KEMENTERIAN PENDIDIKAN
JABATAN PENDIDIKAN NEGERI SELANGOR

SELANGOR

TUISYEN RAKYAT PTRS SELANGOR

PROGRAM TUISYEN 2025

RAKYAT SELANGOR

MATEMATIK TAMBAHAN

DWIBAHASA

Tingkatan 4

DIKUASAI OLEH:

MBI
Menteri Besar Selangor Incorporated
MEMACU KEHIDUPAN

MALAYSIA MADANI

KITASELANGOR

PROGRAM TUISYEN RAKYAT SELANGOR 2025

TINGKATAN 4

MATEMATIK TAMBAHAN

DWIBAHASA

PANEL PENULIS:

Somu a/l Pantinaidu
Guru Cemerlang

Mohd Tauhid bin Ikhsan

Noor Shazwani binti Ramli

Norazlina binti Abd Khair

Nurul Ilani binti Ilham

Wong Jin Wen

CIRI-CIRI EKSKLUSIF MODUL
Program Tuisyen Rakyat Selangor
Matematik Tambahan Tingkatan 4

- Modul ini disediakan berdasarkan Dokumen Standard Kurikulum dan Pentaksiran (DSKP), buku teks Matematik Tambahan KSSM dan mengikut format peperiksaan SPM terkini.
- Latihan topikal yang padat, lengkap dan merangkumi aras rendah, sederhana dan tinggi terdiri daripada soalan rutin, bukan rutin dan KBAT.
- Guru boleh mempelbagaikan kaedah pengajaran dengan mempraktikkan kaedah latih tubi berperingkat menggunakan bahan yang diberikan.
- Modul mesra pengguna dan boleh dimanfaatkan oleh semua kumpulan murid sama ada cemerlang, harapan atau galus serta membolehkan murid-murid mengggunakan modul secara kendiri sebelum berbincang dengan guru.
- 1 set Kertas Model Tingkatan 4 dibekalkan pada akhir modul untuk memberikan gambaran sebenar peperiksaan SPM.
- Skema jawapan yang dibekalkan adalah mengikut peraturan pemarkahan SPM terkini yang menepati piawaian Lembaga Peperiksaan Malaysia (LPM) disediakan dalam kod QR untuk memberi panduan kepada guru dan murid.
- Penggubal modul berpengalaman luas dalam mata pelajaran Matematik Tambahan SPM terdiri dalam kalangan Guru Cemerlang dan Jurulatih Utama Negeri.

KANDUNGAN

JAWAPAN

KOLEKSI VIDEO

ANALISIS SOALAN SPM 2021-2023
MATEMATIK TAMBAHAN

Bab		Tajuk	2021		2022		2023	
			Kertas 1	Kertas 2	Kertas 1	Kertas 2	Kertas 1	Kertas 2
Tingkatan 4	1	Fungsi *Functions*	8	7	3	7	6, 8	
	2	Fungsi Kuadratik *Quadratic Functions*	7	7	8	6	8	8
	3	Sistem Persamaan *Systems of Equations*		5		7		7
	4	Indeks, Surd dan Logaritma *Indices, Surds and Logarithms*	8	7	4, 6, 5		7, 8	
	5	Janjang *Progressions*	5, 8		9	7	2, 7	8
	6	Hukum Linear *Linear Law*	4	10	4	10	4	10
	7	Geometri Koordinat *Coordinate Geometry*	6	10	8	7	3	6
	8	Vektor *Vectors*	6	8	4	10	5	5
Tingkatan 5	1	Sukatan Membulat *Circular Measure*	2, 6		7			9
	2	Pembezaan *Differentiation*	4	10	3	10	9	7
	3	Pengamiran *Integration*	5	7	3	10		10
	4	Pilih Atur dan Gabungan *Permutation and Combination*	7		8		7	
	5	Taburan Kebarangkalian *Probability Distribution*	4	10	3, 5	10	4	10
	6	Fungsi Trigonometri *Trigonometric Functions*	8	9	8	6	2, 8	10

Bahagian C (Kertas 2)			
Tingkatan 4	Penyelesaian Segi Tiga *Solution of Triangles*	10	Nombor Indeks *Index Number*	10
Tingkatan 5	Pengaturcaraan Linear *Linear Programming*	10	Kinematik Gerakan Linear *Kinematics of Linear Motion*	10

FORMAT INSTRUMEN PEPERIKSAAN SPM MATEMATIK TAMBAHAN

Bil.	Perkara	Kertas 1 (3472/1)	Kertas 2 (3472/2)
1	**Jenis instrumen**	Ujian bertulis	
2	**Jenis item**	• Subjektif respons terhad • Subjektif respons terhad berstruktur	
3	**Bilangan soalan**	**Bahagian A** 12 soalan (64 markah) (Jawab **semua** soalan) **Bahagian B** 3 soalan (16 markah) (Jawab **dua** soalan)	**Bahagian A** 7 soalan (50 markah) (Jawab **semua** soalan) **Bahagian B** 4 soalan (30 markah) (Jawab **tiga** soalan) **Bahagian C** 4 soalan (20 markah) (Jawab **dua** soalan)
4	**Jumlah markah**	80	100
5	**Konstruk**	• Mengingat dan memahami • Mengaplikasi • Menganalisis • Menilai • Mencipta	• Mengingat dan memahami • Mengaplikasi • Menganalisis • Menilai • Mencipta
6	**Tempoh ujian**	2 jam	2 jam 30 minit
7	**Cakupan konstruk**	Standard kandungan dan standard pembelajaran dalam Dokumen Standard Kurikulum dan Pentaksiran (DSKP) KSSM (Tingkatan 4 dan Tingkatan 5)	
8	**Aras kesukaran**	Rendah : Sederhana : Tinggi 5 : 3 : 2	
9	**Kaedah penskoran**	Analitik	
10	**Alatan tambahan**	Kalkulator saintifik yang tidak boleh diprogram	

SENARAI RUMUS

Rumus-rumus berikut boleh membantu anda menjawab soalan. Simbol-simbol yang diberi adalah yang biasa digunakan.
The following formulae may be helpful in answering the questions. The symbols given are the ones commonly used.

1 $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

2 $a^m \times a^n = a^{m+n}$

3 $a^m \div a^n = a^{m-n}$

4 $(a^m)^n = a^{mn}$

5 $\log_a mn = \log_a m + \log_a n$

6 $\log_a \left(\dfrac{m}{n}\right) = \log_a m - \log_a n$

7 $\log_a m^n = n \log_a m$

8 $\log_a b = \dfrac{\log_c b}{\log_c a}$

9 $T_n = a + (n-1)d$

10 $S_n = \dfrac{n}{2}[2a + (n-1)d]$

11 $T_n = ar^{n-1}$

12 $S_n = \dfrac{a(r^n - 1)}{r - 1} = \dfrac{a(1 - r^n)}{1 - r}$, $r \neq 1$

13 $S_\infty = \dfrac{a}{1 - r}$, $|r| < 1$

14 $I = \dfrac{Q_1}{Q_0} \times 100$

15 $\overline{I} = \dfrac{\Sigma W_i I_i}{\Sigma W_i}$

16 $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

17 $a^2 = b^2 + c^2 - 2bc \text{ kos } A$
$a^2 = b^2 + c^2 - 2bc \cos A$

18 Luas segi tiga / *Area of triangle*
$= \dfrac{1}{2} ab \sin C$

19 Titik yang membahagi suatu tembereng garis
A point dividing a segment of a line
$(x, y) = \left(\dfrac{nx_1 + mx_2}{m + n}, \dfrac{ny_1 + my_2}{m + n}\right)$

20 Luas segi tiga/*Area of triangle*
$= \dfrac{1}{2}|(x_1y_2 + x_2y_3 + x_3y_1) - (x_2y_1 + x_3y_2 + x_1y_3)|$

21 $|\underset{\sim}{r}| = \sqrt{x^2 + y^2}$

22 $\hat{\boldsymbol{r}} = \dfrac{x\underset{\sim}{i} + y\underset{\sim}{j}}{\sqrt{x^2 + y^2}}$

BAB 1

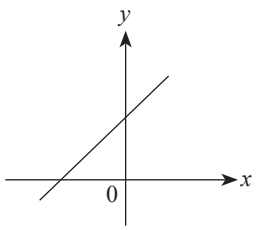
Fungsi
Functions

VIDEO PEMBELAJARAN

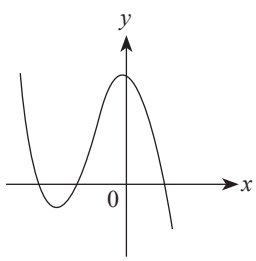
LATIHAN INTENSIF

1 Dengan menggunakan ujian garis mencancang, tentukan sama ada setiap graf yang berikut adalah fungsi atau bukan fungsi.
By using vertical line test, determine whether each of the following graphs is a function or not a function.

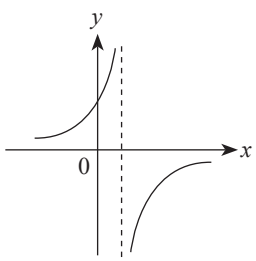
(a)



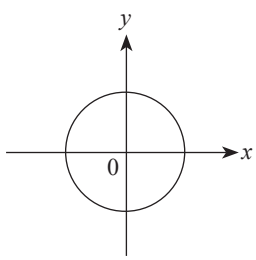
(b)



(c)



(d)

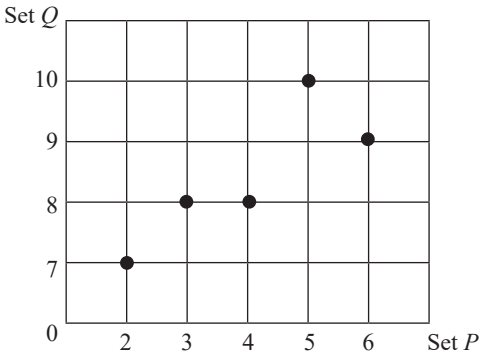


[4 markah/*marks*]

Jawapan/*Answer*:

Menguasai | Belum Menguasai

2 Rajah di bawah menunjukkan graf hubungan antara set P dan set Q.
The diagram below shows the graph relation between set P and set Q.



Nyatakan
State
(a) objek bagi 8,
the object of 8,
(b) julat hubungan itu.
the range of the relation.

[2 markah/*marks*]

Jawapan/*Answer*:

---

3 Hubungan antara R dan S ditakrifkan sebagai hubungan bertertib $\{(0, 1), (1, 2), (k, 4), (5, 6)\}$ bagi suatu fungsi linear f.
The relation between R and S is defined by the set of ordered pairs $\{(0, 1), (1, 2), (k, 4), (5, 6)\}$ *for the linear function f.*
(a) Nyatakan nilai k.
State the value of k.
(b) Ungkapkan hubungan tersebut menggunakan tatatanda fungsi.
Express the relation by the function notation.

[2 markah/*marks*]

Jawapan/*Answer*:

4 Diberi $g : x \rightarrow 2x + 3$ dan $h : x \rightarrow 3x^2 - 8$, cari
Given $g : x \rightarrow 2x + 3$ *and* $h : x \rightarrow 3x^2 - 8$, *find*
(a) $g^{-1}(7)$
(b) $hg(x)$

[4 markah/*marks*]

Jawapan/*Answer*:

---

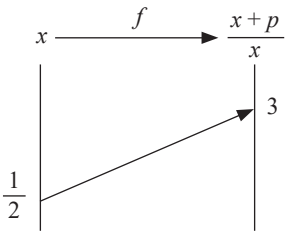
5 Diberi fungsi $f(x) = 2x + 1$ dan $g(x) = 3 - px$, cari
Given the functions $f(x) = 2x + 1$ *and* $g(x) = 3 - px$, *find*
(a) $f(2)$,
(b) nilai bagi p, dengan keadaan $gf(2) = -7$.
the value of p, such that $gf(2) = -7$.

[3 markah/*marks*]

Jawapan/*Answer*:

6 Rajah di bawah menunjukkan fungsi $f(x) = \frac{x+p}{x}$, $x \neq k$, dengan keadaan p ialah pemalar.

The diagram below shows the function $f(x) = \frac{x+p}{x}$, $x \neq k$, *such that p is a constant.*



(a) Nyatakan nilai k.
State the value of k.
(b) Cari nilai bagi p.
Find the value of p.

[3 markah/*marks*]

Jawapan/*Answer*:

---

7 Diberi fungsi $h : x \rightarrow 4x + m$ dan $h^{-1} : x \rightarrow 2kx + \frac{5}{8}$, dengan keadaan m dan k ialah pemalar, cari nilai m dan nilai k.
Given the functions $h : x \rightarrow 4x + m$ *and* $h^{-1} : x \rightarrow 2kx + \frac{5}{8}$, *such that m and k are constants, find the value of m and of k.*

[4 markah/*marks*]

Jawapan/*Answer*:

8 Jadual di bawah menunjukkan beberapa nilai untuk fungsi $f(x)$.
The table below shows some values for the function $f(x)$.

x	–1	0	1	2	3	4
$f(x)$	–5	–2	1	4	7	10

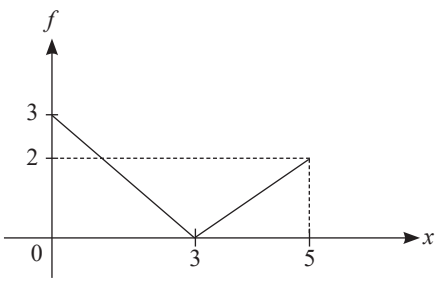
Cari nilai
Find the value of
(a) $f^{-1}(7)$
(b) $f^2(2)$

[3 markah/*marks*]

Jawapan/*Answer*:

---

9 Rajah di bawah menunjukkan fungsi, f untuk domain $0 \leqslant x \leqslant 5$.
The diagram below shows a function, f for domain $0 \leqslant x \leqslant 5$.



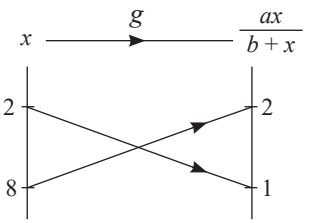
(a) Dengan menggunakan tatatanda fungsi, tulis satu hubungan f.
By using the function notation, write one relation for function f.
(b) Cari nilai-nilai x dengan keadaan $f(x) = 4$.
Find the values of x such that $f(x) = 4$.

[3 markah/*marks*]

Jawapan/*Answer*:

10 Rajah di bawah menunjukkan fungsi $g : x \rightarrow \frac{ax}{b+x}$, $x \neq -b$, dengan keadaan a dan b ialah pemalar.

The diagram below shows the function $g : x \rightarrow \frac{ax}{b+x}$, $x \neq -b$, *such that a and b are constants.*



Cari nilai a dan b.
Find the value of a and of b.

[3 markah/*marks*]

Jawapan/*Answer*:

---

11 Diberi $h : x \rightarrow ax + b$, dengan keadaan a dan b ialah pemalar dan $a > 0$. Jika $h^2 : x \rightarrow 9x + 16$, cari nilai a dan nilai b.
Given $h : x \rightarrow ax + b$, *such that a and b are constants and* $a > 0$. *If* $h^2 : x \rightarrow 9x + 16$, *find the value of a and of b.*

[3 markah/*marks*]

Jawapan/*Answer*:

12 Diberi $h(x) = \frac{8x}{2x + 3}$, $x \neq k$ dan $g(x) = 2x + p$.

Given $h(x) = \frac{8x}{2x + 3}$, $x \neq k$ *and* $g(x) = 2x + p$.

(a) Cari
Find
(i) nilai k,
the value of k,
(ii) $hg(x)$, dalam sebutan p.
$hg(x)$, *in terms of* p.

(b) Tunjukkan apabila $p = -\frac{19}{2}$, $hg(x)$ adalah fungsi songsang pemetaan ke atas diri sendiri.

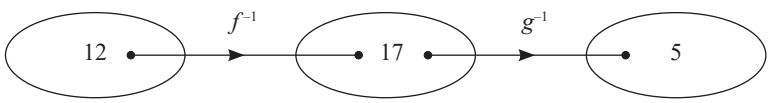
Show that when $p = -\frac{19}{2}$, $hg(x)$ *is an inverse function maps to itself.*

[5 markah/*marks*]

Jawapan/*Answer*:

---

13 Rajah di bawah menunjukkan pemetaan bagi fungsi f^{-1}dan g^{-1}.
The diagram below shows the mapping of the functions f^{-1} *and* g^{-1}.



Nyatakan
State
(a) $fg(5)$
(b) $g^{-1}f^{-1}(12)$

[2 markah/*marks*]

Jawapan/*Answer*:

14 Fungsi g ditakrifkan oleh $g(x) = \frac{3}{x}$, $x \neq 0$.

The function g is defined by $g(x) = \frac{3}{x}$, $x \neq 0$.

(a) Ungkapkan $g^2(x)$, $g^3(x)$ dan $g^4(x)$ dalam bentuk termudah.

Express $g^2(x)$, $g^3(x)$ *and* $g^4(x)$ *in the simplest form.*

(b) Seterusnya, cari g^{6n^2}.

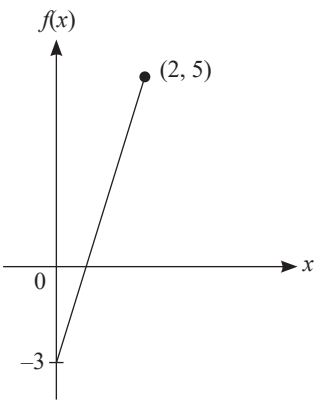
Hence, find g^{6n^2}.

[5 markah/*marks*]

Jawapan/*Answer*:

---

15 Rajah di bawah menunjukkan graf bagi fungsi $f(x)$.
The diagram below shows a graph of function $f(x)$.



Cari
Find

(a) nilai p dalam julat $-3 \leqslant f(x) \leqslant \frac{p}{2}$ untuk domain $0 \leqslant x \leqslant 2$,

the value of p within the range $-3 \leqslant f(x) \leqslant \frac{p}{2}$ *for the domain* $0 \leqslant x \leqslant 2$,

(b) $f^{-1}(x)$.

[5 markah/*marks*]

Jawapan/*Answer*:

16 Diberi fungsi $f(x) = 5x - 3$ dan $g(x) = 7x + 2$, cari nilai x apabila $f^2 = g^2$.
Given the functions $f(x) = 5x - 3$ *and* $g(x) = 7x + 2$*, find the value of* x *when* $f^2 = g^2$.

[3 markah/*marks*]

Jawapan/*Answer*:

---

17 Harga k, dalam RM, dan kuantiti x bagi suatu item dijual mengikut persamaan permintaan $k = 120 - x$ untuk $0 \leqslant x \leqslant 300$. Manakala kos M, dalam RM, bagi pengeluaran x unit diberi oleh $M = 400 + \sqrt{x}$. Dengan menganggap semua item terjual, cari
The cost k, in RM*, and the quantity x for an item sold follow the demand equation* $k = 120 - x$ *for* $0 \leqslant x \leqslant 300$. *Whereas the cost M, in* RM*, for producing x units is given by* $M = 400 + \sqrt{x}$. *By assuming all of the items are sold, find*

(a) kos M sebagai fungsi bagi harga k,
the cost M as the function of price k,

(b) kos pengeluaran item itu jika harga jualannya ialah RM20 seunit.
the production cost of the item if the selling price is RM20 *per unit.*

[4 markah/*marks*]

Jawapan/*Answer*:

18 Isi padu V, dalam mℓ, sebuah kelalang kon yang berisi cecair X diberi oleh fungsi $V = \frac{1}{3}\pi j^2 h$, dengan keadaan j dan h masing-masing ialah jejari dan tinggi, dalam cm, kelalang kon tersebut. Diberi jejari kelalang kon itu ialah 10 cm. Jumlah isi padu awal cecair X ialah 60 mℓ dan mengalami kondensasi dengan kadar malar 8 mℓ per saat.

The volume V, in mℓ*, of a conical flask containing liquid X is given by the function* $V = \frac{1}{3}\pi j^2 h$*, such that j and h are radius and height, in* cm*, of the conical flask respectively. Given the radius of the conical flask is* 10 cm*. The total initial volume of liquid X is* 60 mℓ *and it undergoes condensation at a constant rate of* 8 mℓ *per second.*

(a) Tulis rumus bagi
Write the formula for
(i) isi padu, V cecair X di dalam kelalang kon itu selepas t saat,
the volume, V of liquid X in the conical flask after t seconds,
(ii) tinggi, h cecair X di dalam kelalang kon itu, dalam sebutan V,
the height, h of liquid X in the conical flask, in terms of V,
(iii) fungsi gubahan $hV(t)$.
the composite function $hV(t)$.

(b) Cari tinggi, h, dalam cm, cecair X di dalam kelalang kon itu selepas 30 saat.
Find the height, h, in cm*, of liquid X in the conical flask after* 30 *seconds.*

[7 markah/*marks*]

Jawapan/*Answer*:

BAB 2

Fungsi Kuadratik
Quadratic Functions

VIDEO PEMBELAJARAN

Imbas Kembali

1 Faktorkan setiap ungkapan algebra berikut.
Factorise each of the following algebraic expressions.
(a) $2mh^2 - 98m^3$
(b) $ap^2 - 2apq + aq^2$

Jawapan/*Answer*:

---

2 Kembangkan setiap ungkapan berikut.
Expand each of the following expressions.
(a) $rs(s - 3r + 2rs - 7)$
(b) $(4 - x)(5 - 3x)$
(c) $\left(\frac{1}{3}m - \frac{2}{5}n\right)\left(m + \frac{3}{4}n\right)$

Jawapan/*Answer*:

LATIHAN INTENSIF

1 (a) Diberi $f(x) = 3x^2 - 5x + a$, cari nilai a apabila
Given $f(x) = 3x^2 - 5x + a$, find the value of a when

(i) $-\frac{1}{3}$ adalah punca bagi fungsi $f(x)$,
$-\frac{1}{3}$ *is the root of the function* $f(x)$,

(ii) fungsi $f(x)$ mempunyai dua punca nyata dan sama,
the function $f(x)$ *has two equal and real roots,*

(iii) $\frac{5 \pm \sqrt{11}}{6} i$ adalah punca bagi fungsi $f(x)$.
$\frac{5 \pm \sqrt{11}}{6} i$ *is the root of the function* $f(x)$.

[6 markah/*marks*]

(b) Persamaan kuadratik $(x^2 + 1)m = (2m - n)x - n$ mempunyai dua punca nyata dan sama. Cari nilai $\left(\frac{m}{n}\right)^2$.

The quadratic equation $(x^2 + 1)m = (2m - n)x - n$ *has two equal and real roots. Find the value of* $\left(\frac{m}{n}\right)^2$.

[3 markah/*marks*]

Jawapan/*Answer*:

2 (a) Dengan menggunakan kaedah garis nombor, cari julat nilai x jika $(2x - 3)^2 \leqslant 8(3 - 2x)$.
By using the method of line number, find the range of values of x if $(2x - 3)^2 \leqslant 8(3 - 2x)$.

[3 markah/*marks*]

(b) Dengan menggunakan kaedah penyempurnaan kuasa dua, cari titik minimum atau maksimum bagi $f(x) = \frac{1}{3}x^2 + 2x - 1$. Seterusnya, nyatakan persamaan paksi simetri.

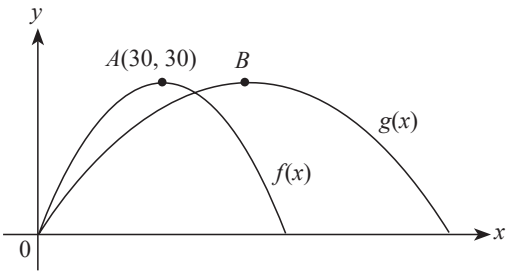
By using the method of completing the square, find the minimum or maximum point of $f(x) = \frac{1}{3}x^2 + 2x - 1$.

Hence, state the equation of axis of symmetry.

[4 markah/*marks*]

Jawapan/*Answer*:

3 Rajah di bawah menunjukkan graf bagi fungsi kuadratik, $f(x)$ dan $g(x)$. A dan B masing-masing adalah titik maksimum bagi fungsi kuadratik $f(x)$ dan $g(x)$.
The diagram below shows the graph of the quadratic functions, $f(x)$ and $g(x)$. A and B are the maximum points of the quadratic functions $f(x)$ and $g(x)$ respectively.



(a) Tuliskan fungsi kuadratik, $f(x)$, dalam bentuk am.
Write the quadratic function, $f(x)$, in general form.

[3 markah/*marks*]

(b) Diberi $g(x) = -\frac{3}{250}x^2 + \frac{6}{5}x$, ungkapkan $g(x)$ dalam bentuk verteks, seterusnya cari jarak AB.
Given that $g(x) = -\frac{3}{250}x^2 + \frac{6}{5}x$, express $g(x)$ in vertex form, hence find the distance AB.

[3 markah/*marks*]

Jawapan/*Answer*:

4 Diberi fungsi kuadratik $f(x) = x^2 - 5x + 2a$ dan $g(x) = x^2 - 5x + 2a + 3$.
Given quadratic functions $f(x) = x^2 - 5x + 2a$ *and* $g(x) = x^2 - 5x + 2a + 3$.

(a) Tuliskan fungsi $f(x)$ dan $g(x)$ yang sesuai pada graf fungsi kuadratik dalam ruang jawapan di bawah.
Write the suitable functions $f(x)$ *and* $g(x)$ *on the graph of quadratic function in the answer space below.*

[2 markah/*marks*]

(b) Berdasarkan rajah di (a) dalam ruang jawapan, cari
Based on the diagram in (a) *in the answer space, find*

(i) nilai m,
the value of m,

(ii) nilai k.
the value of k.

[2 markah/*marks*]

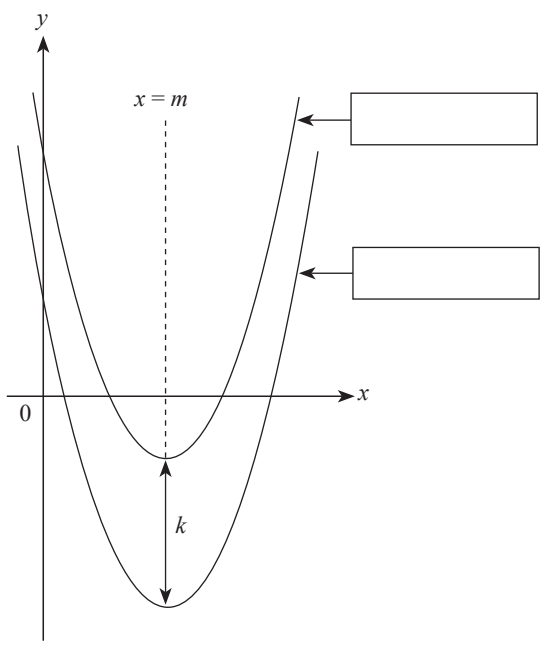
(c) Jika nilai minimum bagi fungsi $f(x)$ ialah $-\frac{13}{4}$, cari nilai a.

If the minimum value of $f(x)$ *is* $-\frac{13}{4}$, *find the value of a.*

[3 markah/*marks*]

Jawapan/*Answer*:

(a)



5 (a) Jika α dan β adalah punca-punca bagi persamaan kuadratik $x^2 + hx + 6 = 0$, manakala $\frac{1}{\alpha}$ dan $\frac{1}{\beta}$ adalah punca-punca bagi persamaan kuadratik $x^2 + \frac{h}{6}x + \frac{1}{h+1} = 0$, cari nilai h.

If α and β are the roots for the quadratic equation $x^2 + hx + 6 = 0$, while $\frac{1}{\alpha}$ and $\frac{1}{\beta}$ are the roots for the quadratic equation $x^2 + \frac{h}{6}x + \frac{1}{h+1} = 0$, find the value of h.

[2 markah/*marks*]

(b) Cari julat untuk nilai x bagi ketaksamaan $15x^2 - 5 > -2(16x - 1)$ dengan menggunakan kaedah garis nombor.
Find the range of the values of x for the inequality $15x^2 - 5 > -2(16x - 1)$ by using the line number method.

[3 markah/*marks*]

(c) Buat generalisasi bagi fungsi kuadratik $f(x) = a(x - b)^2 + c$ apabila
Make a generalisation for the quadratic function $f(x) = a(x - b)^2 + c$ when

(i) a bertambah,
a increases,

(ii) b dan c berkurang.
b and c decrease.

[3 markah/*marks*]

Jawapan/*Answer*:

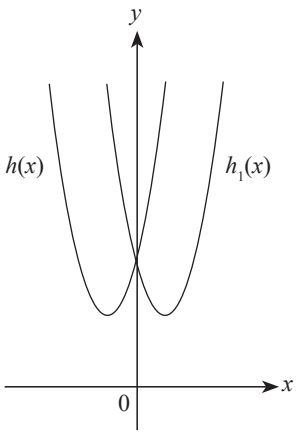
6 (a) (i) Lakarkan graf bagi $f(x) = -5x^2 + 4x - 5$.
Sketch the graph of $f(x) = -5x^2 + 4x - 5$.

[3 markah/*marks*]

(ii) Graf fungsi $g(x)$ merupakan pantulan bagi fungsi $f(x)$ pada garis $y = -2$. Cari fungsi kuadratik $g(x)$.
The graph function $g(x)$ *is a reflection of the function* $f(x)$ *on the line* $y = -2$. *Find the quadratic function of* $g(x)$.

[1 markah/*mark*]

(b) Rajah di bawah menunjukkan graf fungsi kuadratik $h(x) = 3x^2 + (3m^2 - 7m - 2)x + 3$ yang dipantulkan pada garis $x = 0$ membentuk fungsi kuadratik $h_1(x) = 3x^2 - 4x + 3$.
The diagram below shows the graph of a quadratic function $h(x) = 3x^2 + (3m^2 - 7m - 2)x + 3$ *reflected on the line* $x = 0$ *that formed a quadratic function* $h_1(x) = 3x^2 - 4x + 3$.

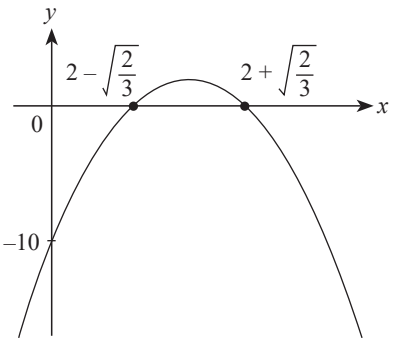


Cari nilai-nilai bagi m.
Find the values of m.

[3 markah/*marks*]

Jawapan/*Answer*:

7 Rajah di bawah menunjukkan graf bagi fungsi kuadratik $f(x)$.
The diagram below shows a graph of quadratic function $f(x)$.



(a) Nyatakan fungsi $f(x)$ dalam bentuk verteks.
State the function $f(x)$ in the vertex form.

[4 markah/*marks*]

(b) Graf bagi fungsi kuadratik $f(x)$ digerakkan secara menegak ke bawah sehingga titik maksimum menyentuh paksi-x. Nyatakan fungsi kuadratik yang baharu.
The graph of the quadratic function $f(x)$ is moved vertically downward until the maximum point touches the x-axis. State the new quadratic function.

[1 markah/*mark*]

(c) Jika $g(x) = -2f(x) + 3$, cari titik minimum $g(x)$.
If $g(x) = -2f(x) + 3$, find the minimum point of $g(x)$.

[2 markah/*marks*]

Jawapan/*Answer*:

8 (a) Titik $A(1, 2)$, $B(0, -3)$ dan $C\left(\frac{7}{2}, -3\right)$ terletak pada fungsi kuadratik $f(x) = ax^2 + bx + c$. Tanpa menggunakan kaedah penyelesaian persamaan serentak, cari nilai a, b dan c.

Points $A(1, 2)$, $B(0, -3)$ *and* $C\left(\frac{7}{2}, -3\right)$ *lies on the quadratic function* $f(x) = ax^2 + bx + c$. *Without using the method of solving simultaneous equations, find the values of a, b and c.*

[5 markah/*marks*]

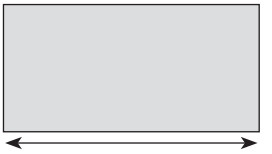
(b) Seterusnya , jika α dan β adalah punca-punca bagi persamaan kuadratik $f(x) = ax^2 + bx + c$, bentukkan fungsi kuadratik yang baharu dengan punca-punca $\frac{1}{2}\alpha + 3$ dan $\frac{1}{2}\beta + 3$.

Hence, if α *and* β *are the roots of the quadratic equation* $f(x) = ax^2 + bx + c$, *form a new quadratic function with roots* $\frac{1}{2}\alpha + 3$ *and* $\frac{1}{2}\beta + 3$.

[4 markah/*marks*]

Jawapan/*Answer*:

9 Rajah di bawah menunjukkan sebuah bingkai gambar berbentuk segi empat tepat.
The diagram below shows a rectangular picture frame.



Perimeter bingkai gambar itu ialah 260 cm.
The perimeter of the picture frame is 260 cm.

(a) Jika panjang bingkai gambar ialah x cm, cari persamaan bagi luas bingkai gambar, $A(x)$ cm^2, dalam sebutan x.
If the length of the picture frame is x cm*, find the equation for the area of picture frame,* $A(x)$ cm^2*, in terms of* x.
[2 markah/*marks*]

(b) Lakarkan graf bagi fungsi $A(x)$.
Sketch the graph of the function $A(x)$.
[3 markah/*marks*]

(c) Jika luas minimum bingkai gambar ialah 861 cm^2, cari julat bagi x.
If the minimum area of the picture frame is 861 cm^2*, find the range of* x.
[3 markah/*marks*]

Jawapan/*Answer*:

10 (a) Dengan menggunakan kaedah penyempurnaan kuasa dua, tunjukkan bahawa punca-punca bagi persamaan kuadratik $a^2x^2 + 3x + 1 = 0$ ialah $\frac{-3 \pm \sqrt{9 - 4a^2}}{2a^2}$.

By using the completing square method, show that the roots of the quadratic equation $a^2x^2 + 3x + 1 = 0$ *is* $\frac{-3 \pm \sqrt{9 - 4a^2}}{2a^2}$.

[3 markah/*marks*]

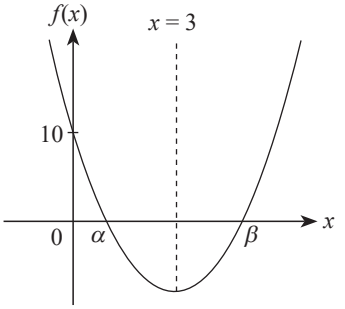
(b) Cari julat nilai a apabila fungsi $y = a^2x^2 + 3x + 1$ tidak bersilang dengan garis $y = ax - \frac{5}{4}$.

Find the range of values of a when the function $y = a^2x^2 + 3x + 1$ *does not intersect the line* $y = ax - \frac{5}{4}$.

[4 markah/*marks*]

Jawapan/*Answer*:

11 (a) Rajah di bawah menunjukkan graf fungsi kuadratik $f(x) = m(x - \alpha)(x - \beta)$ dan paksi simetri $x = 3$.
The diagram below shows the graph of a quadratic function $f(x) = m(x - \alpha)(x - \beta)$ and axis of symmetry $x = 3$.



Diberi $\alpha^2 + \beta^2 = 26$, cari
Given $\alpha^2 + \beta^2 = 26$, find
(i) hasil tambah punca,
sum of roots,
(ii) hasil darab punca.
product of roots.

[4 markah/*marks*]

(b) Tuliskan $f(x) = m(x - \alpha)(x - \beta)$ dalam bentuk verteks.
Write $f(x) = m(x - \alpha)(x - \beta)$ in vertex form.

[3 markah/*marks*]

(c) Jika graf itu digerakkan ke kanan sehingga paksi simetri ialah $x = \beta$, nyatakan fungsi baharu bagi graf tersebut.
If the graph is moved to the right until the axis of symmetry is $x = \beta$, state the new function for the graph.

[1 markah/*mark*]

Jawapan/*Answer*:

12 Diberi bahawa $f(x) = 28x^2 - 13x - 5$.
It is given that $f(x) = 28x^2 - 13x - 5$.

(a) Cari julat nilai x, dengan keadaan $f(x) < 1$.
Find the range of values of x, such that $f(x) < 1$.

[2 markah/*marks*]

(b) Sebiji bola telah disepak pada suatu kedudukan. Pergerakan bola tersebut telah membentuk parabola dengan fungsi $f(x) = -x^2 + (5 - h - k)x + 6 + k$, dengan keadaan h dan k ialah pemalar, mempunyai punca-punca α dan β.
A ball has been kicked at a position. The movement of the ball has formed a parabola with a function of $f(x) = -x^2 + (5 - h - k)x + 6 + k$, *such that h and k are constants, has roots* α *and* β.

(i) Nyatakan $\alpha + \beta$ dan $\alpha\beta$, dalam sebutan h dan/atau k.
State $\alpha + \beta$ *and* $\alpha\beta$, *in terms of h and/or k.*

(ii) Jika tinggi maksimum bola tersebut ialah $\frac{1}{4}(5 - h - k)^2$ unit, tunjukkan bahawa bola itu disepak dari permukaan tanah.
If the maximum height of the ball is $\frac{1}{4}(5 - h - k)^2$ *unit, show that the ball is kicked from the surface of ground.*

[7 markah/*mark*]

Jawapan/*Answer*:

BAB 3

Sistem Persamaan
Systems of Equations

VIDEO PEMBELAJARAN

LATIHAN INTENSIF

1 Selesaikan sistem persamaan linear yang berikut dengan menggunakan kaedah penggantian.
Solve the following system of linear equations using the substitution method.

$$4q - 2p - r = -8$$
$$3p + 6r - q = 2$$
$$9p - 2q = 4$$

[5 markah/*marks*]

Jawapan/*Answer* :

---

2 Selesaikan sistem persamaan linear berikut dengan menggunakan kaedah penggantian.
Solve the following system of linear equations using the substitution method.

$$2x - y - 2z = 2$$
$$3x + 2y = 5$$
$$2y - 3z = 20$$

[5 markah/*marks*]

Jawapan/*Answer* :

3 Selesaikan sistem persamaan linear yang berikut dengan menggunakan kaedah penghapusan.
Solve the following system of linear equations using the elimination method.

$$x + y + z = 250$$
$$15x + 10y + 8z = 2\,825$$
$$y = 2x$$

[5 markah/*marks*]

Jawapan/*Answer*:

---

4 Selesaikan sistem persamaan linear berikut dengan menggunakan kaedah penghapusan.
Solve the following system of linear equations using the elimination method.

$$2x - y + z = -3$$
$$2x + 2y + 3z = 2$$
$$3x - 3y - z = -4$$

[5 markah/*marks*]

Jawapan/*Answer*:

5 Tunjukkan bahawa sistem persamaan linear yang berikut tidak mempunyai penyelesaian.
Show that the following system of linear equations has no solution.

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

[5 markah/*marks*]

Jawapan/*Answer*:

---

6 Selesaikan sistem persamaan linear berikut.
Solve the following system of linear equations.

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

[5 markah/*marks*]

Jawapan/*Answer*:

7 Selesaikan sistem persamaan linear yang berikut.
Solve the following system of linear equations.

$$3x + 2y + z = 90$$
$$4x + 3y + z = 122$$
$$6x + y + 4z = 148$$

[5 markah/*marks*]

Jawapan/*Answer*:

---

8 Selesaikan persamaan serentak berikut menggunakan kaedah penghapusan.
Solve the following simultaneous equations using the elimination method.

$$x + y = 4$$
$$2x^2 - y = 17$$

[5 markah/*marks*]

Jawapan/*Answer*:

9 Selesaikan persamaan serentak berikut menggunakan kaedah penghapusan.
Solve the following simultaneous equations using the elimination method.

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

[4 markah/*marks*]

Jawapan/*Answer* :

---

10 Selesaikan persamaan serentak berikut menggunakan kaedah penggantian. Berikan jawapan dalam tiga tempat perpuluhan.
Solve the following simultaneous equations using the substitution method. Give the answers in three decimal places.

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

[5 markah/*marks*]

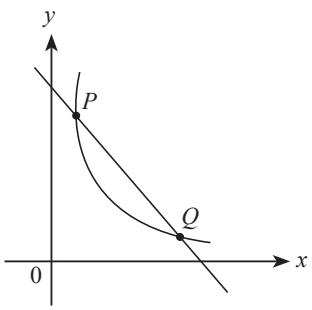
Jawapan/*Answer* :

11 Selesaikan persamaan serentak $x + 3y = 5$ dan $x^2 + y^2 - 6x + 4y = 0$. Beri jawapan betul kepada 4 angka bererti.
Solve the simultaneous equations $x + 3y = 5$ *and* $x^2 + y^2 - 6x + 4y = 0$. *Give the answers correct to* 4 *significant figures.*
[5 markah/*marks*]

Jawapan/*Answer*:

---

12 Rajah di bawah menunjukkan satu garis $3x + y = 3$ menyilang lengkung $\frac{2}{3x} + \frac{1}{y} = 2$ pada dua titik, P dan Q.
The diagram below shows a line $3x + y = 3$ *intersects the curve* $\frac{2}{3x} + \frac{1}{y} = 2$ *at two points,* P *and* Q.



Cari koordinat bagi
Find the coordinates of
(a) P dan/*and* Q,
(b) titik tengah PQ.
the midpoint of PQ.

[8 markah/*marks*]

Jawapan/*Answer*:

13 Jadual di bawah menunjukkan nilai-nilai x bagi persamaan $y = x^2 + 3x + 2$ dan $2x - y + 8 = 0$.
The table below shows the values of x for the equation $y = x^2 + 3x + 2$ *and* $2x - y + 8 = 0$.

x	–4	–3	–2	–1	0	1	2	3
$y = x^2 + 3x + 2$								
$y = 2x + 8$								

(a) Lengkapkan nilai-nilai y dalam jadual di atas.
Complete the values of y in the table above.

[2 markah/*marks*]

(b) Gunakan kertas graf yang disediakan pada ruang jawapan untuk menjawab soalan ini.
Use graph paper provided on the answer space to answer this question.
Menggunakan skala 2 cm kepada 1 unit pada paksi-x dan 2 cm kepada 2 unit pada paksi-y, lukiskan graf $y = x^2 + 3x + 2$ dan $2x - y + 8 = 0$ untuk $-4 \leqslant x \leqslant 3$.
Using a scale of 2 cm *to* 1 *unit on the x-axis and* 2 cm *to* 2 *units on the y-axis, draw the graph of* $y = x^2 + 3x + 2$ *and* $2x - y + 8 = 0$ *for* $-4 \leqslant x \leqslant 3$.

[5 markah/*marks*]

(c) Seterusnya, nyatakan koordinat-koordinat titik persilangan.
Hence, state the coordinates of the intersection points.

[2 markah/*marks*]

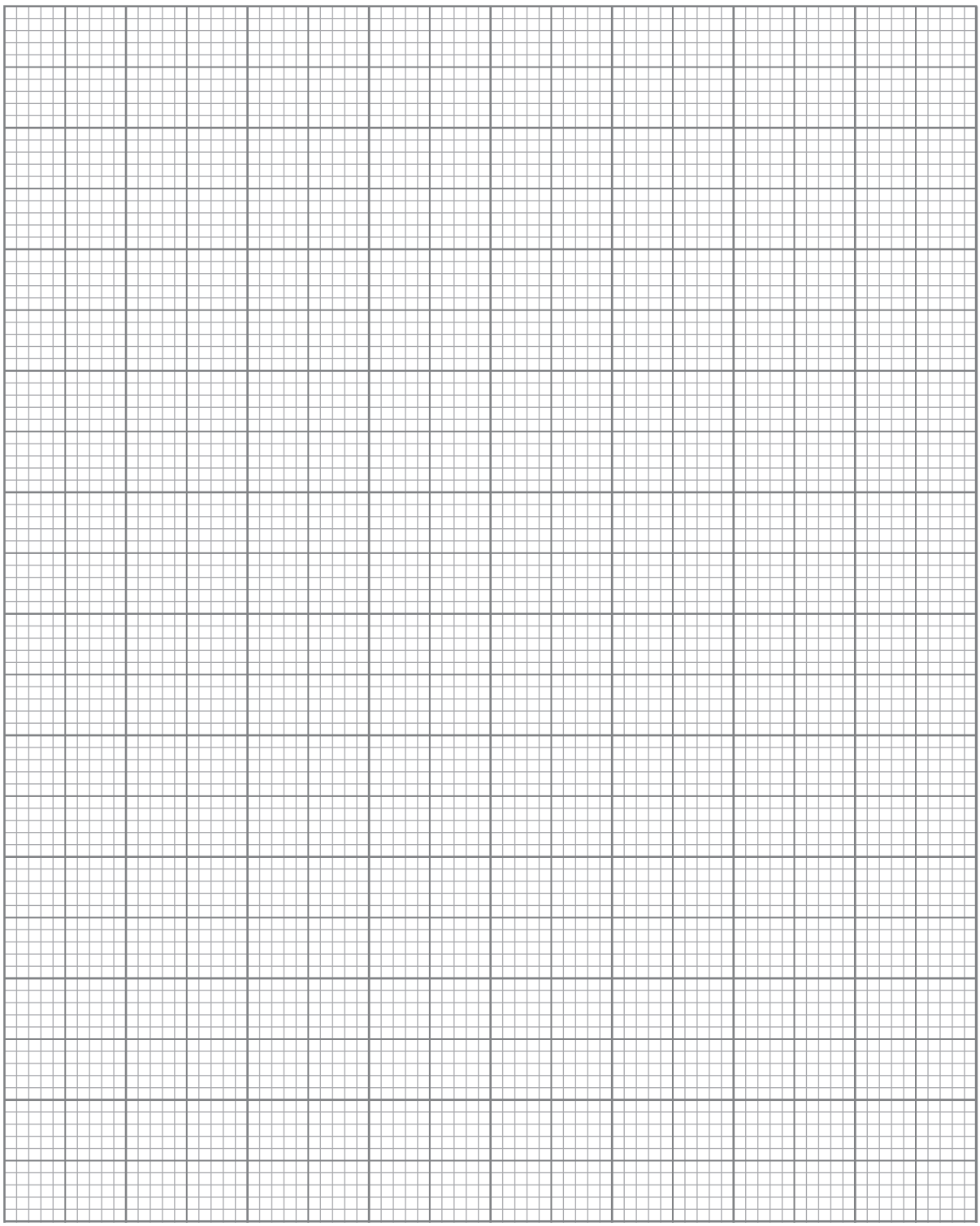
Jawapan/*Answer*:

14 Selesaikan persamaan serentak berikut dengan menggunakan kaedah perwakilan graf. Gunakan skala 2 cm kepada 0.5 unit pada kedua-dua paksi untuk $-1.5 \leqslant x \leqslant 1.5$. Kertas graf disediakan di ruang jawapan.
Solve the simultaneous equations using the graphical representation method. Use a scale of 2 cm *to* 0.5 *unit on both axes for* $-1.5 \leqslant x \leqslant 1.5$. *Graph paper is provided in the answer space.*

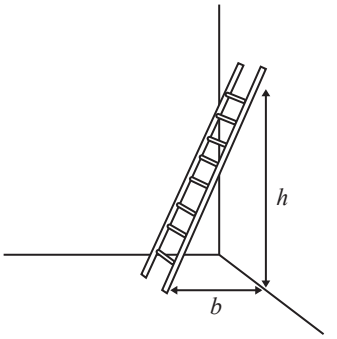
$$2x + 2y = 2$$
$$5x^2 - 3y + 1 = 0$$

[8 markah/*marks*]

Jawapan/*Answer*:



15 Rajah di bawah menunjukkan sebuah tangga sepanjang 5 m disandarkan pada dinding.
The diagram below shows a 5 m *ladder is leaning against a wall.*



Jarak dari dinding ke hujung bahagian bawah tangga adalah setengah daripada jarak dari hujung bahagian atas tangga ke tanah. Cari jarak dari hujung bahagian atas tangga ke tanah.
The distance from the wall to the end of foot of the ladder is half of the distance from the top of the ladder to the ground. Find the distance from the top of the ladder to the ground.

[4 markah/*marks*]

Jawapan/*Answer*:

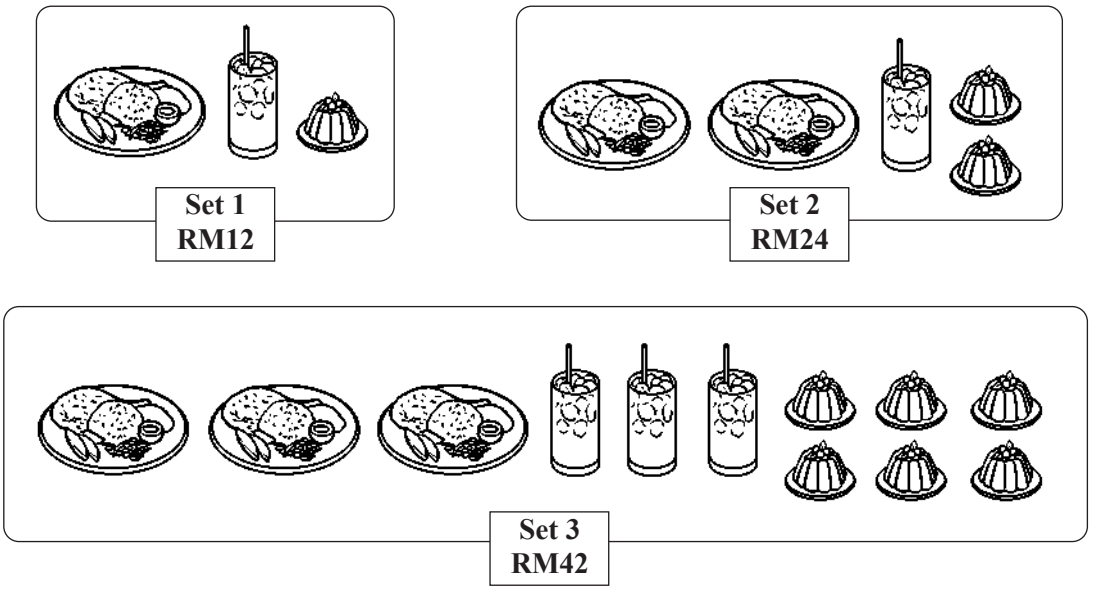
16 Noah ingin memagari kawasan tanaman sayur-sayurannya di atas sebidang tanah yang berbentuk segi tiga bersudut tegak. Diberi sisi paling panjang tanah itu ialah y meter. Dua lagi sisi bagi tanah itu masing-masing ialah x meter dan $(2x - 1)$ meter. Dia menggunakan dawai berduri sepanjang 40 meter untuk memagari sekeliling tanah itu. Cari panjang, dalam meter, bagi setiap sisi tanah itu.

Noah wants to fence off his vegetables planting area on a plot of land in the shape of a right-angled triangle. Given the longest side of the land is y meter. The other two sides of the land are x meter and $(2x - 1)$ *meter, respectively. He fenced around the land using* 40 *meter of barbed wire. Find the length, in meter, of each side of the land.*

[8 markah/*marks*]

Jawapan/*Answer*:

17 Restoran Makan Sedap mempromosikan nasi lemak dengan menawarkan tiga pilihan set seperti berikut:
Restoran Makan Sedap promotes nasi lemak by offering three options of set as below:



Berapakah harga sepinggan nasi lemak, secawan air sirap dan sepinggan puding? Jika harga asal secawan air sirap ialah RM2, berapa peratuskah penjimatan untuk pembelian Set 1?
What is the price of a plate of nasi lemak, a cup of syrup drink and a plate of pudding? If the normal price of a cup of syrup drink is RM2*, what is the percentage of savings by purchasing Set* 1*?*

[7 markah/*marks*]

Jawapan/*Answer*:

18 Man Top Holdings telah mengadakan majlis sambutan ulang tahun jubli perak syarikat di sebuah hotel. Majlis tersebut dihadiri oleh kesemua kakitangan syarikat itu bersama ahli keluarga masing-masing. Jumlah tetamu yang hadir ialah 400 orang, dengan keadaan bilangan tetamu lelaki adalah dua kali bilangan tetamu wanita dan bilangan kanak-kanak adalah lebih 50 berbanding tetamu lelaki. Berapakah bilangan tetamu lelaki, tetamu wanita dan kanak-kanak yang menghadiri majlis tersebut?

Man Top Holdings held a celebration for the company's silver jubilee at a hotel. The event was attended by all the company's staff along with their family members. The total number of guests was 400*, with the number of male guests being twice the number of female guests and the number of children being* 50 *more than the number of male guests. What were the numbers of male guests, female guests and children attending the event?*

[7 markah/*marks*]

Jawapan/*Answer*:

BAB 4

Indeks, Surd dan Logaritma

Indices, Surds and Logarithms

VIDEO PEMBELAJARAN

Imbas Kembali

1 Tanpa menggunakan kalkulator, selesaikan yang berikut.
Without using calculator, solve the following.
(a) $x^4 = 81$
(b) $3^x \times 3^2 = 243$

Jawapan/*Answer* :

---

2 Diberi $(x^p)^2 \times x^{-3} = x^5$, cari nilai p.
Given $(x^p)^2 \times x^{-3} = x^5$, *find the value of* p.

Jawapan/*Answer* :

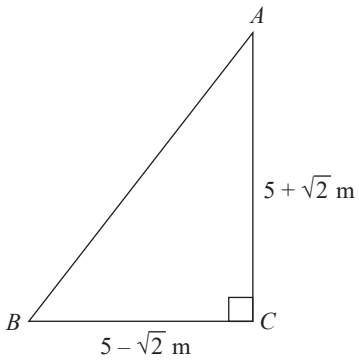
---

3 Diberi $(x^m)^3 \div x^4 = (x^4)^4$, cari nilai m.
Given $(x^m)^3 \div x^4 = (x^4)^4$, *find the value of* m.

Jawapan/*Answer* :

LATIHAN INTENSIF

1 Rajah di bawah menunjukkan sebuah segi tiga *ABC*.
The diagram below shows a triangle ABC.



Tentukan panjang *AB*, dalam m, dalam bentuk surd termudah.
Determine the length of AB, in m*, in the simplest form of surd.*

[2 markah/*marks*]

Jawapan/*Answer* :

---

2 Sebuah segi tiga mempunyai panjang x cm, lebar $2x$ cm dan pepenjuru 15 cm. Cari
A triangle has a length x cm*, width* $2x$ cm *and diagonal* 15 cm*. Find*

(a) nilai x, dalam bentuk surd termudah,
the value of x, in the simplest form of surd,

(b) luas segi tiga, dalam cm^2.
the area of triangle, in cm^2.

[4 markah/*marks*]

Jawapan/*Answer* :

3 Selesaikan persamaan $3^{2x-1} = 2^{3x+1}$. Berikan jawapan anda kepada 3 angka bererti.
Solve the equation $3^{2x-1} = 2^{3x+1}$. *Give your answer to* 3 *significant figures.*

[3 markah/*marks*]

Jawapan/*Answer*:

---

4 Selesaikan persamaan yang berikut dengan memberikan jawapan kepada 3 angka bererti.
Solve the following equations by giving the answers to 3 *significant figures.*

(a) $4e^{5t} = 30$
(b) $\ln (5x - 2) = 7$
(c) $\ln (2x - 3)^2 = 5$

[7 markah/*marks*]

Jawapan/*Answer*:

5 Suhu, T°C bagi secawan minuman panas, t minit selepas dibancuh diberikan oleh
The temperature, T°C of a cup of hot drink, t minutes after it is made is given by

$$T = 65e^{-0.03t} + 10$$

(a) Cari suhu minuman itu apabila baru dibancuh.
Find the temperature of the drink when it is freshly made.
(b) Cari suhu minuman itu apabila $t = 5$.
Find the temperature of the drink when $t = 5$.
(c) Cari nilai t apabila $T = 55$.
Find the value of t when $T = 55$.

[7 markah/*marks*]

Jawapan/*Answer*:

---

6 (a) Diberi bahawa $2^n = a$ dan $5^n = b$, ungkapkan $(6.25)^n$ dalam sebutan a dan b.
Given that $2^n = a$ *and* $5^n = b$, *express* $(6.25)^n$ *in terms of a and b.*

[2 markah/*marks*]

(b) Diberi bahawa $\log_a 3 = 0.613$. Tanpa menggunakan kalkulator,
Given that $\log_a 3 = 0.613$. *Without using a calculator,*
(i) tunjukkan bahawa $\log_a 27a = 2.839$,
show that $\log_a 27a = 2.839$,
(ii) selesaikan persamaan $\sqrt{3} \times a^{n-1} = 3$.
solve the equation $\sqrt{3} \times a^{n-1} = 3$.

[5 markah/*marks*]

Jawapan/*Answer*:

7 Simpanan wang sebuah syarikat selepas n tahun ialah RM3 000$(1 + 0.07)^n$. Tentukan bilangan tahun minimum untuk simpanan syarikat itu melebihi RM6 500.
A company's savings after n years is RM3 000$(1 + 0.07)^n$. *Determine the minimum number of years for the company's savings to exceed* RM6 500.

[3 markah/*marks*]

Jawapan/*Answer* :

---

8 Tanpa menggunakan kalkulator atau jadual nilai, permudahkan
Without using calculator or figure tables, simplify

$$\frac{\log_9 64 \times \log_{49} 9}{\log_7 2}$$

[3 markah/*marks*]

Jawapan/*Answer* :

9 Jika $\log_4 x = p$ dan $\log_2 \sqrt{y} = q$, ungkapkan $\frac{\sqrt{x}}{y^4}$ dalam sebutan p dan q.

If $\log_4 x = p$ *and* $\log_2 \sqrt{y} = q$, *express* $\frac{\sqrt{x}}{y^4}$ *in terms of p and q.*

[4 markah/*marks*]

Jawapan/*Answer*:

---

10 Diberi $\log_8 2 = h$ dan $\log_3 4 = k$, ungkapkan $\log_3 2$ dalam sebutan h dan k.
Given $\log_8 2 = h$ *and* $\log_3 4 = k$, *express* $\log_3 2$ *in terms of h and k.*

[3 markah/*marks*]

Jawapan/*Answer*:

BAB 5

Janjang
Progressions

VIDEO PEMBELAJARAN

LATIHAN INTENSIF

1 Tiga sebutan pertama suatu janjang aritmetik ialah 3, 8, 13. Cari
The first three terms of an arithmetic progression are 3, 8, 13. *Find*
(a) beza sepunya janjang itu,
the common difference of the progression,
(b) sebutan ke-20 janjang itu.
the 20^{th} *term of the progression.*

[3 markah/*marks*]

Jawapan/*Answer* :

---

2 Tiga sebutan pertama suatu janjang aritmetik ialah $(2x - 3)$, $(x + 2)$, 7. Cari, dalam sebutan x,
The first three terms of an arithmetic progression are $(2x - 3)$, $(x + 2)$, 7. *Find, in terms of* x,
(a) beza sepunya janjang itu,
the common difference of the progression,
(b) hasil tambah 12 sebutan pertama janjang itu.
the sum of the first 12 *terms of the progression.*

[3 markah/*marks*]

Jawapan/*Answer* :

3 Hasil tambah n sebutan pertama bagi suatu janjang aritmetik diberi oleh $S_n = \frac{2}{n}(10n - 3)$.

The sum of the first n terms of an arithmetic progression is given by $S_n = \frac{2}{n}(10n - 3)$.

Cari
Find

(a) hasil tambah 11 sebutan pertama,
the sum of the first 11 *terms,*

(b) sebutan ke-11.
the 11th *term.*

[4 markah/*marks*]

Jawapan/*Answer*:

---

4 Diberi q, $p - 3$ dan $4p + 3q$ ialah tiga sebutan berturutan bagi satu janjang aritmetik.
Given that q, $p - 3$ *and* $4p + 3q$ *are three consecutive terms of an arithmetic progression.*

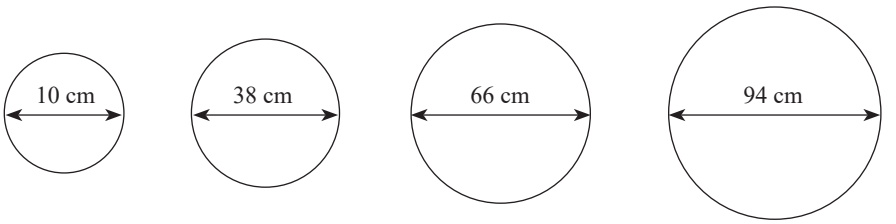
(a) Ungkapkan p dalam sebutan q.
Express p *in terms of* q.

(b) Cari beza sepunya janjang itu jika $q = 2$.
Find the common difference of the progression if $q = 2$.

[4 markah/*marks*]

Jawapan/*Answer*:

5 Rajah di bawah menunjukkan empat bentuk bulatan.
The diagram below shows four circular shapes.



Lilitan bulatan-bulatan itu membentuk suatu janjang aritmetik. Sebutan-sebutan janjang itu disusun secara menaik.
The circumference of the circles form an arithmetic progression. The terms of the progression are in ascending order.

(a) Tulis empat sebutan pertama janjang itu, dalam sebutan π.
Write down the first four terms of the progression, in terms of π.

(b) Cari beza sepunya janjang itu, dalam sebutan π.
Find the common difference of the progression, in terms of π.

[3 markah/*marks*]

Jawapan/*Answer*:

---

6 Hasil tambah *n* sebutan pertama bagi janjang geometri 2.5, 7.5, 22.5, ... ialah 2 732.5. Cari
The sum of the first n terms of a geometric progression 2.5, 7.5, 22.5, ... *is* 2 732.5. *Find*

(a) nisbah sepunya janjang itu,
the common ratio of the progression,

(b) nilai *n*.
the value of n.

[3 markah/*marks*]

Jawapan/*Answer*:

7 Diberi $1, x^2, x^4, \ldots$ adalah sebutan berturutan bagi suatu janjang geometri dan hasil tambah ketakterhinggaan janjang ini ialah 20.
Given that $1, x^2, x^4, \ldots$ *are the consecutive terms of a geometric progression and the sum to infinity of this progression is* 20.
Cari
Find
(a) nisbah sepunya, dalam sebutan x,
the common ratio, in terms of x,
(b) nilai positif x.
the positive value of x.

[3 markah/*marks*]

Jawapan/*Answer*:

---

8 Tiga sebutan pertama suatu janjang geometri ialah m, -15, 45.
The first three terms of a geometric progression are m, -15, 45.
(a) Cari nilai m,
Find the value of m,
(b) Seterusnya, cari hasil tambah dari sebutan ke-4 hingga sebutan ke-6.
Hence, find the sum from the 4^{th} *term to the* 6^{th} *term.*

[4 markah/*marks*]

Jawapan/*Answer*:

9 Dalam suatu janjang geometri, hasil tambah sebutan kedua dan ketiga ialah 12, dan hasil tambah sebutan ketiga dan keempat ialah 60. Cari
In a geometric progression, the sum of the second and third terms is 12*, and the sum of the third and fourth terms is* 60*. Find*

(a) sebutan pertama dan nisbah sepunya janjang itu,
the first term and the common ratio of the progression,

(b) sebutan keenam bagi janjang itu.
the sixth term of the progression.

[6 markah/*marks*]

Jawapan/*Answer* :

---

10 Diberi $\frac{1}{x}, \frac{1}{x^2}, \frac{1}{x^3}, \ldots$ ialah sebutan berturutan bagi suatu janjang geometri dan hasil tambah ketakterhinggaan ialah 1.
Given that $\frac{1}{x}, \frac{1}{x^2}, \frac{1}{x^3}, \ldots$ *are consecutive terms of a geometric progression and its sum to infinity is* 1.

Cari
Find

(a) nisbah sepunya, dalam sebutan x,
the common ratio, in terms of x,

(b) nilai positif x.
the positive value of x.

[3 markah/*marks*]

Jawapan/*Answer* :

11 Sebuah bulatan dibahagikan kepada 15 sektor, dengan keadaan setiap sudut sektor yang dicakupi pada pusat bulatan membentuk suatu janjang aritmetik. Diberi sudut sektor yang terbesar ialah 38°. Cari
A circle is divided into 15 *sectors, with each angle subtended at the centre of the circle forming an arithmetic progression. Given that the angle of the biggest sector is* 38°. *Find*

(a) sudut sektor yang terkecil,
the angle of the smallest sector,

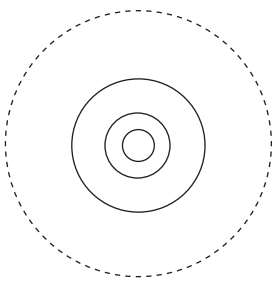
(b) jumlah nilai sudut bagi lima sektor selepas sektor yang terkecil.
the total values of the angles of the five sectors after the smallest sector.

[5 markah/*marks*]

Jawapan/*Answer*:

---

12 Rajah di bawah menunjukkan bulatan-bulatan yang mempunyai pusat yang sama.
The diagram below shows circles with the same centre.



Jejari bulatan yang pertama ialah 2 cm dan jejari bulatan yang berikutnya adalah dua kali jejari bulatan yang sebelumnya.
The radius of the first circle is 2 cm *and the radius of each subsequent circle is twice the radius of the previous circle.*

(a) Tunjukkan bahawa luas bulatan-bulatan itu membentuk suatu janjang geometri.
Show that the areas of these circles forming a geometric progression.

(b) Diberi bahawa bulatan ke-n mempunyai luas $4\,096\pi$ cm^2, cari nilai n.
Given that the area of the n^{th} *circle is* $4\,096\pi$ cm^2, *find the value of n.*

(c) Cari lilitan bulatan kelapan, dalam sebutan π.
Find the circumference of the eighth circle, in terms of π.

[9 markah/*marks*]

Jawapan/*Answer*:

13 Diberi bahawa …, 1 365, k, 12 285, … ialah tiga sebutan berturutan dalam suatu janjang geometri. Hasil tambah empat sebutan pertama bagi janjang ini ialah 18 200, dengan keadaan $r > 0$. Cari
Given that …, 1 365, k, 12 285, … are three consecutive terms in a geometric progression. The sum of the first four terms of this progression is 18 200*, where* $r > 0$*. Find*

(a) nisbah sepunya,
the common ratio,

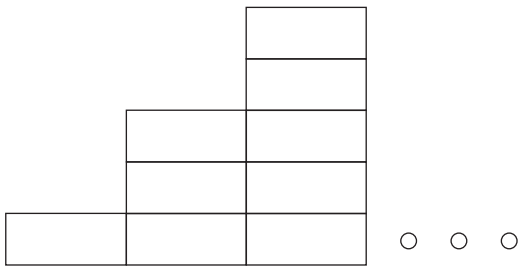
(b) sebutan pertama,
the first term,

(c) nilai n yang paling besar supaya sebutan ke-n kurang daripada 500 000.
the largest value of n so that the n^{th} *term is less than* 500 000*.*

[6 markah/*marks*]

Jawapan/*Answer* :

14 Rajah di bawah menunjukkan sebahagian daripada susunan tangga yang dibina daripada batu bata yang sama saiz.
The diagram below shows part of a staircase made from bricks of the same size.



Anak tangga pertama dibina daripada seketul bata dan bilangan bata pada setiap anak tangga yang berikutnya akan bertambah sebanyak dua ketul.
The first step is made of one brick and the number of bricks on each subsequent step increases by two.

(a) Berapakah bilangan bata yang diperlukan jika tangga itu mempunyai 15 anak tangga?
How many bricks are needed if the staircase has 15 *steps?*

(b) Jika seketul bata berharga RM0.80, tentukan jumlah kos bata untuk membina 20 anak tangga itu.
If one brick costs RM0.80*, calculate the total cost of bricks to build* 20 *steps.*

[5 markah/*marks*]

Jawapan/*Answer*:

15 $2p + q$, $6p + q$, $14p + q$ ialah tiga sebutan yang pertama bagi satu janjang geometri, dengan keadaan $p \neq q$.
$2p + q$, $6p + q$, $14p + q$ are the first three terms of a geometric progression, such that $p \neq q$.

(a) Nyatakan q dalam sebutan p.
State q in terms of p.

(b) Tentukan nisbah sepunya.
Determine the common ratio.

(c) Tunjukkan bahawa sebutan ke-$(n + 1)$ melebihi jumlah n sebutan yang pertama sebanyak $4p$.
Show that the $(n + 1)^{th}$ term is $4p$ more than the sum of the first n terms.

[7 markah/*marks*]

Jawapan/*Answer*:

---

16 Hasil tambah tiga sebutan pertama suatu janjang geometri ialah 64 kali hasil tambah tiga sebutan yang berikutnya.
The sum of the first three terms of a geometric progression is 64 times the sum of the next three terms.

(a) Cari nisbah sepunya janjang itu.
Find the common ratio of the progression.

[3 markah/*marks*]

(b) Diberi hasil tambah tiga sebutan pertama ialah $\frac{21}{8}$. Berdasarkan jawapan di (a), cari
Given the sum of the first three terms is $\frac{21}{8}$. Based on the answer in (a), find

(i) sebutan pertama janjang itu,
the first term of the progression,

(ii) hasil tambah ketakterhinggaan janjang itu.
the sum to infinity of the progression.

[4 markah/*marks*]

Jawapan/*Answer*:

17 (a) Diberi p, q dan r masing-masing adalah sebutan ke-2, sebutan ke-4 dan sebutan ke-6 bagi suatu janjang aritmetik. Jika $\frac{p+q+r}{q+1} = 4$, tentukan nilai q.

Given that p, q and r are the 2^{nd} *term,* 4^{th} *term and* 6^{th} *term of an arithmetic progression respectively If* $\frac{p+q+r}{q+1} = 4$*, determine the value of q.*

[3 markah/*marks*]

(b) (i) Diberi suatu siri janjang geometri $3 + 3^2 + 3^3 + \ldots + 3^n = 363$. Tentukan bilangan sebutan siri itu.
Given a geometric progression series $3 + 3^2 + 3^3 + \ldots + 3^n = 363$*. Determine the number of terms of the progression.*

[2 markah/*marks*]

(ii) Sebiji bola dijatuhkan ke lantai dari ketinggian 6 m. Setiap kali bola itu melantun, ketinggian bola adalah $\frac{2}{3}$ daripada ketinggian yang dicapai sebelumnya. Tentukan jarak yang dilalui oleh bola itu sehingga berhenti.
A ball is dropped to the floor from the height of 6 m*. Each time the ball bounces, the height of the ball is* $\frac{2}{3}$ *of the height it reached before. Determine the distance travelled by the ball until it stops.*

[3 markah/*marks*]

Jawapan/*Answer*:

BAB 6

Hukum Linear
Linear Law

VIDEO PEMBELAJARAN

Imbas Kembali

1 Tentukan kecerunan garis lurus yang menghubungkan titik $A(1, 2)$ dan titik $B(2, -5)$.
Determine the gradient of the straight line joining the points $A(1, 2)$ *and* $B(2, -5)$.

Jawapan/*Answer* :

---

2 Tentukan persamaan garis lurus dengan kecerunan $m = 3$ dan melalui titik $M(7, 3)$.
Determine the equation of straight line with gradient $m = 3$ *and passes through the point* $M(7, 3)$.

Jawapan/*Answer* :

3 Diberi persamaan garis lurus, $y = 2x + 6$. Lengkapkan jadual nilai di bawah dan seterusnya lukis satu garis lurus bagi persamaan tersebut.
Given the equation of straight line, $y = 2x + 6$. Complete the table of values below and hence draw a straight line of the equation.

Jawapan/*Answer*:

x	–2	–1	0	1	2
y					

LATIHAN INTENSIF

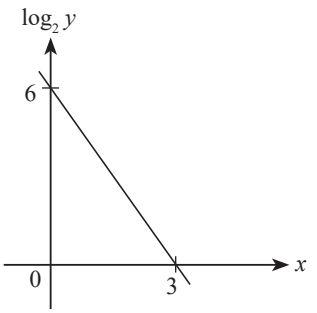
1 Tukarkan persamaan bukan linear yang berikut kepada bentuk linear $Y = mX + c$. Seterusnya, kenal pasti Y, X, m dan c.
Convert the following non-linear equations into the form $Y = mX + c$. Hence, identify Y, X, m and c.
(a) $y(a - x) = bx$
(b) $y = ae^{-bx}$

[5 markah/*marks*]

Jawapan/*Answer*:

---

2 Rajah di bawah menunjukkan satu garis lurus.
The diagram below shows a straight line.

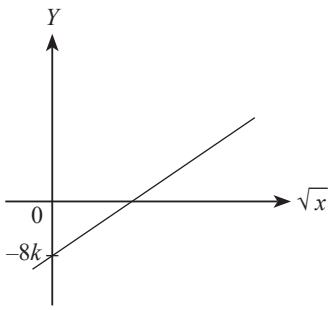


Ungkapkan y dalam sebutan x.
Express y in terms of x.

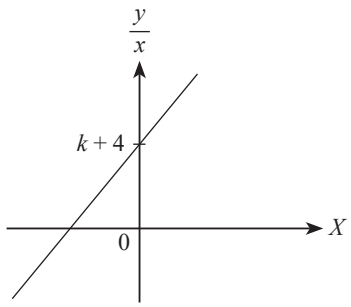
[3 markah/*marks*]

Jawapan/*Answer*:

3 Pemboleh ubah x dan y dihubungkan oleh persamaan $y = ax + b\sqrt{x}$, dengan keadaan a dan b adalah pemalar. Rajah 3(a) dan Rajah 3(b) menunjukkan graf garis lurus yang diperoleh dengan memplot hubungan daripada persamaan itu.
The variables x and y are related by the equation $y = ax + b\sqrt{x}$, *where a and b are constants. Diagram* 3(a) *and Diagram* 3(b) *show the straight line graphs obtained by plotting the relations from the equation.*



Rajah 3(a)
Diagram 3(a)



Rajah 3(b)
Diagram 3(b)

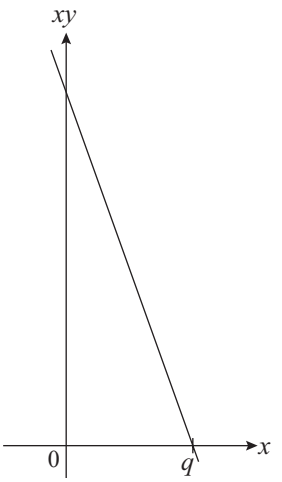
Ungkapkan a dalam sebutan b.
Express a in terms of b.

[3 markah/*marks*]

Jawapan/*Answer* :

4 Pemboleh ubah x dan y dihubungkan oleh persamaan $x^2y = -5x^2 + 10x$.
The variables x and y are related by the equation $x^2y = -5x^2 + 10x$.

(a) Rajah di bawah menunjukkan graf garis lurus yang diperoleh dengan menukar persamaan tersebut kepada bentuk linear.
The diagram below shows a straight line graph obtained by reducing the equation to a linear form.



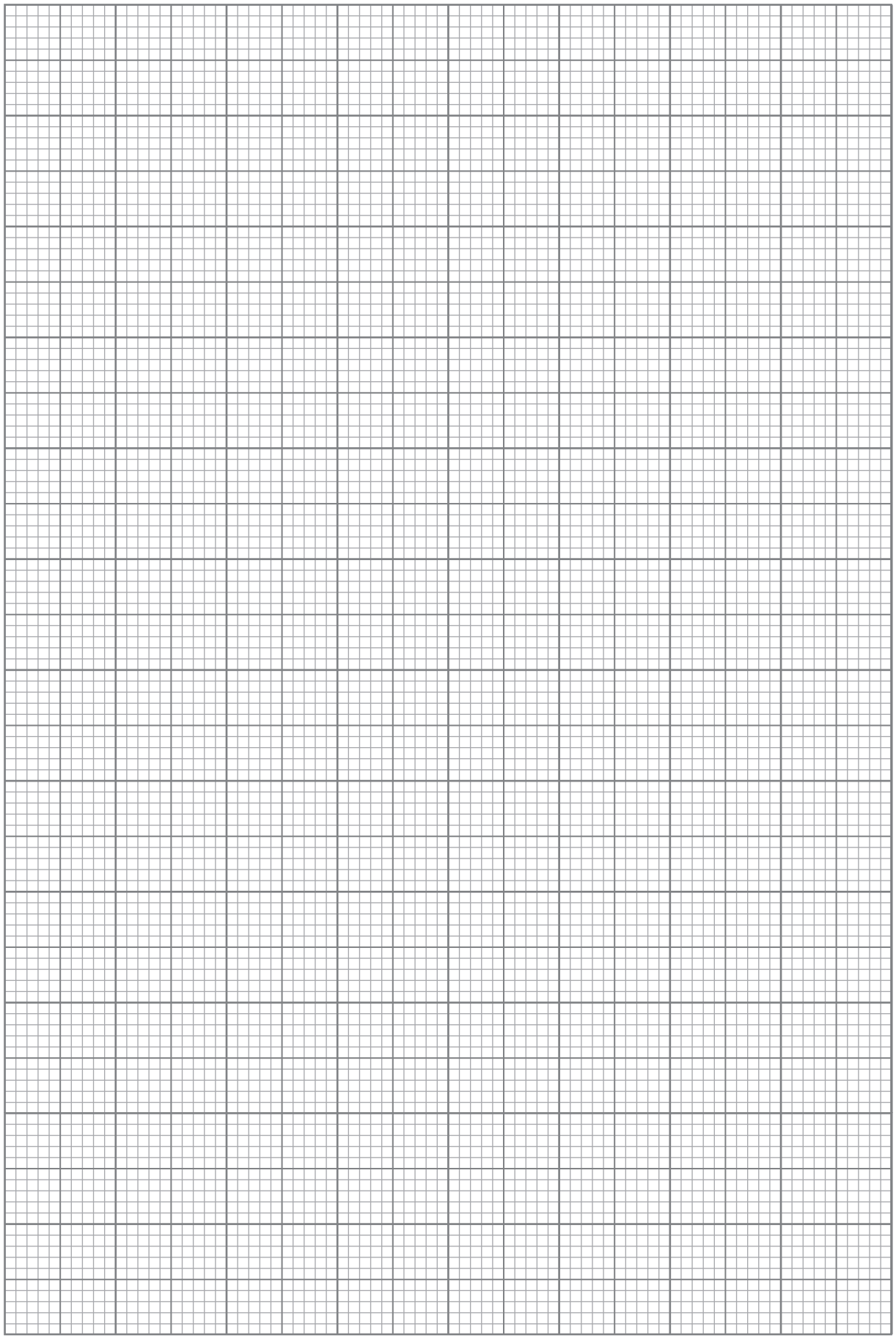
Cari nilai q.
Find the value of q.

(b) Pada kertas graf di halaman 57, lukis semula dan label graf garis lurus dengan memplot xy melawan x.
On the graph paper on the page 57*, redraw and label the graph of the straight line by plotting xy against x.*

[4 markah/*marks*]

Jawapan/*Answer*:

Graf untuk Soalan 4(a)
***Graph for Question* 4(a)**



5 Jadual di bawah menunjukkan nilai-nilai bagi dua pemboleh ubah, x dan y yang diperoleh daripada suatu eksperimen. Pemboleh ubah x dan y dihubungkan oleh persamaan $y = kx^n$, dengan keadaan k dan n ialah pemalar.

The table below shows the values of two variables, x and y obtained from an experiment. The variables x and y are related by the equation $y = kx^n$*, such that k and n are constants.*

x	1.22	1.49	1.82	2.22	3.13	4.06
y	45.00	40.85	36.97	33.45	29.96	24.78

(a) Pada kertas graf di halaman 59, plot graf ln y melawan ln x, menggunakan skala 2 cm kepada 0.2 unit pada paksi-ln x dan 2 cm kepada 0.1 unit pada paksi-ln y. Seterusnya, lukis garis lurus penyuaian terbaik.

On the graph paper on the page 59*, plot graph* ln y *against* ln x*, using a scale of* 2 cm *to* 0.2 *unit on the* ln x*-axis and* 2 cm *to* 0.1 *unit on the* ln y*-axis. Hence, draw the line of best fit.*

(b) Dengan menggunakan graf di (a), cari

By using the graph in (a)*, find*

(i) k

(ii) n

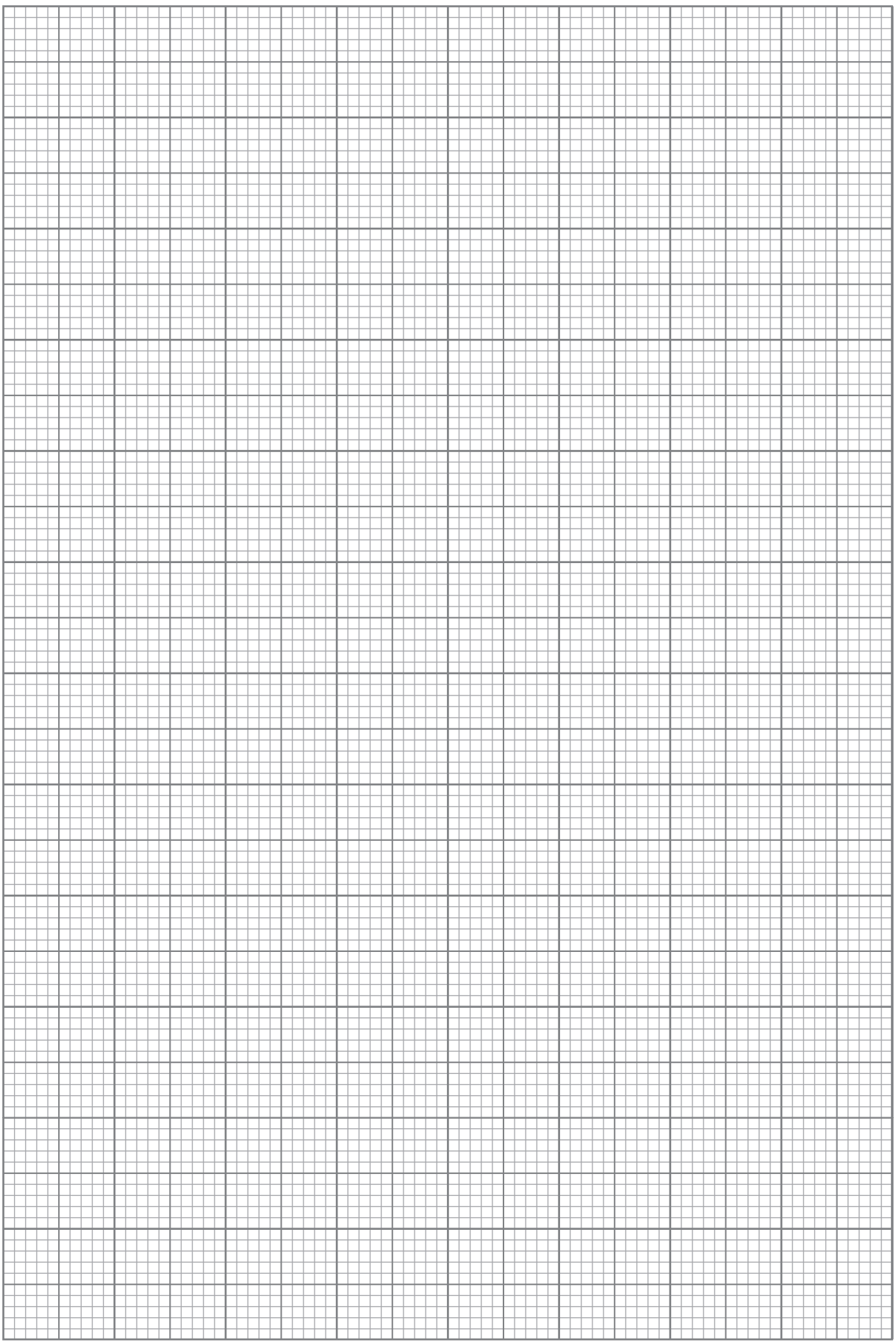
(c) Tandakan ⊗ pada graf, bagi titik yang salah dicatatkan. Seterusnya, cari nilai y yang betul.

Mark ⊗ *on the graph, for the point which was recorded wrongly. Then, find the correct value of y.*

[10 markah/*marks*]

Jawapan/*Answer*:

Graf untuk Soalan 5(a)
***Graph for Question* 5(a)**



6 Jadual di bawah menunjukkan nilai dua pemboleh ubah, x dan y yang diperoleh daripada suatu eksperimen. Pemboleh ubah x dan y dihubungkan oleh persamaan $py = \frac{1}{\sqrt{x}} + q\sqrt{x}$, dengan keadaan p dan q ialah pemalar.

The table below shows the values of two variables, x and y obtained from an experiment. The variables x and y are related by the equation $py = \frac{1}{\sqrt{x}} + q\sqrt{x}$, *such that p and q are constants.*

x	1	2	3	4.1	6	7
y	–4.4	–0.79	0.58	1.98	3.51	4.46

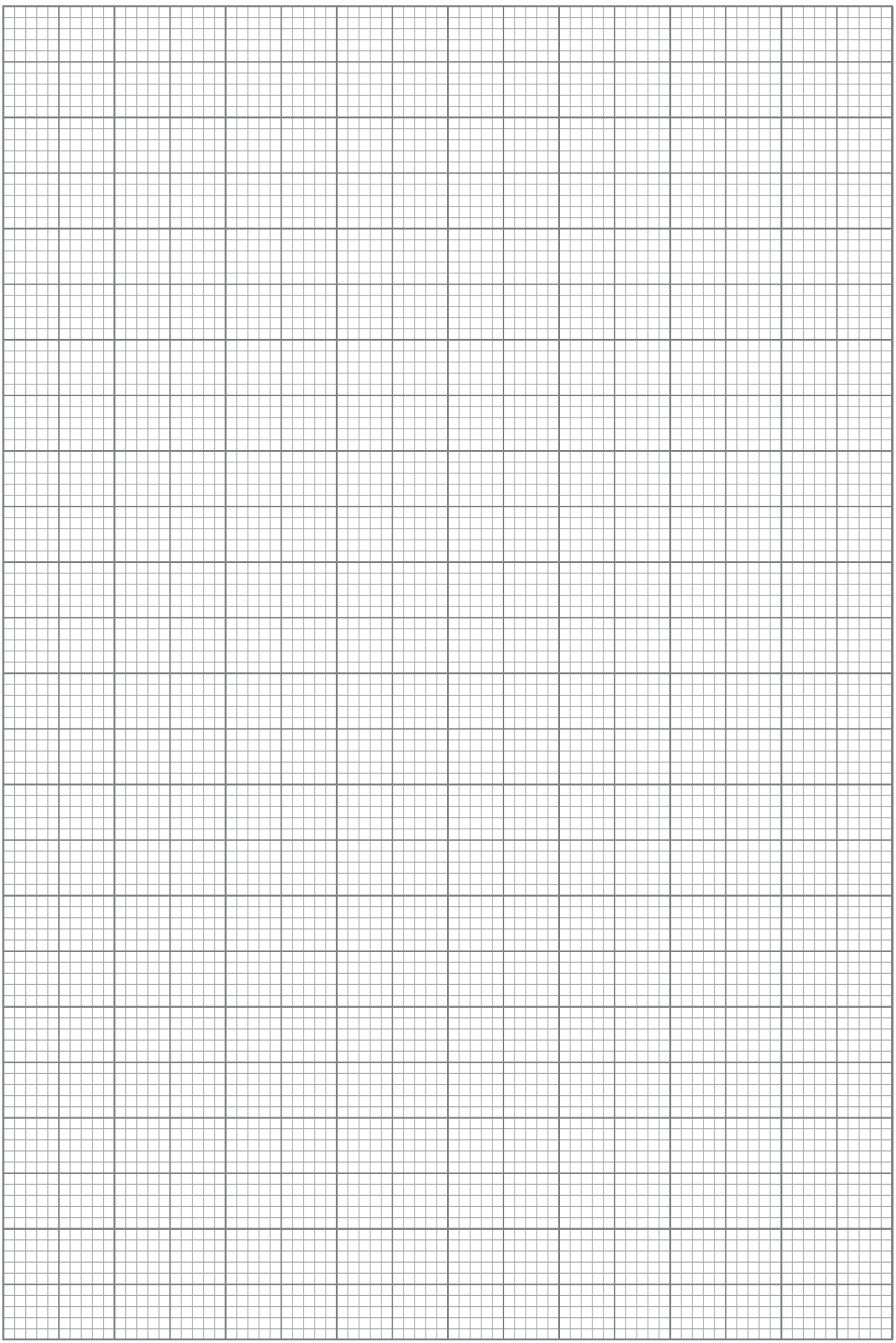
(a) Pada kertas graf di halaman 61, plot graf $y\sqrt{x}$ melawan x, menggunakan skala 2 cm kepada 1 unit pada paksi-x dan 2 cm kepada 2 unit pada paksi-$y\sqrt{x}$. Seterusnya, lukis garis lurus penyuaian terbaik.
On the graph paper on the page 61, *plot graph* $y\sqrt{x}$ *against x, using a scale of* 2 cm *to* 1 *unit on the x-axis and* 2 cm *to* 2 *units on the* $y\sqrt{x}$*-axis. Hence, draw the line of best fit.*

(b) Dengan menggunakan graf di (a),
By using the graph in (a),
(i) cari nilai y apabila $x = 6.5$,
find the value of y when $x = 6.5$,
(ii) tulis $py = \frac{1}{\sqrt{x}} + q\sqrt{x}$ dalam bentuk linear, seterusnya cari nilai p dan nilai q.
write $py = \frac{1}{\sqrt{x}} + q\sqrt{x}$ *in the linear form, hence find the value of p and of q.*

[10 markah/*marks*]

Jawapan/*Answer*:

Graf untuk Soalan 6(a)
***Graph for Question* 6(a)**



7 Jadual di bawah menunjukkan nilai-nilai bagi dua pemboleh ubah, x dan y yang diperoleh daripada satu eksperimen. Pemboleh ubah x dan y dihubungkan oleh persamaan $\frac{n}{y} = px + 1$, dengan keadaan n dan p ialah pemalar.

The table below shows the values of two variables, x and y obtained from an experiment. Variables x and y are related by the equation $\frac{n}{y} = px + 1$*, where n and p are constants.*

x	0.1	0.2	0.3	0.4	0.5	0.6
y	0.303	0.364	0.455	0.606	0.909	1.818

(a) Berdasarkan jadual, bina satu jadual bagi nilai-nilai $\frac{1}{y}$.

Based on the table, construct a table for the values of $\frac{1}{y}$.

[1 markah/*mark*]

(b) Plot $\frac{1}{y}$ melawan x, dengan menggunakan skala 2 cm kepada 0.1 unit pada paksi-x dan 2 cm kepada 0.5 unit pada paksi-$\frac{1}{y}$. Seterusnya, lukis garis lurus penyuaian terbaik.

Plot $\frac{1}{y}$ *against x, using a scale of* 2 cm *to* 0.1 *unit on the x-axis and* 2 cm *to* 0.5 *unit on the* $\frac{1}{y}$*-axis. Hence, draw the line of best fit.*

[3 markah/*marks*]

(c) Gunakan graf di (b) untuk mencari nilai
Use the graph in (b) *to find the value of*

(i) y apabila $x = 0.38$,
y *when* $x = 0.38$,

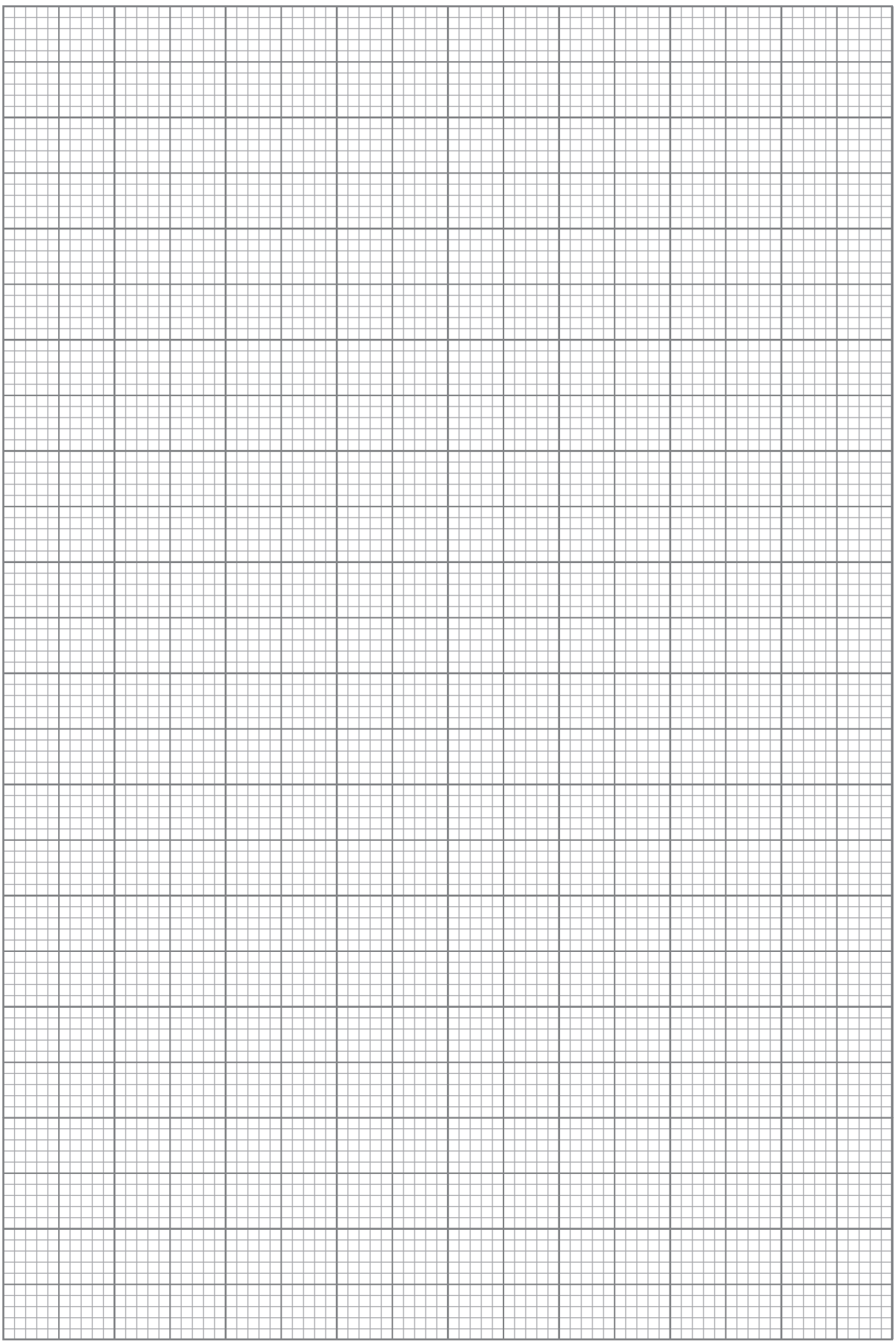
(ii) n,

(iii) p.

[6 markah/*marks*]

Jawapan/*Answer*:

Graf untuk Soalan 7(a)
***Graph for Question* 7(a)**



BAB 7

Geometri Koordinat
Coordinate Geometry

VIDEO PEMBELAJARAN

Imbas Kembali

1 Cari jarak di antara titik-titik yang berikut.
Find the distance between the following points.
(a) (0, –9) dan/*and* (1, 9)
(b) (7, 5) dan/*and* (8, 4)

Jawapan/*Answer* :

---

2 Tentukan titik tengah bagi titik-titik yang berikut.
Determine the midpoint of the following points.
(a) $P(-1, 7)$ dan/*and* $Q(-3, 1)$
(b) $A(3, 1)$ dan/*and* $B(5, 1)$

Jawapan/*Answer* :

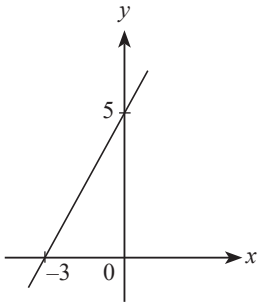
---

3 Tentukan kecerunan bagi koordinat yang berikut.
Determine the gradient of the following coordinates.
(a) $A(3, 1)$ dan/*and* $B(6, 7)$
(b) $P(4, 1)$ dan/*and* $Q(3, 5)$

Jawapan/*Answer* :

Menguasai | Belum Menguasai

4 Tentukan kecerunan bagi garis lurus yang berikut.
Determine the gradient of the following straight line.



Jawapan/*Answer*:

---

5 Tentukan persamaan garis lurus yang melalui titik-titik yang diberi.
Determine the equation of straight line passing through the points given.
(a) $R(-2, 0)$, $S(0, 8)$
(b) $P(-1, 3)$, $N(1, 5)$

Jawapan/*Answer*:

LATIHAN INTENSIF

1 Diberi titik $J(-5, -2)$, $K(-1, 2)$ dan $L(8, h)$ terletak pada satu garis lurus.
Given points $J(-5, -2)$, $K(-1, 2)$ *and* $L(8, h)$ *lie on a straight line.*
Cari
Find

(a) $JK : KL$,

[2 markah/*marks*]

(b) nilai h,
the value of h,

[2 markah/*marks*]

(c) persamaan garis lurus yang berserenjang dan melalui titik J.
the equation of straight line that is perpendicular and passes through point J.

[3 markah/*marks*]

Jawapan/*Answer* :

Menguasai | Belum Menguasai

2 Persamaan bagi P dan Q masing-masing adalah seperti berikut.
The equations for P and Q are as follows respectively.

$$P : 2y + x - 10 = 0$$
$$Q : y + 5 = 2x$$

(a) Tunjukkan bahawa garis lurus P dan Q adalah berserenjang.
Show that the straight lines P and Q are perpendicular.

[2 markah/*marks*]

(b) Cari titik persilangan bagi garis lurus P dan Q.
Find the point of intersection of the straight lines P and Q.

[2 markah/*marks*]

(c) Cari luas segi tiga yang dibatasi oleh garis P, Q dan $y = 5$.
Find the area of the triangle bounded by lines P, Q and $y = 5$.

[3 markah/*marks*]

(d) Satu titik $T(x, y)$ bergerak dengan jaraknya dari garis P sentiasa 2 unit. Cari dua persamaan lokus T.
A point $T(x, y)$ *moves with its distance from the line P is always* 2 *units. Find two equations of the locus of T.*

[2 markah/*marks*]

Jawapan/Answer:

3 $A(2, 3)$, $B(3, p)$, $C(8, 1)$ dan $D(q, 8)$ ialah bucu-bucu sebuah segi empat selari, dengan keadaan p dan q ialah pemalar.
$A(2, 3)$, $B(3, p)$, $C(8, 1)$ and $D(q, 8)$ are the vertices of a parallelogram, such that p and q are constants.
Cari
Find

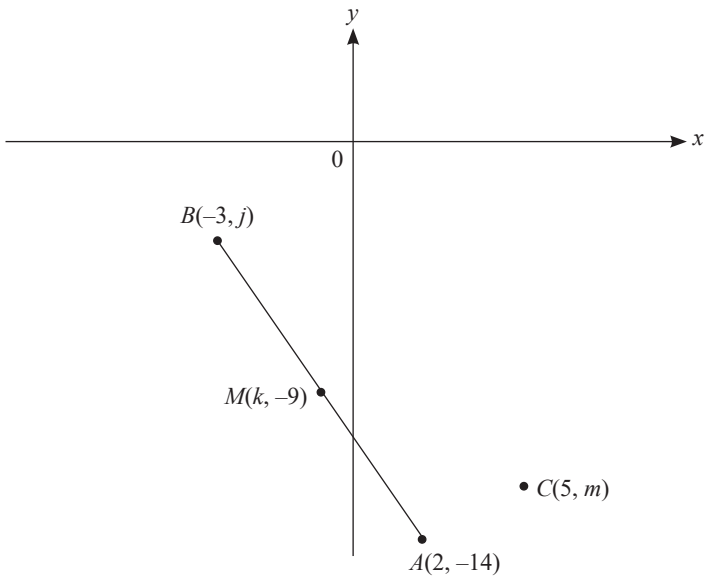
(a) nilai p dan nilai q,
the value of p and of q,

(b) persamaan garis lurus yang selari dengan garis AB dan melalui koordinat titik tengah segi empat selari tersebut.
the equation of the straight line that is parallel with line AB and passes through the coordinates of midpoint of the parallelogram.

[7 markah/*marks*]

Jawapan/*Answer*:

4 Rajah di bawah menunjukkan garis lurus AB. Titik tengah yang menghubungkan $A(2, -14)$ dan $B(-3, j)$ ialah $M(k, -9)$.
The diagram below shows the straight line AB. The midpoint connecting $A(2, -14)$ and $B(-3, j)$ is $M(k, -9)$.



(a) Cari nilai j dan k.
Find the values of j and k.

[2 markah/*marks*]

(b) Cari persamaan normal garis lurus yang berserenjang dengan garis AB dan melalui titik A.
Find the normal equation of the straight line that is perpendicular to line AB and passes through point A.

[4 markah/*marks*]

(c) Jika luas segi tiga ABC ialah 19 unit^2, cari nilai m.
If the area of triangle ABC is 19 units^2, find the value of m.

[4 markah/*marks*]

Jawapan/*Answer*:

5 Satu garis lurus yang menghubungkan titik $A(3, -6)$ dan $B(p, q)$ ialah pembahagi dua sama serenjang bagi garis lurus $7y + x = 11$.
A straight line connecting the points $A(3, -6)$ *and* $B(p, q)$ *is the perpendicular bisector to the straight line* $7y + x = 11$.

(a) Cari koordinat bagi titik tengah AB, dalam sebutan p dan q.
Find the coordinates of the midpoint of AB, in terms of p and q.

[1 markah/*mark*]

(b) Ungkapkan p dalam sebutan q.
Express p in terms of q.

[2 markah/*marks*]

(c) Diberi $p = 5$, cari persamaan lokus T, jika jarak TB sentiasa 3 unit.
Given $p = 5$*, find the equation of the locus of T, if the distance TB is always* 3 *units.*

[4 markah/*marks*]

(d) Seterusnya, tentukan kedudukan titik (6, 7) dengan lingkaran lokus itu.
Hence, determine the position of the point (6, 7) *with the circle of the locus.*

[3 markah/*marks*]

Jawapan/*Answer*:

6 Satu garis lurus mempunyai persamaan $10 - 5x + 2y = 0$.
A straight line has an equation of $10 - 5x + 2y = 0$.

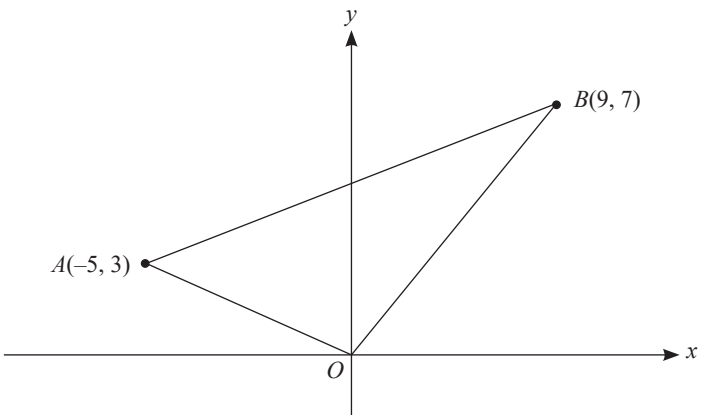
(a) Ungkapkan persamaan garis lurus dalam bentuk pintasan.
Express the equation of the straight line in intercept form.

(b) Seterusnya, cari nilai h jika garis lurus tersebut selari dengan garis lurus $y = 4 - hx$.
Hence, find the value of h if the straight line is parallel with the straight line $y = 4 - hx$.

[3 markah/*marks*]

Jawapan/*Answer*:

7 Rajah di bawah menunjukkan segi tiga *OAB*, dengan keadaan *O* ialah asalan.
The diagram below shows a triangle OAB, such that O is the origin.

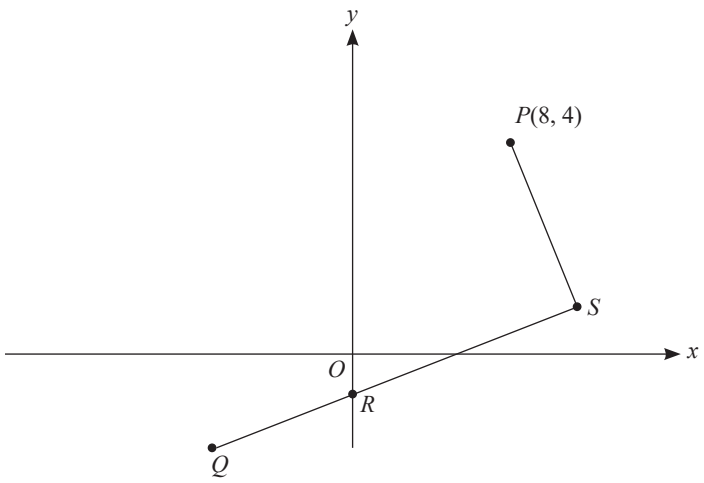


Hitung jarak terdekat dari titik *O* ke garis *AB*.
Calculate the shortest distance from point O to line AB.

[9 markah/*marks*]

Jawapan/*Answer*:

8 Rajah di bawah menunjukkan garis lurus *PS* bertemu dengan garis lurus *QS* pada titik *S*. Garis lurus *QS* menyilang paksi-*y* pada titik *R* dan *O* ialah asalan.
The diagram below shows a straight line PS meets the straight line QS at point S. The straight line QS intersects y-axis at point R and O is the origin.



Diberi bahawa titik *S* ialah jarak terdekat bagi titik *P* ke garis *QS* dan persamaan bagi garis lurus *QS* ialah $2y - x + 5 = 0$.
It is given that the point S is the shortest distance of the point P to the line QS and the equation of the straight line QS is $2y - x + 5 = 0$.

(a) Cari
Find

(i) persamaan garis lurus *PS*,
the equation of the straight line PS,

[2 markah/*marks*]

(ii) koordinat *S*,
the coordinates of S,

[2 markah/*marks*]

(iii) koordinat titik *Q* jika $9QR = 4RS$,
the coordinates of point Q if $9QR = 4RS$,

[2 markah/*marks*]

(iv) luas segi tiga *POS*.
the area of the triangle POS.

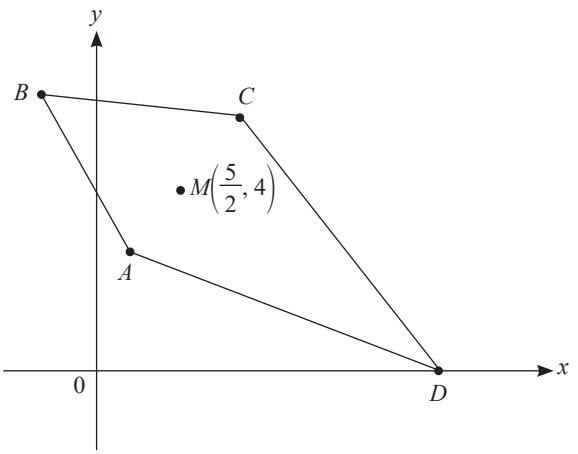
[2 markah/*marks*]

(b) Titik *W* bergerak dengan keadaan jaraknya dari titik *Q* dan *S* adalah sama. Cari persamaan lokus *W*.
Point W moves such that it is equidistant from points Q and S. Find the equation of the locus W.

[2 markah/*marks*]

Jawapan/*Answer*:

9 Rajah di bawah menunjukkan kedudukan rumah Ali (A), Basir (B), Candra (C) dan Daud (D) yang dilukis di atas satah Cartes. Terdapat sebuah balai raya (M) yang terletak di tengah antara rumah Ali dan Candra. Kedudukan keempat-empat rumah tersebut membentuk segi empat selari.
The diagram below shows the position of the houses of Ali (A)*, Basir* (B)*, Candra* (C) *and Daud* (D) *drawn on the Cartesian plane. There is a community hall* (M) *located in the middle between Ali and Candra's house. The position of the four houses forms a parallelogram.*



Diberi persamaan garis lurus DA dan AB masing-masing ialah $5y + 3x - 18 = 0$ dan $2y + 5x - 11 = 0$.
Given the equations of the straight lines DA and AB are $5y + 3x - 18 = 0$ *and* $2y + 5x - 11 = 0$ *respectively*.

(a) Cari kedudukan rumah Ali dan Daud.
Find the location of Ali and Daud's house.

[3 markah/*marks*]

(b) Cari persamaan garis lurus yang menghubungkan rumah Candra dan Daud.
Find the equation of the straight line that connects Candra and Daud's houses.

[3 markah/*marks*]

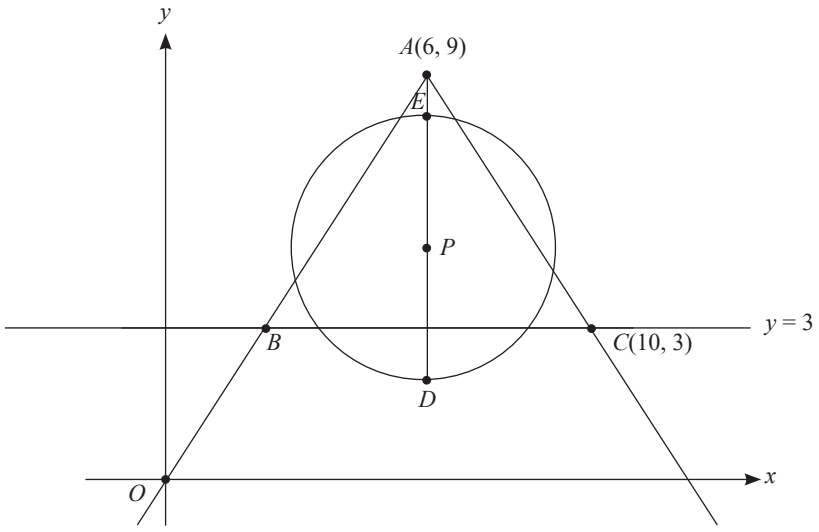
(c) Jika jalan yang menghubungkan rumah Ali dan Candra dipanjangkan ke pasar raya (P), dengan keadaan $AC : CP = 1 : 3$, cari jarak, dalam km, pasar raya itu dengan rumah Ali.
If the road that connects Ali and Candra's house is extended to supermarket (P)*, such that* $AC : CP = 1 : 3$*, find the distance, in* km*, between the supermarket and Ali's house.*

[4 markah/*marks*]

[1 unit mewakili 1 km]
[1 *unit represents* 1 km]

Jawapan/*Answer*:

10 Rajah di bawah menunjukkan sebuah logo syarikat yang dilukis pada satah Cartes. Bentuk logo tersebut terdiri daripada sebuah bulatan yang berpusat di titik *P* dan segi tiga *ABC*. *AEPD* adalah garis lurus yang selari dengan paksi-*y* dan *O* ialah asalan.
The diagram below shows a company logo drawn on a Cartesian plane. The shape of the logo consists of a circle centered at point P and a triangle ABC. AEPD is a straight line that is parallel to the y-axis and O is the origin.



Diberi persamaan garis lurus *BC* ialah $y = 3$.
Given the equation of the straight line BC is $y = 3$.
Cari
Find

(a) persamaan garis lurus *AB*,
the equation of the straight line AB,

[2 markah/*marks*]

(b) koordinat *P* jika luas segi tiga *BPC* ialah 8 unit^2. Tunjukkan pengiraan anda menggunakan rumus luas poligon.
the coordinates of P if the area of triangle BPC is 8 *units*^{2}*. Show your calculations using the polygon area formula.*

[5 markah/*marks*]

(c) persamaan bulatan, jika jarak *AE* ialah 1 unit.
the equation of the circle, if the distance AE is 1 *unit.*

[3 markah/*marks*]

Jawapan/*Answer*:

BAB 8

Vektor
Vectors

VIDEO PEMBELAJARAN

LATIHAN INTENSIF

1 Diberi $\underset{\sim}{u} = \underset{\sim}{i} + 3\underset{\sim}{j}$ dan $\underset{\sim}{v} = 2\underset{\sim}{i} - 9\underset{\sim}{j}$.
Given that $\underset{\sim}{u} = \underset{\sim}{i} + 3\underset{\sim}{j}$ *and* $\underset{\sim}{v} = 2\underset{\sim}{i} - 9\underset{\sim}{j}$.

(a) Nyatakan $\underset{\sim}{u} - k\underset{\sim}{v}$ dalam sebutan *k*.
State $\underset{\sim}{u} - k\underset{\sim}{v}$ *in terms of k.*

(b) Seterusnya, cari nilai *k* jika $\underset{\sim}{u} - k\underset{\sim}{v}$ selari dengan paksi-*x*.
Hence, find the value of k if $\underset{\sim}{u} - k\underset{\sim}{v}$ *is parallel to the x-axis.*

[3 markah/*marks*]

Jawapan/*Answer*:

---

2 Diberi bahawa $A(4, 5)$, $B(6, -9)$ dan $C(x, y)$.
It is given that $A(4, 5)$, $B(6, -9)$ *and* $C(x, y)$.

(a) Ungkapkan $\overrightarrow{AB}$ dalam sebutan $\underset{\sim}{i}$ dan $\underset{\sim}{j}$.
Express $\overrightarrow{AB}$ *in terms of* $\underset{\sim}{i}$ *and* $\underset{\sim}{j}$.

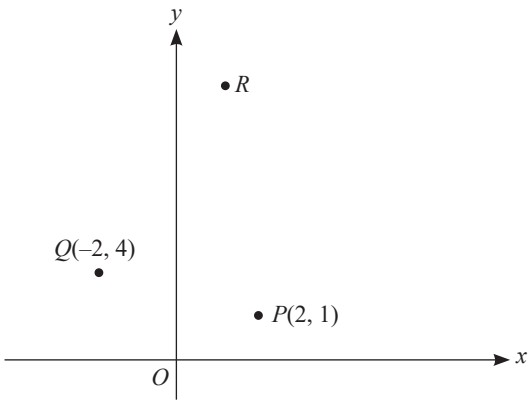
(b) Cari koordinat *C* jika $2\overrightarrow{OC} = \overrightarrow{BA}$.
Find the coordinates of C if $2\overrightarrow{OC} = \overrightarrow{BA}$.

[4 markah/*marks*]

Jawapan/*Answer*:

Menguasai | Belum Menguasai

3 Rajah di bawah menunjukkan tiga titik pada suatu satah Cartes.
The diagram below shows three points on a Cartesian plane.



(a) Nyatakan $\overrightarrow{PQ}$.
State $\overrightarrow{PQ}$.

[1 markah/*mark*]

(b) Diberi bahawa $\overrightarrow{QR} = m\underset{\sim}{i} + 4\underset{\sim}{j}$.
It is given that $\overrightarrow{QR} = m\underset{\sim}{i} + 4\underset{\sim}{j}$.

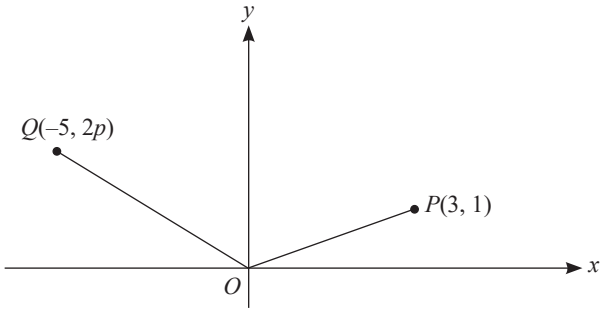
(i) Jika $\overrightarrow{PQ} + 2\overrightarrow{QR} = 2\underset{\sim}{i} + 11\underset{\sim}{j}$, cari nilai *m* dengan menggunakan operasi aritmetik vektor.
If $\overrightarrow{PQ} + 2\overrightarrow{QR} = 2\underset{\sim}{i} + 11\underset{\sim}{j}$, *find the value of m by using vector's arithmetic operations.*

(ii) Seterusnya, tentukan vektor unit dalam arah $\overrightarrow{QR}$.
Hence, determine the unit vector in the direction of $\overrightarrow{QR}$.

[4 markah/*marks*]

Jawapan/*Answer*:

4 Rajah di bawah menunjukkan titik P dan titik Q.
The diagram below shows point P and point Q.



(a) Ungkapkan $\overrightarrow{PQ}$ dalam sebutan p.
Express $\overrightarrow{PQ}$ in terms of p.

[2 markah/*marks*]

(b) Diberi $|\overrightarrow{PQ}| = \sqrt{80}$, cari nilai p.
Given that $|\overrightarrow{PQ}| = \sqrt{80}$, find the value of p.

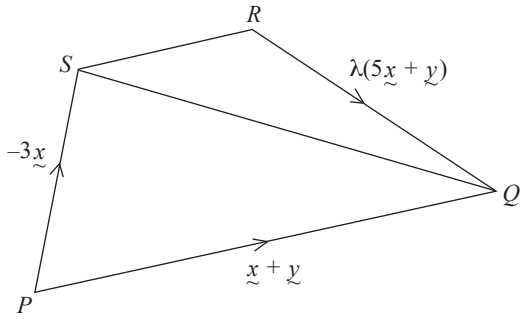
[3 markah/*marks*]

(c) Cari unit vektor dalam arah $\overrightarrow{PQ}$.
Find the vector unit in the direction of $\overrightarrow{PQ}$.

[1 markah/*mark*]

Jawapan/*Answer*:

5 Rajah di bawah menunjukkan sisi empat *PQRS*.
The diagram below shows a quadrilateral PQRS.



Tunjukkan bahawa $\overrightarrow{SR}$ dan $\overrightarrow{PQ}$ adalah selari.
Show that $\overrightarrow{SR}$ *and* $\overrightarrow{PQ}$ *are parallel.*

[5 markah/*marks*]

Jawapan/*Answer* :

6 Sebuah dron berlepas dari bumbung suatu bangunan dari titik $M(3, 8)$ dengan vektor halaju awal $\underset{\sim}{v} = 6\underset{\sim}{i} - 3\underset{\sim}{j}$ ms^{-1}. Selepas t saat, dron itu berada di titik N, dengan keadaan $\overrightarrow{ON} = \overrightarrow{OM} + t\underset{\sim}{v}$.

A drone takes off from the roof of a building at point $M(3, 8)$ *with an initial velocity vector* $\underset{\sim}{v} = 6\underset{\sim}{i} - 3\underset{\sim}{j}$ ms^{-1}. *After t seconds, the drone is at point N, such that* $\overrightarrow{ON} = \overrightarrow{OM} + t\underset{\sim}{v}$.

(a) Cari
Find

(i) laju, dalam ms^{-1}, dron itu,
the speed, in ms^{-1}*, of the drone,*

(ii) kedudukan dron itu dari M selepas 10 saat.
the position of the drone from M after 10 *seconds.*

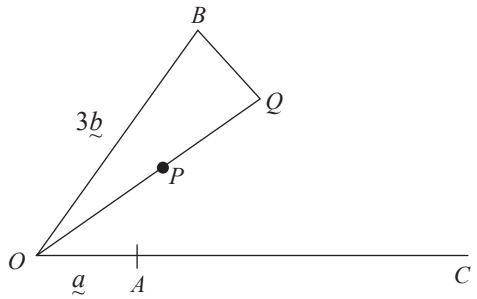
[3 markah/*marks*]

(b) Bilakah dron itu berada di timur titik asalan?
When will the drone be at the east of the origin?

[3 markah/*marks*]

Jawapan/*Answer*:

7 Rajah di bawah menunjukkan sebuah segi tiga OBQ dan garis lurus OAC. Titik P terletak pada garis lurus OQ dan $OC = 4OA$.
The diagram below shows a triangle OBQ and the straight line OAC. Point P lies on the straight line OQ and OC = 4OA.



Diberi bahawa $\overrightarrow{OA} = \underset{\sim}{a}$, $\overrightarrow{OB} = 3\underset{\sim}{b}$, $\overrightarrow{AP} = \frac{1}{3}\overrightarrow{AB}$ dan $\overrightarrow{OQ} = k\overrightarrow{OP}$, dengan keadaan k ialah pemalar.

It is given that $\overrightarrow{OA} = \underset{\sim}{a}$, $\overrightarrow{OB} = 3\underset{\sim}{b}$, $\overrightarrow{AP} = \frac{1}{3}\overrightarrow{AB}$ *and* $\overrightarrow{OQ} = k\overrightarrow{OP}$, *such that k is a constant.*

(a) Ungkapkan
Express

(i) $\overrightarrow{OP}$, dalam sebutan $\underset{\sim}{a}$ dan $\underset{\sim}{b}$,
$\overrightarrow{OP}$, *in terms of* $\underset{\sim}{a}$ *and* $\underset{\sim}{b}$,

(ii) $\overrightarrow{BQ}$, dalam sebutan k, $\underset{\sim}{a}$ dan $\underset{\sim}{b}$.
$\overrightarrow{BQ}$, *in terms of k,* $\underset{\sim}{a}$ *and* $\underset{\sim}{b}$.

[4 markah/*marks*]

(b) Seterusnya, cari nilai h dan k jika $\overrightarrow{BQ} = h\overrightarrow{BC}$, dengan keadaan h ialah pemalar.
Hence, find the values of h and k if $\overrightarrow{BQ} = h\overrightarrow{BC}$, *such that h is a constant.*

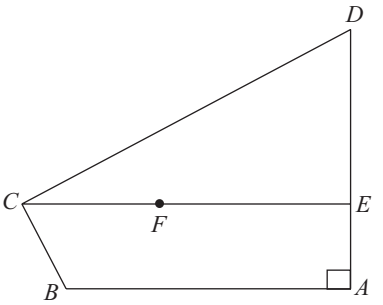
[5 markah/*marks*]

(c) Nyatakan $BQ : QC$.
State $BQ : QC$.

[1 markah/*mark*]

Jawapan/*Answer*:

8 Dalam rajah di bawah, *ABCD* ialah sisi empat.
In the diagram below, ABCD is a quadrilateral.



AED dan *CFE* ialah garis lurus. Diberi bahawa $\overrightarrow{AB} = 24\underset{\sim}{x}$, $\overrightarrow{AE} = 10\underset{\sim}{y}$, $\overrightarrow{DC} = 30\underset{\sim}{x} - 30\underset{\sim}{y}$, $AE = \frac{1}{4}AD$ dan $EF = \frac{3}{5}EC$.

AED and CFE are straight lines. It is given that $\overrightarrow{AB} = 24\underset{\sim}{x}$, $\overrightarrow{AE} = 10\underset{\sim}{y}$, $\overrightarrow{DC} = 30\underset{\sim}{x} - 30\underset{\sim}{y}$, $AE = \frac{1}{4}AD$ *and* $EF = \frac{3}{5}EC$.

(a) Ungkapkan, dalam sebutan *x* dan *y*,
Express, in terms of x and y,

(i) $\overrightarrow{DB}$

(ii) $\overrightarrow{CE}$

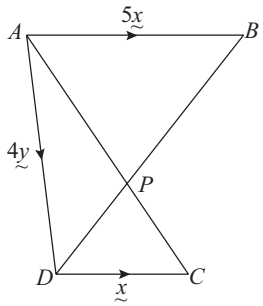
(b) Kenal pasti sama ada *D*, *F* dan *B* adalah segaris atau tidak.
Identify whether D, F and B are collinear or not.

(c) Diberi $|\underset{\sim}{x}| = 3$ unit dan $|\underset{\sim}{y}| = 2$ unit, cari $|\overrightarrow{DB}|$.
Given $|\underset{\sim}{x}| = 3$ *units and* $|\underset{\sim}{y}| = 2$ *units, find* $|\overrightarrow{DB}|$.

[10 markah/*marks*]

Jawapan/*Answer*:

9 Dalam rajah di bawah, $\overrightarrow{AB} = 5\underset{\sim}{x}$, $\overrightarrow{AD} = 4\underset{\sim}{y}$ dan $\overrightarrow{DC} = \underset{\sim}{x}$.
In the diagram below, $\overrightarrow{AB} = 5\underset{\sim}{x}$, $\overrightarrow{AD} = 4\underset{\sim}{y}$ *and* $\overrightarrow{DC} = \underset{\sim}{x}$.



(a) Ungkapkan dalam sebutan $\underset{\sim}{x}$ dan $\underset{\sim}{y}$,
Express in terms of $\underset{\sim}{x}$ *and* $\underset{\sim}{y}$,
(i) $\overrightarrow{AC}$
(ii) $\overrightarrow{BD}$

(b) Diberi $\overrightarrow{BP} = k\overrightarrow{BD}$ dan $\overrightarrow{AP} = h\overrightarrow{AC}$. Ungkapkan $\overrightarrow{AP}$,
Given $\overrightarrow{BP} = k\overrightarrow{BD}$ *and* $\overrightarrow{AP} = h\overrightarrow{AC}$. *Express* $\overrightarrow{AP}$,
(i) dalam sebutan h, $\underset{\sim}{x}$ dan $\underset{\sim}{y}$.
in terms of h, $\underset{\sim}{x}$ *and* $\underset{\sim}{y}$.
(ii) dalam sebutan k, $\underset{\sim}{x}$ dan $\underset{\sim}{y}$.
in terms of k, $\underset{\sim}{x}$ *and* $\underset{\sim}{y}$.
Seterusnya, buktikan $h = k$.
Hence, prove $h = k$.

[7 markah/*marks*]

Jawapan/*Answer*:

10 Suatu zarah P dengan vektor kedudukan $\begin{pmatrix} 1 \\ 2 \end{pmatrix}$ bergerak dengan laju malar 20 m s^{-1} dalam arah yang sama dengan $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$. Satu lagi zarah Q dengan vektor kedudukan $\begin{pmatrix} 17 \\ 18 \end{pmatrix}$ bergerak dengan vektor halaju $\begin{pmatrix} 8 \\ 12 \end{pmatrix}$ m s^{-1}.

A particle P with position vector $\begin{pmatrix} 1 \\ 2 \end{pmatrix}$ *moves with a constant speed of* 20 m s^{-1} *in the same direction with* $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$. *Another particle Q with position vector* $\begin{pmatrix} 17 \\ 18 \end{pmatrix}$ *moves with a velocity vector of* $\begin{pmatrix} 8 \\ 12 \end{pmatrix}$ m s^{-1}.

(a) Cari
Find
(i) vektor halaju bagi zarah P,
the velocity vector of particle P,
(ii) vektor kedudukan bagi zarah P selepas t saat.
the position vector of particle P after t seconds.

[4 markah/*marks*]

(b) Diberi bahawa zarah P dan zarah Q bertembung di suatu titik pertembungan, cari
It is given that particles P and Q collide at a collision point, find
(i) nilai t, dalam saat, apabila kedua-dua zarah itu bertembung,
the value of t, in seconds, when both particles collide,
(ii) vektor kedudukan bagi titik pertembungan itu.
the position vector of the collision point.

[4 markah/*marks*]

Jawapan/*Answer*:

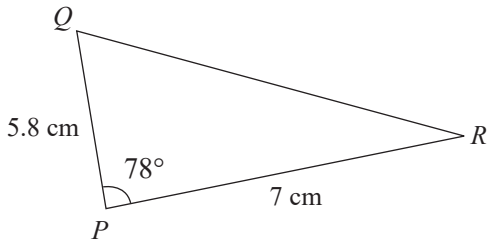
BAB 9

Penyelesaian Segi Tiga
Solution of Triangles

VIDEO PEMBELAJARAN

LATIHAN INTENSIF

1 Rajah di bawah menunjukkan sebuah segi tiga *PQR*.
The diagram below shows a triangle PQR.



(a) Calculate
Hitung
(i) panjang *QR*,
the length of QR,

[2 markah/*marks*]

(ii) luas segi tiga *PQR*,
the area of triangle PQR,

[2 markah/*marks*]

(iii) $\angle PRQ$.

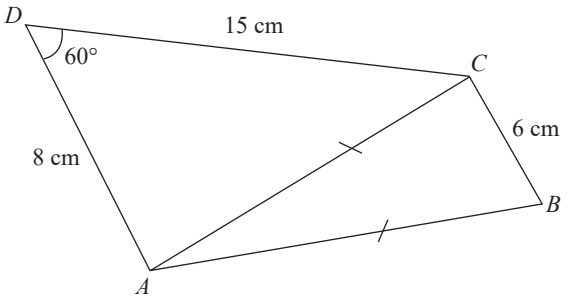
[2 markah/*marks*]

(b) Titik *P* dipanjangkan ke titik *S*. Diberi $\angle PSR = 42°$ dan $PS = 8.3$ cm. Cari nilai-nilai yang mungkin bagi $\angle QRS$.
Point P is extended to point S. Given $\angle PSR = 42°$ *and* $PS = 8.3$ cm. *Find the possible values of* $\angle QRS$.

[4 markah/*marks*]

Jawapan/*Answer*:

2 Rajah di bawah menunjukkan sisi empat *ABCD* dan segi tiga sama kaki *ABC*.
The diagram below shows a quadrilateral ABCD and an isosceles triangle ABC.



Cari
Find

(a) panjang *AB*,
the length of AB,

[2 markah/*marks*]

(b) $\angle DAB$,

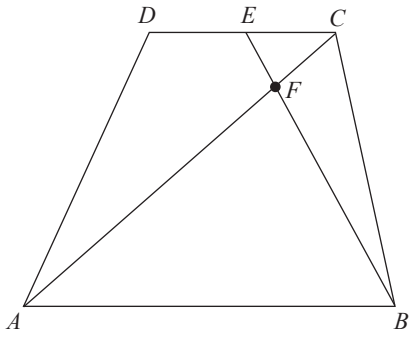
[5 markah/*marks*]

(c) luas seluruh rajah.
the area of the whole diagram.

[3 markah/*marks*]

Jawapan/*Answer* :

3 Rajah di bawah menunjukkan sebuah trapezium *ABCD*. *AC* dan *BE* adalah garis lurus yang bersilang pada titik *F*.
The diagram below shows a trapezium ABCD. AC and BE are straight lines that intersect at point F.



Diberi $AD = EB = 11$ cm, $DE = 3$ cm, $BC = 9$ cm, $\angle DAC = 30°$ dan $\angle DCA = 50°$.
Given $AD = EB = 11$ cm, $DE = 3$ cm, $BC = 9$ cm, $\angle DAC = 30°$ *and* $\angle DCA = 50°$.

(a) Cari
Find

(i) panjang *CE*,
the length of CE,

[2 markah/*marks*]

(ii) panjang garis *AC*,
the length of line AC,

[2 markah/*marks*]

(iii) $\angle CBA$.

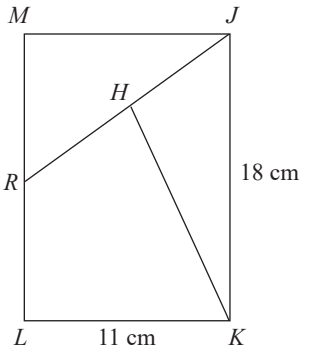
[3 markah/*marks*]

(b) Hitung luas trapezium *ABCD*.
Calculate the area of trapezium ABCD.

[3 markah/*marks*]

Jawapan/*Answer*:

4 Rajah di bawah menunjukkan sebuah segi empat tepat *JKLM*, dengan keadaan *JK*= 18 cm dan *KL* = 11 cm. *R* ialah titik tengah *ML* dan *H* ialah titik tengah *RJ*.
The diagram below shows a rectangle JKLM, such that JK = 18 cm *and KL* = 11 cm. *R is the midpoint of ML and H is the midpoint of RJ.*



Cari
Find

(a) panjang *HK*,
the length of HK,

[4 markah/*marks*]

(b) ∠*JHK,*

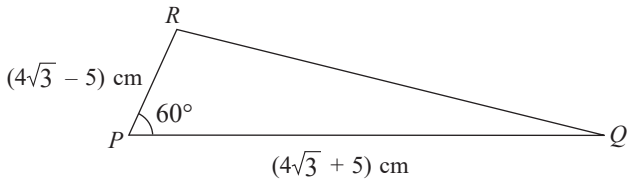
[2 markah/*marks*]

(c) luas sisi empat *KLRH.*
the area of quadrilateral KLRH.

[4 markah/*marks*]

Jawapan/*Answer* :

5 Rajah di bawah menunjukkan sebuah segi tiga PQR.
The diagram below shows a triangle PQR.



Diberi bahawa $PR = (4\sqrt{3} - 5)$ cm, $PQ = (4\sqrt{3} + 5)$ cm dan $\angle QPR = 60°$.
It is given that $PR = (4\sqrt{3} - 5)$ cm, $PQ = (4\sqrt{3} + 5)$ cm *and* $\angle QPR = 60°$.

(a) (i) Cari, dalam cm, panjang QR dalam bentuk surd.
Find, in cm, *the length of QR in surd form.*

[3 markah/*marks*]

(ii) Tunjukkan bahawa $\sin \angle PQR = \frac{\sqrt{a}}{b}(4\sqrt{3} - 5)$, dengan keadaan a dan b ialah integer. Seterusnya, cari nilai tepat bagi $\angle PQR$.

Show that $\sin \angle PQR = \frac{\sqrt{a}}{b}(4\sqrt{3} - 5)$, *such that a and b are integer. Hence, find the exact value of* $\angle PQR$.

[4 markah/*marks*]

(b) Garis QR' dilukis pada segi tiga itu dengan keadaan $QR' = QR$ dan titik R' terletak pada garis PR yang dipanjangkan.
The line QR′ is drawn on the triangle such that QR′ = QR and the point R′ lies on the extended line PR.

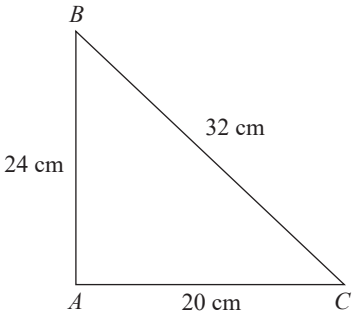
(i) Lakar $\Delta QR'R$.
Sketch the $\Delta QR'R$.

(ii) Cari luas, dalam cm^2, $\Delta QR'R$.
Find the area, in cm^2, *of* $\Delta QR'R$.

[3 markah/*marks*]

Jawapan/*Answer*:

6 Rajah di bawah menunjukkan sebuah segi tiga *ABC*.
The diagram below shows a triangle ABC.



(a) Hitung
Calculate

(i) luas segi tiga *ABC* dengan menggunakan rumus Heron,
the area of triangle ABC using Heron's formula,

[4 markah/*marks*]

(ii) $\angle BAC$.

[2 markah/*marks*]

(b) Jika garis *AC* dipanjangkan ke titik *D* sehingga $\angle CDB = 15°$, cari panjang garis *BD*.
If the line AC is extended to point D until $\angle CDB = 15°$*, find the length of line BD.*

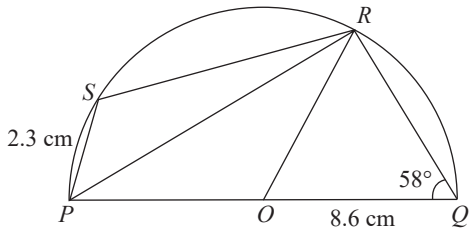
[2 markah/*marks*]

(c) Jika titik *D* digerakkan ke *D'*, dengan keadaan $CD = CD'$, panjang *BC* tidak berubah dan $\angle CBD = \angle CBD'$, lakar segi tiga *BCD'*. Seterusnya nyatakan nilai bagi $\angle BD'C$.
If point D is moved to D', such that $CD = CD'$*, the length of BC remains unchanged and* $\angle CBD = \angle CBD'$*, sketch the triangle BCD'. Hence, state the value of* $\angle BD'C$.

[2 markah/*marks*]

Jawapan/*Answer*:

7 Rajah di bawah menunjukkan sebuah semibulatan dengan pusat O dan berjejari 8.6 cm.
The diagram below shows a semicircle with centre O and radius of 8.6 cm.



(a) Cari
Find
(i) panjang RQ,
the length of RQ,
(ii) panjang RP,
the length of RP,
(iii) $\angle ORS$.

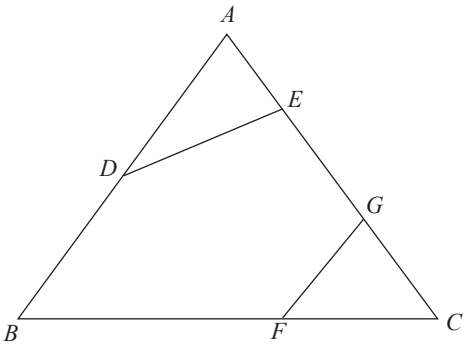
[7 markah/*marks*]

(b) Hitung luas segi tiga PQR dengan menggunakan rumus Heron.
Calculate the area of triangle PQR using Heron's formula.

[3 markah/*marks*]

Jawapan/*Answer*:

8 Rajah di bawah menunjukkan segi tiga *ABC*. *ADB*, *BFC* dan *AEGC* ialah garis lurus.
The diagram below shows triangle ABC. ADB, BFC and AEGC are straight lines.



Diberi $AD = 4$ cm, $AG = 9$ cm, $CG = 5$ cm, $CF = 6.5$ cm, $\angle BAC = 70°$ dan $\angle FCG = 50°$.
Given $AD = 4$ cm, $AG = 9$ cm, $CG = 5$ cm, $CF = 6.5$ cm, $\angle BAC = 70°$ *and* $\angle FCG = 50°$.

(a) Hitung panjang, dalam cm,
Calculate the length, in cm,
(i) FG
(ii) BF

[5 markah/*marks*]

(b) Luas ΔCFG adalah dua kali luas ΔADE. Hitung panjang, dalam cm, AE.
The area of ΔCFG *is twice the area of* ΔADE. *Calculate the length, in* cm, *of AE.*

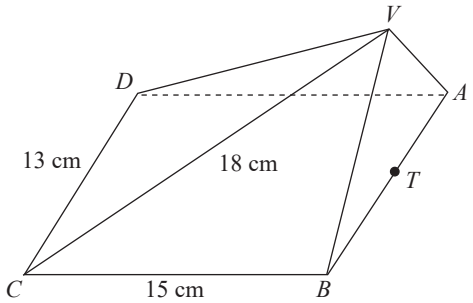
[3 markah/*marks*]

(c) $\Delta A'B'C'$ mempunyai bentuk yang berbeza daripada ΔABC, dengan keadaan $B'C' = BC$, $A'C' = AC$ dan $\angle A'B'C' = \angle ABC$. Hitung $\angle B'C'A'$.
$\Delta A'B'C'$ *has different shape from* ΔABC, *such that* $B'C' = BC$, $A'C' = AC$ *and* $\angle A'B'C' = \angle ABC$. *Calculate* $\angle B'C'A'$.

[2 markah/*marks*]

Jawapan/*Answer* :

9 Rajah di bawah menunjukkan sebuah piramid bertapak segi empat tepat *ABCD*. *V* ialah bucu tegak di atas titik tengah *AB*, iaitu *T*.
The diagram below shows a pyramid with rectangular based ABCD. V is the vertex vertically on the midpoint AB, which is T.



Hitung
Calculate

(a) sudut di antara garis *VC* dengan satah *ABCD*,
the angle between line VC and plane ABCD,

[4 markah/*marks*]

(b) luas satah *VCT*,
the area of plane VCT,

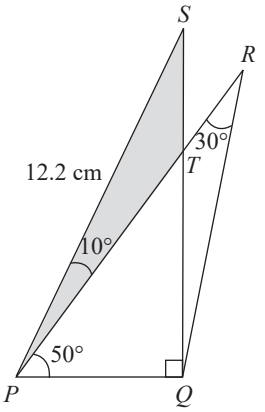
[2 markah/*marks*]

(c) sudut di antara satah *VAB* dengan satah *VCD*.
the angle between plane VAB and plane VCD.

[4 markah/*marks*]

Jawapan/*Answer* :

10 Rajah di bawah menunjukkan dua garis lurus, *PTR* dan *QTS*.
The diagram below shows two straight lines, PTR and QTS.



Hitung
Calculate

(a) panjang *PQ*,
the length of PQ,

[2 markah/*marks*]

(b) panjang *QR*,
the length of QR,

[2 markah/*marks*]

(c) panjang *TR*,
the length of TR,

[3 markah/*marks*]

(d) luas kawasan berlorek.
the area of shaded region.

[3 markah/*marks*]

Jawapan/*Answer* :

BAB 10

Nombor Indeks
Index Numbers

VIDEO PEMBELAJARAN

LATIHAN INTENSIF

1 Jadual di bawah menunjukkan harga dan indeks harga bagi tiga jenis bahan, *A, B* dan *C* yang digunakan dalam penghasilan sejenis bebola ketam.
The table below shows the prices and the price indices of three types of ingredients, A, B and C used in the production of a type of crab balls.

Bahan *Ingredient*	**Harga (RM) per kg pada tahun** *Price* **(RM)** *per* **kg** *for the year*		**Indeks harga pada tahun 2022 berasaskan tahun 2018** *Price index for the year* **2022** *based on the year* **2018**	**Pemberat** *Weightage*
	2018	**2022**		
A	*y*	3.60	*x*	20
B	4.80	6.00	125	60
C	1.20	1.80	150	20

(a) Harga bahan *A* menokok sebanyak 20% dari tahun 2018 hingga tahun 2022. Cari nilai *x* dan *y*.
The price of ingredient A is increased by 20% *from the year* 2018 *to the year* 2022. *Find the values of x and y.*
[3 markah/*marks*]

(b) Hitung indeks gubahan bagi kos membuat bebola ketam pada tahun 2022 berasaskan tahun 2018.
Calculate the composite index for the cost of making the crab balls for the year 2022 *based on the year* 2018.
[2 markah/*marks*]

(c) Diberi bahawa indeks gubahan bagi kos membuat bebola ketam meningkat sebanyak 49% dari tahun 2015 hingga tahun 2022.
It is given that the composite index for the cost of making the crab balls increased by 49% *from the year* 2015 *to the year* 2022.

(i) Hitung indeks gubahan bagi kos membuat bebola ketam pada tahun 2018 berasaskan tahun 2015.
Calculate the composite index for the cost of making the crab balls in the year 2018 *based on the year* 2015.

(ii) Kos membuat sebiji bebola ketam ialah 50 sen pada tahun 2015. Cari bilangan maksimum bebola ikan yang dihasilkan menggunakan peruntukan sebanyak RM300 pada tahun 2022.
The cost of making a crab ball is 50 *sen in the year* 2015. *Find the maximum number of crab balls that can be produced using an allocation of* RM300 *in the year* 2022.
[5 markah/*marks*]

Jawapan/*Answer*:

2 Sekeping kad ucapan dibuat dengan menggunakan empat bahan, *P*, *Q*, *R* dan *S*. Jadual di bawah menunjukkan harga bahan-bahan tersebut.
A wish card is made up of four materials, P, Q, R and S. The table below shows the price of the materials.

Bahan *Material*	**Harga (RM)** *Price* **(RM)**	
	2019	**2021**
P	*a*	4.00
Q	3.00	3.30
R	*b*	*c*
S	2.50	4.00

(a) Nombor indeks bagi bahan *P* pada tahun 2021 berasaskan tahun 2019 ialah 125. Hitung nilai *a*.
The index number for material P in the year 2021 *based on the year* 2019 *is* 125. *Calculate the value of a.*

[2 markah/*marks*]

(b) Nombor indeks bagi bahan *R* pada tahun 2021 berasaskan tahun 2019 ialah 125. Harga bahan *R* pada tahun 2021 adalah RM0.50 lebih daripada harganya yang sepadan dalam tahun 2019.
Hitung nilai *b* dan nilai *c*.
The index number for material R in the year 2021 *based on the year* 2019 *is* 125. *The price of material R in the year* 2021 *is* RM0.50 *more than the corresponding price in* 2019.
Calculate the value of b and of c.

[3 markah/*marks*]

(c) Indeks gubahan kos penghasilan kad ucapan itu pada tahun 2021 berasaskan tahun 2019 ialah 128.7.
The composite index for the production cost of the wish card in the year 2021 *based on the year* 2019 *is* 128.7.
Hitung
Calculate

(i) harga kad ucapan itu pada tahun 2019 jika harganya yang sepadan pada tahun 2021 ialah RM11.20,
the price of the wish card in the year 2019 *if the corresponding price in the year* 2021 *is* RM11.20,

(ii) nilai *h* jika kuantiti bahan-bahan *P*, *Q*, *R* dan *S* yang digunakan adalah mengikut nisbah 6 : 2 : *h* : 3. Beri jawapan dalam integer.
the value of h if the quantity of materials P, Q, R and S used is in the ratio 6 *:* 2 *: h :* 3. *Give the answer in integer.*

[5 markah/*marks*]

Jawapan/*Answer* :

3 Jadual di bawah menunjukkan maklumat tentang empat bahan yang digunakan untuk membuat sejenis minyak wangi.
The table below shows the information of four ingredients used to make a type of perfume.

Bahan *Ingredient*	**Harga (RM) per kg pada tahun** *Price* **(RM)** *per* **kg** *in the year*		**Indeks harga pada tahun 2023 dengan 2021 sebagai tahun asas** *Price index for the year* **2023** *with* **2021** *as the base year.*
	2021	**2023**	
A	*x*	1.35	150
B	2.50	3.00	*y*
C	3.20	4.00	125
D	1.25	*z*	140

(a) Cari nilai-nilai *x, y* dan *z*.
Find the values of x, y and z.

[3 markah/*marks*]

(b) Indeks gubahan untuk kos membuat minyak wangi itu pada tahun 2023 dengan 2021 sebagai tahun asas ialah 130.5. Nisbah bagi bahan-bahan *A, B, C* dan *D* yang digunakan ialah 3 : 5 : 8 : *m*. Cari nilai *m*.
The composite index for the cost of making the perfume in the year 2023 *with* 2021 *as the base year is* 130.5. *The ratio of the ingredients A, B, C and D used is* 3 : 5 : 8 : *m. Find the value of m.*

[2 markah/*marks*]

(c) Dijangkakan bahawa harga minyak wangi itu akan menurun sebanyak 10% dari tahun 2023 ke tahun 2025.
It is expected that the price of the perfume will decrease by 10% *from the year* 2023 *to the year* 2025.

(i) Cari indeks gubahan untuk kos membuat minyak wangi itu pada tahun 2025 dengan 2021 sebagai tahun asas.
Find the composite index for the cost of making the perfume in the year 2025 *with* 2021 *as the base year.*

(ii) Nyatakan harga minyak wangi itu pada tahun 2025 jika harganya pada tahun 2021 ialah RM98 per botol.
State the price of the perfume in the year 2025 *if the price in the year* 2021 *is* RM98 *per bottle.*

(iii) Cari peratus penurunan harga bahan *D* dari tahun 2021 ke tahun 2025 jika harga bahan lain tidak berubah dari tahun 2023 ke tahun 2025.
Find the percentage decrease of the price of ingredient D for the year 2021 *to the year* 2025 *if the price of other ingredients remains unchanged from the year* 2023 *to the year* 2025.

[5 markah/*marks*]

Jawapan/*Answer* :

4 Jadual di bawah menunjukkan maklumat berkaitan empat bahan utama yang digunakan oleh Fatimah untuk membuat sejenis kuih.
The table below shows the information related to four main ingredients used by Fatimah in making a type of kuih.

Bahan *Ingredient*	**Harga per kg (RM)** *Price per* **kg (RM)**		**Indeks harga pada tahun 2023** *Price index in the year* **2023 (2000 = 100)**	**Resepi (g)** *Recipe* **(g)**
	Tahun/*Year* 2000	**Tahun/*Year* 2023**		
Tepung gandum *Wheat flour*	1.60	2.40	x	250
Tepung ubi *Tapioca flour*	y	5.50	110	200
Gula *Sugar*	2.50	z	120	150
Santan *Coconut milk*	3.20	4.00	125	400

(a) Cari nilai-nilai x, y dan z.
Find the values of x, y and z.

[3 markah/*marks*]

(b) Hitung indeks gubahan bagi kos membuat kuih itu pada tahun 2023 berasaskan tahun 2000.
Calculate the composite index for the cost of making the kuih in the year 2023 *based on the year* 2000.

[3 markah/*marks*]

(c) Pada tahun 2000, Fatimah menjual sekotak kuih itu pada harga RM5.00 dengan keuntungan sebanyak 25%. Hitung harga jual sekotak kuih itu jika Fatimah ingin mendapat keuntungan sebanyak 50% pada tahun 2023.
In the year 2000*, Fatimah sold a box of kuih at* RM5.00 *with the profit of* 25%*. Calculate the selling price of a box of kuih if Fatimah wants to obtain a profit of* 50% *in the year* 2023*.*

[4 markah/*marks*]

Jawapan/*Answer* :

5 Jadual di bawah menunjukkan indeks harga, perubahan indeks harga dan pemberat bagi empat bahan, *A*, *B*, *C* dan *D* yang merupakan bahan-bahan utama yang digunakan dalam pembuatan suatu syampu rambut.
The table below shows the price indices, changes in price indices and weightages of four items, A, B, C and D, which are the main items used in the production of a bottle of hair shampoo.

Bahan *Item*	**Indeks harga pada tahun 2023 berasaskan tahun 2021** *Price index for the year* **2023** *based on the year* **2021**	**Perubahan indeks harga dari tahun 2023 ke tahun 2025** *Changes in price indices from the year* **2023** *to the year* **2025**	**Pemberat** *Weightages*
A	115	Menokok 10% 10% *increase*	4
B	150	Tidak berubah *No change*	1
C	*x*	Menokok 20% 20% *increase*	2
D	140	Menyusut 10% 10% *decrease*	3

(a) Hitung
Calculate
(i) harga bahan *A* pada tahun 2021 jika harganya pada tahun 2023 ialah RM8.05,
the price of item A in the year 2021 *if its price in the year* 2023 *is* RM8.05,
(ii) harga bahan *D* pada tahun 2023 jika harganya pada tahun 2021 ialah RM4.50.
the price of item D in the year 2023 *if its price in the year* 2011 *is* RM4.50.

[3 markah/*marks*]

(b) Indeks gubahan bagi kos membuat syampu rambut pada tahun 2023 berasaskan tahun 2021 ialah 127. Hitung nilai *x*.
The composite index for the cost of making a bottle of hair shampoo in the year 2023 *based on the year* 2021 *is* 127. *Calculate the value of x.*

[2 markah/*marks*]

(c) Seterusnya, hitung indeks gubahan bagi kos membuat satu botol syampu rambut pada tahun 2025 berasaskan tahun 2021.
Hence, calculate the composite index for the cost of making a bottle of hair shampoo in the year 2025 *based on the year* 2021.

[3 markah/*marks*]

(d) Hitung kos membuat satu botol syampu rambut pada tahun 2025 jika kos sepadan pada tahun 2021 ialah RM25.00.
Calculate the cost of making a bottle of hair shampoo in the year 2025 *if the corresponding cost in the year* 2021 *is* RM25.00

[2 markah/*marks*]

Jawapan/*Answer*:

6 Jadual di bawah menunjukkan perubahan indeks harga dan peratus penggunaan empat bahan, *A, B, C* dan *D* yang digunakan dalam pembuatan sejenis makanan ringan.
The table below shows the change in price indices and the percentage usage of four items, A, B, C and D which are used in the production of a type of snack.

Bahan *Materials*	**Perubahan indeks harga dari tahun 2021 ke tahun 2023** *Change in price index from the year 2021 to the year 2023*	**Peratus penggunaan (%)** *Percentage usage (%)*
A	Menokok 50% *Increased* 50%	25
B	Menyusut 20% *Reduced* 20%	40
C	Menokok 10% *Increased* 10%	*k*
D	Tidak berubah *No change*	10

(a) Jika harga bahan *B* pada tahun 2021 ialah RM1.50, cari harganya pada tahun 2023.
If the cost of material B in the year 2021 *is* RM1.50*, find the cost in the year* 2023.

[2 markah/*marks*]

(b) Kos pengeluaran bagi makanan ringan ini ialah RM4.60 pada tahun 2021. Hitung
The production cost of the snack was RM4.60 *in the year* 2021*. Calculate*

(i) nilai *k,*
the value of k,

(ii) kos pengeluaran makanan ringan ini pada tahun 2023.
the production cost of the snack in the year 2023.

[5 markah/*marks*]

(c) Kos pengeluaran dijangka akan meningkat sebanyak 35% dari tahun 2023 ke tahun 2025. Hitung peratus perubahan dalam kos pengeluaran dari tahun 2021 ke tahun 2025.
The production cost is expected to increase by 35% *from the year* 2023 *to the year* 2025*. Calculate the percentage change in the production cost from the year* 2021 *to the year* 2025*.*

[3 markah/*marks*]

Jawapan/*Answer*:

Kertas Model Tingkatan 4

KERTAS 1

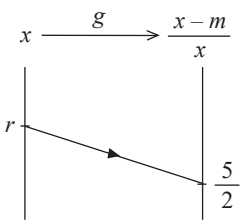
Bahagian *A*
Section A

[64 markah]
[64 *marks*]

Jawab **semua** soalan
Answer ***all*** *questions*

1 Rajah 1 menunjukkan fungsi $g : x \to \frac{x-m}{x}$, $x \neq 0$, dengan keadaan m ialah pemalar.

Diagram 1 *shows the function* $g : x \to \frac{x-m}{x}$, $x \neq 0$, *where m is a constant.*



Rajah 1
Diagram 1

(a) Ungkapkan m dalam sebutan r.
Express m in terms of r.

[2 markah/*marks*]

(b) Diberi bahawa fungsi $h : x \to \frac{x}{2} - 4$, cari fungsi gubahan $gh(x)$ apabila $r = 1$.

It is given that function $h : x \to \frac{x}{2} - 4$, *find the composite function* $gh(x)$ *when* $r = 1$. [3 markah/*marks*]

Jawapan/*Answer*:

2 Selesaikan persamaan kuadratik $x(2x - 4) = 7x + 1$.
Berikan jawapan anda betul kepada tiga tempat perpuluhan.
Solve the quadratic equation $x(2x - 4) = 7x + 1$.
Give your answer correct to three decimal places.

[3 markah/*marks*]

Jawapan/*Answer*:

3 (a) Diberi bahawa $3^{p-1} + 3^{p+1} = k(3^{p-1})$, dengan keadaan k ialah integer. Cari nilai k.
It is given that $3^{p-1} + 3^{p+1} = k(3^{p-1})$*, where k is an integer. Find the value of k.*

[2 markah/*marks*]

(b) Diberi bahawa $8^{2m-3} = \dfrac{1}{\sqrt{4^{n-2}}}$, ungkapkan n dalam sebutan m.

It is given that $8^{2m-3} = \dfrac{1}{\sqrt{4^{n-2}}}$*, express n in terms of m.*

[3 markah/*marks*]

Jawapan/*Answer*:

---

4 Selesaikan persamaan $\ln (x + 1) + \ln (x - 1) = 3$.
Solve the equation $\ln (x + 1) + \ln (x - 1) = 3$.

[3 markah/*marks*]

Jawapan/*Answer*:

5 Diberi bahawa $\log_p 3 = k$ dan $\log_r p = 9$, tunjukkan bahawa
It is given that $\log_p 3 = k$ *and* $\log_r p = 9$, *show that*

$$\log_p 3r^3 - \log_3 p^2 = \frac{3k^2 + k - 6}{3k}$$

[4 markah/*marks*]

Jawapan/*Answer*:

---

6 (a) Hasil tambah n sebutan pertama dalam suatu janjang aritmetik ialah $S_n = n(3n^2 + 8n - 6)$. Cari nilai sebutan ke-7.
It is given that the sum of the first n terms of an arithmetic progression is $S_n = n(3n^2 + 8n - 6)$. *Find the value of the* 7^{th} *term.*

[2 markah/*marks*]

(b) Tiga sebutan pertama bagi suatu janjang aritmetik ialah 154, 146 dan 138. Diberi x ialah sebutan pertama yang bernilai negatif dalam janjang itu. Cari nilai x.
The first three terms of an arithmetic progression are 154, 146 *and* 138. *It is given that x is the first negative term in the progression. Find the value of x.*

[4 markah/*marks*]

Jawapan/*Answer*:

7 Diberi bahawa $2p$, $6p^2$, $18p^3$, ... membentuk satu janjang geometri dengan keadaan $0 < p < \frac{1}{3}$. Hasil tambah ketakterhinggaan janjang ini ialah $\frac{1}{4}$.

It is given that $2p$, $6p^2$, $18p^3$, ... *forms a geometric progression such that* $0 < p < \frac{1}{3}$. *The sum to infinity of the progression is* $\frac{1}{4}$.

Cari
Find

(a) nisbah sepunya janjang ini dalam sebutan p,
the common ratio of the progression in terms of p,

(b) nilai p.
the value of p.

[4 markah/*marks*]

Jawapan/*Answer*:

---

8 Satu garis lurus melalui titik $A(-2, 3)$ dan titik $B(5, 17)$.
A straight line passes through points $A(-2, 3)$ *and* $B(5, 17)$.

(a) Diberi satu titik $C(h, k)$, dengan keadaan garis lurus CA berserenjang dengan garis lurus AB. Ungkapkan h dalam sebutan k.
Given that a point $C(h, k)$*, such that straight line CA perpendicular to the straight line AB. Express h in terms of k.*

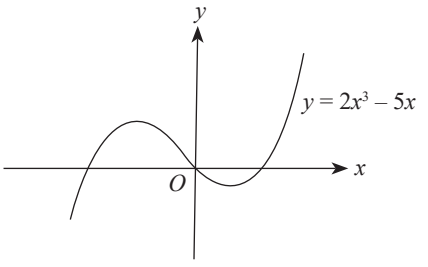
[2 markah/*marks*]

(b) Diberi bahawa luas segi tiga OAC ialah 42 unit^2. Cari nilai-nilai h dan k.
It is given that the area of triangle OAC is 42 unit^2. *Find the values of h and k.*

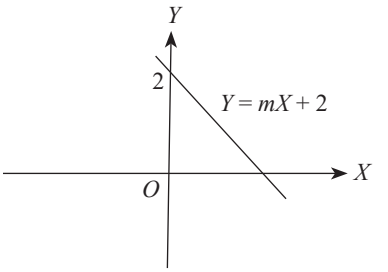
[4 markah/*marks*]

Jawapan/*Answer*:

9 Rajah 9(a) menunjukkan lengkung $y = 2x^3 - 5x$. Rajah 9(b) menunjukkan garis lurus yang diperoleh apabila $y = 2x^3 - 5x$ diungkap dalam bentuk linear $Y = mX + 2$.
Diagram 9(a) *shows the curve* $y = 2x^3 - 5x$. *Diagram* 9(b) *shows the straight line obtained when* $y = 2x^3 - 5x$ *is expressed in the linear form* $Y = mX + 2$.



Rajah 9(a)
Diagram 9(a)



Rajah 9(b)
Diagram 9(b)

(a) Ungkapkan X dan Y dalam sebutan x dan/atau y.
Express X *and* Y *in terms of* x *and/or* y.

[3 markah/*marks*]

(b) Diberi bahawa (2, 3) terletak pada garis lurus $Y = mX + 2$, cari titik sepadan yang terletak pada lengkung $y = 2x^3 - 5x$, dengan keadaan $x > 0$.
It is given that (2, 3) *lies on the straight line* $Y = mX + 2$, *find the corresponding point which lies on the curve* $y = 2x^3 - 5x$, *where* $x > 0$.

[3 markah/*marks*]

Jawapan/*Answer*:

10 Diberi bahawa p ialah salah satu punca bagi persamaan kuadratik $x^2 + 2x(x - 1) = k$.
It is given that p is one of the roots of the quadratic equation $x^2 + 2x(x - 1) = k$.

(a) Ungkapkan p dalam sebutan k.
Express p in terms of k.

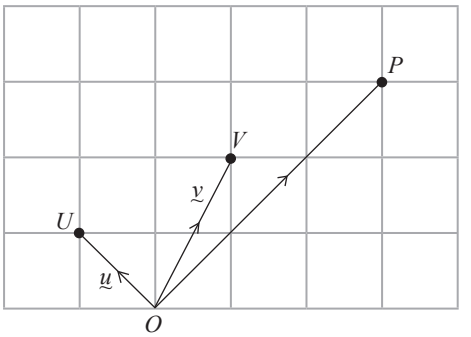
[3 markah/*marks*]

(b) Cari nilai p dan nilai k jika satu punca lagi bagi persamaan kuadratik ini ialah $2p$.
Find the value of p and of k if another root of the quadratic equation is $2p$.

[4 markah/*marks*]

Jawapan/*Answer*:

11 Rajah 11 menunjukkan vektor $\overrightarrow{OU}$, $\overrightarrow{OV}$ dan $\overrightarrow{OP}$ dilukis pada grid segi empat sama yang kongruen dan bersisi 1 unit.
Diagram 11 *shows the vectors* $\overrightarrow{OU}$, $\overrightarrow{OV}$ *and* $\overrightarrow{OP}$ *drawn on a grid of congruent squares with sides of* 1 *unit.*



Rajah 11
Diagram 11

(a) (i) Ungkapkan $\overrightarrow{OP}$ dalam sebutan $\underset{\sim}{i}$ dan $\underset{\sim}{j}$.
Express $\overrightarrow{OP}$ *in terms of* $\underset{\sim}{i}$ *and* $\underset{\sim}{j}$.

(ii) Kemudian, cari vektor unit dalam arah $\overrightarrow{OP}$.
Hence, find the unit vector in the direction of $\overrightarrow{OP}$.

[4 markah/*marks*]

(b) Tentukan $\overrightarrow{OP}$ dalam sebutan $\underset{\sim}{u}$ dan $\underset{\sim}{v}$. Kemudian, tunjukkan bahawa $\overrightarrow{OP}$ selari dengan $\overrightarrow{UT}$, dengan keadaan $\overrightarrow{UT} = -3\underset{\sim}{u} + 6\underset{\sim}{v}$.
Determine $\overrightarrow{OP}$ *in terms of* $\underset{\sim}{u}$ *and* $\underset{\sim}{v}$. *Hence, show that* $\overrightarrow{OP}$ *is parallel to* $\overrightarrow{UT}$, *where* $\overrightarrow{UT} = -3\underset{\sim}{u} + 6\underset{\sim}{v}$.

[3 markah/*marks*]

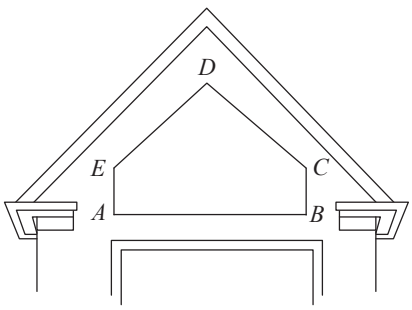
Jawapan/*Answer*:

12 (a) Ringkaskan $\sqrt{20} + 3\sqrt{5} - \frac{1}{\sqrt{45}}$ dalam bentuk $\frac{a\sqrt{5}}{b}$, dengan keadaan $\frac{a}{b}$ ialah pecahan tidak wajar.

Simplify $\sqrt{20} + 3\sqrt{5} - \frac{1}{\sqrt{45}}$ *in the form of* $\frac{a\sqrt{5}}{b}$, *where* $\frac{a}{b}$ *is an improper fraction.*

[3 markah/*marks*]

(b) Rajah 12 menunjukkan keratan rentas bumbung bagi sebuah rumah. *ABCDE* adalah sebuah pentagon.
Diagram 12 *shows the cross-sectional area of roof top of a house. ABCDE is a pentagon.*



Rajah 12
Diagram 12

Diberi bahawa bahagian bumbung dengan keratan rentas *ABCDE* mempunyai ruang isi padu $(35 + \sqrt{28})$ m^3 dan luas pentagon *ABCDE* ialah $(2 + \sqrt{7})$ m^2. Hitung panjang bahagian bumbung ini, dalam bentuk surd termudah.
It is given that the roof part with the cross-sectional area ABCDE has a space volume $(35 + \sqrt{28})$ m^3 *and the area of the pentagon ABCDE is* $(2 + \sqrt{7})$ m^2. *Calculate the length of the roof part, in the simplest surd form.*

[5 markah/*marks*]

Jawapan/*Answer*:

Bahagian B
Section B

[16 markah]
[16 *marks*]

Bahagian ini mengandungi **tiga** soalan. Jawab **dua** soalan.
*This section consist of **three** questions. Answer **two** questions.*

13 Diberi bahawa $f : x \to 3x - 2$ dan $gf : x \to 4 - x$.
It is given that $f : x \to 3x - 2$ *and* $gf : x \to 4 - x$.

(a) Cari
Find

(i) nilai bagi $gf(2)$,
the value of $gf(2)$,

(ii) $f^{-1}(x)$,

(iii) $g(x)$,

[5 markah/*marks*]

(b) Lakarkan graf $y = | gf(x) |$ untuk $-1 \leqslant x \leqslant 5$.
Seterusnya, nyatakan julat bagi y.
Sketch the graph of $y = | gf(x) |$ *for* $-1 \leqslant x \leqslant 5$.
Hence, state the range of y.

[3 markah/*marks*]

Jawapan/*Answer*:

14 Diberi bahawa $f(x) = -x^2 + nx - 4$ mempunyai dua punca yang berbeza.
It is given that $f(x) = -x^2 + nx - 4$ *has two distinct roots.*

(a) Cari julat bagi n.
Find the range of n.

[3 markah/*marks*]

(b) Diberi satu punca positif bagi $f(x)$ adalah 16 kali ganda bagi punca yang lain. Cari punca-punca bagi $f(x)$.
It is given that one positive root of $f(x)$ *is* 16 *times of the other. Find the roots of* $f(x)$.

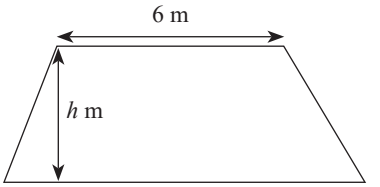
[3 markah/*marks*]

(c) Diberi satu fungsi $g(x)$, dengan keadaan graf $g(x)$ terletak 5 unit sebelah kiri kepada graf $f(x)$. Nyatakan paksi simetri bagi graf $g(x)$.
Given a function $g(x)$*, where the graph of* $g(x)$ *is* 5 *units on the left of the graph* $f(x)$*. State the axis of symmetry of the graph* $g(x)$.

[2 markah/*marks*]

Jawapan/*Answer*:

15 Rajah di bawah menunjukkan sebidang tanah berbentuk trapezium.
The diagram below shows a piece of land in trapezium shaped.



Seorang pekebun ingin menanam bunga ros pada tanah itu. Setiap pokok ros memerlukan luas tanah berdiameter 60 cm. Bilangan pokok bunga ros yang ditanam pada setiap baris membentuk janjang aritmetik. Pada setiap baris yang berikutnya, pekebun itu dapat menanam dua pokok lebih banyak daripada baris sebelumnya.
A gardener wants to plant roses on the land. Each rose plant needs an area of land with the diameter of 60 cm. *The number of plants in each row forms an arithmetic progression. In each subsequent row, the gardener can plant two more plants than the previous row.*

(a) Hitung bilangan pokok ros yang ditanam pada baris ke-8.
Calculate the number of roses planted in the 8^{th} *row.*

[3 markah/*marks*]

(b) Pekebun itu memerlukan 252 pokok untuk memenuhi tanah tersebut. Hitung nilai *h*, dengan keadaan *h* ialah tinggi trapezium itu.
The gardener needs 252 *rose plants to cover the land. Calculate the value of h, where h is the height of the trapezium.*

[5 markah/*marks*]

Jawapan/*Answer*:

KERTAS 2

Bahagian A
Section A

[50 markah]
[50 *marks*]

Jawab **semua** soalan
*Answer **all** questions*

1 Selesaikan persamaan serentak berikut:
Solve the following simultaneous equations:

$$\frac{5}{x} + \frac{8}{y} = 3x + y = 1$$

[5 markah/*marks*]

Jawapan/*Answer*:

2 Fungsi kuadratik f ditakrifkan oleh $f(x) = 2x^2 - kx + 3$, dengan keadaan k ialah pemalar.
The quadratic function f is defined by $f(x) = 2x^2 - kx + 3$, *where k is a constant.*

(a) Dengan menggunakan kaedah penyempurnaan kuasa dua, tunjukkan bahawa paksi simetri $f(x)$ ialah $x = \frac{k}{4}$.

By using completing the square method, show that the axis of symmetry of $f(x)$ *is* $x = \frac{k}{4}$.

[3 markah/*marks*]

(b) Diberi bahawa $f(x)$ mempunyai dua punca, α dan β dengan keadaan $k = 8$. Bentukkan satu persamaan kuadratik dengan punca $\frac{2}{\alpha}$ dan $\frac{2}{\beta}$.

It is given that $f(x)$ *has two roots,* α *and* β *where* $k = 8$. *Form a quadratic equation with the roots* $\frac{2}{\alpha}$ *and* $\frac{2}{\beta}$.

[4 markah/*marks*]

Jawapan/*Answer*:

3 (a) Ringkaskan:
Simplify:

$$\frac{2^{\frac{5}{2}}(x^3y)^p}{(8x^2y^q)^{\frac{1}{2}}}$$

[2 markah/*marks*]

(b) Diberi bahawa $7^p = 5^q = 35^r$, dengan menggunakan hukum-hukum logaritma, ungkapkan r dalam sebutan p dan q.
It is given that $7^p = 5^q = 35^r$, by using the laws of logarithm, express r in terms of p and q.

[5 markah/*marks*]

Jawapan/*Answer*:

4 (a) Diberi bahawa sistem persamaan serentak:
It is given that a system of simultaneous equations:

$$p + 3q - 2r = 5,\ 2p - q + r = 8,\ p - 4q + 3r = 3$$

(i) Selesaikan sistem persamaan serentak tersebut.
Solve the system of simultaneous equations.

(ii) Terangkan hubungan satah-satah daripada penyelesaian yang diperoleh di (i).
Explain the relationship between each plane from the solution obtained in (i).

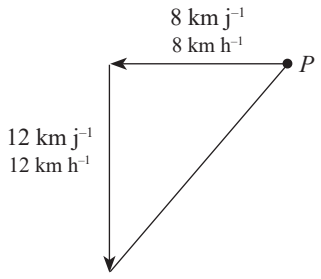
[3 markah/*marks*]

(b) Kamal membeli sekotak buah campuran yang mengandungi buah epal, oren dan mangga dengan harga RM115. Kotak itu mengandungi sejumlah 50 biji buah. Harga setiap biji epal ialah RM1, setiap biji oren ialah RM2 dan setiap biji mangga ialah RM3. Kamal menjual setiap biji epal, oren dan mangga masing-masing berharga RM1.80, RM3 dan RM5. Jualan sekotak buah campuran itu akan membawa keuntungan RM73. Berapakah bilangan setiap jenis buah di dalam kotak tersebut?
Kamal buys a box of mixed fruits which contains apples, oranges and mangoes worth RM115*. The box contains a total of* 50 *fruits. The price of each apple is* RM1*, each orange is* RM2 *and each mango is* RM3*. Kamal sells each apple, orange and mango with the price of* RM1.80*,* RM3 *and* RM5 *respectively. The sales of the whole box of fruits will bring a profit of* RM73*. How many of each fruits in the box?*

[7 markah/*marks*]

Jawapan/*Answer*:

5 Rajah 5 menunjukkan lakaran pergerakan perahu yang dinaiki oleh Gopal dan arus sungai.
Diagram 5 *illustrates the movement of the boat ridden by Gopal and the river stream.*

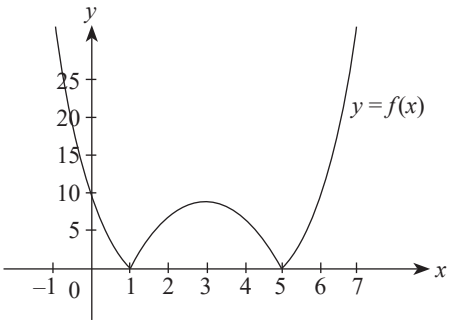


Rajah 5
Diagram 5

Gopal mendayung perahunya dari titik *P* menyeberangi sungai dengan halaju, $\underset{\sim}{v}$, 8 km j^{-1} ke arah barat. Arus sungai itu mengalir dengan halaju, $\underset{\sim}{w}$, 12 km j^{-1} ke arah selatan. Hitung arah dan halaju baharu perahu itu kesan daripada aliran arus tersebut.
Gopal rows his boat from point P across the river with velocity, $\underset{\sim}{v}$, 8 km h^{-1} *to the west. The river stream flows with velocity,* $\underset{\sim}{w}$, 12 km h^{-1} *to the south. Calculate the direction and velocity of the boat after affected by the river stream.*
[5 markah/*marks*]

Jawapan/*Answer*:

6 Rajah 6 menunjukkan graf $f(x) = |2(x-1)(x-5)|$ untuk $-1 < x < 7$.
Diagram 6 shows the graph of $f(x) = |2(x-1)(x-5)|$ *for* $-1 < x < 7$.



Rajah 6
Diagram 6

(a) Terangkan sama ada fungsi songsang bagi $f(x)$ dapat ditentukan.
Explain whether the inverse function of $f(x)$ *can be determined.*

[2 markah/*marks*]

(b) Cari
Find
(i) julat bagi $f(x)$.
the range of $f(x)$.
(ii) nilai b dengan keadaan $f(x) = b$ mempunyai tiga penyelesaian.
the value of b *where* $f(x) = b$ *has three solutions.*

[4 markah/*marks*]

(c) Lakar graf $g(x)$, dengan keadaan $g(x) = f(x) - 2$ untuk $1 \leqslant x \leqslant 5$.
Sketch the graph of $g(x)$, *where* $g(x) = f(x) - 2$ *for* $1 \leqslant x \leqslant 5$.

[2 markah/*marks*]

Jawapan/*Answer*:

7 (a) Dalam suatu janjang geometri dengan sebutan-sebutan yang semakin meningkat, beza sebutan ketiga dengan sebutan kedua adalah dua kali beza sebutan kedua dengan sebutan pertama.
In a geometric progression with their terms increasing, the difference between third and second terms is twice the difference between second term and the first term.

(i) Cari nisbah sepunya bagi janjang geometri itu.
Find the common ratio of the geometric progression.

(ii) Seterusnya, cari sebutan pertama, jika hasil tambah 10 sebutan pertama bagi janjang geometri ini ialah 341.
Hence, find the first term, if the sum of the first 10 *terms for the geometric progression is* 341.

[5 markah/*marks*]

(b) Pada hari sukan tahunan sekolah, Jessica mengambil bahagian dalam acara larian 1 500 m. Dia mengambil masa 110 saat untuk menghabiskan 300 m yang pertama dalam acara larian itu. Bagi setiap 300 m berikutnya, masa larian Jessica adalah $\frac{1}{8}$ kali lebih cepat daripada sebelumnya. Diberi rekod hari sukan tahunan sekolahnya untuk acara ini adalah 7.2 minit. Tentukan sama ada Jessica dapat memecahkan rekod ini.
At the school's annual sport day, Jessica participated in 1 500 m *running event. She took* 110 *seconds to complete the first* 300 m *of the race. For each subsequent* 300 m*, Jessica's running time was* $\frac{1}{8}$ *times faster than the previous one. Given that the school's annual sports day record for this event is* 7.2 *minutes. Determine whether Jessica able to break this record.*

[3 markah/*marks*]

Jawapan/*Answer*:

Bahagian B
Section B

[30 markah]
[30 *marks*]

Bahagian ini mengandungi **empat** soalan. Jawab **tiga** soalan.
*This section consist of **four** questions. Answer **three** questions.*

8 Gunakan kertas graf yang disediakan untuk menjawab soalan ini.
Use the graph paper provided to answer this question.

Jadual 8 menunjukkan nilai-nilai dua pemboleh ubah, x dan y, yang diperoleh daripada suatu eksperimen. Pemboleh ubah x dan y dihubungkan oleh persamaan $2y - px^2 = qx$, dengan keadaan p dan q ialah pemalar.
Table 8 *shows the values of two variables, x and y, obtained from an experiment. Variables x and y are related by the equation* $2y - px^2 = qx$, *where p and q are constants.*

x	0.2	0.4	0.6	0.78	0.9	1
y	0.57	1.36	2.4	3.43	4.185	4.84

Jadual 8
Table 8

(a) Plot $\frac{y}{x}$ melawan x, menggunakan skala 2 cm kepada 0.2 unit pada paksi-x dan 2 cm kepada 0.5 unit pada

paksi-$\frac{y}{x}$.

Seterusnya, lukis garis lurus penyuaian terbaik.

Plot $\frac{y}{x}$ *against x, by using a scale of* 2 cm *to* 0.2 *unit on the x-axis and* 2 cm *to* 0.5 *unit on the* $\frac{y}{x}$*-axis.*

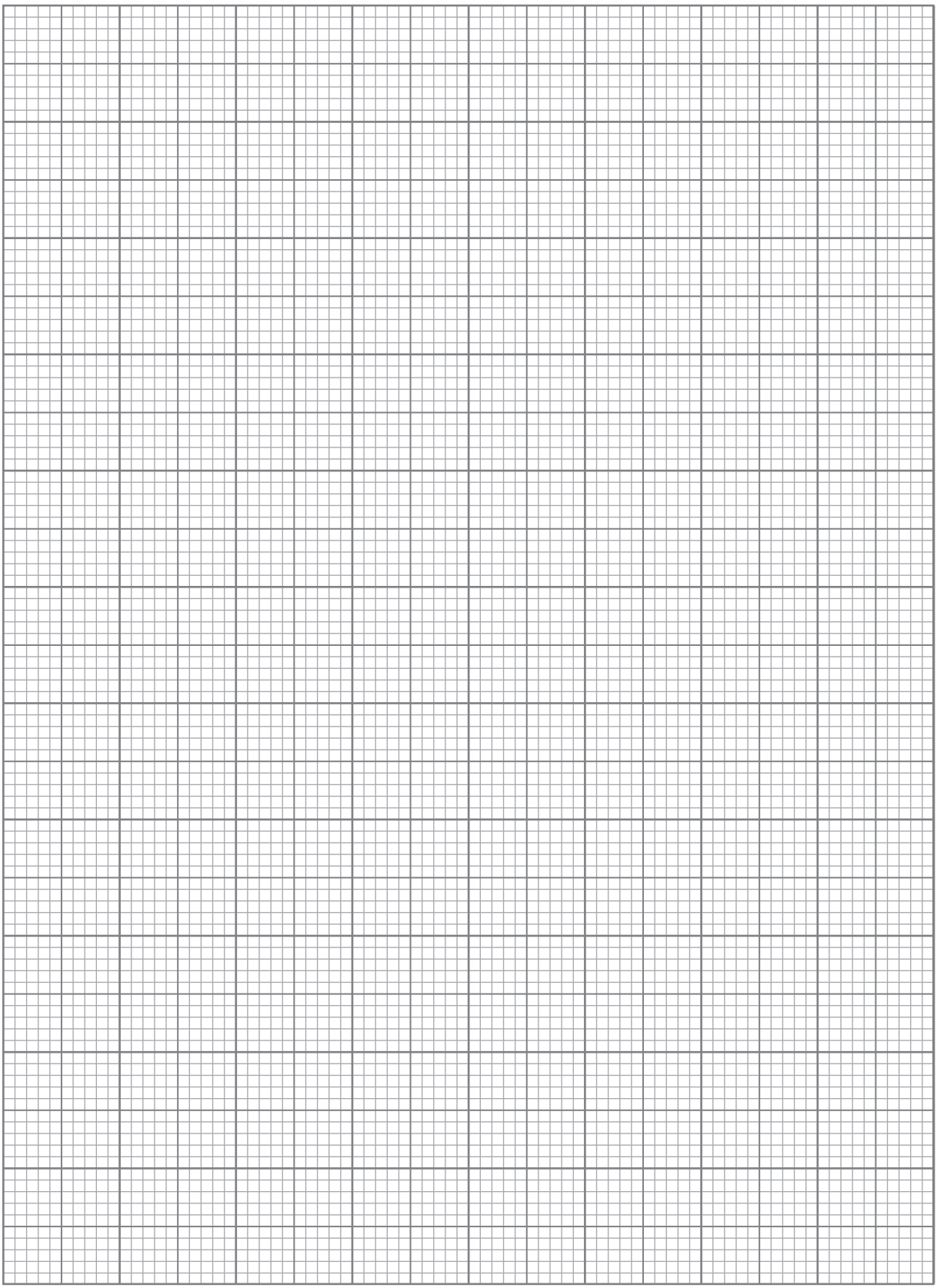
Hence, draw the line of best fit.

[4 markah/*marks*]

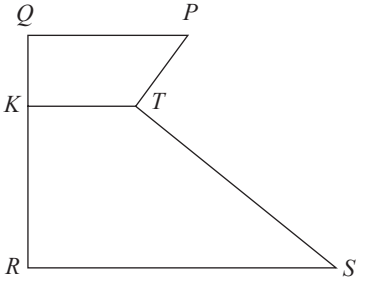
(b) Menggunakan graf di (a), cari nilai
Using the graph in (a)*, find the value of*
(i) y apabila $x = 0.52$,
y *when* $x = 0.52$,
(ii) p,
(iii) q.

[6 markah/*marks*]

Jawapan/*Answer*:



9 Dalam Rajah 9, *PQRST* ialah sebuah pentagon yang terbentuk daripada cantuman dua buah trapezium, dengan keadaan *PQ* berserenjang dengan *QR*.
In Diagram 9, PQRST is a pentagon formed by the combination of two trapeziums, where PQ is perpendicular to QR.



Rajah 9
Diagram 9

Diberi bahawa $\overrightarrow{PQ} = 5\underset{\sim}{a}$, $\overrightarrow{QR} = 6\underset{\sim}{b}$, $QK : KR = 1 : 2$ dan $QP : KT : RS = 5 : 3 : 9$.
It is given that $\overrightarrow{PQ} = 5\underset{\sim}{a}$, $\overrightarrow{QR} = 6\underset{\sim}{b}$, $QK : KR = 1 : 2$ *and* $QP : KT : RS = 5 : 3 : 9$.

(a) Cari vektor berikut dalam sebutan $\underset{\sim}{a}$ dan/atau $\underset{\sim}{b}$:
Find the following vector in terms of $\underset{\sim}{a}$ *and/or* $\underset{\sim}{b}$*:*
(i) $\overrightarrow{PT}$,
(ii) $\overrightarrow{QS}$.

[3 markah/*marks*]

(b) Tunjukkan bahawa *Q*, *T* dan *S* adalah segaris.
Show that Q, T and S are collinear.

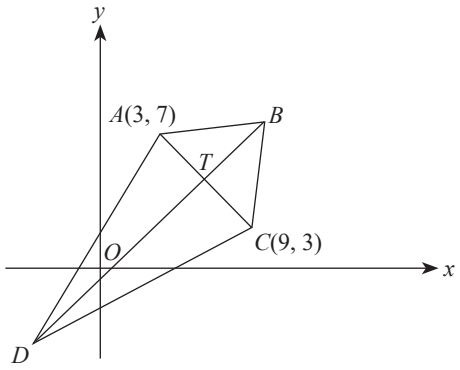
[3 markah/*marks*]

(c) Diberi bahawa $|\underset{\sim}{a}| = 2$ unit dan $|\underset{\sim}{b}| = 3$ unit, hitung nilai $|\overrightarrow{RT}|$.
It is given that $|\underset{\sim}{a}| = 2$ *units and* $|\underset{\sim}{b}| = 3$ *units, calculate the value of* $|\overrightarrow{RT}|$.

[4 markah/*marks*]

Jawapan/*Answer*:

10 Rajah 10 menunjukkan sebuah lelayang *ABCD*. *T* ialah titik persilangan dua pepenjuru lelayang itu.
Diagram 10 *shows a kite ABCD. T is the intersection point of the diagonals.*



Rajah 10
Diagram 10

Cari
Find

(a) persamaan garis lurus *BD*,
the equation of the straight line BD,

[4 markah/*marks*]

(b) nilai terkecil *m* dan *n* dengan keadaan koordinat titik *B* dan *D* masing-masing ialah (8, *k*) dan (–2, –7), dan $DT : BT = m : n$,
the smallest value of m and of n, such that the coordinates of point B and D are (8, *k*) *and* (–2, –7) *respectively, and* $DT : BT = m : n$,

[3 markah/*marks*]

(c) persamaan lokus bagi titik *P*, dengan keadaan *P* ialah satu titik bergerak dan sudut *CPD* sentiasa bersudut tegak. Kemudian, tentu sahkan titik *T* terletak pada lokus *P*.
the equation of the locus of point P where P is a moving point and angle CPD is always a right-angled. Hence, verify that point T lies on the loci P.

[3 markah/*marks*]

Jawapan/*Answer*:

11 Gunakan kertas graf yang disediakan untuk menjawab soalan ini.
Use the graph paper provided to answer this question.

Jadual 11 menunjukkan nilai-nilai dua pemboleh ubah, x dan y, yang diperoleh daripada suatu eksperimen. Pemboleh ubah x dan y dihubungkan oleh persamaan $y = ax^b$, dengan keadaan a dan b ialah pemalar.
Table 11 *shows the values of two variables, x and y, obtained from an experiment. Variables x and y are related by the equation* $y = ax^b$, *where a and b are constants.*

x	1.65	2.54	6.5	20.3	78.25	314.19
y	19.11	21.98	33.12	53.52	93.69	167.34

Jadual 11
Table 11

(a) Berdasarkan jadual yang diberi, bina satu jadual bagi nilai-nilai ln x dan ln y.
Based on the given table, construct a table for the values of ln x *and* ln y.

[2 markah/*marks*]

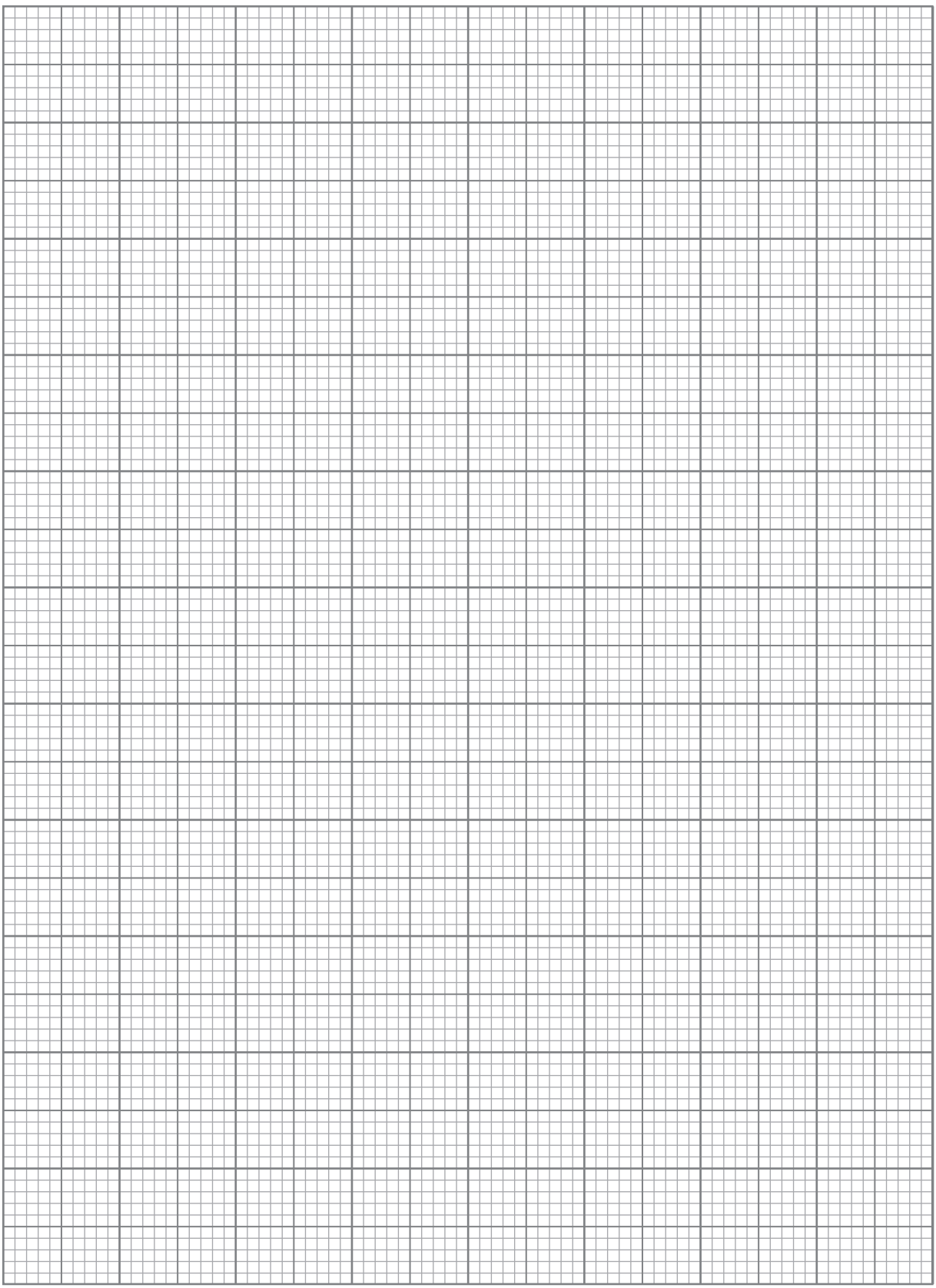
(b) Plot ln y melawan ln x, menggunakan skala 2 cm kepada 1 unit pada paksi-ln x dan 2 cm kepada 0.5 unit pada paksi-ln y.
Seterusnya, lukis garis lurus penyuaian terbaik.
Plot ln y *against* ln x, *by using a scale of* 2 cm *to* 1 *unit on the* ln x*-axis and* 2 cm *to* 0.5 *unit on the* ln y*-axis. Hence, draw the line of best fit.*

[3 markah/*marks*]

(c) Menggunakan graf di (b), cari nilai
Using the graph in (b)*, find the value of*
(i) a,
(ii) b.

[5 markah/*marks*]

Jawapan/*Answer*:



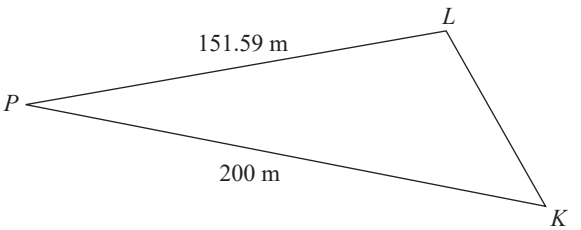
Bahagian C
Section C

[20 markah]
[20 *marks*]

Jawab mana-mana **dua** soalan.
Answer any **two** *questions.*

12 Penyelesaian secara lukisan berskala tidak diterima.
Solution by scale drawing is not accepted.

Rajah 12 menunjukkan sebuah segi tiga KLP bersudut cakah di L. Diberi bahawa PK = 200 m, PL = 151.59 m dan $\angle KPL = 18°$.
Diagram 12 *shows a triangle KLP with an obtuse angle L. It is given that* PK = 200 m, PL = 151.59 m *and* $\angle KPL = 18°$.



Rajah 12
Diagram 12

(a) Cari panjang, dalam m, LK.
Find the length, in m*, of LK.*

[2 markah/*marks*]

(b) Diberi bahawa segi tiga $K'L'P'$ mempunyai bentuk berbeza daripada segi tiga KLP dengan keadaan $PL = P'L'$, $KL = K'L'$ dan $\angle KPL = \angle K'P'L'$.
It is given that triangle $K'L'P'$ *has a different shape from the triangle KLP where* $PL = P'L'$, $KL = K'L'$ *and* $\angle KPL = \angle K'P'L'$.

(i) Lakarkan segi tiga $K'L'P'$.
Sketch the triangle $K'L'P'$.

(ii) Cari $\angle P'K'L'$ dan luas, dalam m^2, segi tiga $K'L'P'$.
Find $\angle P'K'L'$ *and the area, in* m^2*, of the triangle* $K'L'P'$.

(iii) Seterusnya, cari jarak terpendek, dalam m, dari titk P' ke garis $K'L'$.
Hence, find the shortest distance, in m*, from point* P' *to the straight line* $K'L'$.

[8 markah/*marks*]

Jawapan/*Answer*:

13 Jadual 13 menunjukkan indeks harga dan pemberat berkaitan dengan empat komponen dalam penghasilan mikrocip.
Table 13 *shows the price indices and the weightages of four components used in the production of microchip.*

Bahan ***Ingredient***	**Indeks harga pada tahun 2022 berasaskan tahun 2020** ***Price index in the year* 2022 *based on the year* 2020**	**Indeks harga pada tahun 2024 berasaskan tahun 2022** ***Price index in the year* 2024 *based on the year* 2022**	**Pemberat** ***Weightage*** **(%)**
Wafer Silikon *Wafer Silicon*	110	y	65
Transistor *Transistor*	115	120	12
Perintang *Resistor*	120	105	13
Kapasitor *Capacitor*	x	118	10

Jadual 13
Table 13

(a) Harga 500 unit perintang pada tahun 2020 ialah RM7.85, cari harga perintang yang sepadan pada tahun 2022.
The price of 500 *units of resistor in the year* 2020 *is* RM7.85*, find the corresponding price of the resistors in the year* 2022*.*

[1 markah/*mark*]

(b) Diberi bahawa indeks gubahan penghasilan mikrocip bagi tahun 2022 berasaskan tahun 2020 ialah 111.9. Cari nilai x.
Given that the composite index in the production of microchip in the year 2022 *based on the year* 2020 *is* 111.9*. Find the value of* x*.*

[2 markah/*marks*]

(c) Indeks harga wafer silikon pada tahun 2024 berasaskan tahun 2020 ialah 137.5, cari nilai y.
The price index of wafer silicon in the year 2024 *based on* 2020 *is* 137.5*, find the value of* y*.*

[2 markah/*marks*]

(d) Hitung indeks gubahan penghasilan mikrocip pada tahun 2024 berasaskan tahun 2020.
Calculate the composite index in the production of microchip in the year 2024 *based on the year* 2020*.*

[3 markah/*marks*]

(e) Kos penghasilan 1 000 unit mikrocip pada tahun 2020 ialah RM2 850, hitung kos penghasilan yang sepadan pada tahun 2024.
The production cost of 1 000 *units of microchips in the year* 2020 *is* RM2 850*, calculate the corresponding production cost in the year* 2024*.*

[2 markah/*marks*]

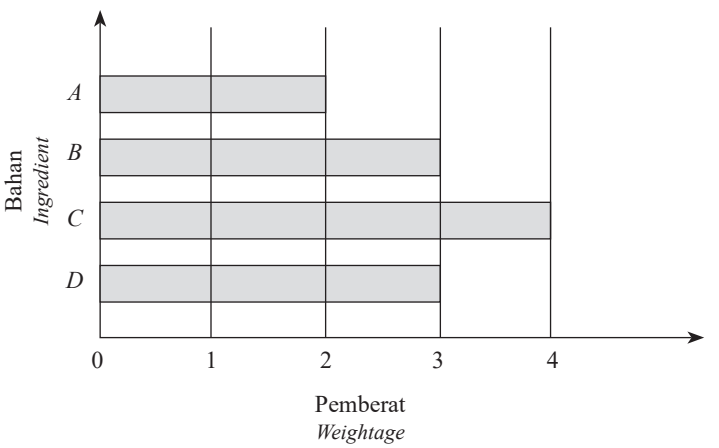
Jawapan/*Answer*:

14 Jadual 14 menunjukkan harga dan indeks harga berkaitan empat bahan yang digunakan dalam penghasilan tart nanas.
Table 14 *shows the prices and the price indices of four ingredients used in the production of pineapple tart.*

Bahan *Ingredient*	**Harga (RM) pada tahun** *Price* **(RM)** *in the year*		**Indeks harga pada tahun 2025 berasaskan tahun 2023** *Price index in the year* **2025** *based on the year* **2023**
	2023	**2025**	
A	12.00	*z*	*y*
B	3.50	4.20	120
C	2.50	2.50	100
D	*x*	14.25	95

Jadual 14
Table 14

Carta palang berikut menunjukkan pemberat bagi empat bahan yang digunakan.
The bar chart below shows the weightage of four ingredients used.



Diberi bahawa harga bahan *A* pada tahun 2025 meningkat 30% dari tahun 2023.
It is given that the price of ingredient A in the year 2025 *increases by* 30% *from the year* 2023.

(a) Cari nilai *x*, *y* dan *z*.
Find the values of x, y and z.

[3 markah/*marks*]

(b) Hitung indeks gubahan untuk menghasilkan tart nanas pada tahun 2025 berasaskan tahun 2023.
Calculate the price index to produce pineapple tart in the year 2025 *based on the year* 2023.

[2 markah/*marks*]

(c) Dianggarkan harga bahan *A* menurun 15%, harga bahan *D* meningkat 10%, manakala harga bahan *B* dan *C* tidak berubah dari tahun 2025 ke tahun 2026. Selain itu, resipi penghasilan tart nanas dikemas kini dengan keadaan penggunaan bahan *D* akan dikurangkan $\frac{1}{3}$ daripada resipi asal.

The estimated price for ingredient A decreases 15%*, the price of ingredient D increases by* 10% *where the prices for ingredients B and C remain unchanged from the year* 2025 *to* 2026*. On top of that, the recipe to produce the pineapple tart is reviewed where the usage of ingredient D will be reduced by* $\frac{1}{3}$ *from the original recipe.*

(i) Hitung indeks gubahan bagi kos penghasilan tart nanas pada tahun 2026 berasaskan tahun 2023
Calculate the composite index for the cost to produce pineapple tart in the year 2026 *based on the year* 2023.

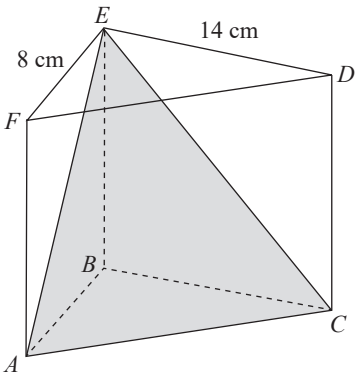
(ii) Kos penghasilan sekotak tart nanas ialah RM18 pada tahun 2023, anggarkan kos penghasilan yang sepadan pada tahun 2026.
The production cost for a box of pineapple tart is RM18 *in the year* 2023*, estimate the respective production cost in the year* 2026.

[5 markah/*marks*]

Jawapan/*Answer*:

15 Penyelesaian secara lukisan berskala tidak diterima.
Solution by scale drawing is not accepted.

Rajah 15 menunjukkan sebuah prisma tegak, dengan keadaan tapak *ABC* berbentuk segi tiga cakah. Titik *E* berada pada 15 cm tegak di atas titik *B*.
Diagram 15 *shows a right prism, where the base ABC is an obtuse-angled triangle. Point E is* 15 cm *vertically above point B.*



Rajah 15
Diagram 15

Diberi bahawa $\angle EDF = 17.08°$,
It is given that $\angle EDF = 17.08°$,

(a) cari $\angle EFD$ dan $\angle AEC$.
find $\angle EFD$ dan $\angle AEC$.

[7 markah/*marks*]

(b) hitung luas, dalam cm^2, bagi segi tiga *ACE*.
calculate the area, in cm^2, *of triangle ACE.*

[2 markah/*marks*]

(c) lakarkan satu segi tiga $A'B'C'$ yang berlainan bentuk dengan segi tiga *ABC*, dengan keadaan $A'B' = AB$, $B'C' = BC$ dan $\angle A'C'B' = \angle ACB$.
sketch a triangle $A'B'C'$ *which has a different shape with triangle ABC, where* $A'B' = AB$, $B'C' = BC$ *and* $\angle A'C'B' = \angle ACB$.

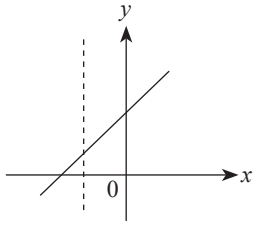
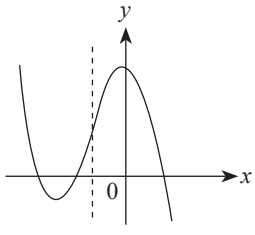
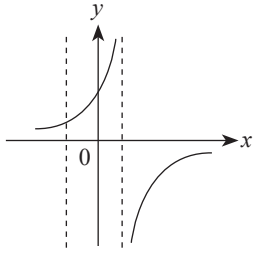
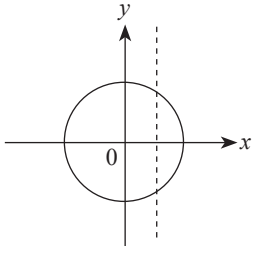
[1 markah/*mark*]

JAWAPAN

Tingkatan 4

BAB 1 **Fungsi**
Functions

LATIHAN INTENSIF

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	(a)  Fungsi (b)  Fungsi (c)  Fungsi (d)  Bukan Fungsi	1, 1 1, 1	4
2	(a) 3, 4 (b) {7, 8, 9, 10}	1 1	2
3	(a) $k = 3$ (b) $f(x) = x + 1$	1 1	2
4	(a) Katakan/*Suppose* $y = 2x + 3$ $x = \frac{y-3}{2}$ Maka/*Hence* $g^{-1}(x) = \frac{x-3}{2}$ $g^{-1}(7) = \frac{7-3}{2}$ $= 2$ (b) $hg(x) = h[g(x)]$ $= 3(2x + 3)^2 - 8$ $= 3(4x^2 + 12x + 9) - 8$ $= 12x^2 + 36x + 19$	1 1 1 1	4

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
5	(a) $f(2) = 2(2) + 1$ $= 5$ (b) $gf(2) = g[f(2)]$ $= g(5)$ $= 3 - p(5)$ $= 3 - 5p$ $gf(2) = -7$ $3 - 5p = -7$ $-5p = -7 - 3$ $p = \frac{-10}{-5}$ $p = 2$	1 1 1	3
6	(a) $k = 0$ (b) $f(x) = \frac{x + p}{x}$ $f\left(\frac{1}{2}\right) = 3$ $\frac{\left(\frac{1}{2}\right) + p}{\left(\frac{1}{2}\right)} = 3$ $\frac{1}{2} + p = 3\left(\frac{1}{2}\right)$ $\frac{1}{2} + p = \frac{3}{2}$ $p = \frac{3}{2} - \frac{1}{2}$ $p = 1$	1 1 1	3
7	Katakan/*Suppose* $y = 4x + m$ $x = \frac{y - m}{4}$ Maka/*Hence* $h^{-1}(x) = \frac{x - m}{4}$ Bandingkan dengan/*Compare with* $h^{-1} : x \to 2kx + \frac{5}{8}$ $-\frac{m}{4} = \frac{5}{8}$ dan/*and* $2k = \frac{1}{4}$ $m = -\frac{5}{8} \times 4$ $k = \frac{1}{4 \times 2}$ $m = -\frac{5}{2}$ $k = \frac{1}{8}$	1 1 1, 1	4
8	(a) $f^{-1}(7) = x$ $f(x) = 7$ $x = 3$ (b) $f^2(2) = f[f(2)]$ $= f[4]$ $= 10$	1 1 1	3
9	(a) $f(x) = \lvert x - 3 \rvert$ (b) $\lvert x - 3 \rvert = \pm 4$ $x - 3 = 4$ dan/*and* $x - 3 = -4$ $x = 4 + 3$ $x = -4 + 3$ $= 7$ dan/*and* $= -1$	1 1 1	3

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
10	$\frac{a(2)}{b+2} = 1$ atau/*or* $\frac{a(8)}{b+8} = 2$ $\frac{2a}{b+2} = 1$ $\frac{8a}{b+8} = 2$ $2a = 1(b+2)$ $8a = 2(b+8)$ $2a = b+2$ $8a = 2b+16$ … ② $b = 2a-2$ … ① Gantikan ① ke dalam ② *Substitute ① into ②* $8a = 2(2a-2)+16$ $8a = 4a-4+16$ $4a = 12$ $a = 3$ dan/*and* $b = 2(3)-2$ $= 4$	1 1 1	3
11	$h(x) = ax+b$ $hh(x) = a(ax+b)+b$ $hh(x) = a^2x+ab+b$ Bandingkan dengan $h^2(x)$, $a^2 = 9$ atau/*or* $ab+b = 16$ *Compare with* $h^2(x)$, $a^2 = 9$ $a = \pm\sqrt{9}$ $a = 3, a = -3$ $\therefore a = 3$ $ab+b = 16$ $3b+b = 16$ $b = 4$ $a = 3$ dan/*and* $b = 4$	1 1 1	3
12	(a) (i) $h(x) = \frac{8x}{2x+3}, x \neq k$ $2x+3 = 0$ $2x = -3$ $x = -\frac{3}{2}$ $\therefore k = -\frac{3}{2}$ (ii) $hg(x) = h[g(x)]$ $= \frac{8(2x+p)}{2(2x+p)+3}$ $= \frac{16x+8p}{4x+2p+3}, x \neq \frac{-2p-3}{4}$ (b) $hg(x) = h[g(x)]$ $= \frac{16x+8\left(-\frac{19}{2}\right)}{4x+2\left(-\frac{19}{2}\right)+3}$ $= \frac{16x-76}{4x-16}$ $= \frac{4x-19}{x-4}$ Katakan/*Suppose* $y = \frac{4x-19}{x-4}$ $y(x-4) = 4x-19$ $xy-4y = 4x-19$ $xy-4x = 4y-19$ $x(y-4) = 4y-19$ $x = \frac{4y-19}{y-4}$	 1 1 1 1	5

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	$\therefore (hg)^{-1}(x) = \dfrac{4x-19}{x-4}$ Oleh sebab $hg(x) = (hg)^{-1}(x) = \dfrac{4x-19}{x-4}$, maka, $hg(x)$ ialah fungsi songsang pemetaan ke atas diri sendiri. *Since* $hg(x) = (hg)^{-1}(x) = \dfrac{4x-19}{x-4}$, *thus* $hg(x)$ *is the inverse function maps to itself.*	1	
13	(a) 12 (b) 5	1 1	2
14	(a) $g(x) = \dfrac{3}{x}$ $g^2(x) = g[g(x)]$ $= g\left(\dfrac{3}{x}\right)$ $= \dfrac{3}{\left(\dfrac{3}{x}\right)}$ $= x$ $g^3(x) = g[g^2(x)]$ $= g(x)$ $= \dfrac{3}{x}$ $g^4(x) = g[g^3(x)]$ atau/*or* $g^4(x) = g^2[g^2(x)]$ $= g\left(\dfrac{3}{x}\right)$ $= g^2(x)$ $= \dfrac{3}{\left(\dfrac{3}{x}\right)}$ $= x$ $= x$ (b) g^{6n^2}, $n = 1, 2, 3, 4, \ldots$ $g^{6(1)^2}(x) = g^6(x) = x$ $g^{6(2)^2}(x) = g^{24}(x) = x$ $g^{6(3)^2}(x) = g^{54}(x) = x$ $g^{6(4)^2}(x) = g^{96}(x) = x$ $\therefore g^{6n^2} = x$	1 1 1 1 1 1	5
15	(a) $\dfrac{p}{2} = 5$ $p = 10$ (b) Kecerunan/*Gradient*, $m = \dfrac{5-(-3)}{2-0}$ $= \dfrac{8}{2}$ $= 4$ $f(x) = 4x - 3$ Katakan/*Suppose* $y = 4x - 3$ $x = \dfrac{y+3}{4}$ $\therefore f^{-1}(x) = \dfrac{x+3}{4}$	1 1 1 1 1	5
16	$f^2(x) = ff(x)$ $= f(5x-3)$ $= 5(5x-3) - 3$ $= 25x - 15 - 3$ atau/*or* $= 25x - 18$ $g^2(x) = gg(x)$ $= g(7x+2)$ $= 7(7x+2) + 2$ $= 49x + 14 + 2$ $= 49x + 16$	1	

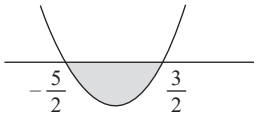
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	$f^2 = g^2$ $25x - 18 = 49x + 16$ $24x = -34$ $x = -\frac{34}{24}$ $x = -\frac{17}{12}$	1 1	3
17	(a) $x = 120 - k$ $M = 400 + \sqrt{120 - k}$ (b) $M = 400 + \sqrt{120 - 20}$ $= \text{RM}410$	1 1 1 1	4
18	(a) (i) $V(t) = 60 + 8t$ (ii) $V = \frac{1}{3}\pi j^2 h$ $h = \frac{3V}{\pi j^2}$ (iii) $hV(t) = \frac{3(60 + 8t)}{\pi j^2}$ Apabila jejari/*When the radius*, $j = 10$ cm $hV(t) = \frac{3(60 + 8t)}{\pi(10)^2}$ $= \frac{180 + 24t}{100\pi}$ $hV(t) = \frac{45 + 6t}{25\pi}$ (b) Apabila/*When* $t = 30$ saat/*seconds* $h(30) = \frac{45 + 6(30)}{25\pi}$ $(\pi = 3.142)$ $= 2.864$ cm	1 1 1 1 1 1	7

BAB 2 Fungsi Kuadratik
Quadratic Functions

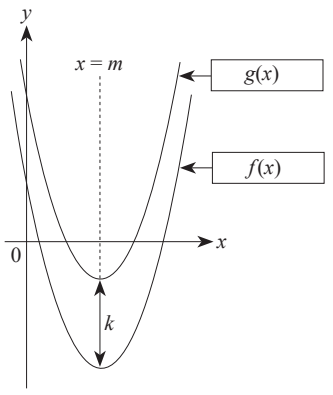
Imbas Kembali

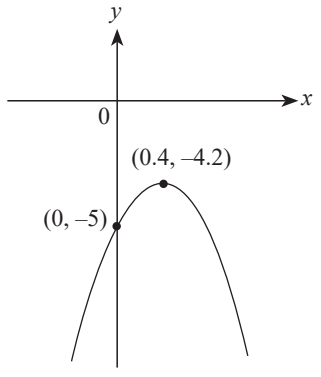
Soalan	Skema Pemarkahan
1	(a) $2mh^2 - 98m^3$ $= 2m(h^2 - 49m^2)$ $= 2m[h^2 - (7m)^2]$ $= 2m(h - 7m)(h + 7m)$ (b) $ap^2 - 2apq + aq^2$ $= a(p^2 - 2pq + q^2)$ $= a(p - q)^2$
2	(a) $rs(s - 3r + 2rs - 7)$ $= rs^2 - 3r^2s + 2r^2s^2 - 7rs$ (b) $(4 - x)(5 - 3x)$ $= 20 - 12x - 5x + 3x^2$ $= 20 - 17x + 3x^2$ (c) $\left(\frac{1}{3}m - \frac{2}{5}n\right)\left(m + \frac{3}{4}n\right)$ $= \frac{1}{3}m^2 + \frac{1}{4}mn - \frac{2}{5}mn - \frac{3}{10}n^2$ $= \frac{1}{3}m^2 - \frac{3}{20}mn - \frac{3}{10}n^2$

LATIHAN INTENSIF

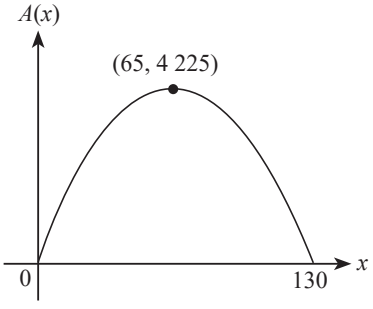
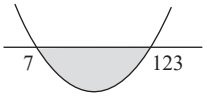
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	(a) (i) $3\left(-\frac{1}{3}\right)^2 - 5\left(-\frac{1}{3}\right) + a = 0$	1	9
	$\frac{1}{3} + \frac{5}{3} + a = 0$		
	$a = -2$	1	
	(ii) $b^2 - 4ac = 0$ (Punca nyata dan sama/*Equal real roots*)		
	$(-5)^2 - 4(3)(a) = 0$	1	
	$25 - 12a = 0$		
	$12a = 25$		
	$a = \frac{25}{12}$	1	
	(iii) $x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(3)(a)}}{2(3)}$		
	$x = \frac{5 \pm \sqrt{25 - 12a}}{6}$		
	Bandingkan dengan/*Compare with* $\frac{5 \pm \sqrt{11}}{6} i$		
	$\frac{5 \pm \sqrt{25 - 12a}}{6} = \frac{5 \pm \sqrt{11}}{6} i$		
	$\sqrt{25 - 12a} = \sqrt{11} \times \sqrt{-1}$	1	
	$\sqrt{25 - 12a} = \sqrt{-11}$		
	$25 - 12a = -11$		
	$12a = 36$		
	$a = 3$	1	
	(b) $(x^2 + 1)m = (2m - n)x - n$		
	$mx^2 + m = 2mx - nx - n$		
	$mx^2 - 2mx + nx + m + n = 0$		
	$mx^2 + (n - 2m)x + m + n = 0$	1	
	$b^2 - 4ac = 0$		
	$(n - 2m)^2 - 4(m)(m + n) = 0$	1	
	$n^2 - 4mn + 4m^2 - 4m^2 - 4mn = 0$		
	$n^2 - 8mn = 0$		
	$n^2 = 8mn$		
	$n = 8m$		
	$\frac{m}{n} = \frac{1}{8}$		
	$\left(\frac{m}{n}\right)^2 = \left(\frac{1}{8}\right)^2$		
	$\left(\frac{m}{n}\right)^2 = \frac{1}{64}$	1	
2	(a) $(2x - 3)^2 \leq 8(3 - 2x)$		
	$4x^2 - 12x + 9 \leq 24 - 16x$		
	$4x^2 + 4x - 15 \leq 0$		
	$(2x - 3)(2x + 5) \leq 0$	1	
		1	
	$-\frac{5}{2} \leq x \leq \frac{3}{2}$	1	

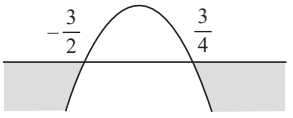
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) $f(x) = \frac{1}{3}x^2 + 2x - 1$ $= \frac{1}{3}(x^2 + 6x - 3)$ $= \frac{1}{3}\left[x^2 + 6x + \left(\frac{6}{2}\right)^2 - \left(\frac{6}{2}\right)^2 - 3\right]$ $= \frac{1}{3}\left[(x+3)^2 - 12\right]$ $= \frac{1}{3}(x+3)^2 - 4$ Titik minimum/*Minimum point* $(-3, -4)$ Paksi simetri/*Axis of symmetry*, $x = -3$	 1 1 1 1	7
3	(a) $f(x) = a(x-b)^2 + c$ Berdasarkan graf/*Based on the graph*, $c = 30$, $b = \frac{0+60}{2} = 30$ Maka/*Thus*, $f(x) = -a(x-30)^2 + 30$ Apabila/*When* $x = 0$, $f(x) = 0$ $-a(0-30)^2 + 30 = 0$ $-900a + 30 = 0$ $a = \frac{30}{900}$ $a = \frac{1}{30}$ Maka/*Thus*, $f(x) = -\frac{1}{30}(x-30)^2 + 30$ $= -\frac{1}{30}(x^2 - 60x + 900) + 30$ $= -\frac{1}{30}x^2 + 2x - 30 + 30$ $f(x) = -\frac{1}{30}x + 2x$ (b) $g(x) = -\frac{3}{250}x^2 + \frac{6}{5}x$ $= -\frac{3}{250}(x^2 - 100x)$ $= -\frac{3}{250}\left[x^2 - 100x + \left(-\frac{100}{2}\right)^2 - \left(-\frac{100}{2}\right)^2\right]$ $= -\frac{3}{250}[(x-50)^2 - 2\,500]$ $= -\frac{3}{250}(x-50)^2 + 30$ Jarak *AB*/*Distance of AB* $= 50 - 30$ $= 20$ unit	 1 1 1 1 1 1 1	6

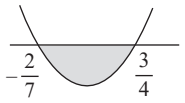
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
4	(a) 	1 1	7
	(b) (i) $x = -\frac{b}{2a}$ $m = -\frac{(-5)}{2(1)}$ $m = \frac{5}{2}$	1	
	(ii) $k = 2a + 3 - 2a$ $k = 3$	1	
	(c) Dengan menggunakan kaedah penyempurnaan kuasa dua, *By using completing the square method,* $f(x) = x^2 - 5x + 2a$ $= x^2 - 5x + \left(-\frac{5}{2}\right)^2 - \left(-\frac{5}{2}\right)^2 + 2a$ $= \left(x - \frac{5}{2}\right)^2 - \frac{25}{4} + 2a$	1	
	$-\frac{25}{4} + 2a = -\frac{13}{4}$ $2a = 3$ $a = \frac{3}{2}$	1 1	
5	(a) $\alpha\beta = 6$ $\frac{1}{\alpha\beta} = \frac{1}{h+1}$ $\frac{1}{6} = \frac{1}{h+1}$	1	
	$h + 1 = 6$ $h = 5$	1	
	(b) $15x^2 - 5 > -2(16x - 1)$ $15x^2 - 5 + 32x - 2 > 0$ $15x^2 + 32x - 7 > 0$ $(5x - 1)(3x + 7) > 0$	1	
	$x = -3$: $(5(-3) - 1)(3(-3) + 7) > 0$ (+) $x = 0$: $(5(0) - 1)(3(0) + 7) < 0$ (−) $x = 1$: $(5(1) - 1)(3(1) + 7) > 0$ (+) $x < -\frac{7}{3}$; $-\frac{7}{3}$; $-\frac{7}{3} < x < \frac{1}{5}$; $\frac{1}{5}$; $x > \frac{1}{5}$	1	
	Maka/*Thus*, $x < -\frac{7}{3}$ atau/*or* $x > \frac{1}{5}$	1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(c) (i) Kelebaran graf berkurang *The width of the graph decreases* (ii) Graf bergerak mengufuk ke kiri dan bergerak secara menegak ke bawah. *The graph moves horizontally to the left and moves vertically downwards.*	1 1, 1	8
6	(a) (i)  Bentuk graf/*Shape of the graph* ⌒ Pintasan-*y*/*y-intercept* Titik maksimum/*Maximum point* (ii) $g(x) = 5x^2 - 4x + (-5 + 2(3))$ $g(x) = 5x^2 - 4x + 1$ (b) $3m^2 - 7m - 2 = 4$ $3m^2 - 7m - 6 = 0$ $(3m + 2)(m - 3) = 0$ $m = -\frac{2}{3}$ atau/*or* $m = 3$	1 1 1 1 1 1 1 1	7
7	(a) Hasil tambah punca/*Sum of roots*: $\alpha + \beta = 2 - \sqrt{\frac{2}{3}} + 2 + \sqrt{\frac{2}{3}}$ $= 4$ Hasil darab punca/*Product of roots*: $\alpha\beta = \left(2 - \sqrt{\frac{2}{3}}\right)\left(2 + \sqrt{\frac{2}{3}}\right)$ $= 4 - \frac{2}{3}$ $= \frac{10}{3}$ Persamaan kuadratik/*Quadratic equation*: $-\left[x^2 - \left(2 - \sqrt{\frac{2}{3}} + 2 + \sqrt{\frac{2}{3}}\right)x + \left(2 - \sqrt{\frac{2}{3}}\right)\left(2 + \sqrt{\frac{2}{3}}\right)\right] = 0$ $-\left(x^2 - 4x + \frac{10}{3}\right) = 0$ $-3x^2 + 12x - 10 = 0$ Maka/*Thus*, $f(x) = -3x^2 + 12x - 10$ $f(x) = -3x^2 + 12x - 10$ $= -3\left(x^2 - 4x + \frac{10}{3}\right)$ $= -3\left[x^2 - 4x + \left(-\frac{4}{2}\right)^2 - \left(-\frac{4}{2}\right)^2 + \frac{10}{3}\right]$ $= -3\left[(x - 2)^2 - \frac{2}{3}\right]$ $= -3(x - 2)^2 + 2$ (b) $f(x) = -3(x - 2)^2$	1 1 1 1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(c) $g(x) = -2[-3(x-2)^2 + 2] + 3$ $= 6(x-2)^2 - 4 + 3$ $= 6(x-2)^2 - 1$	1	7
	Titik minimum/*Minimum point* $(2, -1)$	1	
8	(a) $c = -3$	1	9
	$-\frac{b}{2a} = \frac{0 + \frac{7}{2}}{2}$ $b = -\frac{7}{2}a$	1	
	Gantikan nilai b dan c ke dalam persamaan *Substitute the values of b and c into the equation* $f(x) = ax^2 - \frac{7}{2}ax - 3$		
	Apabila/*When* $x = 1$, $f(x) = 2$ $2 = a(1)^2 - \frac{7}{2}a(1) - 3$	1	
	$-\frac{5}{2}a = 5$ $a = -2$	1	
	Apabila/*When* $a = -2$, $b = -\frac{7}{2}(-2)$ $b = 7$	1	
	(b) $f(x) = -2x^2 + 7x - 3$ Hasil tambah punca/*Sum of roots*: $\alpha + \beta = \frac{-7}{-2}$ $= \frac{7}{2}$	1	
	Hasil darab punca/*Product of roots*: $\alpha\beta = \frac{-3}{-2}$ $= \frac{3}{2}$		
	Hasil tambah punca yang baharu/*New sum of roots*: $\frac{1}{2}\alpha + 3 + \frac{1}{2}\beta + 3 = \frac{1}{2}(\alpha + \beta) + 6$ $= \frac{1}{2}\left(\frac{7}{2}\right) + 6$ $= \frac{31}{4}$	1	
	Hasil darab punca yang baharu/*New product of roots*: $\left(\frac{1}{2}\alpha + 3\right)\left(\frac{1}{2}\beta + 3\right) = \frac{1}{4}\alpha\beta + \frac{3}{2}(\alpha + \beta) + 9$ $= \frac{1}{4}\left(\frac{3}{2}\right) + \frac{3}{2}\left(\frac{7}{2}\right) + 9$ $= \frac{117}{8}$	1	
	Fungsi kuadratik yang baharu/*New quadratic function*: $f(x) = x^2 - \frac{31}{4}x + \frac{117}{8}$	1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
9	(a) Anggap lebar bingkai gambar sebagai y. *Let the width of picture frame be y.* $2x + 2y = 260$ $y = 130 - x$ Luas bingkai gambar/*Area of picture frame*: $A(x) = xy$ $A(x) = x(130 - x)$ $A(x) = 130x - x^2$	1 1	
	(b)  Bentuk graf/*Shape of the graph* ⌒ Pintasan-x/*x-intercept* Titik maksimum/*Maximum point*	1 1 1	8
	(c) $130x - x^2 \geqslant 861$ $-x^2 + 130x - 861 \geqslant 0$ $x^2 - 130x + 861 \leqslant 0$ $(x - 7)(x - 123) \leqslant 0$  $7 \leqslant x \leqslant 123$	1 1 1	
10	(a) $a^2x^2 + 3x + 1 = 0$ $a^2\left(x^2 + \frac{3}{a^2}x + \frac{1}{a^2}\right) = 0$ $a^2\left[x^2 + \frac{3}{a^2}x + \left(\frac{3}{2a^2}\right)^2 - \left(\frac{3}{2a^2}\right)^2 + \frac{1}{a^2}\right] = 0$ $a^2\left[\left(x + \frac{3}{2a^2}\right)^2 - \frac{9}{4a^4} + \frac{1}{a^2}\right] = 0$ $a^2\left[\left(x + \frac{3}{2a^2}\right)^2 - \left(\frac{9 - 4a^2}{4a^4}\right)\right] = 0$ $a^2\left(x + \frac{3}{2a^2}\right)^2 - \left(\frac{9 - 4a^2}{4a^2}\right) = 0$ $a^2\left(x + \frac{3}{2a^2}\right)^2 = \frac{9 - 4a^2}{4a^2}$ $\left(x + \frac{3}{2a^2}\right)^2 = \frac{9 - 4a^2}{4a^4}$ $x + \frac{3}{2a^2} = \pm\sqrt{\frac{9 - 4a^2}{4a^4}}$ $x = -\frac{3}{2a^2} \pm \sqrt{\frac{9 - 4a^2}{4a^4}}$ $x = \frac{-3 \pm \sqrt{9 - 4a^2}}{2a^2}$	1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) Gantikan $y = a^2x^2 + 3x + 1$ ke dalam persamaan $y = ax - \frac{5}{4}$. *Substitute* $y = a^2x^2 + 3x + 1$ *into the equation* $y = ax - \frac{5}{4}$. $a^2x^2 + 3x + 1 = ax - \frac{5}{4}$ $a^2x^2 + (3 - a)x + \frac{9}{4} = 0$ Fungsi tidak bersilang dengan garis/*Function does not intersect with line*: $b^2 - 4ac < 0$ $(3 - a)^2 - 4(a^2)\left(\frac{9}{4}\right) < 0$ $9 - 6a + a^2 - 9a^2 < 0$ $-8a^2 - 6a + 9 < 0$ $-(2a + 3)(4a - 3) < 0$ $(2a + 3)(4a - 3) > 0$  $a < -\frac{3}{2}$ dan/*and* $a > \frac{3}{4}$	1 1 1 1 1	7
11	(a) (i) $\frac{\alpha + \beta}{2} = 3$ $\alpha + \beta = 6$ (ii) $(\alpha + \beta)^2 = \alpha^2 + \beta^2 + 2\alpha\beta$ $6^2 = 26 + 2\alpha\beta$ $2\alpha\beta = 10$ $\alpha\beta = 5$ (b) $f(x) = m(x - \alpha)(x - \beta)$ $= m(x^2 - \beta x - \alpha x + \alpha\beta)$ $= mx^2 - m(\alpha + \beta)x + m\alpha\beta$ $m\alpha\beta = 10$ $5m = 10$ $m = 2$ $f(x) = 2x^2 - 2(6)x + 10$ $f(x) = 2x^2 - 12x + 10$ $f(x) = 2(x^2 - 6x + 5)$ $f(x) = 2\left[x^2 - 6x + \left(-\frac{6}{2}\right)^2 - \left(-\frac{6}{2}\right)^2 + 5\right]$ $f(x) = 2(x - 3)^2 - 8$ (c) $f(x) = 2(x - 5)^2 - 8$	1 1 1 1 1 1 1 1	8

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(a) $28x^2 - 13x - 5 < 1$ $28x^2 - 13x - 6 < 0$ $(4x - 3)(7x + 2) < 0$  $-\frac{2}{7} < x < \frac{3}{4}$	1 1	9
	(b) (i) $\alpha + \beta = (5 - h - k)$ $\alpha\beta = -(6 + k)$	1 1	
	(ii) Paksi simetri/*Axis of symmetry*: $x = \frac{-(5 - h - k)}{2(-1)}$ $x = \frac{5 - h - k}{2}$	 1	
	Tinggi maksimum/*Maximum height*, $-\left(\frac{5 - h - k}{2}\right)^2 + (5 - h - k)\left(\frac{5 - h - k}{2}\right) + 6 + k = \frac{1}{4}(5 - h - k)^2$ $-\left(\frac{5 - h - k}{2}\right)^2 + \frac{(5 - h - k)^2}{2} + 6 + k = \frac{(5 - h - k)^2}{4}$ $\frac{-(5 - h - k)^2 + 2(5 - h - k)^2 + 24 + 4k}{4} = \frac{(5 - h - k)^2}{4}$ $(5 - h - k)^2 + 24 + 4k = (5 - h - k)^2$ $24 + 4k = 0$ $k = -6$	1 1	
	Apabila/*When* $k = -6$, $f(x) = -x^2 + (5 - h - (-6))x + 6 - 6$ $= -x^2 + (11 - h)x$	 1	
	$c = 0$, maka bola disepak dari permukaan tanah. $c = 0$, *thus the ball is kicked from the ground surface.*	1	

BAB 3

Sistem Persamaan
Systems of Equations

LATIHAN INTENSIF

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	$4q - 2p - r = -8$ … ① $3p + 6r - q = 2$ … ② $9p - 2q = 4$ … ③ Daripada/*From* ①, $r = 4q - 2p + 8$ … ④ Gantikan ④ ke dalam ② *Substitute* ④ *into* ② $3p + 6(4q - 2p + 8) - q = 2$ $3p + 24q - 12p + 48 - q = 2$ $23q - 9p + 46 = 0$ $9p = 23q + 46$ … ⑤ Gantikan ⑤ ke dalam ③ *Substitute* ⑤ *into* ③ $23q + 46 - 2q = 4$ $21q = -42$ $q = -2$ Gantikan $q = -2$ ke dalam ⑤ *Substitute* $q = -2$ *into* ⑤ $9p = 23(-2) + 46$ $9p = 0$ $p = 0$ Gantikan $p = 0$ dan $q = -2$ ke dalam ④ *Substitute* $p = 0$ *and* $q = -2$ *into* ④ $r = 4(-2) - 2(0) + 8$ $r = 0$ $p = 0$ dan/*and* $r = 0$ Maka/*Thus*, $p = \frac{46}{189}$, $q = -\frac{40}{21}$ dan/*and* $r = -\frac{20}{189}$.	1 1 1 1 1	5
2	$2x - y - 2z = 2$ … ① $3x + 2y = 5$ … ② $2y - 3z = 20$ … ③ Daripada/*From* ①, $y = 2x - 2z - 2$ … ④ Gantikan ④ ke dalam ② *Substitute* ④ *into* ② $3x + 2(2x - 2z - 2) = 5$ $3x + 4x - 4z - 4 = 5$ $7x - 4z = 9$ …⑤ Gantikan ④ ke dalam ③ *Substitute* ④ *into* ③ $2(2x - 2z - 2) - 3z = 20$ $4x - 4z - 4 - 3z = 20$ $4x - 7z = 24$ … ⑥ Daripada/*From* ⑥, $x = \frac{7z + 24}{4}$ …⑦	1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	Gantikan ⑦ ke dalam ⑤ *Substitute* ⑦ *into* ⑤ $7\left(\frac{7z+24}{4}\right) - 4z = 9$ $\frac{49z+168}{4} - 4z = 9$ $49z + 168 - 16z = 36$ $33z = -132$ $z = -4$ Gantikan $z = -4$ ke dalam ⑦ *Substitute* $z = -4$ *into* ⑦ $x = \frac{7(-4)+24}{4}$ $x = -1$ Gantikan $x = 1$ dan $z = -4$ ke dalam ④ *Substitute* $x = 1$ *and* $z = -4$ *into* ④ $y = 2(-1) - 2(-4) - 2$ $y = 4$ $x = 1, y = 4$ Maka/*Thus*, $x = -1$, $y = 4$ dan/*and* $z = -4$	1 1 1	5
3	$x + y + z = 250$ … ① $15x + 10y + 8z = 2\,825$ … ② $y = 2x$ … ③ ① × 8: $8x + 8y + 8z = 2\,000$ …④ ② – ④: $15x + 10y + 8z = 2\,825$ $(-)\quad 8x + 8y + 8z = 2\,000$ $7x + 2y = 825$ …⑤ ③ × 2: $2y = 4x$ $2y - 4x = 0$ … ⑥ ⑥ – ⑤: $2y - 4x = 0$ $(-)\quad 2y + 7x = 825$ $-11x = -825$ $x = 75$ Gantikan $x = 75$ ke dalam ③ *Substitute* $x = 75$ *into* ③ $y = 2(75)$ $y = 150$ Gantikan $x = 75$ dan $y = 150$ ke dalam ① *Substitute* $x = 75$ and $y = 150$ *into* ① $75 + 150 + z = 250$ $225 + z = 250$ $z = 25$ $y = 150, z = 25$ Maka/*Thus*, $x = 75$, $y = 150$ dan/*and* $z = 25$.	 1 1 1 1 1	5

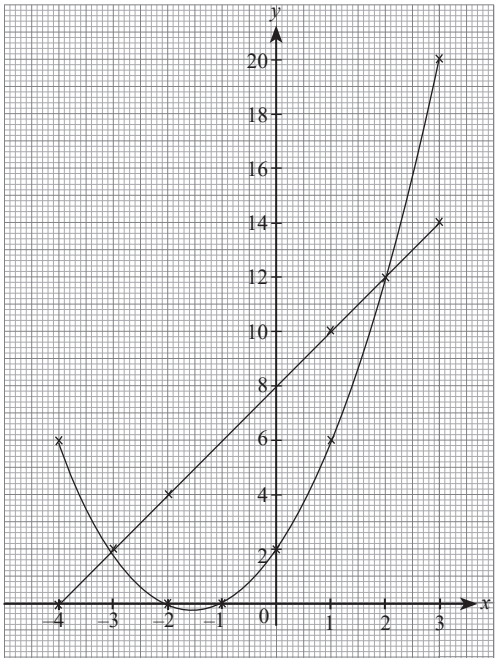
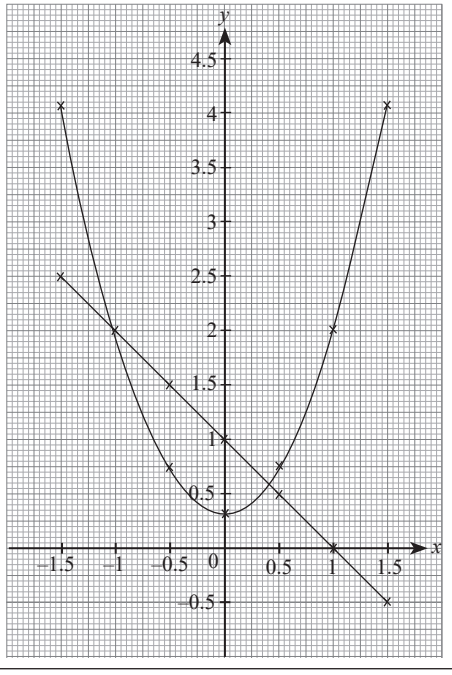
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
4	$2x - y + z = -3$ … ① $2x + 2y + 3z = 2$ … ② $3x - 3y - z = -4$ … ③ ② – ①: $2x + 2y + 3z = 2$ $(-)\quad 2x - y + z = -3$ $3y + 2z = 5$ …④ ① × 3: $6x - 3y + 3z = -9$ … ⑤ ③ × 2: $6x - 6y - 2z = -8$ … ⑥ ⑥ – ⑤: $6x - 6y - 2z = -8$ $(-)\quad 6x - 3y + 3z = -9$ $-3y - 5z = 1$ … ⑦ ④ + ⑦: $3y + 2z = 5$ $(+)\quad -3y - 5z = 1$ $-3z = 6$ $z = -2$ Gantikan $z = -2$ ke dalam ④ *Substitute* $z = -2$ *into* ④ $3y + 2(-2) = 5$ $3y = 9$ $y = 3$ Gantikan $y = 3$ dan $z = -2$ ke dalam ① *Substitute* $y = 3$ *and* $z = -2$ *into* ① $2x - 3 + (-2) = -3$ $2x = 2$ $x = 1$ $y = 3, z = -2$ Maka/*Thus*, $x = 1$, $y = 3$ dan/*and* $z = -2$.	1 1 1 1 1 1	5
5	$x + 4y - 3z = 5$ ...① $-4x - 2y + z = -4$ ...② $-3x + 2y - 2z = -1$ ...③ Daripada ①, *From* ①, $x = 5 - 4y + 3z$ ...④ Gantikan ④ ke dalam ② *Substitute* ④ *into* ② $-4(5 - 4y + 3z) - 2y + z = -4$ $-20 + 16y - 12z - 2y + z = -4$ $14y - 11z - 20 = -4$ $y = \frac{11z + 16}{14}$ ...⑤ Gantikan ④ ke dalam ③ *Substitute* ④ *into* ③ $-3(5 - 4y + 3z) + 2y - 2z = -1$ $-15 + 12y - 9z + 2y - 2z = -1$ $14y - 11z - 15 = -1$ ...⑥ Gantikan ⑤ ke dalam ⑥ *Substitute* ⑤ *into* ⑥ $14\left(\frac{11z + 16}{14}\right) - 11z - 15 = -1$ $1 = -1$ Maka, sistem persamaan linear ini tidak mempunyai penyelesaian kerana $1 \neq -1$. *Therefore, this system of linear equations has no solution because* $1 \neq -1$.	1 1 1 1 1	5

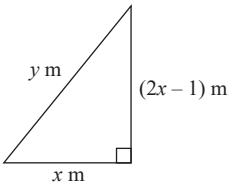
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
6	$-6x - 10y + 4z = -26$ … ① $5x + 2y + 4z = -20$ … ② $14x + 17y - 2z = 19$ … ③		
	② – ①: $5x + 2y + 4z = -20$ $(-)\ -6x - 10y + 4z = -26$ $11x + 12y = 6$ … ④	1	
	③ × 2: $28x + 34y - 4z = 38$ … ⑤	1	
	⑤ + ②: $28x + 34y - 4z = 38$ $(+)\ 5x + 2y + 4z = -20$ $33x + 36y = 18$ … ⑥		5
	④ × 3: $33x + 36y = 18$ … ⑦		
	⑥ – ⑦: $33x + 36y = 18$ $(-)\ 33x + 36y = 18$ $0 = 0$	1 1	
	Maka, sistem persamaan linear ini mempunyai penyelesaian tak terhingga kerana $0 = 0$. *Therefore, the system of linear equations has infinite solution because* $0 = 0$.	1	
7	$3x + 2y + z = 90$ … ① $4x + 3y + z = 122$ … ② $6x + y + 4z = 148$ … ③		
	Daripada/*From* ①, $z = 90 - 3x - 2y$ … ④	1	
	Gantikan ④ ke dalam ② *Substitute* ④ *into* ② $4x + 3y + 90 - 3x - 2y = 122$ $x + y = 32$ $y = 32 - x$ … ⑤	1	
	Gantikan ④ ke dalam ③ *Substitute* ④ *into* ③ $6x + y + 4(90 - 3x - 2y) = 148$ $6x + y + 360 - 12x - 8y = 148$ $-6x - 7y = -212$ … ⑥		
	Gantikan ⑤ ke dalam ⑥ *Substitute* ⑤ *into* ⑥ $-6x - 7(32 - x) = -212$ $-6x - 224 + 7x = -212$ $x = 12$	1 1	5
	Gantikan $x = 12$ ke dalam ⑤ *Substitute* $x = 12$ *into* ⑤ $y = 32 - 12$ $y = 20$		
	Gantikan $x = 12$ dan $y = 20$ ke dalam ④ *Substitute* $x = 12$ *and* $y = 20$ *into* ④ $z = 90 - 3(12) - 2(20)$ $z = 14$		
	$y = 20, z = 14$ Maka/ *Thus*, $x = 12$, $y = 20$ dan/*and* $z = 14$.	1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
8	$x + y = 4$ … ① $2x^2 - y = 17$ … ② ① + ②: $x + y = 4$ (+) $2x^2 - y = 17$ $x + 2x^2 = 21$ $2x^2 + x - 21 = 0$ $(x - 3)(2x + 7) = 0$ $x = 3, x = -\frac{7}{2}$ Gantikan $x = 3$ ke dalam ① *Substitute* $x = 3$ *into* ① $3 - y = 4$ $y = -1$ Gantikan $x = -\frac{7}{2}$ ke dalam ① *Substitute* $x = -\frac{7}{2}$ *into* ① $-\frac{7}{2} - y = 4$ $y = -\frac{15}{2}$ Maka/*Thus*, $x = 3$, $y = -1$ dan/*and* $x = -\frac{7}{2}$, $y = -\frac{15}{2}$.	1 1 1, 1 1	5
9	$2x + y = 4$ … ① $x^2 - y - 4 = 0$ … ② ① + ②: $2x + y = 4$ (+) $x^2 - y - 4 = 0$ $2x + x^2 - 4 = 4$ $x^2 + 2x - 8 = 0$ $(x - 2)(x + 4) = 0$ $x = 2, x = -4$ Gantikan $x = 2$ ke dalam ① *Substitute* $x = 2$ *into* ① $2(2) + y = 4$ $y = 0$ Gantikan $x = -4$ ke dalam ① *Substitute* $x = -4$ *into* ① $2(-4) + y = 4$ $y = 12$ Maka/*Thus*, $x = 2$, $y = 0$ dan/*and* $x = -4$, $y = 12$.	1 1 1 1	4
10	$\frac{x}{2} + \frac{y}{3} = -2$ … ① $2x^2 - xy = -1$ … ② Daripada/*From* ①, $\frac{3x + 2y}{6} = -2$ $3x + 2y = -12$ $y = \frac{-12 - 3x}{2}$ … ③	1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	Gantikan ③ ke dalam ② *Substitute* ③ *into* ② $2x^2 - x\left(\frac{-12-3x}{2}\right) = -1$ $4x^2 + 12x + 3x^2 = -2$ $7x^2 + 12x + 2 = 0$ $x = \frac{-12 \pm \sqrt{12^2 - 4(7)(2)}}{2(7)}$ $x = \frac{-12 \pm \sqrt{88}}{14}$ $x = \frac{-12 + \sqrt{88}}{14}$, $x = \frac{-12 - \sqrt{88}}{14}$ $x = -0.187$ $x = -1.527$ Gantikan $x = -0.187$ ke dalam ③ *Substitute* $x = -0.187$ *into* ③ $y = \frac{-12 - 3(-0.187)}{2}$ $y = -5.720$ Gantikan $x = -1.527$ ke dalam ③ *Substitute* $x = -1.527$ *into* ③ $y = \frac{-12 - 3(-1.527)}{2}$ $y = -3.710$ Maka/*Thus*, $x = -0.187$, $y = -5.720$ dan/*and* $x = -1.527$, $y = -3.710$	1 1 1 1 1	5
11	$x + 3y = 5$ … ① $x^2 + y^2 - 6x + 4y = 0$ … ② Daripada/*From* ①, $x = 5 - 3y$ … ③ Gantikan ③ ke dalam ② *Substitute* ③ *into* ② $(5 - 3y)^2 + y^2 - 6(5 - 3y) + 4y = 0$ $25 - 30y + 9y^2 + y^2 - 30 + 18y + 4y = 0$ $10y^2 - 8y - 5 = 0$ $y = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(10)(-5)}}{2(10)}$ $y = \frac{8 \pm \sqrt{264}}{20}$ $y = \frac{8 + \sqrt{264}}{20}$, $y = \frac{8 - \sqrt{264}}{20}$ $y = 1.212$ $y = -0.4124$ Gantikan $y = 1.212$ ke dalam ③ *Substitute* $y = 1.212$ *into* ③ $x = 5 - 3(1.212)$ $x = 1.364$ Gantikan $y = -0.4124$ ke dalam ③ *Substitute* $y = -0.4124$ *into* ③ $x = 5 - 3(-0.4124)$ $x = 6.237$ Maka/*Thus*, $x = 1.364$, $y = 1.212$ dan/*and* $x = 6.237$, $y = -0.4124$.	1 1 1 1 1	5

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
12	(a) $3x + y = 3 \quad \ldots ①$ $\frac{2}{3x} + \frac{1}{y} = 2 \quad \ldots ②$		
	Daripada/*From* ①, $y = 3 - 3x \quad \ldots ③$	1	
	Daripada/*From* ②, $\frac{2y + 3x}{3xy} = 2$ $2y + 3x = 6xy$ $6xy - 2y - 3x = 0 \quad \ldots ④$		
	Gantikan ③ ke dalam ④ *Substitute* ③ *into* ④ $6x(3 - 3x) - 2(3 - 3x) - 3x = 0$ $18x - 18x^2 - 6 + 6x - 3x = 0$ $-18x^2 + 21x - 6 = 0$ $6x^2 - 7x + 2 = 0$ $(3x - 2)(2x - 1) = 0$ $x = \frac{2}{3} \quad , \quad x = \frac{1}{2}$	1 1	
	Gantikan $x = \frac{2}{3}$ ke dalam ③ *Substitute* $x = \frac{2}{3}$ *into* ③ $y = 3 - 3\left(\frac{2}{3}\right)$ $y = 1$		8
	Gantikan $x = \frac{1}{2}$ ke dalam ③ *Substitute* $x = \frac{1}{2}$ *into* ③ $y = 3 - 3\left(\frac{1}{2}\right)$ $y = \frac{3}{2}$	 1	
	Maka/*Thus*, $P\left(\frac{1}{2}, \frac{3}{2}\right), Q\left(\frac{2}{3}, 1\right)$	1, 1	
	(b) Titik tengah PQ/*Midpoint of* PQ $= \left(\frac{\frac{1}{2} + \frac{2}{3}}{2}, \frac{\frac{3}{2} + 1}{2}\right)$ $= \left(\frac{7}{12}, \frac{5}{4}\right)$	 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
13	(a) **x** | –4 | –3 | –2 | –1 | 0 | 1 | 2 | 3 **$y = x^2 + 3x + 2$** | 6 | 2 | 0 | 0 | 2 | 6 | 12 | 20 **$y = 2x + 8$** | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14	1 1	9
	(b)  Satu titik diplot dengan betul/*One point is plotted correctly* Semua titik diplot dengan betul/*All points are plotted correctly* Graf kuadratik sempurna/*Perfect quadratic graph* Graf garis lurus sempurna/*Perfect straight line graph* Dua titik persilangan/*Two intersection points*	1 1 1 1 1	
	(c) (–3, 2) dan/*and* (2, 12)	1, 1	
14	**x** | –1.5 | –1 | –0.5 | 0 | 0.5 | 1 | 1.5 **$y = \frac{2 - 2x}{2}$** | 2.5 | 2 | 1.5 | 1 | 0.5 | 0 | –0.5 **$y = \frac{5x^2 + 1}{3}$** | 4.08 | 2 | 0.75 | 0.33 | 0.75 | 2 | 4.08	1 1	8
			

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	Satu titik diplot dengan betul/*One point is plotted correctly* Semua titik diplot dengan betul/*All points are plotted correctly* Graf kuadratik sempurna/*Perfect quadratic graph* Graf garis lurus sempurna/*Perfect straight line graph* Dua titik persilangan/*Two intersection points* Maka, $x = -1$, $y = 2$ dan $x = 0.4$, $y = 0.6$ adalah penyelesaian bagi persamaan serentak ini. *Thus,* $x = -1$, $y = 2$ *and* $x = 0.4$, $y = 0.6$ *are the solutions for this simultaneous equations.*	1 1 1 1 1 1	
15	$b = \frac{1}{2}h$ … ① $b^2 + h^2 = 5^2$ $b^2 + h^2 = 25$ … ② Gantikan ① ke dalam ② *Substitute* ① *into* ② $\left(\frac{1}{2}h\right)^2 + h^2 = 25$ $\frac{1}{4}h^2 + h^2 = 25$ $\frac{5}{4}h^2 = 25$ $h^2 = 20$ $h = \sqrt{20}$ $h = 4.472$ Maka, jarak dari hujung bahagian atas tangga ke tanah ialah 4.472 m. *Thus, the distance from the top of ladder to the ground is* 4.472 m.	1 1 1 1	4
16	$x + 2x - 1 + y = 40$ $3x + y = 41$ … ① $y^2 = (2x - 1)^2 + x^2$ $y^2 = 4x^2 - 4x + 1 + x^2$ $y^2 = 5x^2 - 4x + 1$ … ② Daripada/*From* ①, $y = 41 - 3x$ … ③ Gantikan ③ ke dalam ② *Substitute* ③ *into* ② $(41 - 3x)^2 = 5x^2 - 4x + 1$ $1\,681 - 246x + 9x^2 = 5x^2 - 4x + 1$ $4x^2 - 242x + 1\,680 = 0$ $2x^2 - 121x + 840 = 0$ $(2x - 105)(x - 8) = 0$ $x = \frac{105}{2}$, $x = 8$ Gantikan $x = \frac{105}{2}$ ke dalam ③ *Substitute* $x = \frac{105}{2}$ *into* ③ $y = 41 - 3\left(\frac{105}{2}\right)$ $y = -116.5$ (Abaikan/*Ignore*) Gantikan $x = 8$ ke dalam ③ *Substitute* $x = 8$ *into* ③ $y = 41 - 3(8)$ $y = 17$ Gantikan $x = 8$ ke dalam panjang sisi $(2x - 1)$ *Substitute* $x = 8$ *into the length of side* $(2x - 1)$ $2(8) - 1 = 15$ Maka, panjang setiap sisi tanah tersebut ialah 8 m, 15 m dan 17 m. *Thus, the length of each side of the land is* 8 m, 15 m *and* 17 m. 	1 1 1 1 1 1 1 1	8

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
17	Anggap/*Let*: Nasi lemak = x Air sirap/*Syrup drink* = y Puding/*Pudding* = z $x + y + z = 12$ … ① $2x + y + 2z = 24$ … ② $3x + 3y + 6z = 42$ … ③	1	7
	① × 3: $3x + 3y + 3z = 36$ … ④	1	
	③ – ④: $3x + 3y + 6z = 42$ $(-)\ 3x + 3y + 3z = 36$ $3z = 6$ $z = 2$	1	
	② × 3: $6x + 3y + 6z = 72$ … ⑤		
	⑤ – ③: $6x + 3y + 6z = 72$ $(-)\ 3x + 3y + 6z = 42$ $3x = 30$ $x = 10$	1	
	Gantikan $x = 10$ dan $z = 2$ ke dalam ① *Substitute* $x = 10$ *and* $z = 2$ *into* ① $10 + y + 2 = 12$ $y = 0$	1	
	Maka, harga sepinggan nasi lemak ialah RM10, harga sepinggan puding ialah RM2 dan air sirap adalah percuma. *Thus, the price of a plate of nasi lemak is* RM10, *the price of a plate of pudding is* RM2 *and the syrup drink is free.*		
	Peratus penjimatan belian Set 1 *Percentage of savings by purchasing Set* 1 $= \frac{2}{10 + 2 + 2} \times 100\%$ $= 14.29\%$	1 1	
18	Anggap/*Let*: Bilangan kanak-kanak/*Number of children* = x Bilangan lelaki/*Number of males* = y Bilangan wanita/*Number of females* = z		7
	$x + y + z = 400$ … ① $y = 2z$ … ② $x = 50 + y$ … ③	1 1	
	Gantikan ③ ke dalam ① *Substitute* ③ *into* ① $50 + y + y + z = 400$ $50 + 2y + z = 400$ … ④	1	
	Gantikan ② ke dalam ④ *Substitute* ② *into* ④ $50 + 2(2z) + z = 400$ $50 + 5z = 400$ $5z = 350$ $z = 70$	1 1	
	Gantikan $z = 70$ ke dalam ② *Substitute* $z = 70$ *into* ② $y = 2(70)$ $y = 140$	1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	Gantikan $y = 140$ ke dalam ③ *Substitute* $y = 140$ *into* ③ $x = 50 + 140$ $x = 190$ Maka/*Thus*, $x = 190$, $y = 140$ dan/*and* $z = 70$.	1	

BAB 4

Indeks, Surd dan Logaritma
Indices, Surds and Logarithms

Imbas Kembali

Soalan	Skema Pemarkahan
1	(a) $x^4 = 81$ $x^4 = 3^4$ $x = 3$ (b) $3^x \times 3^2 = 243$ $3^{x+2} = 3^5$ $x + 2 = 5$ $x = 3$
2	$(x^p)^2 \times x^{-3} = x^5$ $x^{2p-3} = x^5$ $2p - 3 = 5$ $2p = 8$ $p = 4$
3	$(x^m)^3 \div x^4 = (x^4)^4$ $x^{3m-4} = x^{16}$ $3m - 4 = 16$ $3m = 20$ $m = \frac{20}{3}$

LATIHAN INTENSIF

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	$AB^2 = (5 - \sqrt{2})^2 + (5 + \sqrt{2})^2$ $= 25 - 10\sqrt{2} + 2 + 25 + 10\sqrt{2} + 2$ $= 54$ $AB = \sqrt{54}$ $= 3\sqrt{6}$ m	1 1	2
2	(a) $x^2 + (2x)^2 = 15^2$ $x^2 + 4x^2 = 225$ $5x^2 = 225$ $x^2 = 45$ $x = \sqrt{45}$ $x = 3\sqrt{5}$ (b) $\frac{1}{2} \times x \times 2x = \frac{1}{2} \times 3\sqrt{5} \times 6\sqrt{5}$ $= \frac{1}{2}(18)(5)$ $= 45$ cm^2	1 1 1 1	4

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
3	$3^{2x-1} = 2^{3x+1}$ $\log_{10} 3^{2x-1} = \log_{10} 2^{3x+1}$ $(2x-1)\log_{10} 3 = (3x+1)\log_{10} 2$ $2x\log_{10} 3 - \log_{10} 3 = 3x\log_{10} 2 + \log_{10} 2$ $x(2\log_{10} 3 - 3\log_{10} 2) = \log_{10} 3 + \log_{10} 2$ $x(\log_{10} 9 - \log_{10} 8) = \log_{10} 3 + \log_{10} 2$ $x = \dfrac{\log_{10} 3 + \log_{10} 2}{\log_{10} 9 - \log_{10} 8}$ $x = \dfrac{\log_{10} 6}{\log_{10} \frac{9}{8}}$ $x = 15.2$	1 1 1	3
4	(a) $4e^{5t} = 30$ $e^{5t} = \dfrac{30}{4}$ $e^{5t} = \dfrac{15}{2}$ $5t = \ln\left(\dfrac{15}{2}\right)$ $t = \dfrac{\ln\left(\frac{15}{2}\right)}{5}$ $t = 0.403$ (b) $\ln(5x-2) = 7$ $5x - 2 = e^7$ $x = \dfrac{e^7 + 2}{5}$ $x = 220$ (c) $\ln(2x-3)^2 = 5$ $(2x-3)^2 = e^5$ $2x - 3 = \pm\sqrt{e^5}$ $x = \dfrac{\sqrt{e^5} + 3}{2}$, $x = \dfrac{\sqrt{e^5} - 3}{2}$ $x = 7.59$ $\quad$ $x = 4.59$	 1 1 1 1 1 1, 1	7
5	(a) Apabila minuman baru dibancuh, $t = 0$ *When the drink is freshly made*, $t = 0$ $T = 65e^{-0.03(0)} + 10$ $T = 65e^0 + 10$ $T = 75°C$ (b) Apabila/*When* $t = 5$ $T = 65e^{-0.03(5)} + 10$ $T = 65e^{-0.15} + 10$ $T = 65.95°C$ (c) $55 = 65e^{-0.03t} + 10$ $45 = 65e^{-0.03t}$ $\dfrac{9}{13} = e^{-0.03t}$ $\ln\left(\dfrac{9}{13}\right) = -0.03t$ $t = \dfrac{\ln\left(\frac{9}{13}\right)}{-0.03}$ $t = 12.26$ minit/*minutes*	 1 1 1 1 1 1 1	7

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
6	(a) $(6.25)^n = \left(\frac{25}{4}\right)^n$	1	7
	$= \left(\frac{5}{2}\right)^{2n}$		
	$= \left(\frac{5^n}{2^n}\right)^2$		
	$= \left(\frac{b}{a}\right)^n$	1	
	(b) (i) $\log_a 27a = \log_a 27 + \log_a a$	1	
	$= \log_a 3^3 + \log_a a$		
	$= 3(0.613) + 1$	1	
	$= 2.839$	1	
	(ii) $\sqrt{3} \times a^{n-1} = 3$		
	$a^{n-1} = \frac{3}{\sqrt{3}}$		
	$a^{n-1} = 3^{\frac{1}{2}}$	1	
	$(n-1)\log_a a = \frac{1}{2}\log_a 3$		
	$n - 1 = \frac{1}{2}(0.613)$		
	$n = 1.3065$	1	
7	$3\,000(1 + 0.07)^n > 6\,500$	1	3
	$(1 + 0.07)^n > \frac{6\,500}{3\,000}$		
	$(1 + 0.07)^n > \frac{13}{6}$		
	$\log (1 + 0.07)^n > \log \frac{13}{6}$		
	$n \log (1.07) > \log \frac{13}{6}$	1	
	$n > \frac{\log \frac{13}{6}}{\log (1.07)}$		
	$n > 11.428$		
	Maka/*Thus*, $n = 12$	1	
8	$\frac{\log_9 64 \times \log_{49} 9}{\log_7 2} = \frac{\frac{\log_{49} 64}{\log_{49} 9} \times \log_{49} 9}{\log_7 2}$	1	3
	$= \frac{\log_{49} 64}{\log_7 2}$		
	$= \frac{\log_7 64}{\log_7 49} \div \log_7 2$		
	$= \frac{\log_7 2^6}{\log_7 7^2} \times \frac{1}{\log_7 2}$		
	$= \frac{6\log_7 2}{2\log_7 7} \times \frac{1}{\log_7 2}$	1	
	$= \frac{6}{2}$		
	$= 3$	1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
9	$\log_4 x = p$ $\quad \log_2 \sqrt{y} = q$ $x = 4^p$ $\quad \sqrt{y} = 2^q$ $(\sqrt{y})^2 = (2^q)^2$ $y = 2^{2q}$ $\frac{\sqrt{x}}{y^4} = \frac{\sqrt{4^p}}{(2^{2q})^4}$ $= \frac{(4^p)^{\frac{1}{2}}}{2^{8q}}$ $= \frac{(2^2)^{\frac{p}{2}}}{2^{8q}}$ $= \frac{2^p}{2^{8q}}$ $= 2^{p-8p}$	1 1 1 1	4
10	$\log_8 2 = h$ $\frac{\log_3 2}{\log_3 8} = h$ $\frac{\log_3 2}{\log_3 (2 \times 4)} = h$ $\frac{\log_3 2}{\log_3 2 + \log_3 4} = h$ $\frac{\log_3 2}{\log_3 2 + k} = h$ $\log_3 2 = h(\log_3 2 + k)$ $\log_3 2 = h \log_3 2 + hk$ $\log_3 2 - h \log_3 2 = hk$ $\log_3 2(1 - h) = hk$ $\log_3 2 = \frac{hk}{1-h}$	1 1 1	3

BAB 5 Janjang
Progressions

LATIHAN INTENSIF

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	(a) $d = 8 - 3$ $d = 5$ (b) $T_n = a + (n-1)d$ $T_{20} = 3 + (20-1)(5)$ $= 98$	1 1 1	3
2	(a) $d = (x+2) - (2x-3)$ $d = x + 2 - 2x + 3$ $d = 5 - x$ (b) $S_n = \frac{n}{2}[2a+(n-1)d]$ $S_{12} = \frac{12}{2}[2(2x-3) + (12-1)(5-x)]$ $= 6[4x - 6 + 55 - 11x]$ $= 6(49 - 7x)$	1 1 1	3

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
3	(a) $S_n = \frac{2}{n}(10n - 3)$ $S_{11} = \frac{2}{11}[10(11) - 3]$ $S_{11} = \frac{214}{11}$ (b) $T_{11} = S_{11} - S_{10}$ $T_{11} = \frac{214}{11} - \left[\frac{2}{10}[10(10) - 3]\right]$ $T_{11} = \frac{214}{11} - \frac{97}{5}$ $T_{11} = \frac{3}{55}$	 1 1 1 1	4
4	(a) $d_1 = d_2$ $(p - 3) - q = (4p + 3q) - (p - 3)$ $p - 3 - q = 4p + 3q - p + 3$ $p - 3 - q = 3p + 3q + 3$ $2p = -4q - 6$ $p = -2q - 3$ (b) $p = -2(2) - 3$ $p = -7$ $d = -7 - 3 - 2$ $d = -12$	1 1 1 1	4
5	(a) Lilitan bulatan/*Circumference* $= 2\pi j$ $T_1 = 2 \times \pi \times \frac{10}{2}$ $T_1 = 10\pi$ $T_2 = 2 \times \pi \times \frac{38}{2}$ $T_2 = 38\pi$ $T_3 = 2 \times \pi \times \frac{66}{2}$ $T_3 = 66\pi$ $T_4 = 2 \times \pi \times \frac{94}{2}$ $T_4 = 94\pi$ (b) $d = 38\pi - 10\pi$ $d = 28\pi$	 1 1 1	3
6	(a) $r = \frac{7.5}{2.5}$ $r = 3$ (b) $a = 2.5$, $r = 3$, $S_n = 2\,732.5$ $\frac{a(r^n - 1)}{r - 1} = 2\,732.5$ $\frac{2.5(3^n - 1)}{3 - 1} = 2\,732.5$ $3^n - 1 = 2\,186$ $3^n = 2\,187$ $3^n = 3^7$ $n = 7$	 1 1 1	3

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
7	(a) $r = \frac{x^2}{1}$ $r = x^2$ (b) $S_\infty = \frac{a}{1-r}$ $20 = \frac{1}{1-x^2}$ $20 - 20x^2 = 1$ $20x^2 = 19$ $x^2 = \frac{19}{20}$ $x = \sqrt{\frac{19}{20}}$ $x = 0.9747$	1 1 1	3
8	(a) $\frac{-15}{m} = \frac{45}{-15}$ $\frac{-15}{m} = -3$ $m = 5$ (b) $r = -3$ $S_6 = \frac{5[1-(-3)^6]}{1-(-3)}$ $S_6 = -910$ $S_3 = \frac{5[1-(-3)^3]}{1-(-3)}$ $S_3 = 35$ Hasil tambah/*Sum* $= S_6 - S_3$ $= -910 - 35$ $= -945$	1 1 1 1	4
9	(a) $T_2 + T_3 = 12$ $ar + ar^2 = 12$ $ar(1+r) = 12$ … ① $T_3 + T_4 = 60$ $ar^2 + ar^3 = 60$ $ar(r+r^2) = 60$ … ② ② ÷ ①: $\frac{ar(r+r^2)}{ar(1+r)} = \frac{60}{12}$ $\frac{r+r^2}{1+r} = 5$ $r^2 + r = 5 + 5r$ $r^2 - 4r - 5 = 0$ $(r-5)(r+1) = 0$ $r = 5$, $r = -1$ (abaikan/*ignore*) Gantikan $r = 5$ ke dalam ① *Substitute* $r = 5$ *into* ① $5a(1+5) = 12$ $30a = 12$ $a = \frac{12}{30}$ $a = \frac{2}{5}$ Maka/*Thus*, $a = \frac{2}{5}$, $r = 5$.	 1 1 1 1	6

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) $T_6 = ar^5$ $T_6 = \frac{2}{5}(5)^5$ $T_6 = 1\ 250$	 1 1	
10	(a) $r = \frac{\frac{1}{x^2}}{\frac{1}{x}}$ $r = \frac{1}{x}$ (b) $1 = \frac{\frac{1}{x}}{1 - \frac{1}{x}}$ $1 - \frac{1}{x} = \frac{1}{x}$ $1 = \frac{2}{x}$ $x = 2$	 1 1 1	3
11	(a) $S_{15} = 360$ $S_n = \frac{n}{2}(s + l)$ Anggap sektor terkecil ialah a dan sektor terbesar ialah l. *Let the smallest sector be a and the largest sector be l.* $360 = \frac{15}{2}(a + 38)$ $720 = 15a + 570$ $15a = 150$ $a = 10°$ Sudut terkecil ialah 10°. *The smallest sector is* 10°. (b) $T_{15} = 38$ $10 + (15 - 1)d = 38$ $14d = 28$ $d = 2$ Jumlah nilai sudut bagi lima sektor selepas sektor terkecil *Total value of angles of five sectors after the smallest sector* $= S_6 - S_1$ $S_6 = \frac{6}{2}[2(10) + (6 - 1)(2)]$ $= 90°$ $S_6 - S_1 = 90 - 10$ $= 80°$	 1 1 1 1 1 1	5

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
12	(a) Luas bulatan/*Area of circle* = πj^2 $T_1 = 2^2\pi$ $T_1 = 4\pi$ $T_2 = (2 \times 2)^2\pi$ $T_2 = 16\pi$ $T_3 = (2 \times 4)^2\pi$ $T_3 = 64\pi$ $T_4 = (2 \times 8)^2\pi$ $T_3 = 256\pi$ $r_1 = \frac{16\pi}{4\pi}$ $r_1 = 4$ $r_2 = \frac{64\pi}{16\pi}$ $r_2 = 4$ $r_3 = \frac{256\pi}{64\pi}$ $= 4$ $r_1 = r_2 = r_3 = 4$ Maka, luas bulatan membentuk janjang geometri, $r_1 = r_2 = r_3 = 4$. *Thus, the area of the circles form a geometric progression*, $r_1 = r_2 = r_3 = 4$. (b) $T_n = 4\,096\pi$ $ar^{n-1} = 4\,096\pi$ $(4\pi)(4)^{n-1} = 4\,096\pi$ $4^{n-1} = 1\,024$ $4^{n-1} = 4^5$ $n - 1 = 5$ $n = 6$ (c) Lilitan bulatan/*Circumference* = $2\pi j$ Jejari bulatan/*Radius of circles*: 2, 4, 8, … $a = 2, r = 2$ $T_8 = ar^{8-1}$ $= 2(2)^7$ $= 256$ Lilitan bulatan kelapan/*Circumference of eighth circle* $= 2\pi(256)$ $= 512\pi$ cm	1 1 1 1 1 1 1 1 1 1 1	9
13	(a) $\frac{k}{1\,365} = \frac{12\,285}{k}$ $k^2 = 16\,769\,025$ $k = \pm\sqrt{16\,769\,025}$ $k = 4\,095, k = -4\,095$ $r = \frac{4\,095}{1\,365}$, $r = \frac{-4\,095}{1\,365}$ $r = 3$ $r = -3$ Oleh sebab $r > 0$, maka $r = 3$. *Since* $r > 0$, *thus* $r = 3$. (b) $S_4 = 18\,200$ $\frac{a(3^4 - 1)}{3 - 1} = 18\,200$ $80a = 36\,400$ $a = 455$	1 1 1 1	6

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(c) $T_n < 500\,000$ $ar^{n-1} < 500\,000$ $455(3)^{n-1} < 500\,000$ $3^{n-1} < \frac{100\,000}{91}$ $(n-1)\log_{10} 3 < \log_{10}\frac{100\,000}{91}$ $n - 1 < \frac{\log_{10}\frac{100\,000}{91}}{\log_{10} 3}$ $n - 1 < 6.374$ $n < 7.374$ Maka/*Thus*, $n = 7$	1 1	
14	(a) 1, 3, 5, … $a = 1, d = 2$ $S_{15} = \frac{15}{2}[2(1) + (15-1)(2)]$ $= 225$ ketul bata/*bricks* (b) $S_{20} = \frac{20}{2}[2(1) + (20-1)(2)]$ $= 400$ ketul bata/*bricks* Kos bata/*Cost of bricks* = 400 × RM0.80 = RM320	 1 1 1 1 1	5
15	(a) $r_1 = \frac{6p+q}{2p+q}$ $r_2 = \frac{14p+q}{6p+q}$ $\frac{6p+q}{2p+q} = \frac{14p+q}{6p+q}$ $(6p+q)(6p+q) = (14p+q)(2p+q)$ $36p^2 + 6pq + 6pq + q^2 = 28p^2 + 14pq + 2pq + q^2$ $36p^2 + 12pq + q^2 = 28p^2 + 16pq + q^2$ $8p^2 = 4pq$ $q = \frac{8p^2}{4p}$ $q = 2p$ (b) Gantikan $q = 2p$ ke dalam r_1. *Substitute* $q = 2p$ *into* r_1. $r_1 = \frac{6p + (2p)}{2p + (2p)}$ $= \frac{8p}{4p}$ $= 2$ (c) $T_{n+1} = S_n + 4p$ $T_{n+1} = ar^{n+1-1}$ $= ar^n$ $= (2p+q)(2)^n$ $= (2p+2p)(2^n)$ $= 4p(2^n)$ $S_n = \frac{(2p+q)(2^n-1)}{2-1}$ $= (2p+2p)(2^n-1)$ $= 4p(2^n-1)$	 1 1 1 1 1	7

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	$T_{n+1} - S_n$ $= 4p(2^n) - 4p(2^n - 1)$ $= 4p(2^n) - 4p(2^n) + 4p$ $= 4p$ (Tertunjuk/*Shown*)	1 1	
16	(a) $a + ar + ar^2 = 64(ar^3 + ar^4 + ar^5)$ $a(1 + r + r^2) = 64ar^3(1 + r + r^2)$ $a = 64ar^3$ $r^3 = \frac{1}{64}$ $r = \sqrt[3]{\frac{1}{64}}$ $r = \frac{1}{4}$ (b) (i) $a(1 + r + r^2) = \frac{21}{8}$ $a\left[1 + \frac{1}{4} + \left(\frac{1}{4}\right)^2\right] = \frac{21}{8}$ $\frac{21}{16}a = \frac{21}{8}$ $a = 2$ (ii) $S_\infty = \frac{a}{1 - r}$ $= \frac{2}{1 - \frac{1}{4}}$ $= \frac{8}{3}$	1 1 1 1 1 1 1	7
17	(a) $T_2 = p = a + d$ $T_4 = q = a + 3d$ $T_6 = r = a + 5d$ $\frac{p + q + r}{q + 1} = 4$ $\frac{a + d + a + 3d + a + 5d}{a + 3d + 1} = 4$ $\frac{3a + 9d}{a + 3d + 1} = 4$ $3a + 9d = 4(a + 3d + 1)$ $3a + 9d = 4a + 12d + 4$ $a + 3d = -4$ $q = -4$ (b) (i) $r = \frac{3^2}{3}$ $= 3$ $S_n = 363$ $\frac{3(3^n - 1)}{3 - 1} = 363$ $3(3^n - 1) = 726$ $3^n - 1 = 242$ $3^n = 243$ $3^n = 3^5$ $n = 5$	 1 1 1 1 1	8

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(ii) $T_1 = \frac{2}{3} \times 6 = 4$ $T_2 = \frac{2}{3} \times 4 = \frac{8}{3}$ $T_3 = \frac{2}{3} \times \frac{8}{3} = \frac{16}{9}$ $r = \frac{\frac{8}{3}}{4}$ $r = \frac{2}{3}$ $S_\infty = \frac{4}{1 - \frac{2}{3}}$ $= 12$ Jumlah jarak yang dilalui *Total distance travelled* $= (2 \times 12) + 6$ $= 30$ m	1 1 1	

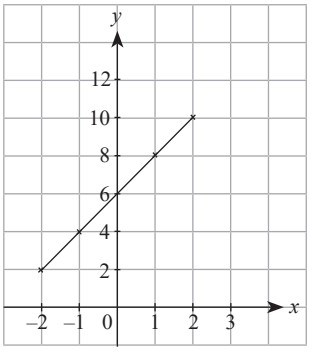
BAB 6

Hukum Linear
Linear Law

Imbas Kembali

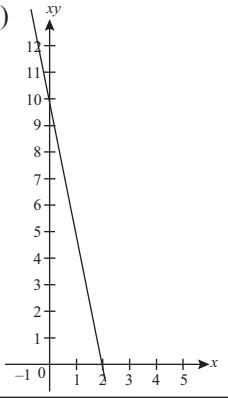
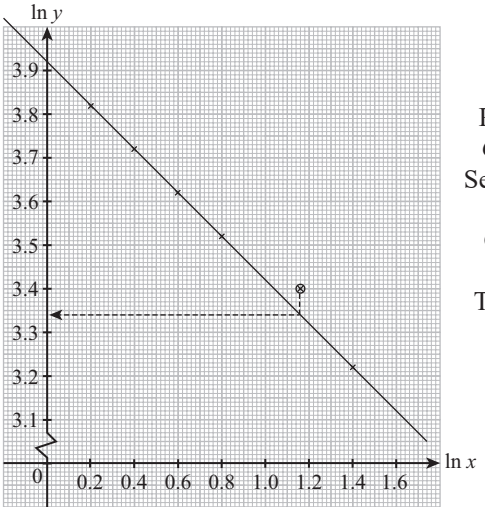
Soalan	Skema Pemarkahan
1	$m = \frac{y_2 - y_1}{x_2 - x_1}$ $m = \frac{-5 - 2}{2 - 1}$ $m = -7$
2	$y = mx + c$ $3 = 3(7) + c$ $c = -18$ $y = 3x - 18$
3	$y = 2x + 6$

x	–2	–1	0	1	2
y	2	4	6	8	10



LATIHAN INTENSIF

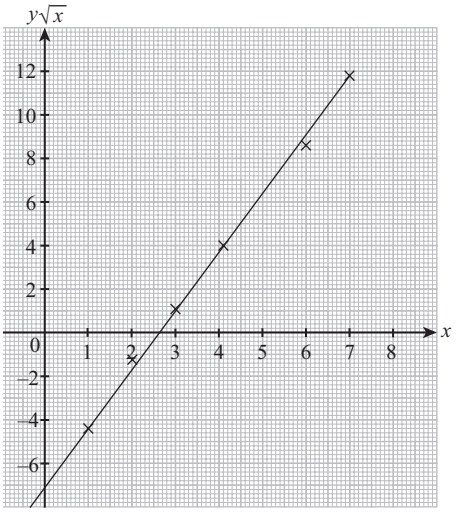
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	(a) $y(a-x)=bx$ $\frac{a-x}{bx}=\frac{1}{y}$ $\frac{1}{y}=\frac{a}{bx}-\frac{x}{bx}$ $\frac{1}{y}=\left(\frac{a}{b}\right)\left(\frac{1}{x}\right)-\left(\frac{1}{b}\right)$ $Y=\frac{1}{y}, m=\frac{a}{b}, X=\frac{1}{x}, c=-\frac{1}{b}$ (b) $y=ae^{-bx}$ $\ln y=\ln ae^{-bx}$ $\ln y=\ln a+\ln e^{-bx}$ $\ln y=-bx\ln e+\ln a$ $\ln y=(-b\ln e)x+\ln a$ $\ln y=-bx+\ln a$ $Y=\ln y, m=-b, X=x, c=\ln a$	1 1 1 1 1	5
2	$m=-\frac{\text{pintasan-}y\text{/intercept-}y}{\text{pintasan-}x\text{/intercept-}x}$ $m=-\frac{3}{6}$ $m=-2$ $\log_2 y=-2x+6$ $y=2^{-2x+6}$	1 1 1	3
3	Rajah/*Diagram* 3(a): $y=ax+b\sqrt{x}$ $\frac{y}{\sqrt{x}}=\frac{ax}{\sqrt{x}}+\frac{b\sqrt{x}}{\sqrt{x}}$ $\frac{y}{\sqrt{x}}=a\sqrt{x}+b$ $b=-8k$ $k=-\frac{b}{8}$ … ① Rajah/*Diagram* 3(b): $y=ax+b\sqrt{x}$ $\frac{y}{x}=\frac{ax}{x}+\frac{b\sqrt{x}}{x}$ $\frac{y}{x}=(b)\left(\frac{1}{\sqrt{x}}\right)+a$ $a=k+4$ … ② Gantikan ① ke dalam ② *Substitute* ① *into* ② $a=\left(-\frac{b}{8}\right)+4$ $a=\frac{32-b}{8}$	1 1 1 1	3

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
4	(a) $x^2y = -5x^2 + 10x$ $xy = -5x + 10$ Titik q pada paksi-x, pintasan-x, $(q, 0)$, *Point q at x-axis, x-intercept,* $(q, 0)$, $xy = -5x + 10$ $0 = -5(q) + 10$ $5q = 10$ $q = \frac{10}{5}$ $= 2$	1 1	4
	(b)  Garis lurus dilukis *A straight line drawn* Melalui titik (0, 10) dan (2, 0) *Passes through the points* (0, 10) *and* (2, 0)	1 1	
5	(a) **ln *x*** 0.20 0.40 0.60 0.80 1.14 1.40 **ln *y*** 3.81 3.71 3.61 3.51 3.40 3.21  Paksi betul dan skala seragam *Correct axes, and uniform scales* Semua titik diplot dengan betul *All points are plotted correctly* Garis lurus penyuaian terbaik *Line of best fit* Titik salah diplot dengan betul *Wrong point is plotted correctly*	1 1 1 1 1	10
	(b) $y = kx^n$ $\ln y = \ln kx^n$ $\ln y = \ln k + \ln x^n$ $\ln y = n \ln x + \ln k$	1	
	(i) Berdasarkan graf/*Based on the graph*, Pintasan-y/*y-intercept,* $c = 3.92$ $\ln k = 3.92$ $k = e^{3.92}$ $k = 50.40$	1	
	(ii) Kecerunan/*Gradient*, $m = \frac{3.21 - 3.81}{1.40 - 0.20}$ $n = -0.5$	1	
	(c) $\ln y = 3.34$ $y = e^{3.34}$ $= 28.22$	1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
6	(a)		

x	1	2	3	4.1	6	7
$y\sqrt{x}$	–4.40	–1.12	1.00	4.00	8.60	11.80

1



Paksi betul dan skala seragam dengan sekurang-kurangnya dua titik diplot dengan betul — 1
Correct axes and uniform scales with at least two points plotted correctly

Semua titik diplot dengan betul — 1
All points are plotted correctly

Garis lurus penyuaian terbaik — 1
Line of best fit

(b) (i) Daripada graf/*From the graph*,
Apabila/*When* $x = 6.5$,

$y\sqrt{x} = 10.4$ — 1

$y\sqrt{6.5} = 10.4$

$y = 4.079$ — 1

(ii) $$py = \frac{1}{\sqrt{x}} + q\sqrt{x}$$

$$py\left(\frac{\sqrt{x}}{p}\right) = q\sqrt{x}\left(\frac{\sqrt{x}}{p}\right) + \frac{1}{\sqrt{x}}\left(\frac{\sqrt{x}}{p}\right)$$ — 1

$$y\sqrt{x} = \frac{q}{p}x + \frac{1}{p}$$

Berdasarkan graf/*Based on the graph*,
Pintasan-y/*y-intercept*, $c = -7.1$ — 1

$$\frac{1}{p} = -7.1$$

$$p = \frac{1}{-7.1}$$

$$= -0.1408$$ — 1

Kecerunan/*Gradient*, $m = \dfrac{11.80 - (-4.4)}{7 - 1}$

$$\frac{q}{p} = 2.7$$

$$\frac{q}{-0.1408} = 2.7$$

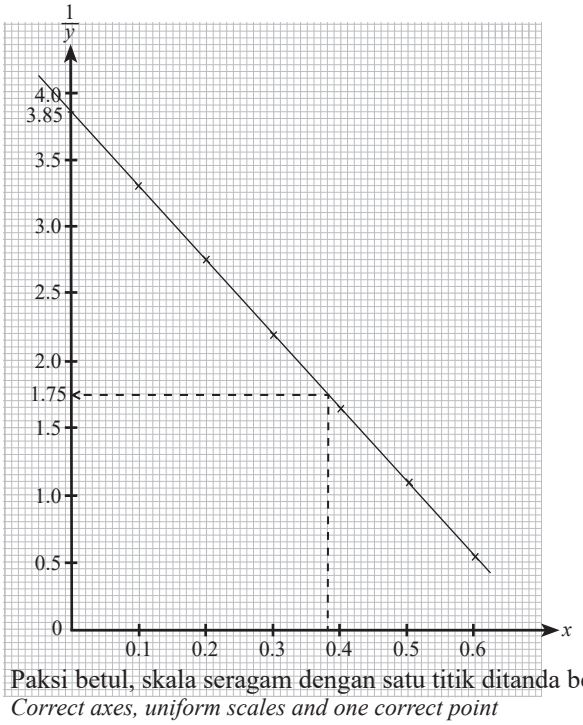
$$q = -0.3802$$ — 1

10

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
7	(a)		

x	0.1	0.2	0.3	0.4	0.5	0.6
$\frac{1}{y}$	3.30	2.75	2.20	1.65	1.10	0.55

1



Paksi betul, skala seragam dengan satu titik ditanda betul — 1
Correct axes, uniform scales and one correct point

Semua titik ditanda betul — 1
All points marked correctly

Garis lurus penyuaian terbaik — 1 — 10
Line of best fit

(b) $\frac{n}{y} = px + 1$ — 1

$\frac{1}{y} = \frac{p}{n}x + \frac{1}{n}$

(i) Apabila/*When* $x = 0.38$,

$\frac{1}{y} = 1.75$

$y = \frac{1}{1.75}$

$= 0.5714$ — 1

(ii) Pintasan-y/*y-intercept* $= 3.85$,

$\frac{1}{n} = 3.85$ — 1

$n = \frac{1}{3.85}$

$= 0.2597$ — 1

(iii) Kecerunan/*Gradient*, $m = \frac{p}{n}$,

$\frac{p}{n} = \frac{3.30 - 0.55}{0.1 - 0.6}$

$\frac{p}{0.2597} = \frac{2.75}{-0.5}$ — 1

$\frac{p}{0.2597} = -5.5$

$p = -5.5 \times 0.2597$

$= -1.428$ — 1

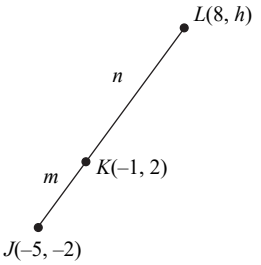
BAB 7

Geometri Koordinat
Coordinates Geometry

Imbas Kembali

Soalan	Skema Pemarkahan
1	(a) Jarak/*Distance* $= \sqrt{(0-1)^2 + (-9-9)^2}$ $= 18.03$ (b) Jarak/*Distance* $= \sqrt{(7-8)^2 + (5-4)^2}$ $= 1.414$
2	(a) Titik tengah/*Midpoint* $= \left(\frac{(-1)+(-3)}{2}, \frac{7+1}{2}\right)$ $= (-2, 4)$ (b) Titik tengah/*Midpoint* $= \left(\frac{3+5}{2}, \frac{1+1}{2}\right)$ $= (4, 1)$
3	(a) $m = \frac{7-1}{6-3}$ $= 2$ (b) $m = \frac{5-1}{3-4}$ $= -4$
4	$m = -\frac{5}{(-3)}$ $= \frac{5}{3}$
5	(a) $m = -\frac{8}{(-2)}$ $= 4$ $y = mx + c$ $0 = 4(-2) + c$ $c = 8$ $y = 4x + 8$ (b) $m = \frac{5-3}{1-(-1)}$ $= 1$ $y = mx + c$ $5 = 1(1) + c$ $c = 4$ $y = x + 4$

LATIHAN INTENSIF

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	(a) $-1 = \dfrac{-5(n) + 8(n)}{m + n}$ $-m - n = -5n + 8m$ $9m = 4n$ $\dfrac{m}{n} = \dfrac{4}{9}$  $JK : KL = 4 : 9$ (b) $2 = \dfrac{-2(9) + h(4)}{4 + 9}$ $2(13) = -18 + 4h$ $44 = 4h$ $h = 11$ (c) $m_{JK} = \dfrac{2 - (-2)}{-1 - (-5)}$ $= \dfrac{4}{4}$ $= 1$ Kecerunan normal/*Gradient of normal*: $m_1 \times m_2 = -1$ $1 \times m_2 = -1$ $m_2 = -1$ $y - (-2) = (-1)(x - (-5))$ atau/*or* $-2 = -1(-5) + c$ $y + 2 = -x - 5$ $c = -7$ $y = -x - 7$ $y = -x - 7$	1 1 1 1 1 1 1 1	7
2	(a) Persamaan garis lurus/*Equation of straight line P* $2y + x - 10 = 0$ $y = -\dfrac{1}{2}x + 5$ $m_1 = -\dfrac{1}{2}$ Persamaan garis lurus/*Equation of straight line Q* atau/*or* $y + 5 = 2x$ $y = 2x - 5$ $m_2 = 2$ Didapati/*It is found that*, $m_1 \times m_2 = -\dfrac{1}{2} \times 2$ $= -1$ Maka, garis lurus *P* dan *Q* adalah berserenjang antara satu sama lain. *Thus, straight lines P and Q are perpendicular to each other.* (b) $2y + x - 10 = 0$ … ① $y + 5 = 2x$ $y = 2x - 5$ … ② Gantikan ② ke dalam ① *Substitute ② into ①* $2(2x - 5) + x - 10 = 0$ $4x - 10 + x - 10 = 0$ $5x = 20$ $x = 4$ Apabila/*When* $x = 4$, $y = 2(4) - 5$ $= 3$ Maka, titik persilangan ialah (4, 3). *Hence, the intersection point is* (4, 3).	1 1 1 1 1	9

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(c) Apabila $y = 5$ bersilang dengan garis P, *When $y = 5$ intersects with straight line P,* $2(5) + x - 10 = 0$ $10 + x - 10 = 0$ $x = 0$ $\therefore (0, 5)$		
	Apabila $y = 5$ bersilang dengan garis Q, atau/*or* *When $y = 5$ intersects with straight line Q,* $5 + 5 = 2x$ $10 = 2x$ $x = 5$ $\therefore (5, 5)$	1	
	Luas segi tiga/*Area of triangle* $= \frac{1}{2}\begin{vmatrix} 4 & 0 & 5 & 4 \\ 3 & 5 & 5 & 3 \end{vmatrix}$ $= \frac{1}{2}\lvert[4(5)+0(5)+5(3)]-[3(0)+5(5)+5(4)]\rvert$ $= \frac{1}{2}\lvert(20+0+15)-(0+25+20)\rvert$ $= \frac{1}{2}\lvert35-45\rvert$ $= \frac{1}{2}\lvert-10\rvert$ $= \frac{1}{2} \times 10$ $= 5$ unit^2/*units*^{2}	1 1	
	(d) Lokus T di atas garis lurus P *Locus T above the straight line P* $2y + x - 10 = 0 + 2$ $2y + x - 12 = 0$	1	
	Lokus T di bawah garis lurus P *Locus T below the straight line P* $2y + x - 10 = 0 - 2$ $2y + x - 8 = 0$	1	
3	(a) Titik tengah/*Midpoint* $= \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ $= \left(\frac{8+2}{2}, \frac{1+3}{2}\right)$ $= (5, 2)$		
	Koordinat-x: / *x-coordinate*: $\frac{q+3}{2} = 5$ atau/*or* $q + 3 = 10$ $q = 10 - 3$ $q = 7$ Koordinat-y: / *y-coordinate*: $\frac{8+p}{2} = 2$ $8 + p = 4$ $p = 4 - 8$ $p = -4$	1 1, 1	7
	(b) Kecerunan/*Gradient*, $m = \frac{-4-3}{3-2}$ $= -7$	1	
	$y - 2 = -7(x - 5)$ $y = -7x + 35 + 2$ $y = -7x + 37$	1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
4	(a) Koordinat-x/*x-coordinate*, $k = \frac{-3+2}{2}$ $k = -\frac{1}{2}$	1	
	Koordinat-y/*y-coordinate*, $-9 = \frac{j+(-14)}{2}$ $-18 = j - 14$ $j = -18 + 14$ $= -4$	1	
	(b) Didapati/*It is found that* $A(2, -14)$ dan/*and* $B(-3, -4)$ Kecerunan/*Gradient*, $m_{AB} = \frac{-14-(-4)}{2-(-3)}$ $= \frac{-10}{5}$ $= -2$	1	
	Kecerunan garis berserenjang/*Gradient of perpendicular line*: $-2 \times m_2 = -1$ $m_2 = \frac{1}{2}$	1	10
	Persamaan garis berserenjang/*Equation of perpendicular line*: $y - 2 = \frac{1}{2}(x - (-14))$	1	
	$y = \frac{1}{2}x + 9$	1	
	(c) Luas/*Area of* $\Delta ABC = 19$ $\frac{1}{2}\begin{vmatrix} -3 & 2 & 5 & -3 \\ -4 & -14 & m & -4 \end{vmatrix} = 19$ $\frac{1}{2}\lvert[-3(-14) + 2(m) + 5(-4)] - [-3(m) + 5(-14) + 2(-4)]\rvert = 19$ $\lvert(42 + 2m - 20) - (-3m - 70 - 8)\rvert = 38$ $\lvert(22 + 2m) - (-3m - 78)\rvert = 38$ $\lvert100 + 5m\rvert = 38$	1 1	
	$100 + 5m = 38$ atau/*or* $100 + 5m = -38$ $5m = -62$ $5m = -138$ $m = -12.4$ $m = -27.6$ (abaikan/*ignore*)	1 1	
5	(a) Titik tengah/*Midpoint* $= \left(\frac{3+p}{2}, \frac{-6+q}{2}\right)$	1	
	(b) $7y + x = 11$ $7\left(\frac{-6+q}{2}\right) + \left(\frac{3+p}{2}\right) = 11$ $-42 + 7q + 3 + p = 22$ $p = 22 + 42 - 3 - 7q$ $p = 61 - 7q$	1 1	
	(c) Apabila/*When* $p = 5$, $5 = 61 - 7q$ $q = \frac{56}{7}$ $= 8$ $\therefore B(5, 8)$	1 1	10
	$TB = 3$ $\sqrt{(x-5)^2 + (y-8)^2} = 3$ $(\sqrt{(x-5)^2 + (y-8)^2})^2 = 3^2$ $x^2 - 10x + 25 + y^2 - 16y + 64 = 9$ $x^2 + y^2 - 10x - 16y + 80 = 0$	1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(d) Jarak titik $B(5, 8)$ ke titik (6, 7) *The distance of point* $B(5, -10)$ *to the point* (6, 7) $= \sqrt{(5-6)^2 + (8-7)^2}$ $= \sqrt{(-1)^2 + (1)^2}$ $= \sqrt{2} < 3$ Maka, titik (6, 7) terletak di dalam bulatan lokus T kerana $\sqrt{2} < 3$. *Hence, the point* (6, 7) *lies inside the circle of locus T because* $\sqrt{2} < 3$.	1 1 1	
6	(a) $10 - 5x + 2y = 0$ $5x - 2y = 10$ $\frac{5x}{10} - \frac{2y}{10} = \frac{10}{10}$ $\frac{x}{2} - \frac{y}{5} = 1$ (b) $\frac{x}{2} - \frac{y}{5} = 1$ Kecerunan/*Gradient*, $m = -\frac{(-5)}{2}$ $= \frac{5}{2}$ $-h = \frac{5}{2}$ $h = -\frac{5}{2}$	1 1 1	3
7	Kecerunan/*Gradient of AB*, $m_{AB} = \frac{7-3}{9-(-5)}$ $= \frac{4}{14}$ $= \frac{2}{7}$ Persamaan garis lurus *AB*/*Equation of straight line AB* $y - 3 = \frac{2}{7}(x - (-5))$ atau/*or* $y - 7 = \frac{2}{7}(x - 9)$ $y - 3 = \frac{2}{7}x + \frac{10}{7}$ $y - 7 = \frac{2}{7}x - \frac{18}{7}$ $y = \frac{2}{7}x + \frac{31}{7}$ $y = \frac{2}{7}x + \frac{31}{7}$ Untuk menentukan jarak terdekat, garis dari *O* ke garis *AB* mesti berserenjang. *To determine the shortest distance, the line from O to the line AB must be perpendicular.* Maka, kecerunan/*Hence, gradient*, $m = -1$ $m_{O \perp AB} \times \frac{2}{7} = -1$ $m_{O \perp AB} = -\frac{7}{2}$ Persamaan garis lurus dari *O* ke garis *AB*, $y = -\frac{7}{2}x$ *Equation of straight line O to the line AB,* $y = -\frac{7}{2}x$ Untuk memperoleh titik persilangan antara garis serenjang dengan garis lurus *AB* *To obtain intersection point between perpendicular line and the straight line AB* $y = \frac{2}{7}x + \frac{31}{7}$ … ① $y = -\frac{7}{2}x$ … ②	1 1 1 1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	Gantikan ② ke dalam ① *Substitute ② into ①* $-\frac{7}{2}x = \frac{2}{7}x + \frac{31}{7}$ $-\frac{7}{2}x - \frac{2}{7}x = \frac{31}{7}$ $-\frac{53}{14}x = \frac{31}{7}$ $x = -\frac{62}{53}$ Apabila/*When* $x = -\frac{62}{53}$, $y = -\frac{7}{2}\left(-\frac{62}{53}\right)$ $= \frac{217}{53}$ Titik persilangan/*Intersection point* $\left(\frac{-62}{53}, \frac{217}{53}\right)$ Jarak terdekat dari O ke garis lurus AB *The shortest distance from O to straight line AB* $= \sqrt{\left(-\frac{62}{53} - 0\right)^2 + \left(\frac{217}{14} - 0\right)^2}$ = 15.54 unit/*units*	1 1 1 1 1 1	9
8	(a) (i) $2y - x + 5 = 0$ $y = \frac{1}{2}x - \frac{5}{2}$ Kecerunan/*Gradient*, $m_{RS} = \frac{1}{2}$ $m_{PS} \times \frac{1}{2} = -1$ $m_{RS} = \frac{1}{\frac{1}{2}}$ $= -2$ Persamaan garis lurus PS/*Equation of straight line PS*, $y - 4 = -2(x - 8)$ $y = -2x + 20$ (ii) $y = -2x + 20$ … ① $2y - x + 5 = 0$ … ② Gantikan ① ke dalam ② *Substitute ① into ②* $2(-2x + 20) - x + 5 = 0$ $-4x + 40 - x + 5 = 0$ $5x = 45$ $x = 9$ Gantikan $x = 9$ ke dalam ① *Substitute* $x = 9$ *into ①* $y = -2(9) + 20$ $= 2$ $S(9, 2)$	1 = 1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(iii) Koordinat-x bagi $R = 0$ *x-coordinate of R* atau/*or* Koordinat-y bagi $R = -\frac{5}{2}$ *y-coordinate of R* $\frac{x(9)+9(4)}{9+4} = 0$ atau/*or* $\frac{y(9)+2(4)}{9+4} = -\frac{5}{2}$ $9x + 36 = 0$ $9y + 8 = -\frac{5}{2} \times 13$ $9x = -36$ $9y = -\frac{65}{2} - 8$ $x = -4$ $y = -\frac{9}{2}$ $Q\left(-4, -\frac{9}{2}\right)$	1 1	10
	(iv) Luas/*Area of* $\Delta POS = \frac{1}{2}\begin{vmatrix} 8 & 0 & 9 & 8 \\ 4 & 0 & 2 & 4 \end{vmatrix}$ $= \frac{1}{2}\lvert[8(0) + 0(2) + 9(4)] - [4(0) + 0(9) + 2(8)]\rvert$ $= \frac{1}{2}\lvert 36 - 16 \rvert$ $= \frac{1}{2}\lvert 20 \rvert$ $= 10$ unit^2/*units*^{2}	1 1 1	
	(b) $WQ = WS$ $\sqrt{(x-(-4))^2 + \left(y-\frac{9}{2}\right)^2} = \sqrt{(x-9)^2 + (y-2)^2}$ $x^2 + 8x + 16 + y^2 - 9y + \frac{81}{4} = x^2 - 18x + 81 + y^2 - 4y + 4$ $26x - 5y = \frac{195}{4}$	1 1	
9	(a) $5y + 3x - 18 = 0$ Apabila/*When* $y = 0$ $5(0) + 3x - 18 = 0$ $x = 6$ Maka/*Hence* $D(6, 0)$	1	10
	$5y + 3x - 18 = 0$ $y = \frac{18 - 3x}{5}$ … ① $2y + 5x - 11 = 0$ … ② Gantikan ① ke dalam ② *Substitute* ① *into* ② $2\left(\frac{18-3x}{5}\right) + 5x - 11 = 0$ $36 - 6x + 25x - 55 = 0$ $19x = 19$ $x = 1$	1	
	Gantikan $x = 1$ ke dalam ① *Substitute* $x = 1$ *into* ① $y = \frac{18 - 3(1)}{5}$ $= 3$ Maka/*Hence* $A(1, 3)$.	1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) Koordinat-x bagi $C = \frac{5}{2}$ *x-coordinate of C* $\frac{x+1}{2} = \frac{5}{2}$ $x = 4$ Koordinat-y bagi $C = 4$ *y-coordinate of C* $\frac{y+3}{2} = 4$ $y = 5$	1	
	Maka/*Hence* $C(4, 5)$. Kecerunan/*Gradient*, $m_{CD} = \frac{5-0}{4-6}$ $= -\frac{5}{2}$		
	Persamaan garis lurus/*Equation of straight line* $y - 6 = -\frac{5}{2}(x - 0)$	1	10
	$y = -\frac{5}{2}x + 6$	1	
	(c) Koordinat-x bagi $P = 4$ *x-coordinate of P* $\frac{1(3)+x(1)}{1+3} = 4$ $x = 13$ Koordinat-y bagi $P = 5$ *y-coordinate of P* $\frac{3(3)+y(1)}{1+3} = 5$ $y = 11$	1	
	Maka/*Hence* $P(13, 11)$.	1	
	Jarak/*The distance of AP* $= \sqrt{(13-1)^2 + (11-3)^2}$ $= 14.42$ km	1 1	
10	(a) Kecerunan/*Gradient*, $m_{AB} = \frac{9-0}{6-0}$ $= \frac{3}{2}$	1	
	Persamaan garis lurus AB/*Equation of straight line AB*: $\therefore y = \frac{3}{2}x$	1	
	(b) Apabila/*When* $y = 3$ $3 = \frac{3}{2}x$ $x = 2$	1	
	$B(2, 3)$, $P(6, y)$, $C(10, 3)$ $\frac{1}{2}\begin{vmatrix} 2 & 6 & 10 & 2 \\ 3 & y & 3 & 3 \end{vmatrix} = 8$	1	
	$\frac{1}{2}\|[2y + 6(3) + 10(3)] - [3(6) + y(10) + 3(2)]\| = 8$ $\|(2y + 18 + 30) - (18 + 10y + 6)\| = 16$ $\|(2y + 48) - (10y + 24)\| = 16$ $\|-8y + 24\| = 16$	1	
	$-8y + 24 = 16$ atau/*or* $-8y + 24 = -16$ $8y = 8$ $8y = 40$ $y = 1$ (abaikan/*ignored*) $y = 5$	1	
	Maka/*Hence* $P(6 , 5)$.	1	
	(c) Jejari bulatan/*Radius of the circle* $= 9 - 5 - 1$ $= 3$ $EP = 3$ $\sqrt{(x-6)^2 + (y-5)^2} = 3$ $x^2 + y^2 - 12x - 10y + 52 = 0$	1 1 1	

BAB 8 **Vektor**
Vector

LATIHAN INTENSIF

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	$\underset{\sim}{u} = \underset{\sim}{i} + 3\underset{\sim}{j}$, $\underset{\sim}{v} = 2\underset{\sim}{i} - 9\underset{\sim}{j}$ (a) $\underset{\sim}{u} - k\underset{\sim}{v} = \underset{\sim}{i} + 3\underset{\sim}{j} - k(2\underset{\sim}{i} - 9\underset{\sim}{j})$ $= \underset{\sim}{i} + 3\underset{\sim}{j} - 2k\underset{\sim}{i} + 9k\underset{\sim}{j}$ $= (1 - 2k)\underset{\sim}{i} + (3 + 9k)\underset{\sim}{j}$ (b) $3 + 9k = 0$ $9k = -3$ $k = -\frac{1}{3}$	1 1 1	3
2	(a) $\overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB}$ $= -4\underset{\sim}{i} - 5\underset{\sim}{j} + 6\underset{\sim}{i} - 9\underset{\sim}{j}$ $= 2\underset{\sim}{i} - 14\underset{\sim}{j}$ (b) $2\overrightarrow{OC} = \overrightarrow{BA}$ $\overrightarrow{OC} = \frac{1}{2}(\overrightarrow{BA})$ $= \frac{1}{2}(-2\underset{\sim}{i} + 14\underset{\sim}{j})$ $= -\underset{\sim}{i} + 7\underset{\sim}{j}$ $C(-1, 7)$	 1 1 1 1	4
3	(a) $\overrightarrow{PQ} = \overrightarrow{PO} + \overrightarrow{OQ}$ $\overrightarrow{PQ} = -2\underset{\sim}{i} - \underset{\sim}{j} - 2\underset{\sim}{i} + 4\underset{\sim}{j}$ $\overrightarrow{PQ} = -4\underset{\sim}{i} + 3\underset{\sim}{j}$ (b) (i) $\overrightarrow{PQ} + 2\overrightarrow{QR} = 2\underset{\sim}{i} + 11\underset{\sim}{j}$ $-4\underset{\sim}{i} + 3\underset{\sim}{j} + 2(m\underset{\sim}{i} + 4\underset{\sim}{j}) = 2\underset{\sim}{i} + 11\underset{\sim}{j}$ $-4\underset{\sim}{i} + 3\underset{\sim}{j} + 2m\underset{\sim}{i} + 8\underset{\sim}{j} = 2\underset{\sim}{i} + 11\underset{\sim}{j}$ $(-4 + 2m)\underset{\sim}{i} + 11\underset{\sim}{j} = 2\underset{\sim}{i} + 11\underset{\sim}{j}$ $-4 + 2m = 2$ $2m = 6$ $m = 3$ (ii) $\overrightarrow{QR} = 3\underset{\sim}{i} + 4\underset{\sim}{j}$ Vektor unit dalam arah $\overrightarrow{QR}$ *Unit vector in the direction of* $\overrightarrow{QR}$ $= \frac{3\underset{\sim}{i} + 4\underset{\sim}{j}}{\sqrt{(3)^2 + (4)^2}}$ $= \frac{3\underset{\sim}{i} + 4\underset{\sim}{j}}{5}$ $= \frac{3}{5}\underset{\sim}{i} + \frac{4}{5}\underset{\sim}{j}$	 1 1 1 1 1	5

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
4	(a) $\overrightarrow{PQ} = \overrightarrow{PO} + \overrightarrow{OQ}$ $= \begin{pmatrix} -3 \\ -1 \end{pmatrix} + \begin{pmatrix} -5 \\ 2p \end{pmatrix}$ $= \begin{pmatrix} -8 \\ 2p-1 \end{pmatrix}$ (b) $\sqrt{(-8)^2 + (2p-1)^2} = \sqrt{80}$ $64 + 4p^2 - 4p + 1 = 80$ $4p^2 - 4p - 15 = 0$ $(2p+3)(2p-5) = 0$ $p = -\frac{3}{2}, p = \frac{5}{2}$ Maka/*Thus*, $p = \frac{5}{2}$ (c) $\overrightarrow{PQ} = \begin{pmatrix} -8 \\ 4 \end{pmatrix}$ Unit vektor/ *Vector unit* $= \frac{1}{\sqrt{80}} \begin{pmatrix} -8 \\ 4 \end{pmatrix}$	1 1 1 1 1 1	6
5	$\overrightarrow{SR} = m\overrightarrow{PQ}$ $\overrightarrow{SP} + \overrightarrow{PQ} + \overrightarrow{QR} = m(\underset{\sim}{x} + \underset{\sim}{y})$ $3\underset{\sim}{x} + \underset{\sim}{x} + \underset{\sim}{y} - 5\lambda\underset{\sim}{x} - \lambda\underset{\sim}{y} = m\underset{\sim}{x} + m\underset{\sim}{y}$ $(4 - 5\lambda)\underset{\sim}{x} + (1 - \lambda)\underset{\sim}{y} = m\underset{\sim}{x} + m\underset{\sim}{y}$ $m = 4 - 5\lambda, m = 1 - \lambda$ $4 - 5\lambda = 1 - \lambda$ $4\lambda = 3$ $\lambda = \frac{3}{4}$ $m = 4 - 5\left(\frac{3}{4}\right)$, $m = 1 - \frac{3}{4}$ $= \frac{1}{4}$ $= \frac{1}{4}$ *SR* adalah selari dengan *PQ* kerana $\overrightarrow{SR} = \frac{1}{4}\overrightarrow{PQ}$. *SR is parallel to PQ because* $\overrightarrow{SR} = \frac{1}{4}\overrightarrow{PQ}$.	1 1 1 1 1 1	5
6	(a) (i) $\lvert\underset{\sim}{v}\rvert = \sqrt{(6)^2 + (-3)^2}$ $= \sqrt{45}$ $= 3\sqrt{5}$ ms^{-1} (ii) $\overrightarrow{ON} = \begin{pmatrix} 3 \\ 8 \end{pmatrix} + 10\begin{pmatrix} 6 \\ -3 \end{pmatrix}$ $= \begin{pmatrix} 63 \\ -22 \end{pmatrix}$ (b) $\overrightarrow{ON} = \begin{pmatrix} 3 \\ 8 \end{pmatrix} + t\begin{pmatrix} 6 \\ -3 \end{pmatrix}$ $= \begin{pmatrix} 3+6t \\ 8-3t \end{pmatrix}$ Dron berada di timur titik asalan apabila $y = 0$ *The drone is at east of origin when* $y = 0$ $y = 0$ $8 - 3t = 0$ $3t = 8$ $t = \frac{8}{3}$ saat/ *seconds*	1 1 1 1 1 1 1	6

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
7	(a) (i) $\overrightarrow{AB} = -\underset{\sim}{a} + 3\underset{\sim}{b}$ $\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP}$ $= \underset{\sim}{a} + \frac{1}{3}(-\underset{\sim}{a} + 3\underset{\sim}{b})$ $= \underset{\sim}{a} - \frac{1}{3}\underset{\sim}{a} + \underset{\sim}{b}$ $= \frac{2}{3}\underset{\sim}{a} + \underset{\sim}{b}$ (ii) $\overrightarrow{BQ} = \overrightarrow{BO} + \overrightarrow{OQ}$ $= -3\underset{\sim}{b} + k\left(\frac{2}{3}\underset{\sim}{a} + \underset{\sim}{b}\right)$ $= -3\underset{\sim}{b} + \frac{2}{3}k\underset{\sim}{a} + k\underset{\sim}{b}$ $= \frac{2}{3}k\underset{\sim}{a} + (k-3)\underset{\sim}{b}$ (b) $\overrightarrow{BQ} = h\overrightarrow{BC}$ $\overrightarrow{BO} + \overrightarrow{OQ} = h(\overrightarrow{BO} + \overrightarrow{OC})$ $-3k + k\left(\frac{2}{3}\underset{\sim}{a} + \underset{\sim}{b}\right) = h(4\underset{\sim}{a} - 3\underset{\sim}{b})$ $\frac{2}{3}k\underset{\sim}{a} + (k-3)\underset{\sim}{b} = 4h\underset{\sim}{a} - 3h\underset{\sim}{b}$ Jadi/*Thus*, $\frac{2}{3}k = 4h$ $k = \frac{4h \times 3}{2}$ $k = 6h$ … ① $k - 3 = -3h$ $3h + k = 3$ … ② Gantikan ① ke dalam ②: *Substitute ① into ②:* $3h + 6h = 3$ $9h = 3$ $h = \frac{1}{3}$ Apabila/*When* $h = \frac{1}{3}$, $k = 6\left(\frac{1}{3}\right)$ $k = 2$ Maka/*Hence*, $h = \frac{1}{3}$ dan/*and* $k = 2$. (c) $BQ : QC = 1 : 2$	1 1 1 1 1 1 1 1 1 1	10
8	(a) (i) $\overrightarrow{DB} = \overrightarrow{DA} + \overrightarrow{AB}$ atau/*or* $\overrightarrow{CD} = \overrightarrow{CD} + \overrightarrow{DE}$ $= -40\underset{\sim}{y} + 24\underset{\sim}{x}$ (ii) $\overrightarrow{CE} = \overrightarrow{CD} + \overrightarrow{DE}$ $= -30\underset{\sim}{x} + 30\underset{\sim}{y} + (-30\underset{\sim}{y})$ $= -30\underset{\sim}{x}$	1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) $\overrightarrow{PB} = \lambda\overrightarrow{DF}$	1	
	$24\underset{\sim}{x} - 40\underset{\sim}{y} = \lambda(\overrightarrow{DC} + \overrightarrow{CP})$		
	$24\underset{\sim}{x} - 40\underset{\sim}{y} = \lambda\left((30\underset{\sim}{x} - 30\underset{\sim}{y} + \frac{2}{5}\overrightarrow{CE})\right)$	1	
	$24\underset{\sim}{x} - 40\underset{\sim}{y} = \lambda\left[30\underset{\sim}{x} - 30\underset{\sim}{y} + \frac{2}{5}(-30\underset{\sim}{x})\right]$	1	
	$24\underset{\sim}{x} - 40\underset{\sim}{y} = \lambda(18\underset{\sim}{x} - 30\underset{\sim}{y})$		
	$24\underset{\sim}{x} - 40\underset{\sim}{y} = 18\lambda\underset{\sim}{x} - 30\lambda\underset{\sim}{y}$		
	Bandingkan $\underset{\sim}{x}$: *Compare* $\underset{\sim}{x}$: $24 = 18\lambda$ $\lambda = \frac{4}{3}$		
	Bandingkan $\underset{\sim}{y}$: *Compare* $\underset{\sim}{y}$: $-40 = -30\lambda$ $\lambda = \frac{4}{3}$	1	10
	$\therefore \overrightarrow{DB} = \frac{4}{3}\overrightarrow{DF}$	1	
	Maka D, F dan B adalah segaris. *Therefore D, F and B are collinear.*	1	
	(c) $\overrightarrow{DB} = -40\underset{\sim}{y} + 24\underset{\sim}{x}$		
	$\lvert\overrightarrow{DB}\rvert = \sqrt{(40(2))^2 + (24(3))^2}$	1	
	$= 107.63$ units	1	
9	(a) (i) $\overrightarrow{AC} = \overrightarrow{AD} + \overrightarrow{DC}$		
	$= 4\underset{\sim}{y} + \underset{\sim}{x}$	1	
	(ii) $\overrightarrow{BD} = \overrightarrow{BA} + \overrightarrow{AD}$		
	$= -5\underset{\sim}{x} + 4\underset{\sim}{y}$	1	
	(b) (i) $\overrightarrow{AP} = h\overrightarrow{AC}$		
	$= h(4\underset{\sim}{y} + \underset{\sim}{x})$		
	$= h\underset{\sim}{x} + 4h\underset{\sim}{y}$	1	
	(ii) $\overrightarrow{BP} = k\overrightarrow{BD}$		
	$\overrightarrow{BA} + \overrightarrow{AP} = k\overrightarrow{BD}$		
	$\overrightarrow{AP} = k\overrightarrow{BD} - \overrightarrow{BA}$		
	$\overrightarrow{AP} = k(-5\underset{\sim}{x} + 4\underset{\sim}{y}) - (-5\underset{\sim}{x})$	1	
	$\overrightarrow{AP} = (5 - 5k)\underset{\sim}{x} + 4k\underset{\sim}{y}$	1	
	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)		
	$4k = 4h$	1	
	$k = h$	1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
10	(a) (i) $\underset{\sim}{v}_P = \frac{20}{\sqrt{3^2+4^2}}\begin{pmatrix}3\\4\end{pmatrix}$	1	
	$= 4\begin{pmatrix}3\\4\end{pmatrix}$		
	$= \begin{pmatrix}12\\16\end{pmatrix}$	1	
	(ii) $\underset{\sim}{r}_P = \begin{pmatrix}1\\2\end{pmatrix} + t\begin{pmatrix}12\\16\end{pmatrix}$	1	
	$= \begin{pmatrix}1+12t\\2+16t\end{pmatrix}$	1	
	(b) (i) $\underset{\sim}{r}_P = \underset{\sim}{r}_Q$		
	$\begin{pmatrix}1+12t\\2+16t\end{pmatrix} = \begin{pmatrix}17+8t\\18+12t\end{pmatrix}$		8
	Maka/*Hence*, $1+12t = 17+8t$ atau/*or* $2+16t = 18+12t$	1	
	$12t - 8t = 17 - 1$		
	$4t = 16$		
	$t = \frac{16}{4}$		
	$= 4$ saat/*seconds*	1	
	(ii) $r_P = \begin{pmatrix}1+12t\\2+16t\end{pmatrix}$		
	Apabila/*When* $t = 4$, $r_P = \begin{pmatrix}1+12(4)\\2+16(4)\end{pmatrix}$	1	
	$= \begin{pmatrix}49\\66\end{pmatrix}$ m	1	

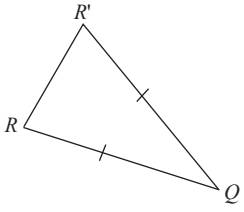
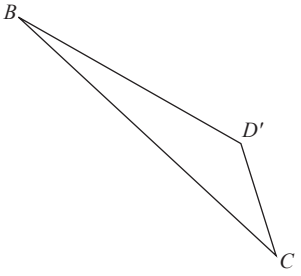
BAB 9

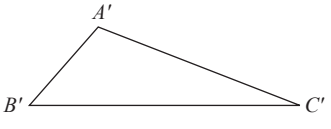
Penyelesaian Segi Tiga
Solution of Triangles

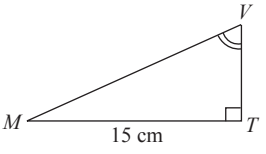
LATIHAN INTENSIF

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	(a) (i) $QR^2 = 5.8^2 + 7^2 - 2(5.8)(7)\cos 78°$	1	
	$QR = 8.109$ cm	1	
	(ii) $\frac{1}{2}(5.8)(7)\sin 78°$	1	
	$= 19.86$ cm^2	1	
	(iii) $\frac{\sin \angle PRQ}{5.8} = \frac{\sin 78°}{8.109}$	1	
	$\angle PRQ = 44.39°$	1	
	(b) $\frac{\sin \angle PRS}{8.3} = \frac{\sin 42°}{7}$	1	10
	$\angle PRS = 52.50°$ atau/*or* $\angle PRS = 127.5°$	1	
	$\angle QRS = 52.50° - 44.40°$ atau/*or* $\angle QRS = 127.5° - 44.40°$	1	
	$= 8.1°$ $= 83.1°$	1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
2	(a) Panjang/*Length of AB* = Panjang/*Length of AC* $AC^2 = 8^2 + 15^2 - 2(8)(15)\cos 60°$ $AC = 13$ cm Maka/*Thus*, $AB = 13$ cm (b) $\frac{\sin \angle DAC}{15} = \frac{\sin 60°}{13}$ $\angle DAC = 87.80°$ $6^2 = 13^2 + 13^2 - 2(13)(13)\cos \angle CAB$ $\angle CAB = 26.68°$ $\angle DAB = 87.80° + 26.68°$ $= 114.48°$ (c) $\frac{1}{2}(8)(15)\sin 60° + \frac{1}{2}(13)(13)\sin 26.68°$ $= 51.96 + 37.94$ $= 89.9$ cm^2	1 1 1 1 1 1 1 1 2 1	10
3	(a) (i) $\frac{DC}{\sin 30°} = \frac{11}{\sin 50°}$ $DC = 7.180$ $CE = 7.180 - 3$ $= 4.180$ cm (ii) $\frac{AC}{\sin 100°} = \frac{11}{\sin 50°}$ $AC = 14.14$ cm (iii) $11^2 = 9^2 + 4.180^2 - 2(9)(4.180)\cos \angle BCE$ $\angle BCE = 107.42°$ $\angle BCA = 107.42° - 50°$ $= 57.42°$ $AB^2 = 14.14^2 + 9^2 - 2(14.14)(9)\cos 57.42°$ $AB = 12$ cm $\frac{\sin \angle CBA}{14.14} = \frac{\sin 57.42°}{12}$ $\angle CBA = 83.17°$ (b) Luas trapezium/*Area of trapezium ABCD* $= \frac{1}{2}(9)(14.14)\sin 57.42° + \frac{1}{2}(11)(7.18)\sin 100°$ $= 92.51$ cm^2	1 1 1 1 1 1 1 1 1 1 1 1, 1 1	10
4	(a) $HJ = \frac{\sqrt{9^2 + 11^2}}{2}$ $= 7.106$ cm $\tan \angle MRJ = \frac{11}{9}$ $\angle MRJ = 50.71°$ $\angle HJK = \angle MRJ = 50.71°$ $HK^2 = 7.106^2 + 18^2 - 2(7.106)(18)\cos 50.71°$ $HK = 14.58$ cm (b) $\frac{\sin \angle JHK}{18} = \frac{\sin 50.71°}{14.58}$ $\angle JHK = 72.84°$	1 1 1 1 1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(c) Luas/*Area of JKLM* – Luas/*Area of* $\angle JMR$ – Luas/*Area of* $\angle HJK$ $= (11)(18) - \frac{1}{2}(11)(9) - \frac{1}{2}(7.106)(18)\sin 50.71°$ $= 99\ \text{cm}^2$	1, 1, 1 1	10
5	(a) (i) $QR^2 = (4\sqrt{3} - 5)^2 + (4\sqrt{3} + 5)^2 - 2(4\sqrt{3} - 5)(4\sqrt{3} + 5)\cos 60°$	1	
	$QR = \sqrt{48 - 40\sqrt{3} + 25 + 48 + 40\sqrt{3} + 25 - 2(48 - 25)\left(\frac{1}{2}\right)}$	1	
	$= \sqrt{123}$ cm	1	
	(ii) $\frac{4\sqrt{3} - 5}{\sin \angle PQR} = \frac{\sqrt{123}}{\sin 60°}$	1	
	$\frac{4\sqrt{3} - 5}{\sin \angle PQR} = \frac{\sqrt{123}}{\frac{\sqrt{3}}{2}}$		
	$\frac{4\sqrt{3} - 5}{\sin \angle PQR} = 2\sqrt{41}$		
	$\sin \angle PQR = \frac{4\sqrt{3} - 5}{2\sqrt{41}} \times \frac{\sqrt{41}}{\sqrt{41}}$	1	10
	$= \frac{\sqrt{41}}{82}(4\sqrt{3} - 5)$, Tertunjuk/*Shown*	1	
	Maka/*Hence*, $\angle PQR = 8.66°$	1	
	(b) (i) 	1	
	(ii) Luas/*Area of* $\Delta QR'R = \frac{1}{2}(\sqrt{123})(\sqrt{123})(\sin 42.68°)$	1	
	$= 41.69\ \text{cm}^2$	1	
6	(a) (i) $s = \frac{32 + 24 + 20}{2}$	1	
	$= 38$	1	
	Luas/*Area* $= \sqrt{38(38 - 32)(38 - 24)(38 - 20)}$	1	
	$= 239.7\ \text{cm}^2$	1	
	(ii) $32^2 = 24^2 + 20^2 - 2(24)(20)\cos \angle BAC$	1	
	$\angle BAC = 92.87°$	1	
	(b) $\frac{BD}{\sin 92.87°} = \frac{24}{\sin 15°}$	1	
	$BD = 92.61$ cm	1	10
	(c) 	1	
	$\angle BD'C = 180° - 15°$ $= 165°$	1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
7	(a) (i) $\angle ROQ = 180° - 58° - 58°$ $= 64°$ $\frac{RQ}{\sin 64°} = \frac{8.6}{\sin 58°}$ $RQ = 9.115$ cm (ii) $\angle ROP = 180° - 64°$ $= 116°$ $\angle RPQ = 90° - 58°$ $= 32°$ $\frac{RP}{\sin 116°} = \frac{8.6}{\sin 32°}$ $PR = 14.59$ cm (iii) $\angle PSR = 180° - 58°$ $= 122°$ $\frac{\sin \angle PRS}{2.3} = \frac{\sin 122°}{14.59}$ $\angle PRS = 7.68°$ $\angle ORS = 7.68° + \left(\frac{180° - 116°}{2}\right)$ $= 39.68°$ (b) $s = \frac{17.2 + 9.115 + 14.59}{2}$ $= 20.45$ Luas/*Area of* ΔPQR $= \sqrt{20.45(20.45 - 17.2)(20.45 - 9.115)(20.45 - 14.59)}$ $= 66.44$ cm^2	 1 1 1 1 1 1 1 1 1	10
8	(a) (i) $FG^2 = 5^2 + 6.5^2 - 2(5)(6.5) \cos 50°$ $FG = 5.047$ cm (ii) $\frac{BC}{\sin 70°} = \frac{14}{\sin 60°}$ $BC = 15.19$ cm $BF = 15.19 - 6.5$ $= 8.69$ cm (b) $2 \times$ Luas/*Area of* ΔADE= Luas/ *Area of* ΔFCG $2\left[\frac{1}{2}(4)(AE) \sin 70°\right] = \frac{1}{2}(6.5)(5) \sin 50°$ $(4)(AE) \sin 70° = 12.448$ $AE = 3.312$ cm (c)  $\angle B'C'A' = 50° - (180° - 70° - 70°)$ $= 10°$	1 1 1 1 1 1 1 1 1 1	10

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
9	(a) $CT = \sqrt{15^2 + \left(\frac{13}{2}\right)^2}$	1	10
	$= 16.35$ cm	1	
	$\cos \angle VCT = \frac{16.35}{18}$	1	
	$\angle VCT = 24.72°$	1	
	(b) $\frac{1}{2}(18)(16.35)\sin 24.72°$	1	
	$= 61.54$ cm^2	1	
	(c) Katakan titik tengah CD ialah M *Assume the midpoint of CD is M*		
			
	$\sin 24.72° = \frac{VT}{18}$	1	
	$VT = 7.527$ cm	1	
	$\tan \angle MVT = \frac{15}{7.527}$	1	
	$\angle MVT = 63.35°$	1	
10	(a) $\cos 60° = \frac{PQ}{12.2}$	1	10
	$PQ = 6.1$ cm	1	
	(b) $\frac{QR}{\sin 50°} = \frac{6.1}{\sin 30°}$	1	
	$QR = 9.346$ cm	1	
	(c) $\angle SQR = 180° - 90° - 50° - 30°$ $= 10°$		
	$\tan 50° = \frac{QT}{6.1}$		
	$QT = 7.27$ cm	1	
	$\frac{TR}{\sin 10°} = \frac{7.27}{\sin 30°}$	1	
	$TR = 2.525$ cm	1	
	(d) Luas kawasan berlorek/ *Area of shaded region*		
	$= \frac{1}{2}(12.2)(6.1)\sin 60° - \frac{1}{2}(6.1)(7.270)$	2	
	$= 10.05$ cm^2	1	

BAB 10

Nombor Indeks
Index Numbers

LATIHAN INTENSIF

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	(a) $x = 120$	1	10
	$\frac{3.60}{y} \times 100 = 120$	1	
	$y =$ RM3.00	1	
	(b) $\bar{I}_{\frac{2022}{2018}} = \frac{(120 \times 20) + (125 \times 60) + (150 \times 20)}{20 + 60 + 20}$	1	
	$= 129$	1	
	(c) (i) $\bar{I}_{\frac{2018}{2015}} = \frac{149 \times 100}{129}$	1	
	$= 115.50$	1	
	(ii) $\frac{P_{2022}}{0.50} \times 100 = 149$	1	
	$P_{2022} =$ RM0.75	1	
	Bilangan maksimum bola ketam/ *Maximum number of crab balls*		
	$= \frac{300}{0.75}$		
	$= 400$	1	
2	(a) $\frac{4.00}{a} \times 100 = 125$	1	10
	$a = 3.20$	1	
	(b) $\frac{b + 0.50}{b} \times 100 = 125$	1	
	$b = 2.00$	1	
	$c = 2.00 + 0.50$		
	$= 2.50$	1	
	(c) (i) $\frac{11.20}{Q_{2019}} \times 100 = 128.7$	1	
	$x =$ RM8.70	1	
	(ii) $\frac{125(6) + 110(2) + 125(h) + 160(3)}{6 + 2 + h + 3} = 128.7$	1, 1	
	$\frac{1\,450 + 125h}{11 + h} = 128.7$		
	$3.7h = 34.3$		
	$h = 9.27$		
	Bundar kepada integer terhampir, $h = 9$.	1	
	Round off to the nearest integer, $h = 9$.		
3	(a) $\frac{1.35}{x} \times 100 = 150$	1	
	$x = 0.90$		
	$y = \frac{3.00}{2.50} \times 100$		
	$y = 120$	1	
	$\frac{z}{1.25} \times 100 = 140$		
	$z = 1.75$	1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) $\frac{(150\times 3)+(120\times 5)+(125\times 8)+(140\times m)}{3+5+8+m}=130.5$	1	
	$\frac{2050+140m}{16+m}=130.5$		
	$2\,050+140m=2\,088+130.5m$		
	$9.5m=38$	1	
	$m=4$		
	(c) (i) $\frac{130.5\times 90}{100}=117.45$	1, 1	
	(ii) $\frac{P_{2025}}{98}\times 100=117.45$		
	$P_{2025}=\text{RM}115.10$	1	10
	(iii) $\frac{(150\times 3)+(120\times 5)+(125\times 8)+4n}{3+5+8+4}=117.45$	1	
	$\frac{2\,050+4n}{20}=117.45$		
	$2\,050+4n=2\,349$		
	$4n=2\,99$		
	$n=74.75$		
	$100-74.75=25.25$		
	Maka, peratus penurunan harga bahan *D* ialah 25.25%. *Thus, the percentage decrease of the price of ingredient D is 25.25%.*	1	
4	(a) $x=\frac{2.40}{1.60}\times 100=150$	1	
	$\frac{5.50}{y}\times 100=110$	1	
	$y=5.00$		
	$\frac{z}{2.50}\times 100=120$	1	
	$z=3.00$		
	(b) $\bar{I}_{\frac{2023}{2000}}=\frac{(150\times 250)+(110\times 200)+(120\times 150)+(125\times 400)}{250+200+150+400}$	1	
	$=\frac{127\,500}{1\,000}$	1	
	$=127.5$	1	
	(c) $P_{2000}=\frac{5}{1.25}$		10
	$=\text{RM}4.00$	1	
	$\frac{P_{2023}}{4}\times 100=127.5$	1	
	$P_{2023}=\text{RM}5.10$	1	
	Harga jual pada tahun 2023/ *Selling price in the year* 2023 $=1.50\times 5.10$ $=\text{RM}7.65$	1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
5	(a) (i) $\frac{Q_{2023}}{Q_{2021}} \times 100 = 115$		
	$\frac{\text{RM}8.05}{Q_{2021}} \times 100 = 115$	1	
	$Q_{2021} = \frac{\text{RM}8.05}{115} \times 100$		
	$= \text{RM}7.00$	1	
	(ii) $\frac{Q_{2023}}{\text{RM}4.50} \times 100 = 140$		
	$Q_{2023} = \frac{140}{100} \times \text{RM}4.50$		
	$Q_{2023} = \text{RM}6.30$	1	
	(b) $I_{2023/2021} = 127$		
	$\frac{(115 \times 4) + (150 \times 1) + (x \times 2) + (140 \times 3)}{4 + 1 + 2 + 3} = 127$	1	10
	$\frac{1\,030 + 2x}{10} = 127$		
	$2x = 1\,270 - 1\,030$		
	$x = 120$	1	
	(c) $I_{\frac{2025}{2021}} = \frac{(126.5 \times 4) + (150 \times 1) + (144 \times 2) + (126 \times 3)}{4 + 1 + 2 + 3}$	1, 1	
	$= 132.2$	1	
	(d) $\frac{Q_{2025}}{\text{RM}25.00} \times 100 = 132.2$	1	
	$Q_{2025} = \frac{132.2}{100} \times \text{RM}25.00$		
	$= \text{RM}33.05$	1	
6	(a) $\frac{P_{2023}}{P_{2021}} \times 100 = 120$	1	
	$\frac{P_{2023}}{\text{RM}1.50} \times 100 = 120$		
	$P_{2023} = \text{RM}1.80$	1	
	(b) (i) $25 + 40 + k + 10 = 100$		
	$k = 25$	1	
	(ii) $\bar{I} = \frac{(150 \times 25) + (80 \times 40) + (110 \times 25) + (100 \times 10)}{25 + 40 + 25 + 10}$	1	
	$= 107$	1	10
	$\frac{P_{2023}}{4.60} \times 100 = 107$	1	
	$P_{2023} = \text{RM}4.92$	1	
	(c) $\bar{I}_{\frac{2025}{2021}} = \frac{107 \times 135}{100}$	1	
	$= 144.45$	1	
	Maka, peratus perubahan kos pengeluaran dari tahun 2021 ke tahun 2025 meningkat sebanyak 44.45%. *Thus, the percentage change in the production cost from the year* 2021 *to the year* 2025 *increases by* 44.45%	1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
7	(a) $I_{2020/2017} = I_{2020/2015} \times I_{2015/2017}$		10
	$= \frac{120}{108} \times 100$	1	
	$= 111.11$	1	
	(b) (i) $\frac{28.60}{22} \times 100 = x$	1	
	$x = 130$	1	
	(ii) $Q_{2017} = \frac{117 \times 22}{100}$	1	
	$= \text{RM}25.74$	1	
	(c) $\frac{108(2) + 125(k) + 117(3)}{2 + k + 3} = 119.2$	1	
	$\frac{567 + 125k}{5 + k} = 119.2$		
	$5.8\,k = 29$		
	$k = 5$	1	
	(d) $Q_{2015} = \frac{59.60}{119.20} \times 100$	1	
	$= \text{RM}50.00$	1	

Kertas Model SPM

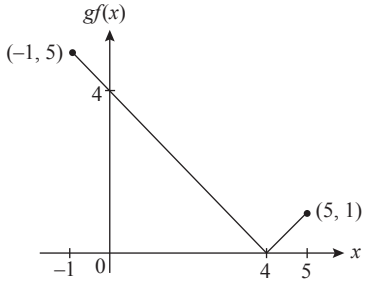
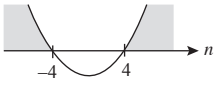
Kertas 1

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	(a) $\frac{r-m}{r}=\frac{5}{2}$ $2(r-m)=5r$ $2r-2m=5r$ $-2m=3r$ $m=-\frac{3r}{2}$ (b) $g(x)=\frac{x+\frac{3}{2}}{x}$ $g(x)=\frac{2x+3}{2x}$ $gh(x)=g\left(\frac{x}{2}-4\right)$ $gh(x)=\frac{2\left(\frac{x}{2}-4\right)+3}{2\left(\frac{x}{2}-4\right)}$ $gh(x)=\frac{x-5}{x-8}, x\neq 8$	1 1 1 1 1	5
2	$x(2x-4)=7x+1$ $2x^2-4x=7x+1$ $2x^2-11x-1=0$ $x=\frac{-(-11)\pm\sqrt{(-11)^2-4(2)(-1)}}{2(2)}$ $x=\frac{11+\sqrt{129}}{4}$, $x=\frac{11-\sqrt{129}}{4}$ $x=5.589$ $x=-0.089$	1 1 1	3
3	(a) $3^{p-1}+3^{p+1}=3^p(3^{-1})+3^p(3)$ $=\left(\frac{1}{3}\right)(3^p)+3(3^p)$ $=3^p\left(\frac{1}{3}+3\right)$ $=\frac{10}{3}(3^p)$ $=10(3^{p-1})$ Maka/*Thus*, $k=10$ (b) $8^{2m-3}=\frac{1}{\sqrt{4^{n-2}}}$ $2^{3(2m-3)}=2^{-\frac{1}{2}(n-2)}$ $3(2m-3)=-\frac{1}{2}(n-2)$ $6m-9=-\frac{1}{2}(n-2)$ $-12m+18=n-2$ $n=-12m+20$	1 1 1 1 1	5

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
4	$\ln (x+1) + \ln (x-1) = 3$ $\ln (x+1)(x-1) = 3$ $\ln (x^2-1) = 3$ $x^2 - 1 = e^3$ $x^2 = e^3 + 1$ $x = \pm\sqrt{e^3+1}$ Oleh sebab/*Since* $x - 1 > 0$, $x = \sqrt{e^3+1}$.	 1 1 1	3
5	$\log_p 3r^3 - \log_3 p^2$ $= \log_p 3 + \log_p r^3 - 2\log_3 p$ $= k + \dfrac{\log_r r^3}{\log_r p} - 2\left(\dfrac{\log_p p}{\log_p 3}\right)$ $= k + \dfrac{3}{9} - 2\left(\dfrac{1}{k}\right)$ $= k + \dfrac{1}{3} - \dfrac{2}{k}$ $= \dfrac{3k^2 + k - 6}{3k}$	 1 1 1 1	4
6	(a) $S_n = n(3n^2 + 8n - 6)$ $T_n = S_n - S_{n-1}$ $T_7 = S_7 - S_6$ $= 7[3(7)^2 + 8(7) - 6] - 6[3(6)^2 + 8(6) - 6]$ $= 479$ (b) $a = 154$, $d = 146 - 154 = -8$ $154 + (n-1)(-8) < 0$ $154 < 8(n-1)$ $n - 1 > \dfrac{154}{8}$ $n > \dfrac{154}{8} + 1$ $n > 20.25$ Maka/*Thus,* $n = 21$ $x = T_{21}$ $x = 154 + (21-1)(-8)$ $x = -6$	 1 1 1 1 1 1	6
7	(a) $r = \dfrac{6p^2}{2p}$ $r = 3p$ (b) $S_\infty = \dfrac{a}{1-r}$ $\dfrac{1}{4} = \dfrac{2p}{1-3p}$ $1 - 3p = 8p$ $11p = 1$ $p = \dfrac{1}{11}$	1 1 1 1	4
8	(a) $\dfrac{k-3}{h-(-2)} \times \dfrac{17-3}{5-(-2)} = -1$ $\dfrac{k-3}{h+2} = -\dfrac{1}{2}$ $2(k-3) = -(h+2)$ $2k - 6 = -h - 2$ $h = -2k + 4$	1 1	6

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) $\frac{1}{2}\begin{vmatrix} 0 & -2 & -2k+4 & 0 \\ 0 & 3 & k & 0 \end{vmatrix} = 42$		
	$\frac{1}{2}\lvert[(0)(3)+(-2)(k)+(-2k+4)(0)]-[(0)(-2)+(3)(-2k+4)+(k)(0)]\rvert = 42$	1	
	$\lvert -2k-(-6k+12)\rvert = 84$		
	$\lvert 4k-12\rvert = 84$		
	$4k-12=84$, $4k-12=-84$	1	
	$k=24$ $\quad k=-18$	1	
	$h=-2(24)+4$, $h=-2(-18)+4$		
	$h=-44$ $\quad h=40$	1	
9	(a) $y=2x^3-5x$		
	$\frac{y}{x^3}=\frac{2x^3}{x^3}-\frac{5x}{x^3}$	1	
	$\frac{y}{x^3}=2-\frac{5}{x^2}$		
	$Y=\frac{y}{x^3}$	1	
	$X=\frac{1}{x^2}$	1	
	(b) $\frac{1}{x^2}=2$ atau/*or* $\frac{y}{x^3}=3$	1	6
	$x=\frac{\sqrt{2}}{2}$	1	
	$\frac{y}{\left(\frac{\sqrt{2}}{2}\right)^3}=3$		
	$y=3\left(\frac{\sqrt{2}}{2}\right)^3$		
	$y=\frac{3\sqrt{2}}{4}$		
	Titik sepadan/*Corresponding point*: $\left(\frac{\sqrt{2}}{2},\frac{3\sqrt{2}}{4}\right)$	1	
10	(a) $x^2+2x(x-1)=k$		
	$x^2+2x^2-2x-k=0$		
	$3x^2-2x-k=0$	1	
	$x=\frac{-(-2)\pm\sqrt{(-2)^2-4(3)(-k)}}{2(3)}$	1	
	$x=\frac{2\pm\sqrt{4+12k}}{2(3)}$		
	$x=\frac{2\pm2\sqrt{1+3k}}{2(3)}$		
	$x=\frac{1\pm\sqrt{1+3k}}{3}$		7
	$p=\frac{1\pm\sqrt{1+3k}}{3}$	1	
	(b) $3x^2-2x-k=0$		
	Hasil tambah punca/*Sum of roots:*		
	$p+2p=-\left(\frac{-2}{3}\right)$	1	
	$p=\frac{2}{9}$	1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	Hasil darab punca/*Product of roots:* $p(2p) = \frac{-k}{3}$ $\frac{2}{9} \times 2\left(\frac{2}{9}\right) = \frac{-k}{3}$ $\frac{8}{81} = \frac{-k}{3}$ $k = -\frac{8}{27}$	1 1	
11	(a) (i) $\overrightarrow{OP} = 3\underset{\sim}{i} + 3\underset{\sim}{j}$ (ii) $\lvert\overrightarrow{OP}\rvert = \sqrt{3^2 + 3^2}$ $= \sqrt{18}$ $= 3\sqrt{2}$ Vektor unit dalam arah $\overrightarrow{OP}$ *Unit vector in the direction of* $\overrightarrow{OP}$ $\frac{1}{3\sqrt{2}}(3\underset{\sim}{i} + 3\underset{\sim}{j})$ $= \frac{\sqrt{2}}{2}(\underset{\sim}{i} + \underset{\sim}{j})$ (b) $\overrightarrow{OP} = -\underset{\sim}{u} + 2\underset{\sim}{v}$ $\overrightarrow{OP} = \frac{1}{3}(-3\underset{\sim}{u} + 6\underset{\sim}{v})$ $\overrightarrow{OP} = \frac{1}{3}\overrightarrow{UT}$ $\overrightarrow{OP}$ selari dengan $\overrightarrow{UT}$ kerana $\overrightarrow{OP} = \frac{1}{3}\overrightarrow{UT}$ $\overrightarrow{OP}$ *is parallel to* $\overrightarrow{UT}$ *because* $\overrightarrow{OP} = \frac{1}{3}\overrightarrow{UT}$	1 1 1 1 1 1 1 1	7
12	(a) $\sqrt{20} + 3\sqrt{5} - \frac{1}{\sqrt{45}}$ $= \sqrt{4 \times 5} + 3\sqrt{5} - \frac{1}{\sqrt{9 \times 5}}$ $= 2\sqrt{5} + 3\sqrt{5} - \frac{1}{3\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$ $= 5\sqrt{5} - \frac{\sqrt{5}}{3(5)}$ $= \frac{15 \times 5\sqrt{5}}{15} - \frac{\sqrt{5}}{15}$ $= \frac{74\sqrt{5}}{15}$ (b) Anggap p sebagai panjang bahagian bumbung. *Assume p as the length of the roof part.* $\left(2 + \sqrt{7}\right)p = 35 + \sqrt{28}$ $p = \frac{35 + \sqrt{28}}{2 + \sqrt{7}} \times \frac{2 - \sqrt{7}}{2 - \sqrt{7}}$ $= \frac{70 - 35\sqrt{7} + 2\sqrt{28} - \sqrt{196}}{4 - 7}$ $= \frac{70 - 35\sqrt{7} + 2\sqrt{4 \times 7} - 14}{-3}$ $= \frac{56 + 31\sqrt{7}}{-3}$ $= \frac{31\sqrt{7} - 56}{3}$	1 1 1 1 1 1 1 1	8

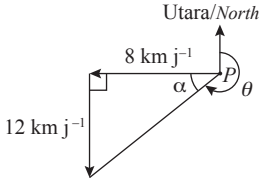
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
13	(a) (i) $gf(2) = 4 - 2$ $= 2$	1	
	(ii) Anggap/*Let* $y = f(x)$ $x = f^{-1}(y)$ $y = 3x - 2$	1	
	$x = \dfrac{y+2}{3}$	1	
	$f^{-1}(x) = \dfrac{x+2}{3}$		
	(iii) $gf(x) = 4 - x$ $g(3x - 2) = 4 - x$		
	Anggap/*Let* $y = 3x - 2$ $x = \dfrac{y+2}{3}$		
	$g(y) = 4 - \left(\dfrac{y+2}{3}\right)$ $= \dfrac{12 - y - 2}{3}$ $= \dfrac{10 - y}{3}$	1	
	$g(x) = \dfrac{10 - x}{3}$	1	8
	(b) $gf(x) = 4 - x$, $-1 \leqslant x \leqslant 5$ $gf(-1) = 5$; Koordinat/*Coordinates*: (–1, 5) $gf(5) = -1$; Koordinat/*Coordinates*: (5, –1)		
	Apabila/*When* $gf(x) = 0$ $4 - x = 0$ $x = 4$		
	Koordinat/*Coordinates*: (4, 0)		
			
	Graf berbentuk V yang melalui titik (4, 0). *Graph shape is* V *passing through point* (4. 0).	1	
	Graf betul yang melalui (–1, 5) dan (5, –1) *Correct graph passing through* (–1, 5) *and* (5, –1)	1	
	Julat/*Range of* y: $0 \leqslant y \leqslant 5$	1	
14	(a) $-x^2 + nx - 4 = 0$		
	$b^2 - 4ac > 0$ $n^2 - 4(-1)(-4) > 0$ $n^2 - 16 > 0$ $(n + 4)(n - 4) > 0$	1	
		1	
	$n < -4$, $n < 4$	1	

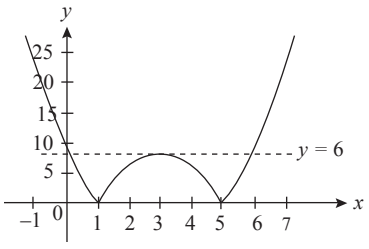
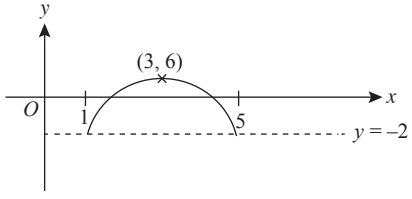
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) $-x^2 + nx - 4 = 0$ Punca-punca/*Roots*: α, 16α ($\alpha > 0$) Hasil tambah punca/*Sum of roots*: $\alpha + 16\alpha = -\left(\frac{n}{-1}\right)$ $17\alpha = n$ Hasil darab punca/*Product of roots*: $\alpha(16\alpha) = \frac{-4}{-1}$ $16\alpha^2 = 4$ $\alpha^2 = \frac{1}{4}$ $\alpha = \frac{1}{2}$ $16\alpha = 16\left(\frac{1}{2}\right)$ $= 8$ Maka, punca-punca bagi $f(x)$ ialah $\frac{1}{2}$ dan 8. *Thus, the roots of* $f(x)$ *are* $\frac{1}{2}$ *and* 8. (c) Paksi simetri bagi $f(x)$: *Axis of symmetry of* $f(x)$: $x = \frac{\frac{1}{2} + 8}{2}$ $x = \frac{17}{4}$ Paksi simetri bagi $g(x)$: *Axis of symmetry of* $g(x)$: $x = \frac{17}{4} - 5$ $x = -\frac{3}{4}$	1 1 1 1	8
15	(a) $a = \frac{600}{60} = 10$ $T_8 = 10 + (8 - 1)(2)$ $= 24$ (b) $252 = \frac{n}{2}[2(10) + (n - 1)(2)]$ $252 = n(10 + n - 1)$ $252 = 10n + n^2 - n$ $n^2 + 9n - 252 = 0$ $(n - 12)(n + 21) = 0$ $n = 12$, $n = -21$ (Abaikan/*Ignore*) Maka/*Thus*, $n = 12$. $h = 12 \times 60$ cm $= 720$ cm $= 7.2$ m	1 1 1 1 1 1 1 1 1	8

Kertas 2

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	$\frac{5}{x}+\frac{8}{y}$ …① $3x+y=1$ …② Daripada/*From* ②, $y=1-3x$ …③	1	5
	Gantikan ③ ke dalam ① *Substitute* ③ *into* ① $\frac{5}{x}+\frac{8}{1-3x}=1$	1	
	$\frac{5(1-3x)}{x(1-3x)}+\frac{8x}{(1-3x)x}=1$ $5-15x+8x=x-3x^2$ $3x^2-8x+5=0$ $(3x-5)(x-1)=0$	1	
	$3x-5=0$, $x-1=0$ $x=\frac{5}{3}$ $x=1$	1	
	Gantikan nilai x ke dalam ③ *Substitute the values of x into* ③ $y=1-3\left(\frac{5}{3}\right)$ $y=1-3(1)$ $y=-4$ $y=-2$	1	
2	(a) $f(x)=2x^2-kx+3$ $=2\left[x^2-\frac{k}{2}x-\left(\frac{\frac{k}{2}}{2}\right)^2-\left(\frac{\frac{k}{2}}{2}\right)^2\right]+3$	1	7
	$=2\left[\left(x-\frac{k}{4}\right)^2-\left(\frac{k}{4}\right)^2\right]+3$	1	
	$=2\left(x-\frac{k}{2}\right)^2-\frac{k^2}{8}+3$	1	
	Paksi simetri/*Axis of symmetry*: $x=\frac{k}{2}$		
	(b) $2x^2-8x+3=0$ Punca-punca α dan β: *Roots of* α *and* β: Hasil tambah punca/*Sum of roots*: $\alpha+\beta=-\left(\frac{-8}{2}\right)=4$	1	
	Hasil darab punca/*Product of roots*: $\alpha\beta=\frac{3}{2}$		
	Punca-punca $\frac{2}{\alpha}$ dan $\frac{2}{\beta}$: *Roots of* $\frac{2}{\alpha}$ *and* $\frac{2}{\beta}$: Hasil tambah punca/*Sum of roots*: $\frac{2}{\alpha}+\frac{2}{\beta}=\frac{2(\alpha+\beta)}{}$	1	
	$=\frac{2(4)}{\frac{3}{2}}$ $=\frac{16}{3}$		

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	Hasil darab punca/*Product of roots*: $\frac{2}{\alpha} \times \frac{2}{\beta} = \frac{4}{\alpha\beta}$ $= \frac{4}{\frac{3}{2}}$ $= \frac{8}{3}$ Persamaan kuadratik/*Quadratic equation*: $x^2 - \frac{16}{3} + \frac{8}{3} = 0$ $3x^2 - 16x + 8 = 0$	1 1	
3	(a) $\frac{2^{\frac{5}{2}}(x^3y)^p}{(8x^2y^q)^{\frac{1}{2}}} = \frac{2^{\frac{5}{2}} \times x^{3p}y^p}{(2^3)^{\frac{1}{2}} \times (x^2)^{\frac{1}{2}} \times (y^q)^{\frac{1}{2}}}$ $= 2^{\frac{5}{2}-\frac{3}{2}} \times x^{3p-1} \times y^{p-\frac{q}{2}}$ $= 2x^{3p-1}y^{\frac{2p-q}{2}}$ (b) $7^p = 5^q = 35^r$ $\ln 7^p = \ln 5^q$ $p \ln 7 = q \ln 5$ $\ln 7 = \frac{q}{p} \ln 5$ …① $5^q = 35^r$ $\ln 5^q = \ln 35^r$ $q \ln 5 = r \ln 35$ $q \ln 5 = r (\ln 7 \times 5)$ $q \ln 5 = r (\ln 7 + \ln 5)$ …② Gantikan ① ke dalam ② *Substitute ① into ②* $q \ln 5 = r\left(\frac{q}{p} \ln 5 + \ln 5\right)$ $q \ln 5 = r \ln 5 \left(\frac{q}{p} + 1\right)$ $q = \frac{r(q+p)}{p}$ $r = \frac{pq}{p+q}$	1 1 1 1 1 1	7
4	(a) (i) $p + 3q - 2r = 5$ …① $2p - q + r = 8$ …② $p - 4q + 3r = 3$ …③ ① + ③: $2p - q + r = 8$ …④ ④ – ②: $0 = 0$ ∴ Penyelesaian tak terhingga/*Infinite solutions* (ii) Satah-satah bersilang pada satu garis lurus. *Planes intersect on a straight line.* (b) Anggap/*Let*: x = bilangan epal/*number of apples* y = bilangan oren/*number of oranges* z = bilangan mangga/*number of mangoes*	1 1 1	

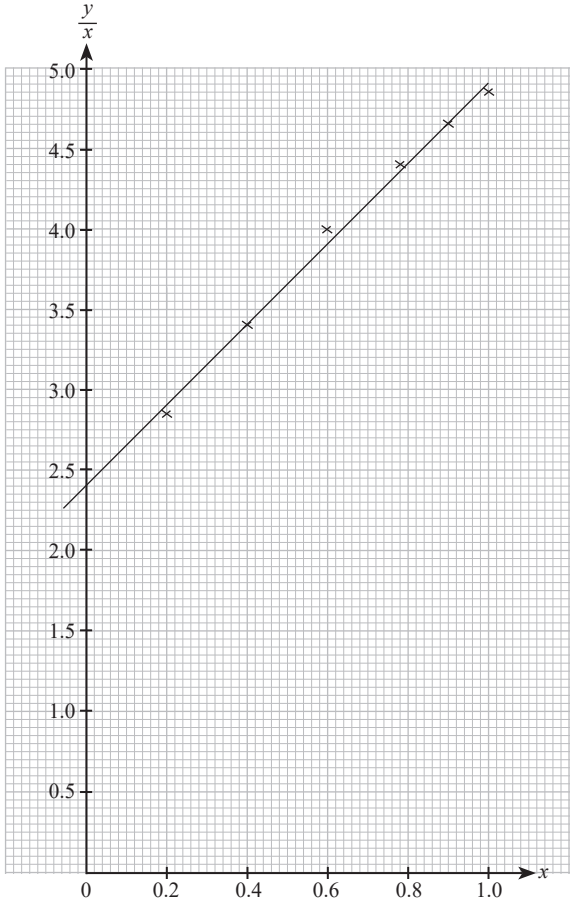
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	$x + y + z = 50$ …①	1	10
	$x + 2y + 3z = 115$ …②		
	$0.8x + y + 2z = 73$ …③	1	
	② – ①:		
	$y + 2z = 65$ …④	1	
	② × 0.8:		
	$0.8x + 1.6y + 2.4z = 92$ …⑤		
	⑤ – ③:		
	$0.6y + 0.4z = 19$ …⑥		
	(6) ÷ 0.2:		
	$3y + 2z = 95$ …⑦		
	⑦ – ④:		
	$2y = 30$	1	
	$y = 15$	1	
	Gantikan $y = 15$ ke dalam ⑦		
	Substitute $y = 15$ *into* ⑦	1	
	$3(15) + 2z = 95$		
	$2z = 50$		
	$z = 25$	1	
	Gantikan $y = 15$, $z = 25$ ke dalam ①		
	Substitute $y = 15$, $z = 25$ *into* ①		
	$x + 15 + 25 = 50$		
	$x = 10$	1	
	Maka, 10 biji epal, 15 biji oren dan 25 biji mangga.		
	Thus, 10 *apples*, 15 *oranges and* 25 *mangoes.*		
5			5
	$\underset{\sim}{v} + \underset{\sim}{w} = -8\underset{\sim}{i} - 12\underset{\sim}{j}$	1	
	$\lvert \underset{\sim}{v} + \underset{\sim}{w} \rvert = \sqrt{(-8)^2 + (-12)^2}$	1	
	$= \sqrt{208}$	1	
	$= 4\sqrt{13}$		
	$\alpha = \tan^{-1}\left(\frac{12}{8}\right)$		
	$= 56.31°$	1	
	$\theta = 180° - 56.31°$		
	$= 123.69°$	1	
	Halaju baharu ialah $4\sqrt{13}$ km j^{-1} pada arah 123.69°.		
	The new velocity is $4\sqrt{13}$ km h^{-1} *in the direction* 123.69°.		
6	(a) Fungsi songsang $f(x)$ **tidak dapat ditentukan** kerana apabila ujian garis mengufuk dilakukan, **garis mengufuk itu memotong graf $f(x)$** pada dua, tiga atau empat titik. Ini menunjukkan $f(x)$ **bukan fungsi satu dengan satu.**	1	
	The inverse function of $f(x)$ *cannot be determined because when the horizontal line test is performed, the horizontal line intersects the graph of* $f(x)$ *at two, three or four points. This indicates that* $f(x)$ *is not a one-to-one function.*	1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) (i) $f(-1) = \lvert 2(-1-1)(-1-5) \rvert$ $= 24$ $f(7) = \lvert 2(7-1)(7-5) \rvert$ $= 24$	1	
	Julat bagi $f(x)$ ialah $0 \leqslant f(x) \leqslant 24$. *The range of* $f(x)$ *is* $0 \leqslant f(x) \leqslant 24$.	1	
	(ii) 		
	$f(x) = b$ berlaku apabila garis mengufuk melalui titik pusingan. $f(x) = b$ *occurs when the horizontal line passes through the turning point.*		
	Paksi simetri/*Axis of symmetry of* $f(x)$, $x = \frac{1+5}{2}$		8
	$x = 3$	1	
	$f(3) = \lvert 2(3-1)(3-5) \rvert$ $= \lvert -8 \rvert$ $= 8$		
	Maka/*Thus*, $b = 8$.	1	
	(c) 		
	Graf lengkung dengan titik maksimum (3, 6). *Curve graph with maximum point* (3, 6).	1	
	Graf lengkung melalui titik (1, –2), (3, 6) dan (5, –2). *Curve graph passing through points* (1, –2), (3, 6) *and* (5, –2).	1	
7	(a) (i) $T_3 - T_2 = 2(T_2 - a)$ $ar^2 - ar = 2(ar - a)$ $ar^2 - ar = 2ar - 2a$	1	
	$ar^2 - 3ar + 2a = 0$ $a(r^2 - 3r + 2) = 0$ $r^2 - 3r + 2 = 0$ $(r-1)(r-2) = 0$ $r = 1$ (Abaikan/*Ignore*) , $r = 2$	1	
	$\therefore r = 2$	1	
	(ii) $\frac{a(2^{10}-1)}{2-1} = 341$	1	
	$a(1\,023) = 341$ $a = \frac{1}{3}$	1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) $a = 110$, $n = \frac{1\,500}{300} = 5$		
	$r = 1 - \frac{1}{8} = \frac{7}{8}$	1	
	$S_5 = \frac{110\left(1 - \left(\frac{7}{8}\right)^5\right)}{1 - \frac{7}{8}}$	1	8
	= 428.64 saat/*seconds* = 7.144 minit/*minutes*		
	Jessica dapat memecahkan rekod kerana 7.144 minit kurang daripada 7.2 minit. *Jessica was able to break the record because* 7.144 *minutes is less than* 7.2 *minutes.*	1	
8	(a)		

x	0.2	0.4	0.6	0.78	0.9	1
$\frac{y}{x}$	2.85	3.4	4	4.40	4.65	4.84

	1	
	1	
	1	10
	1	
	1	



Kedua-dua paksi dilabel dengan skala uniform dan satu titik diplot dengan betul.
Both axes are labeled in uniform scale and one point plotted correctly.

Enam titik diplot dengan betul.
Six points plotted correctly.

Garis lurus penyuaian terbaik.
Line of best fit.

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) (i) Daripada graf, apabila $x = 0.52$, $\frac{y}{x} = 3.7$ *From the graph, when* $x = 0.52$, $\frac{y}{x} = 3.7$ $\frac{y}{0.52} = 3.7$ $y = 1.924$	1	
	(ii) $2y - px^2 = qx$ $2y = px^2 + qx$ $\frac{y}{x} = \frac{p}{2}x + \frac{q}{2}$	1	10
	$\frac{p}{2} = \frac{4.5 - 2.4}{0.84 - 0}$ $\frac{p}{2} = 2.5$ $p = 5$	1 1	
	(iii) $\frac{q}{2} = 2.4$ $q = 4.8$	1 1	
9	(a) (i) $\overrightarrow{PT} = \overrightarrow{PQ} + \overrightarrow{QK} + \overrightarrow{KT}$ $= 5\underset{\sim}{a} + 2\underset{\sim}{b} - 3\underset{\sim}{a}$ $= 2\underset{\sim}{a} + 2\underset{\sim}{b}$	1 1	
	(ii) $\overrightarrow{QS} = \overrightarrow{QR} + \overrightarrow{RS}$ $= 6\underset{\sim}{a} - 9\underset{\sim}{a}$	1	
	(b) $\overrightarrow{QT} = \overrightarrow{QK} + \overrightarrow{KT}$ atau/*or* $\overrightarrow{QT} = 2\overrightarrow{QS}$ $= 2\underset{\sim}{b} - 3\underset{\sim}{a}$ $2\underset{\sim}{b} - 3\underset{\sim}{a} = \lambda(6\underset{\sim}{b} - 9\underset{\sim}{a})$ $= \frac{1}{3}(6\underset{\sim}{a} - 9\underset{\sim}{a})$ $6\lambda = 2$, $-9\lambda = -3$ $= \frac{1}{3}\overrightarrow{QS}$ $\lambda = \frac{2}{6}$ $\lambda = \frac{1}{3}$ $\lambda = \frac{1}{3}$ Oleh sebab $\overrightarrow{QT} = \frac{1}{3}\overrightarrow{QS}$, maka Q, T dan S adalah segaris. *Since* $\overrightarrow{QR} = \frac{1}{3}\overrightarrow{QS}$ *, thus Q, T and S are collinear.*	1 1 1	10
	(c) $\overrightarrow{RT} = \overrightarrow{RK} + \overrightarrow{KT}$ $= -4\underset{\sim}{b} - 3\underset{\sim}{a}$ $\lvert\overrightarrow{RT}\rvert = \sqrt{[(-4)(3)]^2 + [(-3)(2)]^2}$ $= \sqrt{180}$ $= 6\sqrt{5}$	1 1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
10	(a) $T(x, y) = \left(\frac{3+9}{2}, \frac{7+3}{2}\right)$ $= (6, 5)$	1	10
	$m_{AC} = \frac{7-3}{3-9}$ $= -\frac{2}{3}$	1	
	$-\frac{2}{3} \times m_{BD} = -1$ $m_{BD} = \frac{3}{2}$		
	$y - 5 = \frac{3}{2}(x - 6)$	1	
	$y = \frac{3}{2}x - 9 + 5$ $y = \frac{3}{2}x - 4$	1	
	(b) $\frac{8m + (-2)n}{m + n} = 6$	1	
	$8m - 2n = 6m + 6n$ $2m = 8n$ $\frac{m}{n} = \frac{8}{2}$ $\frac{m}{n} = \frac{4}{1}$ $m : n = 4 : 1$	1	
	Maka/*Thus*, $m = 4$, $n = 1$	1	
	(c) $\left(\frac{y-3}{x-9}\right) \times \left(\frac{y-(-7)}{x-(-2)}\right) = -1$	1	
	$\left(\frac{y-3}{x-9}\right) \times \left(\frac{y+7}{x+2}\right) = -1$ $(y - 3)(y + 7) = -(x - 9)(x + 2)$ $y^2 + 7y - 3y - 21 = -x^2 - 2x + 9x + 18$ $x^2 + y^2 - 7x + 4y - 39 = 0$		
	Gantikan $T(6, 5)$ ke dalam persamaan locus *Substitute* $T(6, 5)$ *into the locus equation* $(6)^2 + (5)^2 - 7(6) + 4(5) - 39 = 0$	1	
	Maka, titik T terletak pada lokus P. *Thus, point T is on loci P.*	1	

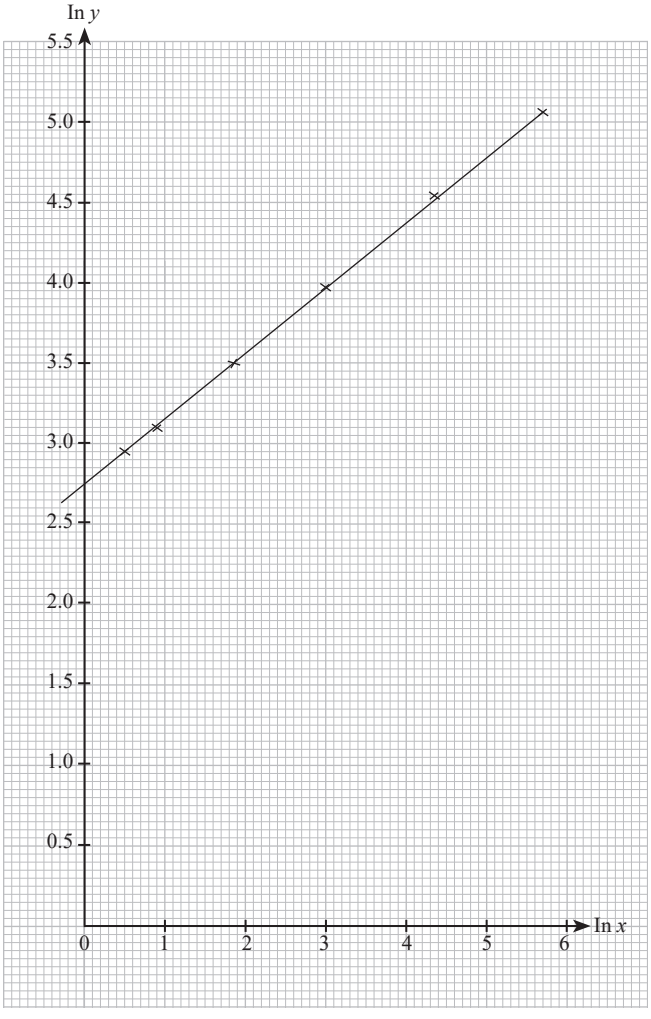
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
11	(a)		

$\ln x$	0.50	0.93	1.87	3.01	4.36	5.75
$\ln y$	2.95	3.09	3.50	3.98	4.54	5.12

1

1

(b)



Kedua-dua paksi dilabel dengan skala uniform dan satu titik diplot dengan betul. 1
Both axes are labeled in uniform scale and one point plotted correctly.

Enam titik diplot dengan betul. 1
Six points plotted correctly.

Garis lurus penyuaian terbaik. 1
Line of best fit.

10

(c) $y = ax^b$

$\ln y = \ln ax^b$

$\ln y = \ln a + \ln x^b$

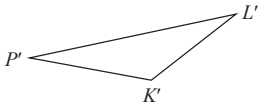
$\ln y = \ln a + b \ln x$ 1

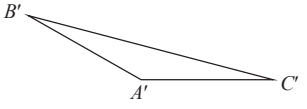
(i) $\ln a = 2.75$ 1

$a = 15.64$ 1

(ii) $b = \dfrac{4.4 - 2.75}{4 - 0}$ 1

$= 0.4125$ 1

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
12	(a) $LK^2 = 151.59^2 + 200^2 - 2(151.59)(200)\cos 18°$ $LK = 72.88$ m	1 1	
	(b) (i)  	1	
	(ii) $\frac{\sin \angle PKL}{} = \frac{\sin 18°}{72.88}$	1	
	$\angle PKL = 40°$	1	
	$\angle P'K'L' = 180° - 40°$ $= 140°$	1	10
	$\angle P'L'K' = 180° - 140° - 18°$ $= 22°$		
	Luas segi tiga/*Area of triangle* $P'K'L'$ $= \frac{1}{2}(72.88)(151.59)\sin 22°$	1	
	$= 2\,069.30$ m^2	1	
	(iii) $2\,069.30 = \frac{1}{2}(72.88)t$	1	
	$t = 56.79$ m	1	
13	(a) $\frac{P_{2022}}{7.85} \times 100 = 120$ $P_{2022} = \text{RM}9.42$	1	
	(b) $\frac{(110 \times 65) + (115 \times 12) + (120 \times 13) + 10x}{} = 111.9$	1	
	$\frac{10\,090 + 10x}{100} = 111.9$		
	$10x = 1\,100$		
	$x = 110$	1	
	(c) $\frac{110}{100} \times \frac{y}{100} \times 100 = 137.5$	1	
	$y = 125$	1	
	(d) $\bar{I}_{\frac{2024}{2022}} = \frac{(125 \times 65) + (120 \times 12) + (105 \times 13) + (118 \times 10)}{65 + 12 + 13 + 10}$	1	10
	$= 121.1$		
	$\bar{I}_{\frac{2024}{2020}} = \frac{121.1}{100} \times \frac{111.9}{100} \times 100$	1	
	$= 135.51$	1	
	(e) $\frac{P_{2024}}{2085} \times 100 = 135.51$	1	
	$P_{2024} = \text{RM}3\,862.04$	1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
14	(a) $\frac{14.25}{x} \times 100 = 95$		
	$x = 15$	1	
	$y = 130$	1	
	$\frac{z}{12.00} \times 100 = 130$	1	
	$z = 15.60$		
	(b) $\bar{I}_{\frac{2025}{2023}} = \frac{(130 \times 2) + (120 \times 3) + (100 \times 4) + (95 \times 3)}{2 + 3 + 4 + 3}$	1	
	$= 108.75$	1	
	(c) (i) Indeks harga pada tahun 2026 berasaskan tahun 2023: *Price index in the year* 2026 *based on the year* 2023*:*		
	$I_A = \frac{130 \times 85}{100} = 110.50$		10
	$I_B = \frac{120 \times 100}{100} = 120$	1	
	$I_C = \frac{100 \times 100}{100} = 100$		
	$I_D = \frac{95 \times 110}{100} = 104.50$		
	$\bar{I}_{\frac{2026}{2023}} = \frac{(110.5 \times 2) + (120 \times 3) + (100 \times 4) + (104.50 \times 2)}{2 + 3 + 4 + 2}$	1	
	$= 108.18$	1	
	(ii) $\frac{P_{2026}}{18} \times 100 = 108.18$	1	
	$P_{2026} = \text{RM}19.47$	1	
15	(a) $\frac{\sin \angle EFD}{} = \frac{\sin 17.08}{8}$	1	
	$\angle EFD = 30.93°$	1	
	$\angle FED = 180° - 17.08° - 30.93°$ $= 131.99°$		
	$AC = FD$		
	$FD^2 = 8^2 + 14^2 - 2(8)(14) \text{ kos } 131.99$	1	
	$FD = 20.24 \text{ cm}$	1	
	$AC = 20.24 \text{ cm}$		
	$AE = \sqrt{8^2 + 15^2}$ atau/*or* $EC = \sqrt{14^2 + 15^2}$	1	
	$= 17\text{cm}$ $= 20.52 \text{ cm}$		
	$20.24^2 = 17^2 + 20.52^2 - 2(17)(20.52) \text{ kos } \angle AEC$	1	10
	$\angle AEC = 64.50°$	1	
	(b) Luas segi tiga *ACE*/*Area of triangle ACE*		
	$= \frac{1}{2}(17)(20.52) \sin 64.50°$	1	
	$= 157.43 \text{ cm}^2$	1	
	(c) 	1	

KEMENTERIAN PENDIDIKAN
JABATAN PENDIDIKAN NEGERI SELANGOR

SELANGOR

TUISYEN RAKYAT PTRS SELANGOR

KATA ALUAN YAB DATO' MENTERI BESAR SELANGOR

Program Tuisyen Rakyat Selangor (PTRS) merupakan salah satu inisiatif pendidikan unggul Kerajaan Negeri Selangor yang menyediakan kelas tambahan secara percuma kepada pelajar Tingkatan 4 dan Tingkatan 5 dalam enam (6) mata pelajaran teras, iaitu Bahasa Melayu, Bahasa Inggeris, Matematik, Matematik Tambahan, Sains, dan Sejarah.

Bagi memperkukuh persediaan awal pelajar menghadapi peperiksaan, PTRS kini diperluaskan kepada pelajar Tingkatan 4 bagi enam (6) mata pelajaran tertentu, dengan sasaran manfaat kepada seramai 70,000 pelajar.

YAB DATO' SERI AMIRUDIN BIN SHARI
DATO' MENTERI BESAR SELANGOR

Sejak diperkenalkan pada tahun 2012 dalam skala kecil dan dilaksanakan secara fizikal, modul latihan PTRS telah dikembangkan ke dalam bentuk dalam talian sejak pandemik Covid-19. Langkah ini bertujuan memudahkan akses kepada pelajar dan guru, sekali gus membolehkan lebih 271,000 pelajar memanfaatkan modul pembelajaran yang boleh diakses melalui aplikasi mudah alih, sama ada di telefon pintar atau tablet.

Bagi memastikan kejayaan pelaksanaan PTRS tahun ini, Kerajaan Negeri Selangor telah memperuntukkan sebanyak RM10 juta, dengan pembiayaan serta pelaksanaan bersama oleh Jawatankuasa Tetap Pendidikan dan Modal Insan Negeri Selangor, Menteri Besar Selangor (Pemerbadanan) MBI serta Jabatan Pendidikan Negeri Selangor.

Saya yakin bahawa inisiatif ini akan mengukuhkan daya saing anak-anak Selangor dalam pencapaian akademik, yang menjadi asas kepada masa depan yang lebih cerah. Ia juga akan meningkatkan kebolehpasaran mereka, membolehkan mereka bersaing dengan tenaga kerja dari negara maju.

Sumbangan generasi muda ini amat penting dalam merealisasikan aspirasi Selangor sebagai negeri termaju dan berdaya saing di barisan hadapan Malaysia.

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Koleksi Video PdP

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