

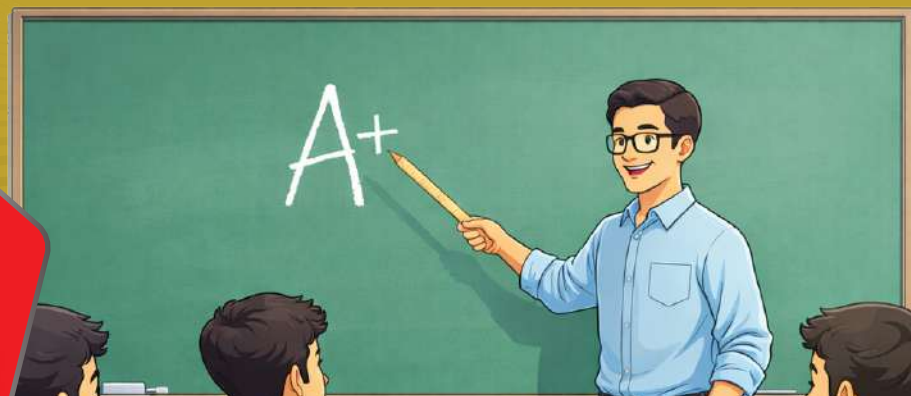


PROGRAM TUISYEN RAKYAT SELANGOR



MATEMATIK TAMBAHAN

DWIBAHASA



KITASELANGOR

DIKUASAI OLEH:



PROGRAM TUISYEN RAKYAT SELANGOR



MATEMATIK TAMBAHAN

DWIBAHASA

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Program Tuisyen Rakyat Selangor Matematik Tambahan Tingkatan 4

CIRI-CIRI EKSKLUSIF

- Modul ini disediakan berdasarkan Dokumen Standard Kurikulum dan Pentaksiran (DSKP) dan buku teks Matematik Tambahan KSSM.
- Latihan topikal disusun secara ansur maju berformatkan peperiksaan SPM terkini.
- Latihan yang padat, lengkap dan merangkumi pelbagai aras rendah, sederhana dan tinggi serta 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 menggunakan modul secara sendiri sebelum berbincang dengan guru.
- Satu set Kertas Model Tingkatan 4 dibekalkan pada akhir modul untuk memberikan gambaran sebenar peperiksaan SPM.
- Skema jawapan yang disediakan adalah berpanduan peraturan pemarkahan terkini yang menepati piawaian Lembaga Peperiksaan Malaysia (LPM) dan boleh diakses melalui kod QR sebagai panduan kepada guru dan murid.
- Penggubal modul berpengalaman luas dalam mata pelajaran Matematik Tambahan SPM terdiri dalam kalangan Guru Cemerlang dan Jurulatih Utama Negeri.
- Video Ulasan Jawapan juga disediakan untuk soalan-soalan tertentu bagi memastikan pengajaran dan pembelajaran (PdP) yang berkesan.

KANDUNGAN

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113 – 138



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 terhadap • Subjektif respons terhadap 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	

ANALISIS SOALAN SPM 2022-2024

MATEMATIK TAMBAHAN

Bab	Tajuk	2022		2023		2024	
		Kertas 1	Kertas 2	Kertas 1	Kertas 2	Kertas 1	Kertas 2
Tingkatan 4	1 Fungsi <i>Functions</i>	3	7	6, 8		3, 8	
	2 Fungsi Kuadratik <i>Quadratic Functions</i>	8	6	8	8	8	6
	3 Sistem Persamaan <i>Systems of Equations</i>		7		7	5	
	4 Indeks, Surd dan Logaritma <i>Indices, Surds and Logarithms</i>	4, 6, 5		7, 8		3	6
	5 Janjang <i>Progressions</i>	9	7	2, 7	8	8	10
	6 Hukum Linear <i>Linear Law</i>	4	10	4	10	2	10
	7 Geometri Koordinat <i>Coordinate Geometry</i>	8	7	3	6	5	10
	8 Vektor <i>Vectors</i>	4	10	5	5	2, 8	8
Tingkatan 5	1 Sukatan Membulat <i>Circular Measure</i>	7			9	2	7
	2 Pembezaan <i>Differentiation</i>	3	10	9	7	9	7
	3 Pengamiran <i>Integration</i>	3	10		10	6	10
	4 Pilih Atur dan Gabungan <i>Permutation and Combination</i>	8		7		8, 6	
	5 Taburan Kebarangkalian <i>Probability Distribution</i>	3, 5	10	4	10		6
	6 Fungsi Trigonometri <i>Trigonometric Functions</i>	8	6	2, 8	10	5	10
Bahagian C (Kertas 2)							
Tingkatan 4	Penyelesaian Segi Tiga <i>Solution of Triangles</i>	10	Nombor Indeks <i>Index Number</i>				10
Tingkatan 5	Pengaturcaraan Linear <i>Linear Programming</i>	10	Kinematik Gerakan Linear <i>Kinematics of Linear Motion</i>				10

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 $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
- 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 $\log_a \left(\frac{m}{n}\right) = \log_a m - \log_a n$
- 7 $\log_a m^n = n \log_a m$
- 8 $\log_a b = \frac{\log_c b}{\log_c a}$
- 9 $T_n = a + (n-1)d$
- 10 $S_n = \frac{n}{2}[2a + (n-1)d]$
- 11 $T_n = ar^{n-1}$
- 12 $S_n = \frac{a(r^n - 1)}{r - 1} = \frac{a(1 - r^n)}{1 - r}, r \neq 1$
- 13 $S_\infty = \frac{a}{1 - r}, |r| < 1$
- 14 $I = \frac{Q_1}{Q_0} \times 100$
- 15 $\bar{I} = \frac{\sum W_i I_i}{\sum W_i}$
- 16 $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
- 17 $a^2 = b^2 + c^2 - 2bc \cos A$
 $a^2 = b^2 + c^2 - 2bc \cos A$
- 18 Luas segi tiga / Area of triangle
 $= \frac{1}{2} ab \sin C$
- 19 Titik yang membahagi suatu tembereng garis
A point dividing a segment of a line
 $(x, y) = \left(\frac{nx_1 + mx_2}{m + n}, \frac{ny_1 + my_2}{m + n}\right)$
- 20 Luas segi tiga / Area of triangle
 $= \frac{1}{2} |(x_1 y_2 + x_2 y_3 + x_3 y_1) - (x_2 y_1 + x_3 y_2 + x_1 y_3)|$
- 21 $|r| = \sqrt{x^2 + y^2}$
- 22 $\hat{r} = \frac{x\hat{i} + y\hat{j}}{\sqrt{x^2 + y^2}}$

BAB
1

Fungsi
Functions



- 1 Rajah 1 menunjukkan hubungan antara set A dan set B dalam bentuk graf.

Diagram 1 shows the relation between set A and set B in graph form.

- (a) Nyatakan

State

- (i) imej-imej bagi 1,
the images of 1,
(ii) kodomain hubungan itu,
the codomain of the relation,

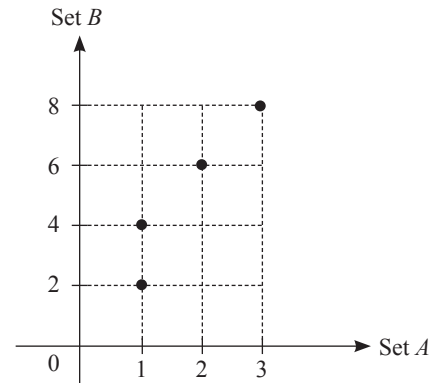
[2 markah/marks]

- (b) Wakilkan hubungan itu dalam bentuk pasangan tertib.

Represent the relation in the form of ordered pairs.

[1 markah/mark]

Jawapan/Answer:

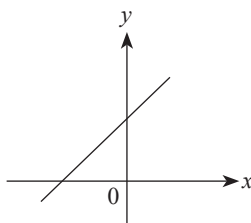


Rajah/Diagram 1

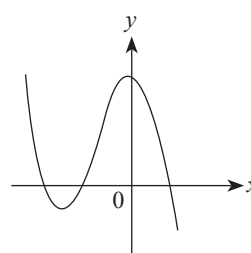
- 2 Dengan menggunakan ujian garis mencancang, tentukan sama ada setiap graf yang berikut adalah fungsi atau bukan fungsi.

By using vertical line test, determine whether each of the following graphs is a function or not a function.

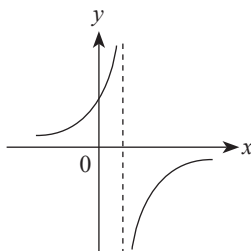
- (a)



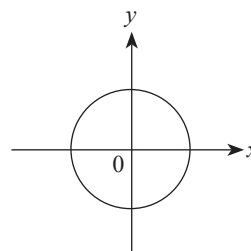
- (b)



- (c)



- (d)



[4 markah/marks]

Jawapan/Answer:

- 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 .

[1 markah/mark]

- (b) Ungkapkan hubungan tersebut menggunakan tatatanda fungsi.

Express the relation by the function notation.

[1 markah/mark]

Jawapan/Answer:

- 4 Hubungan set P kepada set Q ditakrifkan oleh set pasangan tertib $\{(A, 1), (A, 2), (B, 1), (B, 2), (B, 3), (C, 4), (C, 5)\}$. Nyatakan

The relation from set P to set Q is defined by the set of ordered pairs $\{(A, 1), (A, 2), (B, 1), (B, 2), (B, 3), (C, 4), (C, 5)\}$. State

- (a) imej bagi B ,
the image of B ,

[1 markah/mark]

- (b) objek bagi 2.
the object of 2.

[1 markah/mark]

Jawapan/Answer:

- 5 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 .

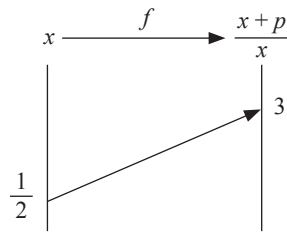
Given the functions $h : x \rightarrow 4x + m$ and $h^{-1} : x \rightarrow 2kx + \frac{5}{8}$, such that m and k are constants, find the value of m and of k .

[4 markah/marks]

Jawapan/Answer:

- 6 Rajah 2 menunjukkan fungsi $f(x) = \frac{x+p}{x}$, $x \neq k$, dengan keadaan p ialah pemalar.

Diagram 2 shows the function $f(x) = \frac{x+p}{x}$, $x \neq k$, such that p is a constant.



Rajah/Diagram 2

- (a) Nyatakan nilai k .
State the value of k .

[1 markah/mark]

- (b) Cari nilai bagi p .
Find the value of p .

[2 markah/marks]

Jawapan/Answer:

- 7 Diberi fungsi $h(x) = \frac{6}{x}$, $x \neq 0$ dan fungsi gubahan $hg(x) = 3x$, cari

Given the function $h(x) = \frac{6}{x}$, $x \neq 0$ and the composite function $hg(x) = 3x$, find

- (a) $g(x)$,
(b) nilai x apabila $gh(x) = 5$.
the value of x when $gh(x) = 5$.

[2 markah/marks]

[2 markah/marks]

Jawapan/Answer:

- 8 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 $gf(2) = -7$.

[1 markah/mark]

[2 markah/marks]

Jawapan/Answer:

- 9 Jadual 1 menunjukkan beberapa nilai untuk fungsi $f(x)$.
Table 1 shows some values for the function $f(x)$.

x	-1	0	1	2	3	4
$f(x)$	-5	-2	1	4	7	10

Jadual/Table 1

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

[1 markah/mark]

- (b) $f^2(2)$

[2 markah/marks]

Jawapan/Answer:

- 10 Rajah 3 menunjukkan fungsi f untuk domain $0 \leq x \leq 5$.

Diagram 3 shows a function f for domain $0 \leq x \leq 5$.

- (a) Dengan menggunakan tatatanda fungsi, tulis satu hubungan f .

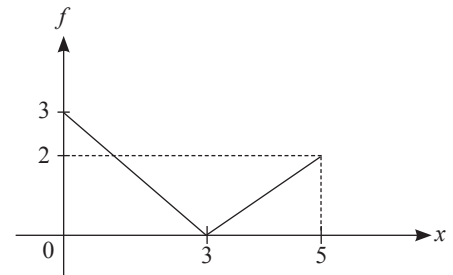
By using the function notation, write one relation for function f .

[1 markah/mark]

- (b) Cari nilai-nilai x dengan keadaan $f(x) = 6$.

Find the values of x such that $f(x) = 6$.

[2 markah/marks]



Rajah/Diagram 3

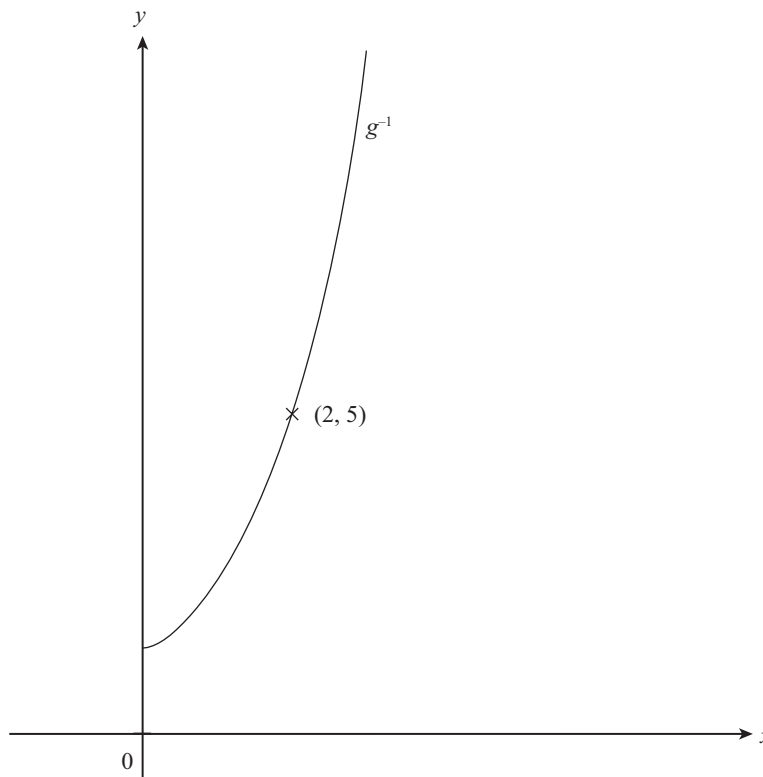
Jawapan/Answer:

- 11 Rajah 4 menunjukkan graf fungsi g^{-1} yang ditakrifkan oleh $g^{-1}(x) = 1 + x^2$ untuk domain $0 \leq x \leq 3$. Pada satah yang sama, lakarkan graf bagi g dengan menunjukkan koordinat titik yang sepadan dengan titik yang dinyatakan dalam graf g^{-1} .

Diagram 4 shows the graph function g^{-1} which is defined by $g^{-1}(x) = 1 + x^2$ for the domain $0 \leq x \leq 3$. On the same plane, sketch the graph of g by indicating the coordinates of the points corresponding to those on the graph of g^{-1} .

[2 markah/marks]

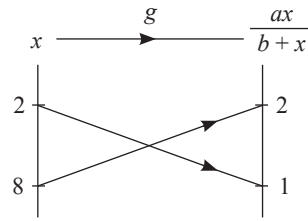
Jawapan/Answer:



Rajah/Diagram 4

- 12 Rajah 5 menunjukkan fungsi $g : x \rightarrow \frac{ax}{b+x}$, $x \neq -b$, dengan keadaan a dan b ialah pemalar.

Diagram 5 shows the function $g : x \rightarrow \frac{ax}{b+x}$, $x \neq -b$, such that a and b are constants.



Rajah/Diagram 5

Cari nilai a dan b .

Find the value of a and of b .

[3 markah/marks]

Jawapan/Answer:

- 13 Rajah 6 menunjukkan graf fungsi kuadratik dengan persamaan

$f(x) = \frac{2}{x}$. Berdasarkan Rajah 6, tentukan dan berikan kewajaran sama ada graf berikut

Diagram 6 shows the graph of a quadratic function with the equation

$f(x) = \frac{2}{x}$. Based on Diagram 6, determine and give justification whether the following graph

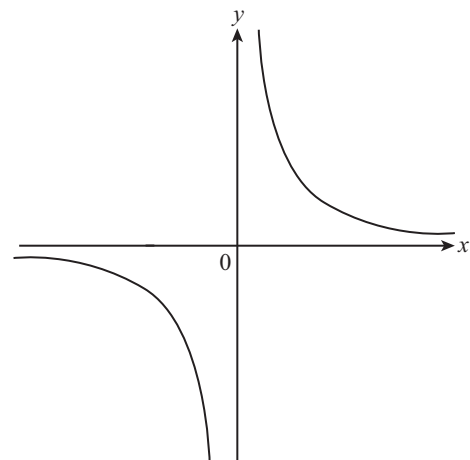
- (a) ialah fungsi atau bukan,
is a function,

[2 markah/marks]

- (b) mempunyai fungsi songsang atau tidak.
has an inverse function.

[2 markah/marks]

Jawapan/Answer:



Rajah/Diagram 6

14 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 .

[3 markah/marks]

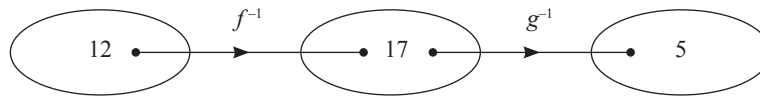
(b) Tunjukkan apabila $p = -\frac{19}{2}$, $hg(x)$ adalah fungsi songsang pemetaan ke atas diri sendiri.

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

[2 markah/marks]

Jawapan/Answer:

- 15 Rajah 7 menunjukkan pemetaan bagi fungsi f^{-1} dan g^{-1} .
 Diagram 7 shows the mapping of the functions f^{-1} and g^{-1} .



Rajah/Diagram 7

Nyatakan

State

(a) $fg(5)$

[1 markah/mark]

(b) $g^{-1}f^{-1}(12)$

[1 markah/mark]

Jawapan/Answer:

- 16 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.

[3 markah/marks]

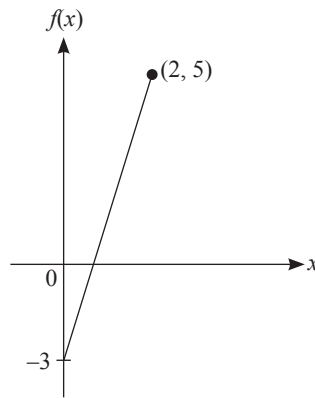
- (b) Seterusnya, cari g^{6n^2} .
 Hence, find g^{6n^2} .

[2 markah/marks]

Jawapan/Answer:



- 17 Rajah 8 menunjukkan graf bagi fungsi $f(x)$.
 Diagram 8 shows a graph of function $f(x)$.



Rajah/Diagram 8

Cari
 Find

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

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

[2 markah/marks]

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

[3 markah/marks]

Jawapan/Answer:

- 18 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:

- 19 Harga k , dalam RM, dan kuantiti x bagi suatu item dijual mengikut persamaan permintaan $k = 120 - x$ untuk $0 \leq x \leq 300$. 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 $0 \leq x \leq 300$. While 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 , [2 markah/marks]
- (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. [2 markah/marks]

Jawapan/Answer:

- 20 Isi padu V , dalam $\text{m}\ell$, 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 $\text{m}\ell$ dan mengalami kondensasi dengan kadar malar 8 $\text{m}\ell$ per saat.
- The volume V , in $\text{m}\ell$, 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 $\text{m}\ell$ and it undergoes condensation at a constant rate of 8 $\text{m}\ell$ per second.*
- (a) Tulis rumus bagi
Write the formula for
- 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,
 - 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 ,
 - fungsi gubahan $hV(t)$.
the composite function $hV(t)$.
- [5 markah/marks]
- (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. [2 markah/marks]

Jawapan/Answer:

BAB
2Fungsi Kuadratik
Quadratic Functions

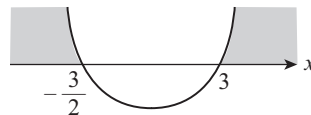
- 1 Rahman mempunyai sekeping kad manila berbentuk segi empat tepat dengan panjang $(3x + 1)$ cm dan lebar x cm. Dia memotong satu segi empat sama yang mempunyai sisi x cm daripada kad manila tersebut. Cari julat nilai x jika luas kad manila yang tinggal adalah selebih-lebihnya $(x^2 + 12)$ cm². Seterusnya, tentukan nilai-nilai integer x yang mungkin.

Rahman has a rectangular shaped manila card with the length of $(3x + 1)$ cm and width of x cm. He cuts a piece of square with the side length of x cm from the manila card. Find the range of values of x if the remaining area of the manila card is at most $(x^2 + 12)$ cm². Hence, determine the possible values of integer x .

[3 markah/marks]

Jawapan/Answer:

- 2 (a) Rajah 1 menunjukkan kawasan berlorek yang memuaskan suatu ketaksamaan kuadratik.
Diagram 1 shows the shaded regions that satisfy a quadratic inequality.



Rajah/Diagram 1

Bentukkan ketaksamaan kuadratik bagi kawasan tersebut.
Form the quadratic inequality for the region.

[2 markah/marks]

- (b) Diberi bahawa n dan $6 - n$ ialah punca-punca bagi persamaan kuadratik $x^2 + px + 9 = 0$, dengan keadaan p dan n ialah pemalar. Cari nilai p dan nilai n .

Given that n and $6 - n$ are the roots of the quadratic equation $x^2 + px + 9 = 0$, such that p and n are constants. Find the value of p and of n .

[3 markah/marks]

Jawapan/Answer:

- 3 (a) Jika punca-punca bagi persamaan kuadratik $x^2 + qx + r = 0$ ialah α dan $\alpha + 2$, ungkapkan r dalam sebutan q .
If the roots of the quadratic equation $x^2 + qx + r = 0$ are α and $\alpha + 2$, express r in terms of q . [4 markah/marks]
- (b) Diberi $\frac{5}{3}$ ialah satu punca bagi persamaan kuadratik $3x^2 - px + 5 = 0$. Hitung nilai p .
Given $\frac{5}{3}$ is one of the roots of the quadratic equation $3x^2 - px + 5 = 0$. Calculate the value of p . [2 markah/marks]

Jawapan/Answer:

-
- 4 Jika 2^m ialah salah satu punca bagi persamaan kuadratik $(x - 4)(x + 9) = 0$, buktikan bahawa $(x - 4)(x + 9) = 4^m - 5(2^m) - 36$. Seterusnya, cari nilai pemalar m .
If 2^m is one of the roots of the quadratic equation $(x - 4)(x + 9) = 0$, prove that $(x - 4)(x + 9) = 4^m + 5(2^m) - 36$. Hence, find the value of the constant m . [5 markah/marks]

Jawapan/Answer:

- 5 Lengkung $y = ax^2 + bx + c$ mempunyai titik maksimum di $(-3, 14)$ dan melalui titik $(0, -4)$. Cari nilai a , b dan c . Seterusnya, ungkapkan fungsi lengkung itu dalam bentuk $y = m(x + n)^2 + k$.
The curve $y = ax^2 + bx + c$ has a maximum point at $(-3, 14)$ and passes through the point $(0, -4)$. Find the values of a , b and c . Hence, express the function of the curve in the form of $y = m(x + n)^2 + k$.

[3 markah/marks]

Jawapan/Answer:

- 6 (a) Dengan menggunakan kaedah garis nombor, cari julat nilai x jika $(2x - 3)^2 \leq 8(3 - 2x)$.

By using the method of line number, find the range of values of x if $(2x - 3)^2 \leq 8(3 - 2x)$.

[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:

7 Diberi fungsi kuadratik $f(x) = hx^2 + kx - 6$ mempunyai titik maksimum $(3, 12)$.

Given the quadratic function $f(x) = hx^2 + kx - 6$ has the maximum point $(3, 12)$.

(a) (i) Ungkapkan, dalam sebutan h dan k , fungsi kuadratik itu dalam bentuk $f(x) = a(x + p)^2 + q$, dengan keadaan a , p dan q ialah pemalar.

Express, in terms of h and k , the quadratic function in the form of $f(x) = a(x + p)^2 + q$, such that a , p and q are constants.

(ii) Seterusnya, tentukan nilai h dan nilai k .

Hence, determine the value of h and of k .

[4 markah/marks]

(b) Dengan menggunakan nilai h dan k daripada (a), cari nilai t jika $y = 4t$ ialah tangen kepada lengkung $f(x) = hx^2 + kx - 6$.

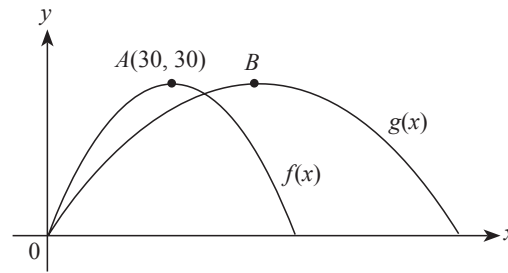
By using the values of h and k from (a), find the value of t if $y = 4t$ is a tangent to the curve $f(x) = hx^2 + kx - 6$.

[2 markah/marks]

Jawapan/Answer:

- 8 Rajah 2 menunjukkan graf bagi fungsi kuadratik, $f(x)$ dan $g(x)$. A dan B masing-masing adalah titik maksimum bagi fungsi kuadratik $f(x)$ dan $g(x)$.

Diagram 2 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.



Rajah/Diagram 2

- (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 .

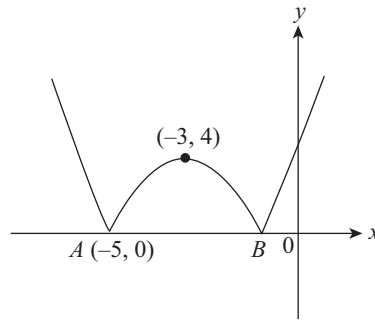
Given that $g(x) = -\frac{3}{250}x^2 + \frac{6}{5}x$, express $g(x)$ in vertex form. Hence, find the distance of AB .

[3 markah/marks]

Jawapan/Answer:

- 9 Rajah 3 menunjukkan graf lengkung $y = |-(x - p)^2 + q - 1|$ dengan titik pusingan di $(-3, 4)$. Titik-titik A dan B terletak pada paksi- x .

Diagram 3 shows the graph of the curve $y = |-(x - p)^2 + q - 1|$ with the turning point at $(-3, 4)$. The points A and B are on the x -axis.



Rajah/Diagram 3

Cari

Find

- nilai p dan nilai q ,
the value of p and of q ,
- koordinat B ,
the coordinates of B ,
- titik pusingan bagi graf lengkung $y = |-(x - p)^2 + q - 1|$.
the turning point for the graph of the curve $y = |-(x - p)^2 + q - 1|$.

[3 markah/marks]

[1 markah/mark]

[1 markah/mark]

Jawapan/Answer:

- 10** Fungsi kuadratik $f(x) = -x^2 + px + 6$, dengan keadaan p ialah pemalar, mempunyai titik maksimum di $B(-1, k)$ dan menyilang paksi- $f(x)$ pada titik A .
The quadratic function $f(x) = -x^2 + px + 6$, such that p is a constant, has the maximum point at $B(-1, k)$ and intersects the $f(x)$ -axis at point A .
- (a) Nyatakan koordinat titik A .
State the coordinates of point A . [1 markah/mark]
- (b) Dengan menggunakan kaedah penyempurnaan kuasa dua, cari nilai p dan nilai k .
By using the completing the square method, find the value of p and of k . [2 markah/marks]
- (c) Seterusnya, lakarkan graf $f(x)$ untuk $-3 \leq x \leq 0$.
Hence, sketch the graph of $f(x)$ for $-3 \leq x \leq 0$. [3 markah/marks]

Jawapan/Answer:



11 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 .

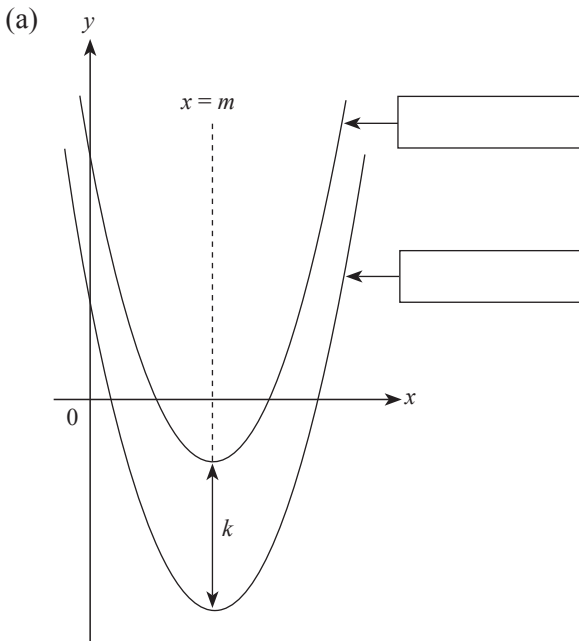
[2 markah/marks]

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

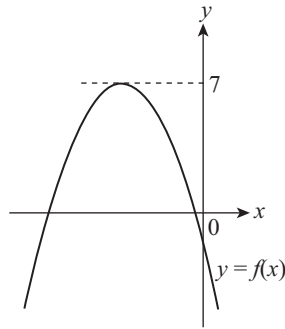
If the minimum value of $f(x)$ is $-\frac{13}{4}$, find the value of a .

[3 markah/marks]

Jawapan/Answer:



- 12 Rajah 4 menunjukkan graf fungsi kuadratik $f(x) = -(x + 3)^2 + 3k - 1$, dengan keadaan k ialah pemalar.
 Diagram 4 shows the graph of the quadratic function $f(x) = -(x + 3)^2 + 3k - 1$, such that k is a constant.



Rajah/Diagram 4

- (a) Nyatakan persamaan paksi simetri bagi lengkung itu.
 State the equation of the axis of symmetry for the curve. [1 markah/mark]
- (b) Diberi nilai maksimum bagi lengkung itu ialah 7, hitung nilai k . Seterusnya, nyatakan persamaan lengkung itu apabila dipantulkan pada paksi- x .
 Given the maximum value of the curve is 7, calculate the value of k . Hence, state the equation of the curve when reflected on the x -axis. [3 markah/marks]

Jawapan/Answer:

- 13 Satu fungsi kuadratik diberi sebagai $f(x) = 2(x - k)^2 + h$.
 A quadratic function is given as $f(x) = 2(x - k)^2 + h$.

- (a) Nyatakan kesan terhadap kedudukan graf $f(x)$ apabila
 State the effect on the position of the graph $f(x)$ when
- (i) nilai h berkurang,
 the value of h decreases,
 - (ii) nilai k bertambah.
 the value of k increases.

[2 markah/marks]

- (b) Nyatakan fungsi $f(x)$ apabila graf dipantulkan pada garis lurus $y = h$.
 State the function $f(x)$ when the graph is reflected on the straight line $y = h$.

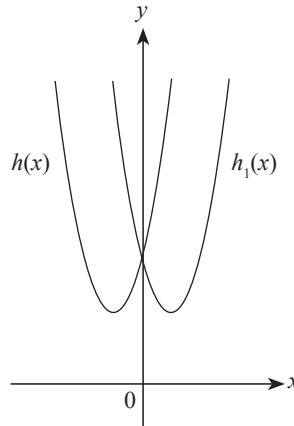
[1 markah/mark]

Jawapan/Answer:

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

[4 markah/marks]

- (b) Rajah 5 menunjukkan graf fungsi kuadratik $h(x) = 3x^2 + (3m^2 - 7m - 2)x + 3$ yang dipantulkan pada garis $x = 0$ membentuk fungsi kuadratik $h_1(x) = 3x^2 - 4x + 3$.
Diagram 5 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 $h_1(x) = 3x^2 - 4x + 3$.



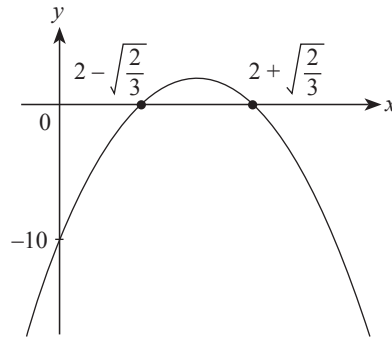
Rajah/Diagram 5

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

[3 markah/marks]

Jawapan/Answer:

- 15 Rajah 6 menunjukkan graf bagi fungsi kuadratik $f(x)$.
Diagram 6 shows a graph of quadratic function $f(x)$.

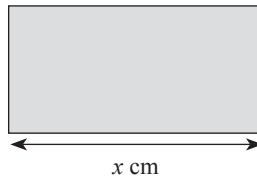


Rajah/Diagram 6

- (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:

- 16 Rajah 7 menunjukkan sebuah bingkai gambar berbentuk segi empat tepat.
Diagram 7 shows a rectangular picture frame.



Rajah/Diagram 7

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, $A(x)$ cm², dalam sebutan x .

If the length of the picture frame is x cm, find the equation for the area of picture frame, $A(x)$ cm², 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 cm², cari julat bagi x .

If the minimum area of the picture frame is 861 cm², find the range of x .

[3 markah/marks]

Jawapan/Answer:

- 17 (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 $y = ax - \frac{5}{4}$.

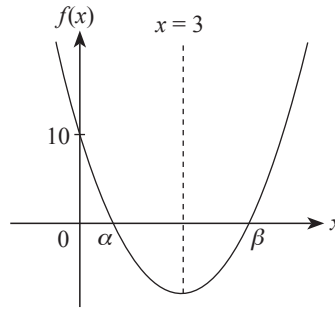
Find the range of values of a when the function $y = a^2x^2 + 3x + 1$ does not intersect the line $y = ax - \frac{5}{4}$.

[4 markah/marks]

Jawapan/Answer:

18 Rajah 8 menunjukkan graf fungsi kuadratik $f(x) = m(x - \alpha)(x - \beta)$ dan paksi simetri $x = 3$.

Diagram 8 shows the graph of a quadratic function $f(x) = m(x - \alpha)(x - \beta)$ and axis of symmetry $x = 3$.



Rajah/Diagram 8

(a) 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:

BAB
3Sistem Persamaan
Systems of Equations

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

$$\begin{aligned}9x - 2y &= 6 \\4y - 2x - z &= -8 \\3x + 6z - y &= 2\end{aligned}$$

[5 markah/marks]

Jawapan/Answer:

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

$$\begin{aligned}4q - 2p - r &= -8 \\3p + 6r - q &= 2 \\9p - 2q &= 4\end{aligned}$$

[5 markah/marks]

Jawapan/Answer:

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

$$\begin{aligned}-6x - 10y + 4z &= -26 \\5x + 2y + 4z &= -20 \\14x + 17y - 2z &= 19\end{aligned}$$

[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.

$$\begin{aligned} -x + y + 2z &= -3 \\ 2x + 3y + 2z &= 2 \\ -3x - y + 3z &= -4 \end{aligned}$$

[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.

$$\begin{aligned} x + 4y - 3z &= 5 \\ -4x - 2y + z &= -4 \\ -3x + 2y - 2z &= -1 \end{aligned}$$

[5 markah/marks]

Jawapan/Answer:

- 6 Selesaikan persamaan serentak berikut menggunakan kaedah penggantian. Berikan jawapan dalam 4 angka bererti.

Solve the following simultaneous equations using the substitution method. Give the answers in 4 significant numbers.

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

[5 markah/marks]

Jawapan/Answer:

Tingkatan 4

-
- 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.

$$\begin{aligned}2x + y &= 4 \\ x^2 - y - 4 &= 0\end{aligned}$$

[4 markah/marks]

Jawapan/Answer :

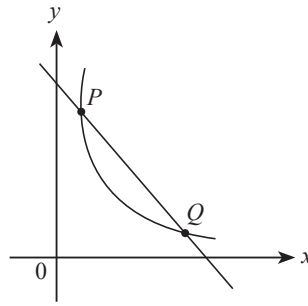
-
- 9 Selesaikan persamaan serentak $x + 3y = 5$ dan $x^2 + y^2 - 6x + 4y = 0$. Beri jawapan betul kepada empat angka bererti.
Solve the simultaneous equations $x + 3y = 5$ and $x^2 + y^2 - 6x + 4y = 0$. Give the answer correct to 4 significant figures.

[5 markah/marks]

Jawapan/Answer:

10 Rajah 1 menunjukkan satu garis $3x + y = 3$ menyilang lengkung $\frac{2}{3x} + \frac{1}{y} = 2$ pada dua titik, P dan Q .

Diagram 1 shows a line $3x + y = 3$ intersects the curve $\frac{2}{3x} + \frac{1}{y} = 2$ at two points, P and Q .



Rajah/Diagram 1

Cari koordinat bagi

Find the coordinates of

(a) P dan/and Q ,

[5 markah/marks]

(b) titik tengah PQ .

the midpoint of PQ .

[2 markah/marks]

Jawapan/Answer:

- 11 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 $-4 \leq x \leq 3$.

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 $-4 \leq x \leq 3$.

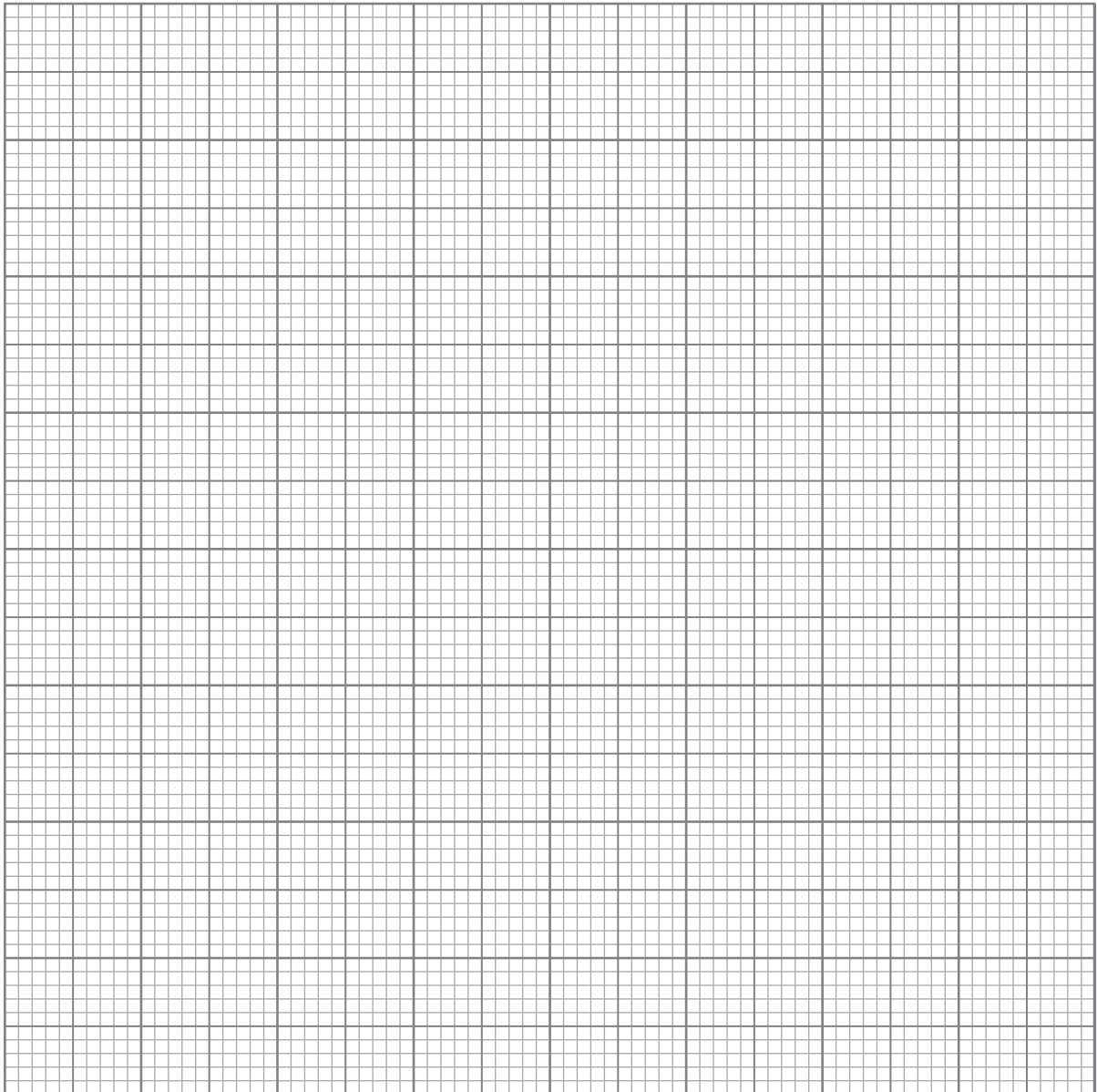
[5 markah/marks]

- (c) Seterusnya, nyatakan koordinat-koordinat titik persilangan.

Hence, state the coordinates of the intersection points.

[2 markah/marks]

Jawapan/Answer:

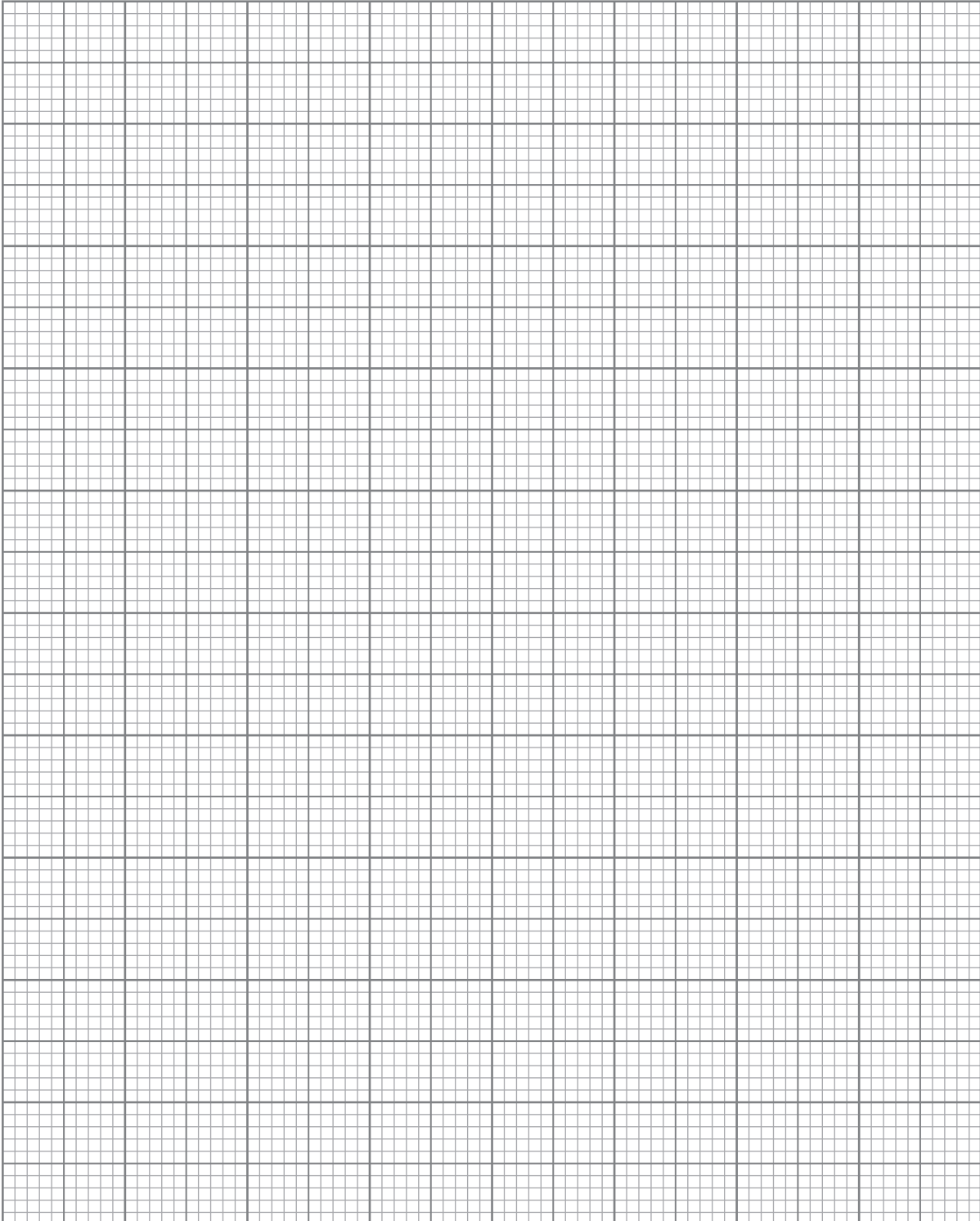


- 12 Selesaikan persamaan serentak berikut dengan menggunakan kaedah perwakilan graf. Gunakan skala 2 cm kepada 0.5 unit pada kedua-dua paksi untuk $-1.5 \leq x \leq 1.5$. Kertas graf disediakan di ruang jawapan.
Solve the simultaneous equations using the graphical representation method. Use a scale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

$$\begin{aligned}x + 2y &= 3 \\ 2x^2 - x - 2y + 1 &= 0\end{aligned}$$

[8 markah/marks]

Jawapan/Answer:

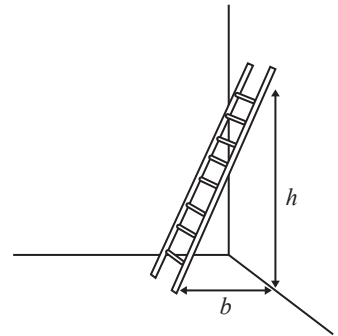


- 13 Rajah 2 menunjukkan sebuah tangga sepanjang 5 m disandarkan pada dinding. Jarak dari dinding ke hujung bahagian bawah tangga adalah setengah daripada jarak dari hujung bahagian atas tangga ke tanah. Cari jarak dari hujung bahagian atas tangga ke tanah.

Diagram 2 shows a 5 m ladder is leaning against a wall. 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:



Rajah/Diagram 2

- 14 Jika $(2, 1)$ ialah salah satu penyelesaian bagi persamaan serentak:
If $(2, 1)$ is one of the solution for the simultaneous equation:

$$x^2 + xy + ay = 2ax + 3y = b$$

Cari

Find

- (a) nilai a dan nilai b ,
the value of a and of b ,

[3 markah/marks]

- (b) penyelesaian yang satu lagi.
the other solution.

[5 markah/marks]

Jawapan/Answer:



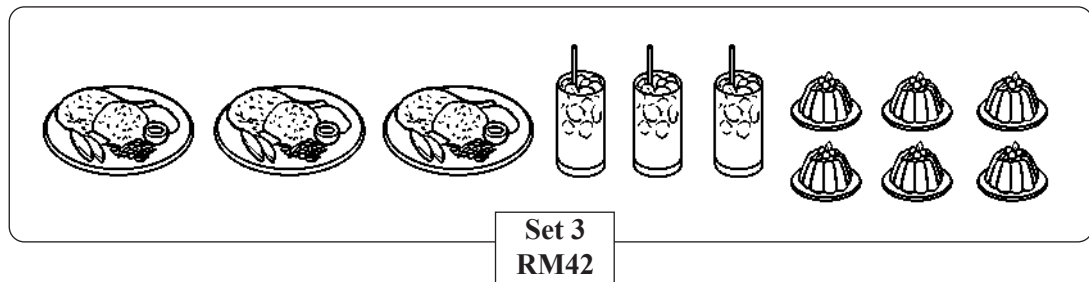
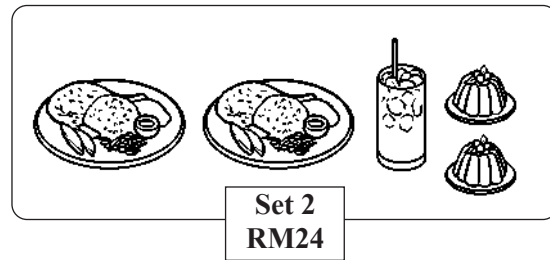
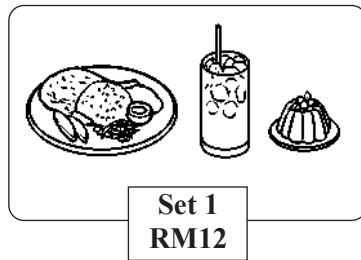
- 15 Noah ingin memagari kawasan tanaman sayur-sayurannya di atas sebidang tanah yang berbentuk segi tiga bersudut tegak. Diberi sisi paling panjang tanah itu ialah y meter. Dua lagi sisi bagi tanah itu ialah masing-masing x meter dan $(2x - 1)$ meter. Dia menggunakan dawai berduri sepanjang 40 meter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

Noah wants to fence off his vegetable 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 the land with 40 meter of barbed wire. Find the length, in meter, of each side of the land.

[7 markah/marks]

Jawapan/Answer:

- 16 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:

- 17 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
4Indeks, Surd dan Logaritma
Indices, Surds and Logarithms

- 1 (a) Permudahkan ungkapan berikut.
Simplify the following expression.

$$\frac{x(16x^4y^8)^{\frac{1}{4}}}{\sqrt[3]{8y^9}}$$

[2 markah/marks]

- (b) (i) Tulis $\log_a 81a$ sebagai logaritma tunggal asas a .
Write $\log_a 81a$ as a single logarithm in base a .
(ii) Seterusnya, cari nilai a jika $\log_a 81a = 1$.
Hence, find the value of a if $\log_a 81a = 1$.

[4 markah/marks]

Jawapan/Answer:

- 2 Selesaikan persamaan kuadratik yang berikut dengan menggunakan kaedah rumus.
Solve the following quadratic equation by using formula.

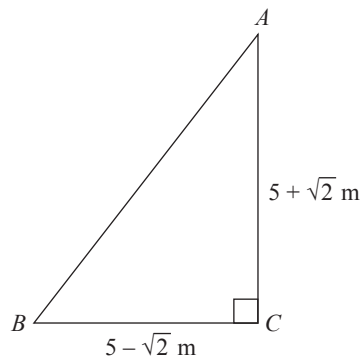
$$(\sqrt{5} - 2)x^2 + 2x + (\sqrt{5} + 2) = 0$$

Beri jawapan dalam bentuk $a + b\sqrt{5}$, dengan keadaan a dan b ialah pemalar.
Give the answer in the form $a + b\sqrt{5}$, such that a and b are constants.

[4 markah/marks]

Jawapan/Answer:

- 3 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.

[3 markah/marks]

Jawapan/Answer:

- 4 Sebuah segi tiga bersudut tegak mempunyai panjang x cm, lebar $2x$ cm dan pepenjuru 15 cm. Cari

A right-angled 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,

[2 markah/marks]

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

[2 markah/marks]

Jawapan/Answer :

-
- 5 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 :

6 Selesaikan persamaan yang berikut dengan memberikan jawapan kepada 3 angka bererti.

Solve the following equations by giving the answers to 3 significant figures.

(a) $4e^{5t} = 30$

[2 markah/marks]

(b) $\ln(5x - 2) = 7$

[2 markah/marks]

(c) $\ln(2x - 3)^2 = 5$

[3 markah/marks]

Jawapan/Answer:

7 Diberi bahawa $16^n = a^2$ dan $9^n = b$, ungkapkan 4.5^n dalam sebutan a dan b .

Given that $16^n = a^2$ and $9^n = b$, express 4.5^n in terms of a and b .

[3 markah/marks]

Jawapan/Answer:

- 8 (a) Selesaikan persamaan:
Solve the equation:

$$x^{\frac{2}{3}} - 7x^{\frac{1}{3}} + 6 = 0$$

[3 markah/marks]

- (b) Selesaikan $\log_4 x = 2 - \log_x 4$.
Solve $\log_4 x = 2 - \log_x 4$.

[3 markah/marks]

Jawapan/Answer:

- 9 Suhu, $T^{\circ}\text{C}$ bagi secawan minuman panas, t minit selepas dibancuh diberikan oleh
The temperature, $T^{\circ}\text{C}$ 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 $T = 55$.

[2 markah/marks]

[2 markah/marks]

[3 markah/marks]

Jawapan/Answer :

- 10 (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 :

- 11 Simpanan wang sebuah syarikat selepas n tahun ialah $\text{RM}3\,000(1 + 0.07)^n$. Tentukan bilangan tahun minimum untuk simpanan syarikat itu melebihi $\text{RM}6\,500$.
A company's savings after n years is $\text{RM}3\,000(1 + 0.07)^n$. Determine the minimum number of years for the company's savings to exceed $\text{RM}6\,500$.

[3 markah/marks]

Jawapan/Answer:

- 12 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:



13 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:

14 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:

- 15 (a) Diberi bahawa $\frac{h}{k} = \frac{1}{4} + 0.373737\dots$, cari nilai h dan nilai k tanpa menggunakan kaedah janjang.

Given that $\frac{h}{k} = \frac{1}{4} + 0.373737\dots$, find the value of h and of k without using the progression method.

[3 markah/marks]

- (b) Diberi bahawa $q\sqrt{3} = \frac{12}{3-\sqrt{3}} - p$, cari nilai p dan nilai q .

Given that $q\sqrt{3} = \frac{12}{3-\sqrt{3}} - p$, find the value of p and of q .

[3 markah/marks]

Jawapan/Answer :

BAB
5Janjang
Progressions

- 1 Tiga sebutan pertama suatu janjang aritmetik ialah 4, 11, 18. Cari
The first three terms of an arithmetic progression are 4, 11, 18. Find

(a) beza sepunya janjang itu,
the common difference of the progression,

[1 markah/mark]

(b) hasil tambah 42 sebutan pertama selepas sebutan ke-5.
the sum of the first 42 terms after the 5th term.

[2 markah/marks]

Jawapan/Answer:

- 2 Hasil tambah n sebutan pertama bagi suatu janjang aritmetik diberi oleh $S_n = \frac{n}{2}(5n - 3)$. Cari
The sum of the first n terms of an arithmetic progression is given by $S_n = \frac{n}{2}(5n - 3)$. Find

(a) hasil tambah 8 sebutan pertama,
the sum of the first 8 terms,

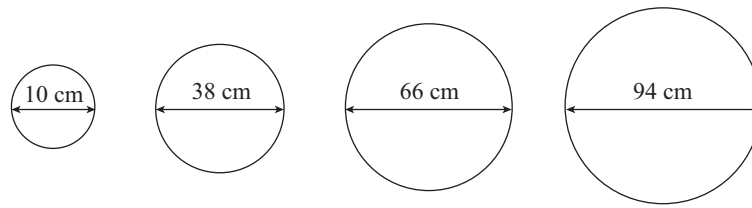
[2 markah/marks]

(b) sebutan ke-8.
the 8th term.

[2 markah/marks]

Jawapan/Answer:

- 3 Rajah 1 menunjukkan empat biji bola berbentuk bulat.
Diagram 1 shows four balls in the shape of circle.



Rajah/Diagram 1

Perimeter bola-bola itu membentuk suatu janjang aritmetik. Sebutan-sebutan janjang itu disusun secara menaik.

The perimeter of the balls form an arithmetic progression. The terms of the progression are in ascending order.

[Perimeter bulatan = $2\pi r$]

[Perimeter of circle = $2\pi r$]

- (a) Tulis empat sebutan pertama janjang itu dalam sebutan π .

Write down the first four terms of the progression in terms of π .

[1 markah/mark]

- (b) Cari beza sepunya janjang itu dalam sebutan π .

Find the common difference of the progression in terms of π .

[2 markah/marks]

Jawapan/Answer:

Tingkatan 4

- 4 Sebutan ke-11 suatu janjang aritmetik ialah $2 + 6p$ dan hasil tambah 6 sebutan pertama janjang itu ialah $5p - 8$, dengan keadaan p ialah pemalar. Diberi bahawa beza sepunya janjang aritmetik itu ialah 6. Cari nilai p .

The 11th term of an arithmetic progression is $2 + 6p$ and the sum of the first 6 terms of the progression is $5p - 8$, where p is a constant. Given that the common difference of the progression is 6. Find the value of p .

[3 markah/marks]

Jawapan/Answer:

5 Hasil tambah n sebutan pertama bagi janjang geometri 6, -12 , 24, ... ialah $-8\ 190$. Cari
The sum of the first n terms of geometric progression 6, -12 , 24, ... is $-8\ 190$. Find

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

[1 markah/mark]

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

[2 markah/marks]

Jawapan/Answer:

6 Diberi $1, x^2, x^4, \dots$ ialah suatu janjang geometri dan hasil tambah ketakterhinggaan ialah 18. Cari
Given that $1, x^2, x^4, \dots$ is a geometric progression and its sum to infinity is 18. Find

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

[1 markah/mark]

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

[2 markah/marks]

Jawapan/Answer:

- 7 Lima sebutan pertama bagi suatu janjang geometri ialah $\frac{7}{8}, x, y, \frac{7}{64}, \frac{7}{128}, \dots$. Hitung jumlah x dan y .

The first five terms of a geometric progression are $\frac{7}{8}, x, y, \frac{7}{64}, \frac{7}{128}, \dots$. Calculate the sum of x and y .

[3 markah/marks]

Jawapan/Answer:

- 8 Sebutan ke-5 suatu janjang geometri ialah 15. Hasil tambah sebutan ke-5 dan ke-6 ialah 10. Cari

The 5th term of a geometric progression is 15. The sum of the 5th term and the 6th term is 10. Find

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

[4 markah/marks]

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

[2 markah/marks]

Jawapan/Answer:

- 9 (a) Dalam suatu janjang aritmetik, sebutan ketiga ialah tiga kali sebutan pertama. Dengan menggunakan a sebagai sebutan pertama, ungkapkan jumlah n sebutan pertama, dalam sebutan a dan n .
In an arithmetic progression, the third term is three times the first term. Using a as the first term, express the sum of the first n terms, in terms of a and n . [3 markah/marks]
- (b) Seterusnya, cari sebutan yang kelima, jika jumlah 5 sebutan pertama ialah 45.
Hence, find the fifth term if the sum of the first 5 terms is 45. [4 markah/marks]

Jawapan/Answer:

-
- 10 Dalam suatu janjang geometri, sebutan pertama ialah a dan nisbah sepunya ialah r . Diberi sebutan ketiga janjang itu melebihi sebutan pertama sebanyak $8a$, cari nilai-nilai r .
In a geometric progression, the first term is a and the common ratio is r . Given that the third term of the progression exceeds the first term by $8a$, find the values of r . [2 markah/marks]

Jawapan/Answer:

- 11 Maklumat berikut merujuk kepada hasil tambah sebutan-sebutan bagi suatu janjang geometri.
The following information refers to the sum of the terms in a geometric progression.

$$\begin{aligned} 0.171717 \dots &= a + 0.0017 + b + \dots, \text{ dengan keadaan } a \text{ dan } b \text{ ialah pemalar.} \\ 0.171717 \dots &= a + 0.0017 + b + \dots, \text{ such that } a \text{ and } b \text{ are constants.} \end{aligned}$$

- (a) Tentukan nilai a dan nilai b ,
Determine the value of a and of b ,

[2 markah/marks]

- (b) Seterusnya, ungkapkan perpuluhan berulang tersebut dalam bentuk pecahan termudah.
Hence, express the repeating decimals in the simplest form of fraction.

[2 markah/marks]

Jawapan/Answer:

- 12 Diberi bahawa x , y dan z masing-masing ialah sebutan ke-2, sebutan ke-4 dan sebutan ke-6 bagi suatu janjang aritmetik. Jika $\frac{x + y + z}{y + 1} = 4$, tentukan nilai y .

Given that x , y and z are the 2nd term, the 4th term and the 6th term of an arithmetic progression respectively.

If $\frac{x + y + z}{y + 1} = 4$, determine the value of y .

[3 markah/marks]

Jawapan/Answer:

- 13 (a) Diberi siri $3 + 3^2 + 3^3 + \dots + 3^n = 363$, tentukan bilangan sebutan dalam siri tersebut.

Given the series $3 + 3^2 + 3^3 + \dots + 3^n = 363$, determine the number of terms in the series.

[2 markah/marks]

- (b) Sebiji bola dijatuhkan ke lantai daripada ketinggian 6 m. Setiap kali bola itu melantun, bola mencapai ketinggian $\frac{2}{3}$ 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, it reaches a height of $\frac{2}{3}$ of the height it reached before. Determine the distance travelled by the ball until it stops.

[4 markah/marks]

Jawapan/Answer:

- 14 (a) Diberi janjang $3a, 4a - 5, 5a - 10, 6a - 15, \dots$. Cari julat nilai a dengan keadaan hasil tambah 15 sebutan yang pertama adalah negatif.
Given the progression $3a, 4a - 5, 5a - 10, 6a - 15, \dots$. Find the range of values of a such that the sum of the first 15 terms is negative.

[3 markah/marks]

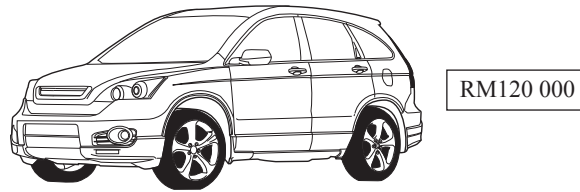
- (b) Dalam satu janjang geometri, sebutan keempat ialah 18 dan hasil tambah sebutan kelima dan keenam ialah $\frac{27}{2}$. Cari nilai-nilai yang mungkin bagi nisbah sepunya bagi janjang tersebut.

In a geometric progression, the fourth term is 18 and the sum of the fifth and the sixth terms is $\frac{27}{2}$. Find the possible values of the common ratio of the progression.

[4 markah/marks]

Jawapan/Answer:

- 15 (a) Rajah 2 menunjukkan harga sebuah kereta pada tahun 2025.
Diagram 2 shows the price of a car in the year 2025.



Rajah/Diagram 2

Harga kereta tersebut selepas n tahun diberi oleh $T_n = 120\,000(0.85)^n$.

The price of the car after n years is given by $T_n = 120\,000(0.85)^n$.

- (i) Hitung harga kereta tersebut selepas 5 tahun.

Calculate the price of the car after 5 years.

- (ii) Selepas berapa tahunkah harga kereta itu jatuh sehingga kurang daripada RM50 000 buat kali pertama?

After how many years that the price of the car drops to less than RM50 000 for the first time?

[5 markah/marks]

- (b) Dalam suatu janjang aritmetik, hasil tambah tiga sebutan pertama ialah 12 dan hasil tambah tiga sebutan berikutnya ialah 75. Cari sebutan pertama dan beza sepunya.

In an arithmetic progression, the sum of the first three terms is 12 and the sum of the next three terms is 75. Find the first term and the common difference.

[4 markah/marks]

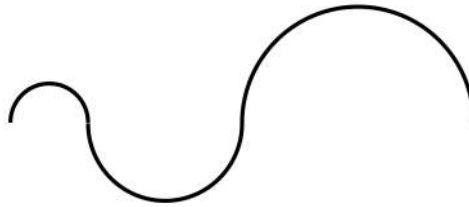
Jawapan/Answer:

- 16 Seorang pekerja memulakan pekerjaan baharu dengan gaji tahunan permulaan sebanyak RM36 000. Syarikat menjamin kenaikan tahunan sebanyak 15% berdasarkan gaji tahun sebelumnya.
An employee starts a new job with an initial annual salary of RM36 000. The company guarantees an annual increment of 15% based on the previous year's salary.
- (a) Hitung gaji tahunan pekerja tersebut pada tahun ketiga perkhidmatannya.
Calculate the employee's annual salary in his third year of employment. [2 markah/marks]
- (b) Tentukan bilangan tahun minimum yang perlu dilalui oleh pekerja tersebut supaya jumlah pendapatan bulanan melebihi RM8 000.
Determine the minimum number of years the employee must work so that his monthly salary exceeds RM8 000. [3 markah/marks]
- (c) Pekerja itu menyimpan 30% daripada gaji tahunannya bermula daripada tahun ketiga perkhidmatannya. Hitung jumlah keseluruhan simpanan pekerja tersebut selepas 10 tahun perkhidmatan.
The employee saves 30% of his annual salary starting from his third year of employment. Calculate the total amount that the employee has saved after 10 years of employment. [3 markah/marks]

Jawapan/Answer:

- 17 Segulung dawai sepanjang 144π cm dibengkokkan untuk membentuk 9 semibulatan. Tiga buah semibulatan yang pertama ditunjukkan dalam Rajah 3. Semibulatan yang pertama mempunyai jejari r cm. Bagi setiap semibulatan berikutnya, jejari bertambah sebanyak 2 cm.

A roll of wire with a length of 144π cm is bent to form 9 semicircles. The first three semicircles are shown in Diagram 3. The first semicircle has a radius of r cm. For each subsequent semicircle, the radius increases by 2 cm.



Rajah/Diagram 3

- (a) Tunjukkan bahawa panjang lilitan semibulatan itu membentuk suatu janjang aritmetik dan seterusnya, nyatakan beza sepunya.
Show that the length of the circumference of the semicircle forms an arithmetic progression and hence, state the common difference.

[2 markah/marks]

- (b) Cari jejari bagi semibulatan yang pertama.
Find the radius of the first semicircle.

[2 markah/marks]

- (c) Cari bilangan semibulatan maksimum yang dapat dibentuk dengan menggunakan segulung dawai sepanjang 198π cm.
Find the maximum number of semicircles that can be formed by using a roll of wire with a length of 198π cm.

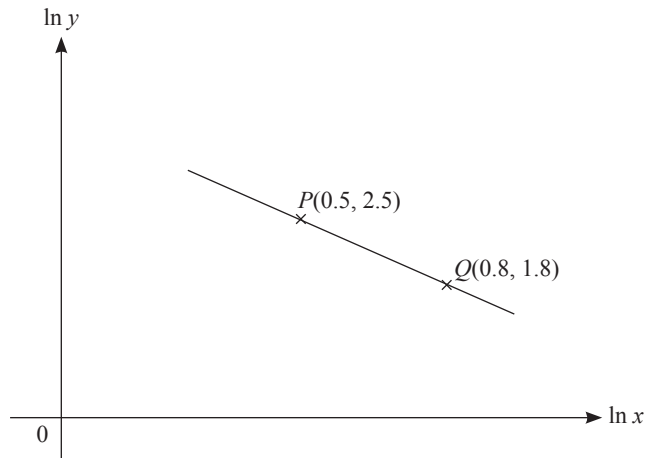
[3 markah/marks]

Jawapan/Answer:



BAB
6Hukum Linear
Linear Law

- 1 Rajah 1 menunjukkan graf garis lurus $\ln y$ melawan $\ln x$ yang melalui titik $P(0.5, 2.5)$ dan titik $Q(0.8, 1.8)$.
Diagram 1 shows a straight line graph $\ln y$ against $\ln x$ that passes through points $P(0.5, 2.5)$ and $Q(0.8, 1.8)$.



Rajah/Diagram 1

- (a) Ungkapkan y dalam sebutan x .
Express y in terms of x .
- (b) Seterusnya, cari nilai y apabila $x = 5$.
Hence, find the value of y when $x = 5$.

[3 markah/marks]

[2 markah/marks]

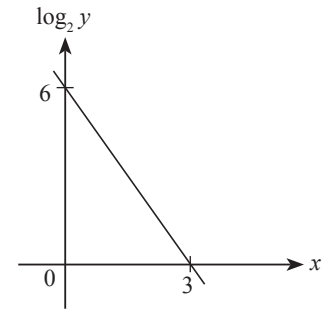
Jawapan/Answer:

- 2 Rajah 2 menunjukkan satu garis lurus. Ungkapkan y dalam sebutan x .

Diagram 2 shows a straight line. Express y in terms of x .

[3 markah/marks]

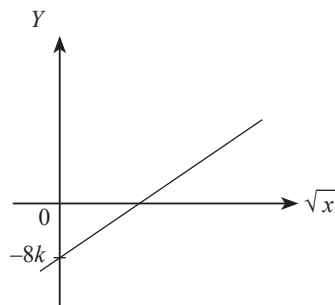
Jawapan/Answer :



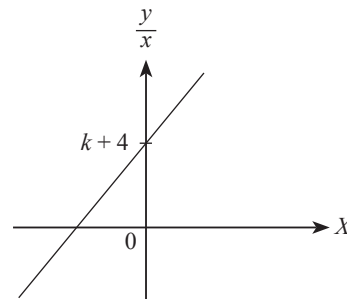
Rajah/Diagram 2

- 3 Pemboleh ubah x dan y dihubungkan oleh persamaan $y = ax + b\sqrt{x}$, dengan keadaan a dan b adalah pemalar. Rajah 3.1 dan Rajah 3.2 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 3.1 and Diagram 3.2 show the straight line graphs obtained by plotting the relations from the equation.



Rajah/Diagram 3.1



Rajah/Diagram 3.2

Ungkapkan a dalam sebutan b .

Express a in terms of b .

[3 markah/marks]

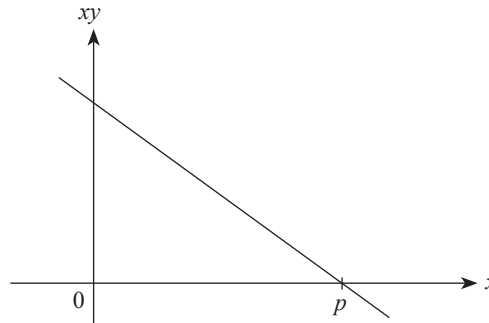
Jawapan/Answer :

- 4 Pemboleh ubah x dan y dihubungkan oleh persamaan $x^2y = -\frac{3}{4}x^2 + 6x$.

The variables x and y are related by the equation $x^2y = -\frac{3}{4}x^2 + 6x$.

- (a) Rajah 4.1 menunjukkan graf garis lurus yang diperoleh dengan menukar persamaan tersebut kepada bentuk linear.

The diagram 4.1 shows a straight line graph obtained by reducing the equation to a linear form.



Rajah/Diagram 4.1

Cari nilai p .

Find the value of p .

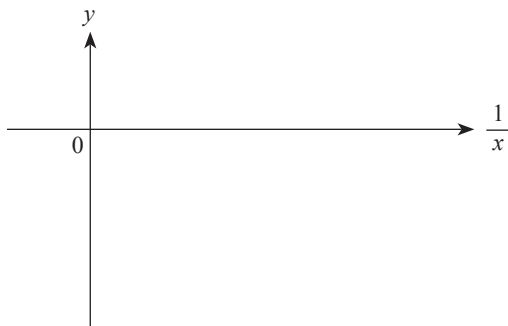
[3 markah/marks]

- (b) Pada Rajah 4.2 di ruang jawapan, lukis dan label satu graf garis lurus yang diperoleh dengan memplot y melawan $\frac{1}{x}$.

On Diagram 4.2 in the answer space, draw and label the straight line graph obtained by plotting y against $\frac{1}{x}$.

[2 markah/marks]

Jawapan/Answer:



Rajah/Diagram 4.2

- 5 Rajah 5 menunjukkan graf lengkung $y = 2x^k$, dengan keadaan k ialah pemalar.

Diagram 5 shows the curve $y = 2x^k$, such that k is a constant.

- (a) Apabila suatu garis lurus $\log_2 y$ melawan $\log_2 x$ diplotkan, nyatakan koordinat P dan Q yang sepadan.

When a straight line $\log_2 y$ against $\log_2 x$ is plotted, state the corresponding coordinates of P and Q .

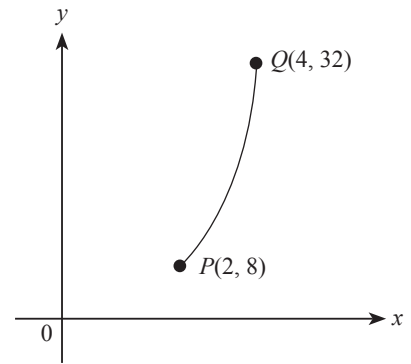
[3 markah/marks]

- (b) Seterusnya, cari nilai k .

Hence, find the value of k .

[2 markah/marks]

Jawapan/Answer :



Rajah/Diagram 5

- 6 Rajah 6 menunjukkan sebahagian daripada graf y melawan x bagi persamaan $y = px^2 + 10x$, dengan keadaan p ialah pemalar.

Diagram 6 shows part of the graph of y against x for the equation $y = px^2 + 10x$, such that p is a constant.

- (a) Lakarkan graf garis lurus $\frac{y}{x}$ melawan x .

Sketch the straight line graph of $\frac{y}{x}$ against x .

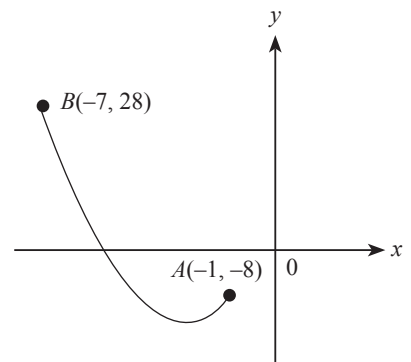
[1 markah/mark]

- (b) Tentukan persamaan garis lurus penyuaian terbaik itu.

Determine the equation of the line of best fit.

[3 markah/marks]

Jawapan/Answer :



Rajah/Diagram 6

- 7 Jadual 1 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.

Table 1 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

Jadual/Table 1

- (a) Pada kertas graf di halaman 62, 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 62, 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.

[6 markah/marks]

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

By using the graph in (a), find

- (i) k ,
(ii) n .

[3 markah/marks]

- (c) Tandakan $\otimes$ pada graf, bagi titik yang salah dicatatkan. Seterusnya, cari nilai y yang betul.

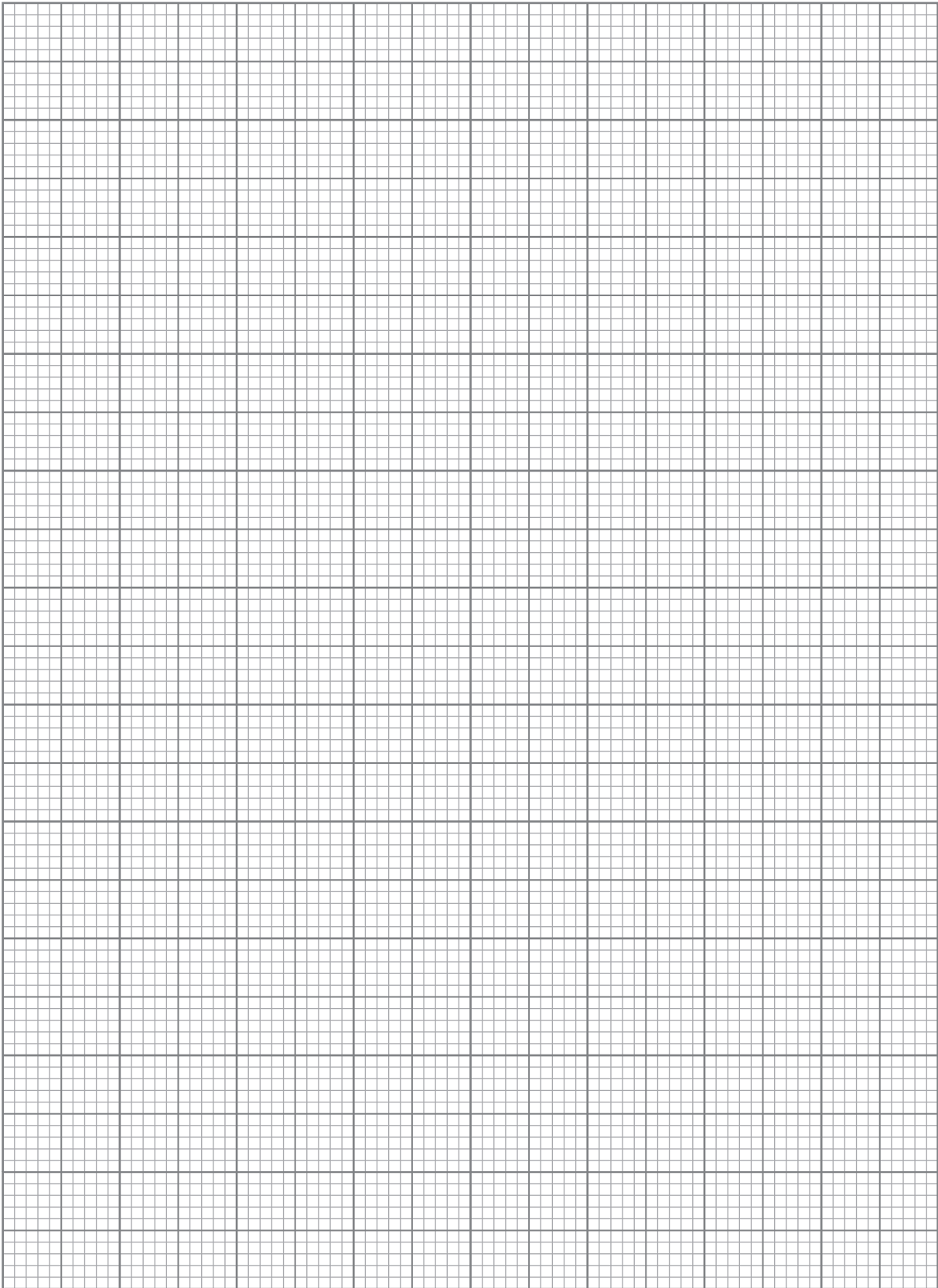
Mark $\otimes$ on the graph, for the point which was recorded wrongly. Then, find the correct value of y .

[1 markah/mark]

Jawapan/Answer:

Kertas graf untuk Soalan 7
Graph paper for Question 7

Tingkatan 4



- 8 Jadual 2 menunjukkan nilai dua pemboleh ubah, x dan y , yang diperolehi 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.

Table 2 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

Jadual/Table 2

- (a) Pada kertas graf di halaman 64, 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 64, 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.

[4 markah/marks]

- (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 .

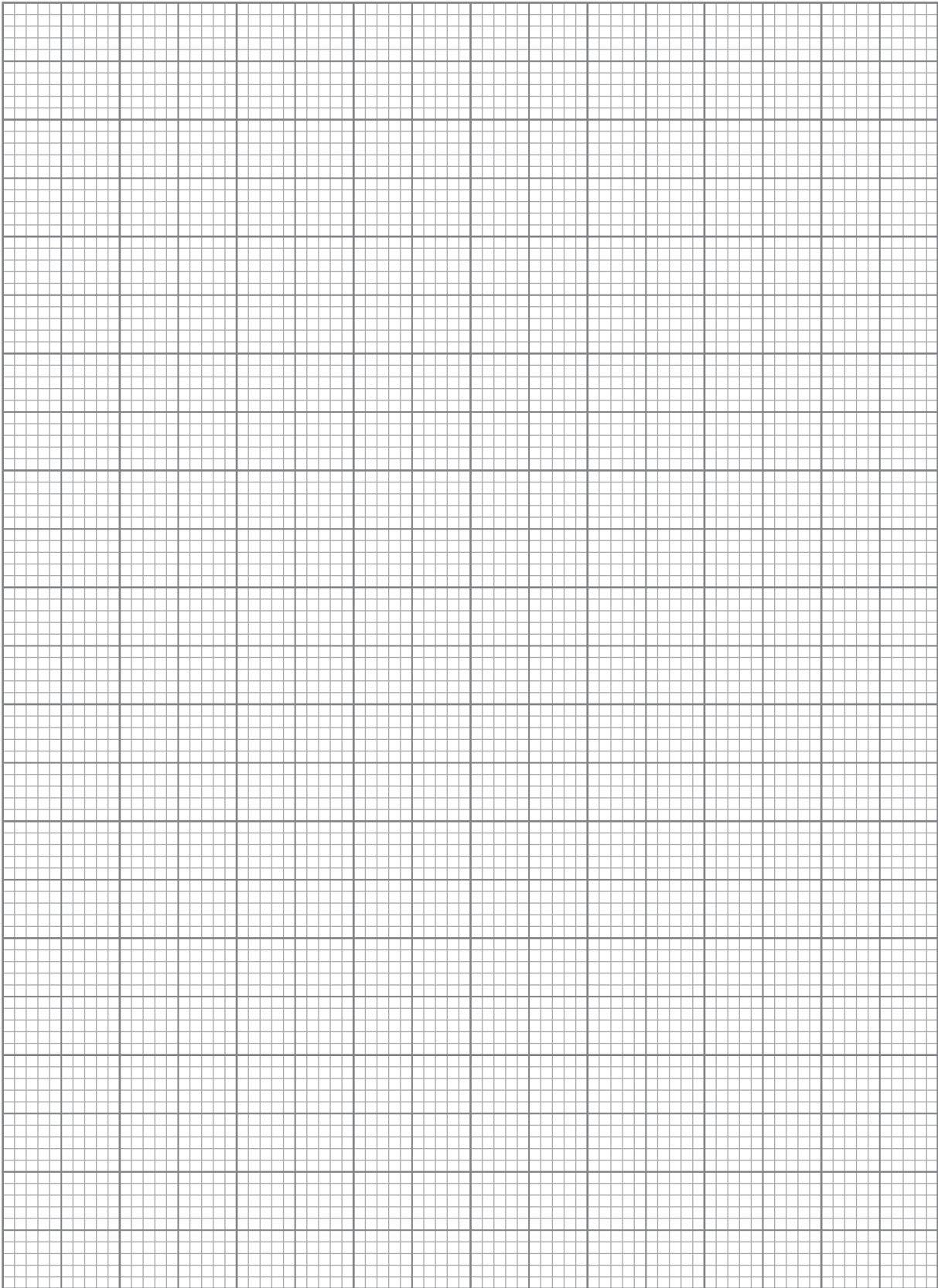
[6 markah/marks]

Jawapan/Answer:



Kertas graf untuk Soalan 8
Graph paper for Question 8

Tingkatan 4



- 9 Jadual 3 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.

Table 3 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

Jadual/Table 3

- (a) Berdasarkan Jadual 3, bina satu jadual bagi nilai-nilai $\frac{1}{y}$.

Based on Table 3, construct a table for the values of $\frac{1}{y}$.

[1 markah/mark]

- (b) Pada kertas graf di halaman 66, 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.

On the graph paper on page 66, 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

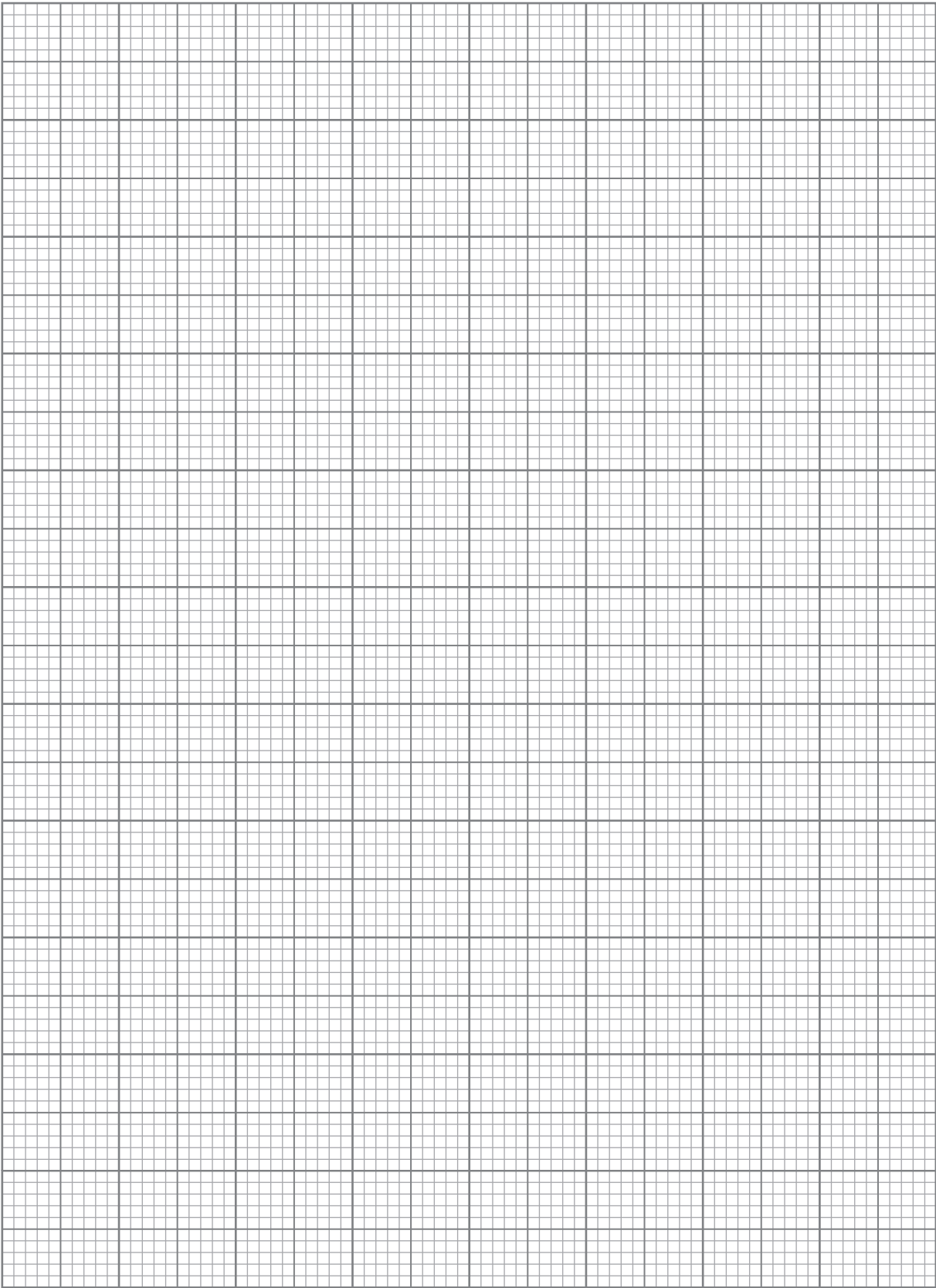
- (i) y apabila $x = 0.38$,
- y when $x = 0.38$,
- (ii) n ,
- (iii) p .

[6 markah/marks]

Jawapan/Answer:

Kertas graf untuk Soalan 9
Graph paper for Question 9

Tingkatan 4



BAB
7Geometri Koordinat
Coordinate Geometry

1 Diberi titik $J(-5, -2)$, $K(-1, 2)$ dan $L(8, h)$ terletak pada satu garis lurus. Cari

Given points $J(-5, -2)$, $K(-1, 2)$ and $L(8, h)$ lie on a straight line. Find

(a) $JK : KL$,

[2 markah/marks]

(b) nilai h ,
the value of h ,

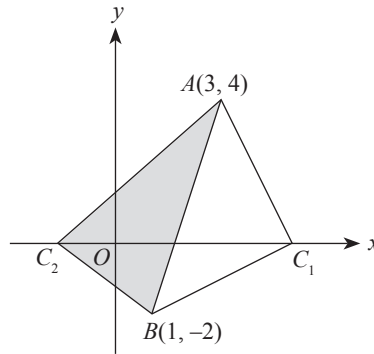
[2 markah/marks]

(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:

- 2 Rajah 1 menunjukkan dua buah segi tiga ABC_1 dan ABC_2 masing-masing dengan luas yang sama 10 unit².
Diagram 1 shows two triangles ABC_1 and ABC_2 with the same area of 10 unit² respectively.



Rajah/Diagram 1

Koordinat bucu A dan B masing-masing ialah $(3, 4)$ dan $(1, 2)$ manakala bucu C_1 dan C_2 terletak pada paksi- x . Cari koordinat C_1 dan C_2 .

The coordinates of vertices A and B are $(3, 4)$ and $(1, 2)$ respectively whereas vertices C_1 and C_2 lie on the x -axis.

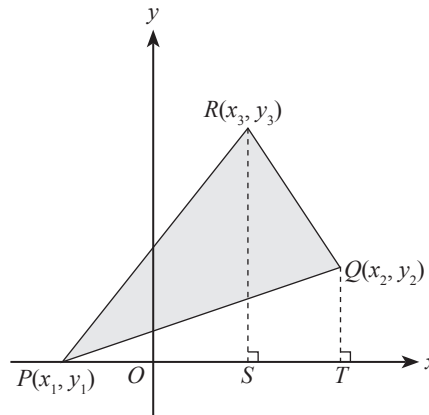
Find the coordinates of C_1 and C_2 .

[4 markah/marks]

Jawapan/Answer :

- 3 Rajah 2 menunjukkan sebuah segi tiga PQR dengan keadaan titik $P(x_1, y_1)$, $Q(x_2, y_2)$ dan $R(x_3, y_3)$ disusun mengikut tertib lawan arah jam.

Diagram 2 shows a triangle PQR in which the points $P(x_1, y_1)$, $Q(x_2, y_2)$ and $R(x_3, y_3)$ are arranged in an anti-clockwise order.

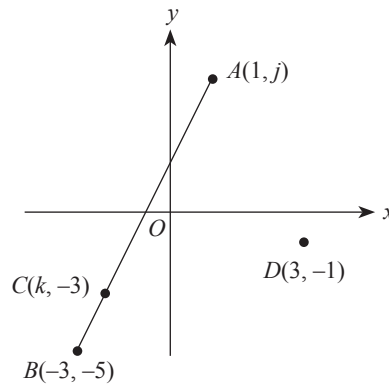


Rajah/Diagram 2

- (a) Menggunakan koordinat bagi bucu-bucu P , Q dan R , terbitkan rumus bagi luas suatu segi tiga.
Using the coordinates of the vertices P , Q and R , derive the formula for the area of a triangle. [3 markah/marks]
- (b) (i) Diberi koordinat bagi bucu Q dan R masing-masing ialah $(4, 2)$ dan $(2, 5)$, dan bucu P terletak pada paksi- x . Cari koordinat P jika luas ΔPQR ialah 11 unit^2 .
Given the coordinates of the vertices Q and R are $(4, 2)$ and $(2, 5)$ respectively, and the vertex P lies on the x -axis. Find the coordinates of P if the area of ΔPQR is 11 units^2 .
- (ii) Seterusnya, cari persamaan lokus titik bergerak S supaya jaraknya dari titik Q dan titik R adalah dalam nisbah $2 : 1$.
Hence, find the equation of locus of moving point S in which its distance from point Q and point R is in the ratio $2 : 1$. [5 markah/marks]

Jawapan/Answer:

- 4 Rajah 3 menunjukkan garis lurus AB pada satah Cartes.
Diagram 3 shows a straight line AB on a Cartesian plane.



Rajah/Diagram 3

- (a) Diberi bahawa titik $C(k, -4)$ membahagi tembereng garis yang menghubungkan titik A dan titik B dengan keadaan $AC : CB = 3 : 1$. Cari nilai k dan j .
Given that the point $C(k, -4)$ divides the line segment that connects point A and point B such that $AC : CB = 3 : 1$. Find the values of k and j . [2 markah/marks]
- (b) Cari persamaan garis lurus yang berserenjang dengan garis AB dan melalui titik A .
Find the equation of straight line that is perpendicular to line AB and passes through point A . [3 markah/marks]
- (c) Cari luas segi tiga ABD .
Find the area of triangle ABD . [2 markah/marks]

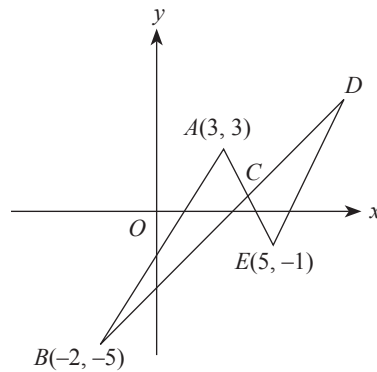
Jawapan/Answer :

- 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 Rajah 4 menunjukkan dua buah segi tiga ABC dan CDE . Garis lurus bersilang AE dengan garis lurus BD di titik C .

Diagram 4 shows two triangles ABC and CDE . The straight line AE intersects the straight line BD at point C .



Rajah/Diagram 4

Diberi bahawa titik C ialah titik tengah bagi AE dan $BC : CD = 3 : 2$.
Given that the point C is the midpoint of AE and $BC : CD = 3 : 2$.

- (a) Cari

Find

- (i) koordinat D ,
the coordinates of D ,
- (ii) luas, dalam unit^2 , segi tiga CDE .
the area, in units^2 , of triangle CDE .

[5 markah/marks]

- (b) Titik P bergerak di sepanjang lilitan sebuah bulatan dengan diameter AB .

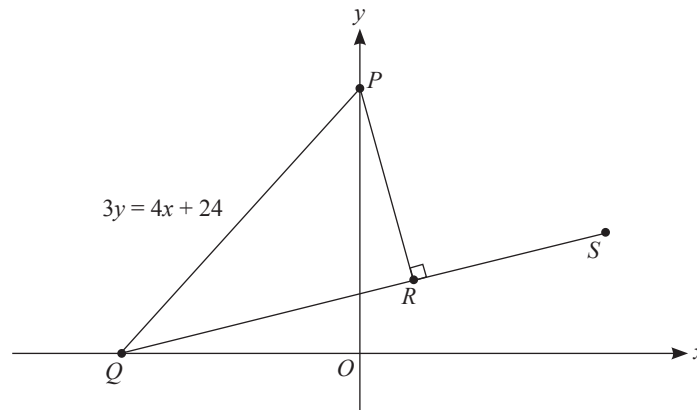
Point P moves along the circumference of a circle with diameter AB .

- (i) Cari persamaan lokus P .
Find the equation of locus of P .
- (ii) Seterusnya, tentukan sama ada lokus P melalui titik C .
Hence, determine whether the locus of P passes through point C .

[5 markah/marks]

Jawapan/Answer:

- 7 Rajah 5 menunjukkan garis PQ menyalang paksi- x pada titik Q dan menyalang paksi- y pada titik P . Garis lurus PR berserenjang dengan garis lurus QS pada titik R .
Diagram 5 shows a straight line PQ intersects x -axis at point Q and intersects y -axis at point P . The straight line PR is perpendicular to straight line QS at point R .



Rajah/Diagram 5

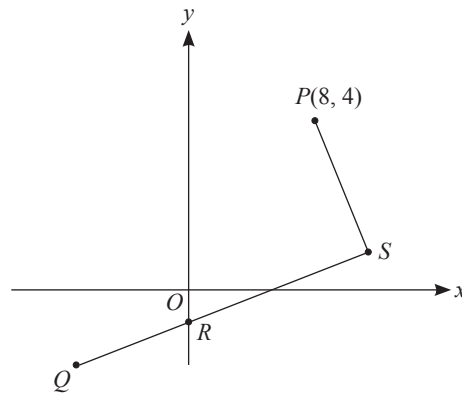
Diberi bahawa persamaan garis PQ ialah $3y = 4x + 24$ dan kecerunan garis lurus PR ialah -3 . Cari
It is given that the equation of the straight line PQ is $3y = 4x + 24$, and the gradient of PR is -3 . Find

- koordinat P dan Q ,
the coordinates of P and Q , [2 markah/marks]
- persamaan garis lurus PR dan QR ,
the equations of the straight line PR and QR , [4 markah/marks]
- koordinat titik R ,
the coordinates of point R , [2 markah/marks]
- koordinat S jika $QR : RS = 13 : 7$.
the coordinates of point S if $QR : RS = 13 : 7$. [2 markah/marks]

Jawapan/Answer:

- 8 Rajah 6 menunjukkan garis lurus PS bertemu dengan garis lurus QS pada titik S . Garis lurus QS menyalang paksi- y pada titik R dan O ialah asalan.

Diagram 6 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.



Rajah/Diagram 6

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

- persamaan garis lurus PS ,
the equation of the straight line PS ,
- koordinat S ,
the coordinates of S ,
- koordinat titik Q jika $9QR = 4RS$,
the coordinates of point Q if $9QR = 4RS$,
- luas segi tiga POS .
the area of the triangle POS .

[8 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 .

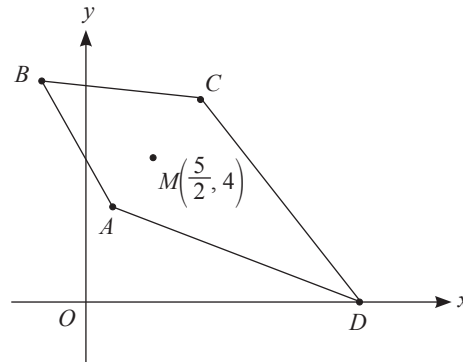
[2 markah/marks]

Jawapan/Answer:



- 9 Rajah 7 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.

Diagram 7 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.



Rajah/Diagram 7

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.

[1 unit mewakili 1 km]

[1 unit represents 1 km]

- (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.

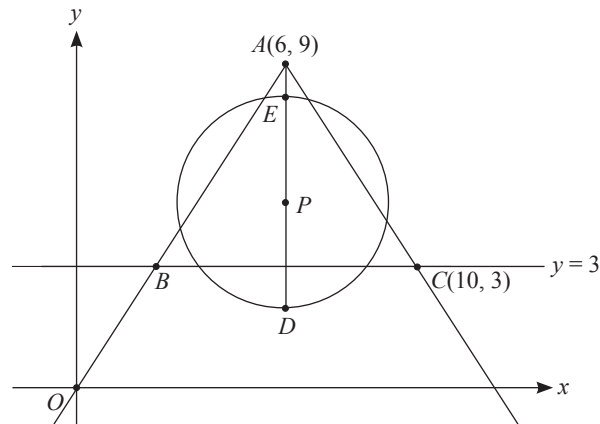
If the road that connects Ali and Candra's house is extended to supermarket (P), such that $AC : CP = 1 : 3$, find the distance, in km, between the supermarket and Ali's house.

[4 markah/marks]

Jawapan/Answer:

- 10 Rajah 8 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.

Diagram 8 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.



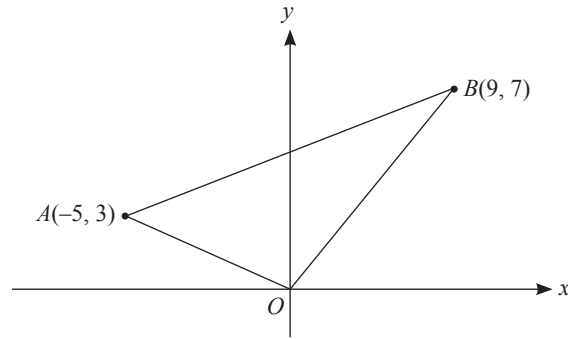
Rajah/Diagram 8

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

- persamaan garis lurus AB ,
the equation of the straight line AB ,
[2 markah/marks]
- koordinat P jika luas segi tiga BPC ialah 8 unit². Tunjukkan pengiraan anda menggunakan rumus luas poligon.
the coordinates of P if the area of triangle BPC is 8 units². Show your calculations using the polygon area formula.
[5 markah/marks]
- 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:

- 11 Rajah 9 menunjukkan segi tiga OAB , dengan keadaan O ialah asalan.
Diagram 9 shows a triangle OAB , such that O is the origin.



Rajah/Diagram 9

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

[9 markah/marks]

Jawapan/Answer:

BAB
8Vektor
Vectors

- 1 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 $\vec{AB}$ dalam sebutan $\underline{i}$ dan $\underline{j}$.
Express $\vec{AB}$ in terms of $\underline{i}$ and $\underline{j}$.

[2 markah/marks]

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

[2 markah/marks]

Jawapan/Answer :

Tingkatan 4

- 2 Diberi $\underline{u} = \underline{i} + 3\underline{j}$ dan $\underline{v} = 2\underline{i} - 9\underline{j}$.

Given that $\underline{u} = \underline{i} + 3\underline{j}$ and $\underline{v} = 2\underline{i} - 9\underline{j}$.

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

[2 markah/marks]

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

[1 markah/mark]

Jawapan/Answer :

3 Diberi $\underline{m} = \begin{pmatrix} k \\ 3 \end{pmatrix}$ dan $\underline{n} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$, cari

Given $\underline{m} = \begin{pmatrix} k \\ 3 \end{pmatrix}$ and $\underline{n} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$, find

(a) $|\underline{n}|$,

[1 markah/mark]

(b) nilai k , dengan keadaan $\underline{m} + \underline{n}$ adalah selari dengan paksi- y .
the value of k , such that $\underline{m} + \underline{n}$ is parallel to y -axis.

[4 markah/marks]

Jawapan/Answer:

4 Diberi $\underline{x} = 2\underline{i} + 3\underline{j}$ dan $\underline{y} = -2\underline{i} + \underline{j}$. Titik M ialah $(2, -2)$ dan titik N ialah $(7, 3)$. Diberi $\overrightarrow{MN} = h\underline{x} + k\underline{y}$, dengan keadaan h dan k ialah pemalar. Cari

Given $\underline{x} = 2\underline{i} + 3\underline{j}$ and $\underline{y} = -2\underline{i} + \underline{j}$. Point M is $(2, -2)$ and point N is $(7, 3)$. Given $\overrightarrow{MN} = h\underline{x} + k\underline{y}$, such that h and k are constants. Find

(a) nilai h dan nilai k ,
the value of h and of k .

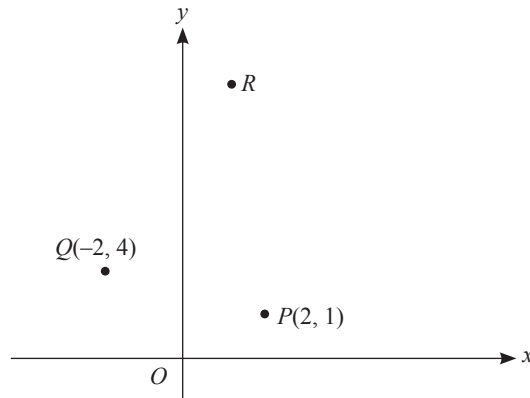
[3 markah/marks]

(b) vektor unit pada arah $\overrightarrow{MN}$, dalam sebutan $\underline{i}$ dan $\underline{j}$.
the unit vector in the direction of $\overrightarrow{MN}$, in terms of $\underline{i}$ and $\underline{j}$.

[3 markah/marks]

Jawapan/Answer:

- 5 Rajah 1 menunjukkan tiga titik pada suatu satah Cartes.
Diagram 1 shows three points on a Cartesian plane.



Rajah/Diagram 1

- (a) Nyatakan $\vec{PQ}$.
State $\vec{PQ}$.

[1 markah/mark]

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

- (i) Jika $\vec{PQ} + 2\vec{QR} = 2\vec{i} + 11\vec{j}$, cari nilai m dengan menggunakan operasi aritmetik vektor.

If $\vec{PQ} + 2\vec{QR} = 2\vec{i} + 11\vec{j}$, find the value of m by using vector's arithmetic operations.

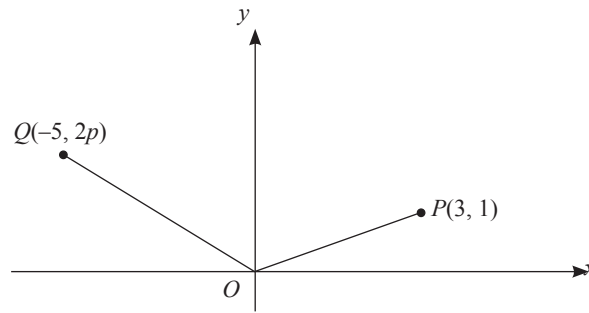
- (ii) Seterusnya, tentukan vektor unit dalam arah $\vec{QR}$.

Hence, determine the unit vector in the direction of $\vec{QR}$.

[4 markah/marks]

Jawapan/Answer:

- 6 Rajah 2 menunjukkan titik P dan titik Q .
Diagram 2 shows point P and point Q .



Rajah/Diagram 2

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

[2 markah/marks]

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

[3 markah/marks]

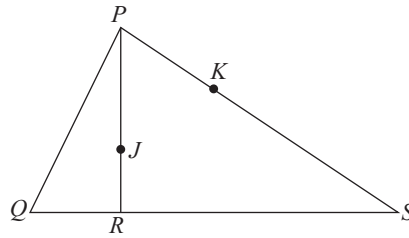
- (c) Cari unit vektor dalam arah $\vec{PQ}$.
Find the vector unit in the direction of $\vec{PQ}$.

[1 markah/mark]

Jawapan/Answer:

- 7 Rajah 3 menunjukkan garis lurus QRS dengan keadaan $QS = 4QR$. Titik J pada garis PR dan titik K pada garis PS masing-masing dengan keadaan $PR = 3JR$ dan $PS = 3PK$. Diberi $\overrightarrow{QR} = \underline{x}$ dan $\overrightarrow{QP} = \underline{y}$.

Diagram 3 shows a straight line QRS such that $QS = 4QR$. Point J on line PR and point K on line PS such that $PR = 3JR$ and $PS = 3PK$ respectively. Given $\overrightarrow{QR} = \underline{x}$ and $\overrightarrow{QP} = \underline{y}$.



Rajah/Diagram 3

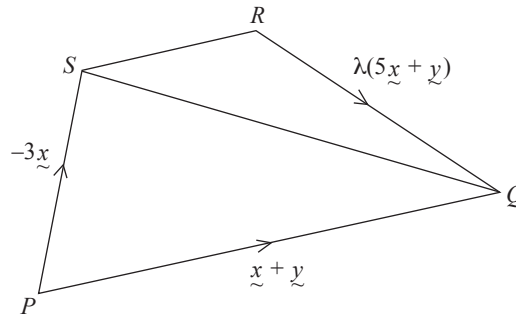
- (a) Ungkapkan $\overrightarrow{QK}$ dan $\overrightarrow{JS}$, dalam sebutan $\underline{x}$ dan $\underline{y}$.
Express $\overrightarrow{QK}$ and $\overrightarrow{JS}$, in terms of $\underline{x}$ and $\underline{y}$.
- (b) Tentukan sama ada titik Q, J dan K segaris atau tidak.
Determine whether point Q, J and K are collinear or not.

[4 markah/marks]

[4 markah/marks]

Jawapan/Answer:

- 8 Rajah 4 menunjukkan sebuah sisi empat $PQRS$.
 Diagram 4 shows a quadrilateral $PQRS$.



Rajah/Diagram 4

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

[5 markah/marks]

Jawapan/Answer:

Tingkatan 4

- 9 Diberi bahawa $\vec{OA} = 6\vec{a}$ dan $\vec{OB} = k\vec{b}$ dengan keadaan k ialah pemalar. P ialah satu titik pada garis AB dengan keadaan $AP : PB = 1 : 2$.

Given that $\vec{OA} = 6\vec{a}$ and $\vec{OB} = k\vec{b}$ such that k is a constant. P is a point on the line AB where $AP : PB = 1 : 2$.

- (a) Cari $\vec{OP}$ dalam sebutan k , $\vec{a}$ dan $\vec{b}$.

Find $\vec{OP}$ in terms of k , $\vec{a}$ and $\vec{b}$.

[2 markah/marks]

- (b) Jika garis OP dipanjangkan ke Q supaya $\vec{PQ} = 20\vec{a} + 15\vec{b}$, cari nilai k .

If line OP is extended to Q so that $\vec{PQ} = 20\vec{a} + 15\vec{b}$, find the value of k .

[4 markah/marks]

Jawapan/Answer:

10 (a) Diberi $\underline{p} = k^2\underline{i} + 2\underline{j}$ dan $\underline{q} = 2k\underline{i} + 3\underline{j}$, cari nilai-nilai k yang mungkin jika $3\underline{p} + 2\underline{q} = 4\underline{i} + 12\underline{j}$.

Given that $\underline{p} = k^2\underline{i} + 2\underline{j}$ and $\underline{q} = 2k\underline{i} + 3\underline{j}$, find the possible values of k if $3\underline{p} + 2\underline{q} = 4\underline{i} + 12\underline{j}$.

[2 markah/marks]

(b) Diberi bahawa vektor $\underline{a} = \begin{pmatrix} 7 \\ -1 \end{pmatrix}$ dan vektor $\underline{b} = \begin{pmatrix} h \\ 3 \end{pmatrix}$, dengan keadaan h ialah pemalar.

It is given that the vector $\underline{a} = \begin{pmatrix} 7 \\ -1 \end{pmatrix}$ and vector $\underline{b} = \begin{pmatrix} h \\ 3 \end{pmatrix}$, such that h is a constant.

(i) Ungkapkan, dalam sebutan h , $\underline{a} + 2\underline{b}$.

Express, the vector, in terms of h , $\underline{a} + 2\underline{b}$.

(ii) Diberi $|\underline{a} + 2\underline{b}| = \sqrt{34}$ unit, cari nilai-nilai yang mungkin bagi h .

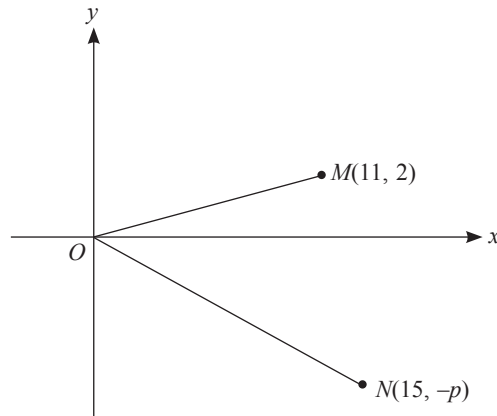
Given $|\underline{a} + 2\underline{b}| = \sqrt{34}$ units, find the possible values of h .

[3 markah/marks]

Jawapan/Answer:



- 11 Rajah 5 menunjukkan titik M dan titik N . Diberi bahawa p ialah pemalar.
Diagram 5 shows point M and point N . Given that p is a constant.



Rajah/Diagram 5

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

[2 markah/marks]

- (b) Diberi bahawa $|\overrightarrow{NM}| = \sqrt{20}$, dengan keadaan $p < 0$. Cari nilai p .
It is given that $|\overrightarrow{NM}| = \sqrt{20}$, such that $p < 0$. Find the value of p .

[2 markah/marks]

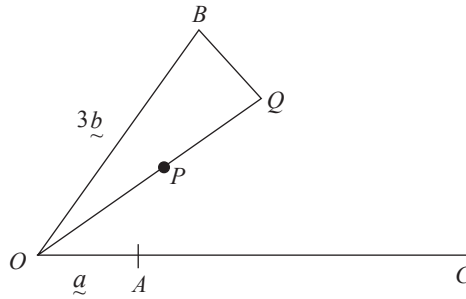
- (c) Cari vektor unit, dalam arah $\overrightarrow{NM}$.
Find the unit vector, in the direction of $\overrightarrow{NM}$.

[2 markah/marks]

Jawapan/Answer:

- 12 Rajah 6 menunjukkan sebuah segi tiga OBQ dan garis lurus OAC . Titik P terletak pada garis lurus OQ dan $OC = 4OA$.

Diagram 6 shows a triangle OBQ and the straight line OAC . Point P lies on the straight line OQ and $OC = 4OA$.



Rajah/Diagram 6

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

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

- (a) Ungkapkan

Express

(i) $\vec{OP}$, dalam sebutan $\underline{a}$ dan $\underline{b}$,
 $\vec{OP}$, in terms of $\underline{a}$ and $\underline{b}$.

(ii) $\vec{BQ}$, dalam sebutan k , $\underline{a}$ dan $\underline{b}$.
 $\vec{BQ}$, in terms of k , $\underline{a}$ and $\underline{b}$.

[4 markah/marks]

- (b) Seterusnya, cari nilai h dan k jika $\vec{BQ} = h\vec{BC}$, dengan keadaan h ialah pemalar.

Hence, find the values of h and k if $\vec{BQ} = h\vec{BC}$, such that h is a constant.

[5 markah/marks]

- (c) Nyatakan $BQ : QC$.

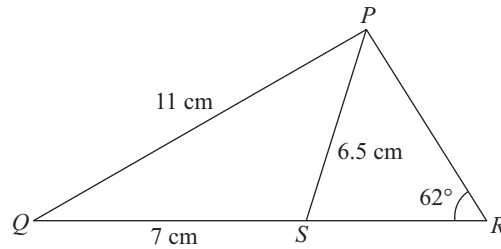
State $BQ : QC$.

[1 markah/mark]

Jawapan/Answer:

BAB
9Penyelesaian Segi Tiga
Solution of Triangles

- 1 Rajah 1 menunjukkan sebuah segi tiga PQR dengan keadaan QSR ialah garis lurus.
Diagram 1 shows a triangle PQR such that QSR is a straight line.



Rajah/Diagram 1

Hitung

Calculate

(a) $\angle QSP$,

[2 markah/marks]

(b) panjang SR ,
the length of SR ,

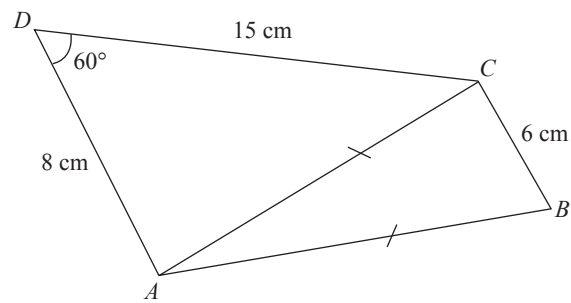
[4 markah/marks]

(c) luas segi tiga PQR .
the area of triangle PQR .

[4 markah/marks]

Jawapan/Answer:

- 2 Rajah 2 menunjukkan sisi empat $ABCD$ dan segi tiga sama kaki ABC .
 Diagram 2 shows a quadrilateral $ABCD$ and an isosceles triangle ABC .



Rajah/Diagram 2

Cari

Find

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

[2 markah/marks]

- (b) $\angle DAB$,

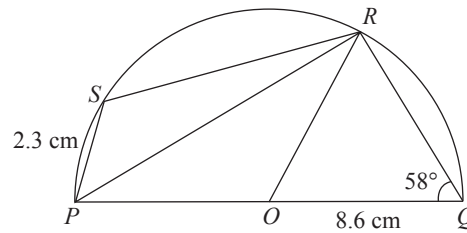
[5 markah/marks]

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

[3 markah/marks]

Jawapan/Answer :

- 3 Rajah 3 menunjukkan sebuah semibulatan dengan pusat O dan berjari 8.6 cm.
 Diagram 3 shows a semicircle with centre O and a radius of 8.6 cm.



Rajah/Diagram 3

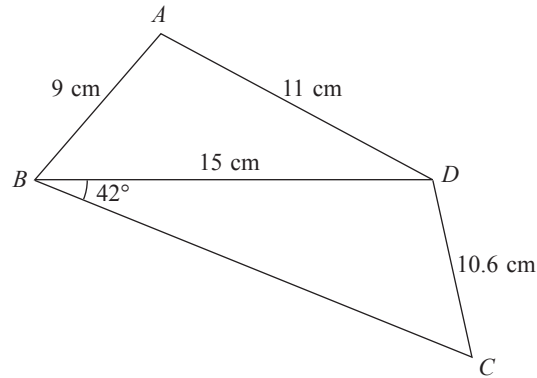
- (a) Cari
 Find
- panjang RQ ,
 the length of RQ ,
 - panjang RP ,
 the length of RP ,
 - $\angle ORS$.
- (b) Hitung luas segi tiga PQR dengan menggunakan rumus Heron.
 Calculate the area of triangle PQR using Heron's formula.

[7 markah/marks]

[3 markah/marks]

Jawapan/Answer:

- 4 (a) Rajah 4 menunjukkan sebuah sisi empat $ABCD$.
Diagram 4 shows a quadrilateral $ABCD$.



Rajah/Diagram 4

Hitung

Calculate

- (i) $\angle BCD$, diberikan $\angle BCD$ adalah tirus,
 $\angle BCD$, given that $\angle BCD$ is acute,
- (ii) $\angle BAD$,
- (ii) luas, dalam cm^2 , sisi empat $ABCD$.
the area, in cm^2 , of quadrilateral $ABCD$.

[7 markah/marks]

- (b) Sebuah segi tiga $B'C'D'$ mempunyai ukuran yang sama seperti segi tiga BCD tetapi berlainan bentuk daripada segi tiga BCD .

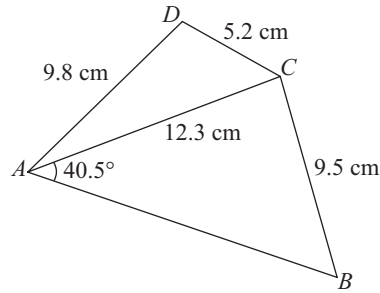
A triangle $B'C'D'$ has the same measurement as triangle BCD but it is different in shape from triangle BCD .

- (i) Lakar segi tiga $B'C'D'$.
Sketch the triangle $B'C'D'$.
- (ii) Nyatakan $\angle B'C'D'$.
State $\angle B'C'D'$.

[3 markah/marks]

Jawapan/Answer:

- 5 Rajah 5 menunjukkan sebuah sisi empat $ABCD$ dengan keadaan $\angle ABC$ ialah sudut tirus.
 Diagram 5 shows a quadrilateral $ABCD$ where $\angle ABC$ is an acute angle.



Rajah/Diagram 5

- (a) Hitung

Calculate

- (i) $\angle ABC$,
- (ii) $\angle ADC$,
- (iii) luas, dalam cm^2 , $\triangle ACD$.
 the area, in cm^2 , of $\triangle ACD$.

[6 markah/marks]

- (b) Sebuah segi tiga $AB'C$ mempunyai ukuran yang sama dengan segi tiga ABC , dengan keadaan $AC = 12.3 \text{ cm}$, $CB' = 9.5 \text{ cm}$ dan $\angle B'AC = 40.5^\circ$.

A triangle $AB'C$ has the same measurement as triangle ABC , such that $AC = 12.3 \text{ cm}$, $CB' = 9.5 \text{ cm}$ and $\angle B'AC = 40.5^\circ$.

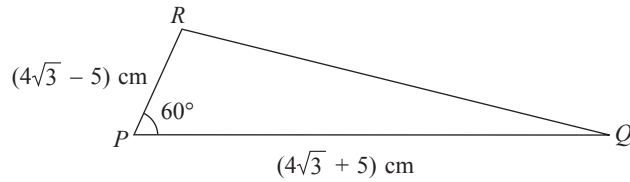
- (i) Lakar segi tiga $AB'C$.
 Sketch the triangle $AB'C$.
- (ii) Nyatakan saiz $\angle AB'C$.
 State the size of $\angle AB'C$.

[4 markah/marks]

Jawapan/Answer:

6 Rajah 6 menunjukkan sebuah segi tiga PQR .

Diagram 6 shows a triangle PQR .



Rajah/Diagram 6

Diberi bahawa $PR = (4\sqrt{3} - 5)$ cm, $PQ = (4\sqrt{3} + 5)$ cm dan $\angle QPR = 60^\circ$.

It is given that $PR = (4\sqrt{3} - 5)$ cm, $PQ = (4\sqrt{3} + 5)$ cm and $\angle QPR = 60^\circ$.

- (a) (i) Cari, dalam cm, panjang QR dalam bentuk surd.

Find, in cm, the length of QR in surd form.

- (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 $\angle PQR$.
[7 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 $\triangle QR'R$.

Sketch the $\triangle QR'R$.

- (ii) Cari luas, dalam cm^2 , $\triangle QR'R$.

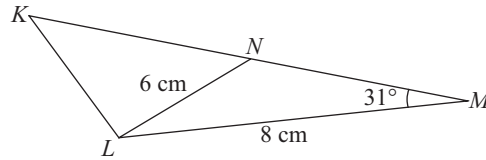
Find the area, in cm^2 , of $\triangle QR'R$.

[3 markah/marks]

Jawapan/Answer:



- 7 (a) Rajah 7 menunjukkan sebuah segi tiga KLM dengan keadaan $LM = 8$ cm, $LN = 6$ cm dan $\angle KML = 31^\circ$. Titik N berada pada KM dengan keadaan $LN = LK$.
Diagram 7 shows a triangle KLM such that $LM = 8$ cm, $LN = 6$ cm and $\angle KML = 31^\circ$. Point N is on KM such that $LN = LK$.



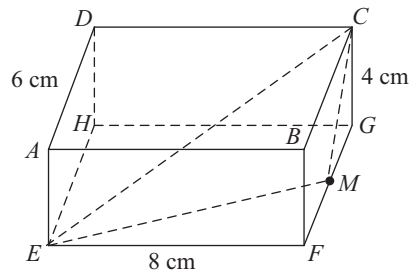
Rajah/Diagram 7

Hitung

Calculate

- (i) $\angle LKN$,
 (ii) panjang KN .
the length of KN .
- (b) Rajah 8 menunjukkan sebuah kuboid. M ialah titik tengah FG .
Diagram 8 shows a cuboid. M is the midpoint of FG .

[5 markah/marks]



Rajah/Diagram 8

Hitung

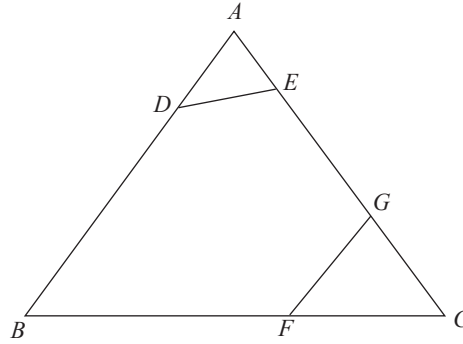
Calculate

- (i) $\angle CME$,
 (ii) luas $\triangle CME$.
the area of $\triangle CME$.

[5 markah/marks]

Jawapan/Answer:

- 8 Rajah 9 menunjukkan segi tiga ABC . ADB , BFC dan $AEGC$ ialah garis lurus.
Diagram 9 shows triangle ABC . ADB , BFC and $AEGC$ are straight lines.



Rajah/Diagram 9

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

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

[5 markah/marks]

- (b) Luas $\triangle CFG$ adalah dua kali luas $\triangle ADE$. Hitung panjang, dalam cm, AE .
The area of $\triangle CFG$ is twice the area of $\triangle ADE$. Calculate the length, in cm, of AE .

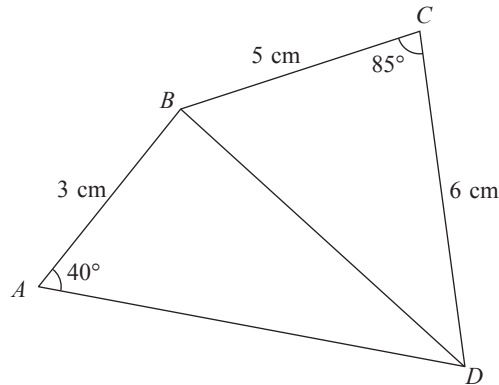
[3 markah/marks]

- (c) $\triangle A'B'C'$ mempunyai bentuk yang berbeza daripada $\triangle ABC$, dengan keadaan $B'C' = BC$, $A'C' = AC$ dan $\angle A'B'C' = \angle ABC$. Hitung $\angle B'C'A'$.
 $\triangle A'B'C'$ has different shape from $\triangle ABC$, 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 10 menunjukkan sebuah sisi empat $ABCD$, dengan keadaan AB ialah sisi terpendek.
Diagram 10 shows a quadrilateral $ABCD$, such that AB is its shortest side.



Rajah/Diagram 10

- (a) Hitung

Calculate

- (i) panjang dalam cm, bagi BD ,
the length, in cm, of BD ,
- (ii) $\angle ADB$.

[4 markah/marks]

- (b) Cari

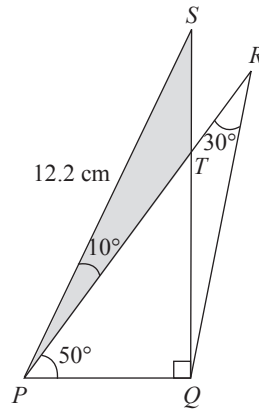
Find

- (i) luas, dalam cm^2 , $\triangle ABD$,
the area, in cm^2 , of $\triangle ABD$,
- (ii) jarak terdekat, dalam cm, dari titik B ke garis AD .
the shortest distance, in cm, from the point B to the line AD .

[6 markah/marks]

Jawapan/Answer:

- 10 Rajah 11 menunjukkan dua garis lurus, PTR dan QTS .
 Diagram 11 shows two straight lines, PTR and QTS .



Rajah/Diagram 11

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 ,

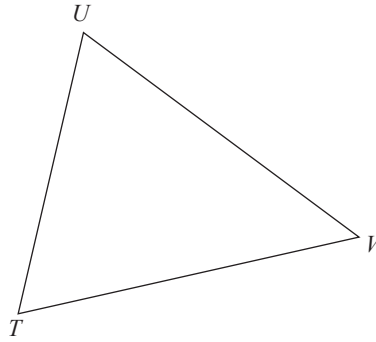
[3 markah/marks]

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

[3 markah/marks]

Jawapan/Answer:

- 11 Rajah 12 menunjukkan sebuah segi tiga TUV .
Diagram 12 shows a triangle TUV .



Rajah/Diagram 12

Diberi bahawa panjang $UT = m$ cm dan $UV = n$ cm.
Given that the length of $UT = m$ cm and $UV = n$ cm.

- (a) Tunjukkan luas segi tiga TUV adalah $A = \frac{1}{2} mn \sin U$.

Show that the area of the triangle TUV is $A = \frac{1}{2} mn \sin U$.

[3 markah/marks]

- (b) Diberi $UT = 12$ cm, $UV = 14.4$ cm dan $\angle TUV = 67^\circ$.
Given $UT = 12$ cm, $UV = 14.4$ cm and $\angle TUV = 67^\circ$.

- (i) Cari

Find

- (a) panjang TV , dalam cm,
the length of TV , in cm,

- (b) $\angle UTV$.

- (ii) Titik T' berada di atas garis TV dengan keadaan $UT' = UT$.
Point T' is located on the line TV such that $UT' = UT$.

- (a) Lakar segi tiga $T'UV$.
Sketch the triangle $T'UV$.

- (b) Seterusnya, cari nilai bagi $\angle UT'V$.
Hence, find the value of $\angle UT'V$.

[7 markah/marks]

Jawapan/Answer :

BAB
10Nombor Indeks
Index Numbers

- 1 Jadual 1 menunjukkan harga, indeks harga dan peratus perbelanjaan bagi empat potong kek, P , Q , R dan S .

Table 1 shows the price, price indices and the percentage of expenditure for four slices of cakes, P , Q , R and S .

Kek Cake	Harga sepotong Price per slice (RM)		Indeks harga pada tahun 2025 berasaskan tahun 2023 Price indices in the year 2025 based on the year 2023	Peratus perbelanjaan Percentage of expenditure (%)
	2023	2025		
P	x	3.12	130	20
Q	3.00	4.20	y	25
R	5.00	5.90	118	m
S	2.80	z	110	30

Jadual/Table 1

- (a) Cari nilai m , x , y dan z .
Find the values of m , x , y and z . [4 markah/marks]
- (b) Hitung indeks gubahan bagi kek itu pada tahun 2025 berasaskan tahun 2023.
Calculate the composite index for the cake in the year 2025 based on the year 2023. [3 markah/marks]
- (c) Jadual 2 menunjukkan indeks jualan dan pemberat bagi tiga jenis item, K , L dan M pada tahun 2023 berasaskan tahun 2021.
Table 2 shows the sales indices and weightages for three items, K , L and M in the year 2023 based on the year 2021.

Item Item	Indeks jualan Sales indices	Pemberat Weightage
K	120	x
L	80	y
M	155	z

Jadual/Table 2

Diberi indeks gubahan bagi item K dan L pada tahun 2023 berasaskan tahun 2021 ialah 110 manakala indeks gubahan bagi item K dan M ialah 125. Cari nisbah $x : y : z$.

Given the composite index for items K and L in the year 2023 based on the year 2021 is 110 whereas the composite index for items K and M is 125. Determine the ratio $x : y : z$.

[3 markah/marks]

Jawapan/*Answer*:

- 2 Jadual 3 menunjukkan indeks harga dan peratus penggunaan empat bahan utama yang digunakan untuk membuat sebiji kek keju.

Table 3 shows the price indices and the percentage of usage for four main ingredients used in making a cheese cake.

Bahan Ingredient	Indeks harga pada tahun 2025 berasaskan tahun 2022 Price indices in the year 2025 based on the year 2022	Pemberat Weightage
Telur Egg	105	5
Krim keju Cream cheese	110	10
Krim putar Whipping cream	x	5
Gula kastor Castor sugar	110	3

Jadual/Table 3

- (a) Hitung

Calculate

- harga krim keju pada tahun 2025 jika harganya pada tahun 2022 ialah RM18,
the price of the cream cheese in 2025 if its price in 2022 is RM18,
- indeks harga telur pada tahun 2022 berasaskan tahun 2020 jika indeks harganya pada tahun 2025 berasaskan tahun 2020 ialah 120.
the price index for the eggs in the year 2022 based on the year 2020 if the price index in the year 2025 based on the year 2020 is 120.

[4 markah/marks]

- (b) Indeks gubahan kos penghasilan kek keju itu pada tahun 2025 berasaskan tahun 2022 ialah 125. Hitung
The composite index for the production cost of the cheese cake in the year 2025 based on the year 2022 is 125.

Calculate

- nilai x dan seterusnya, jelaskan jawapan anda.
the value of x and hence, explain your answer.
- harga sebiji kek itu pada tahun 2022 jika harga yang sepadan pada tahun 2025 ialah RM90.
the price of the cake in the year 2022 if the corresponding price in the year 2025 is RM90.

[6 markah/marks]

Jawapan/Answer:

- 3 Sekeping kad ucapan dibuat dengan menggunakan empat bahan, P , Q , R dan S . Jadual 4 menunjukkan harga bahan-bahan tersebut.

A wish card is made up of four materials, P , Q , R and S . Table 4 shows the price of the materials.

Bahan Material	Harga (RM) Price (RM)	
	2024	2026
P	a	4.00
Q	3.00	3.30
R	b	c
S	2.50	4.00

Jadual/Table 4

- (a) Nombor indeks bagi bahan P pada tahun 2026 berasaskan tahun 2024 ialah 125. Hitung nilai a .
The index number for material P in the year 2026 based on the year 2024 is 125. Calculate the value of a . [2 markah/marks]
- (b) Nombor indeks bagi bahan R pada tahun 2026 berasaskan tahun 2024 ialah 125. Harga bahan R pada tahun 2026 adalah RM0.50 lebih daripada harganya yang sepadan dalam tahun 2024. Hitung nilai b dan nilai c .
The index number for material R in the year 2026 based on the year 2024 is 125. The price of material R in the year 2026 is RM0.50 more than the corresponding price in 2024. Calculate the value of b and of c . [3 markah/marks]
- (c) Indeks gubahan kos penghasilan kad ucapan itu pada tahun 2026 berasaskan tahun 2024 ialah 128.7.
The composite index for the production cost of the wish card in the year 2026 based on the year 2024 is 128.7.
 Hitung
Calculate
- (i) harga kad ucapan itu pada tahun 2024 jika harganya yang sepadan pada tahun 2026 ialah RM11.20,
the price of the wish card in the year 2024 if the corresponding price in the year 2026 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:

- 4 Jadual 5 menunjukkan harga dan pemberat bagi empat jenis makanan yang dijual di sebuah bakeri.
Table 5 shows the prices and the weightages for four types of food sold in a bakery.

Makanan <i>Food</i>	Harga (RM) <i>Price (RM)</i>		Pemberat <i>Weightage</i>
	2023	2025	
Biskut <i>Biscuit</i>	2.50	3.00	3
Kek <i>Cake</i>	3.00	3.60	2
Donat <i>Doughnut</i>	1.50	2.40	1
Sandwic <i>Sandwich</i>	2.00	3.50	4

Jadual/Table 5

- (a) Hitung
Calculate
- (i) indeks harga bagi setiap jenis makanan pada tahun 2025 berasaskan tahun 2023.
price index for each type of food in the year 2025 based on the year 2023.
 - (ii) indeks gubahan bagi harga makanan di bakeri itu pada tahun 2025 berasaskan tahun 2023.
the composite index for the price of food at the bakery in the year 2025 based on the year 2023.
 - (iii) harga makanan yang dijual di bakeri itu pada tahun 2025 jika harganya yang sepadan pada tahun 2023 ialah RM94.00.
the price of the food sold at the bakery in the year 2025 if the corresponding price for the year 2023 was RM94.00.
- [8 markah/marks]
- (b) Harga bagi empat jenis makanan itu telah bertambah sebanyak 15% dari tahun 2025 hingga tahun 2026. Cari indeks gubahan bagi harga makanan di bakeri pada tahun 2026 dengan menggunakan tahun 2023 sebagai tahun asas.
The price for the four types of food increases by 15% from the year 2025 to the year 2026. Find the composite index for the price of food at the bakery for the year 2026 by using the year 2023 as the base year.
- [2 markah/marks]

Jawapan/Answer:

- 5 Jadual 6 menunjukkan maklumat tentang empat bahan yang digunakan untuk membuat sejenis minyak wangi.

Table 6 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

Jadual/Table 6

- (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) 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 :

6 Jadual 7 menunjukkan maklumat berkaitan empat bahan utama yang digunakan oleh Fatimah untuk membuat sejenis kuih.

Table 7 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

Jadual/Table 7

- (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 :

- 7 Jadual 8 menunjukkan perubahan indeks harga dan peratus penggunaan empat bahan, *A*, *B*, *C* dan *D* yang digunakan dalam pembuatan sejenis makanan ringan.

Table 8 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 <i>Materials</i>	Perubahan indeks harga dari tahun 2021 ke tahun 2023 <i>Change in price index from the year 2021 to the year 2023</i>	Peratus penggunaan (%) <i>Percentage usage (%)</i>
<i>A</i>	Menokok 50% <i>Increased 50%</i>	25
<i>B</i>	Menyusut 20% <i>Reduced 20%</i>	40
<i>C</i>	Menokok 10% <i>Increased 10%</i>	<i>k</i>
<i>D</i>	Tidak berubah <i>No change</i>	10

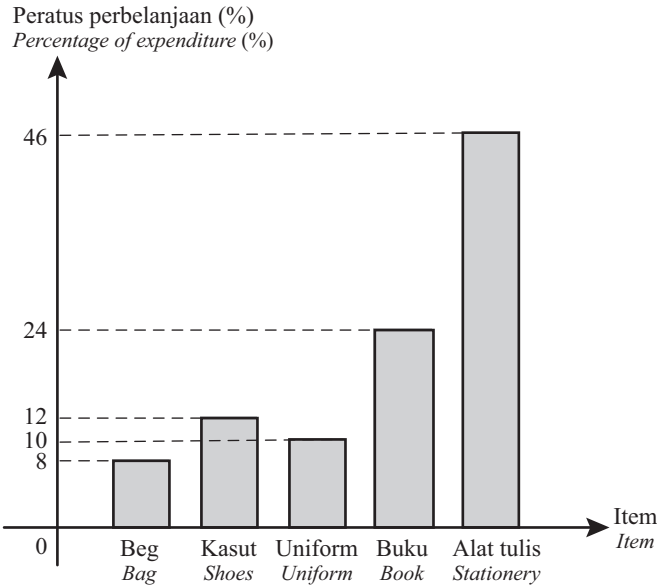
Jadual/Table 8

- (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 :

8 Rajah 1 menunjukkan carta palang berkenaan perbelanjaan tahunan untuk beberapa item pada tahun 2024.
Diagram 1 shows a bar chart on the annual expenditure for some items in 2024.



Rajah/Diagram 1

Jadual 9 menunjukkan harga dan indeks harga bagi item-item tersebut.
Table 9 shows the price and price indices of the items.

Item Item	Harga pada tahun 2022 Price in the year 2022	Harga pada tahun 2024 Price in the year 2024	Indeks harga pada tahun 2024 dengan tahun 2022 sebagai tahun asas Price indices in the year 2024 with the year 2022 as the base year
Beg Bag	x	RM70	175
Kasut Shoes	RM30	RM45	150
Uniform Uniform	RM60	RM75	125
Buku Book	RM20	y	100
Alat tulis Stationery	RM15	RM18	z

Jadual/Table 9

- (a) Cari nilai-nilai x , y dan z .
Find the values of x , y and z .
[3 markah/marks]
- (b) Hitung indeks gubahan bagi harga item-item itu pada tahun 2024 dengan tahun 2022 sebagai tahun asas.
Calculate the composite index for the price of the items in 2024 with the year 2022 as the base year.
[3 markah/marks]
- (c) Jumlah perbelanjaan tahunan bagi item-item itu pada tahun 2022 ialah RM500. Hitung jumlah perbelanjaan tahunan yang sepadan pada tahun 2024.
The total annual expenditure for the items in 2022 is RM500. Calculate the corresponding total annual expenditure in 2024.
[2 markah/marks]
- (d) Kos item-item itu meningkat 20% dari tahun 2024 ke tahun 2025. Cari indeks gubahan tahun 2025 dengan tahun 2022 sebagai tahun asas.
The cost of the items increased by 20% from 2024 to 2025. Find the composite index in 2025 with the year 2022 as the base year.
[2 markah/marks]

Jawapan/*Answer*:

9 Jadual 10 menunjukkan harga dan indeks harga bagi empat bahan, P , Q , R dan S yang digunakan untuk menghasilkan keropok ikan.

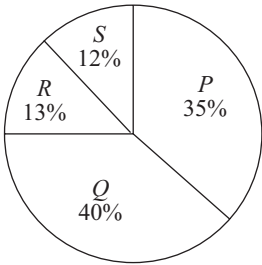
Table 10 shows the price and price indices for four materials, P , Q , R and S used to make fish crackers.

Bahan Material	Harga per kg (RM) Price per kg (RM)		Indeks harga pada tahun 2024 berasaskan tahun 2022 Price indices in the year 2024 based on the year 2022
	2022	2024	
P	4.00	6.00	150
Q	2.00	2.60	x
R	0.06	0.75	125
S	y	0.40	125

Jadual/Table 10

Rajah 2 menunjukkan carta pai yang mewakili kuantiti relatif bagi penggunaan bahan-bahan P , Q , R dan S .

Diagram 2 shows a pie chart that represents the relative quantity of the usage of materials P , Q , R and S .



Rajah/Diagram 2

- (a) Cari nilai-nilai x dan y .
Find the values of x and y .
[3 markah/marks]
- (b) Hitung indeks gubahan bagi kos penghasilan keropok ikan itu pada tahun 2024 berasaskan tahun 2022. Seterusnya, hitung kos penghasilan keropok ikan itu pada tahun yang sepadan bagi tahun 2024 jika kos penghasilan pada tahun 2022 ialah RM10.60.
Calculate the composite index for the production cost of the fish crackers in the year 2024 based on the year 2022. Then, calculate the production cost of the fish crackers on the corresponding year in 2024 if the production cost in 2022 is RM10.60.
[5 markah/marks]
- (c) Kos penghasilan keropok ikan itu dijangka meningkat sebanyak 25% dari tahun 2022 ke tahun 2026. Cari indeks gubahan kos penghasilan keropok ikan itu yang dijangkakan pada tahun 2026 berasaskan tahun 2024.
The production cost of the fish crackers is expected to increase by 25% from 2022 to 2026. Find the composite index for the production cost of the fish crackers in the year 2026 based on the year 2024.
[2 markah/marks]

Jawapan/*Answer*:

10 Jadual 11 menunjukkan indeks harga, perubahan indeks harga dan peratusan penggunaan bagi tiga bahan yang digunakan dalam pembuatan sejenis biskut.
Table 11 shows the price index, the change in price index and the percentage of usage of three ingredients used in the making of a type of biscuit.

Bahan <i>Ingredient</i>	Indeks harga pada tahun 2024 berasaskan tahun 2023 <i>Price index in the year 2024 based on the year 2023</i>	Perubahan indeks harga dari tahun 2024 ke tahun 2025 <i>Change in price index from the year 2024 to the year 2025</i>	Peratus penggunaan <i>Percentage of usage (%)</i>
K	110	Tidak berubah <i>No change</i>	20
M	85	Meningkat 20% <i>Increases 20%</i>	45
N	130	Tidak berubah <i>No change</i>	35

Jadual/Table 11

- (a) Jika harga bagi K pada tahun 2024 ialah RM1.65 seunit, kira harga seunitnya pada tahun 2023.
If the price of K in the year 2024 is RM1.65 per unit, calculate its price per unit in the year 2023.
[2 markah/marks]
- (b) Kira indeks harga bagi M pada tahun 2025 berasaskan tahun 2023.
Calculate the price index for M in the year 2025 based on the year 2023.
[2 markah/marks]
- (c) Hitungkan indeks gubahan bagi kos membuat biskut tersebut pada tahun 2025 berasaskan tahun 2023.
Calculate the composite index for the cost of making the biscuit in the year 2025 based on the year 2023.
[2 markah/marks]
- (d) Jika kos membuat biskut tersebut pada tahun 2023 ialah RM2.75, kira harga jualannya pada tahun 2025 dengan keuntungan 30%.
If the cost of making the biscuit in the year 2023 is RM2.75, calculate its selling price in the year 2025 with a 30% profit.
[4 markah/marks]

Jawapan/Answer:

- 11 Sebuah kilang menghasilkan sejenis racun perosak yang terdiri daripada campuran tiga jenis bahan kimia, P , Q dan R dalam nisbah $3 : h : 5$. Jadual 12 menunjukkan indeks harga pada tahun 2023 dan 2024 berasaskan tahun 2022 bagi setiap bahan kimia tersebut. Indeks gubahan pada tahun 2023 dan 2024 berasaskan tahun 2022 masing-masing ialah 101.4 dan 108.5.

A factory produces a type of pesticide that consists of a mixture of three types of chemicals, P , Q and R in the ratio of $3 : h : 5$. Table 12 shows the price index in the years 2023 and 2024 based on the year 2022 for each of the chemicals. The composite indices in the years 2023 and 2024 based on the year 2022 are 101.4 and 108.5 respectively.

Bahan Kimia Chemical	Indeks harga berasaskan tahun 2022 Price index based on the year 2022	
	2023	2024
P	122.8	125
Q	88	110
R	110	k

Jadual/Table 12

- (a) Cari nilai h .
Find the value of h . [2 markah/marks]
- (b) Cari nilai k .
Find the value of k . [2 markah/marks]
- (c) Dari tahun 2024 ke tahun 2025, indeks harga bagi bahan kimia P telah meningkat sebanyak 10%, indeks harga bagi bahan kimia Q telah menurun sebanyak 6% manakala indeks bagi bahan kimia R tidak berubah.
From the year 2024 to the year 2025, the price index of chemical P has increased by 10%, the price index of chemical Q has decreased by 6% while the price index of chemical R was unchanged.
- (i) Hitung indeks gubahan pada tahun 2025 berasaskan tahun 2023.
Calculate the composite index in the year 2025 based on the year 2023.
- (ii) Jika kos pembuatan racun perosak tersebut pada tahun 2023 ialah RM85, hitung kos yang sepadan pada tahun 2025.
If the manufacturing cost of the pesticide in the year 2023 is RM85, calculate the corresponding cost in the year 2025.

[6 markah/marks]



Jawapan/*Answer*:

Tingkatan 4

Kertas Model Tingkatan 4

KERTAS 1

Masa: 2 jam

Bahagian A Section A

[64 markah]
[64 marks]

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

- 1 (a) Selesaikan persamaan kuadratik $2x(x + 3) = (2 - x)(x + 2)$ dengan menggunakan kaedah penyempurnaan kuasa dua. Tulis jawapan anda betul kepada tiga tempat perpuluhan.
Solve the quadratic equation $2x(x + 3) = (2 - x)(x + 2)$ by using completing the square method. Give your answer correct to three decimal places. [3 markah/marks]
- (b) Lengkung fungsi kuadratik $f(x) = (x - q)^2 + 2p$ menyilang paksi- x pada titik-titik $(-1, 0)$ dan $(5, 0)$. Garis lurus $y = -9$ adalah tangen kepada lengkung di titik minimum lengkung itu.
The curve of a quadratic function $f(x) = (x - q)^2 + 2p$ intersects the x -axis at points $(-1, 0)$ and $(5, 0)$. The straight line $y = -9$ is the tangent to the curve at the minimum point of the curve.
- (i) Cari nilai p dan nilai q .
Find the value of p and of q .
- (ii) Tulis persamaan bagi lengkung itu dalam bentuk verteks, jika graf itu dipantulkan pada paksi- x .
Write the equation of the curve in the vertex form, if the graph is reflected about the x -axis.

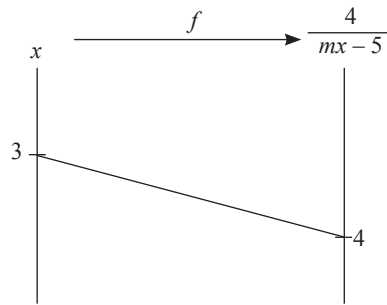
[4 markah/marks]

Jawapan/Answer:

- 2 (a) Diberi bahawa vektor $\overrightarrow{PM} = 4\hat{x} + (h + 2)\hat{y}$. Jika $\overrightarrow{PM}$ dipanjangkan kepada titik X dengan keadaan $\overrightarrow{MX} = \hat{x} + g\hat{y}$. Ungkapkan h dalam sebutan g .
It is given that vector $\overrightarrow{PM} = 4\hat{x} + (h + 2)\hat{y}$. If $\overrightarrow{PM}$ is extended to point X such that $\overrightarrow{MX} = \hat{x} + g\hat{y}$. Express h in terms of g .
- [3 markah/marks]
- (b) Angin bergerak dengan halaju 8 km h^{-1} menghala ke utara. Sebuah layang-layang bergerak ke arah barat dengan halaju 16 km h^{-1} . Hitung laju layang-layang yang sebenar dan arah gerakannya.
The air current is flowing at a velocity of 8 km h^{-1} due north. A kite is steered heading west at a velocity of 16 km h^{-1} . Find the actual speed and direction of the movement of the kite.
- [3 markah/marks]

Jawapan/Answer:

- 3 (a) Rajah 1 menunjukkan pemetaan bagi fungsi f dengan keadaan m ialah pemalar.
Diagram 1 shows the mapping of function f such that m is a constant.



Rajah/Diagram 1

- (i) Cari nilai m .
Find the value of m . [2 markah/marks]
- (ii) Nyatakan objek yang tidak mempunyai imej.
State the object which has no image. [1 markah/mark]
- (b) Diberi bahawa $f(x + 5) = g(2x - 1)$, cari $g^{-1}(x)$ dalam sebutan $f^{-1}(x)$.
Given that $f(x + 5) = g(2x - 1)$, find $g^{-1}(x)$ in terms of $f^{-1}(x)$. [3 markah/marks]

Jawapan/Answer:

- 4 Suatu garis lurus $4x = 3y + 24$ memotong paksi- x di titik L dan paksi- y di titik M . Cari
A straight line $4x = 3y + 24$ cuts the x -axis at point L and y -axis at point M . Find
- (a) kecerunan garis lurus itu,
the gradient of the straight line,
- (b) persamaan pembahagi dua sama serenjang garis lurus itu.
the equation of the perpendicular bisector of the straight line.

[1 markah/mark]

[3 markah/marks]

Jawapan/Answer:

- 5 (a) Hasil tambah n sebutan pertama dalam suatu jangjang 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 7th term.

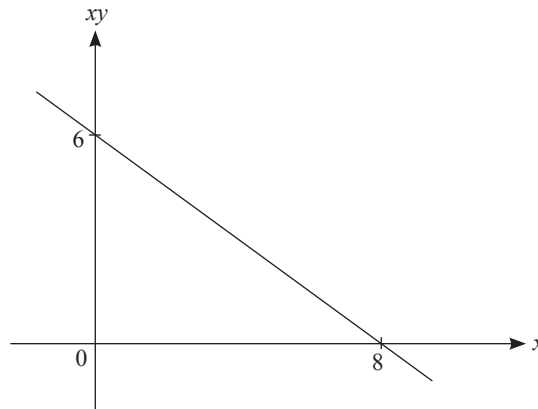
[2 markah/marks]

- (b) Tiga sebutan pertama bagi suatu jangjang aritmetik ialah 154, 146 dan 138. Diberi x ialah sebutan pertama yang bernilai negatif dalam jangjang 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:

- 6 Rajah 2.1 menunjukkan sebahagian graf garis lurus yang diperoleh dengan memplot xy melawan x .
Diagram 2.1 shows part of a straight line graph obtained by plotting xy against x .



Rajah/Diagram 2.1

- (a) Ungkapkan y dalam sebutan x .
Express y in terms of x .

[2 markah/marks]

- (b) Pada Rajah 2.2 di ruang jawapan, lukis dan label satu graf garis lurus yang diperoleh dengan memplot y melawan $\frac{1}{x}$.

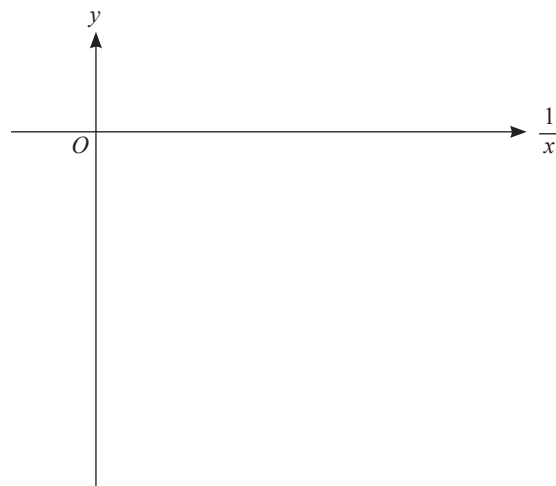
On Diagram 2.2 in the answer space, draw and label the straight line graph obtained by plotting y against $\frac{1}{x}$.

[2 markah/marks]

Jawapan/Answer:

- (a)

- (b)



Rajah/Diagram 2.2

- 7 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]

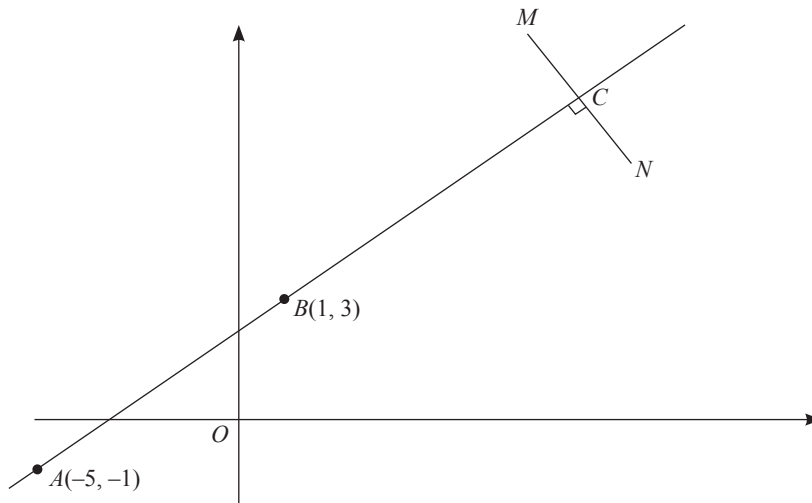
Jawapan/Answer:

- 8 Penyelesaian secara lukisan berskala **tidak** diterima.

*Solution by scale drawing is **not** accepted.*

Rajah 3 menunjukkan dua garis lurus ABC dan MCN .

Diagram 3 shows two straight lines ABC and MCN .



Rajah/Diagram 3

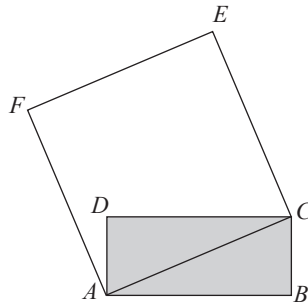
Diberi $AB : BC = 2 : 3$, cari persamaan garis lurus MCN .

Given that $AB : BC = 2 : 3$, find the equation of the straight line MCN .

[6 markah/marks]

Jawapan/Answer:

- 9 Rajah 5 menunjukkan sebuah segi empat tepat $ABCD$ dan sebuah segi empat sama $ACEF$.
Diagram 5 shows a rectangle $ABCD$ and a square $ACEF$.



Rajah/Diagram 5

Diberi $AB = (\sqrt{5} + 1)$ cm dan perimeter segi empat tepat $ABCD$ ialah $6\sqrt{5}$. Tulis luas segi empat sama $ACEF$ dalam bentuk $(a + b\sqrt{5})$ cm², dengan keadaan a , b dan c ialah integer.

Given $AB = (\sqrt{5} + 1)$ cm and the perimeter of rectangle $ABCD$ is $6\sqrt{5}$. Write the area of square $ACEF$ in the form $(a + b\sqrt{5})$ cm², such that a , b and c are integers.

[3 markah/marks]

Jawapan/Answer:

- 10 (a) Diberi bahawa $x = 3^a$ dan $y = 9^b$, ungkapkan $\log_9 \frac{\sqrt{y}}{81x^2}$ dalam sebutan a dan b .

It is given that $x = 3^a$ and $y = 9^b$, express $\log_9 \frac{\sqrt{y}}{81x^2}$ in terms of a and b .

[4 markah/marks]

- (b) Diberi bahawa $x^2 + 4y^2 = 5xy$, tunjukkan $\log(x - 2y) = \frac{1}{2}(\log x + \log y)$.

It is given that $x^2 + 4y^2 = 5xy$, show that $\log(x - 2y) = \frac{1}{2}(\log x + \log y)$.

[4 markah/marks]

Jawapan/Answer:

11 Penyelesaian secara lukisan berskala tidak diterima.*Solution by scale drawing is not accepted.*Diberi bahawa $\overrightarrow{AB} = -5\hat{i} + \hat{j}$ dan $\overrightarrow{AC} = -\hat{i} - 4\hat{j}$.*It is given that $\overrightarrow{AB} = -5\hat{i} + \hat{j}$ and $\overrightarrow{AC} = -\hat{i} - 4\hat{j}$.*

(a) Cari

Find(i) $\overrightarrow{BC}$,(ii) vektor unit dalam arah $\overrightarrow{BC}$.
the unit vector in the direction of $\overrightarrow{BC}$.

[4 markah/marks]

(b) Diberi $\overrightarrow{AD} = \hat{i} - 18\hat{j}$, dengan keadaan p ialah pemalar dan $\overrightarrow{AD}$ adalah selari dengan $\overrightarrow{BC}$. Cari nilai p .*Given $\overrightarrow{AD} = \hat{i} - 18\hat{j}$, such that p is a constant and $\overrightarrow{AD}$ is parallel to $\overrightarrow{BC}$. Find the value of p .*

[3 markah/marks]

Jawapan/Answer:

12 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:

Bahagian B
Section B

[16 markah]

[16 marks]

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

- 13 (a) Diberi bahawa $m(x) = 3x + a$, dengan keadaan a ialah pemalar. Ungkapkan a dalam sebutan k apabila $m(2k - 3) = 2a$.

Given that $m(x) = 3x + a$, such that a is a constant. Express a in terms of k when $m(2k - 3) = 2a$.

[2 markah/marks]

- (b) Diberi $g^{-1}(x) = 5x + 4$ dan $fg(x) = 1 + 2x$, cari

Given $g^{-1}(x) = 5x + 4$ and $fg(x) = 1 + 2x$, find(i) $fg[g^{-1}(3)]$

- (ii) fungsi $h(x)$ jika diketahui bahawa $fh(x) = 2x^2 + 7$.
the function $h(x)$ if it is known that $fh(x) = 2x^2 + 7$.

[6 markah/marks]

Jawapan/Answer:

14 Diberi bahawa 3, 9, 15, ... ialah suatu jangjang aritmetik.

It is given that 3, 9, 15, ... is an arithmetic progression.

(a) Cari hasil tambah $(n + 2)$ sebutan pertama bagi jangjang aritmetik itu dalam sebutan n .

Find the sum of the first $(n + 2)$ terms of the arithmetic progression in terms of n .

[3 markah/marks]

(b) Seterusnya, cari nilai n jika beza antara hasil tambah $(n + 2)$ sebutan pertama dengan hasil tambah n sebutan pertama adalah 72.

Hence, find the value of n if the difference between the sum of the first $(n + 2)$ terms and the sum of the first n term is 72.

[3 markah/marks]

(c) Berdasarkan jawapan di (b), tentukan hasil tambah $(n + 2)$ sebutan pertama bagi jangjang aritmetik itu.

Based on the answer in (b), determine the sum of the first $(n + 2)$ terms of the arithmetic progression.

[2 markah/marks]

Jawapan/Answer:

- 15 (a) Diberi bahawa persamaan kuadratik $x^2 + 5m - 2 = 2m(m - x)$ dengan keadaan m ialah pemalar mempunyai punca-punca α dan β .
It is given that the quadratic equation $x^2 + 5m - 2 = 2m(m - x)$ such that m is a constant has roots α and β .
- (i) Nyatakan $\alpha + \beta$ dan $\alpha\beta$ dalam sebutan m .
State $\alpha + \beta$ and $\alpha\beta$ in terms of m .
- (ii) Ungkapkan x dalam sebutan m .
Express x in terms of m .
- [4 markah/marks]
- (b) Diberi garis lurus $y = k + 1$ tidak bersilang dengan lengkung $2x^2 + xy = -2$. Cari julat nilai-nilai bagi k .
Given the straight line $y = k + 1$ does not intersect the curve $2x^2 + xy = -2$. Find the range of values of k .
- [4 markah/marks]

Jawapan/Answer:

KERTAS 2

Masa: 2 jam 30 minit

Bahagian A
Section A[50 markah]
[50 marks]Jawab **semua** soalan
Answer all questions

- 1 (a) Lakar graf fungsi kuadratik $f(x) = -3(x - 5)^2 + p$ dengan keadaan $p < 0$.
Sketch the quadratic function graph of $f(x) = -3(x - 5)^2 + p$ such that $p < 0$. [2 markah/marks]
- (b) Diberi bahawa α dan β ialah punca-punca bagi persamaan kuadratik $2x^2 + mx - n = 0$. Bentukkan satu persamaan kuadratik yang baharu dengan punca-punca α^2 dan β^2 .
It is given that α and β are roots of the quadratic equation $2x^2 + mx - n = 0$. Form a new quadratic equation with roots α^2 and β^2 . [6 markah/marks]

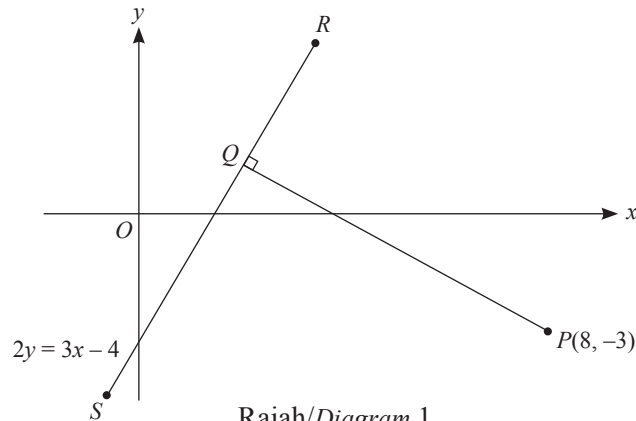
Jawapan/Answer:

2 Penyelesaian secara lukisan berskala **tidak** diterima.

*Solutions by scale drawing is **not** accepted.*

Rajah 1 menunjukkan dua garis lurus PQ dan RS . Persamaan garis lurus RS ialah $2y = 3x - 4$.

Diagram 1 shows two straight lines PQ and RS . The equation of straight line RS is $2y = 3x - 4$.



Rajah/Diagram 1

(a) Cari

Find

- (i) persamaan garis lurus PQ dalam bentuk am,
the equation of the straight line PQ in standard form,
- (ii) koordinat Q .
the coordinates of Q .

[5 markah/marks]

(b) Garis lurus PQ dipanjangkan ke titik T , dengan keadaan $PQ : QT = 2 : 3$. Cari koordinat T .

The straight line PQ is extended to the point T , such that $PQ : QT = 2 : 3$. Find the coordinates of T .

[3 markah/marks]

Jawapan/Answer:

3 Diberi bahawa $f: x \rightarrow |x - 5|$ dan $g: x \rightarrow 7 - 3x$.

It is given that $f: x \rightarrow |x - 5|$ and $g: x \rightarrow 7 - 3x$.

(a) Tentukan $gf(x)$.

Determine $gf(x)$.

[2 markah/marks]

(b) Lakar graf $f(x)$ untuk domain $-1 \leq x \leq 6$. Seterusnya, nyatakan julat bagi $f(x)$.

Sketch the graph of $f(x)$ for the domain $-1 \leq x \leq 6$. Hence, state the range of $f(x)$.

[4 markah/marks]

Jawapan/Answer:

- 4 Terdapat dua jangjang geometri, P dan Q dengan sebutan pertama masing-masing ialah 8 dan 16. Nisbah sepunya bagi P ialah m dan bagi Q pula ialah n dan kedua-duanya bernilai positif. Diberi bahawa kedua-dua jangjang itu mempunyai hasil tambah ketakterhinggaan yang sama dan hasil tambah sebutan ke-3 bagi P dan Q ialah $8\frac{1}{2}$.

There are two geometric progressions, P and Q with their first terms are 8 and 16 respectively. The common ratio of P is m while Q is n and both values are positive. Given that both progressions have the same sum to infinity and the sum of the 3rd terms of P and Q is $8\frac{1}{2}$.

- (a) Cari nilai m dan nilai n .

Find the value of m and of n .

[6 markah/marks]

- (b) Maria menyatakan bahawa hasil tambah 4 sebutan pertama bagi P adalah lebih besar daripada hasil tambah 4 sebutan pertama bagi Q . Adakah pernyataan itu benar? Wajarkan jawapan anda.

Maria states that the sum of the first 4 terms of P is larger than the sum of the first four terms of Q . Is the statement true? Justify your answer.

[3 markah/marks]

Jawapan/Answer:

- 5 Di sebuah taman tema, harga tiket masuk berbeza mengikut umur dengan kadar yang berlainan untuk kanak-kanak, remaja, dan dewasa. Keluarga Encik Chong melawat taman tema itu dan membeli 3 tiket kanak-kanak, 2 tiket remaja dan 1 tiket dewasa dengan jumlah harga sebanyak RM27. Keluarga Encik Fauzi membeli 4 tiket kanak-kanak, 3 tiket remaja dan 2 tiket dewasa dengan jumlah harga sebanyak RM42.50. Manakala, Encik Ravi membayar untuk keluarganya dengan membeli 1 tiket kanak-kanak dan 2 tiket dewasa dengan bayaran sejumlah RM17.

At a theme park, ticket prices vary by age with different rates for children, teens, and adults. Mr. Chong's family visited the park and bought 3 children's tickets, 2 teens' tickets and 1 adult ticket for a total price of RM27. Mr. Fauzi's family bought 4 children's tickets, 3 teens' tickets and 2 adult tickets with a total price of RM42.50. Meanwhile, Mr. Ravi paid for his family by buying 1 child ticket and 2 adult tickets for a total of RM17.

- (a) Tuliskan tiga persamaan linear untuk mewakili situasi yang diberi.

Write three linear equations to represent the given situation.

[2 markah/marks]

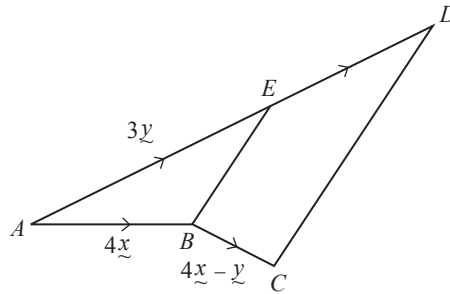
- (b) Seterusnya, tentukan harga sekeping tiket masuk, dalam RM, untuk setiap jenis tiket.

Hence, determine the price of an entrance ticket, in RM, for each type of tickets.

[5 markah/marks]

Jawapan/Answer:

- 6 Rajah 2 menunjukkan sebuah segi tiga ABE dan sebuah sisi empat $BCDE$. AED ialah satu garis lurus.
 Diagram 2 shows a triangle ABE and a quadrilateral $BCDE$. AED is a straight line.



Rajah/Diagram 2

Diberi bahawa $\vec{AB} = 4\vec{x}$, $\vec{AE} = 3\vec{y}$, $\vec{AE} = \frac{3}{5}\vec{AD}$ and $\vec{BC} = 4\vec{x} - \vec{y}$.

It is given that $\vec{AB} = 4\vec{x}$, $\vec{AE} = 3\vec{y}$, $\vec{AE} = \frac{3}{5}\vec{AD}$ and $\vec{BC} = 4\vec{x} - \vec{y}$.

- (a) Ungkapkan dalam sebutan $\vec{x}$ dan $\vec{y}$ bagi

Express in terms of $\vec{x}$ and $\vec{y}$ of

(i) $\vec{BE}$

(ii) $\vec{CD}$

[3 markah/marks]

- (b) Tunjukkan bahawa $\vec{CD}$ dan $\vec{BE}$ adalah selari.

Show that $\vec{CD}$ and $\vec{BE}$ are parallel.

[2 markah/marks]

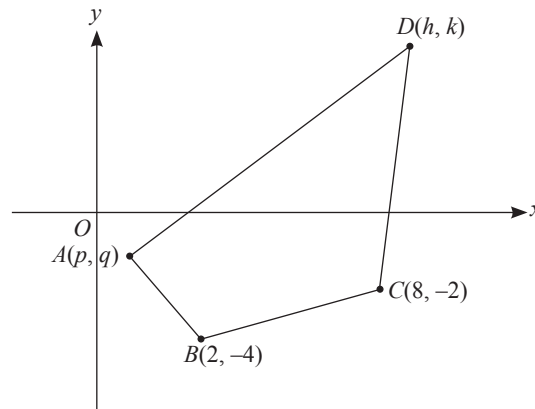
Jawapan/Answer:

7 Penyelesaian secara lukisan berskala **tidak** diterima.

*Solutions by scale drawing is **not** accepted.*

Rajah 3 menunjukkan kawasan kolam ikan Encik Samad yang dikelilingi oleh empat batang tiang di kedudukan $A(p, q)$, $B(2, -4)$, $C(8, -2)$ dan $D(h, k)$. Tiang E terletak pada garis lurus AD dan berkoordinat $(4, 4)$ dengan keadaan nisbah $AE : ED = 3 : 2$.

Diagram 3 shows the area of Mr. Samad's fish pond which is surrounded by four pillars at the position of $A(p, q)$, $B(2, -4)$, $C(8, -2)$ and $D(h, k)$. Pillar E lies on the straight line AD with the coordinates of $(4, 4)$ such that the ratio of $AE : ED = 3 : 2$.



Rajah/Diagram 3

(a) Sahkan $\frac{3k + 2q}{5} = 4$.

Verify that $\frac{3k + 2q}{5} = 4$.

[2 markah/marks]

(b) Diberi bahawa (p, q) ialah $(1, -1)$.

It is given that (p, q) is $(1, -1)$.

(i) Cari nilai h dan nilai k .

Find the value of h and of k .

(ii) Seterusnya, hitung luas kolam ikan Encik Samad.

Hence, calculate the area of Mr. Samad's fish pond.

[5 markah/marks]

Jawapan/Answer:

Bahagian B**Section B**

[30 markah]

[30 marks]

Jawab mana-mana **tiga** soalan.*Answer any **three** questions.*

- 8 Pada jam 1200, lori P berada pada vektor kedudukan $3\hat{i} + 3\hat{j}$ di lebuh raya O . Lori P bergerak dengan halaju $(4\hat{i} + \hat{j}) \text{ km j}^{-1}$. Sejam kemudian, lori Q bergerak dari vektor kedudukan $7\hat{i} - 17\hat{j}$ dengan halaju $(4\hat{i} + 8\hat{j}) \text{ km j}^{-1}$.

At 1200 hours, lorry P is at the position vector $3\hat{i} + 3\hat{j}$ at highway O . Lorry P is travelling with velocity $(4\hat{i} + \hat{j}) \text{ km h}^{-1}$.

An hour later, lorry Q is travelling from the position vector $7\hat{i} - 17\hat{j}$ with velocity $(4\hat{i} + 8\hat{j}) \text{ km h}^{-1}$.

- (a) Ungkapkan vektor kedudukan lori P dan lori Q pada waktu t jam.

Express the position vector of lorry P and of lorry Q at time t hours.

[3 markah/marks]

- (b) Gunakan jawapan anda di (a) untuk menentukan jarak lori P dan lori Q pada jam 1500.

Use your answers in (a) to determine the distance apart of lorry P and lorry Q at 1500 hours.

[3 markah/marks]

- (c) Tentukan sama ada lori P dan lori Q akan bertemu atau tidak. Jika ya, cari vektor kedudukan dan masa titik pertemuan.

Determine whether lorry P and lorry Q will meet or not. If they do, find the position vector and the time of the meeting point.

[4 markah/marks]

Jawapan/Answer:

9 (a) Diberi $3^{2x} = a^4 2^{3x}$, tunjukkan bahawa $x = \frac{4}{\log_a \left(\frac{9}{8} \right)}$.

Given $3^{2x} = a^4 2^{3x}$, show that $x = \frac{4}{\log_a \left(\frac{9}{8} \right)}$.

[3 markah/marks]

(b) Selesaikan persamaan berikut:

Solve the following equation:

$$\frac{\log_3(5x + 6)}{\log_9(x + 2)} = 4$$

[4 markah/marks]

(c) Titik $(1 - \sqrt{5}, n)$ terletak di atas lengkung $y = \frac{10 + 2\sqrt{5}}{x^2}$. Cari nilai n dalam bentuk $a + b\sqrt{5}$, dengan keadaan a dan b ialah integer.

Point $(1 - \sqrt{5}, n)$ lies on the curve $y = \frac{10 + 2\sqrt{5}}{x^2}$. Find the value of n in the form $a + b\sqrt{5}$, such that a and b are integers.

[3 markah/marks]

Jawapan/Answer:

- 10** Suatu fungsi kuadratik yang diberi oleh $f(x) = hx^2 + kx + 18$, dengan keadaan h dan k ialah pemalar, mempunyai titik minimum $(2, 6)$.

A quadratic function given by $f(x) = hx^2 + kx + 18$, such that h and k are constants, has a minimum point $(2, 6)$.

- (a) (i) Ungkapkan fungsi kuadratik itu dalam bentuk $f(x) = a(x + p)^2 + q$, dengan keadaan a , p dan q ialah pemalar.

Express the quadratic function in the form of $f(x) = a(x + p)^2 + q$, such that a , p and q are constants.

- (ii) Seterusnya, tentukan nilai-nilai h dan k .

Hence, determine the values of h and k .

[7 markah/marks]

- (b) Tentukan julat nilai x , jika $f(x) \leq 18$.

Determine the range of values of x , if $f(x) \leq 18$.

[3 markah/marks]

Jawapan/Answer:

- 11 Jadual 1 menunjukkan nilai-nilai bagi dua pemboleh ubah, x dan y , yang diperoleh daripada suatu eksperimen. Pemboleh ubah x dan y dihubungkan oleh persamaan $\frac{1}{b}y = x^a$, dengan keadaan a dan b ialah pemalar.

Table 1 shows the values of two variables, x and y , obtained from an experiment. The variables x and y are related by the equation $\frac{1}{b}y = x^a$, such that a and b are constants.

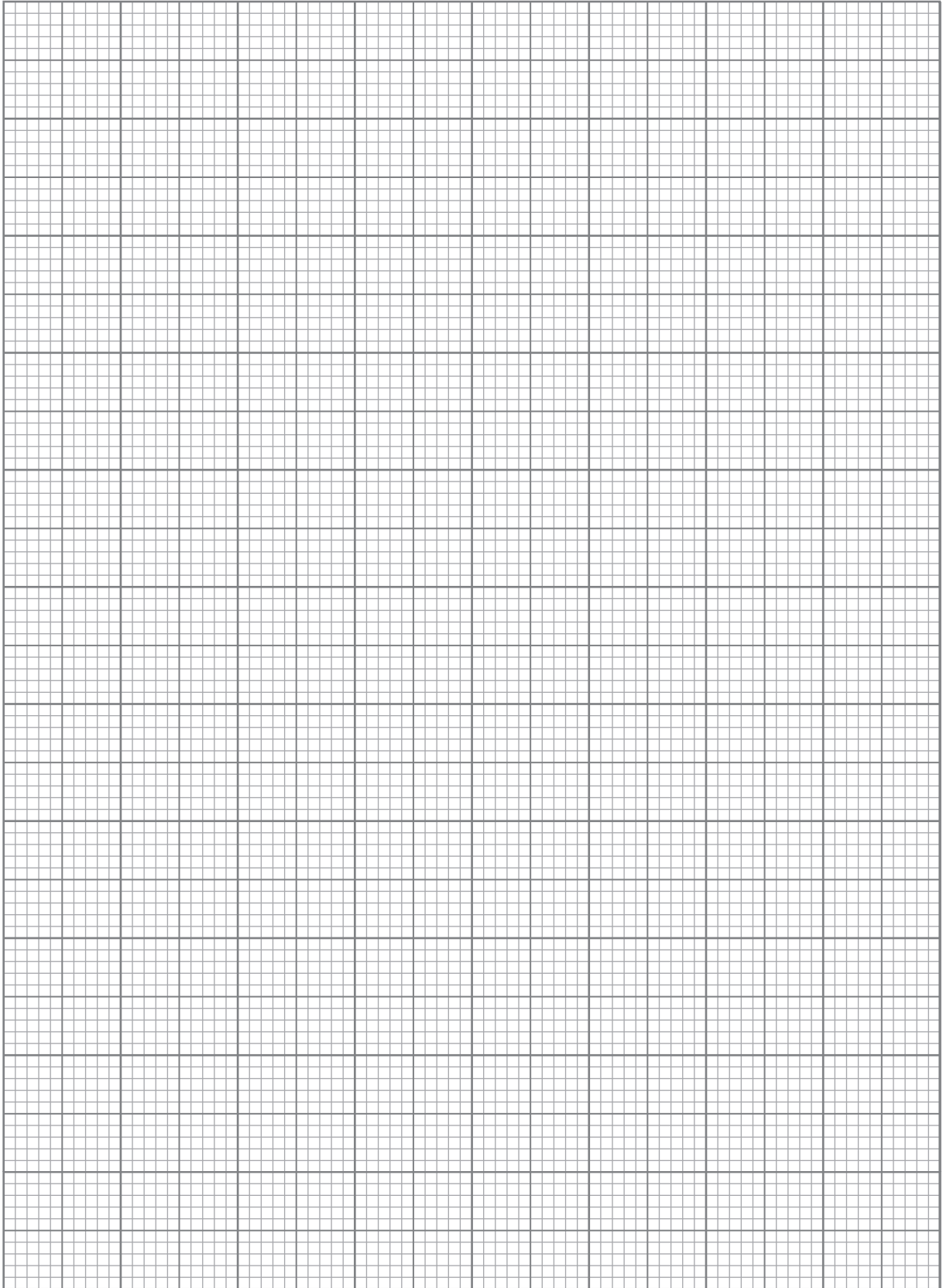
x	2.00	3.16	3.98	6.31	10.00	18.2
y	3.45	5.20	7.50	11.05	20.00	36.20

Jadual/Table 1

- (a) Berdasarkan Jadual 1, bina satu jadual bagi nilai-nilai $\log_{10} x$ dan $\log_{10} y$.
Based on Table 1, construct a table for the values $\log_{10} x$ and $\log_{10} y$. [2 markah/marks]
- (b) Plot graf $\log_{10} y$ melawan $\log_{10} x$, menggunakan skala 2 cm kepada 0.2 unit pada kedua-dua paksi. Seterusnya, lukis garis lurus penyuaian terbaik.
Plot graph $\log_{10} y$ against $\log_{10} x$, using a scale of 2 cm to 0.2 unit on both axes. Hence, draw the line of best fit. [3 markah/marks]
- (c) Tulis $\frac{1}{b}y = x^a$ dalam bentuk linear. Seterusnya, dengan menggunakan graf di (b), cari nilai a dan nilai b .
Write $\frac{1}{b}y = x^a$ in linear form. Hence, by using the graph in (b), find the value of a and of b . [5 markah/marks]

Jawapan/Answer:

Kertas graf untuk Soalan 11
Graph paper for Question 11



Bahagian C
Section C

[20 markah]
[20 marks]

Jawab **dua** soalan.
Answer **two** questions.

- 12 Jadual 2 menunjukkan harga dan indeks harga bagi tiga jenis bahan *A*, *B* dan *C* yang digunakan dalam penghasilan sejenis bebola ketam.
Table 2 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 <i>Ingredients</i>	Harga (RM) per kg pada tahun <i>Price (RM) per kg for the year</i>		Indeks harga pada tahun 2024 berasaskan tahun 2020 <i>Price indices in the year 2024 based on the year 2020</i>	Peratus penggunaan (%) <i>Percentage of usage (%)</i>
	2020	2024		
<i>A</i>	<i>y</i>	3.60	<i>x</i>	20
<i>B</i>	4.80	6.00	125	60
<i>C</i>	1.20	1.80	150	20

Jadual/Table 2

- (a) Harga bahan *A* meningkat sebanyak 20% dari tahun 2020 hingga tahun 2024.
The price of ingredient A is increased by 20% from the year 2020 to the year 2024.
(i) Nyatakan nilai *x*.
State the value of x.
(ii) Cari nilai *y*.
Find the value of y.
[3 markah/marks]
- (b) Hitung indeks gubahan bagi kos membuat bebola ketam pada tahun 2024 berasaskan tahun 2020.
Calculate the composite index for the cost of making the crab balls for the year 2024 based on the year 2020.
[2 markah/marks]
- (c) Diberi bahawa indeks gubahan bagi kos membuat bebola ketam meningkat sebanyak 49% dari tahun 2017 hingga tahun 2024.
It is given that the composite index for the cost of making the crab balls increased by 49% from the year 2017 to the year 2024.
(i) Hitung indeks gubahan bagi kos membuat bebola ketam pada tahun 2020 berasaskan 2017.
Calculate the composite index for the cost of making the crab balls in the year 2020 based on the year 2017.
(ii) Kos membuat sebiji bebola ketam ialah 50 sen dalam tahun 2017. Cari bilangan maksimum bebola ketam yang boleh dihasilkan menggunakan peruntukan sebanyak RM300 pada tahun 2024.
The cost of making a crab ball is 50 cent in the year 2017. Find the maximum number of crab balls that can be produced using an allocation of RM300 in the year 2024.
[5 markah/marks]

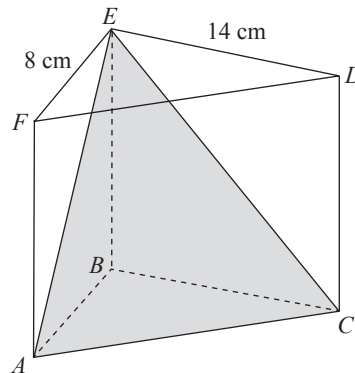
Jawapan/*Answer*:

13 Penyelesaian secara lukisan berskala **tidak** diterima.

*Solution by scale drawing is **not** accepted.*

Rajah 4 menunjukkan sebuah prisma tegak, dengan keadaan tapak ABC berbentuk segi tiga bersudut cakah. Titik E berada pada 15 cm tegak di atas titik B .

Diagram 4 shows a right prism, such that the base ABC is an obtuse-angled triangle. Point E is 15 cm vertically above point B .



Rajah/Diagram 4

Diberi bahawa $\angle EDF = 17.08^\circ$,

It is given that $\angle EDF = 17.08^\circ$,

(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/Answer:

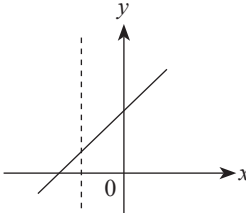
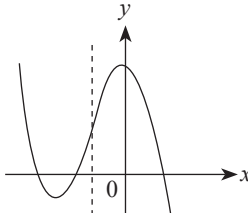
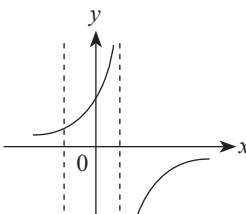
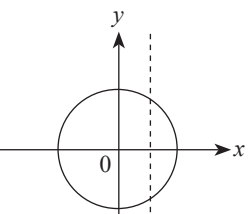
JAWAPAN

Tingkatan 4

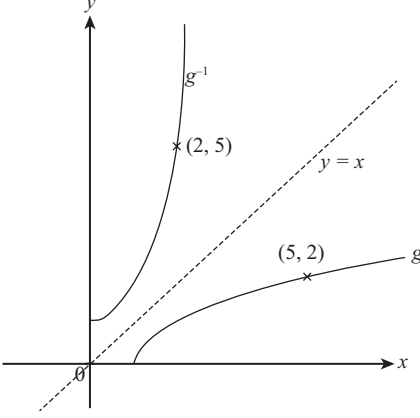
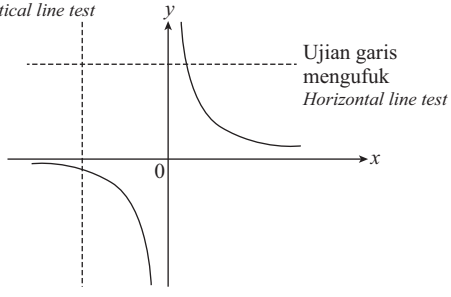


Fungsi

Functions

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	(a) (i) $\text{Imej/Image} = 2, 4$ (ii) $\text{Kodomain/Codomain} = \{0, 2, 4, 6, 8\}$ (b) $\{(1, 2), (1, 4), (2, 6), (3, 8)\}$	1 1 1	3
2	(a)  Fungsi (b)  Fungsi (c)  Fungsi (d)  Bukan Fungsi	1, 1 1, 1	4
3	(a) $k = 3$ (b) $f(x) = x + 1$	1 1	2
4	(a) $\text{Imej/Image} = 1, 2, 3$ (b) $\text{Objek/Object} = A, B$	1 1	2
5	Katakan/Suppose $y = 4x + m$ $x = \frac{y - m}{4}$ Maka/Hence $h^{-1}(x) = \frac{x - m}{4}$ Bandingkan dengan/Comparing with $h^{-1}: x \rightarrow 2kx + \frac{5}{8}$ $-\frac{m}{4} = \frac{5}{8} \quad \text{dan/and} \quad 2k = \frac{1}{4}$ $m = -\frac{5}{8} \times 4 \quad k = \frac{1}{4 \times 2}$ $= -\frac{5}{2} \quad = \frac{1}{8}$	1 1 1, 1	4

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
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	(a) Katakan/Suppose $y = \frac{6}{x}$ $x = \frac{6}{y}$ Maka/Hence $h^{-1}(x) = \frac{6}{x}, x \neq 0$ $h^{-1}(x)[hg(x)] = \frac{6}{3x}, x \neq 0$ $g(x) = \frac{2}{x}, x \neq 0$ (b) $g[h(x)] = 5$ $\frac{2}{\frac{6}{x}} = 5$ $\frac{1}{3}x = 5$ $x = 5 \times 3$ $= 15$	1 1 1 1	4
8	(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
9	(a) 3 (b) $f^2(2) = ff(2)$ $= f(4)$ $= 10$	1 1 1	3

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
10	(a) $f(x) = x - 3$ (b) $x - 3 = \pm 6$ $x - 3 = 6$ dan/and $x - 3 = -6$ $x = 6 + 3$ $x = -6 + 3$ $= 9$ dan/and $= -3$	1 1 1	3
11	 Lakaran graf g The sketching of graph g Koordinat titik sepadan The corresponding coordinates	1 1	2
12	$\frac{a(2)}{b+2} = 1$ 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
13	(a) Graf ini ialah suatu fungsi. This graph is a function. Ini kerana, apabila diuji dengan ujian garis mencancang, garis itu memotong graf hanya pada satu titik sahaja. This is because when the vertical line test is carried out, the line cuts the graph at only one point. (b) Graf ini mempunyai fungsi songsang. This graph has an inverse function. Ini kerana, apabila diuji dengan ujian garis mengufuk, garis memotong graf hanya pada satu titik sahaja. When the horizontal line test is carried out, the line cuts the graph at only one point. 	1 1 1 1	4

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
14	(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 $y = \frac{4x-19}{x-4}$ $y(x-4) = 4x-19$ $xy-4y = 4x-19$ $xy-4x = 4y-19$ $x(y-4) = 4y-19$ $x = \frac{4y-19}{y-4}$ $\therefore (hg)^{-1}(x) = \frac{4x-19}{x-4}$ Oleh sebab $hg(x) = (hg)^{-1}(x) = \frac{4x-19}{x-4}$, maka, $hg(x)$ ialah fungsi songsang pemetaan ke atas diri sendiri. Since $hg(x) = (hg)^{-1}(x) = \frac{4x-19}{x-4}$, thus $hg(x)$ is the inverse function maps to itself.	1 1 1 1 1 1	5
15	(a) 12 (b) 5	1 1	2
16	(a) $g(x) = \frac{3}{x}$ $g^2(x) = g[g(x)]$ $= g\left(\frac{3}{x}\right)$ $= \frac{3}{\left(\frac{3}{x}\right)}$ $= x$ $g^3(x) = g[g^2(x)]$ $= g(x)$ $= \frac{3}{x}$	1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	$g^4(x) = g[g^3(x)]$ $= g\left(\frac{3}{x}\right)$ $= \frac{3}{\left(\frac{3}{x}\right)}$ $= x$ atau/or $g^4(x) = g^2[g^2(x)]$ $= g^2(x)$ $= x$	1	5
	(b) $g^{6n^2}, n = 1, 2, 3, 4, \dots$ $g^{6(1)^2}(x) = g^6(x) = x$ $g^{6(2)^2}(x) = g^{24}(x) = x$ $g^{6(3)^2}(x) = g^{54}(x) = x$ $g^{6(4)^2}(x) = g^{96}(x) = x$ $\therefore g^{6n^2} = x$	1 1	
17	(a) $\frac{p}{2} = 5$ $p = 10$ (b) Kecerunan/Gradient, $m = \frac{5 - (-3)}{2 - 0}$ $= \frac{8}{2}$ $= 4$ $f(x) = 4x - 3$ Katakan/Suppose $y = 4x - 3$ $x = \frac{y + 3}{4}$ $\therefore f^{-1}(x) = \frac{x + 3}{4}$	1 1 1 1 1	5
18	$f^2(x) = ff(x)$ $= f(5x - 3)$ $= 5(5x - 3) - 3$ $= 25x - 15 - 3$ $= 25x - 18$ atau/or $g^2(x) = gg(x)$ $= g(7x + 2)$ $= 7(7x + 2) + 2$ $= 49x + 14 + 2$ $= 49x + 16$ $f^2 = g^2$ $25x - 18 = 49x + 16$ $24x = -34$ $x = -\frac{17}{12}$	1 1 1	3
19	(a) $x = 120 - k$ $M = 400 + \sqrt{120 - k}$ (b) $M = 400 + \sqrt{120 - 20}$ $= \text{RM}410$	1 1 1 1	4
20	(a) (i) $V(t) = 60 - 8t$ (ii) $V = \frac{1}{3}\pi j^2 h$ $h = \frac{3V}{\pi j^2}$	1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(iii) $hV(t) = \frac{3(60 - 8t)}{\pi j^2}$ Apabila jejari/When the radius, $j = 10$ cm $hV(t) = \frac{3(60 - 8t)}{\pi(10)^2}$ $= \frac{180 - 24t}{100\pi}$ $hV(t) = \frac{45 - 6t}{25\pi}$	1 1 1	7
	(b) Apabila/When $t = 30$ saat/seconds $h(30) = \frac{45 - 6(30)}{25\pi} \quad (\pi = 3.142)$ $= -1.719$ $\therefore h = 0$ cm	1 1	

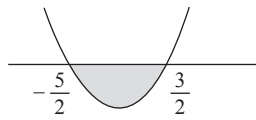


Fungsi Kuadratik

Quadratic Functions

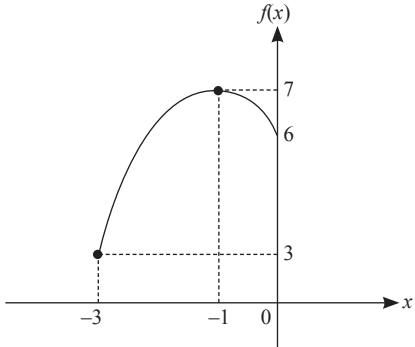
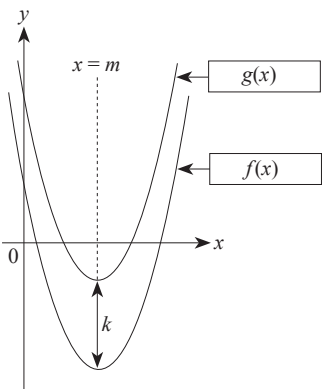
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	$x(3x + 1) - x^2 \leq x^2 + 12$ $3x^2 + x - x^2 - x^2 - 12 \leq 0$ $x^2 + x - 12 \leq 0$ $(x - 3)(x + 4) \leq 0$ $0 < x \leq 3$ Nilai x yang mungkin ialah 1, 2 dan 3. The possible values of x are 1, 2 and 3.	1 1 1	3
2	(a) $\alpha = -\frac{3}{2}, \beta = 3$ Hasil tambah punca/Sum of roots $= \alpha + \beta$ $= -\frac{3}{2} + 3$ $= \frac{3}{2}$ Hasil darab punca/Product of roots $= \alpha\beta$ $= -\frac{3}{2} \times 3$ $= -\frac{9}{2}$ Ketaksamaan kuadratik/The quadratic: $x^2 - (\alpha + \beta)x + (\alpha\beta) = 0$ $x^2 - \frac{3}{2}x + \left(-\frac{9}{2}\right) = 0$ $2x^2 - 3x - 9 = 0$ $(2x + 3)(x - 3) > 0$ $2x^2 - 6x + 3x - 9 > 0$ $2x^2 - 3x - 9 > 0$	1 1	

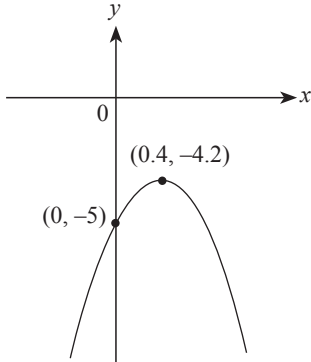
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) $x^2 + px + 9 = 0$ $x^2 - \left(\begin{array}{c} \text{Hasil tambah punca} \\ \text{Sum of roots} \end{array} \right) x + \left(\begin{array}{c} \text{Hasil darab punca} \\ \text{Product of roots} \end{array} \right) = 0$ Hasil darab punca/Product of roots = 9 $n(6 - n) = 9$ $6n - n^2 - 9 = 0$ $n^2 - 6n + 9 = 0$ $(n - 3)^2 = 0$ $n - 3 = 0$ $n = 3$ Hasil tambah punca/Sum of roots = -p $n + 6 - n = -p$ $-p = 6$ $p = -6$	1 1 1	5
3	(a) $x^2 + qx + r = 0$ $x^2 - \left(\begin{array}{c} \text{Hasil tambah punca} \\ \text{Sum of roots} \end{array} \right) x + \left(\begin{array}{c} \text{Hasil darab punca} \\ \text{Product of roots} \end{array} \right) = 0$ Hasil tambah punca/Sum of roots = q $\alpha + \alpha + 2 = -q$ $2\alpha + 2 = -q$ $\alpha = \frac{-q - 2}{2}$ Hasil darab punca/Product of roots = r $\alpha(\alpha + 2) = r$ $\alpha^2 + 2\alpha = r$ $r = \alpha^2 + 2\alpha$ $r = \left(\frac{-q - 2}{2} \right)^2 + 2 \left(\frac{-q - 2}{2} \right)$ $r = \frac{q^2 + 4q + 4 - 4q - 8}{4}$ $r = \frac{q^2 - 4}{4}$ (b) $3x^2 - px + 5 = 0$ $3\left(\frac{5}{3}\right)^2 - p\left(\frac{5}{3}\right) + 5 = 0$ $\frac{25}{3} - p\frac{5}{3} + 5 = 0$ $\frac{5}{3}p = \frac{25}{3} + 5$ $p = \frac{\frac{25}{3} + 3}{3}$ $= 8$	1 1 1 1 1	6
4	$(x - 4)(x + 9) = 0$ $x^2 + 9x - 4x - 36 = 0$ $x^2 + 5x - 36 = 0$ Katakan/Suppose $2^m = x$, $(2^m)^2 + 5(2^m) - 36 = 0$ $4^m + 5(2^m) - 36 = 0 \text{ (Terbukti/Proven)}$ $2^m = 4$ $2^m = 2^2$ $m = 2$	1 1 1 1 1	5

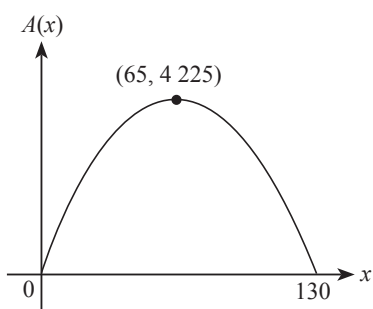
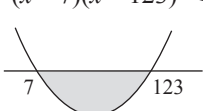
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
5	Diberi titik maksimum di $(-3, 14)$, maka $y = m(x + 3)^2 + 14$. <i>Given the maximum point at $(-3, 14)$, then $y = m(x + 3)^2 + 14$.</i> Gantikan titik $(0, -4)$ ke dalam $y = m(x + 3)^2 + 14$, maka <i>Substitute point $(0, -4)$ into $y = m(x + 3)^2 + 14$, then</i> $-4 = m(0 + 3)^2 + 14$ $9m = -18$ $m = -2$ Oleh itu/<i>Therefore</i>, $y = -2(x + 3)^2 + 14$ $y = -2(x^2 + 6x + 9) + 14$ $y = -2x^2 - 12x - 4$ Bandingkan dengan/<i>Compare with</i> $y = ax^2 + bx + c$ Maka/<i>Therefore</i>, $a = -2$, $b = -12$, $c = -4$ Persamaan lengkung/<i>Equation of the curve</i>: $y = -2(x + 3)^2 + 14$	1 1 1	3
6	(a) $(2x - 3)^2 \leq 8(3 - 2x)$ $4x^2 - 12x + 9 \leq 24 - 16x$ $4x^2 + 4x - 15 \leq 0$ $(2x - 3)(2x + 5) \leq 0$  $-\frac{5}{2} \leq x \leq \frac{3}{2}$ (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/<i>Minimum point</i> $(-3, -4)$ Paksi simetri/<i>Axis of symmetry</i>, $x = -3$	1 1 1 1 1 1 1	7
7	(a) (i) $f(x) = hx^2 + kx - 6$ $= h\left(x^2 + \frac{k}{h}x\right) - 6$ $= h\left[x^2 + \frac{k}{h}x + \left(\frac{k}{2h}\right)^2 - \left(\frac{k}{2h}\right)^2\right] - 6$ $= h\left[x^2 + \frac{k}{h}x + \left(\frac{k}{2h}\right)^2 - \left(\frac{k}{2h}\right)^2\right] - 6$ $= h\left[\left(x + \frac{k}{2h}\right)^2 - \frac{k^2}{4h^2}\right] - 6$ $= h\left(x + \frac{k}{2h}\right)^2 - \frac{k^2}{4h} - 6$	1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(ii) Diberi titik maksimum (3, 12) maka <i>Given the maximum point (3, 12), then</i> $-\frac{k}{2h} = 3$ $k = 3 \times (-2h)$ $= -6h \quad \dots \textcircled{1}$ $-\frac{k^2}{4h} - 6 = 12 \quad \dots \textcircled{2}$ Gantikan ① ke dalam ②: <i>Substitute ① into ②:</i> $-\frac{(-6h)^2}{4h} - 6 = 12$ $-\frac{36h^2}{4h} - 6 = 12$ $-9h = 12 + 6$ $h = \frac{18}{-9}$ $= -2$ Gantikan $h = -2$ ke dalam ①: <i>Substitute $h = -2$ into ①:</i> $k = -6(-2)$ $k = 12$ (b) $y = 4t \quad \dots \textcircled{1}$ $y = -2x^2 + 12x - 6 \quad \dots \textcircled{2}$ Gantikan ① ke dalam ②: <i>Substitute ① into ②:</i> $-2x^2 + 12x - 6 = 4t$ $2x^2 - 12x + 6 + 4t = 0$ Guna $b^2 - 4ac = 0$ kerana bersilang hanya pada satu titik. <i>Use $b^2 - 4ac = 0$ because intersects at only one point.</i> $(-12)^2 - 4(2)(6 + 4t) = 0$ $144 - 8(6 + 4t) = 0$ $144 - 48 - 32t = 0$ $96 - 32t = 0$ $32t = 96$ $t = 3$	1 1 1	6
8	(a) $f(x) = a(x - b)^2 + c$ Berdasarkan graf/<i>Based on the graph,</i> $c = 30, b = \frac{0 + 60}{2} = 30$ Maka/<i>Thus,</i> $f(x) = -a(x - 30)^2 + 30$ Apabila/<i>When</i> $x = 0, f(x) = 0$ $-a(0 - 30)^2 + 30 = 0$ $-900a + 30 = 0$ $a = \frac{30}{900}$ $a = \frac{1}{30}$	1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	Maka/Thus, $f(x) = -\frac{1}{30}(x-30)^2 + 30$ $= -\frac{1}{30}(x^2 - 60x + 900) + 30$ $= -\frac{1}{30}x^2 + 2x - 30 + 30$ $f(x) = -\frac{1}{30}x^2 + 2x$ (b) $g(x) = -\frac{3}{250}x^2 + \frac{6}{5}x$ $= -\frac{3}{250}(x^2 - 100x)$ $= -\frac{3}{250}\left[x^2 - 100x + \left(-\frac{100}{2}\right)^2 - \left(-\frac{100}{2}\right)^2\right]$ $= -\frac{3}{250}[(x-50)^2 - 2500]$ $= -\frac{3}{250}(x-50)^2 + 30$ Jarak AB/Distance of AB = 50 - 30 = 20 unit	1 1 1 1	6
9	(a) Daripada graf, paksi simetri ialah $x = -3$ From the graph, the axis of symmetry is $x = -3$ Daripada persamaan, paksi simetri ialah $x = p$, maka $p = -3$ From the equation, the axis of symmetry is $x = p$, then $p = -3$ $q - 1 = 4$ $q = 4 + 1$ $q = 5$ (b) $(x - (-3))^2 - 4 = 0$ $(x + 3)^2 - 4 = 0$ $x^2 + 6x + 9 - 4 = 0$ $x^2 + 6x + 5 = 0$ $(x + 1)(x + 5) = 0$ $x + 1 = 0, \quad x + 5 = 0$ $x = -1 \quad x = -5$ $B(-1, 0)$ (c) $(-3, -4)$	1 1 1 1 1 1	5
10	(a) $A(0, 6)$ (b) $f(x) = -x^2 + px + 6$ $= -(x^2 - px - 6)$ $= -\left[x^2 - px + \left(\frac{-p}{2}\right)^2 - \left(\frac{-p}{2}\right)^2 - 6\right]$ $= -\left[\left(x - \frac{p}{2}\right)^2 - \frac{p^2}{4} - 6\right]$ $= -\left(x - \frac{p}{2}\right)^2 + \frac{p^2}{4} + 6$	1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	Apabila nilai maksimum ialah $(-1, k)$ maka <i>When the maximum value is $(-1, k)$ then</i> $\frac{p}{2} = -1$ $p = -2$ $\frac{p^2}{4} + 6 = k$ $\frac{(-2)^2}{4} + 6 = k$ $1 + 6 = k$ $k = 7$ (c)  Graf kuadratik <i>Quadratic graph</i> Titik maksimum $(-1, 7)$ <i>Maximum point $(-1, 7)$</i> Pintasan-y <i>y-intercept</i>	1 1 1 1	6
11	(a)  (b) (i) $x = -\frac{b}{2a}$ $m = -\frac{(-5)}{2(1)}$ $m = \frac{5}{2}$ (ii) $k = 2a + 3 - 2a$ $k = 3$ (c) Dengan menggunakan kaedah penyempurnaan kuasa dua, <i>By using completing the square method,</i> $f(x) = x^2 - 5x + 2a$ $= x^2 - 5x + \left(-\frac{5}{2}\right)^2 - \left(-\frac{5}{2}\right)^2 + 2a$ $= \left(x - \frac{5}{2}\right)^2 - \frac{25}{4} + 2a$ $-\frac{25}{4} + 2a = -\frac{13}{4}$ $2a = 3$ $a = \frac{3}{2}$	1 1 1 1 1 1 1	7

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
12	(a) $f(x) = -(x+3)^2 + 3k - 1$ Persamaan paksi simetri/<i>Axis of symmetry</i>, $x = -3$ (b) $3k - 1 = 7$ $3k = 7 + 1$ $k = \frac{8}{3}$ Persamaan lengkung apabila dipantulkan pada paksi-x: <i>The equation of the curve when reflected on the x-axis:</i> $y = (x+3)^2 - 7$ $y = x^2 + 6x + 9 - 7$ $y = x^2 + 6x + 2$	1 1 1 1	4
13	(a) (i) Graf akan bergerak ke bawah secara mencancang. <i>The graph will moves down vertically.</i> (ii) Graf akan bergerak ke kanan secara mengufuk. <i>The graph will moves to the right horizontally.</i> (b) $f(x) = -2(x-k)^2 + h$	1 1 1	3
14	(a) (i)  Bentuk graf/<i>Shape of the graph</i> $\cap$ Pintasan-y/<i>y-intercept</i> Titik maksimum/<i>Maximum point</i> (ii) $g(x) = -(-5x^2 + 4x - 5) + 2(-2)$ $g(x) = 5x^2 - 4x + 1$ (b) $3m^2 - 7m - 2 = 4$ $3m^2 - 7m - 6 = 0$ $(3m+2)(m-3) = 0$ $m = -\frac{2}{3}$ atau/<i>or</i> $m = 3$	1 1 1 1 1 1 1 1	7
15	(a) Hasil tambah punca/<i>Sum of roots</i>: $\alpha + \beta = 2 - \sqrt{\frac{2}{3}} + 2 + \sqrt{\frac{2}{3}}$ $= 4$ Hasil darab punca/<i>Product of roots</i>: $\alpha\beta = \left(2 - \sqrt{\frac{2}{3}}\right)\left(2 + \sqrt{\frac{2}{3}}\right)$ $= 4 - \frac{2}{3}$ $= \frac{10}{3}$ Persamaan kuadratik/<i>Quadratic equation</i>: $-[x^2 - (2 - \sqrt{\frac{2}{3}} + 2 + \sqrt{\frac{2}{3}})x + (2 - \sqrt{\frac{2}{3}})(2 + \sqrt{\frac{2}{3}})] = 0$ $-(x^2 - 4x + \frac{10}{3}) = 0$ $-3x^2 + 12x - 10 = 0$ Maka/<i>Thus</i>, $f(x) = -3x^2 + 12x - 10$	1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	$f(x) = -3x^2 + 12x - 10$ $= -3\left(x^2 - 4x + \frac{10}{3}\right)$ $= -3\left[x^2 - 4x + \left(-\frac{4}{2}\right)^2 - \left(-\frac{4}{2}\right)^2 + \frac{10}{3}\right]$ $= -3\left[(x-2)^2 - \frac{2}{3}\right]$ $= -3(x-2)^2 + 2$ (b) $f(x) = -3(x-2)^2$ (c) $g(x) = -2[-3(x-2)^2 + 2] + 3$ $= 6(x-2)^2 - 4 + 3$ $= 6(x-2)^2 - 1$ Titik minimum/Minimum point (2, -1)	1 1 1 1	7
16	(a) Anggap lebar bingkai gambar sebagai y. <i>Let the width of picture frame be y.</i> $2x + 2y = 260$ $y = 130 - x$ Luas bingkai gambar/Area of picture frame: $A(x) = xy$ $A(x) = x(130 - x)$ $A(x) = 130x - x^2$ (b) $A(x)$  Bentuk graf/Shape of the graph $\cap$ Pintasan-x/x-intercept Titik maksimum/Maximum point (c) $130x - x^2 \geq 861$ $-x^2 + 130x - 861 \geq 0$ $x^2 - 130x + 861 \leq 0$ $(x-7)(x-123) \leq 0$  $7 \leq x \leq 123$	1 1 1 1 1 1	8

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Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(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	8



Sistem Persamaan *Systems of Equations*

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	$9x - 2y = 6 \quad \dots \textcircled{1}$ $4y - 2x - z = -8 \quad \dots \textcircled{2}$ $3x + 6z - y = 2 \quad \dots \textcircled{3}$ Daripada persamaan $\textcircled{1}$, <i>From equation $\textcircled{1}$,</i> $x = \frac{6 + 2y}{9} \quad \dots \textcircled{4}$ Gantikan $\textcircled{4}$ ke dalam $\textcircled{2}$: <i>Substitute $\textcircled{4}$ into $\textcircled{2}$:</i> $4y - 2\left(\frac{6 + 2y}{9}\right) - z = -8$ $z = \frac{32y + 60}{9} \quad \dots \textcircled{5}$ Gantikan $\textcircled{4}$ ke dalam $\textcircled{3}$: <i>Substitute $\textcircled{4}$ into $\textcircled{3}$:</i> $3\left(\frac{6 + 2y}{9}\right) + 6z - y = 2$ $2 + \frac{2y}{3} + 6z - y = 2$ $6z = \frac{y}{3}$ $z = \frac{y}{18} \quad \dots \textcircled{6}$ Gantikan $\textcircled{5}$ ke dalam $\textcircled{6}$: <i>Substitute $\textcircled{5}$ into $\textcircled{6}$:</i> $\frac{32y + 60}{9} = \frac{y}{18}$ $576y + 1\,080 = 9y$ $567y = -1\,080$ $y = -\frac{40}{21}$	1 1 1	

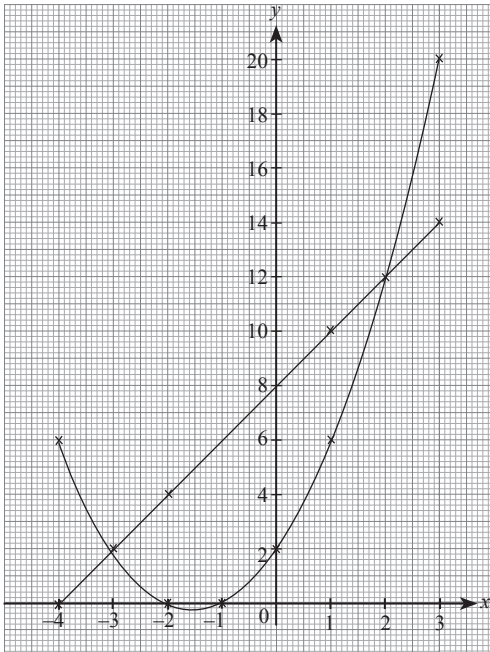
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	Gantikan $y = -\frac{40}{21}$ ke dalam ⑤: <i>Substitute $y = -\frac{40}{21}$ into ⑤:</i> $z = \frac{32\left(-\frac{40}{21}\right) + 60}{9}$ $= -\frac{20}{189}$ Gantikan $y = -\frac{40}{21}$ ke dalam ④: <i>Substitute $y = -\frac{40}{21}$ into ④:</i> $x = \frac{6 + 2\left(-\frac{40}{21}\right)}{9}$ $= \frac{46}{189}$ Maka, $x = \frac{46}{189}$, $y = -\frac{40}{21}$, $z = -\frac{20}{189}$ ialah penyelesaian bagi sistem persamaan linear ini. <i>Therefore, $x = \frac{46}{189}$, $y = -\frac{40}{21}$, $z = -\frac{20}{189}$ are the solutions for the system of linear equations.</i>	1 1	5
2	$4q - 2p - r = -8 \quad \dots \text{①}$ $3p + 6r - q = 2 \quad \dots \text{②}$ $9p - 2q = 4 \quad \dots \text{③}$ Daripada/From ①, $r = 4q - 2p + 8 \quad \dots \text{④}$ Gantikan ④ ke dalam ② <i>Substitute ④ into ②</i> $3p + 6(4q - 2p + 8) - q = 2$ $3p + 24q - 12p + 48 - q = 2$ $23q - 9p + 46 = 0$ $9p = 23q + 46 \quad \dots \text{⑤}$ Gantikan ⑤ ke dalam ③ <i>Substitute ⑤ into ③</i> $23q + 46 - 2q = 4$ $21q = -42$ $q = -2$ Gantikan $q = -2$ ke dalam ⑤ <i>Substitute $q = -2$ into ⑤</i> $9p = 23(-2) + 46$ $9p = 0$ $p = 0$ Gantikan $p = 0$ dan $q = -2$ ke dalam ④ <i>Substitute $p = 0$ and $q = -2$ into ④</i> $r = 4(-2) - 2(0) + 8$ $r = 0$ $p = 0$ dan/and $r = 0$ Maka/Thus, $p = 0$, $q = -2$ dan/and $r = 0$.	1 1 1 1 1	5

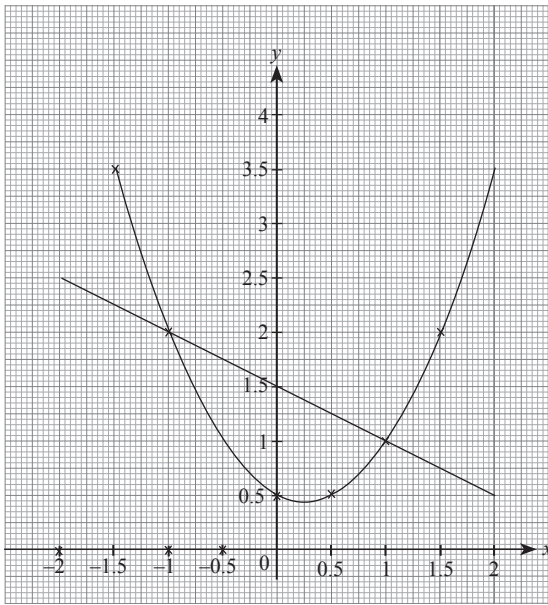
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
3	$\begin{aligned} -6x - 10y + 4z &= -26 \quad \dots \textcircled{1} \\ 5x + 2y + 4z &= -20 \quad \dots \textcircled{2} \\ 14x + 17y - 2z &= 19 \quad \dots \textcircled{3} \end{aligned}$ Daripada ①, From ①, $-6x - 10y + 4z = -26$ $x = \frac{13 - 5y + 2z}{3} \quad \dots \textcircled{4}$ Gantikan ④ ke dalam ②: Substitute ④ into ②: $5\left(\frac{13 - 5y + 2z}{3}\right) + 2y + 4z = -20$ $\frac{-19y + 22z + 65}{3} = -20$ $y = \frac{22z + 125}{19} \quad \dots \textcircled{5}$ Gantikan ④ ke dalam ③: Substitute ④ into ③: $14\left(\frac{13 - 5y + 2z}{3}\right) + 17y - 2z = 19$ $\frac{-19y + 22z + 182}{3} = 19 \quad \dots \textcircled{6}$ Gantikan ⑤ ke dalam ⑥: Substitute ⑤ into ⑥: $\frac{-19\left(\frac{22z + 125}{19}\right) + 22z + 182}{3} = 19$ $\frac{-22z - 125 + 22z + 182}{3} = 19$ $19 = 19$ Maka, sistem persamaan linear ini mempunyai penyelesaian tak terhingga kerana $19 = 19$. Therefore, the system of linear equations has infinity solution because $19 = 19$.	1 1 1 1 1	5
4	$\begin{aligned} -x + y + 2z &= -3 \quad \dots \textcircled{1} \\ 2x + 3y + 2z &= 2 \quad \dots \textcircled{2} \\ -3x - y + 3z &= -4 \quad \dots \textcircled{3} \end{aligned}$ $\textcircled{1} \times 2: -2x + 2y + 4z = -6 \quad \dots \textcircled{4}$ $\textcircled{4} + \textcircled{2}: \quad -2x + 2y + 4z = -6$ $\begin{array}{r} (+) \quad 2x + 3y + 2z = 2 \\ \hline \quad \quad 5y + 6z = -4 \quad \dots \textcircled{5} \end{array}$ $\textcircled{1} \times 3: -3x + 3y + 6z = -9 \quad \dots \textcircled{6}$ $\textcircled{6} - \textcircled{3}: \quad -3x + 3y + 6z = -9$ $\begin{array}{r} (-) \quad -3x - y + 3z = -4 \\ \hline \quad \quad 4y + 3z = -5 \quad \dots \textcircled{7} \end{array}$ $\textcircled{7} \times 2: 8y + 6z = -10 \quad \dots \textcircled{8}$ $\textcircled{8} - \textcircled{5}: \quad 8y + 6z = -10$ $\begin{array}{r} (-) \quad 5y + 6z = -4 \\ \hline \quad \quad 3y = -6 \\ \quad \quad y = -2 \end{array}$ Gantikan $y = -2$ ke dalam ⑤ Substitute $y = -2$ into ⑤ $5(-2) + 6z = -4$ $z = 1$	1 1 1 1	

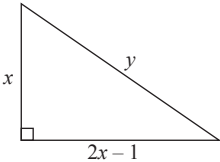
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	Gantikan $y = -2$ dan $z = 1$ ke dalam ①: <i>Substitute $y = -2$ and $z = 1$ into ①:</i> $-x + (-2) + 2(1) = -3$ $x = 3$ Maka/<i>Thus</i>, $x = 3$, $y = -2$ dan/<i>and</i> $z = 1$.	1	5
5	$x + 4y - 3z = 5$...① $-4x - 2y + z = -4$...② $-3x + 2y - 2z = -1$...③ Daripada ①, <i>From ①,</i> $x = 5 - 4y + 3z$...④ Gantikan ④ ke dalam ② <i>Substitute ④ into ②</i> $-4(5 - 4y + 3z) - 2y + z = -4$ $-20 + 16y - 12z - 2y + z = -4$ $14y - 11z - 20 = -4$ $y = \frac{11z + 16}{14}$...⑤ Gantikan ④ ke dalam ③ <i>Substitute ④ into ③</i> $-3(5 - 4y + 3z) + 2y - 2z = -1$ $-15 + 12y - 9z + 2y - 2z = -1$ $14y - 11z - 15 = -1$...⑥ Gantikan ⑤ ke dalam ⑥ <i>Substitute ⑤ into ⑥</i> $14\left(\frac{11z + 16}{14}\right) - 11z - 15 = -1$ $1 = -1$ Maka, sistem persamaan linear ini tidak mempunyai penyelesaian kerana $1 \neq -1$. <i>Therefore, this system of linear equations has no solution because $1 \neq -1$.</i>	1 1 1 1 1 1	5
6	$\frac{x}{2} + \frac{y}{3} = -2$...① $2x^2 - xy = -1$...② Daripada ①, <i>From ①,</i> $x = -4 - \frac{2y}{3}$...③ Gantikan ③ ke dalam ②: <i>Substitute ③ into ②:</i> $2\left(-4 - \frac{2y}{3}\right)^2 - y\left(-4 - \frac{2y}{3}\right) = -1$ $14y^2 + 132y + 297 = 0$ $y = \frac{-132 \pm \sqrt{132^2 - 4(14)(297)}}{2(14)}$ $y = -3.709$ dan/<i>and</i> $y = -5.719$ Gantikan $y = -3.709$ ke dalam ③: <i>Substitute $y = -3.709$ into ③:</i> $x = -4 - \frac{2(-3.709)}{3}$ $= -1.527$	1 1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	Gantikan $y = -5.719$ ke dalam ③: <i>Substitute $y = -5.719$ into ③:</i> $x = -4 - \frac{2(-5.719)}{3}$ $= -0.1873$ Maka, $x = -1.527$, $y = -3.709$ dan $x = -0.1873$, $y = -5.719$ ialah penyelesaian bagi persamaan serentak ini. <i>Therefore, $x = -1.527$, $y = -3.709$ and $x = -0.1873$, $y = -5.719$ are the solutions for the simultaneous equation.</i>	1	5
7	$3x + 2y + z = 90 \quad \dots \text{①}$ $4x + 3y + z = 122 \quad \dots \text{②}$ $6x + y + 4z = 148 \quad \dots \text{③}$ Daripada/From ①, $z = 90 - 3x - 2y \quad \dots \text{④}$ Gantikan ④ ke dalam ② <i>Substitute ④ into ②</i> $4x + 3y + 90 - 3x - 2y = 122$ $x + y = 32$ $y = 32 - x \quad \dots \text{⑤}$ Gantikan ④ ke dalam ③ <i>Substitute ④ into ③</i> $6x + y + 4(90 - 3x - 2y) = 148$ $6x + y + 360 - 12x - 8y = 148$ $-6x - 7y = -212 \quad \dots \text{⑥}$ Gantikan ⑤ ke dalam ⑥ <i>Substitute ⑤ into ⑥</i> $-6x - 7(32 - x) = -212$ $-6x - 224 + 7x = -212$ $x = 12$ Gantikan $x = 12$ ke dalam ⑤ <i>Substitute $x = 12$ into ⑤</i> $y = 32 - 12$ $y = 20$ Gantikan $x = 12$ dan $y = 20$ ke dalam ④ <i>Substitute $x = 12$ and $y = 20$ into ④</i> $z = 90 - 3(12) - 2(20)$ $z = 14$ $y = 20$, $z = 14$ Maka/Thus, $x = 12$, $y = 20$ dan/and $z = 14$.	1 1 1 1 1	5
8	$2x + y = 4 \quad \dots \text{①}$ $x^2 - y - 4 = 0 \quad \dots \text{②}$ ① + ②: $\begin{array}{r} 2x + y = 4 \\ (+) \quad x^2 - y - 4 = 0 \\ \hline 2x + x^2 - 4 = 4 \\ x^2 + 2x - 8 = 0 \\ (x - 2)(x + 4) = 0 \\ x = 2, x = -4 \end{array}$ Gantikan $x = 2$ ke dalam ① <i>Substitute $x = 2$ into ①</i> $2(2) + y = 4$ $y = 0$	1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	Gantikan $x = -4$ ke dalam ① <i>Substitute $x = -4$ into ①</i> $2(-4) + y = 4$ $y = 12$ Maka/Thus, $x = 2, y = 0$ dan/and $x = -4, y = 12$.	1	4
9	$x = 5 - 3y$...① $x^2 + y^2 - 6x + 4y = 0$...② Gantikan ① ke dalam ②: <i>Substitute ① into ②:</i> $(5 - 3y)^2 + y^2 - 6(5 - 3y) + 4y = 0$ $25 - 30y + 9y^2 + y^2 - 30 + 18y + 4y = 0$ $10y^2 - 8y - 5 = 0$ $y = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(10)(-5)}}{2(10)}$ $y = \frac{8 \pm \sqrt{264}}{20}$ $= 1.212 \text{ atau/or } -0.4124$ Gantikan $y = 1.212$ ke dalam ①: <i>Substitute $y = 1.212$ into ①</i> $x = 5 - 3(1.212)$ $= 1.364$ Gantikan $y = -0.4124$ ke dalam ①: <i>Substitute $y = -0.4124$ into ①</i> $x = 5 - 3(-0.4124)$ $= 6.237$ $x = 1.364, y = 1.212$ atau/or $x = 6.237, y = -0.4124$	1 1 1 1	5
10	(a) $3x + y = 3$... ① $\frac{2}{3x} + \frac{1}{y} = 2$... ② Daripada/From ①, $y = 3 - 3x$...③ Daripada/From ②, $\frac{2y + 3x}{3xy} = 2$ $2y + 3x = 6xy$ $6xy - 2y - 3x = 0 \text{ ...④}$ Gantikan ③ ke dalam ④ <i>Substitute ③ into ④</i> $6x(3 - 3x) - 2(3 - 3x) - 3x = 0$ $18x - 18x^2 - 6 + 6x - 3x = 0$ $-18x^2 + 21x - 6 = 0$ $6x^2 - 7x + 2 = 0$ $(3x - 2)(2x - 1) = 0$ $x = \frac{2}{3}, x = \frac{1}{2}$ Gantikan $x = \frac{2}{3}$ ke dalam ③ <i>Substitute $x = \frac{2}{3}$ into ③</i> $y = 3 - 3\left(\frac{2}{3}\right)$ $y = 1$	1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah																											
	Gantikan $x = \frac{1}{2}$ ke dalam ③ Substitute $x = \frac{1}{2}$ into ③ $y = 3 - 3\left(\frac{1}{2}\right)$ $y = \frac{3}{2}$ Maka/Thus, $P\left(\frac{1}{2}, \frac{3}{2}\right), Q\left(\frac{2}{3}, 1\right)$ (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 1	7																											
11	(a) <table><tr><td>x</td><td>-4</td><td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>$y = x^2 + 3x + 2$</td><td>6</td><td>2</td><td>0</td><td>0</td><td>2</td><td>6</td><td>12</td><td>20</td></tr><tr><td>$y = 2x + 8$</td><td>0</td><td>2</td><td>4</td><td>6</td><td>8</td><td>10</td><td>12</td><td>14</td></tr></table> (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 (c) (-3, 2) dan/and (2, 12)	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 1 1 1 1, 1	9
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																						

Soalan	Skema Pemarkahan	Markah	Jumlah Markah																								
12	<table><tr><td>x</td><td>-1.5</td><td>-1</td><td>-0.5</td><td>0</td><td>0.5</td><td>1</td><td>1.5</td></tr><tr><td>$y = \frac{3-x}{2}$</td><td>2.25</td><td>2.00</td><td>1.75</td><td>1.50</td><td>1.25</td><td>1.00</td><td>0.75</td></tr><tr><td>$y = \frac{2x^2-x+1}{2}$</td><td>3.50</td><td>2.00</td><td>1.00</td><td>0.50</td><td>0.50</td><td>1.00</td><td>2.00</td></tr></table>  Satu titik diplot dengan betul/<i>One point is plotted correctly</i> Semua titik diplot dengan betul/<i>All points are plotted correctly</i> Graf kuadratik sempurna/<i>Perfect quadratic graph</i> Graf garis lurus sempurna/<i>Perfect straight line graph</i> Dua titik persilangan/<i>Two intersection points</i> Maka, $x = -1, y = 2$ dan $x = 1, y = 1$ adalah penyelesaian bagi persamaan serentak tersebut. <i>Thus, $x = -1, y = 2$ dan $x = 1, y = 1$ are the solutions for the simultaneous equations.</i>	x	-1.5	-1	-0.5	0	0.5	1	1.5	$y = \frac{3-x}{2}$	2.25	2.00	1.75	1.50	1.25	1.00	0.75	$y = \frac{2x^2-x+1}{2}$	3.50	2.00	1.00	0.50	0.50	1.00	2.00	1 1 1	8
x	-1.5	-1	-0.5	0	0.5	1	1.5																				
$y = \frac{3-x}{2}$	2.25	2.00	1.75	1.50	1.25	1.00	0.75																				
$y = \frac{2x^2-x+1}{2}$	3.50	2.00	1.00	0.50	0.50	1.00	2.00																				
13	$b = \frac{1}{2}h \qquad \dots \textcircled{1}$ $b^2 + h^2 = 5^2$ $b^2 + h^2 = 25 \qquad \dots \textcircled{2}$ Gantikan ① ke dalam ② <i>Substitute ① into ②</i> $\left(\frac{1}{2}h\right)^2 + h^2 = 25$ $\frac{1}{4}h^2 + h^2 = 25$ $\frac{5}{4}h^2 = 25$ $h^2 = 20$ $h = \sqrt{20}$ $h = 4.472$ Maka, jarak dari hujung bahagian atas tangga ke tanah ialah 4.472 m. <i>Thus, the distance from the top of ladder to the ground is 4.472 m.</i>	1 1 1 1	4																								

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
14	(a) Gantikan (2, 1) ke dalam persamaan $2ax + 3y = b$, <i>Substitute (2, 1) into the equation $2ax + 3y = b$,</i> $2a(2) + 3(1) = b$ $4a + 3 = b$ $4a - b = -3 \dots \textcircled{1}$ Gantikan (2, 1) ke dalam persamaan $x^2 + xy + ay = b$: <i>Substitute (2, 1) into equation $x^2 + xy + ay = b$:</i> $(2)^2 + (2)(1) + a(1) = b$ $4 + 2 + a = b$ $a - b = -6$ $\textcircled{1} - \textcircled{2}$: $3a = 3$ $a = 1$ Gantikan $a = 1$ ke dalam $\textcircled{1}$: <i>Substitute $a = 1$ into $\textcircled{1}$:</i> $4(1) - b = -3$ $b = 7$ $\therefore a = 1, b = 7$ (b) $2x + 3y = 7$ $y = \frac{7-2x}{3} \dots \textcircled{1}$ $x^2 + xy + y = 7 \dots \textcircled{2}$ Gantikan $\textcircled{1}$ ke dalam $\textcircled{2}$: <i>Substitute $\textcircled{1}$ into $\textcircled{2}$:</i> $x^2 + x\left(\frac{7-2x}{3}\right) + \left(\frac{7-2x}{3}\right) = 7$ $3x^2 + 7x - 2x^2 + 7 - 2x = 21$ $x^2 + 5x - 14 = 0$ $(x+7)(x-2) = 0$ $x+7 = 0$ atau/or $x-2 = 0$ $x = -7$ $x = 2$ Gantikan $x = -7$ ke dalam $\textcircled{1}$: <i>Substitute $x = -7$ into $\textcircled{1}$:</i> $y = \frac{7-2(-7)}{3}$ $= 7$ $\therefore$ Penyelesaian yang satu lagi ialah $(-7, 7)$. <i>The other solution is $(-7, 7)$.</i>	1 1 1 1 1 1 1 1	8
15	$y^2 = x^2 + (2x-1)^2$ $y^2 = x^2 + 4x^2 - 4x + 1$ $y^2 = 5x^2 - 4x + 1 \dots \textcircled{1}$ Perimeter = 40 $y + x + 2x - 1 = 40$ $y = 40 + 1 - 3x$ $y = 41 - 3x \dots \textcircled{2}$ Gantikan $\textcircled{2}$ ke dalam $\textcircled{1}$: <i>Substitute $\textcircled{2}$ into $\textcircled{1}$:</i> $(41 - 3x)^2 = 5x^2 - 4x + 1$ $1681 - 246x + 9x^2 = 5x^2 - 4x + 1$ $9x^2 - 5x^2 - 246x + 4x + 1681 - 1 = 0$ $4x^2 - 242x + 1680 = 0$ $2x^2 - 121x + 840 = 0$ $(2x-105)(x-8) = 0$ $2x-105 = 0$ atau/or $x-8 = 0$ $x = \frac{105}{2} = 52\frac{1}{2}$ (ditolak/rejected) $x = 8$ 	1 1 1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	$y = 41 - 3x$ $= 41 - 3(8)$ $= 41 - 24$ $= 17$ $2x - 1 = 2(8) - 1$ $= 15$ Sisi-sisi itu ialah 8 m, 15 m dan 17 m. <i>The sides are 8 m, 15 m and 17 m.</i>	1 1	7
16	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 $① \times 3: 3x + 3y + 3z = 36$... ④ $③ - ④:$ $\begin{array}{r} 3x + 3y + 6z = 42 \\ (-) 3x + 3y + 3z = 36 \\ \hline 3z = 6 \\ z = 2 \end{array}$ $② \times 3: 6x + 3y + 6z = 72$... ⑤ $⑤ - ③:$ $\begin{array}{r} 6x + 3y + 6z = 72 \\ (-) 3x + 3y + 6z = 42 \\ \hline 3x = 30 \\ x = 10 \end{array}$ Gantikan $x = 10$ dan $z = 2$ ke dalam ① Substitute $x = 10$ and $z = 2$ into ① $10 + y + 2 = 12$ $y = 0$ Maka, harga sepinggan nasi lemak ialah RM10, harga sepinggan puding ialah RM2 dan air sirap adalah percuma. <i>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.</i> Peratus penjimatan belian Set 1 <i>Percentage of savings by purchasing Set 1</i> $= \frac{2}{10 + 2 + 2} \times 100\%$ $= 14.29\%$	1 1 1 1 1	7
17	Anggap/Let: Bilangan kanak-kanak/Number of children = x Bilangan lelaki/Number of males = y Bilangan wanita/Number of females = z $x + y + z = 400$... ① $y = 2z$... ② $x = 50 + y$... ③ Gantikan ③ ke dalam ① Substitute ③ into ① $50 + y + y + z = 400$ $50 + 2y + z = 400$... ④	1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	Gantikan ② ke dalam ④ <i>Substitute ② into ④</i> $50 + 2(2z) + z = 400$ $50 + 5z = 400$ $5z = 350$ $z = 70$ Gantikan $z = 70$ ke dalam ② <i>Substitute $z = 70$ into ②</i> $y = 2(70)$ $y = 140$ Gantikan $y = 140$ ke dalam ③ <i>Substitute $y = 140$ into ③</i> $x = 50 + 140$ $x = 190$ Maka/Thus, $x = 190$, $y = 140$ dan/and $z = 70$.	1 1 1 1	7



Indeks, Surd dan Logaritma
Indices, Surds and Logarithms

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	(a) $\frac{x(16x^4y^8)^{\frac{1}{4}}}{\sqrt[3]{8y^9}} = \frac{x \times 16^{\frac{1}{4}} \times x^{4(\frac{1}{4})} \times y^{8(\frac{1}{4})}}{8^{\frac{1}{3}} \times (y^9)^{\frac{1}{3}}}$ $= \frac{x \times (2^4)^{\frac{1}{4}} \times xy^2}{2y^3}$ $= \frac{2x^2y^2}{y^3}$ $= \frac{x^2}{y}$ (b) (i) $\log_a 81a = \frac{\log_a 81a}{\log_a a^2}$ (Tukar asas/Change base) $= \frac{\log_a 81a}{2 \log_a a}$ $= \frac{\log_a 81a}{2(1)}$ $= \frac{1}{2} \log_a 81a$ (ii) $\log_a 81a = 1$ $\frac{1}{2} \log_a 81a = 1$ $\log_a (81a)^{\frac{1}{2}} = 1$ $\log_a \sqrt{81a} = 1$ $\log_a 9\sqrt{a} = 1$ $9\sqrt{a} = a^1$ $(9\sqrt{a})^2 = a^2$ $81a = a^2$ $81 = \frac{a^2}{a}$ $a = 81$	1 1 1 1 1	6

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
2	$(\sqrt{5} - 2)x^2 + 2x + (\sqrt{5} + 2) = 0$ $a = \sqrt{5} - 2, \quad b = 2, \quad c = \sqrt{5} + 2$ $x = \frac{-2 \pm \sqrt{(2)^2 - 4(\sqrt{5} - 2)(\sqrt{5} + 2)}}{2(\sqrt{5} - 2)}$ $= \frac{-2 \pm \sqrt{4 - 4(5 + 2\sqrt{5} - 2\sqrt{5} - 4)}}{2(\sqrt{5} - 2)}$ $= \frac{-2 \pm \sqrt{4 - 4(5 - 4)}}{2(\sqrt{5} - 2)}$ $= \frac{-2}{2(\sqrt{5} - 2)}$ $= \frac{-1}{\sqrt{5} - 2} \times \frac{\sqrt{5} + 2}{\sqrt{5} + 2}$ $= \frac{-\sqrt{5} - 2}{5 + 2\sqrt{5} - 2\sqrt{5} - 4}$ $= \frac{-\sqrt{5} - 2}{5 - 4}$ $= \frac{-\sqrt{5} - 2}{1}$ $= -\sqrt{5} - 2$	 1 1 1 1	4
3	$AB^2 = (5 - \sqrt{2})^2 + (5 + \sqrt{2})^2$ $= 25 - 10\sqrt{2} + 2 + 25 + 10\sqrt{2} + 2$ $= 54$ $AB = \sqrt{54}$ $= \sqrt{9 \times 6}$ $= 3\sqrt{6} \text{ m}$	 1 1 1	3
4	(a) $x^2 + (2x)^2 = 15^2$ $x^2 + 4x^2 = 225$ $5x^2 = 225$ $x^2 = 45$ $x = \sqrt{45}$ $x = \sqrt{9 \times 5}$ $x = 3\sqrt{5}$ (b) $\frac{1}{2} \times x \times 2x = \frac{1}{2} \times 3\sqrt{5} \times 2(3\sqrt{5})$ $= \frac{1}{2}(18)(5)$ $= 45 \text{ cm}^2$	 1 1 1 1	4
5	$3^{2x-1} = 2^{3x+1}$ $\log_{10} 3^{2x-1} = \log_{10} 2^{3x+1}$ $(2x-1) \log_{10} 3 = (3x+1) \log_{10} 2$ $2x \log_{10} 3 - \log_{10} 3 = 3x \log_{10} 2 + \log_{10} 2$ $x(2 \log_{10} 3 - 3 \log_{10} 2) = \log_{10} 3 + \log_{10} 2$ $x[2(0.4771) - 3(0.3010)] = 0.4771 + 0.3010$ $0.0512x = 0.7781$ $x = 15.20$	 1 1 1	3

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
6	(a) $4e^{5t} = 30$ $e^{5t} = \frac{30}{4}$ $e^{5t} = \frac{15}{2}$ $5t = \ln\left(\frac{15}{2}\right)$ $t = \frac{\ln\left(\frac{15}{2}\right)}{5}$ $t = 0.4030$ (b) $\ln(5x - 2) = 7$ $5x - 2 = e^7$ $x = \frac{e^7 + 2}{5}$ $x = 219.73$ (c) $\ln(2x - 3)^2 = 5$ $(2x - 3)^2 = e^5$ $2x - 3 = \pm\sqrt{e^5}$ $x = \frac{\sqrt{e^5} + 3}{2}, \quad x = \frac{-\sqrt{e^5} + 3}{2}$ $x = 7.591, \quad x = -4.591$	1 1 1 1 1, 1	7
7	$16^n = a^2$ $2^{4n} = a^2 \quad 9^n = b$ $2^n = (a^2)^{\frac{1}{4}} \quad 3^{2n} = b$ $2^n = \sqrt[4]{a}$ $4.5^n = \left(\frac{9}{2}\right)^n$ $= \frac{9^n}{2^n}$ $= \frac{3^{2n}}{2^n}$ $= \frac{b}{\sqrt{a}}$	1 1 1	3
8	(a) $x^{\frac{2}{3}} - 7x^{\frac{1}{3}} + 6 = 0$ $\left(x^{\frac{1}{3}}\right)^2 - 7x^{\frac{1}{3}} + 6 = 0$ Katakan/Suppose, $x^{\frac{1}{3}} = a$, $a^2 - 7a + 6 = 0$ $(a - 6)(a - 1) = 0$ $a - 6 = 0, \quad a - 1 = 0$ $a = 6 \quad a = 1$ Gantikan $a = 6$ dan $a = 1$ ke dalam $x^{\frac{1}{3}} = a$, Substitute $a = 6$ and $a = 1$ into $x^{\frac{1}{3}} = a$, $x^{\frac{1}{3}} = 6 \quad x^{\frac{1}{3}} = 1$ $x = 6^3 \quad x = 1^3$ $x = 216 \quad x = 1$	1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) $\log_4 x = 2 - \log_x 4$ $\log_4 x + \log_x 4 = 2$ $\log_4 x + \frac{\log_4 4}{\log_4 x} = 2$ $\log_4 x + \frac{1}{\log_4 x} = 2$ Katakan/<i>Suppose</i> $\log_4 x = a$, $a + \frac{1}{a} = 2$ $a^2 + 1 = 2a$ $a^2 - 2a + 1 = 0$ $(a - 1)^2 = 0$ $a - 1 = 0$ $a = 1$ Gantikan $a = 1$ ke dalam $\log_4 x = a$, <i>Substitute</i> $a = 1$ into $\log_4 x = a$, $\log_4 x = 1$ $x = 4$	1 1	6
9	(a) Apabila minuman baru dibancuh, $t = 0$ <i>When the drink is freshly made, $t = 0$</i> $T = 65e^{-0.03(0)} + 10$ $T = 65e^0 + 10$ $T = 75^\circ\text{C}$ (b) Apabila/<i>When</i> $t = 5$ $T = 65e^{-0.03(5)} + 10$ $T = 65e^{-0.15} + 10$ $T = 65.95^\circ\text{C}$ (c) $55 = 65e^{-0.03t} + 10$ $45 = 65e^{-0.03t}$ $\frac{9}{13} = e^{-0.03t}$ $\ln\left(\frac{9}{13}\right) = -0.03t$ $t = \frac{\ln\left(\frac{9}{13}\right)}{-0.03}$ $t = 12.26$ minit/<i>minutes</i>	1 1 1 1 1 1	7
10	(a) $(6.25)^n = \left(\frac{25}{4}\right)^n$ $= \left(\frac{5}{2}\right)^{2n}$ $= \left(\frac{5^n}{2^n}\right)^2$ $= \left(\frac{b}{a}\right)^n$ (b) (i) $\log_a 27a = \log_a 27 + \log_a a$ $= \log_a 3^3 + \log_a a$ $= 3(0.613) + 1$ $= 2.839$	1 1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	$(ii) \quad \sqrt{3} \times a^{n-1} = 3$ $a^{n-1} = \frac{3}{\sqrt{3}}$ $a^{n-1} = 3^{\frac{1}{2}}$ $(n-1) \log_a a = \frac{1}{2} \log_a 3$ $n-1 = \frac{1}{2}(0.613)$ $n = 1.3065$	 1 1	 7
11	$3\,000(1+0.07)^n > 6\,500$ $(1+0.07)^n > \frac{6\,500}{3\,000}$ $(1+0.07)^n > \frac{13}{6}$ $\log(1+0.07)^n > \log \frac{13}{6}$ $n \log(1.07) > \log \frac{13}{6}$ $n > \frac{\log \frac{13}{6}}{\log(1.07)}$ $n > 11.428$ Maka/Thus, $n = 12$	 1 1 1	 3
12	$\frac{\log_9 64 \times \log_{49} 9}{\log_7 2} = \frac{\log_{49} 64}{\log_{49} 9} \times \log_{49} 9$ $= \frac{\log_{49} 64}{\log_7 2}$ $= \frac{\log_7 64}{\log_7 49} \div \log_7 2$ $= \frac{\log_7 2^6}{\log_7 7^2} \times \frac{1}{\log_7 2}$ $= \frac{6 \log_7 2}{2 \log_7 7} \times \frac{1}{\log_7 2}$ $= \frac{6}{2}$ $= 3$	 1 1 1	 3
13	$\log_4 x = p \qquad \log_2 \sqrt{y} = q$ $x = 4^p \qquad \sqrt{y} = 2^q$ $(\sqrt{y})^2 = (2^q)^2$ $y = 2^{2q}$ $\frac{\sqrt{x}}{y^4} = \frac{\sqrt{4^p}}{(2^{2q})^4}$ $= \frac{(4^p)^{\frac{1}{2}}}{2^{8q}}$ $= \frac{(2^2)^{\frac{p}{2}}}{2^{8q}}$ $= \frac{2^p}{2^{8q}}$ $= 2^{p-8q}$	 1 1 1 1	 4

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
14	$\log_8 2 = h$ $\frac{\log_3 2}{\log_3 8} = h$ $\frac{\log_3 2}{\log_3 (2 \times 4)} = h$ $\frac{\log_3 2}{\log_3 2 + \log_3 4} = h$ $\frac{\log_3 2}{\log_3 2 + k} = h$ $\log_3 2 = h(\log_3 2 + k)$ $\log_3 2 = h \log_3 2 + hk$ $\log_3 2 - h \log_3 2 = hk$ $\log_3 2(1 - h) = hk$ $\log_3 2 = \frac{hk}{1 - h}$	1 1 1	3
15	(a) Katakan/Let $N = 0.373737\ldots$...① ① $\times 100$: $100N = 37.373737\ldots$② ② – ①: $100N = 37.373737$ (–) $N = 0.373737$ $99N = 37$ $N = \frac{37}{99}$ $\frac{h}{k} = \frac{1}{4} + \frac{37}{99}$ $\frac{h}{k} = \frac{247}{396}$ Maka/Thus, $h = 247$ dan/and $k = 396$ (b) $q\sqrt{3} = \frac{12}{3 - \sqrt{3}} - p$ Nisbahkan/Rationalise $\frac{12}{3 - \sqrt{3}}$ $\frac{12}{3 - \sqrt{3}} = \frac{12}{3 - \sqrt{3}} \times \frac{3 + \sqrt{3}}{3 + \sqrt{3}}$ $= \frac{12(3 + \sqrt{3})}{6}$ $= 2(3 + \sqrt{3})$ $q\sqrt{3} = 2(3 + \sqrt{3}) - p$ $q\sqrt{3} = 6 + 2\sqrt{3} - p$ $q\sqrt{3} = 2\sqrt{3} + (6 - p)$ Bandingkan/Compare $q = 2, 0 = 6 - p$ $p = 6$ Maka/Thus, $p = 6$ dan/and $q = 2$.	1 1 1 1 1 1 1	6

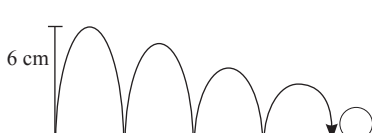


**Janjang
Progressions**

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	(a) Beza sepunya/<i>Common difference</i> $= 11 - 4$ $= 7$ (b) Hasil tambah sebutan/<i>Sum of terms</i> $= S_{47} - S_5$ $= \frac{47}{2}[2(4) + (47 - 1)(7)] - \frac{5}{2}[2(4) + (5 - 1)(7)]$ $= 7\,755 - 90$ $= 7\,665$	1 1 1	3
2	(a) $S_n = \frac{n}{2}(5n - 3)$ $S_8 = \frac{8}{2}[5(8) - 3]$ $= \frac{8}{2}(37)$ $= 148$ (b) $T_8 = 148 - \frac{7}{2}[5(7) - 3]$ $= 148 - 112$ $= 36$	1 1 1 1	4
3	(a) $T_1 = 2 \times \pi \times \frac{10}{2}$ $= 10\pi$ $T_2 = 2 \times \pi \times \frac{38}{2}$ $= 38\pi$ $T_3 = 2 \times \pi \times \frac{66}{2}$ $= 66\pi$ $T_4 = 2 \times \pi \times \frac{94}{2}$ $= 94\pi$ Empat sebutan pertama: $10\pi, 38\pi, 66\pi, 94\pi$ <i>First four terms:</i> $10\pi, 38\pi, 66\pi, 94\pi$ (b) $d = T_2 - T_1$ $= 38\pi - 10\pi$ $= 28\pi$	1 1 1	3
4	Beza sepunya/<i>Common difference</i>, $d = 6$, $T_{11} = a + (11 - 1)(6)$ $a + 60 = 2 + 6p$ $a = 6p - 58 \dots \textcircled{1}$ $S_6 = \frac{6}{2}[2a + (6 - 1)(6)]$ $6a + 90 = 5p - 8$ $6a = 5p - 98 \dots \textcircled{2}$ Gantikan $\textcircled{1}$ ke dalam $\textcircled{2}$, <i>Substitute $\textcircled{1}$ into $\textcircled{2}$,</i> $6(6p - 58) = 5p - 98$ $36p - 348 = 5p - 98$ $31p = 250$ $p = \frac{250}{31}$	1 1 1	3

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
5	(a) Nisbah sepunya/Common ratio, $r = \frac{-12}{6}$ $= -2$ (b) $a = 6, r = -2$ $S_n = -8\ 190$ $\frac{a(1-r^n)}{1-r} = -8\ 190$ $\frac{6(1-(-2)^n)}{1-(-2)} = -8\ 190$ $1-(-2)^n = -4\ 095$ $(-2)^n = 4\ 096$ $(-2)^n = (-2)^{12}$ $n = 12$	1 1 1	3
6	(a) Nisbah sepunya/Common ratio, $r = \frac{x^2}{1}$ $= x^2$ (b) $S_\infty = \frac{a}{1-r}$ $18 = \frac{1}{1-x^2}$ $18 - 18x^2 = 1$ $18x^2 = 17$ $x^2 = \frac{17}{18}$ $x = \sqrt{\frac{17}{18}}$ $= 0.9718$	1 1 1	3
7	Nisbah sepunya/Common ratio, $r = \frac{7}{128} \div \frac{7}{64}$ $= \frac{7}{128} \times \frac{64}{7}$ $= \frac{1}{2}$ $x = \frac{7}{8} \times \frac{1}{2} = \frac{7}{16}$ $y = \frac{7}{16} \times \frac{1}{2} = \frac{7}{32}$ $x + y = \frac{7}{16} + \frac{7}{32} = \frac{21}{32}$	1 1 1	3
8	(a) $T_5 = 15$ $ar^4 = 15 \dots \textcircled{1}$ $T_5 + T_6 = 10$ $15 + ar^5 = 10$ $ar^5 = -5 \dots \textcircled{2}$ $\textcircled{2} \div \textcircled{1}: \frac{ar^5}{ar^4} = \frac{-5}{15}$ $r = -\frac{1}{3}$ Gantikan $r = -\frac{1}{3}$ ke dalam $\textcircled{1}$, Substitute $r = -\frac{1}{3}$ into $\textcircled{1}$, $a\left(-\frac{1}{3}\right)^4 = 15$ $a = 1\ 215$	1 1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) $S_{\infty} = \frac{a}{1-r}$ $= \frac{1\,215}{1 - \left(-\frac{1}{3}\right)}$ $= 1\,215 \times \frac{3}{4}$ $= 911\frac{1}{4}$	1 1	6
9	(a) $T_3 = 3T_1$ $a + 2d = 3a$ $2d = 2a$ $d = a$ $S_n = \frac{n}{2}[2a + (n-1)(a)]$ $= \frac{n}{2}(2a + an - a)$ $= \frac{n}{2}(a + an)$ $= \frac{an}{2}(1 + n)$ (b) $S_5 = 45$ $\frac{5a}{2}(1 + 5) = 45$ $5a(6) = 90$ $30a = 90$ $a = 3$ $T_5 = 3 + (5-1)(3)$ $= 15$	1 1 1 1 1	7
10	$T_3 = a + 8a$ $= 9a$ $\frac{T_3}{T_1} = \frac{ar^2}{a} = \frac{9a}{a}$ $r^2 = 9$ $r = \pm\sqrt{9}$ $r = \pm 3$	1 1	2
11	(a) $a = 0.17$ $b = 0.000017$ (b) Nisbah sepunya/Comman ratio, $r = \frac{0.0017}{0.17}$ $= 0.01$ $0.171717... = 0.17 + 0.0017 + 0.000017 + ...$ $= S_{\infty}$ $= \frac{0.17}{1 - 0.01}$ $= \frac{17}{99}$	1 1 1 1	4

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
12	(a) $a + d = x$... ① $a + 3d = y$... ② $a + 5d = z$... ③ ② – ①: $2d = y - x$ $d = \frac{y - x}{2}$... ④ ③ – ②: $2d = z - y$ $d = \frac{z - y}{2}$... ⑤ ④ = ⑤: $\frac{y - x}{2} = \frac{z - y}{2}$ $y - x = z - y$ $2y = z + x$ $x = 2y - z$... ⑥ Gantikan ⑥ ke dalam $\frac{x + y + z}{y + 1} = 4$: Substitute ⑥ into $\frac{x + y + z}{y + 1} = 4$: $\frac{2y - z + y + z}{y + 1} = 4$ $3y = 4(y + 1)$ $3y = 4y + 4$ $3y - 4y = 4$ $y = -4$	1 1 1	3
13	(a) Nisbah sepunya/Common difference, $r = \frac{3^2}{3}$ Sebutan pertama/First term, $a = 3$ $S_n = 363$ $\frac{3(3^n - 1)}{3 - 1} = 363$ $3^n - 1 = 363 \times \frac{2}{3}$ $3^n = 242 + 1$ $3^n = 243$ $3^n = 3^5$ $n = 5$ (b) Ketinggian pertama/First height, $T_1 = \frac{2}{3} \times 6 = 4$ Ketinggian kedua/Second height, $T_2 = \frac{2}{3} \times 4 = \frac{8}{3}$ Nisbah sepunya/Common ratio, $r = \frac{2}{3}$ $S_\infty = \frac{4}{1 - \frac{2}{3}}$ $= 12$ Jarak yang dilalui oleh bola itu, The distance travelled by the ball, $= (12 \times 2) + 6$ $= 30 \text{ m}$ 	1 1 1 1 1 1	6

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
14	(a) $d_1 = T_2 - T_1 = (4a - 5) - 3a = a - 5$ $d_2 = T_3 - T_2 = (5a - 10) - (4a - 5) = a - 5$ $\therefore d = a - 5$ $\frac{15}{2} [2(3a) + (15 - 1)(a - 5)] < 0$ $\frac{15}{2} [6a + 14(a - 5)] < 0$ $\frac{15}{2} (6a + 14a - 70) < 0$ $\frac{15}{2} (20a - 70) < 0$ $2a - 7 < 0$ $a < \frac{7}{2}$ (b) $ar^{4-1} = 18$ $ar^3 = 18 \quad \dots \textcircled{1}$ $T_5 + T_6 = \frac{27}{2}$ $ar^{5-1} + ar^{6-1} = \frac{27}{2}$ $ar^4 + ar^5 = \frac{27}{2}$ $ar^3(r + r^2) = \frac{27}{2} \quad \dots \textcircled{2}$ Gantikan/Substitute $\textcircled{1}$ ke dalam/into $\textcircled{2}$ $18(r + r^2) = \frac{27}{2}$ $36(r + r^2) = 27$ $4(r + r^2) = 3$ $4r + 4r^2 = 3$ $4r^2 + 4r - 3 = 0$ $(2r - 1)(2r + 3) = 0$ $2r - 1 = 0$ dan/and $2r + 3 = 0$ $r = \frac{1}{2} \quad r = -\frac{3}{2}$	1 1 1 1 1 1 1 1	7
15	(a) (i) $T_5 = 120\,000(0.85)^5$ $= \text{RM}53\,244.60$ (ii) $T_n < 50\,000$ $120\,000(0.85)^n < 50\,000$ $(0.85)^n < \frac{50\,000}{120\,000}$ $\log(0.85)^n < \log \frac{5}{12}$ $n \log 0.85 < \log \frac{5}{12}$ $n(-0.07058) < -0.3802$ $n > 5.387$ $n = 6$ (b) $S_3 = 12$ $\frac{3}{2}(2a + 2d) = 12$ $3a + 3d = 12$ $a + d = 4$ $a = 4 - d \quad \dots \textcircled{1}$ $S_6 = 12 + 75 = 87$ $\frac{6}{2}(2a + 5d) = 87$ $3(2a + 5d) = 87$ $2a + 5d = 29 \quad \dots \textcircled{2}$	1 1 1 1 1 1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	Gantikan/Substitute ① ke dalam/into ② $2(4 - d) + 5d = 29$ $8 - 2d + 5d = 29$ $3d = 21$ $d = 7$ Gantikan/Substitute $d = 7$ ke dalam/into ① $a = 4 - 7$ $a = -3$	1 1	9
16	(a) Gaji permulaan/Initial salary, $a = 36\,000$ Nisbah sepunya/Common ratio, $r = 1.15$ $T_3 = 36\,000(1.15)^{3-1}$ $= \text{RM}47\,610$ (b) Tukar gaji bulanan sasaran kepada gaji tahunan: Convert target monthly salary to annual salary: $T_n > 8000 \times 12$ $36\,000(1.15)^{(n-1)} > 96\,000$ $(1.15)^{(n-1)} > \frac{96\,000}{36\,000}$ $\log(1.15)^{(n-1)} > \log \frac{8}{3}$ $(n-1) \log 1.15 > \log \frac{8}{3}$ $(n-1)(0.06070) > 0.4260$ $n-1 > 7.018$ $n > 8.018$ Bilangan tahun minimum, $n = 9$ tahun Minimum number of years, $n = 9$ years (c) Simpanan tahun ke-3/Third year savings: $0.3 \times T_3 = 0.3 \times 47\,610$ $= \text{RM}14\,283$ Bilangan sebutan bagi simpanan/Number of terms for savings: $N = 10 - 3 + 1 = 8$ $S_8 = \frac{14\,283((1.15)^8 - 1)}{1.15 - 1}$ $= \text{RM}196\,060.16$	1 1 1 1 1 1 1 1 1 1	8
17	(a) $T_1 = \pi r$ $T_2 = \pi(r+2) = \pi r + 2\pi$ $T_3 = \pi(r+4) = \pi r + 4\pi$ $d_1 = T_2 - T_1 = (\pi r + 2\pi) - \pi r = 2\pi$ $d_2 = T_3 - T_2 = (\pi r + 4\pi) - (\pi r + 2\pi) = 2\pi$ Oleh kerana $d_1 = d_2 = 2\pi$, maka ia membentuk jangjang aritmetik dengan beza sepunya, $d = 2\pi$. Since $d_1 = d_2 = 2\pi$, thus it forms an arithmetic progression with the common difference, $d = 2\pi$. (b) $a = \pi r$; $d = 2\pi$ $S_9 = 144\pi$ $\frac{9}{2}[2(\pi r) + (9-1)(2\pi)] = 144\pi$ $\frac{9}{2}(2\pi r + 16\pi) = 144\pi$ $9\pi(r+8) = 144\pi$ $r+8 = 16$ $r = 8$	1 1 1 1	

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	(c) $S_n \leq 198\pi$ $\frac{n}{2} [2(8\pi) + (n-1)(2\pi)] \leq 198\pi$ $\frac{n}{2} (16\pi + 2\pi n - 2\pi) \leq 198\pi$ $\frac{\pi n}{2} (14 + 2n) \leq 198\pi$ $n(7 + n) \leq 198$ $n^2 + 7n \leq 198$ $n^2 + 7n - 198 \leq 0$ $(n-11)(n+18) \leq 0$ $-18 \leq n \leq 11$ $n = 11$ Maka, bilangan maksimum semibulatan yang dapat dibentuk ialah 11. Thus, the maximum number of semicircles that can be formed is 11.	1 1 1	7

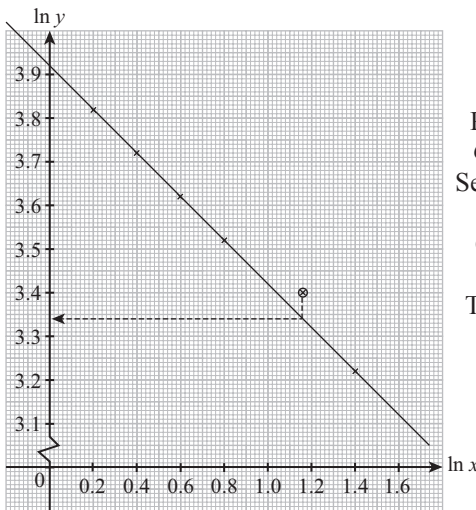


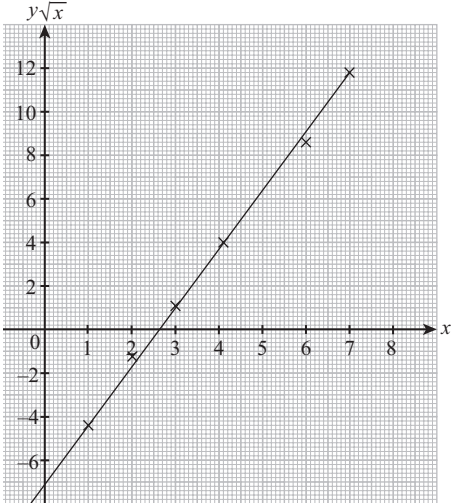
Hukum Linear
Linear Law

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	(a) Kecerunan/Gradient, $m = \frac{2.5 - 1.8}{0.5 - 0.8}$ $= -\frac{7}{3}$ $\ln y = -\frac{7}{3} \ln x + c$ $2.5 = -\frac{7}{3}(0.5) + c \quad \text{atau/or} \quad 1.8 = -\frac{7}{3}(0.8) + c$ $2.5 = -\frac{7}{6} + c \quad 1.8 = -\frac{28}{15} + c$ $c = 2.5 + \frac{7}{6} \quad c = 1.8 + \frac{28}{15}$ $= \frac{11}{3} \quad = \frac{11}{3}$ $\ln y = -\frac{7}{3} \ln x + \frac{11}{3}$ $\ln y + \frac{7}{3} \ln x = \frac{11}{3}$ $\ln y + \ln x^{\frac{7}{3}} = \frac{11}{3}$ $\ln x^{\frac{7}{3}} y = \frac{11}{3}$ $x^{\frac{7}{3}} y = e^{\frac{11}{3}}$ $y = \frac{e^{\frac{11}{3}}}{x^{\frac{7}{3}}}$ (b) Apabila/When $x = 5$, $y = \frac{e^{\frac{11}{3}}}{5^{\frac{7}{3}}}$ $= \frac{39.12}{42.75}$ $= 0.9151$	1 1 1 1	5

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
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 3.1: $y = ax + b\sqrt{x}$ $\frac{y}{\sqrt{x}} = \frac{ax}{\sqrt{x}} + \frac{b\sqrt{x}}{\sqrt{x}}$ $\frac{y}{\sqrt{x}} = a\sqrt{x} + b$ $b = -8k$ $k = -\frac{b}{8} \dots \textcircled{1}$ Rajah/Diagram 3.2: $y = ax + b\sqrt{x}$ $\frac{y}{x} = \frac{ax}{x} + \frac{b\sqrt{x}}{x}$ $\frac{y}{x} = (b)\left(\frac{1}{\sqrt{x}}\right) + a$ $a = k + 4 \dots \textcircled{2}$ Gantikan $\textcircled{1}$ ke dalam $\textcircled{2}$ Substitute $\textcircled{1}$ into $\textcircled{2}$ $a = \left(-\frac{b}{8}\right) + 4$ $a = \frac{32-b}{8}$	 1 1 1	3
4	(a) $x^2y = -\frac{3}{4}x^2 + 6x$ $\frac{x^2y}{x} = -\frac{3x^2}{4x} + \frac{6x}{x}$ $xy = -\frac{3}{4}x + 6$ $0 = -\frac{3}{4}(p) + 6$ $\frac{3}{4}p = 6$ $3p = 24$ $p = 8$ (b) $x^2y = -\frac{3}{4}x^2 + 6x$ $\frac{x^2y}{x^2} = -\frac{3x^2}{4x^2} + \frac{6x}{x^2}$ $y = 6\left(\frac{1}{x}\right) - \frac{3}{4}$	 1 1 1 1	5

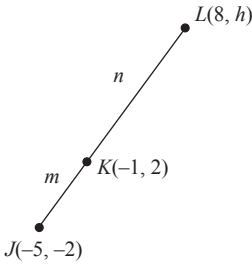
Program Tuisyen Rakyat Selangor

Soalan	Skema Pemarkahan	Markah	Jumlah Markah														
	(b) $y = px^2 + 10x$ $\frac{y}{x} = \frac{px^2}{x} + \frac{10x}{x}$ $\frac{y}{x} = px + 10$ $p = m$ $= \frac{8 - (-4)}{-1 - (-7)}$ $= \frac{12}{6}$ $= 2$ Persamaan garis lurus penyuaian terbaik: $\frac{y}{x} = 2x + 10$ Equation of line of best fit: $\frac{y}{x} = 2x + 10$	1 1 1	4														
7	(a) <table><tr><td>ln x</td><td>0.20</td><td>0.40</td><td>0.60</td><td>0.80</td><td>1.14</td><td>1.40</td></tr><tr><td>ln y</td><td>3.81</td><td>3.71</td><td>3.61</td><td>3.51</td><td>3.40</td><td>3.21</td></tr></table>  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 (b) $y = kx^n$ $\ln y = \ln kx^n$ $\ln y = \ln k + \ln x^n$ $\ln y = n \ln x + \ln k$ (i) Berdasarkan graf/Based on the graph, Pintasan-y/y-intercept, $c = 3.92$ $\ln k = 3.92$ $k = e^{3.92}$ $k = 50.40$ (ii) Kecerunan/Gradient, $m = \frac{3.21 - 3.81}{1.40 - 0.20}$ $n = -0.5$ (c) $\ln y = 3.34$ $y = e^{3.34}$ $= 28.22$	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	1 1 1 1 1 1 1 1 1 1	10
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											

Soalan	Skema Pemarkahan	Markah	Jumlah Markah													
8	(a) <table border="1"><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4.1</td><td>6</td><td>7</td></tr><tr><td>$y\sqrt{x}$</td><td>-4.40</td><td>-1.12</td><td>1.00</td><td>4.01</td><td>8.60</td><td>11.80</td></tr></table>  Paksi betul dan skala seragam dengan sekurang-kurangnya dua titik diplot dengan betul <i>Correct axes and uniform scales with at least two points plotted correctly</i> Semua titik diplot dengan betul <i>All points are plotted correctly</i> Garis lurus penyuaian terbaik <i>Line of best fit</i> (b) (i) Daripada graf/<i>From the graph</i>, Apabila/<i>When</i> $x = 6.5$, $y\sqrt{x} = 10.4$ $y\sqrt{6.5} = 10.4$ $y = 4.079$ (ii) $py = \frac{1}{\sqrt{x}} + q\sqrt{x}$ $py\left(\frac{\sqrt{x}}{p}\right) = q\sqrt{x}\left(\frac{\sqrt{x}}{p}\right) + \frac{1}{\sqrt{x}}\left(\frac{\sqrt{x}}{p}\right)$ $y\sqrt{x} = \frac{q}{p}x + \frac{1}{p}$ Berdasarkan graf/<i>Based on the graph</i>, Pintasan-y/<i>y-intercept</i>, $c = -7.1$ $\frac{1}{p} = -7.1$ $p = \frac{1}{-7.1}$ $= -0.1408$ Kecerunan/<i>Gradient</i>, $m = \frac{11.80 - (-4.4)}{7 - 1}$ $\frac{q}{p} = 2.7$ $\frac{q}{-0.1408} = 2.7$ $q = -0.3802$	x	1	2	3	4.1	6	7	$y\sqrt{x}$	-4.40	-1.12	1.00	4.01	8.60	11.80	1 <
x	1	2	3	4.1	6	7										
$y\sqrt{x}$	-4.40	-1.12	1.00	4.01	8.60	11.80										

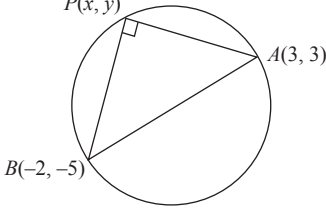


Geometri Koordinat
Coordinate Geometry

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	(a) $-1 = \frac{-5(n) + 8(n)}{m + n}$ $-m - n = -5n + 8m$ $9m = 4n$ $\frac{m}{n} = \frac{4}{9}$ $JK : KL = 4 : 9$ (b) $2 = \frac{-2(9) + h(4)}{4 + 9}$ $2(13) = -18 + 4h$ $44 = 4h$ $h = 11$ (c) $m_{JK} = \frac{2 - (-2)}{-1 - (-5)}$ $= \frac{4}{4}$ $= 1$ 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	7
2	Luas/Area of $\Delta ABC = 10 \text{ unit}^2$ $\frac{1}{2} \begin{vmatrix} 3 & 1 & x & 3 \\ 4 & -2 & 0 & 4 \end{vmatrix} = 10$ $\frac{1}{2} [3(-2) + 1(0) + x(4)] - [4(1) + (-2)(x) + 0(3)] = 10$ $\frac{1}{2} [-6 + 4x - 4 + 2x] = 10$ $ 6x - 10 = 20$ $6x - 10 = 20$ dan/and $6x - 10 = -20$ $6x = 30$ $6x = -10$ $x = 5$ $x = -\frac{5}{3}$ Maha/Thus, $C_1 = (5, 0)$ dan/and $C_2 = \left(-\frac{5}{3}, 0\right)$.	1 1 1 1	4
3	(a) Luas/Area of ΔPQR $= \text{Luas } \Delta PRS + \text{luas trapezium } QRST - \text{luas } \Delta PQT$ $\text{Area of } \Delta PRS + \text{area of trapezium } QRST - \text{area of } \Delta PQT$ $= \left(\frac{1}{2} \times PS \times RS\right) + \left(\frac{1}{2} \times ST \times (RS + QT)\right) - \left(\frac{1}{2} \times PT \times QT\right)$ $= \frac{1}{2}(x_3 - x_1)(y_3 - y_1) + \frac{1}{2}(x_2 - x_3)[(y_2 - y_1) + (y_3 - y_1)] - \frac{1}{2}(x_2 - x_1)(y_2 - y_1)$ $= \frac{1}{2}(x_3y_3 - x_3y_1 - x_1y_3 + x_1y_1 + x_2y_2 - x_2y_1 + x_2y_3 - x_2y_1 - x_3y_2 + x_3y_1 -$ $x_3y_3 + x_3y_1 - x_2y_2 + x_2y_1 + x_1y_2 - x_1y_1)$ $= \frac{1}{2}(x_3y_1 + x_2y_3 + x_1y_2 - x_1y_3 - x_2y_1 - x_3y_2)$ $= \frac{1}{2} x_1y_2 + x_2y_3 + x_3y_2 - x_2y_1 - x_3y_2 - x_1y_3$ $= \frac{1}{2} (x_1y_2 + x_2y_3 + x_3y_1) - (x_2y_1 + x_3y_2 + x_1y_3)$	1, 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) (i) Luas/Area of $\Delta PQR = 11 \text{ unit}^2$ $\frac{1}{2} \begin{vmatrix} x & 4 & 2 & x \\ 0 & 2 & 5 & 0 \end{vmatrix} = 11$ $\frac{1}{2} [x(2) + 4(5) + 2(0)] - [0(4) + 2(2) + 5(x)] = 11$ $ 2x + 20 - 4 - 5x = 22$ $ -3x + 16 = 22$ $\begin{array}{ll} -3x + 16 = 22 & \text{dan/and} \quad -3x + 16 = -22 \\ 3x = -6 & 3x = 38 \\ x = -2 & x = \frac{38}{3} \\ & \text{(abaikan/ignore)} \end{array}$ $\therefore P(-2, 0)$ (ii) $SQ : SR = 2 : 1$ $\frac{SQ}{SR} = \frac{2}{1}$ $SQ = 2SR$ $\sqrt{(x-4)^2 + (y-2)^2} = 2\sqrt{(x-2)^2 + (y-5)^2}$ $x^2 - 8x + 16 + y^2 - 4y + 4 = 4(x^2 - 4x + 4 + y^2 - 10y + 25)$ $x^2 + y^2 - 8x - 4y + 20 = 4x^2 + 4y^2 - 16x - 40y + 116$ $3x^2 + 3y^2 - 8x - 36y + 96 = 0$	1 1 1 1	8
4	(a) $AC : CB = 3 : 1$ $C(k, -3) = \left(\frac{1(1) + 3(-3)}{3+1}, \frac{1(j) + 3(-5)}{3+1} \right)$ $= \left(-2, \frac{j-15}{4} \right)$ Bandingkan/Compare $k = -2$ $\frac{j-15}{4} = -3$ $j-15 = -12$ $j = 3$ (b) $m = \frac{3 - (-5)}{1 - (-3)} = 2$ $2 \times m_2 = -1$ $m_2 = -\frac{1}{2}$ $y-3 = -\frac{1}{2}(x-1)$ $y-3 = -\frac{1}{2}x + \frac{1}{2}$ $y = -\frac{1}{2}x + \frac{7}{2}$ (c) Luas/Area of ΔABD $= \frac{1}{2} \begin{vmatrix} 1 & -3 & 3 & 1 \\ 3 & -5 & -1 & 3 \end{vmatrix}$ $= \frac{1}{2} [1(-5) + (-3)(-1) + 3(3)] - [3(-3) + (-5)(3) + (-1)(1)]$ $= \frac{1}{2} 7 - (-25) $ $= 16 \text{ unit}^2$	1 1 1 1 1 1	7

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
5	(a) Titik tengah/<i>Midpoint</i> $= \left(\frac{3+p}{2}, \frac{-6+q}{2} \right)$ (b) $7y + x = 11$ $7\left(\frac{-6+q}{2}\right) + \left(\frac{3+p}{2}\right) = 11$ $-42 + 7q + 3 + p = 22$ $p = 22 + 42 - 3 - 7q$ $p = 61 - 7q$ (c) Apabila/<i>When</i> $p = 5$, $5 = 61 - 7q$ $q = \frac{56}{7}$ $= 8$ $\therefore B(5, 8)$ $TB = 3$ $\sqrt{(x-5)^2 + (y-8)^2} = 3$ $(\sqrt{(x-5)^2 + (y-8)^2})^2 = 3^2$ $x^2 - 10x + 25 + y^2 - 16y + 64 = 9$ $x^2 + y^2 - 10x - 16y + 80 = 0$ (d) Jarak titik $B(5, 8)$ ke titik $(6, 7)$ <i>The distance of point $B(5, -10)$ to the point $(6, 7)$</i> $= \sqrt{(5-6)^2 + (8-7)^2}$ $= \sqrt{(-1)^2 + (1)^2}$ $= \sqrt{2} < 3$ Maka, titik $(6, 7)$ terletak di dalam bulatan lokus T kerana $\sqrt{2} < 3$. <i>Hence, the point $(6, 7)$ lies inside the circle of locus T because $\sqrt{2} < 3$.</i>	1 1 1 1 1 1 1 1 1 1	10
6	(a) (i) $C(x, y) = \left(\frac{3+5}{2}, \frac{3+(-1)}{2} \right)$ $= (4, 1)$ $BC : CD = 3 : 2$ Katakan/<i>Let</i> $D(x, y)$ $C(4, 1) = \left(\frac{2(-2) + 3(x)}{3+2}, \frac{2(-5) + 3(y)}{3+2} \right)$ $= \left(\frac{3x-4}{5}, \frac{3y-10}{5} \right)$ Bandingkan/<i>Compare</i> $\frac{3x-4}{5} = 4$ dan/<i>and</i> $\frac{3y-10}{5} = 1$ $3x-4 = 20$ $3y-10 = 5$ $3x = 24$ $3y = 15$ $x = 8$ $y = 5$ $\therefore D(8, 5)$ (ii) Luas/<i>Area of</i> $\triangle CDE$ $= \frac{1}{2} \begin{vmatrix} 4 & 5 & 8 & 4 \\ 1 & -1 & 5 & 1 \end{vmatrix}$ $= \frac{1}{2} [4(-1) + 5(5) + 8(1)] - [1(5) + (-1)(8) + 5(4)]$ $= \frac{1}{2} 29 - 17$ $= 6 \text{ unit}^2$	1 1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) (i)  $m_{PA} m_{PB} = -1$ $\left(\frac{y-3}{x-3}\right)\left(\frac{y-(-5)}{x-(-2)}\right) = -1$ $\frac{(y-3)(y+5)}{(x-3)(x+2)} = -1$ $y^2 + 5y - 3y - 15 = -(x^2 + 2x - 3x - 6)$ $y^2 + 2y - 15 + x^2 - x - 6 = 0$ $x^2 + y^2 - x + 2y - 21 = 0$ (ii) Di titik/At point C(4, 1), $(4)^2 + (1)^2 - (4) + 2(1) - 21 = -6$ $0 \neq -6$ Maka, lokus P tidak melalui titik C. Thus, locus of P does not pass through point C.	1 1 1 1 1	10
7	(a) Daripada persamaan garis lurus From the equation of straight line $3y = 4x + 24$ $y = \frac{4}{3}x + 8$ $\therefore P(8, 0)$ Kecerunan/Gradient, $m_{PQ} = -\frac{\text{Pintasan-y/Intercept-y}}{\text{Pintasan-x/Intercept-x}}$ $\frac{4}{3} = -\frac{8}{\text{Pintasan-x/Intercept-x}}$ $\text{Pintasan-x/Intercept-x} = -\frac{8}{\frac{4}{3}}$ $= -6$ $\therefore Q(0, -6)$ (b) Persamaan garis lurus/Equation of straight line PR, $y - 0 = -3(x - 8)$ $y = -3x + 8$ $m_{QR} \times -3 = -1$ $m_{QR} = \frac{1}{3}$ Persamaan garis lurus/Equation of straight line QR, $y - 0 = \frac{1}{3}(x - (-6))$ $y = \frac{1}{3}x + 2$	1 1 1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(c) $y = -3x + 8$... ① $y = \frac{1}{3}x + 2$... ② Gantikan ① ke dalam ② <i>Substitute ① into ②</i> $-3x + 8 = \frac{1}{3}x + 2$ $\frac{10}{3}x = 6$ $x = \frac{9}{5}$ Gantikan $x = \frac{9}{5}$ ke dalam ① atau ② <i>Substitute $x = \frac{9}{5}$ into ① or ②</i> $y = -3\left(\frac{9}{5}\right) + 8$ atau/or $y = \frac{1}{3}\left(\frac{9}{5}\right) + 2$ $= \frac{13}{5}$ $= \frac{13}{5}$ Maka/Hence $R\left(\frac{9}{5}, \frac{13}{5}\right)$. (d) Koordinat-x bagi $R = \frac{9}{5}$ Koordinat-y bagi $R = \frac{13}{5}$ <i>x-coordinate of R</i> <i>y-coordinate of R</i> $\frac{x(13) + (-6)(7)}{13 + 7} = \frac{9}{5}$ $\frac{y(13) + (0)(7)}{13 + 7} = \frac{13}{5}$ $13x - 42 = \frac{9}{5} \times 20$ $13y = \frac{13}{5} \times 20$ $13x = 78$ $13y = 52$ $x = 6$ $y = 4$ $S(6, 4)$	1 1 1 1 1	10
8	(a) (i) $2y - x + 5 = 0$ $y = \frac{1}{2}x - \frac{5}{2}$ Kecerunan/<i>Gradient</i>, $m_{RS} = \frac{1}{2}$ $m_{PS} \times \frac{1}{2} = -1$ $m_{RS} = \frac{1}{\frac{1}{2}}$ $= -2$ Persamaan garis lurus <i>PS/Equation of straight line PS</i>, $y - 4 = -2(x - 8)$ $y = -2x + 20$ (ii) $y = -2x + 20$... ① $2y - x + 5 = 0$... ② Gantikan ① ke dalam ② <i>Substitute ① into ②</i> $2(-2x + 20) - x + 5 = 0$ $-4x + 40 - x + 5 = 0$ $5x = 45$ $x = 9$ Gantikan $x = 9$ ke dalam ① <i>Substitute $x = 9$ into ①</i> $y = -2(9) + 20$ $= 2$ $S(9, 2)$	1 1 1 1	

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

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) Kecerunan/Gradient, $m_{CD} = m_{AB}$ $= -\frac{5}{2}$ Persamaan garis lurus/Equation of straight line $y - 0 = -\frac{5}{2}(x - 6)$ $y = -\frac{5}{2}x + 15$ (c) 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 $\frac{y+3}{2} = 4$ $y = 5$ Maka/Hence C(4, 5). 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 $\frac{3(3) + y(1)}{1+3} = 5$ $y = 11$ Maka/Hence P(13, 11). Jarak/The distance of AP = $\sqrt{(13-1)^2 + (11-3)^2}$ = 14.42 km	1 1 1 1 1 1 1 1 1	10
10	(a) Kecerunan/Gradient, $m_{AB} = \frac{9-0}{6-0}$ $= \frac{3}{2}$ Persamaan garis lurus AB/Equation of straight line AB: $\therefore y = \frac{3}{2}x$ (b) Apabila/When $y = 3$ $3 = \frac{3}{2}x$ $x = 2$ B(2, 3), P(6, y), C(10, 3) $\frac{1}{2} \begin{vmatrix} 2 & 6 & 10 & 2 \\ 3 & y & 3 & 3 \end{vmatrix} = 8$ $\frac{1}{2} [[2y + 6(3) + 10(3)] - [3(6) + y(10) + 3(2)]] = 8$ $ (2y + 18 + 30) - (18 + 10y + 6) = 16$ $ (2y + 48) - (10y + 24) = 16$ $ -8y + 24 = 16$ -8y + 24 = 16 atau/or -8y + 24 = -16 8y = 8 8y = 40 y = 1 (abaikan/ignored) y = 5 Maka/Hence P(6, 5). (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 1 1 1 1 1 1 1 1 1 1 1	10

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
11	Kecerunan/<i>Gradient of AB</i>, $m_{AB} = \frac{7-3}{9-(-5)}$ $= \frac{4}{14}$ $= \frac{2}{7}$ Persamaan garis lurus <i>AB/Equation of straight line AB</i> $y - 3 = \frac{2}{7}(x - (-5)) \quad \text{atau/or} \quad y - 7 = \frac{2}{7}(x - 9)$ $y - 3 = \frac{2}{7}x + \frac{10}{7} \qquad\qquad\qquad y - 7 = \frac{2}{7}x - \frac{18}{7}$ $y = \frac{2}{7}x + \frac{31}{7} \qquad\qquad\qquad y = \frac{2}{7}x + \frac{31}{7}$ Untuk menentukan jarak terdekat, garis dari O ke garis AB mesti berserenjang. <i>To determine the shortest distance, the line from O to the line AB must be perpendicular.</i> Maka, kecerunan/<i>Hence, gradient, m = -1</i> $m_{O\perp AB} \times \frac{2}{7} = -1$ $m_{O\perp AB} = -\frac{7}{2}$ Persamaan garis lurus dari O ke garis AB, $y = -\frac{7}{2}x$ <i>Equation of straight line O to the line AB, $y = -\frac{7}{2}x$</i> Untuk memperoleh titik persilangan antara garis serenjang dengan garis lurus AB <i>To obtain intersection point between perpendicular line and the straight line AB</i> $y = \frac{2}{7}x + \frac{31}{7} \quad \dots \textcircled{1}$ $y = -\frac{7}{2}x \quad \dots \textcircled{2}$ Gantikan ② ke dalam ① <i>Substitute ② into ①</i> $-\frac{7}{2}x = \frac{2}{7}x + \frac{31}{7}$ $-\frac{7}{2}x - \frac{2}{7}x = \frac{31}{7}$ $-\frac{53}{14}x = \frac{31}{7}$ $x = -\frac{62}{53}$ Apabila/<i>When x = -\frac{62}{53},</i> $y = -\frac{7}{2}\left(-\frac{62}{53}\right)$ $= \frac{217}{53}$ Titik persilangan/<i>Intersection point</i> $\left(\frac{-62}{53}, \frac{217}{53}\right)$ Jarak terdekat dari O ke garis lurus AB <i>The shortest distance from O to straight line AB</i> $= \sqrt{\left(-\frac{62}{53} - 0\right)^2 + \left(\frac{217}{53} - 0\right)^2}$ $= 4.258 \text{ unit/units}$	1 1 1 1 1 1 1 1 1 1 1 1 1	9


Vektor
Vectors

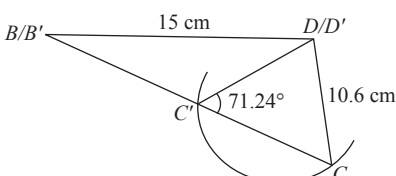
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	(a) $\vec{AB} = \vec{AO} + \vec{OB}$ $= -4\hat{i} - 5\hat{j} + 6\hat{i} - 9\hat{j}$ $= 2\hat{i} - 14\hat{j}$ (b) $2\vec{OC} = \vec{BA}$ $\vec{OC} = \frac{1}{2}(\vec{BA})$ $= \frac{1}{2}(-2\hat{i} + 14\hat{j})$ $= -\hat{i} + 7\hat{j}$ $C(-1, 7)$	1 1 1 1	4
2	$\underline{u} = \hat{i} + 3\hat{j}, \underline{v} = 2\hat{i} - 9\hat{j}$ (a) $\underline{u} - k\underline{v} = \hat{i} + 3\hat{j} - k(2\hat{i} - 9\hat{j})$ $= \hat{i} + 3\hat{j} - 2k\hat{i} + 9k\hat{j}$ $= (1 - 2k)\hat{i} + (3 + 9k)\hat{j}$ (b) $3 + 9k = 0$ $9k = -3$ $k = -\frac{1}{3}$	1 1 1	3
3	(a) $n = \sqrt{6^2 + (-8)^2}$ $= 10$ (b) $\underline{m} + \underline{n} = \begin{pmatrix} k \\ 3 \end{pmatrix} + \begin{pmatrix} 6 \\ -8 \end{pmatrix}$ $= \begin{pmatrix} k+6 \\ -5 \end{pmatrix}$ Oleh sebab $\underline{m} + \underline{n}$ adalah selari dengan paksi-y, maka <i>Since $\underline{m} + \underline{n}$ is parallel to y-axis, then</i> $\begin{pmatrix} k+6 \\ -5 \end{pmatrix} = \begin{pmatrix} 0 \\ y \end{pmatrix}$ $k+6 = 0$ $k = -6$	1 1 1 1 1	5
4	(a) $\vec{OM} = 2\hat{i} - 2\hat{j}$ $\vec{ON} = 7\hat{i} + 3\hat{j}$ $\vec{MN} = \vec{MO} + \vec{ON}$ $= -2\hat{i} + 2\hat{j} + 7\hat{i} + 3\hat{j}$ $= 5\hat{i} + 5\hat{j}$ $\vec{MN} = h\underline{v} + k\underline{w}$ $h(2\hat{i} + 3\hat{j}) + k(-2\hat{i} + \hat{j}) = 5\hat{i} + 5\hat{j}$ $(2h - 2k)\hat{i} + (3h + k)\hat{j} = 5\hat{i} + 5\hat{j}$ Bandingkan pekali/Comparing coefficient, $2h - 2k = 5 \dots \textcircled{1}$ $3h + k = 5 \dots \textcircled{2}$ Daripada/From $\textcircled{2}$ $k = 5 - 3h \dots \textcircled{3}$ Gantikan $\textcircled{3}$ ke dalam $\textcircled{1}$ Substitute $\textcircled{3}$ into $\textcircled{1}$ $2h - 2(5 - 3h) = 5$ $2h - 10 + 6h = 5$ $8h = 5 + 10$ $h = \frac{15}{8}$ $k = 5 - 3\left(\frac{15}{8}\right)$ $k = -\frac{5}{8}$	1 1 1	

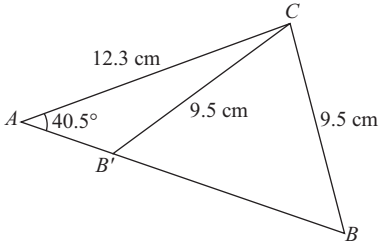
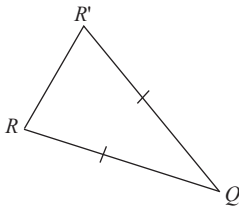
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) $ \overrightarrow{MN} = \sqrt{5^2 + 5^2}$ $ \overrightarrow{MN} = \sqrt{50}$ $= 5\sqrt{2}$ $\overrightarrow{MN} = \frac{1}{5\sqrt{2}} (5\hat{i} + 5\hat{j})$ $\overrightarrow{MN} = \frac{\hat{i}}{\sqrt{2}} + \frac{\hat{j}}{\sqrt{2}}$	1 1 1	6
5	(a) $\overrightarrow{PQ} = \overrightarrow{PO} + \overrightarrow{OQ}$ $\overrightarrow{PQ} = -2\hat{i} - \hat{j} - 2\hat{i} + 4\hat{j}$ $\overrightarrow{PQ} = -4\hat{i} + 3\hat{j}$ (b) (i) $\overrightarrow{PQ} + 2\overrightarrow{QR} = 2\hat{i} + 11\hat{j}$ $-4\hat{i} + 3\hat{j} + 2(m\hat{i} + 4\hat{j}) = 2\hat{i} + 11\hat{j}$ $-4\hat{i} + 3\hat{j} + 2m\hat{i} + 8\hat{j} = 2\hat{i} + 11\hat{j}$ $(-4 + 2m)\hat{i} + 11\hat{j} = 2\hat{i} + 11\hat{j}$ $-4 + 2m = 2$ $2m = 6$ $m = 3$ (ii) $\overrightarrow{QR} = 3\hat{i} + 4\hat{j}$ Vektor unit dalam arah $\overrightarrow{QR}$ <i>Unit vector in the direction of $\overrightarrow{QR}$</i> $= \frac{3\hat{i} + 4\hat{j}}{\sqrt{(3)^2 + (4)^2}}$ $= \frac{3\hat{i} + 4\hat{j}}{5}$ $= \frac{3}{5}\hat{i} + \frac{4}{5}\hat{j}$	1 1 1 1	5
6	(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 = $\begin{pmatrix} \frac{-8}{\sqrt{80}} \\ \frac{4}{\sqrt{80}} \end{pmatrix}$	1 1 1 1 1 1	6

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
7	(a) $\overrightarrow{PS} = \overrightarrow{PQ} + \overrightarrow{QS}$ $= -\underline{y} + 4\underline{x}$ $= \frac{1}{3}\overrightarrow{PS}$ $= -\frac{1}{3}\underline{y} + \frac{4}{3}\underline{x}$ $\overrightarrow{QK} = \overrightarrow{QP} + \overrightarrow{PK}$ $= \underline{y} - \frac{1}{3}\underline{y} + \frac{4}{3}\underline{x}$ $= \frac{2}{3}\underline{y} + \frac{4}{3}\underline{x}$ $\overrightarrow{JS} = \overrightarrow{JP} + \overrightarrow{PS}$ $= \frac{2}{3}\overrightarrow{RP} + \overrightarrow{PS}$ $= \frac{2}{3}(\overrightarrow{RQ} + \overrightarrow{QP}) + (-\underline{y} + 4\underline{x})$ $= -\frac{2}{3}\underline{x} + \frac{2}{3}\underline{y} - \underline{y} + 4\underline{x}$ $= \frac{10}{3}\underline{x} - \frac{1}{3}\underline{y}$ (b) $\overrightarrow{QJ} = \lambda\overrightarrow{QK}$ (dilihat/seen) $\overrightarrow{QP} + \overrightarrow{PJ} = \lambda\left(\frac{2}{3}\underline{y} + \frac{4}{3}\underline{x}\right)$ $\underline{y} + \frac{2}{3}(-\underline{y} + \underline{x}) = \lambda\left(\frac{2}{3}\underline{y} + \frac{4}{3}\underline{x}\right)$ $\frac{2}{3}\underline{x} + \frac{1}{3}\underline{y} = \frac{4}{3}\lambda\underline{x} + \frac{2}{3}\lambda\underline{y}$ $\frac{4}{3}\lambda = \frac{2}{3} \quad \text{atau/or} \quad \frac{2}{3}\lambda = \frac{1}{3}$ $\lambda = \frac{1}{2} \quad \lambda = \frac{1}{2}$ $\overrightarrow{QJ} = \frac{1}{2}\overrightarrow{QK}$ Maka, Q, J dan K adalah segaris. Therefore, Q, J and K are collinear.	1 1 1 1 1 1 1 1 1 1	8
8	$\overrightarrow{SR} = m\overrightarrow{PQ}$ $\overrightarrow{SP} + \overrightarrow{PQ} + \overrightarrow{QR} = m(\underline{x} + \underline{y})$ $3\underline{x} + \underline{x} + \underline{y} - 5\lambda\underline{x} - \lambda\underline{y} = m\underline{x} + m\underline{y}$ $(4 - 5\lambda)\underline{x} + (1 - \lambda)\underline{y} = m\underline{x} + m\underline{y}$ $m = 4 - 5\lambda, m = 1 - \lambda$ $4 - 5\lambda = 1 - \lambda$ $4\lambda = 3$ $\lambda = \frac{3}{4}$ $m = 4 - 5\left(\frac{3}{4}\right), \quad m = 1 - \frac{3}{4}$ $= \frac{1}{4} \quad = \frac{1}{4}$ 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

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
9	(a) $\vec{AB} = \vec{AO} + \vec{OB}$ $= -6\vec{a} + k\vec{b}$ $\vec{OP} = \vec{OA} + \vec{AP}$ $= \vec{OA} + \frac{1}{3}\vec{AB}$ $= 6\vec{a} + \frac{1}{3}(-6\vec{a} + k\vec{b})$ $= 6\vec{a} - 2\vec{a} + \frac{1}{3}k\vec{b}$ $= 4\vec{a} + \frac{1}{3}k\vec{b}$ (b) Apabila OP dipanjangkan, O, P dan Q ialah segaris, maka <i>When O is extended, P and Q are collinear, then</i> $\vec{OP} = \lambda\vec{PQ}$ $4\vec{a} + \frac{1}{3}k\vec{b} = \lambda(20\vec{a} + 15\vec{b})$ $4\vec{a} + \frac{1}{3}k\vec{b} = 20\lambda\vec{a} + 15\lambda\vec{b}$ $20\lambda = 4 \quad \text{atau/or} \quad 15\lambda = \frac{1}{3}k$ $\lambda = \frac{1}{5} \quad \quad \quad k = 9$	1 1 1 1, 1	6
10	(a) $3\vec{p} = 3(k^2\vec{i} + 2\vec{j})$ dan/and $2\vec{q} = 2(2k\vec{i} + 3\vec{j})$ $= 3k^2\vec{i} + 6\vec{j}$ $= 4k\vec{i} + 6\vec{j}$ $3\vec{p} + 2\vec{q} = (3k^2\vec{i} + 6\vec{j}) + (4k\vec{i} + 6\vec{j})$ $= (3k^2\vec{i} + 4k\vec{i}) + 12\vec{j} \quad \dots \textcircled{1}$ Dengan membandingkan pekali/By comparing the coefficient $3k^2 + 4k = 4$ $3k^2 + 4k - 4 = 0$ $(3k - 2)(k + 2) = 0 \quad (\text{dilihat/seen})$ $k = \frac{2}{3} \quad \text{dan/and} \quad k = -2 \quad \dots \textcircled{1}$ (b) (i) $\begin{pmatrix} 7 \\ -1 \end{pmatrix} + 2\begin{pmatrix} h \\ -3 \end{pmatrix} = \begin{pmatrix} 7 + 2h \\ 5 \end{pmatrix}$ (ii) $\sqrt{(7 + 2h)^2 + (5)^2} = \sqrt{34}$ $4h^2 + 28h + 40 = 0$ $h^2 + 7h + 10 = 0$ $(h + 2)(h + 5) = 0$ $h + 2 = 0, \quad h + 5 = 0$ $h = -2 \quad \quad \quad h = -5$	1 1 1 1	5
11	(a) $\vec{OM} = \begin{pmatrix} 11 \\ 2 \end{pmatrix}$, $\vec{ON} = \begin{pmatrix} 15 \\ -p \end{pmatrix}$ $\vec{NM} = \vec{NO} + \vec{OM}$ $= \begin{pmatrix} -15 \\ p \end{pmatrix} + \begin{pmatrix} 11 \\ 2 \end{pmatrix}$ $= \begin{pmatrix} -15 + 11 \\ p + 2 \end{pmatrix}$ $= \begin{pmatrix} -4 \\ p + 2 \end{pmatrix}$	1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) $\overrightarrow{NM} = 20$ $\sqrt{(-4)^2 + (p+2)^2} = \sqrt{20}$ $16 + (p+2)^2 = 20$ $p^2 + 4p + 4 + 16 - 20 = 0$ $p^2 + 4p = 0$ $p(p+4) = 0$ $p = 0$, $p + 4 = 0$ $p = -4$ $p < 0, \therefore p = -4$ (c) $\overrightarrow{NM} = \begin{pmatrix} -4 \\ -4 + 2 \end{pmatrix}$ $\overrightarrow{NM} = \sqrt{(-4)^2 + (-2)^2}$ $= \begin{pmatrix} -4 \\ -2 \end{pmatrix}$ $= \sqrt{20}$ Vektor unit/Unit vector, $NM = \frac{-2\hat{i} - \hat{j}}{\sqrt{5}} = \frac{-2\hat{i}}{\sqrt{5}} - \frac{\hat{j}}{\sqrt{5}}$	1 1 1 1	6
12	(a) (i) $\overrightarrow{AB} = -\underline{a} + 3\underline{b}$ $\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP}$ $= \underline{a} + \frac{1}{3}(-\underline{a} + 3\underline{b})$ $= \underline{a} - \frac{1}{3}\underline{a} + \underline{b}$ $= \frac{2}{3}\underline{a} + \underline{b}$ (ii) $\overrightarrow{BQ} = \overrightarrow{BO} + \overrightarrow{OQ}$ $= -3\underline{b} + k\left(\frac{2}{3}\underline{a} + \underline{b}\right)$ $= -3\underline{b} + \frac{2}{3}k\underline{a} + k\underline{b}$ $= \frac{2}{3}k\underline{a} + (k-3)\underline{b}$ (b) $\overrightarrow{BQ} = h\overrightarrow{BC}$ $\overrightarrow{BO} + \overrightarrow{OQ} = h(\overrightarrow{BO} + \overrightarrow{OC})$ $-3k + k\left(\frac{2}{3}\underline{a} + \underline{b}\right) = h(4\underline{a} - 3\underline{b})$ $\frac{2}{3}k\underline{a} + (k-3)\underline{b} = 4h\underline{a} - 3h\underline{b}$ Jadi/Thus, $\frac{2}{3}k = 4h$ $k = \frac{4h \times 3}{2}$ $k = 6h \dots \textcircled{1}$ $k - 3 = -3h$ $3h + k = 3 \dots \textcircled{2}$ Gantikan $\textcircled{1}$ ke dalam $\textcircled{2}$: Substitute $\textcircled{1}$ into $\textcircled{2}$: $3h + 6h = 3$ $9h = 3$ $h = \frac{1}{3}$ 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	10

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(iii) $\angle PSR = 180^\circ - 58^\circ$ $= 122^\circ$ $\frac{\sin \angle PRS}{2.3} = \frac{\sin 122^\circ}{14.59}$ $\angle PRS = 7.68^\circ$ $\angle ORS = 7.68^\circ + \left(\frac{180^\circ - 116^\circ}{2}\right)$ $= 39.68^\circ$ (b) $s = \frac{17.2 + 9.115 + 14.59}{2}$ $= 20.45$ Luas/Area of ΔPQR $= \sqrt{20.45(20.45 - 17.2)(20.45 - 9.115)(20.45 - 14.59)}$ $= 66.44 \text{ cm}^2$	1 1 1 1 1	10
4	(a) (i) $\frac{\sin \angle BCD}{15} = \frac{\sin 42^\circ}{10.6}$ $\sin \angle BCD = \frac{\sin 42^\circ}{10.6} \times 15$ $\angle BCD = 71.24^\circ$ (ii) $15^2 = 9^2 + 11^2 - 2(9)(11) \cos \angle BAD$ $\cos \angle BAD = \frac{9^2 + 11^2 - 15^2}{2(9)(11)}$ $\angle BAD = 96.67^\circ$ (iii) Luas/Area of $\Delta ABD = \frac{1}{2} \times 9 \times 11 \times \sin 96.67^\circ$ $= 49.16 \text{ cm}^2$ Luas/Area of $\Delta BCD = \frac{1}{2} \times 15 \times 10.6 \times \sin 66.76^\circ$ $= 73.05 \text{ cm}^2$ Luas/Area of $\Delta BCD = 49.16 + 73.05$ $= 122.21 \text{ cm}^2$ (b) (i)  (ii) $\angle B'C'D' = 180^\circ - 71.24^\circ$ $= 108.76^\circ$	1 1 1 1 1 1 1 1 1 1	10
5	(a) (i) $\frac{\sin \angle ABC}{12.3} = \frac{\sin 40.5^\circ}{9.5}$ $\angle ABC = 57.23^\circ$ (ii) $12.3^2 = 9.8^2 + 5.2^2 - 2(9.8)(5.2) \cos \angle ADC$ $\cos \angle ADC = \frac{9.8^2 + 5.2^2 - 12.3^2}{2(9.8)(5.2)}$ $\angle ADC = 106.07^\circ$ (iii) Luas/Area of $\Delta ACD = \frac{1}{2}(9.8)(5.2) \sin 106.07^\circ$ $= 24.48 \text{ cm}^2$ Kaedah alternatif/Alternative method $S = \frac{9.8 + 5.2 + 12.3}{2}$ Luas/Area of $\Delta ACD = \sqrt{13.65(13.65 - 12.3)(13.65 - 5.2)(13.65 - 9.8)}$ $= 24.48 \text{ cm}^2$	1 1 1 1 1 1 1 atau/or 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) (i)  (ii) $\frac{\sin \angle BB'C}{12.3} = \frac{\sin 40.5^\circ}{9.5}$ $\angle BB'C = 57.23^\circ$ $\therefore \angle AB'C = 180^\circ - 57.23^\circ$ $= 122.7^\circ$	1 1 1 1	10
6	(a) (i) $QR^2 = (4\sqrt{3} - 5)^2 + (4\sqrt{3} + 5)^2 - 2(4\sqrt{3} - 5)(4\sqrt{3} + 5) \cos 60^\circ$ $QR = \sqrt{48 - 40\sqrt{3} + 25 + 48 + 40\sqrt{3} + 25 - 2(48 - 25)\left(\frac{1}{2}\right)}$ $= \sqrt{123} \text{ cm}$ (ii) $\frac{4\sqrt{3} - 5}{\sin \angle PQR} = \frac{\sqrt{123}}{\sin 60^\circ}$ $\frac{4\sqrt{3} - 5}{\sin \angle PQR} = \frac{\sqrt{123}}{\frac{\sqrt{3}}{2}}$ $\frac{4\sqrt{3} - 5}{\sin \angle PQR} = 2\sqrt{41}$ $\sin \angle PQR = \frac{4\sqrt{3} - 5}{2\sqrt{41}} \times \frac{\sqrt{41}}{\sqrt{41}}$ $= \frac{\sqrt{41}}{82} (4\sqrt{3} - 5), \text{ Tertunjuk/Shown}$ Maka/Hence, $\angle PQR = 8.66^\circ$ (b) (i)  (ii) Luas/Area of $\triangle QR'R = \frac{1}{2}(\sqrt{123})(\sqrt{123})(\sin 42.68^\circ)$ $= 41.69 \text{ cm}^2$	1 1 1 1 1 1 1 1 1 1 1	10
7	(a) (i) $\frac{\sin \angle LNM}{8} = \frac{\sin 31^\circ}{6}$ $\angle LNM = 43.37^\circ$ (sudut tirus/acute angle) Maka/Then $\angle LNM = 180^\circ - 43.37^\circ$ $= 136.63^\circ$ $\angle LNK = 43.37^\circ$ $\angle LKN = 43.37^\circ$ (ii) $\angle KLN = 180^\circ - 2(43.37^\circ)$ $= 93.26^\circ$ $\frac{KN}{\sin 93.26^\circ} = \frac{6}{\sin 43.37^\circ}$ $KN = 8.723 \text{ cm}$	1 1 1 1 1 1 1 1	

Program Tuisyen Rakyat Selangor

[illegible]



Nombor Indeks
Index Numbers

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	(a) $\frac{3.12}{x} \times 100 = 130$ $x = 2.40$ $\frac{4.20}{3.00} \times 100 = y$ $y = 140$ $\frac{z}{2.80} \times 100 = 110$ $z = 3.08$ $m = 100 - 20 - 25 - 30$ $= 25$ (b) $\bar{I} = \frac{130(20) + 140(25) + 118(25) + 110(30)}{20 + 25 + 24 + 30}$ $= \frac{12\,350}{100}$ $= 123.5$ (c) $\frac{120x + 80y}{x + y} = 110$ $120x + 80y = 110x + 110y$ $10x = 30y$ $x = 3y$ $\frac{120x + 155z}{x + z} = 125$ $120x + 155z = 125x + 125z$ $30z = 5x$ $6z = x$ $x : y : z = 6 : 2 : 1$	1 1 1 1 1, 1 1 1 1 1	10
2	(a) (i) $\frac{Q_{2025}}{18} \times 100 = 110$ $Q_{2021} = \text{RM}19.80$ (ii) $I = \frac{Q_{2022}}{Q_{2025}} \times \frac{Q_{2025}}{Q_{2020}} \times 100$ $= \frac{120}{105} \times 100$ $= 114.29$ (b) (i) $\frac{105(5) + 110(10) + x(5) + 110(3)}{5 + 10 + 5 + 3} = 125$ $\frac{1\,955 + 5x}{23} = 125$ $5x = 1\,545$ $x = 184$ Peningkatan 84% dari tahun 2022 ke tahun 2025 84% increment from the year 2022 to the year 2025. (ii) $\frac{90}{Q_{2022}} \times 100 = 125$ $Q_{2022} = \text{RM}72$	1 1 1 1 1, 1 1 1 1 1 1	10

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
3	(a) $\frac{4.00}{a} \times 100 = 125$ $a = 3.20$ (b) $\frac{b + 0.50}{b} \times 100 = 125$ $b = 2.00$ $c = 2.00 + 0.50$ $= 2.50$ (c) (i) $\frac{11.20}{P_{2024}} \times 100 = 128.7$ $P_{2024} = \text{RM}8.70$ (ii) $\frac{125(6) + 110(2) + 125(h) + 160(3)}{6 + 2 + h + 3} = 128.7$ $\frac{1\,450 + 125h}{11 + h} = 128.7$ $3.7h = 34.3$ $h = 9.27$ Bundar kepada integer terhampir, $h = 9$. <i>Round off to the nearest integer; $h = 9$.</i>	1 1 1 1 1 1 1 1 1, 1 1	10
4	(a) (i) Biskut/Biscuit: $I = \frac{3.00}{2.50} \times 100$ Menggunakan rumus yang betul $= 120$ <i>Use the correct formula</i> Kek/Cake: $I = \frac{3.60}{3.00} \times 100$ Tiga jawapan betul $= 120$ <i>Three correct answers</i> Donat/Donut: $I = \frac{3.60}{3.00} \times 100$ Semua jawapan betul $= 160$ <i>All answers are correct</i> Sandwic/Sandwich: $I = \frac{3.50}{2.00} \times 100$ $= 175$ (ii) $I = \frac{(120 \times 3) + (120 \times 2) + (160 \times 1) + (175 \times 4)}{3 + 2 + 1 + 4}$ $= \frac{1\,460}{10}$ $= 146$ (iii) $\frac{P_{2025}}{10} \times 100 = 146$ $P_{2025} = \frac{146}{100} \times 94$ $= 137.24$ (c) $I_{2022/2021} = 115$ $I_{2022/2019} = \frac{115}{100} \times 146$ $I_{2022/2019} = 167.9$	1 1 1 1, 1 1 1 1 1 1	10

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
5	(a) $\frac{1.35}{x} \times 100 = 150$ $x = 0.90$ $y = \frac{3.00}{2.50} \times 100$ $y = 120$ $\frac{z}{1.25} \times 100 = 140$ $z = 1.75$ (b) $\frac{(150 \times 3) + (120 \times 5) + (125 \times 8) + (140 \times m)}{3 + 5 + 8 + m} = 130.5$ $\frac{2050 + 140m}{16 + m} = 130.5$ $2\,050 + 140m = 2\,088 + 130.5m$ $9.5m = 38$ $m = 4$ (c) (i) $\frac{130.5 \times 90}{100} = 117.45$ (ii) $\frac{(150 \times 3) + (120 \times 5) + (125 \times 8) + 4n}{3 + 5 + 8 + 4} = 117.45$ $\frac{2\,050 + 4n}{20} = 117.45$ $2\,050 + 4n = 2\,349$ $4n = 2\,99$ $n = 74.75$ $100 - 74.75 = 25.25$ Maka, peratus penurunan harga bahan D ialah 25.25%. <i>Thus, the percentage decrease of the price of ingredient D is 25.25%.</i>	1 1 1 1 1 1, 1 1 1 1 1	10
6	(a) $x = \frac{2.40}{1.60} \times 100 = 150$ $\frac{5.50}{y} \times 100 = 110$ $y = 5.00$ $\frac{z}{2.50} \times 100 = 120$ $z = 3.00$ (b) $\bar{I}_{\frac{2023}{2000}} = \frac{(150 \times 250) + (110 \times 200) + (120 \times 150) + (125 \times 400)}{250 + 200 + 150 + 400}$ $= \frac{127\,500}{1\,000}$ $= 127.5$ (c) $P_{2000} = \frac{5}{1.25}$ $= \text{RM}4.00$ $\frac{P_{2023}}{4} \times 100 = 127.5$ $P_{2023} = \text{RM}5.10$ Harga jual pada tahun 2023/Selling price in the year 2023 $= 1.50 \times 5.10$ $= \text{RM}7.65$	1 1 1 1 1 1 1 1 1 1 1 1 1 1	10

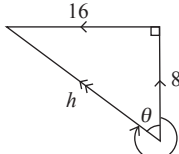
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
7	(a) $\frac{P_{2023}}{P_{2021}} \times 100 = 80$ $\frac{P_{2023}}{\text{RM1.50}} \times 100 = 80$ $P_{2023} = \text{RM1.20}$ (b) (i) $25 + 40 + k + 10 = 100$ $k = 25$ (ii) $\bar{I} = \frac{(150 \times 25) + (80 \times 40) + (110 \times 25) + (100 \times 10)}{25 + 40 + 25 + 10}$ $= 107$ $\frac{P_{2023}}{4.60} \times 100 = 107$ $P_{2023} = \text{RM4.92}$ (c) $\bar{I}_{\frac{2025}{2021}} = \frac{107 \times 135}{100}$ $= 144.45$ Maka, peratus perubahan kos pengeluaran dari tahun 2021 ke tahun 2025 meningkat sebanyak 44.45%. <i>Thus, the percentage change in the production cost from the year 2021 to the year 2025 increases by 44.45%</i>	1 1 1 1 1 1 1 1 1 1 1	10
8	(a) $\frac{70}{x} \times 100 = 175$ $x = \text{RM40}$ (b) $\frac{y}{20} \times 100 = 100$ $x = \text{RM20}$ $\frac{18}{15} \times 100 = z$ $z = \text{RM120}$ (b) $\bar{I} = \frac{175(8) + 150(12) + 125(10) + 100(24) + 120(46)}{8 + 12 + 10 + 24 + 46}$ $= \frac{12\,370}{100}$ $= 123.7$ (c) $\frac{x}{500} \times 100 = 123.7$ $x = \text{RM618.50}$ (d) $\frac{120}{100} \times 123.7 = 148.44$	1 1 1 1, 1 1 1 1 1, 1	10
9	(a) $x = \frac{2.60}{2.00} \times 100$ atau/or $\frac{0.40}{y} \times 100 = 125$ $x = 130$ $y = 0.32$ (b) $\bar{I} = \frac{150(35) + 130(40) + 125(13) + 125(12)}{35 + 40 + 13 + 12}$ $= \frac{13\,575}{100}$ $= 135.75$ $\frac{P_{2024}}{10.60} \times 100 = 135.75$ $P_{2024} = \text{RM14.39}$ (c) $\bar{I}_{\frac{2026}{2024}} = \frac{125}{135.75} \times 100$ $= 92.08$	1 1, 1 1, 1 1 1 1 1 1	10

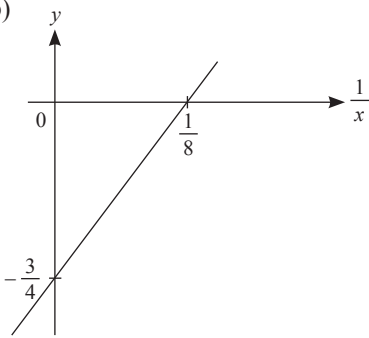
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
10	(a) $110 = \frac{1.65}{P_{2023}} \times 100$ $P_{2023} = \text{RM}1.50$ (b) $I_{2025/2023} = \frac{120 \times 85}{100}$ $= 102$ (c) $I_{2025/2023} = \frac{(110 \times 20) + (102 \times 45) + (130 \times 35)}{20 + 45 + 35}$ $= \frac{11\,340}{100}$ $= 113.4$ (d) $113.4 = \frac{C_{2025}}{2.75} \times 100$ $C_{2025} = \frac{113.4 \times 2.75}{100}$ $= \text{RM}3.12$ Harga jualan $= 3.12 \times \frac{130}{100}$ $= \text{RM}4.06$	1 1 1 1 1 1 1 1 1	10
11	(a) $\frac{(122.8 \times 3) + (88 \times h) + (110 \times 5)}{3 + h + 5} = 101.4$ $\frac{368.4 + 88h + 550}{8 + h} = 101.4$ $918.4 + 88h = 101.4(8 + h)$ $918.4 + 88h = 811.2 + 101.4h$ $13.4h = 107.2$ $h = 8$ (b) $\frac{(125 \times 3) + (110 \times 8) + (k \times 5)}{3 + 8 + 5} = 108.5$ $\frac{375 + 880 + 5k}{16} = 108.5$ $1\,255 + 5k = 1\,736$ $5k = 481$ $k = 96.2$ (c) (i) Bahan kimia/Chemical P: $I_{2025/2024} = 110$ $I_{2025/2022} = \frac{110 \times 125}{100} = 137.5$ $I_{2025/2023} = \frac{137.5}{122.8} \times 100 \approx 111.97$ Bahan kimia/Chemical Q: $I_{2025/2024} = 94$ $I_{2025/2022} = \frac{94 \times 110}{100} = 103.4$ $I_{2025/2023} = \frac{103.4}{88} \times 100 = 117.5$	1 1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	Bahan kimia/<i>Chemical R</i>: $I_{2025/2024} = 100$ $I_{2025/2022} = \frac{100 \times 96.2}{100} = 96.2$ $I_{2025/2023} = \frac{96.2}{110} \times 100 \approx 87.45$ $\bar{I}_{2025/2023} = \frac{(111.97 \times 3) + (117.5 \times 8) + (87.45 \times 5)}{16}$ $= \frac{335.91 + 940 + 437.25}{16}$ ≈ 107.07 (ii) $\frac{P_{2025}}{P_{2023}} \times 100 = \bar{I}_{2025/2023}$ $\frac{P_{2025}}{85} \times 100 = 107.07$ $P_{2025} = \text{RM}91.01$ Kos pembuatan racun perosak pada tahun 2025 ialah RM91.01. <i>The manufacturing cost of the pesticide in the year 2025 is RM91.01.</i>	1 1 1 1	

Kertas Model SPM**Kertas 1**

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	(a) $2x(x+3) = (2-x)(x+2)$ $2x^2 + 6x = 2x - x^2 + 4 - 2x$ $3x^2 + 6x - 4 = 0$ $3\left(x^2 + 2x - \frac{4}{3}\right) = 0$ $3\left[x^2 + 2x + \left(\frac{2}{2}\right)^2 - \left(\frac{2}{2}\right)^2 - \frac{4}{3}\right] = 0$ $3\left[(x+1)^2 - 1 - \frac{4}{3}\right] = 0$ $3\left[(x+1)^2 - \frac{7}{3}\right] = 0$ $3(x+1)^2 - 7 = 0$ $3(x+1)^2 = 7$ $(x+1)^2 = \frac{7}{3}$ $x+1 = \pm\sqrt{\frac{7}{3}}$ $x+1 = \sqrt{\frac{7}{3}} \quad \text{atau/or} \quad x+1 = -\sqrt{\frac{7}{3}}$ $x = \sqrt{\frac{7}{3}} - 1 \quad \quad \quad x = -\sqrt{\frac{7}{3}} - 1$ $= 0.528 \quad \quad \quad = -2.528$	1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) (i) $f(x) = (x - q)^2 + 2p$ $y = -9$ ialah tangen kepada lengkung pada titik minimum lengkung, maka, $y = -9$ is the tangent to the curve at the minimum of the curve, hence, $2p = -9$ $p = -\frac{9}{2}$ Graf menyalang paksi-x pada titik-titik $(-1, 0)$ dan $(5, 0)$, maka Graph intersects the x-axis at points $(-1, 0)$ and $(5, 0)$, hence $q = \frac{-1 + 5}{2}$ $= 2$ (ii) $f(x) = (x - 2)^2 + 2\left(-\frac{9}{2}\right)$ $f(x) = (x - 2)^2 - 9$ Persamaan bagi lengkung apabila graf dipantulkan pada paksi-x The equation of the curve when the graph is reflected about the x-axis $f(x) = -(x - 2)^2 + 9$	1 1 7 1 1	
2	(a) $\vec{PM} = \lambda \vec{MX}$ $4\tilde{x} + (h + 2)\tilde{y} = \lambda(\tilde{x} + g\tilde{y})$ $4\tilde{x} + (h + 2)\tilde{y} = \lambda\tilde{x} + \lambda g\tilde{y}$ $\therefore \lambda = 4$ dan/and $h + 2 = \lambda g$ $h = \lambda g - 2$ $h = 4g - 2$ (b)  $\tan \theta = \frac{16}{8}$ $= 2$ $\theta = 63.43^\circ$ $v = \sqrt{16^2 + 8^2}$ $= 17.89$ $360^\circ - 63.43^\circ = 296.57^\circ$	1 1 1 6 1 1 1	
3	(a) (i) $f(x) = \frac{4}{mx - 5}$ $f(3) = 4$ $\frac{4}{m(3) - 5} = 4$ $4 = 4(3m - 5)$ $3m - 5 = 1$ $3m = 6$ $m = 2$ (ii) Objek tidak akan mempunyai imej apabila The object will not has image when $2x - 5 = 0$ $x = \frac{5}{2}$ Maka, objek $= \frac{5}{2}$. Hence, the object $= \frac{5}{2}$. (b) $f(x + 5) = g(2x - 1)$ $g^{-1}f(x + 5) = 2x - 1$ Katakan/Suppose $f(x + 5) = u$ $x + 5 = f^{-1}(u)$ $x = f^{-1}(u) - 5$ Jadi/Thus $g^{-1}(u) = 2[f^{-1}(u) - 5] - 1$ $= 2f^{-1}(u) - 11$ Maka/Hence $g^{-1}(x) = 2f^{-1}(x) - 11$	1 1 6 1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
4	(a) $4x = 3y + 24$ $\frac{4}{3}x = y + 8$ $y = \frac{4}{3}x - 8$ Kecerunan/<i>Gradient</i>, $m = \frac{4}{3}$ (b) $m_1 \times \frac{4}{3} = -1$ dan/<i>and</i> Titik tengah/<i>Midpoint</i> $= \left(\frac{6}{2}, \frac{-8}{2}\right)$ $m_1 = -\frac{3}{4}$ $= (3, -4)$ $-4 = -\frac{3}{4}(3) + c$ $y - (-4) = -\frac{3}{4}(x - 3)$ atau/<i>or</i> $c = -\frac{7}{4}$ $y = -\frac{3}{4}x - \frac{7}{4}$ $y = -\frac{3}{4}x - \frac{7}{4}$	1 1 1 1	4
5	(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) $a = 154, d = 146 - 154 = -8$ $154 + (n - 1)(-8) < 0$ $154 < 8(n - 1)$ $n - 1 > \frac{154}{8}$ $n > \frac{154}{8} + 1$ $n > 20.25$ Maka/<i>Thus</i>, $n = 21$ $x = T_{21}$ $x = 154 + (21 - 1)(-8)$ $x = -6$	1 1 1 1 1 1 1	6
6	(a) Kecerunan/<i>Gradient</i>, $m = -\frac{6}{8}$ $= -\frac{3}{4}$ $xy = -\frac{3}{4}x + 6$ $y = -\frac{3}{4} + 6\left(\frac{1}{x}\right)$ (b)  Garis lurus dengan kecerunan positif <i>A straight line with positive gradient</i> Pintasan-x/<i>x-intercept</i> $= \frac{1}{8}$ Pintasan-y/<i>y-intercept</i> $= -\frac{3}{4}$	1 1 1 1	4

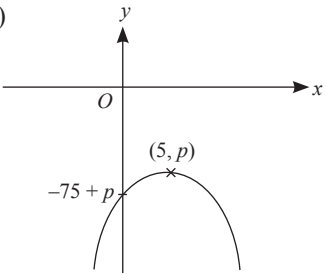
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
7	$x(2x - 4) = 7x + 1$ $2x^2 - 4x = 7x + 1$ $2x^2 - 11x - 1 = 0$ $x = \frac{-(-11) \pm \sqrt{(-11)^2 - 4(2)(-1)}}{2(2)}$ $x = \frac{11 + \sqrt{129}}{4}, \quad x = \frac{11 - \sqrt{129}}{4}$ $x = 5.589 \quad x = -0.089$	1 1 1	3
8	(a) $AB : BC = 2 : 3$ $(1, 3) = \left(\frac{2x + 3(-5)}{2 + 3}, \frac{2y + 3(-1)}{2 + 3} \right)$ Formula betul Correct formula $\frac{2x + 3(-5)}{5} = 1 \quad \text{dan/and} \quad \frac{2y + 3(-1)}{5} = 3$ Selesaikan/Solve $2x - 15 = 5 \quad 2y - 3 = 15$ $2x = 20 \quad 2y = 18$ $x = 10 \quad y = 9$ Maka/Hence, $C(10, 9)$. (b) Kecerunan/Gradient, $m_{ABC} = \frac{3 - (-1)}{1 - (-5)}$ $= \frac{2}{3}$ $m_{MCN} \times \frac{2}{3} = -1$ $m_{MCN} = -\frac{3}{2}$ Maka, persamaan bagi MCN ialah Hence, the equation of MCN is $y - 9 = -\frac{3}{2}(x - 10)$ $y = -\frac{3}{2}x + 24$	1 1 1 1 1 1	6
9	Perimeter/Perimeter of $ABCD = 6\sqrt{5}$ $2(\sqrt{5} + 1) + 2BC = 6\sqrt{5}$ $2\sqrt{5} + 2 + 2BC = 6\sqrt{5}$ $2BC = 4\sqrt{5} - 2$ $BC = 2\sqrt{5} - 1$ $AC = \sqrt{(\sqrt{5} + 1)^2 + (2\sqrt{5} - 1)^2}$ $= \sqrt{5 + \sqrt{5} + \sqrt{5} + 1 + 4(5) - 2\sqrt{5} - 2\sqrt{5} + 1}$ $= \sqrt{27 - 2\sqrt{5}}$ Luas/Area of $ACEF = (\sqrt{27 - 2\sqrt{5}})^2$ $= 27 - 2\sqrt{5}$	1 1 1	3

[illegible]

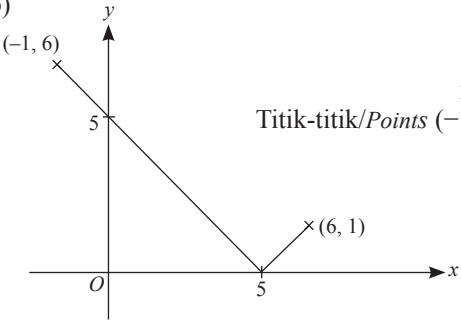
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
13	(a) $m(2k-3) = 2a$ $3(2k-3) + a = 2a$ $6k-9+a = 2a$ $a = 6k-9$ (b) (i) $g^{-1}(x) = 5x+4$ $g^{-1}(3) = 5(3)+4$ $= 19$ $fg(x) = 1+2x$ $fg(19) = 1+2(19)$ $= 39$ (ii) $fg[g^{-1}(x)] = 1+2(5x+4)$ $f(x) = 1+10x+8$ $f(x) = 10x+9$ $fh(x) = 2x^2+7$ $10[h(x)]+9 = 2x^2+7$ $10[h(x)] = 2x^2-2$ $h(x) = \frac{x^2-1}{5}$	1 1 1 1 1 1 1 1	8
14	(a) Janjang aritmetik/<i>Arithmetic progression</i> = 3, 9, 15, ... Sebutan pertama/<i>First term</i> = 3 Nisbah sepunya/<i>Common ratio</i> = 6 Boleh tersirat <i>Can be implied</i> $S_{n+2} = \frac{n+2}{2}[2(3) + (n+2-1)(6)]$ $= \frac{n+2}{2}[6 + 6n + 6]$ $= (n+2)(6+3n)$ $= 3(n+2)^2$ (b) $S_{n+2} - S_n = 72$ $3(n+2)^2 - \frac{n}{2}[2(3) + (n-1)6] = 72$ $3(n^2+4n+4) - \frac{n}{2}[6+6n-6] = 72$ $3n^2+12n+12-3n^2 = 72$ $12n = 60$ $n = 5$ (c) $S_{n+2} = S_7$ $= \frac{7}{2}[2(3) + (7-1)6]$ $= 147$	1 1 1 1, 1 1 1 1	8
15	(a) (i) $x^2+5m-2 = 2m(m-x)$ (Bentuk am/<i>Standard form</i>) $x^2+2mx-2m^2+5m-2 = 0$ $\alpha + \beta = -2m$ dan/and $\alpha\beta = -2m^2+5m-2$ (ii) $x = \frac{-2m \pm \sqrt{(2m)^2 - 4(1)(-2m^2+5m-2)}}{2(1)}$ $= \frac{-2m \pm \sqrt{4m^2+8m^2-20m+8}}{2}$ $= \frac{-2m \pm \sqrt{12m^2-20m+8}}{2}$ $= \frac{-2m \pm \sqrt{4(3m^2-5m+2)}}{2}$ $= \frac{-2m \pm 2\sqrt{3m^2-5m+2}}{2}$ $= -m \pm \sqrt{3m^2-5m+2}$	1, 1 1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) $2x^2 + xy = -2$ $2x^2 + x(k+1) = -2$ $2x^2 + x(k+1) + 2 = 0$ (Bentuk am/Standard form) Tidak bersilang/Not intersect: $b^2 - 4ac < 0$ $(k+1)^2 - 4(2)(2) < 0$ $k^2 + 2k + 1 - 16 < 0$ $k^2 + 2k - 15 < 0$ $(k+5)(k-3) < 0$ (Mesti betul/Must be correct)  $\therefore -5 < k < 3$	1 1 1 1	8

Kertas 2

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
1	(a)  Bentuk graf/Shape of the graph $\cap$ Titik $(5, p)$ dan pintasan-y $-75 + p$ The point $(5, p)$ and y-intercept-y $-75 + p$ (b) $2x^2 + mx - n = 0$ $x^2 + \frac{m}{2}x - \frac{n}{2} = 0$ $\alpha + \beta = -\frac{m}{2}$ dan/and $\alpha\beta = -\frac{n}{2}$ Punca-punca baru/New roots: α^2, β^2 $\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$ $= \left(-\frac{m}{2}\right)^2 - 2\left(-\frac{n}{2}\right)$ $= \frac{m^2}{4} + n$ $= \frac{m^2 + 4n}{4}$ (HTP atau HDP) (SOR or POR) $\alpha^2\beta^2 = (\alpha\beta)^2$ $= \left(-\frac{n}{2}\right)^2$ $= \frac{n^2}{4}$ Maka, persamaan kuadratik baharu ialah Hence, the new quadratic equation is $x^2 - \left(\frac{m^2 + 4n}{4}\right)x + \frac{n^2}{4} = 0$ $4x^2 - (m^2 + 4n)x + n^2 = 0$	1 1 1 1 1 1 1	8

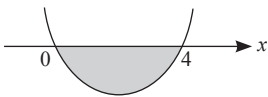
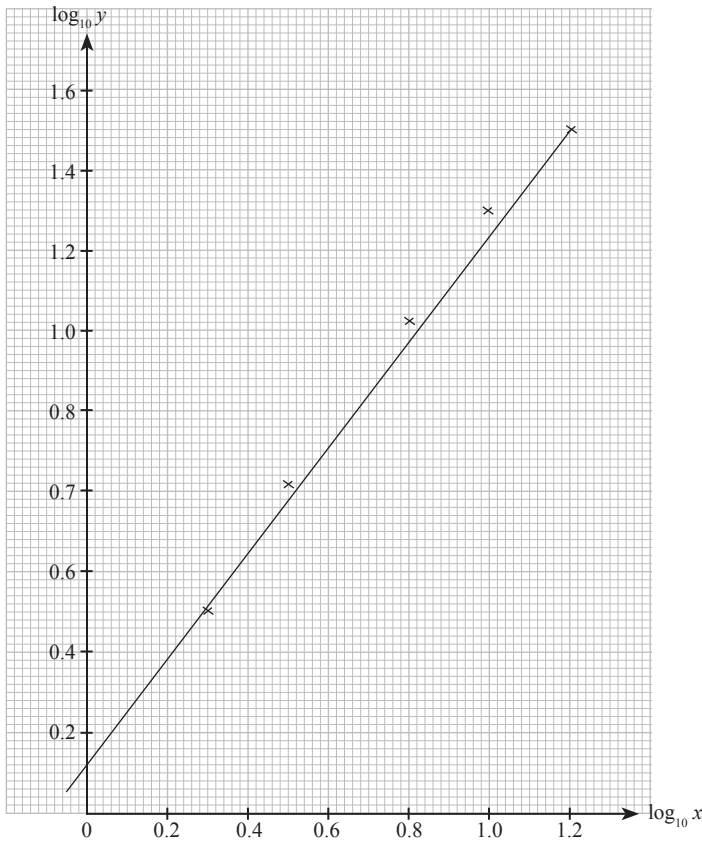
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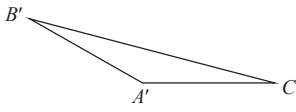
Soalan	Skema Pemarkahan	Markah	Jumlah Markah
3	(a) $f: x \rightarrow x - 5$ dan/and $g: x \rightarrow 7 - 3x$. $gf(x) = g(x - 5)$ $= 7 - 3 x - 5$ (b)  Bentuk graf/Shape of graph V Seluruh graf di atas paksi-x The entire graph is above the x-axis Titik-titik/Points $(-1, 6)$, $(6, 1)$, $(0, 5)$ dan/and $(5, 0)$ Julat/Range of $f: 0 < y < 6$	1 1 1 1 1 1	6
4	(a) $\frac{8}{1-m} = \frac{16}{1-n}$ $1-n = 2(1-m)$ $1-n = 2-2m$ $n = 2m-1$ Apabila/When $n = 2m-1$, $8m^2 + 16(2m-1)^2 = \frac{17}{2}$ $8m^2 + 16(4m^2 - 4m + 1)^2 = \frac{17}{2}$ $8m^2 + 64m^2 - 64m + 16 = \frac{17}{2}$ $72m^2 - 64m + 16 = \frac{17}{2}$ $144m^2 - 128m + 15 = 0$ $(36m-5)(4m-3) = 0$ $m = \frac{5}{36}$ atau/or $m = \frac{3}{4}$ Apabila/When $m = \frac{5}{36}$ $n = 2\left(\frac{5}{36}\right) - 1 = -\frac{13}{18}$ (abaikan/ignore) Apabila/When $m = \frac{3}{4}$, $n = 2\left(\frac{3}{4}\right) - 1 = \frac{1}{2}$ Maka/Thus, $m = \frac{3}{4}$ dan/and $n = \frac{1}{2}$. (b) Janjang/Progression P: $S_4 = \frac{8\left[1 - \left(\frac{3}{4}\right)^4\right]}{1 - \frac{3}{4}} = 32\left(\frac{175}{256}\right) = \frac{175}{8} = 21\frac{7}{8}$ Janjang/Progression Q: $S_4 = \frac{16\left[1 - \left(\frac{1}{2}\right)^4\right]}{1 - \frac{1}{2}} = 32\left(\frac{15}{16}\right) = 30$ Maka, pernyataan Maria adalah palsu. Thus, Maria's statement is false.	1 1 1 1 1 1 1 1 1 1 1	9

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
5	(a) Katakan/Suppose x = harga sekeping tiket kanak-kanak <i>price of a ticket of child</i> y = harga sekeping tiket remaja <i>price of a ticket of a teenager</i> z = harga sekeping tiket dewasa <i>price of a ticket of an adult</i> $3x + 2y + z = 27 \dots ①$ $4x + 3y + 2z = 42.50 \dots ②$ $x + 2z = 17 \dots ③$ Ketiga-tiga persamaan betul <i>The three equations are all correct</i> Satu persamaan betul <i>One correct equation</i> Semua persamaan salah <i>All equations are incorrect</i> (b) $① \times 2 : 6x + 4y + 2z = 54 \dots ④$ $④ - ② : 2x + y = 11.50 \dots ⑤$ $② - ③ : 3x + 3y = 25.50 \dots ⑥$ $⑤ \times 3 : 6x + 3y = 34.50 \dots ⑦$ $⑦ - ⑥ : 3x = 9$ $x = 3$ Gantikan $x = 3$ dalam ⑤, <i>Substitute $x = 3$ into ⑤,</i> $2(3) + y = 11.50$ $y = 5.50$ Gantikan $x = 3$ dalam ③, <i>Substitute $x = 3$ into ③,</i> $3 + 2z = 17$ $z = 7$ Maka/Hence, x, harga tiket kanak-kanak/<i>price of ticket of a child</i> = RM3, y, harga tiket remaja/<i>price of ticket of a teen</i> = RM5.50, $dan/and z$, harga tiket dewasa/<i>price of ticket of an adult</i> = RM7.	2 1 0 1 1 1 1	7
6	(a) (i) $\vec{BE} = \vec{BA} + \vec{AE}$ $= -4\hat{x} + 3\hat{y}$ (ii) $\vec{CD} = \vec{CB} + \vec{BE} + \vec{ED}$ $= -4\hat{x} + \hat{y} - 4\hat{x} + 3\hat{y} + 2\hat{y}$ $= -8\hat{x} + 6\hat{y}$ (b) $\vec{CD} = -8\hat{x} + 6\hat{y}$ $= 2(-4\hat{x} + 3\hat{y})$ $= 2\vec{BE}$ Maka, $\vec{CD}$ dan $\vec{BE}$ adalah selari. <i>Hence, $\vec{CD}$ and $\vec{BE}$ are parallel.</i>	1 1 1 1 1	5
7	(a) $\frac{4-q}{k-4} = \frac{3}{2}$ $2(4-q) = 3(k-4)$ $3k + 2q = 20$ $3k + 2q = 4(5)$ $\frac{3k + 2q}{5} = 4$ (Q.E.D) (mesti dilihat/<i>must be seen</i>)	1 1	

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
	(b) (i) Diberi/Given $(p, q) = (1, -1)$ $\frac{3h+2(1)}{5} = 4 \quad \text{atau/or} \quad \frac{3k+2(-1)}{5} = 4$ $3h+2=20 \quad 3k-2=20$ $3h=18 \quad 3k=22$ $h=6 \quad k=\frac{22}{3}$ (ii) Luas/Area = $\frac{1}{2} \begin{vmatrix} 1 & 2 & 8 & 6 & 1 \\ -1 & -4 & -2 & \frac{22}{3} & -1 \end{vmatrix}$ $= \frac{1}{2} \left[1(-4) + 2(-2) + 8\left(\frac{22}{3}\right) + 6(-1) \right] - \left[2(-1) + 8(-4) + 6(-2) + 1\left(\frac{22}{3}\right) \right]$ $= \frac{1}{2} \left \frac{134}{3} - \left(-\frac{116}{3}\right) \right $ $= \frac{1}{2} \left \frac{250}{3} \right $ $= \frac{125}{3} \text{ unit}^2/\text{units}^2$	1 1, 1 1 1	7
8	(a) $\vec{OP} = \begin{pmatrix} 3 \\ 3 \end{pmatrix}$, Halaju/Velocity of P, $v_P = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$ $\vec{OQ} = \begin{pmatrix} 7 \\ -17 \end{pmatrix}$, Halaju/Velocity of Q, $v_Q = \begin{pmatrix} 4 \\ 8 \end{pmatrix}$ Selepas t jam/After t hours, $\vec{OP}_t = \begin{pmatrix} 3 \\ 3 \end{pmatrix} + t \begin{pmatrix} 4 \\ 1 \end{pmatrix} \quad \vec{OQ}_t = \begin{pmatrix} 7 \\ -17 \end{pmatrix} + (t-1) \begin{pmatrix} 4 \\ 8 \end{pmatrix}$ $= \begin{pmatrix} 3+4t \\ 3+t \end{pmatrix} = \begin{pmatrix} 3+4t \\ -25+8t \end{pmatrix}$ $= (3+4t)\underline{i} + (3+t)\underline{j} = (3+4t)\underline{i} + (-25+8t)\underline{j}$ (b) Pada jam 1500, $t = 3$, At 1500 hours, $t = 3$, $\vec{OP}_3 = \begin{pmatrix} 3+4(3) \\ 3+(3) \end{pmatrix} \quad \text{atau/or} \quad \vec{OQ}_3 = \begin{pmatrix} 3+4(3) \\ -25+8(3) \end{pmatrix}$ $= \begin{pmatrix} 15 \\ 6 \end{pmatrix} = \begin{pmatrix} 15 \\ -1 \end{pmatrix}$ Jarak antara P dan Q/The distance of P and Q = $6 - (-1)$ = 7 km (c) Apabila/When $3+t = -25+8t$ $7t = 28$ $t = 4$ Apabila/When $t = 4$, $\vec{OP}_4 = \begin{pmatrix} 3+4(4) \\ 3+(4) \end{pmatrix}$ $= \begin{pmatrix} 19 \\ 7 \end{pmatrix}$ Maka, P dan Q akan bertemu pada jam 1600 di $(19\underline{i} + 7\underline{j})$. Hence, P and Q will meet at 1600 hours at $(19\underline{i} + 7\underline{j})$.	1 1, 1 1 1 1 1 1 1	10

[illegible]

Soalan	Skema Pemarkahan	Markah	Jumlah Markah														
	(b) $f(x) \leq 18$ $3x^2 - 12x + 18 \leq 18$ $3x^2 - 12x \leq 0$ $x(x - 4) \leq 0$  $\therefore 0 \leq x \leq 4$	1 1 1	10														
11	(a) <table border="1"><tr><td>$\log_{10} x$</td><td>0.30</td><td>0.50</td><td>0.60</td><td>0.80</td><td>1.00</td><td>1.26</td></tr><tr><td>$\log_{10} y$</td><td>0.54</td><td>0.72</td><td>0.88</td><td>1.04</td><td>1.30</td><td>1.56</td></tr></table> (b)  Paksi betul, skala seragam dengan satu titik ditanda betul <i>Correct axes, uniform scales with one point marked correctly</i> Semua titik ditanda betul <i>All points marked correctly</i> Garis lurus penyuaian terbaik <i>Line of best fit</i> (c) $\frac{1}{b}y = x^n$ $y = bx^n$ $\log_{10} y = \log_{10} b + \log_{10} x^n$ $\log_{10} y = a \log_{10} x + \log_{10} b \rightarrow$ Bentuk linear/<i>Linear form</i> Daripada graf/<i>From the graph</i>, $a = m = 1.16$ dan/<i>and</i> $\log_{10} b = 0.14$ $b = 10^{0.14}$ $= 1.38$	$\log_{10} x$	0.30	0.50	0.60	0.80	1.00	1.26	$\log_{10} y$	0.54	0.72	0.88	1.04	1.30	1.56	1 1 1 1 1 1 1 1 1 1	10
$\log_{10} x$	0.30	0.50	0.60	0.80	1.00	1.26											
$\log_{10} y$	0.54	0.72	0.88	1.04	1.30	1.56											

Soalan	Skema Pemarkahan	Markah	Jumlah Markah
12	(a) (i) 120 (ii) $I_{2024/2020} = 120$ $\frac{3.6}{y} \times 100 = 120$ $y = \frac{3.6 \times 100}{120}$ $y = \text{RM}3$ (b) $\bar{I}_{2024/2020} = \frac{120(20) + 125(60) + 150(20)}{20 + 60 + 20}$ $= 129$ (c) (i) Diberi/Given $\bar{I}_{2024/2017} = 149$ Maka/Hence $\bar{I}_{2020/2017} = \frac{149}{129} \times 100$ $= 115.50$ (ii) $\bar{I}_{2020/2017} = 149$ $\frac{P_{2024}}{0.50} \times 100 = 149$ $P_{2024} = \frac{149 \times 0.50}{100}$ $= \text{RM}0.75$ Bilangan maksimum bebola ketam The maximum number of crab balls $= \frac{300}{0.75}$ $= 400$	1 1 1 1 1 1 1 1 1 1 1	10
13	(a) $\frac{\sin \angle EFD}{14} = \frac{\sin 17.08^\circ}{8}$ $\angle EFD = 30.93^\circ$ $\angle FED = 180^\circ - 17.08^\circ - 30.93^\circ$ $= 131.99^\circ$ $AC = FD$ $FD^2 = 8^2 + 14^2 - 2(8)(14) \cos 131.99^\circ$ $FD = 20.24 \text{ cm}$ $AC = 20.24 \text{ cm}$ $AE = \sqrt{8^2 + 15^2}$ atau/or $EC = \sqrt{14^2 + 15^2}$ $= 17 \text{ cm} \quad \quad \quad = 20.52 \text{ cm}$ $20.24^2 = 17^2 + 20.52^2 - 2(17)(20.52) \cos \angle AEC$ $\angle AEC = 64.50^\circ$ (b) Luas segi tiga ACE/Area of triangle ACE $= \frac{1}{2}(17)(20.52) \sin 64.50^\circ$ $= 157.43 \text{ cm}^2$ (c) 	1 1 1 1 1 1 1 1 1 1 1	10

PROGRAM TUISYEN RAKYAT SELANGOR



KATA ALUAN YAB DATO' MENTERI BESAR SELANGOR

Program Tuisyen Rakyat Selangor (PTRS) terus menjadi antara intervensi pendidikan strategik Kerajaan Negeri Selangor dalam memperkukuh prestasi akademik pelajar sekolah menengah, khususnya bagi menghadapi peperiksaan Sijil Pelajaran Malaysia (SPM).

Memasuki tahun 2026, pelaksanaan PTRS memberi tumpuan kepada pendekatan berasaskan hasil (outcome-based intervention) dengan sasaran meningkatkan penguasaan lapan (8) mata pelajaran teras iaitu Bahasa Melayu, Bahasa Inggeris, Matematik, Sejarah, Sains, Matematik Tambahan, Fizik dan Kimia dalam kalangan pelajar Tingkatan 4 dan Tingkatan 5.

Bagi tahun ini, program menyasarkan manfaat kepada sekurang-kurangnya 150,000 pelajar di seluruh Negeri Selangor, dengan penekanan kepada akses saksama, peningkatan kompetensi subjek kritikal serta pengurangan jurang pencapaian akademik antara sekolah dan daerah.

Sejak diperkenalkan pada tahun 2009 dan melalui fasa transformasi digital pascapandemik, modul latihan PTRS kini distrukturkan dalam bentuk hibrid; fizikal dan dalam talian bagi memastikan keberkesanan penyampaian serta kebolehcapaian yang lebih meluas. Platform digital yang dibangunkan telah membolehkan lebih ramai pelajar mengakses bahan pembelajaran secara fleksibel melalui peranti mudah alih, selaras dengan aspirasi pendigitalan pendidikan negeri.

Bagi memastikan kejayaan pelaksanaan PTRS tahun ini, Kerajaan Negeri Selangor telah memperuntukkan sebanyak RM11 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.

Kerajaan Negeri yakin bahawa PTRS 2026 bukan sahaja meningkatkan pencapaian akademik, malah memperkukuh kesiapsiagaan pelajar untuk melangkah ke pendidikan tinggi dan pasaran kerja yang semakin kompetitif. Pembangunan modal insan berkualiti kekal menjadi teras kepada agenda menjadikan Selangor sebagai negeri termaju, berdaya tahan dan berdaya saing di peringkat nasional dan serantau.

Komitmen ini mencerminkan iltizam Kerajaan Negeri dalam memastikan setiap anak Selangor diberi peluang yang adil untuk berjaya.



YAB DATO' SERI AMIRUDIN BIN SHARI

DATO' MENTERI BESAR SELANGOR

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