60° , $x = 60°$

x = 60°, 120°, 240°, 300°

5 $\tan^2 x + (1 + \tan^2 x) - 3 = 0$

$2\tan^2 x - 2 = 0$

$\tan x = 1$, $\tan x = -1$

$x = 45°$, $x = 45°$

x = 45°, 135°, 225°, 315°

6 $\text{kot}/cot\ x = -\dfrac{2}{3}$

$\tan x = -\dfrac{3}{2}, 0°$

$x = 56.31°$ $x = 0°$

$x = 123.69°, 303.69°$ $x = 0°, 180°$

$x = 0°, 123.69°, 180°, 303.69°$

7 (a) $\dfrac{1}{\text{kos}/cos\ A} = \dfrac{1}{\sqrt{1-p^2}}$

(b) $\sin 2\theta = 2 \sin \theta \text{ kos } \theta$

$sin\ 2\theta = 2\ sin\ \theta\ cos\ \theta$

$\sin 2\theta = 2p\sqrt{1-p^2}$

8 $\sin x(2 \text{ kos } x + 1) = 0$

$sin\ x(2\ cos\ x + 1) = 0$

$\sin x = 0$, $\sin x = -\dfrac{1}{2}$

$x = 0°$, $x = 60°$

x = 0°, 180°, 120°, 240°

9 $\text{kos } \theta = -0.5736$

$\theta = 55°$

180 – 55 =125° (Sukuan/ *Quadrant* I)

180° + 55° = 235° (Sukuan/ *Quadrant* III)

10 (a) $\text{kot}/cot\ A = -\dfrac{5}{12}$

(b) $\tan(A - B) = \dfrac{\tan A - \tan B}{1 + \tan A \tan B}$

$\tan(A - B) = \dfrac{\left(-\frac{12}{5}\right) - \left(\frac{4}{3}\right)}{1 + \left(-\frac{12}{5}\right)\left(\frac{4}{3}\right)}$

$\tan(A - B) = -\dfrac{56}{33}$

11 $x + 25° = 48.59°$

$x = 23.59°$

$x = 23.59°$ (Sukuan/ *Quadrant* I)

$x = 180° - 23.59°$

$x = 156.41°$ (Sukuan/ *Quadrant* IV)

12 (a) $\sin A = -\dfrac{3}{5}$

(b) $\text{kos } A \text{ kos } B - \sin A \sin B$

$cos\ A\ cos\ B - sin\ A\ sin\ B$

$= \left(\dfrac{-3}{5}\right)\left(\dfrac{-\sqrt{3}}{2}\right) - \left(\dfrac{-4}{5}\right)\left(\dfrac{-1}{2}\right)$

$= \dfrac{4 + 3\sqrt{3}}{10}$ @ 0.1196

13 $3(\text{sek}^2\theta - 1) - 5\text{ sek } \theta + 5 = 0$

$3(sec^2\theta - 1) - 5\ sec\ \theta + 5 = 0$

$3\text{ sek}^2\,\theta - 5\text{ sek } \theta + 2 = 0$

$3\ sec^2\theta - 5\ sec\ \theta + 2 = 0$

$\text{sek}/sec\ \theta = 1$, $\text{kos}/cos\ \theta = 1$

$\theta = 0°$

I → 0°

IV → 360°

14 $-2\tan\alpha = 5 - 3\left(\dfrac{1}{\tan\alpha}\right)$

$-2\tan^2\alpha - 5\tan\alpha + 3 = 0$

$\tan\alpha = \dfrac{1}{2}$, $\tan\alpha = -3$

$\alpha = 26.57°$, $\alpha = 71.57°$

α = 26.57°, 108.43°

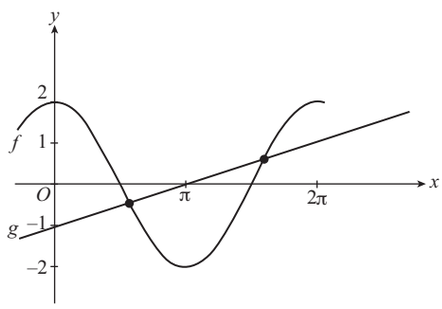
15 (a) $\dfrac{\sin x}{\kos x} + \dfrac{\kos x}{\sin x} \Big/ \dfrac{\sin x}{\cos x} + \dfrac{\cos x}{\sin x}$

$= \dfrac{\sin^2 x + \kos^2 x}{\sin x \kos x} \Big/ \dfrac{\sin^2 x + \cos^2 x}{\sin x \cos x}$

$= \dfrac{1}{\kos x} + \dfrac{1}{\sin x} \Big/ \dfrac{1}{\cos x} + \dfrac{1}{\sin x}$

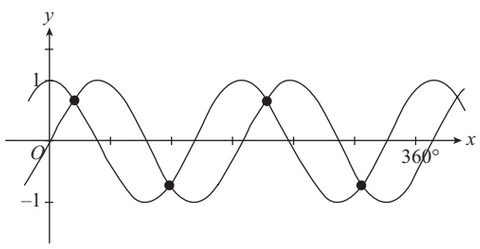
= sek x kosek $x \rightarrow$ Terbukti/*Proven*
sec x cosec x

(b)



Bilangan penyelesaian/*Number of solutions* : 2

16



Bilangan penyelesaian/*Number of solutions* : 4

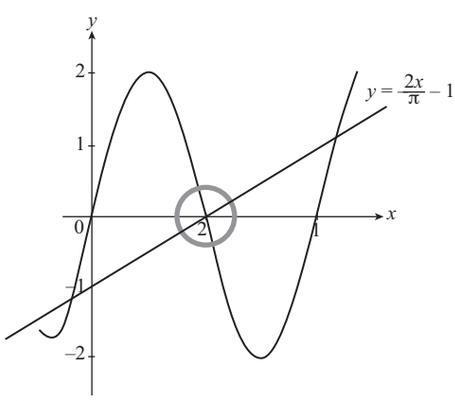
17 (a) $\dfrac{(\sin x \kos y + \kos x \sin y) - (\sin x \kos y - \kos x \sin y)}{(\kos x \kos y + \sin x \sin y) + (\kos x \sin y + \sin x \sin y)}$

$\dfrac{(\sin x \cos y + \cos x \sin y) - (\sin x \cos y - \cos x \sin y)}{(\cos x \cos y + \sin x \sin y) + (\cos x \sin y + \sin x \sin y)}$

$= \dfrac{2 \kos x \sin y}{2 \kos x \kos y} \Big/ \dfrac{2 \cos x \sin y}{2 \cos x \cos y}$

= tan $y \rightarrow$ Terbukti/*Proven*

(b)



Bilangan penyelesaian/*Number of solutions* : 1

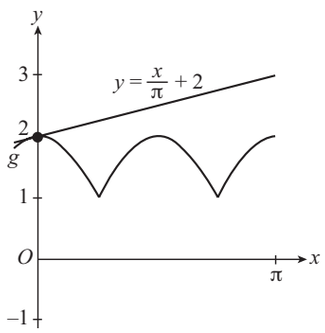
18 $\dfrac{1 + \dfrac{\sin^2 x}{\kos^2 x}}{\kos^2 x} \Big/ \dfrac{1 + \dfrac{\sin^2 x}{\cos^2 x}}{\cos^2 x}$

$= \left(\dfrac{1}{\kos^2 x}\right)^2 \Big/ \left(\dfrac{1}{\cos^2 x}\right)^2$

$= \left(\dfrac{1}{1 - \sin^2 x}\right)^2$

$= \dfrac{1}{1 - 2\sin^2 x + \sin^4 x}$

19



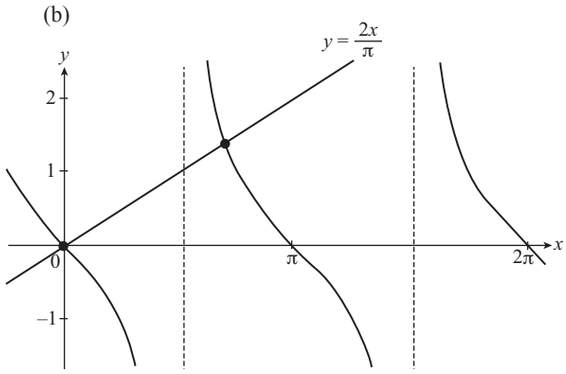
Bilangan penyelesaian/*Number of solutions* : 1

20 (a) $\dfrac{\sin x(1 - \kos^2 x)}{\kos x(1 - \kos^2 x)}$

$\dfrac{\sin x(1 - \cos^2 x)}{\cos x(1 - \cos^2 x)}$

= tan $x \rightarrow$ Terbukti/*Proven*

(b)



Bilangan penyelesaian/*Number of solutions* : 2

21 (a) $\sin\left(x + \dfrac{\pi}{4}\right) - \kos\left(x - \dfrac{\pi}{4}\right) = (\sin x \kos 45° + \kos x \sin 45°) - (\kos x \kos 45°) + (\sin x \sin 45°)$

$sin\left(x + \dfrac{\pi}{4}\right) - cos\left(x + \dfrac{\pi}{4}\right) = (sin\ x\ cos\ 45° + cos\ x\ sin\ 45°) - (cos\ x\ cos\ 45°) + (sin\ x\ sin\ 45°)$

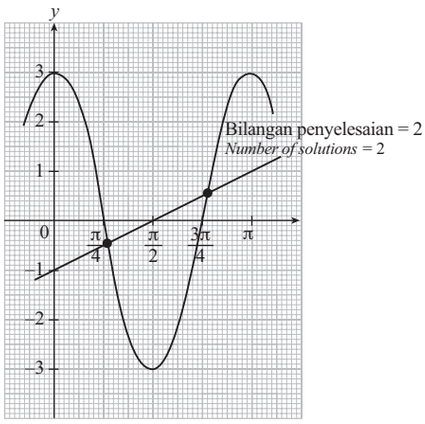
$\left(\dfrac{3}{5}\right)\left(\dfrac{\sqrt{2}}{2}\right) - \left(\dfrac{4}{5}\right)\left(\dfrac{\sqrt{2}}{2}\right) - \left(\dfrac{4}{5}\right)\left(\dfrac{\sqrt{2}}{2}\right) - \left(\dfrac{3}{5}\right)\left(\dfrac{\sqrt{2}}{2}\right)$

$\dfrac{\sqrt{2}}{2}\left(\dfrac{3}{5} + \dfrac{4}{5} - \dfrac{4}{5} - \dfrac{3}{5}\right) = 0$ Terbukti/*Proven*

(b) (i)

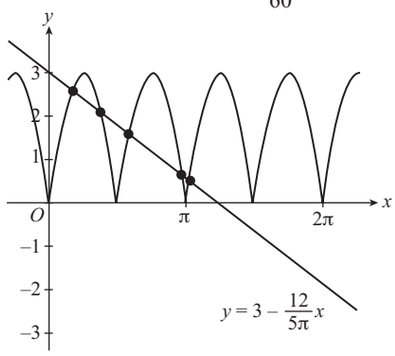
x	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π
y	3	0	–3	0	3

(ii)



Penyelesaian/*Solutions*: $\frac{17}{60}\pi$ dan/*and* $\frac{23}{60}\pi$

22



Bilangan Penyelesaian: 4
Number of solutions: 4

23 $y = a \sin bx + c$
a = amplitud/*amplitude* = 3
kala/*period* = $\pi = \frac{2\pi}{b}$, $b = 2$
Graf fungsi $y = 3 \sin 2x$ telah mengalami translasi $\begin{pmatrix} 0 \\ 1 \end{pmatrix}$, maka $c = 1$.
The graph of function $y = 3 \sin 2x$ *has undergone translation* $\begin{pmatrix} 0 \\ 1 \end{pmatrix}$, *therefore* $c = 1$.
$a = 3$, $b = 2$ dan/*and* $c = 1$

24 (a) $\sin 2x = \sin(x + x)$
$\sin (x + x) = \sin x \cos x + \cos x \sin x$
sin (x + x) = sin x cos x + cos x sin x
sin x kos *x* + kos *x* sin *x* = 2 sin *x* kos *x*
sin x cos x + cos x sin x = 2 sin x cos x
→ Terbukti/*Proven*

(b) $2 = 3 \sin 2x$
$\sin 2x = \frac{2}{3}$

Bab 7 Pengaturcaraan Linear
Linear Programming

1 (a) Persamaan garis lurus *UV*/*Equation of straight line UV*:
$m = 1$
$y = x + c$
$3 = (1) + c$
$c = 2$
$y = x + 2$

Persamaan garis lurus *UW*/*Equation of straight line UW*:
$m = -1$
$y = -x + c$
$3 = -(1) + c$
$c = 4$
$y = -x + 4$

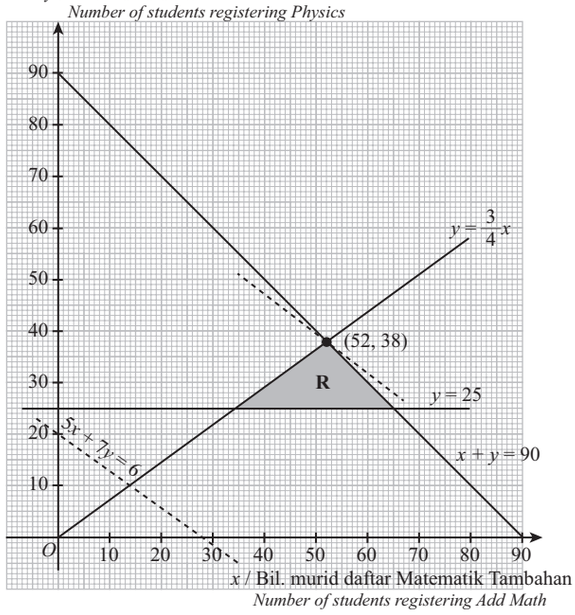
Persamaan garis lurus *VW*/*Equation of straight line VW*:
$m = 4$
$y = 4x + c$
$8 = 4(6) + c$
$c = -16$
$y = 4x - 16$

Tiga ketaksamaan/*Three inequalities*:
$y \leqslant x + 2$
$y \geqslant -x + 4$
$y \leqslant 4x - 16$

(b) (i) (300 , 100) (ii) (300 , 100)

2 (a) I : $x + y \leqslant 90$ III : $y \leqslant \frac{3}{4}x$
II : $y \geqslant 25$

(b)

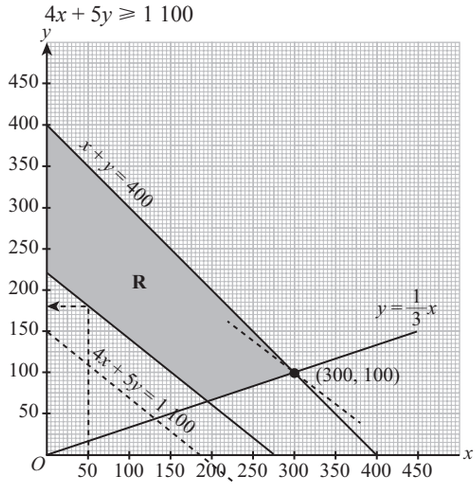


(c) (i) 33 orang murid/*students*
(ii) $500x + 700y = k$
Bilangan murid maksimum
Maximum number of students
(52 , 38)

Jumlah kutipan maksimum sebulan
Maximum collected in a month,
$k = 500(52) + 700(38)$
$k = \text{RM}526$

3 (a) I : $x + y \leqslant 400$
II : $y \geqslant 13x$
III: $12x + 15y \geqslant 3\,300$
$4x + 5y \geqslant 1\,100$

(b)



(i) 180 penapis/*filters*

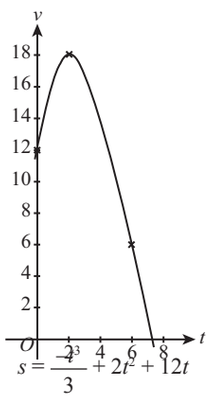
(ii) $12x + 15y = k$
Bilangan penapis minimum
Minimum number of filter
(300 , 100)
Jumlah keuntungan maksimum dalam sehari
maximum total profit in a day
$k = 12(300) + 15(100)$
$= \text{RM}5\,100$

Bab 8 Kinematik Gerakan Linear
Kinematic of Linear Motions

1 (a) (i) $v = 4t - t^2 + 12$
$4 - 2t = 0$
$t = 2s$
$v(2) = 5(2) - (2)^2 + 12$
$v = 18\ \text{ms}^{-1}$

(ii) $v = 0$
$4t - t^2 + 12 = 0$
$t = 6,\ t = -2$ (tidak diterima/*not accepted*)
$k = 6$

(b)



$s = \dfrac{-t^3}{3} + 2t^2 + 12t$

$s(6) = \dfrac{-(6)^3}{3} + 2(6)^2 + 12(6)$

$s = 72\ \text{m}$

2 (a) $v = 3t^2 - 12t$
$a = 6t - 12$
$a = 0$
$6t - 12 = 0$
$t = 2\text{s}$
$v(2) = 3(2)^2 - 12(2)$
$v = -12\ \text{m s}^{-1}$

(b) $s = t^3 - 6t^2$
$|s_3 - s_2| = |((3)^3 - 6(3)^2) - ((2)^3 - 6(2)^2)|$
$= 11\ \text{m}$

(c) $s = 0$
$t^3 - 6t^2 = 0$
$t = 6,\ t = 0 \rightarrow t = 6s$

(d) $3t^2 - 12t < 0$
$0 < t < 4$

3 (a) $v_p = 6 + t - t^2$
$a_p = 1 - 2t \rightarrow a = 0$

$1 - 2t = 0$

$t = \dfrac{1}{2}\ s$

$v_p\left(\dfrac{1}{2}\right) = 6 + \left(\dfrac{1}{2}\right) - \left(\dfrac{1}{2}\right)^2$

$v_p = \dfrac{25}{4}\ m\ s^{-1}$

(b) $v_p = 0$
$6 + t - t^2 = 0$
$t = 3,\ t = -2$ (tidak diterima/*not accepted*)

$s = 6t + \dfrac{t^2}{2} - \dfrac{t^3}{3}$

$s(3) = 6(3) + \dfrac{(3)^2}{2} - \dfrac{(3)^3}{3}$

$s = \dfrac{27}{2}\ \text{m}$

(c) Jarak *B* ke *C*/*Distance B to C*

$-3 = \dfrac{\text{Jarak/}\textit{Distance}}{3}$

Jarak/*Distance* = 9 m

$15 - \dfrac{9}{2} - 9 = \dfrac{3}{2}\ \text{m}$

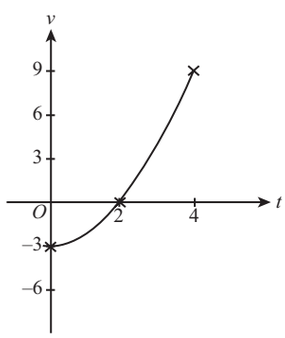
4 (a) (i) $v(0) = 2(0)^2 - 5(0) - 3$
$= -3\ \text{m s}^{-1}$

(ii) $2t^2 - 5t - 3 < 0$
$0 < t < 3$

(iii) $a > 0$
$a = 4t - 5$
$4t - 5 > 0$

$t = \dfrac{5}{4}\ \text{s}$

(b)



(c) $\left|\int_0^3 2t^2 - 5t - 3\ dt\right| + \int_3^4 2t^2 - 5t - 3\ dt$

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

$\left|\frac{(3)^3}{3} - \frac{5(3)^2}{2} - 3(3) - 0\right| - \left|\left(\frac{(4)^3}{3} - \frac{5(4)}{2} - 3(4)\right)\right|$

$- \left|\left(\frac{(3)^3}{3} - \frac{5(3)^2}{2} - 3(3)\right)\right|$

$s = \left|-\frac{27}{2}\right| + \frac{25}{6}$

$s = \frac{27}{2} + \frac{25}{6}$

$s = \frac{53}{3}$ m

5 (a) $v(0) = 3(0)^2 - 8(0) + 5$

$v = 5$ m s^{-1}

(b) $a = 6t - 8$

$a = 0$

$6t - 8 = 0$

$t = \frac{4}{3}$ s

$v\left(\frac{4}{3}\right) = 3\left(\frac{4}{3}\right)^2 - 8\left(\frac{4}{3}\right) + 5$

$v = -\frac{1}{3}$ m s^{-1}

(c) $3t^2 - 8t + 5 < 0$

$1 < t < \frac{5}{3}$

(c) $\left|\int_0^1 2t^2 - 5t - 3\ dt\right| + \left|\int_1^{\frac{5}{3}} 2t^2 - 5t - 3\ dt\right| + \left|\int_{\frac{5}{3}}^4 2t^2 - 5t - 3\ dt\right|$

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

$\left|(1)^3 - \frac{5(1)^2}{2} - 3 - 0\right| + \left|\left(\left(\frac{5}{3}\right)^3 - \frac{5\left(\frac{5}{3}\right)^2}{2} - 3\right) - \left((1)^3 - \right.\right.$

$\left.\left.\frac{5(1)^2}{2} - 3\right)\right| + \left|\left((4)^3 - \frac{5(4)^2}{2} - 3\right) - \left(\left(\frac{5}{3}\right)^3 - \frac{5\left(\frac{5}{3}\right)^3}{2} - 3\right)\right|$

$s = \left|-\frac{29}{6}\right| + \left|-\frac{-326}{81}\right| + \left|-\frac{77}{162}\right|$

$s = \frac{28}{3}$ m

6 (a) $a = 3t^2 - 10t + 4$

$a = 4$ m s^{-2}

(b) $a = 3t^2 - 10t + 4$

$3t^2 - 10t + 4 < 12$

$3t^2 - 10t - 8 < 0$

$0 < t < 4$

(c) $t^3 - 5t^2 + 4t = 0$

$t = 4, 1, 0$

(c) $\int_0^1 t^3 - 5t^2 + 4t\ dt + \left|\int_1^4 t^3 - 5t^2 - 4t\ dt\right|$

$= \left|\frac{t^4}{4} - \frac{5t^3}{3} + 2t^2\right|_0^1 + \left|\frac{t^4}{4} - \frac{5t^3}{3} + 2t^2\right|_1^4$

$= \left(\frac{(1)^4}{4} - \frac{5(1)^3}{4} + 2(1)^2 - 0\right) + \left|\left(\frac{(4)^4}{4} - \frac{5(4)^3}{3} + 2(4)^2\right)\right.$

$\left. - \left(\frac{(1)^4}{4} - \frac{5(1)^3}{3} + 2(1)^2\right)\right|$

$= \frac{7}{12} + \frac{285}{4}$

$= \frac{431}{6}$ m

7 (a) $v = 4t - 4$

$a = 4$ m s^{-2} (Terbukti/*Proven*)

(b) (i) $v = 0$

$4t - 4 = 0$

$t = 1$ s

(ii) $s = 2t^2 - 4t - 30$

$s = 30$

$2t^2 - 4t - 30 = 0$

$t = 5$, $t = -3$ (tidak diterima/*not accepted*)

$v(5) = 4(5) - 4$

$v = 16$ m s^{-1}

(iii) $s(1) = 2(1)^2 - 4(1) - 30$

$s = -32$

Jumlah jarak/*Total distance*

$32 + 32 + 30 = 94$ m

8 (a) $a = 0$

$8 - 2t = 0$

$t = 4s$

(b) $v = 8t - t^2 + 20$

$v(4) = 8(4) - (2)^2 + 20$

$v = 48$ m s^{-1}

(c) $v = 0$

$8t - t^2 + 20 = 0$

$t = 10$, $t = -2$ (tidak diterima/*not accepted*)

(d) $\int_0^6 8t - t^2 + 20\ dt$

$s = -\frac{t^3}{3} - 4t^2 + 20t$

$s = \left(-\frac{(6)^3}{3} - 4(6)^2 + 20(6)\right) - 0$

$= 192$ m

9 (a) $s = 48t^2 - 16t^3$

$v = 0$

$96t - 48t^2 = 0$

$t = 0$, $t = 2$

$s(2) = 48(2)^2 - 16(2)^3$

$s = 64$ km

(b) $a = 96 - 96t$

(c) $a = 0$

$96 - 96t = 0$

$t = 1$ s

$v(1) = 96(1) - 48(1)^2$

$v = 48$ km j^{-1}/ 48 km h^{-1}

10 (a) $a = 8t - 8$
$v = 4t^2 - 8t + 3$

(b) $a = 0$
$8t - 8 = 0$
$t = 1$ s

$v = 4(1)^2 - 8(1) + 3$
$= -1$ m s^{-1}

(c) $4t^2 - 8t + 3 > 0$

$0, t < \frac{1}{2}, t > \frac{3}{2}$

(d) $s = -\frac{4t^3}{3} - 4t^2 + 3t$

$4t^2 - 8t + 3 = 0$

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

$s\left(\frac{1}{2}\right) = \frac{4\left(\frac{1}{2}\right)^3}{3} - 4\left(\frac{1}{2}\right)^2 + 3\left(\frac{1}{2}\right)$

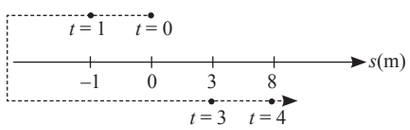
$s = \frac{2}{3}$ m

11 (a)

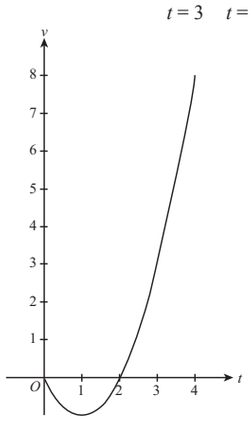
Masa/*Time*, *t*(s)	0	1	2	3	4
Sesaran/*Displacement*, *s*(m)	0	–1	0	3	8

(b) $s(4) - s(1) = 8 - (-1)$
Jumlah jarak/*Total distance* = 9 m

(c) (i)



(ii)



12 (a) $-2 = 4q - p$
$6 = 9q - \frac{9}{2}p$

$p = -\frac{14}{3}, q = -\frac{5}{3}$

$v = \frac{-5}{3}t^2 + \frac{14}{3}t$

(b) $\frac{-5}{3}t^2 + \frac{14}{3}t < 0$

$t > \frac{14}{3}$

$s = \frac{pt^3}{2} - \frac{pt^2}{2}$

$\frac{q(3)^3}{3} - \frac{p(3)^2}{2} = 6$

(c) $\left|\int_3^4 \frac{-5}{3}t^2 + \frac{14}{3}t\,dt\right|$

$\left|\left[\frac{-5t^3}{9} + \frac{14}{6}t^2\right]_3^4\right|$

$\left|\left[\frac{-5(4)^3}{9} + \frac{14}{6}(4)^2\right] - \left[\frac{-5(3)^3}{9} + \frac{14}{6}(3)^2\right]\right|$

$\left|-\frac{38}{9}\right| = \frac{38}{9}$ m

KERTAS MODEL

Kertas 1

1 $2j + j\theta = 54$
$j(2 + \theta) = 54$

$j = \frac{54}{2 + \theta}$ ...①

$\frac{1}{2}j^2\theta = 180$

$j^2\theta = 360$ ...②

Gantikan ① dalam ②
Substitute ① *into* ②

$\left(\frac{54}{2 + \theta}\right)^2\theta = 360$

$\frac{29\,16\theta}{4 + 4\theta + \theta^2} = 360$

$2\,916\theta = 360\theta^2 + 1\,440\theta + 1\,440$
$360\theta^2 + 1\,476\theta - 1\,440 = 0$
$10\theta^2 + 41\theta + 40 = 0$
$(2\theta - 5)(5\theta - 8) = 0$

$\theta = \frac{5}{2}, \theta = \frac{8}{5}$

Maka/*Thus*, $\theta_1 = 2.5°$

2 $T_1 = x, d = y, T_7 = 22, S_9 = 162$
$T_n = a + (n - 1)d$
$22 = x + 6y$
$x = 22 - 6y$ …①

$S_n = \frac{n}{2}[2a + (n - 1)d]$

$162 = \frac{9}{2}[2x + 8y]$

$18 = x + 4y$ …②

Gantikan ① dalam ②
Substitute ① *into* ②
$18 = 22 - 6y + 4y$
$2y = 4$
$y = 2$

Gantikan $y = 2$ dalam ①
Substitute $y = 2$ *into* ①
$x = 22 - 6(2)$
$x = 10$

3 (a) $h(x) = 2x - 5$

$y = 2x - 5$

$x = \dfrac{y+5}{2}$

$h^{-1}(x) = \dfrac{x+5}{2}$

(b) $gh^{-1}(x) = g\left(\dfrac{x+5}{2}\right)$

$= \dfrac{3\left(\dfrac{x+5}{2}\right)}{2} + 4$

$= \dfrac{3x+31}{4}$

(c) $fg(x) = 4x + 7$

$f\left(\dfrac{3x}{2} + 4\right) = 4x + 7$

Katakan/*Let* $y = \dfrac{3x}{2} + 4$

$x = \dfrac{2y-8}{3}$

$f(y) = 4\left(\dfrac{2y-8}{3}\right) + 7$

$= \dfrac{8y-11}{3}$

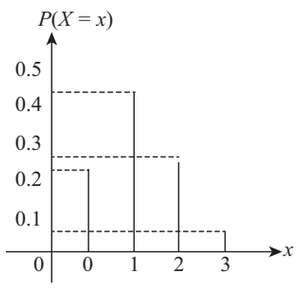
$f(x) = \dfrac{8x-11}{3}$

4 $P(X = 0) = 0.216$

$P(X = 1) = 0.144 + 0.144 + 0.144 = 0.432$

$P(X = 2) = 0.096 + 0.096 + 0.096 = 0.288$

$P(X = 3) = 0.064$



5 (a) $Z = \dfrac{X - \mu}{\sigma}$

(b) $P(z > k) = 0.3264$

$k = 0.45$

$\dfrac{X - 16}{5} = 0.45$

$X = 18.25$

6 (a) $m = 15\%$

$m = \dfrac{3}{20}$

$y - y_1 = m(x - x_1)$

$y - 6 = \dfrac{3}{20}(x - 10)$

$y = \dfrac{3}{20}x + \dfrac{9}{2}$

(b) $\dfrac{3(10) + 2x}{5} = p$

$\dfrac{30 + 2x}{5} = p$

$\dfrac{6(3) + 2x}{5} = p$

$18 + 2y = 30$

$2y = 12$

$y = 6$

7 Anggap x ialah panjang dan y ialah lebar kolam.
Let x be the length and y are be width of the pond.

$2x + 2y = 130$ ... ①

$2x(2y) - xy = 3\,000$

$4xy - xy = 3\,000$ ... ②

$3xy = 3\,000$

$x = \dfrac{1\,000}{y}$

$2\left(\dfrac{1\,000}{y}\right) + 2y = 130$

$2\,000 + 2y^2 = 130y$

$2y^2 - 130y + 2\,000 = 0$

$y^2 - 65y + 1\,000 = 0$

$(y - 40)(y - 25) = 0$

$y = 40, y = 25$

Apabila/*When* $y = 40$,

$x = \dfrac{1\,000}{40}$

$x = 25$

Apabila/*When* $y = 25$,

$x = \dfrac{1\,000}{25}$

$x = 40$

8 (a) ${}^nP_r = \dfrac{n!}{(n-r)!}$, ${}^nC_r = \dfrac{n!}{r!\,(n-r)!}$

$6({}^{10}C_r) = {}^{10}P_r$

$6\left(\dfrac{10!}{r!(10-r)!}\right) = \dfrac{10!}{(10-r)!}$

$6\left(\dfrac{1}{r!}\right) = 1$

$r! = 6$

$\therefore r = 3$

(b) $\dfrac{10!}{2!\,2!\,2!} = \dfrac{3628800}{8}$

$= 453\,600$

9 (a) $18^q = 2^x$

$q \log_{10} 18 = x \log_{10} 2$

$q = \dfrac{x \log_{10} 2}{\log_{10} 18}$

$q = 0.2398x$

$18^q = 3y$

$q \log_{10} 18 = y \log_{10} 3$

$q = \dfrac{x \log_{10} 3}{\log_{10} 18}$

$q = 0.3801y$

(b) $x = \log_3 5$

$x = \dfrac{\log_{10} 5}{\log_{10} 3}$

$x = 1.465$

$k = 1 + \dfrac{1}{2}(1.465)$

$k = 1.7325$

$9^k = 9^{1.7325}$

$= 45$

10 (a) $5x - x^2 = 4$

$x^2 - 5x + 4 = 0$

$(x - 1)(x - 4) = 0$

$x = 1, x = 4$

$\int_1^4 (5x - x^2)dx - (3 \times 4)$

$= \left[\dfrac{5x^2}{2} - \dfrac{x^3}{3}\right]_1^4 - 12$

$= \left(\dfrac{80}{2} - \dfrac{64}{3}\right) - \left(\dfrac{5}{2} - \dfrac{1}{3}\right) - 12$

$= \dfrac{9}{2}$ unit^2

(b) $\pi\int_0^1 4dx - \pi\int_0^1 (5x - x^2)\,dx$

$= \pi[4x]_0^1 - \pi\left[\dfrac{5x^2}{2} - \dfrac{x^3}{3}\right]_0^1$

$= 4\pi - \dfrac{13}{6}\pi$

$= \dfrac{11}{6}\pi$ unit^3

11 $Y = mX + c$

$x^2y = mx + c$

$9 = 6(4) + c$

$c = -15$

$x^2y = 6x - 15$

$y = \dfrac{6}{x} - \dfrac{15}{x^2}$

$y = \dfrac{6}{30.4} - \dfrac{15}{30.4^2}$

$y = 0.1811$

12 (a) $f(x) = 2\left(x^2 - \dfrac{h}{2}x - \dfrac{k}{2}\right)$

$= 2\left[\left(x^2 - \dfrac{h}{2}x + \left(-\dfrac{h}{4}\right)^2 - \left(-\dfrac{h}{4}\right)^2 - \dfrac{k}{2}\right)\right]$

$= 2\left[\left(x - \dfrac{h}{2}\right)^2 - \dfrac{h^2}{16} - \dfrac{k}{2}\right)\right]$

$= 2\left(x - \dfrac{h}{4}\right)^2 - \dfrac{h^2}{8} - k$

$-1 = \dfrac{h}{4}$

$h = -4$

$-\dfrac{16}{8} - k = 13$

$k = -15$

(b) $2x^2 + 4x + 15 \geqslant 31$

$2x^2 + 4x - 16 \geqslant 0$

$x^2 + 2x - 8 \geqslant 0$

$(x + 4)(x - 2) \geqslant 0$

$x \leqslant -4\,,\ x \geqslant 2$

13 (a) $y = (3 - 2x)^3$

$\dfrac{dy}{dx} = 3(3 - 2x)^2(-2)$

$= -6(3 - 2x)^2$

Pada titik/*At point* (1, 1),

$\dfrac{dy}{dx} = -6[3 - 2(1)]^2$

$= -6$

Persamaan tangen/*Equation of tangent*:

$y - 1 = -6(x - 1)$

$y = -6x + 7$

(b) $\dfrac{dP}{dt} = 0.2$

$P = 2\pi j$

$\dfrac{dP}{dt} = 2\pi$

$\dfrac{dj}{dt} = \dfrac{dj}{dP} \times \dfrac{dP}{dt}$

$\dfrac{dj}{dt} = \dfrac{1}{2\pi} \times 0.2$

$= 0.0318$

14 (a) $\overrightarrow{PQ} = \overrightarrow{PO} + \overrightarrow{OQ}$

$\overrightarrow{PQ} = \begin{pmatrix} -5 \\ -3 \end{pmatrix} + \begin{pmatrix} 2 \\ 6 \end{pmatrix}$

$= \begin{pmatrix} -3 \\ 1 \end{pmatrix}$

(b) $\overrightarrow{PR} = \overrightarrow{PO} + \overrightarrow{OR}$

$\overrightarrow{PR} = \begin{pmatrix} 5 \\ 5 \end{pmatrix} + \begin{pmatrix} -12 \\ 4 \end{pmatrix}$

$\overrightarrow{PR} = -7i + 9j$

(c) $|\overrightarrow{PQ}| = \sqrt{(-3)^2 + (1)^2}$

$= \sqrt{10}$

$\therefore \dfrac{1}{\sqrt{10}} \begin{pmatrix} -3 \\ 1 \end{pmatrix}$

(d) $\frac{m}{-3} = \frac{4}{1}$

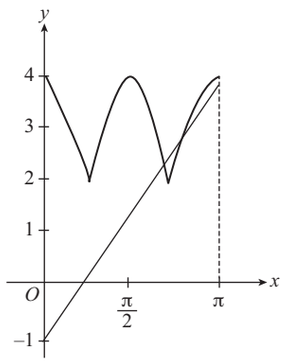
$m = -12$

15 (a) $a = 3, b = 2$

$f(x) = a \kos bx$

$f(x) = 3 \kos 2x$

(b) $y = |3 \kos 2x| + 1$



(c) $\frac{\pi}{4x}[1 + y] = 1$

$1 + y = \frac{4x}{\pi}$

$y = \frac{4x}{\pi} - 1$

Bilangan penyelesaian/*Number of solutions* = 2

Kertas 2

1 $2x + 2y = 56$

$x = \frac{56 - 2y}{2}$ ... ①

$SQ^2 = x^2 + y^2$

$20^2 = x^2 + y^2$ ... ②

$400 = \left(\frac{56 - 2y}{2}\right)^2 + y^2$

$400 = \frac{3\,136 - 224y + 4y}{4} + y^2$

$1\,600 = 3\,136 - 224y + 4y^2 + 4y^2$

$8y^2 - 224y + 1\,536 = 0$

$y^2 - 28y + 192 = 0$

$(y - 12)(y - 16) = 0$

$y = 12, y = 16$

Apabila/*When* $y = 12$,

$x = \frac{56 - 2(12)}{2}$

$x = 16$

Apabila/*When* $y = 16$,

$x = \frac{56 - 2(16)}{2}$

$x = 12$

(a) $\tan^2 x + 2 \kos^2 x - \sek^2 x$

$= (\sek^2 x - 1) + 2 \kos^2 x - \sek^2 x$

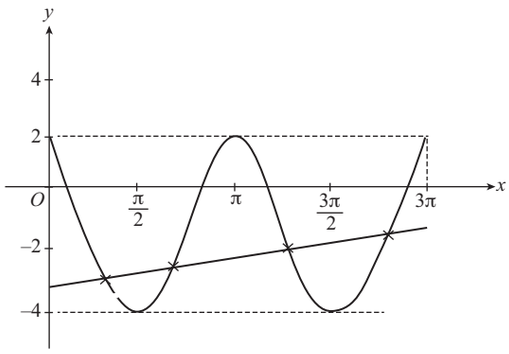
$= 2 \kos^2 x - 1$

$= \kos 2x$ (Terbukti/*Proven*)

(b) $3(\tan^2 x + 2 \kos^2 x - \sek^2 x) = \frac{x}{4} - 2$

$3 \kos 2x - 1 = \frac{x}{4} - 3$

$y = \frac{x}{4} - 3$



Bilangan penyelesaian/*Number of solutions* = 4

3 $T_1 = a = 1, d = 0.5$

(a) (i) $T_{12} = 1 + 11(0.5)$

$= 6.50$

Wang yang disimpan pada hari ke-12 ialah RM6.50.

The money saved on the 12th *day is* RM6.50.

(ii) $S_{15} = \frac{15}{2}[2(1) + 14(0.5)]$

$= 67.50$

Jumlah wang yang disimpan ialah RM67.50.

The total amount of money saved was RM67.50.

(b) $S_n \geqslant 115$

$\frac{n}{2}[2(1) + (n - 1)(0.5)] \geqslant 115$

$n[2 + 0.5n - 0.5] \geqslant 230$

$1.5n + 0.5n^2 - 230 \geqslant 0$

$n^2 + 3n - 460 \geqslant 0$

$(n + 23)(n - 20) \geqslant 0$

$n \leqslant -23, n \geqslant 20$

Bilangan hari yang diambil ialah 20.

The number of days taken is 20.

4 (a) $3x^2 + hx + k = 0$

$x^2 + \frac{h}{3} + \frac{k}{3} = 0$

Hasil tambah punca/*Sum of roots* $= \frac{h}{3}$

$-2 + 5 = -\frac{h}{3}$

$h = -9$

Hasil darab punca/*Product of roots* $= \frac{k}{3}$

$(-2)(5) = \frac{k}{3}$

$-10 = \frac{k}{3}$

$k = -30$

(b) $3x^2 - 9x - 30 = m$

$3x^2 - 9x - 30 - m = 0$

$b^2 - 4ac > 0$

$(-9)^2 - 4(3)(-30 - m) > 0$

$81 + 360 + 12m > 0$

$441 + 12m > 0$

$12m > -441$

$m > -\frac{147}{4}$

5 (a) $f(x) = 2 - x - x^2$

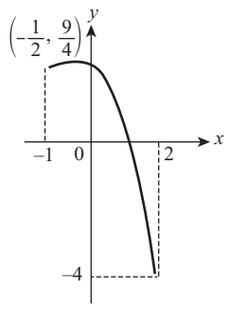
$= -\left[x^2 + x + \left(\frac{1}{2}\right)^2 - \left(\frac{1}{2}\right)^2 - 2\right]$

$= -\left[\left(x + \frac{1}{2}\right)^2 - \frac{1}{4} - 2\right]$

$= -\left(x + \frac{1}{2}\right)^2 + \frac{9}{4}$

Nilai maksimum/*Maximum value* $= \frac{9}{4}$

(b)



Julat/*Range* $= -4 < f(x) \leqslant \frac{9}{4}$

(c) Apabila ujian garis mencancang dilakukan, garis hanya melalui satu titik pada graf. Maka, graf ialah fungsi. *When vertical line test is done, the line is passes through only one point on the graph. Thus, the graph is a function.*

6 (a) $y = x^3 - 9x^2 + 24x + 2$

$\frac{dy}{dx} = 3x^2 - 18x + 24$

Titik pusingan/*Turning point*, $\frac{dy}{dx} = 0$

$3x^2 - 18x + 24 = 0$

$x^2 - 6x + 8 = 0$

$(x - 2)(x - 4) = 0$

$x = 2, x = 4$

(b) Apabila/*When* $x = 4$,

$y = (4)^3 - 9(4)^2 + 24(4) + 2$

$y = 18$

Koordinat *L*/*Coordinates of L* = (4, 18)

Luas/*Area*

$= \int_0^4 (x^3 - 9x^2 + 24x + 2)dx - \left[\frac{1}{2} \times (2 + 18) \times 4\right]$

$= \left[\frac{x^4}{4} - \frac{9x^3}{3} + \frac{24x^2}{2} + 2x\right]_0^4 - 40$

$= \left[\frac{4^4}{4} - \frac{9(4)^3}{3} + \frac{24(4)^2}{2} + 2(4)\right] - 40$

$= 72 - 40$

$= 32 \text{ unit}^2$

7 (a) $V = (24 - 2x)(24 - 2x)(x)$

$V = 576x - 48x^2 - 48x^2 + 4x^3$

$V = 4x^3 - 96x^2 + 576x$

(b) $V = 4x^3 - 96x^2 + 576x$

$\frac{dV}{dx} = 12x^2 - 192x + 576$

Apabila/*When* $\frac{dV}{dx} = 0$,

$12x^2 - 192x + 576 = 0$

$x^2 - 16x + 48 = 0$

$(x - 4)(x - 12) = 0$

$x = 4, x = 12$

Apabila/*When* $x = 4$,

$V = 4(4)^3 - 96(4)^2 + 576(4)$

$V = 1\,024 \text{ cm}^3$

Apabila/*When* $x = 12$,

$V = 4(12)^3 - 96(12)^2 + 576(12)$

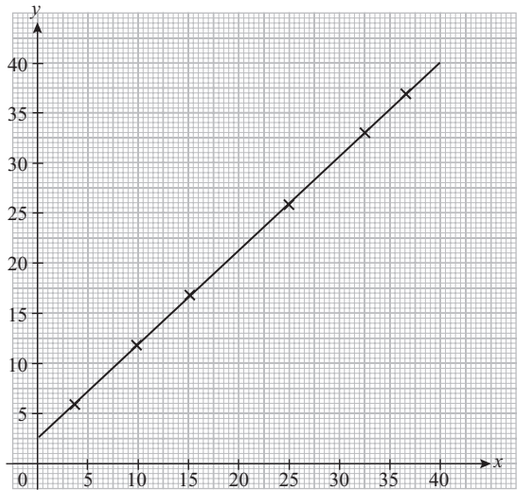
$V = 0$

Isi padu maksimum/*Maximum volume* $= 1\,024 \text{ cm}^3$

8 (a)

x^2	4	9	16	25	30.25	36
xy	6.2	11.1	18.0	27.0	31.9	37.8

(b)



(i) $y = ax + \frac{a}{bx}$

$xy = ax^2 + \frac{a}{b}$

Kecerunan/*Tangent*, $a = \frac{37.8 - 6.2}{36 - 4}$

$a = 0.9875$

(ii) Pintasan-*y*/*y-intercept* $= \frac{a}{b}$

$2.5 = \frac{0.9875}{b}$

$b = 0.395$

9 (a) $\frac{1}{2}\begin{vmatrix} 2 & -5 & h & 2 \\ 3 & 2 & -h & 3 \end{vmatrix} = 37.5$

$|(4 + 5h + 3h) - (-15 + 2h - 2h)| = 75$
$|19 + 8h| = 75$
$19 + 8h = \pm 75$
$8h = 56 \quad , \quad 8h = -56$
$h = 7 \qquad h = -\frac{47}{4}$ (Abaikan/*Ignore*)

(b) $(x, y) = \left(\frac{1(7) + 2(-5)}{3}, \frac{1(-7) + 2(2)}{3}\right)$
$x = 1 \qquad y = -1$
Koordinat *N*/*Coordinates of N* = (1, –1)

(c) $m_{AN} = \frac{3 - (-1)}{2 - (-1)} = \frac{4}{3}$
$m_{BC} = \frac{2 - (-7)}{-5 - 7} = \frac{-3}{4}$
$m_{AN} \times m_{BC} = \frac{4}{3} \times \left(-\frac{3}{4}\right)$
$= -1$
Garis lurus *AN* dan *BC* berserenjang.
The straight lines AN and BC are perpendicular.

(b) $\sqrt{(x + 5)^2 + (y - 2)^2} = 2\sqrt{(x - 7)^2 + (y + 7)^2}$
$x^2 + 10x + 25 + y^2 - 4y + 4 = 4(x^2 - 14x + 49 + y^2 + 14y + 49)$
$3x^2 + 3y^2 - 66x + 60y + 363 = 0$

10 (a) (i) $\frac{{}^9P_5}{4} = 2\,520$

(ii) $2! \times \frac{8!}{3!} = 13\,440$

(b) (i) ${}^{10}C_7 = 120$
(ii) ${}^5C_4 \times {}^5C_3 = 50$
(iii) $({}^5C_4 \times {}^5C_3) + ({}^5C_5 \times {}^5C_2) = 60$

11 (a) (i) $P(X \geqslant 13) = P(X = 13) + P(X = 14) + P(X = 15)$
$= {}^{15}C_{13}(0.75)^{13}(0.25)^2 + {}^{15}C_{14}(0.75)^{14}(0.25)^1 + {}^{15}C_{15}(0.75)^{15}(0.25)^0$
$= 0.1559 + 0.0668 + 0.0134$
$= 0.2361$

(ii) $\sigma = \sqrt{npq}$
$10.2 = \sqrt{n(0.75(0.25)}$
$n = 554.88$
$n \approx 555$

(b) (i) $P(X > 85) = P\left(Z > \frac{85 - 58}{15}\right)$
$= P(Z > 1.8)$
$= 0.0359$

(ii) $P(X < w) = 0.1$
$-\frac{w - 58}{15} = 1.281$
$w = 38.79$

12 (a) $v = 15t - 3t^2$
$a = 15 - 6t$
Apabila/*When* $t = 0$, $a = 15$
Pecutan apabila zarah mula bergerak ialah 15 m s^{-2}.
The acceleration when the particle starts to move is 15 m s^{-2}.

(b) $15 - 6t = 0$
$t = \frac{5}{2}$
$v_{\text{maks}} = 15\left(\frac{5}{4}\right) - 3\left(\frac{5}{4}\right)^2$
$= \frac{75}{4}$ m s^{-1}

(c) $s = \int (15t - 3t^2)dt$
$= \frac{15}{2}t^2 - t^3 + c$

Apabila $t = 0$ dan $s = 0$, $c = 0$
When $t = 0$ *and* $s = 0$, $c = 0$

Pada masa *t*/*At time t*,
$s = \frac{15}{2}t^2 - t^3$

Apabila zarah berada semula di *O*
When the particle is at O again,
$15t^2 - 2t^3 = 0$
$t^2(15 - 2t) = 0$
$t = 0$, $t = 7.5$
$\therefore\ t = 7.5$

(d) $|s_4 - s_3|$
$= \left[\left(\frac{15}{2}(4)^2 - (4)^3\right) - \left(\frac{15}{2}(3)^2 - (3)^3\right)\right]$
$= 56 - 40.5$
$= 15.5$ m

13 (a) (i) Biskut/*Biscuit*:
$I = \frac{3.00}{2.50} \times 100 = 120$

Kek/*Cake*:
$I = \frac{3.60}{3.00} \times 100 = 120$

Donat/*Donut*:
$I = \frac{2.40}{1.50} \times 100 = 160$

Sandwic/*Sandwich*:
$I = \frac{3.50}{2.00} \times 100 = 175$

(ii) $\bar{I} = \frac{(120 \times 3) + (120 \times 2) + (160 \times 1) + (175 \times 4)}{15}$
$= \frac{1460}{10}$
$= 146$

(iii) $\frac{Q_{2021}}{94} \times 100 = 146$
$Q_{2021} = \text{RM}137.24$

(b) $\bar{I}_{22/21} = 115$
$\bar{I}_{22/19} = \frac{115 \times 146}{100}$
$= 167.9$

14 (a) (i) $\dfrac{\sin \angle PQS}{11.5} = \dfrac{\sin 43°}{9.8}$

$$\sin \angle PQS = \frac{\sin 43° \times 11.5}{9.8}$$

$$= 53.16°$$

(ii) $10.3^2 = 8^2 + 9.8^2 - 2(8)(9.8) \text{ kos } \angle QSR$

$$\text{kos } \angle QSR = \frac{8^2 + 9.8^2 - 10.3^2}{2(8)(9.8)}$$

$\angle QSR = 69.87°$

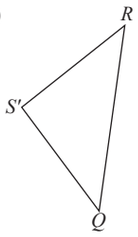
(iii) Luas/*Area of PQRS*

= Luas/*Area of PQS* + Luas/*Area of QRS*

$= \dfrac{1}{2}(11.5)(9.8) \sin 83.84° + \dfrac{1}{2}(8)(9.8) \sin 69.87°$

$= 92.83 \text{ cm}^2$

(b) (i)



(ii) $\angle RS'S = 69.87°$

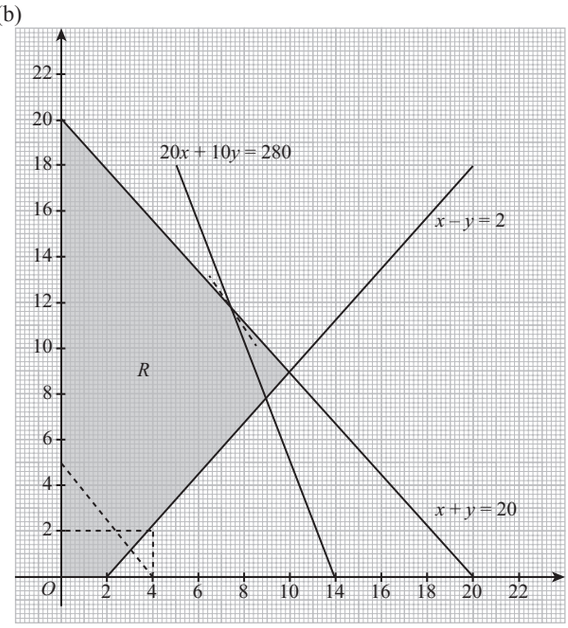
$\angle QS'R = 180° - 69.87° = 110.13°$

15 (a) *I*: $x + y \leqslant 20$

II: $20x + 10y \leqslant 280$

III: $x - y \leqslant 2$

(b)



(c) (i) Daripada graf/*From the graph*,

Apabila/*When* $x = 4$, $y = 2$

$\therefore$ Masa yang diperuntukkan untuk aktiviti aerobik ialah 2 jam.

The time allocated for aerobic activity is 2 hours.

(ii) $k = 5\,000x + 3\,500y$

$k = 5\,000(8) + 3\,500(12)$

$= 82\,000$