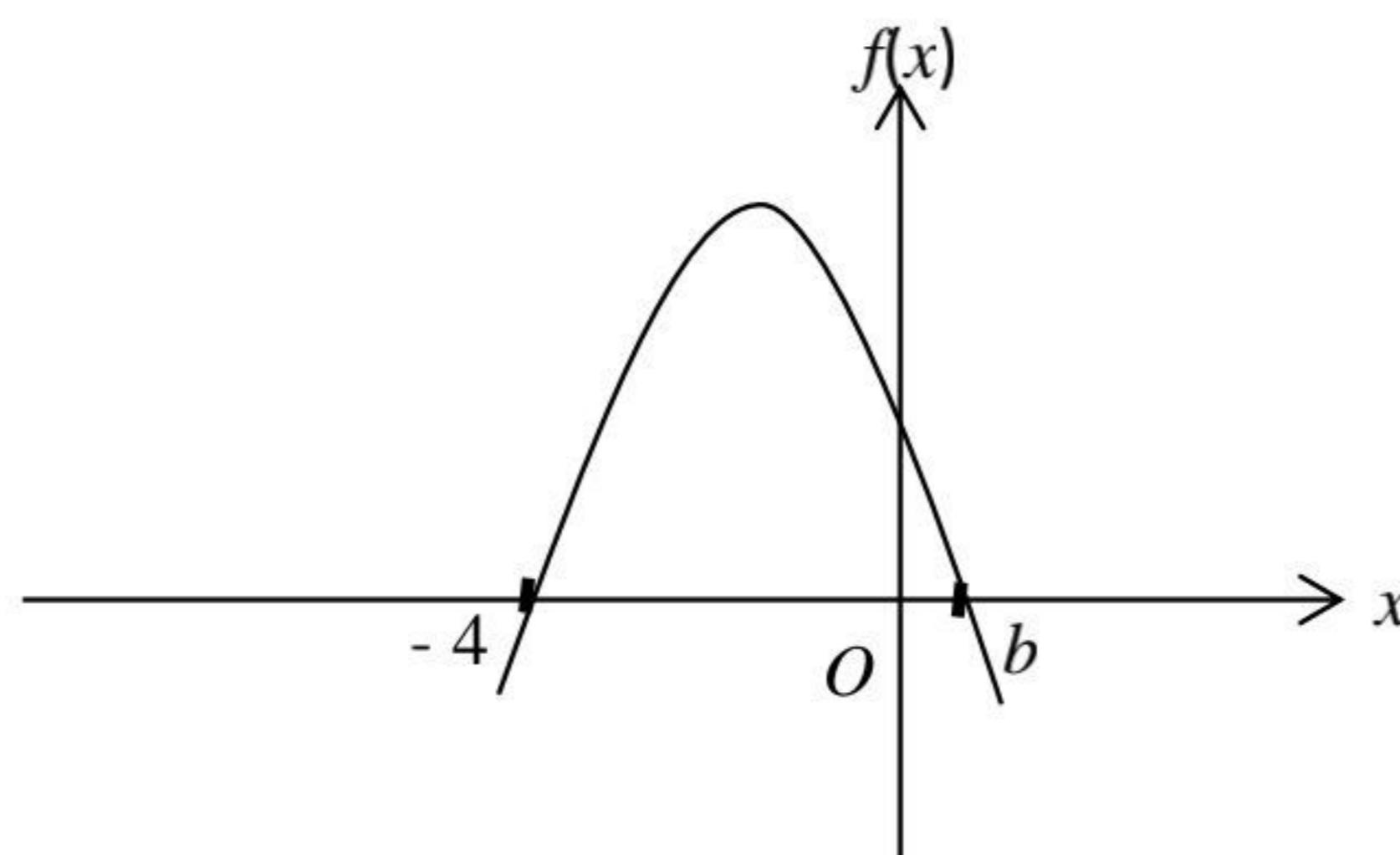


Bahagian A
[64 Markah]

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

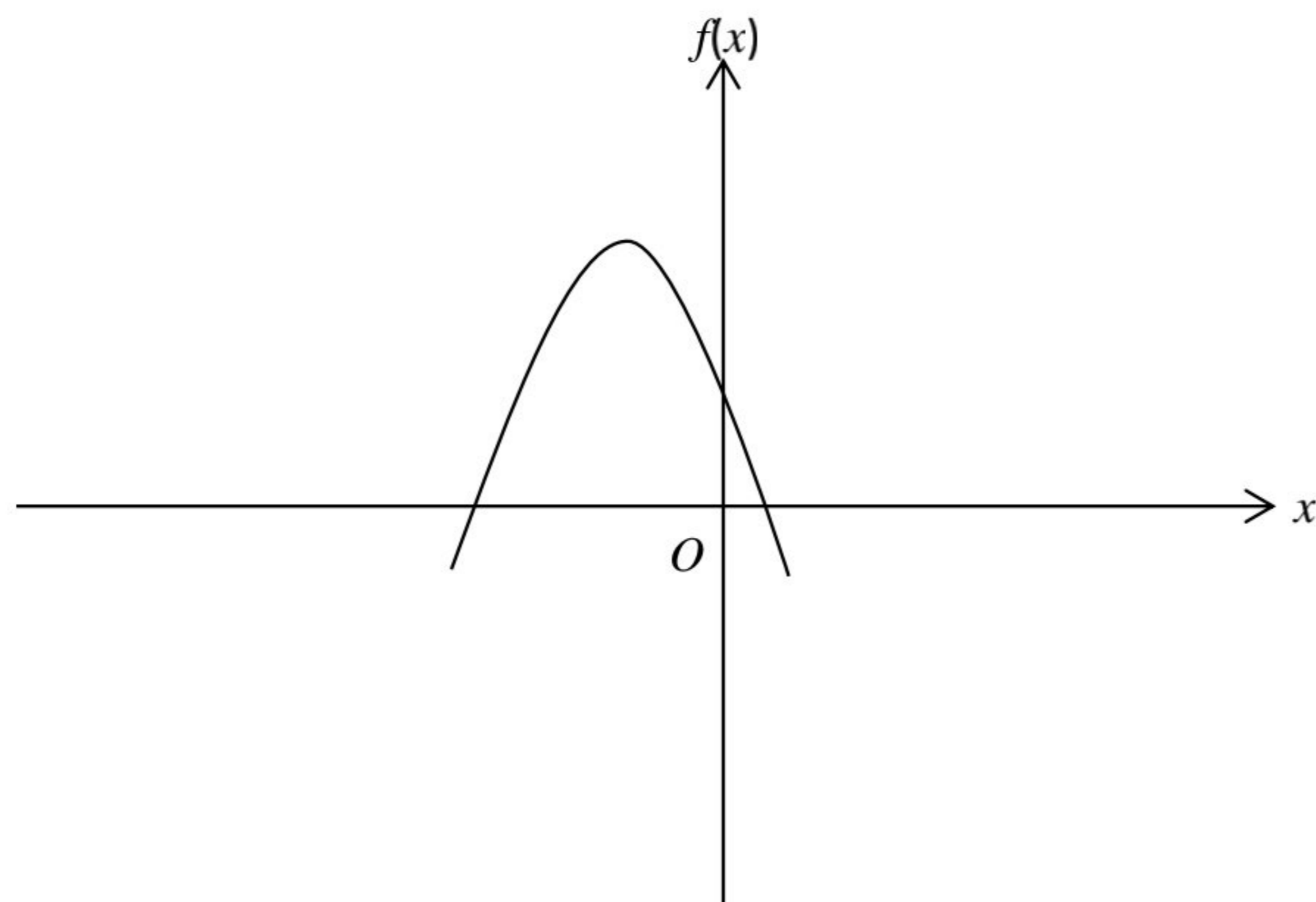
- 1** Rajah 1 menunjukkan graf bagi fungsi kuadratik $f(x) = -2x^2 - 5x + c$.
Diagram 1 shows the graph of a quadratic function $f(x) = -2x^2 - 5x + c$.



Rajah 1
Diagram 1

- (a) Cari nilai b dan c .
Find the value of b and c . [3 markah]
[3 marks]
- (b) Nyatakan persamaan paksi simetri dan koordinat bagi titik pusingan.
State the equation of axis of symmetry and the coordinates of the turning point. [2 markah]
[2 marks]
- (c) Jika nilai b bertukar daripada -5 menjadi 5 , nyatakan kesannya dan seterusnya lakarkan graf pada paksi yang sama dengan graf fungsi kuadratik asas di ruangan jawapan.
If the value of b changed from -5 to 5 , state its effect and hence sketch the graph on the same axes with the original graph of quadratic function in the answer space. [2 markah]
[2 marks]

Jawapan/ *Answer:*



2 (a) Selesaikan persamaan $\frac{3^{2n+1}}{27} = 9^{2n}$
Solve the equation $\frac{3^{2n+1}}{27} = 9^{2n}$

[3 markah]

[3 marks]

- (b) (i) Selesaikan persamaan berikut dan beri jawapan betul kepada tiga angka bererti.
Solve each of the following equation and give the answer correct to three significant figures.

$$2^{2x+1} = 12$$

- (ii) Jika $p = \log_e 2$; $q = \log_e 3$; $r = \log_e 5$ ungkapkan $\ln \frac{5\sqrt{3}}{2}$ dalam sebutan p, q dan r

If $p = \log_e 2$; $q = \log_e 3$; $r = \log_e 5$ express $\ln \frac{5\sqrt{3}}{2}$ in terms of p, q dan r

[5 markah]

[5 marks]

Jawapan/ Answer:

- 3 Diberi suatu jangjang geometri ialah $6k, 4k, \frac{8}{3}k, \dots$. Diberi bahawa hasil tambah hingga ketakherhinggaan bagi jangjang ini ialah 45. Cari
A geometric progression is given by $6k, 4k, \frac{8}{3}k, \dots$. It is given that the sum to infinity of the progression is 45. Find

(a) r

[1 markah]

[1 marks]

(b) nilai minimum n dengan keadaan sebutan ke- n lebih kecil daripada 1.
the minimum value of n such that the n th term is less than 1

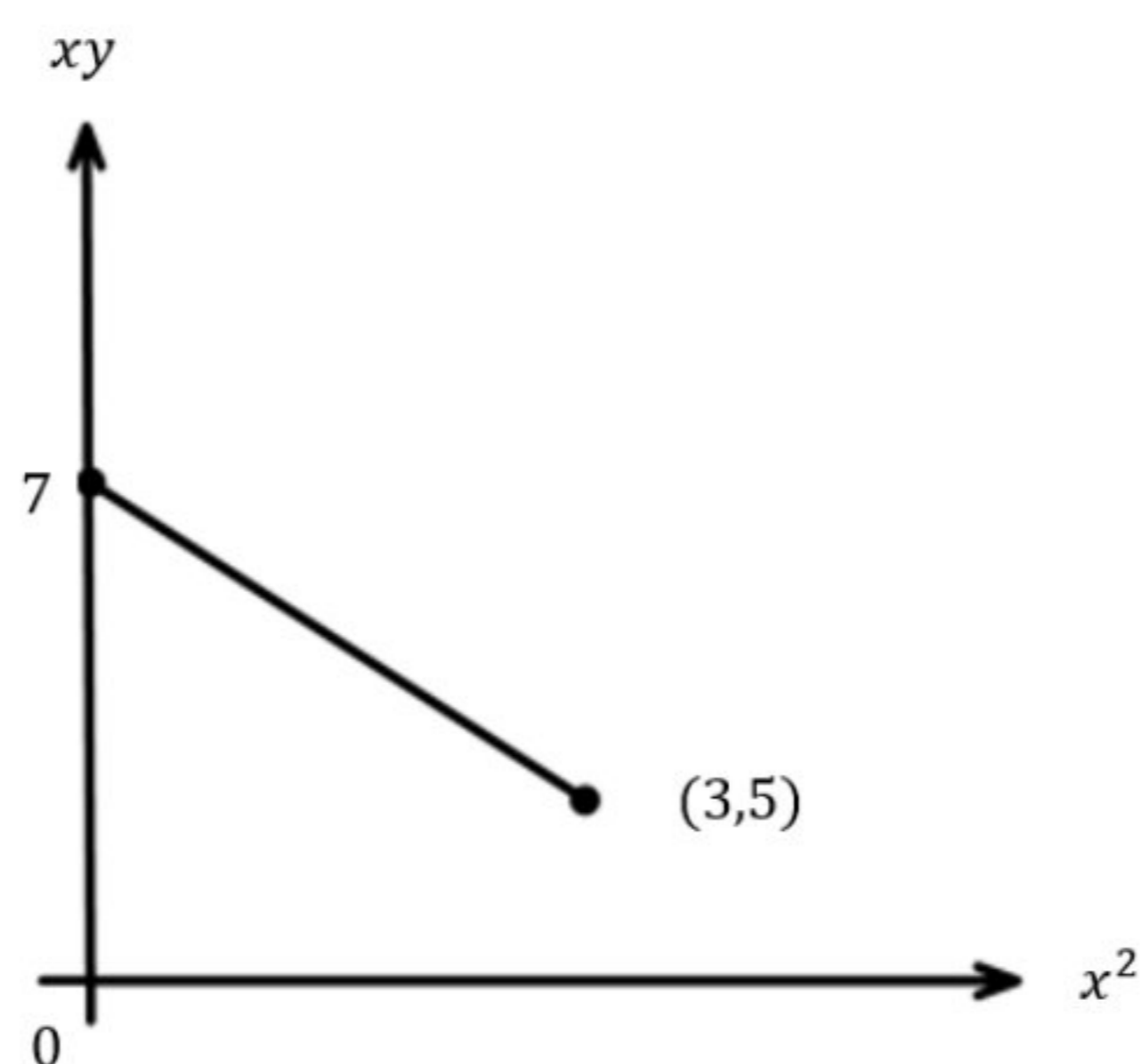
[4 markah]

[4 marks]

Jawapan/ Answer:

4. Pemboleh ubah x dan y dihubungkan oleh persamaan $y = \frac{hx}{p} + \frac{k}{x}$, dengan keadaan p , h dan k ialah pemalar. Suatu garis lurus diperoleh dengan memplotkan xy melawan x^2 , seperti ditunjukkan pada Rajah 4.

The variables x and y are related by the equation $y = \frac{hx}{p} + \frac{k}{x}$, where p , h and k are constants. A straight is obtained by plotting xy against x^2 , as shown in Diagram 4.



Rajah 2
Diagram 2

- (a) Tukarkan persamaan lengkung kepada persamaan garis lurus.
Convert the equation of a curve to the linear equation.

[1 markah]
[1 mark]

- (b) Cari nilai k seterusnya ungkapkan h dalam sebutan p .
Find the value of k hence express h in term of p .

[3 markah]
[3 marks]

Jawapan/ Answer:

- 5 Diberi bucu-bucu R dan S masing-masing ialah $(6, 7)$ dan $(2, -2)$, dan bucu T terletak pada paksi x . Cari koordinat T yang mungkin, dengan keadaan luas ΔRST ialah 14 unit^2 .
Given that vertices R and S respectively are $(6, 7)$ and $(2, -2)$, and the vertex T is located on the x -axis. Find possible T coordinates, with area of ΔRST is 14 unit^2 .

[3 markah]

[3 marks]

Jawapan/ Answers:

- 6 Zarah A bergerak dari titik $P(-4, 5)$ dengan halaju malar $(2\mathbf{i} - \mathbf{j}) \text{ ms}^{-1}$ manakala zarah B bergerak dari titik $Q(-8, 9)$ dengan halaju malar $(3\mathbf{i} - 2\mathbf{j}) \text{ ms}^{-1}$.
Particle A moves from point $P(-4, 5)$ with a constant velocity of $(2\mathbf{i} - \mathbf{j}) \text{ ms}^{-1}$ while particle B moves from point $Q(-8, 9)$ with a constant velocity of $(3\mathbf{i} - 2\mathbf{j}) \text{ ms}^{-1}$.

Cari, / Find,

- (a) masa t , dalam saat, apabila zarah A dan zarah B bertemu,
the time t , in seconds, when particle A and particle B meet,

[3 markah]

[3 marks]

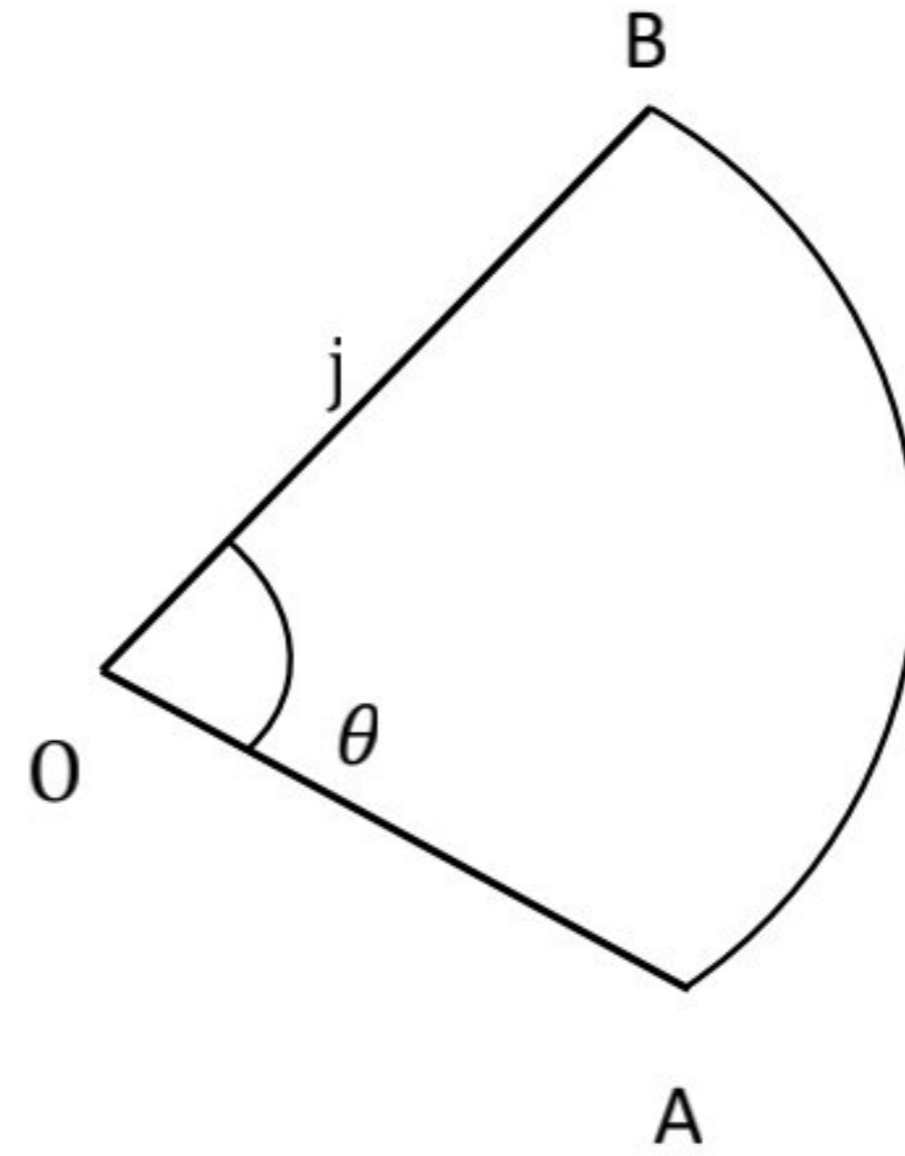
- (b) titik pertemuan bagi zarah A dan zarah B.
the meeting point of particle A and particle B.

[3 markah]

[3 marks]

Jawapan / Answers:

- 7 Rajah 3 menunjukkan sektor OAB . Diberi luas sektor ialah 50 cm^2 dan perimeternya ialah 30 cm . Cari nilai yang mungkin bagi jejari sektor dan sudut sepadan tercangkum.
Diagram 3 shows sector OAB . Given that area of the sector is 50 cm^2 and the perimeter is 30 cm . Find the possible values of the radius of the sector and the corresponding subtended angle.

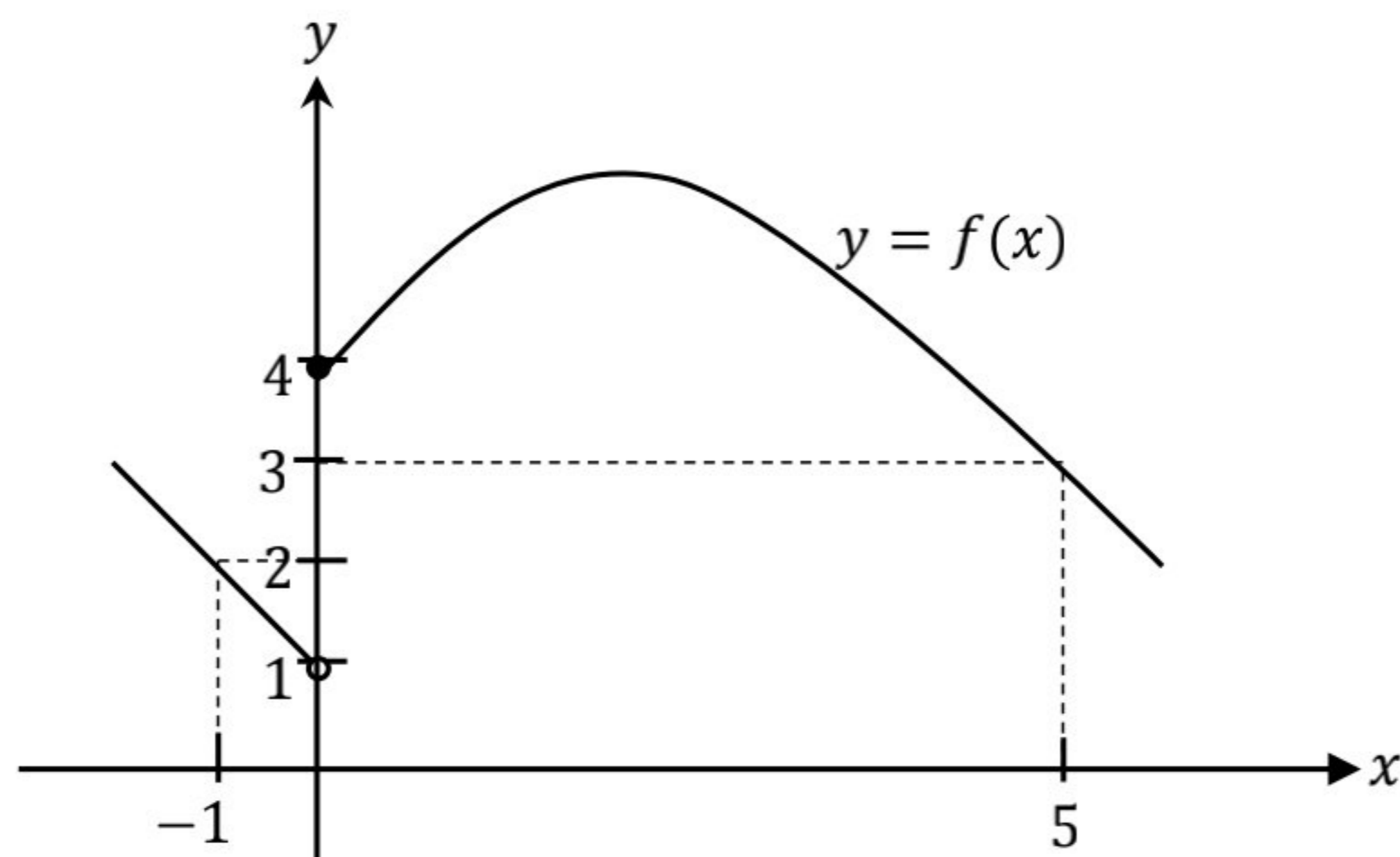


Rajah 3
Diagram 3

[4 markah]
[4 marks]

Jawapan/ Answer:

- 8 Rajah 4 menunjukkan sebahagian daripada graf fungsi $y = f(x)$.
The diagram 4 shows a part of the function graph $y = f(x)$



Rajah 4
Diagram 4

- (a) Berdasarkan graf,
Based on the graph,
(i) cari $f(0)$
find $f(0)$
(ii) tentukan sama ada $\lim_{x \rightarrow 0} f(x)$ wujud atau tidak. Jelaskan.
determine whether $\lim_{x \rightarrow 0} f(x)$

[2 markah]
[2 marks]

- (b) Seterusnya, cari
Then, find
(i) $\lim_{x \rightarrow -1} f(x)$
(ii) $\lim_{x \rightarrow 5} f(x)$

[2 markah]
[2 marks]

Jawapan/ Answer:

9 Diberi bahawa $\int_4^6 q(x) dx = 7$, cari
It is given that $\int_4^6 q(x) dx = 7$, find

(a) nilai bagi $\int_6^4 q(x) dx$,
the value of $\int_6^4 q(x) dx$

(b) nilai m jika $\int_4^6 [mx - q(x)] dx = 21$.
the value of m if $\int_4^6 [mx - q(x)] dx = 21$.

[4 markah]

[4 marks]

Jawapan/Answer :

- 10 (a) (i)** Suatu mesyuarat telah dihadiri oleh 3 orang pengarah syarikat dan 3 orang setiausahanya. Mereka telah duduk mengelilingi sebuah meja bulat dengan kedudukan berselang-seli jawatan. Berapakah bilangan cara yang mungkin susunan ahli mesyuarat yang hadir.

A meeting was attended by 4 company directors and 4 secretaries. They have sat around a round table with alternating positions. How many ways is it possible to arrange the meeting members present.

[2 markah]

[2 marks]

- (ii)** Rajah 5(a) menunjukkan 8 jubin huruf dalam permainan sahiba.
Diagram 5(a) shows 8 tiles of Sahibba.



Rajah 5(a)
Diagram 5(a)

Cari bilangan susunan yang mungkin menggunakan semua huruf jika huruf pertama bermula dengan huruf vokal dan berakhir dengan huruf konsonan.

Find the number of possible arrangements using all the letters if the first letter starts with a vowel and ends with a consonant.

[2 markah]

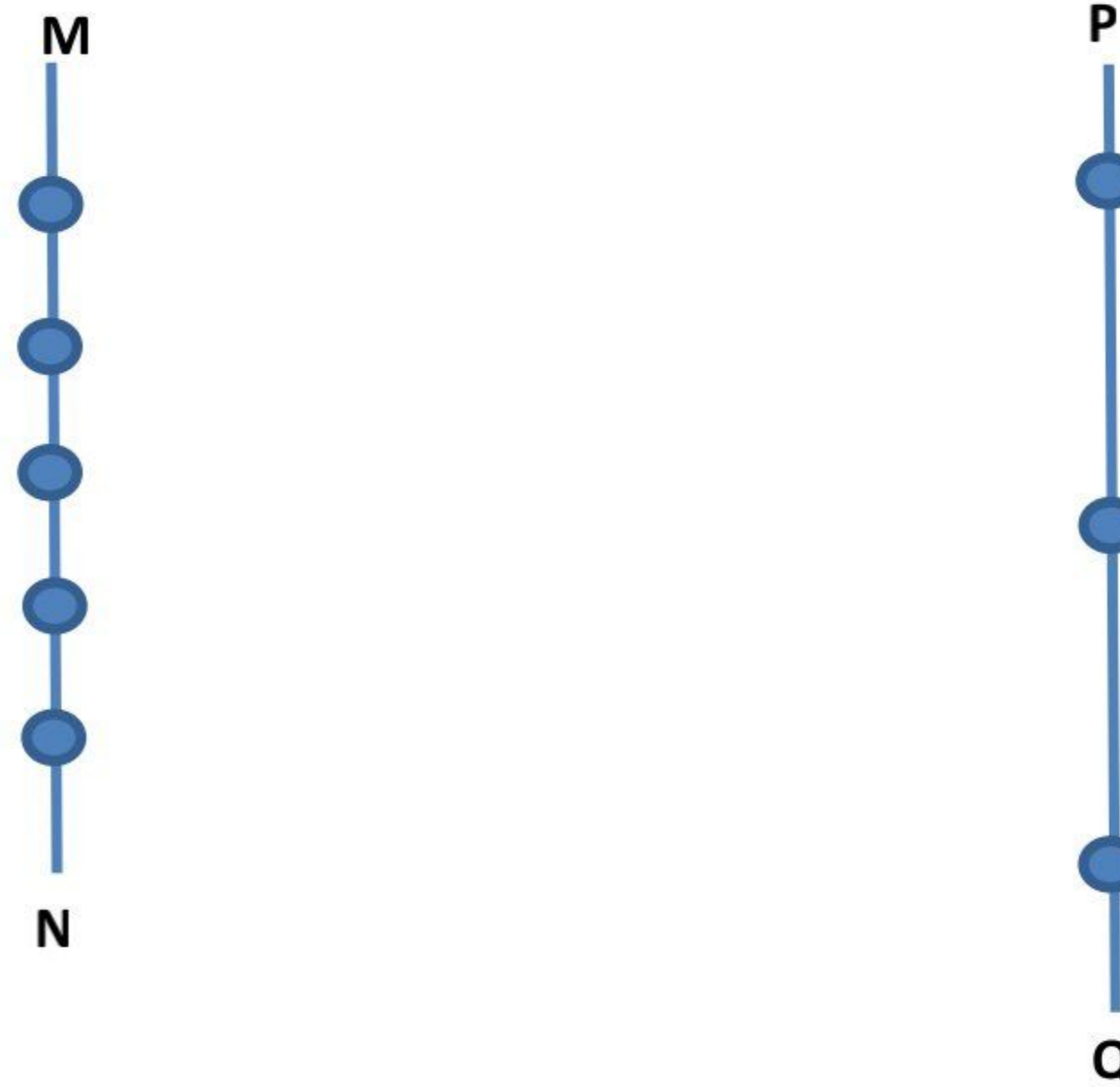
[2 marks]

Jawapan/Answer :

10 (b)

Rajah 5(b) menunjukkan lima titik pada garis lurus MN dan tiga titik pada garis lurus PQ .

Diagram 5(b) shows five points on the straight line PQ and three points on the straight line RS .



Rajah 5(b)
Diagram 5(b)

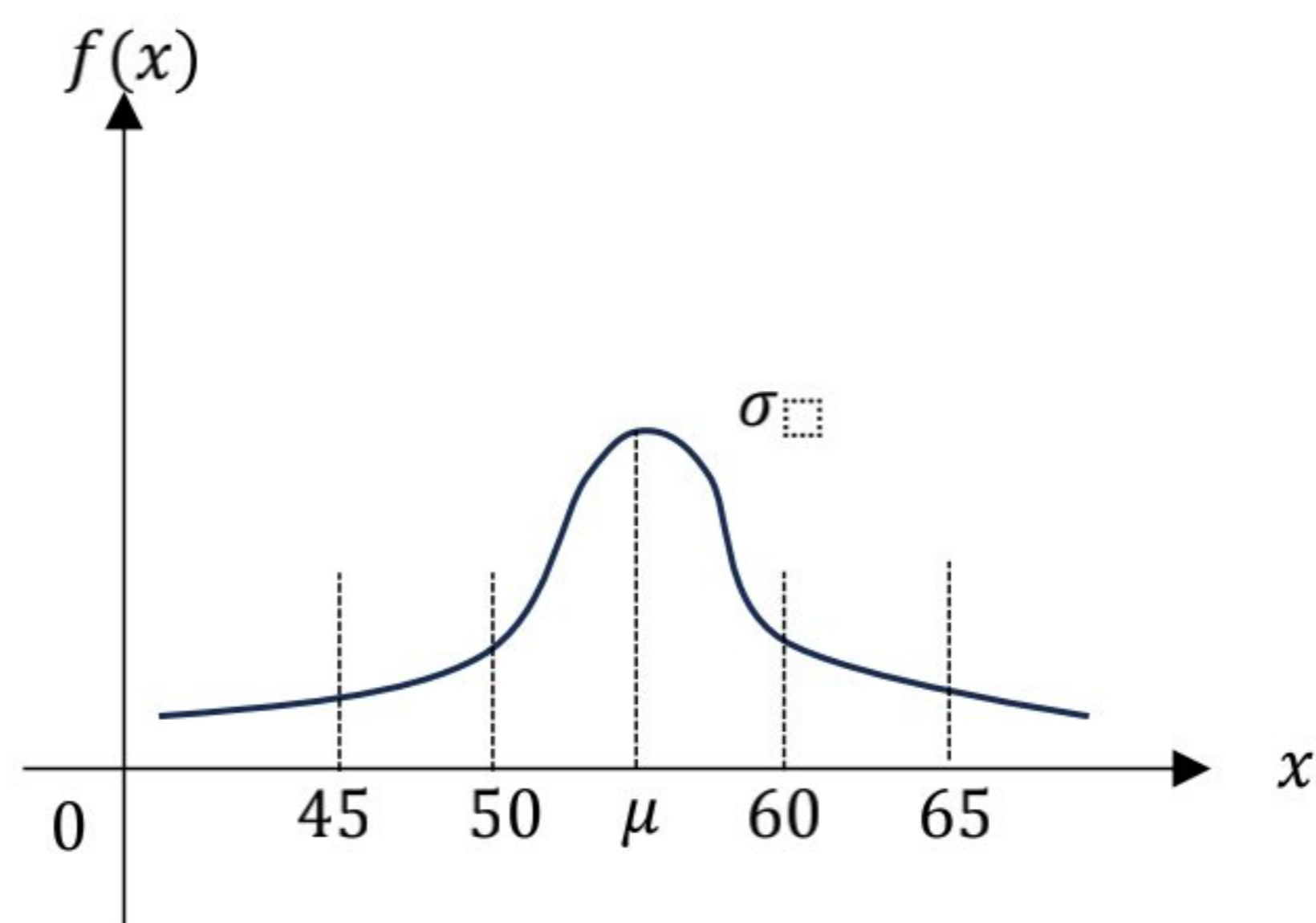
Jika sebuah segi tiga boleh dibentuk dengan menyambungkan mana-mana tiga titik daripada dua garis lurus itu, hitung bilangan segi tiga yang dapat dibentuk.

If a triangle can be formed by joining any three points from the two straight lines, calculate the number of triangles that can be formed.

[4 markah]
[4 marks]

Jawapan/Answer :

- 11 (a) Rajah 6(a) menunjukkan graf taburan normal.
Diagram 6(a) shows normal distribution graph.



Rajah 6(a)
Diagram 6(a)

Jika μ dan σ masing-masing ialah min dan sisihan piawai bagi graf taburan normal itu.
If μ and σ are the mean and the standard deviation of the normal distribution graph.

- (i) Cari min,
Find mean,

[1 markah]

[1 mark]

- (ii) Jika min baharu, μ_1 dan sisihan piawai baharu, σ_1 diberi. Min baharu tidak berubah, sisihan piawai baharu lebih besar daripada sisihan piawai lama. Terangkan kesan taburan normal itu.

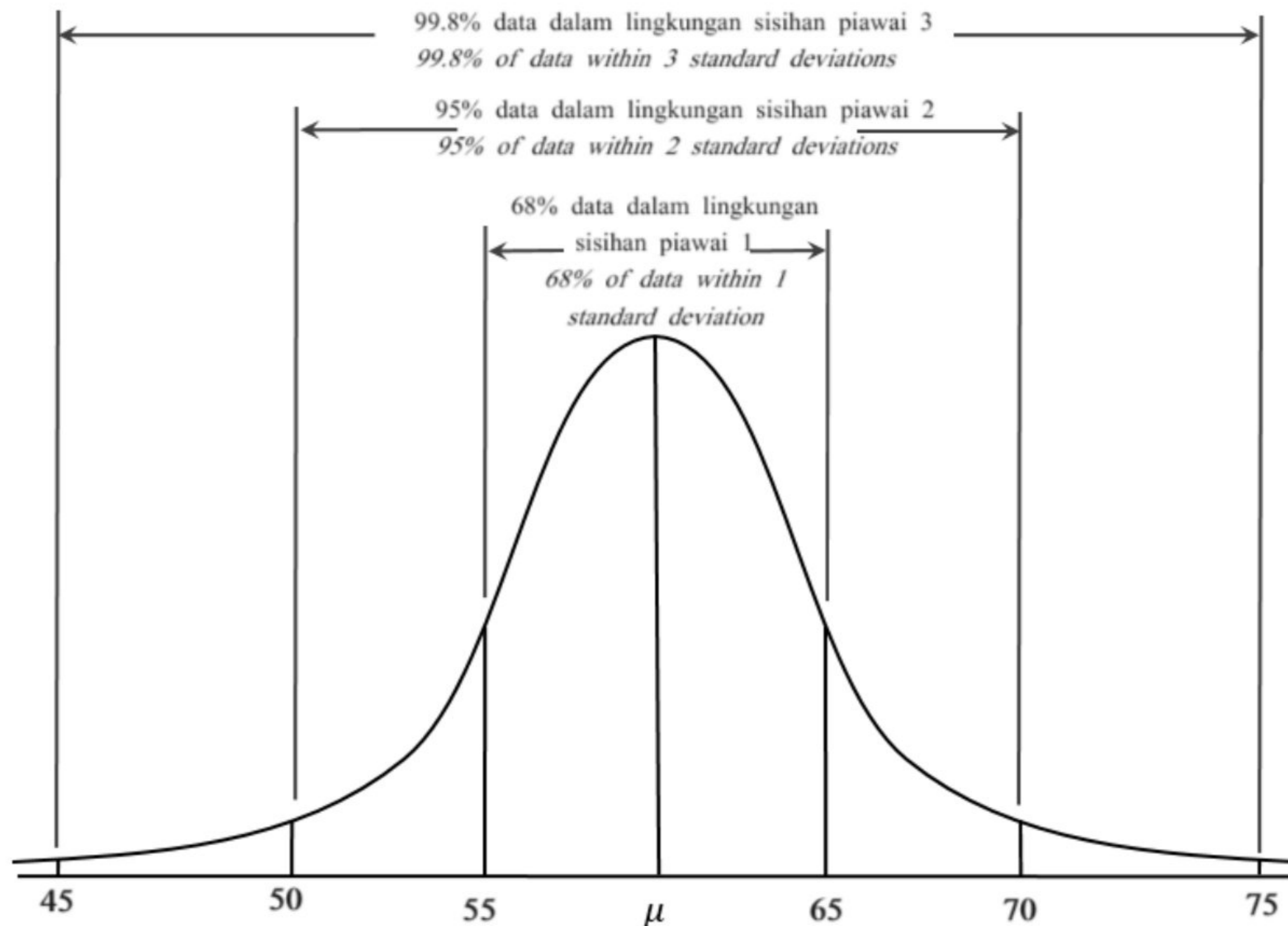
If new mean, μ_1 and new standard deviation, σ_1 are given. New mean no changes, new standard deviation is larger than old standard deviation. Explain the effect of the normal distribution.

[1 markah]

[1 mark]

Jawapan/Answer :

- 11 (b)** Rajah graf Taburan Normal 6(b) menunjukkan peratusan taburan data yang wujud dalam setiap lingkungan sisihan piawai tertentu.
Normal Distribution graph 6(b) shows the percentage of data distribution within each standard deviation.



Rajah 6(b)
 Diagram 6(b)

Cari,
 Find,

(a) $P(55 < X < 70)$,

[1 markah]
 [1 mark]

(b) $P(X < 50)$,

[1 markah]
 [1 mark]

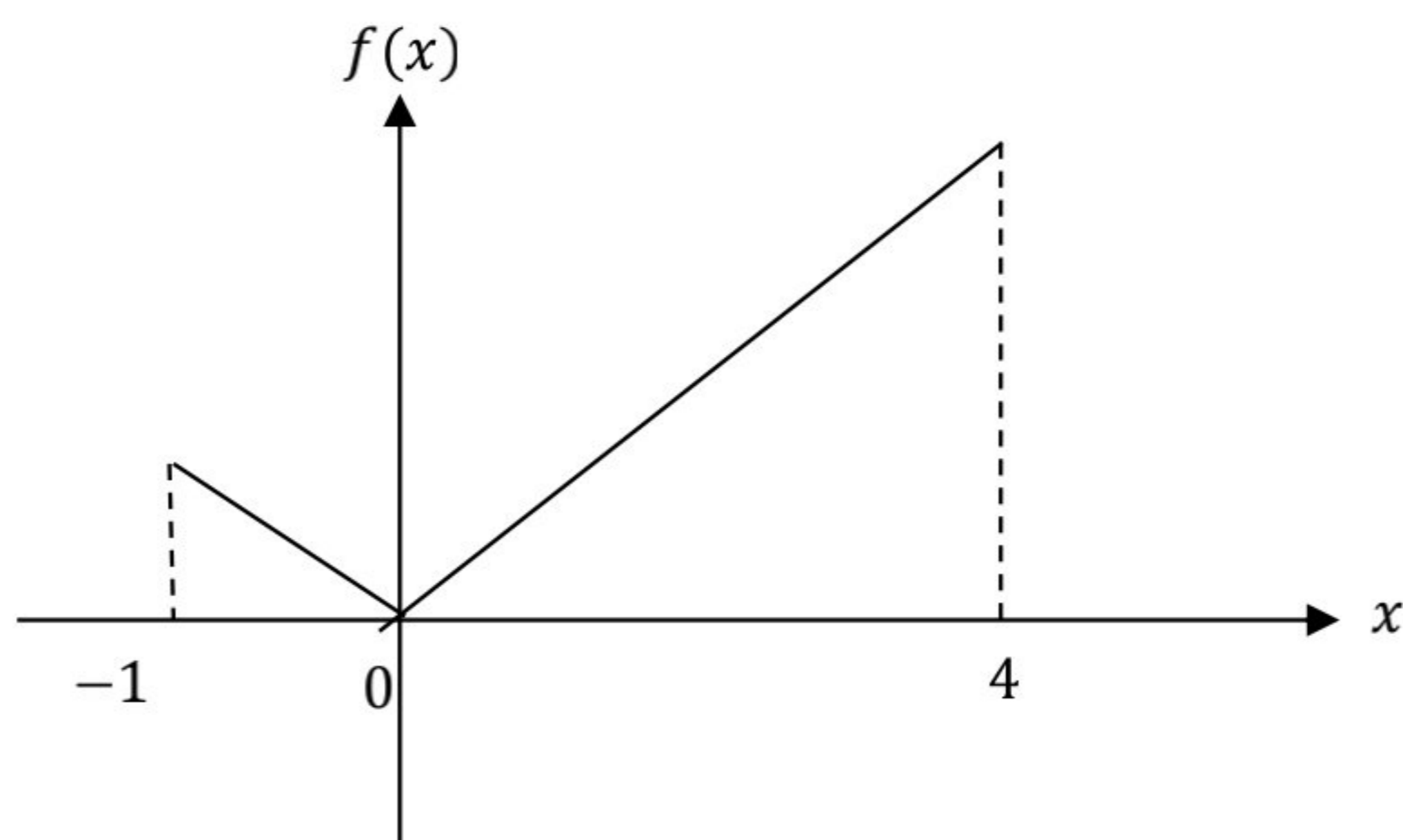
(c) $P(X > 75)$.

[1 markah]
 [1 mark]

Jawapan/ Answer:

- 12** Rajah 7 di bawah menunjukkan sebahagian graf bagi fungsi $f(x) = |2x|$ bagi domain $-1 \leq x \leq 4$

Diagram 7 below shows part of the graph of the function $f(x) = |2x|$ in the domain $-1 \leq x \leq 4$.



Rajah 7
Diagram 7

- (a) Nyatakan / State
- (i) objek bagi 2,
the object of 2,
 - (ii) julat bagi nilai $f(x)$ yang sepadan dengan domain yang diberikan.
the range of the values of $f(x)$ corresponding to the given domain.
- [3 markah]
[3 marks]
- (b) Lakarkan graf fungsi $f(x) = |2x| + 4$ untuk domain $-1 \leq x \leq 4$. Seterusnya, nyatakan julat yang sepadan dengan domain yang diberi.
Sketch the graph of each of the function $f(x) = |2x| + 4$ in the domain $-1 \leq x \leq 4$. Hence, state the corresponding range for the given domain.
- [3 markah]
[3 marks]

Jawapan/Answer :

Bahagian B
[16 markah/Marks]

Jawab mana-mana **dua** soalan dalam bahagian ini.
Answer any two questions in this section.

- 13 (a)** Diberi bahawa $f(x) = 2x - x^2$ dengan domain $-1 \leq x \leq 3$. Dengan menggunakan lakaran graf tentukan sama ada $f^{-1}(x)$ ialah satu fungsi atau tidak.
Given that $f(x) = 2x - x^2$ for the domain $-1 \leq x \leq 3$. By sketching graph determine whether $f^{-1}(x)$ is a function or not.

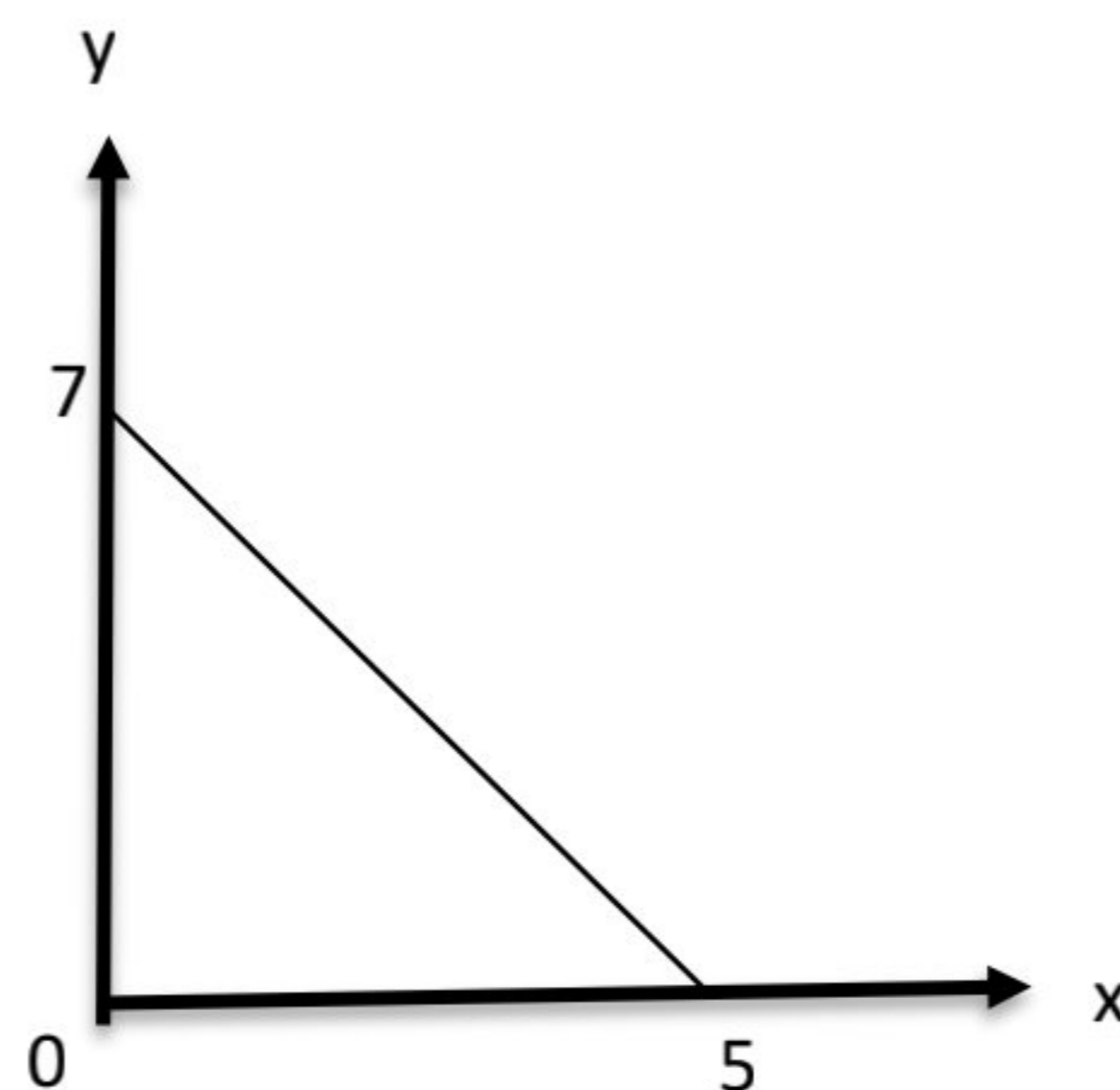
[4 markah / marks]

- (b)** Seterusnya, nyatakan domain x yang sesuai supaya $f(x) = 2x - x^2$ mempunyai fungsi songsang.
Hence, state the suitable domain x so that $f(x) = 2x - x^2$ has an inverse function.

[1 markah]

[1 marks]

- (c)** Rajah 8(c) di bawah menunjukkan graf bagi fungsi satu dengan satu g . Lakarkan graf g^{-1} dan seterusnya nyatakan domain dan julat bagi g^{-1} .
The diagrams 8(c) below show the graph of one to one functions, g . In each case, sketch the graph of g^{-1} and state the domain of g^{-1} .



Rajah 8(c)
Diagram 8(c)

[3 markah]

[3 marks]

Jawapan/Answer :

14 (a) Permudahkan :

Simplify :

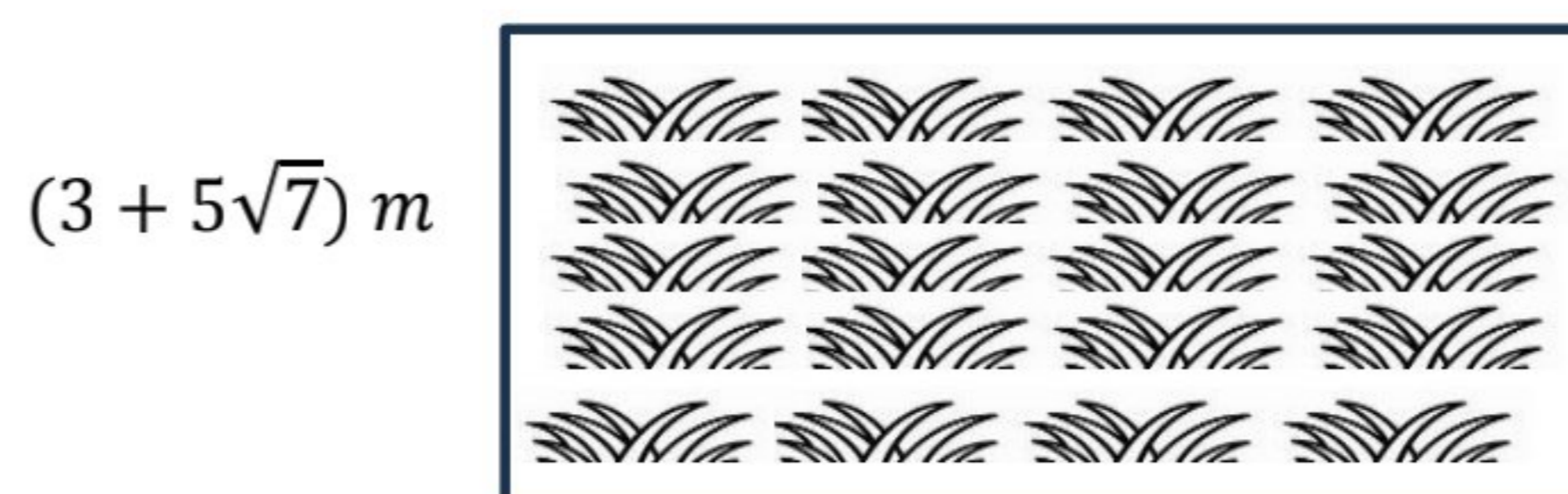
$$\frac{2 - \sqrt{3}}{2 + \sqrt{3}} + \frac{12}{\sqrt{3}}$$

[4 markah]

[4 marks]

(b) Adam membeli rumput karpet untuk hiasan halaman rumahnya. Rajah 14 di bawah menunjukkan rumput karpet yang berbentuk segi empat tepat di halaman rumah Adam dengan lebar $(3 + 5\sqrt{7})$ m

Adam bought a grass carpet to decorate his yard. Figure 14 below shows a rectangular carpet grass right in Adam's yard with a width of $(3 + 5\sqrt{7})$ m



Rajah 9

Figure 9

Diberi panjang rumput karpet itu adalah dua kali lebarnya. Hitung luas rumput karpet di halaman rumah Adam dalam bentuk $(a + b\sqrt{7})m^2$ dengan keadaan a dan b ialah nombor nisbah.

Given the length of the carpet grass is twice its width. Calculate the area of carpet grass in Adam's yard in the form $(a + b\sqrt{7})m^2$ where a and b are rational numbers.

[4 markah]

[4 marks]

Jawapan / Answer :

- 15 (a)** Diberi bahawa $\tan \theta = p$ untuk $0 \leq \theta \leq \pi$. Ungkapan setiap yang berikut dalam sebutan p .
Given $\tan \theta = p$ for $0 \leq \theta \leq \pi$. Express each of the following in terms of p .

(i) $\sin 2\theta$

(ii) $\cos^2 \frac{\theta}{2}$

$$\cos^2 \frac{\theta}{2}$$

[5 markah]
[5 marks]

- (b)** Selesaikan persamaan $\cos 2\theta = 5 \cos \theta - 3$, dengan keadaan $0^\circ \leq \theta \leq 180^\circ$.
Solve equation $\cos 2\theta = 5 \cos \theta - 3$, where $0^\circ \leq \theta \leq 180^\circ$.

[3 markah]
[3 marks]

Jawapan/ Answer:

KERTAS SOALAN TAMAT
END OF QUESTION PAPER

SULIT

NO. KAD PENGENALAN

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ANGKA GILIRAN

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PEPERIKSAAN PERCUBAAN SPM

SESI AKADEMIK 2023/2024

MATEMATIK TAMBAHAN

Kertas 2

2 jam 30 minit

3472/2

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. Tulis *nombor kad pengenalan* dan *angka giliran* anda pada petak yang disediakan.
2. Kertas peperiksaan ini mengandungi **tiga** bahagian : **Bahagian A**, **Bahagian B** dan **Bahagian C**.
3. Jawapan hendaklah ditulis pada ruang jawapan yang disediakan di dalam kertas peperiksaan ini.
4. Kertas peperiksaan ini adalah dalam dwibahasa.
5. Jawapan boleh ditulis dalam Bahasa Melayu atau Bahasa Inggeris.
6. Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.
7. Kerja mengira mesti ditunjukkan.
8. Jadual Kebarangkalian Hujung Atas $Q(z)$ bagi Taburan Normal $N(0,1)$ disediakan di halaman 4.
9. **Kertas peperiksaan** ini hendaklah diserahkan kepada pengawas peperiksaan pada akhir peperiksaan.

	Bahagian A							Jum	
No soalan	1	2	3	4	5	6	7		
Markah penuh	7	6	8	8	8	6	7		
Markah diperoleh									
	Bahagian B				Bahagian C				Jum
No Soalan	8	9	10	11	12	13	14	15	
Markah penuh	10	10	10	10	10	10	10	10	
Markah diperoleh									

NAMA MURID :
TINGKATAN :

Kertas peperiksaan ini mengandungi **26** halaman bercetak.

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	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	18	Isi padu kisanan <i>Volume of revolution</i> $= \int_a^b \pi y^2 dx$ atau (or) $= \int_a^b \pi x^2 dy$
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	$\log_a mn = \log_a m + \log_a n$	19	$I = \frac{Q_1}{Q_0} \times 100$
6	$\log_a \frac{m}{n} = \log_a m - \log_a n$	20	$\bar{I} = \frac{\sum I_i W_i}{\sum W_i}$
7	$\log_a m^n = n \log_a m$	21	${}^n P_r = \frac{n!}{(n-r)!}$
8	$\log_a b = \frac{\log_c b}{\log_c a}$	22	${}^n C_r = \frac{n!}{(n-r)!r!}$
9	$T_n = a + (n-1)d$	23	$P(X = r) = {}^n C_r p^r q^{n-r}, p + q = 1$
10	$S_n = \frac{n}{2} [2a + (n-1)d]$	24	Min / Mean, $\mu = np$
11	$T_n = ar^{n-1}$	25	$\sigma = \sqrt{npq}$
12	$S_n = \frac{a(1-r^n)}{1-r} = \frac{a(r^n-1)}{r-1}, r \neq 1$	26	$z = \frac{X-\mu}{\sigma}$
13	$S_\infty = \frac{a}{1-r}, r < 1$	27	Panjang lengkok, $s = j\theta$ <i>Arc length, $s = r\theta$</i>
14	$y = uv, \frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$	28	Luas sektor, $L = \frac{1}{2} j^2 \theta$ <i>Area of sector, $A = \frac{1}{2} r^2 \theta$</i>
15	$y = \frac{u}{v}, \frac{dy}{dx} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$	29	$\sin^2 A + \cos^2 A = 1$ $\sin^2 A + \cos^2 A = 1$
16	$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$	30	$\sec^2 A = 1 + \tan^2 A$ $\sec^2 A = 1 + \tan^2 A$
17	Luas di bawah lengkung <i>Area under a curve</i> $= \int_a^b y dx$ atau (or) $= \int_a^b x dy$	31	$\operatorname{cosec}^2 A = 1 + \cot^2 A$ $\operatorname{cosec}^2 A = 1 + \cot^2 A$

$$32 \quad \sin 2A = 2 \sin A \cos A$$

$$\sin 2A = 2 \sin A \cos A$$

$$33 \quad \cos 2A = \cos^2 A - \sin^2 A$$

$$= 2 \cos^2 A - 1$$

$$= 1 - 2 \sin^2 A$$

$$\cos 2A = \cos^2 A - \sin^2 A$$

$$= 2 \cos^2 A - 1$$

$$= 1 - 2 \sin^2 A$$

$$34 \quad \tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$$

$$35 \quad \sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$36 \quad \cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$37 \quad \tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$

$$38 \quad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$39 \quad a^2 = b^2 + c^2 - 2bc \cos A$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$40 \quad \text{Luas segi tiga / Area of triangle}$$

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

$$41 \quad \text{Titik yang membahagi suatu tembereng garis}$$

$$A \text{ point dividing a segment of a line}$$

$$(x, y) = \left(\frac{nx_1 + mx_2}{m + n}, \frac{ny_1 + my_2}{m + n} \right)$$

$$42 \quad \text{Luas segi tiga / Area of triangle}$$

$$= \frac{1}{2} |(x_1 y_2 + x_2 y_3 + x_3 y_1) - ((x_2 y_1 + x_3 y_2 + x_1 y_3))|$$

$$43 \quad |\underline{r}| = \sqrt{x^2 + y^2}$$

$$44 \quad \hat{\underline{r}} = \frac{x\underline{i} + y\underline{j}}{\sqrt{x^2 + y^2}}$$

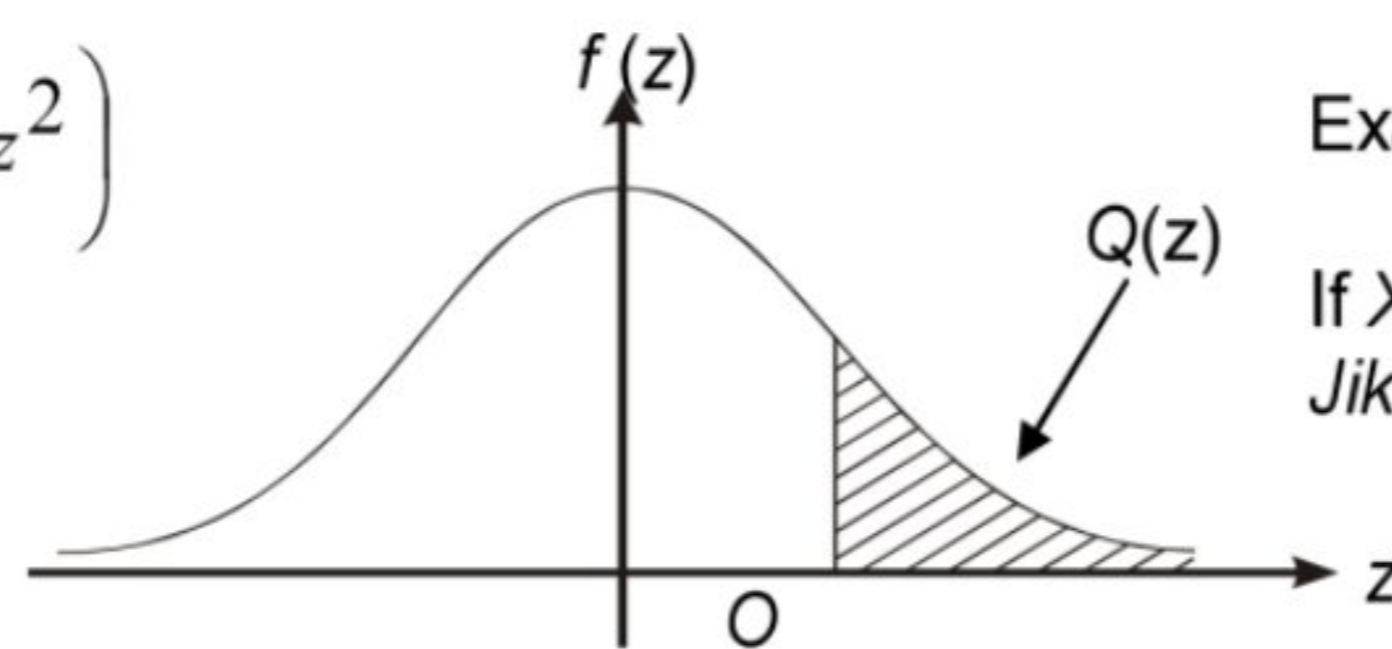
KEBARANGKALIAN HUJUNG ATAS Q(z) BAGI TABURAN NORMAL N(0,1)

THE UPPER TAIL PROBABILITY Q(z) FOR NORMAL DISTRIBUTION N(0,1)

z										Minus / Tolak									
	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641	4	8	12	16	20	24	28	32	36
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247	4	8	12	16	20	24	28	32	36
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859	4	8	12	15	19	23	27	31	35
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483	4	7	11	15	19	22	26	30	34
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121	4	7	11	15	18	22	25	29	32
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776	3	7	10	14	17	20	24	27	31
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451	3	7	10	13	16	19	23	26	29
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148	3	6	9	12	15	18	21	24	27
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867	3	5	8	11	14	16	19	22	25
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611	3	5	8	10	13	15	18	20	23
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379	2	5	7	9	12	14	16	19	21
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170	2	4	6	8	10	12	14	16	18
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985	2	4	6	7	9	11	13	15	17
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823	2	3	5	6	8	10	11	13	14
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681	1	3	4	6	7	8	10	11	13
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559	1	2	4	5	6	7	8	10	11
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455	1	2	3	4	5	6	7	8	9
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367	1	2	3	4	4	5	6	7	8
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294	1	1	2	3	4	4	5	6	6
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233	1	1	2	2	3	4	4	5	5
2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183	0	1	1	2	2	3	3	4	4
2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143	0	1	1	2	2	2	3	3	4
2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110	0	1	1	1	2	2	2	3	3
2.3	0.0107	0.0104	0.0102								0	1	1	1	1	2	2	2	2
				0.00990	0.00964	0.00939	0.00914				3	5	8	10	13	15	18	20	23
								0.00889	0.00866	0.00842	2	5	7	9	12	14	16	16	21
2.4	0.00820	0.00798	0.00776	0.00755	0.00734						2	4	6	8	11	13	15	17	19
						0.00714	0.00695	0.00676	0.00657	0.00639	2	4	6	7	9	11	13	15	17
2.5	0.00621	0.00604	0.00587	0.00570	0.00554	0.00539	0.00523	0.00508	0.00494	0.00480	2	3	5	6	8	9	11	12	14
2.6	0.00466	0.00453	0.00440	0.00427	0.00415	0.00402	0.00391	0.00379	0.00368	0.00357	1	2	3	5	6	7	9	9	10
2.7	0.00347	0.00336	0.00326	0.00317	0.00307	0.00298	0.00289	0.00280	0.00272	0.00264	1	2	3	4	5	6	7	8	9
2.8	0.00256	0.00248	0.00240	0.00233	0.00226	0.00219	0.00212	0.00205	0.00199	0.00193	1	1	2	3	4	4	5	6	6
2.9	0.00187	0.00181	0.00175	0.00169	0.00164	0.00159	0.00154	0.00149	0.00144	0.00139	0	1	1	2	2	3	3	4	4
3.0	0.00135	0.00131	0.00126	0.00122	0.00118	0.00114	0.00111	0.00107	0.00104	0.00100	0	1	1	2	2	2	3	3	4

$$f(z) = \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{1}{2}z^2\right)$$

$$Q(z) = \int_k^{\infty} f(z) dz$$



Example / Contoh:

If $X \sim N(0, 1)$, then $P(X > k) = Q(k)$
 Jika $X \sim N(0, 1)$, maka $P(X > k) = Q(k)$

Bahagian A
Section A

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

- 1** Aiman, Janny dan Chew bercadang membeli pen, pensel dan pembaris dari kedai buku Chong Beng untuk peralatan sekolah mereka. Aiman membeli sebatang pen, 3 batang pensel dan 2 batang pembaris dengan harga RM 9. Janny pula membeli 2 batang pen, sebatang pensel dan 3 batang pembaris juga dengan harga yang sama dengan Aiman. Manakala Chew membeli 3 batang pen, 4 batang pensel dan sebatang pembaris dengan harga RM 14. Cari harga bagi sebatang pen, pensel dan pembaris yang dijual oleh kedai tersebut.

Aiman, Janny dan Chew have planned to buy pen, pencil and ruler from Chong Beng Book Stor for their school apparatus. Aiman bought a pen, 3 pencils and 2 rulers for RM 9. Janny bought 2 pens, a pencil, and 3 rulers with the price as same as Aiman. Meanwhile Chew bought 3 pens, 4 pencils and a ruler for RM 14. Find the price for each pen, pencil and ruler that been sold at the shop.

[7 markah/ marks]

Jawapan/ Answer:

- 2 Fungsi kuadratik $f(x) = x^2 + 2kx + 5k - 3$ mempunyai nilai minimum -17 , dengan keadaan ialah k pemalar.

The quadratic function $f(x) = x^2 + 2kx + 5k - 3$ has a minimum value of -17 , where k is a constant.

- (a) Ungkapkan fungsi $f(x)$ dalam bentuk verteks dengan menggunakan kaedah penyempurnaan kuasa dua, seterusnya cari nilai- nilai yang mungkin bagi k .

Express function $f(x)$ in the vertex form by using the method of completing the square, hence find the values of k .

[4 markah/ marks]

- (b) Dengan menggunakan nilai $k < 0$, tulis persamaan baru graf tersebut dalam bentuk verteks jika graf itu dipantulkan pada paksi- x dan seterusnya nyatakan koordinat bagi titik pusingan baru graf itu.

By using the value $k < 0$, write the new equation of the curve in vertex form if the graph is reflected at the x - axis and hence state the coordinate of the new turning point.

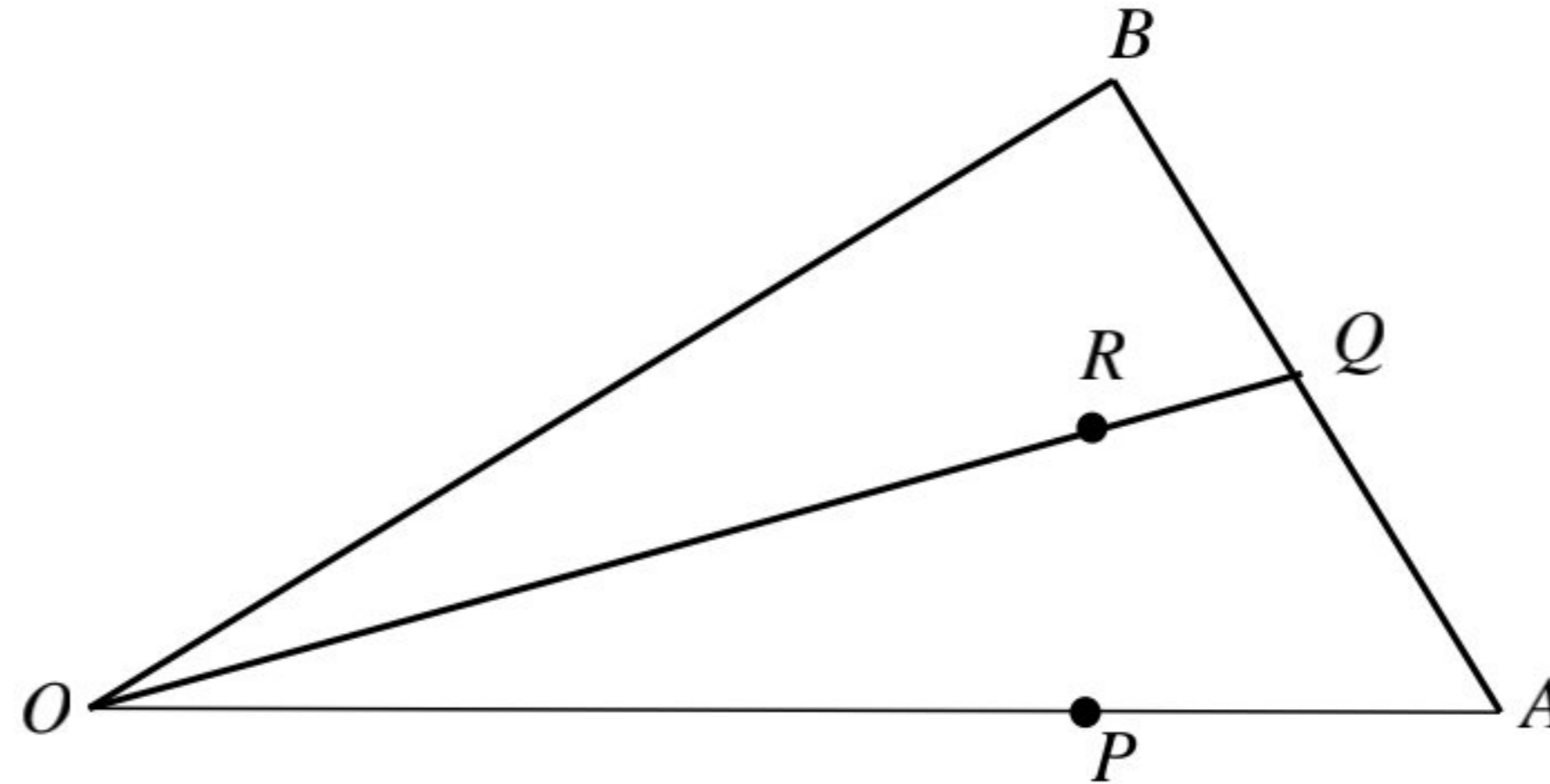
[2 markah/marks]

Jawapan /Answer :

- 3 Rajah 1 menunjukkan segi tiga OAB dengan keadaan $OP = \frac{2}{3}OA$, $AB = 2AQ$ dan $OR = \frac{4}{5}OQ$.
Diberi $\overrightarrow{OA} = 9\underline{x}$ dan $\overrightarrow{OB} = 4\underline{y}$.

Diagram 1 shows a triangle OAB such that $OP = \frac{2}{3}OA$, $AB = 2AQ$ and $OR = \frac{4}{5}OQ$.

Given that $\overrightarrow{OA} = 9\underline{x}$ and $\overrightarrow{OB} = 4\underline{y}$.



Rajah 1
Diagram 1

- (a) Ungkapkan, dalam sebutan \underline{x} dan/atau \underline{y} .

Express in terms of \underline{x} and/or \underline{y} .

- (i) \overrightarrow{PB} ,
(ii) \overrightarrow{OQ} .

[3 markah/ marks]

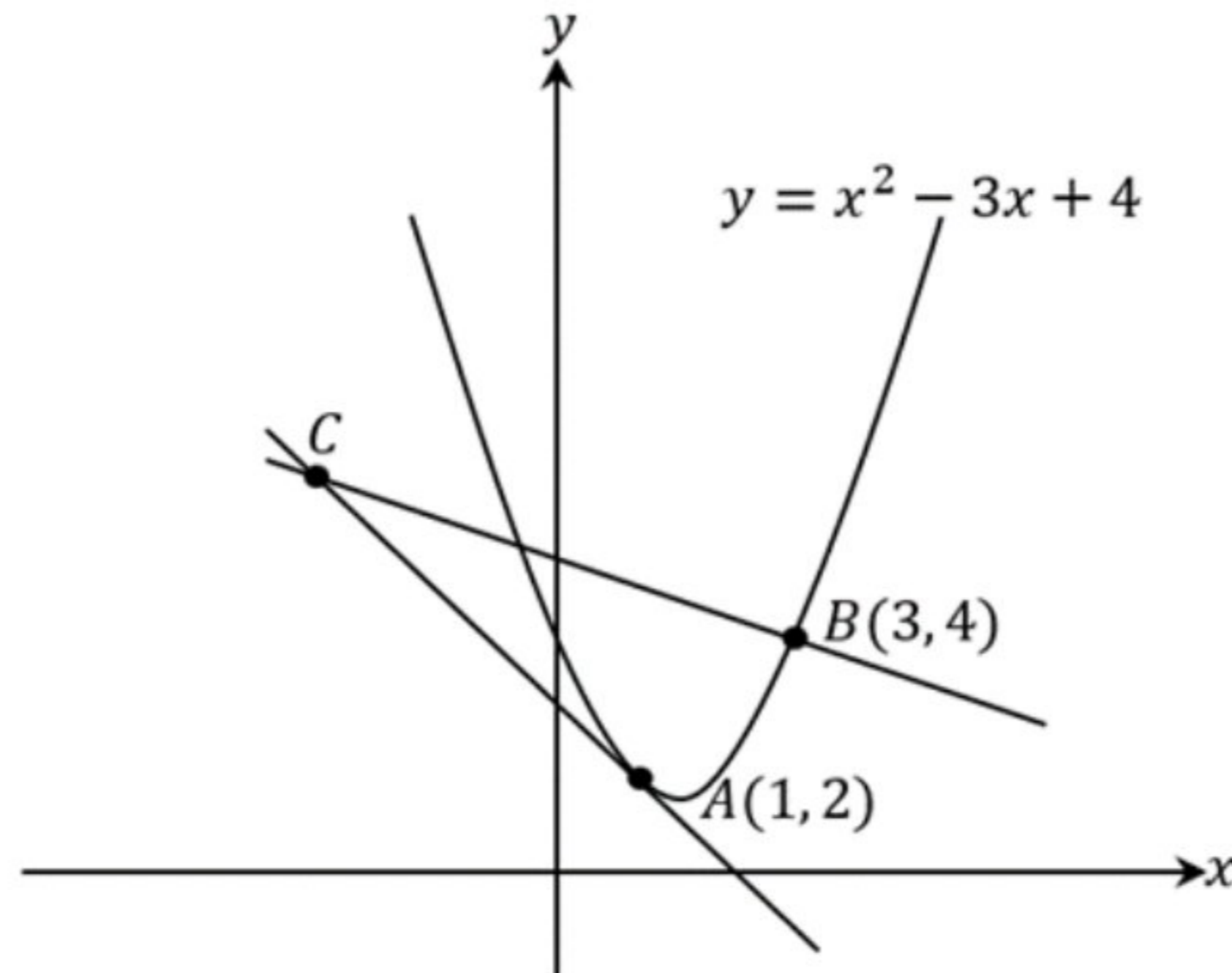
- (b) Seterusnya, buktikan titik-titik P , R dan B adalah segaris.
Hence, prove that P , R and B are collinear.

[4 markah/ marks]

Jawapan /Answer :

- 4 Rajah 2 menunjukkan lengkung $y = x^2 - 3x + 4$ dengan keadaan titik $A(1, 2)$ dan titik $B(3, 4)$ terletak pada lengkung itu. Garis AC ialah tangen kepada lengkung pada titik A dan garis BC pula ialah normal kepada lengkung pada titik B . Dua garis lurus melalui garis tangen AC dan garis normal BC , dan bertemu pada titik C .

The diagram 2 shows the curve $y = x^2 - 3x + 4$ where point $A(1, 2)$ and point $B(3, 4)$ are located on the curve. The line AC is a tangent to the curve at point A and the line BC is normal to the curve at point B . Two straight lines going through AC and BC , and meet at point C .



Rajah 2
Diagram 2

- (a) persamaan tangen pada titik A ,
the equation of the tangent at point A , [3 markah/marks]
- (b) persamaan normal pada titik B ,
the equation of the normal at point B , [2 markah/marks]
- (c) koordinat C , iaitu titik pertemuan kedua-dua garis lurus.
the coordinates of C where the two straight lines meet. [2 markah/marks]

Jawapan/Answer :

- 5 (a) Buktikan bahawa $\frac{\tan^2 \theta}{\sin^2 \theta} = \frac{\sin^2 \theta}{\cos^2 \theta} + 1$.

Prove that $\frac{\tan^2 \theta}{\sin^2 \theta} = \frac{\sin^2 \theta}{\cos^2 \theta} + 1$.

[2 markah/ marks]

- (b) Lakarkan graf $y = 2 \sin \frac{3}{2}x$ untuk $0 \leq x \leq 2\pi$. Seterusnya, cari persamaan satu garis lurus yang sesuai untuk menyelesaikan persamaan $2 \sin \frac{3}{2}x + \frac{3}{4\pi}x = 1$. Dengan menggunakan paksi yang sama, lukis garis lurus itu dan nyatakan bilangan penyelesaian bagi persamaan $2 \sin \frac{3}{2}x + \frac{3}{4\pi}x = 1$ untuk $0 \leq x \leq 2\pi$.

Sketch the graph $y = 2 \sin \frac{3}{2}x$ for $0 \leq x \leq 2\pi$. Hence, find the equation of a suitable

straight line to solve the equation $2 \sin \frac{3}{2}x + \frac{3}{4\pi}x = 1$. Using the same axes, draw the

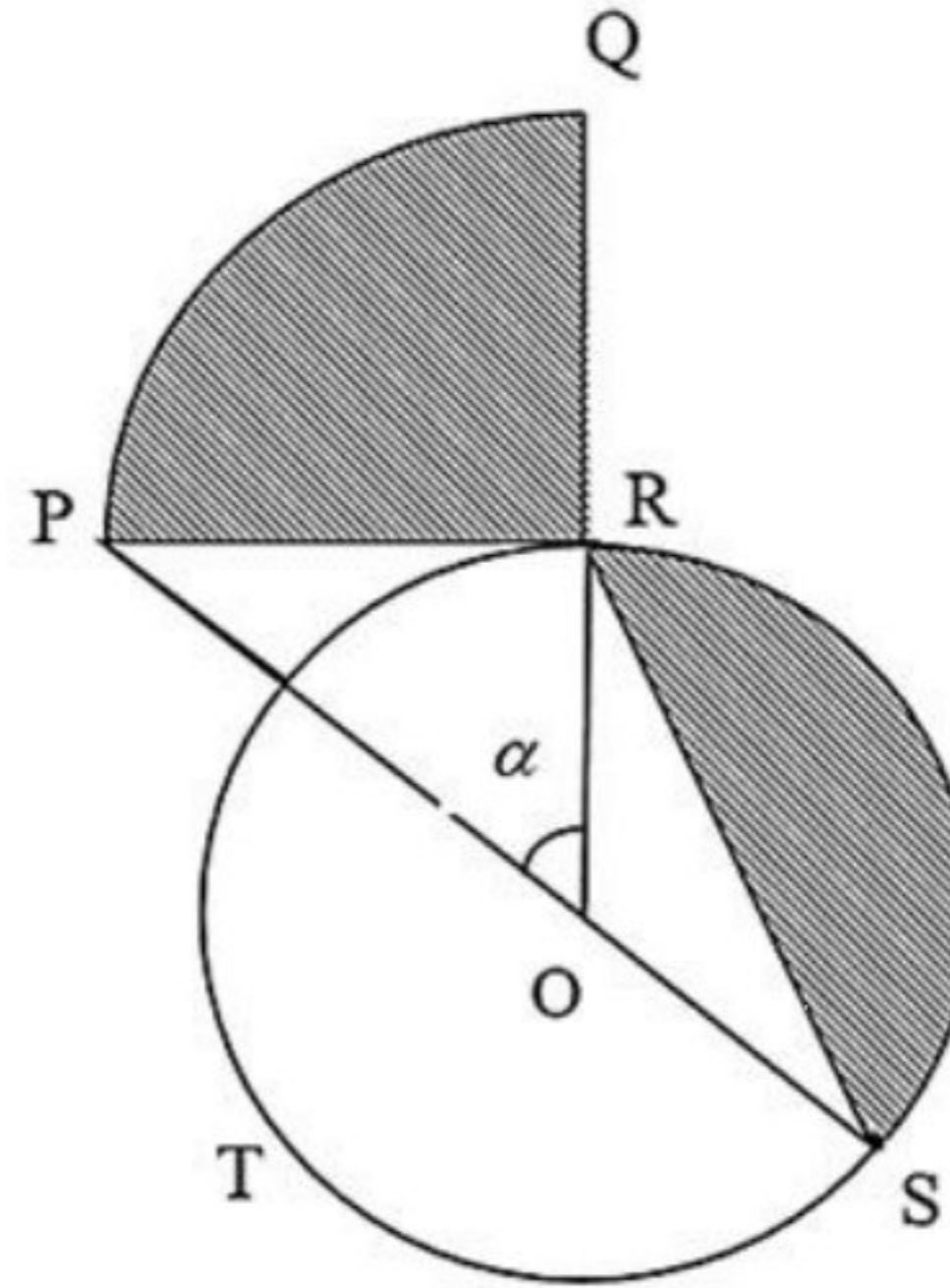
straight line and state the number of solutions to the equation $2 \sin \frac{3}{2}x + \frac{3}{4\pi}x = 1$ for $0 \leq x \leq 2\pi$.

[6 markah/ marks]

Jawapan/ Answer:

- 6 Rajah 3 di bawah menunjukkan pelan kolam yang terdiri daripada satu bulatan RST yang berpusat di O dan berjajari 9 m dan kolam tambahan PRQ untuk kanak-kanak. PR ialah tangen kepada bulatan pada titik R dan PRQ adalah sukuan bagi bulatan berpusat R. R adalah titik tengah bagi OQ dan RS adalah garis perentas. ORQ dan POS adalah garis lurus.

Diagram 3 below shows pool plan consisting of a circle RST with centre O and radius 9 m and an additional pool PRQ for children. PR is a tangent to the circle at point R and PRQ is a quadrant of a circle with centre R. R is the midpoint of OQ and RS is a chord. ORQ and POS are straight lines.



Rajah 3
Diagram 3

Hitung / Calculate,

[Guna / Use $\pi = 3.142$]

- (a) luas sektor PRQ, dalam cm^2 ,
area of PRQ, in cm^2 ,
- (b) perimeter, dalam cm, bagi kawasan berlorek.
the perimeter, in cm, of the shaded region.

[2 markah/marks]

[4 markah/marks]

Jawapan/Answer :

- 7 Diberi hasil tambah n sebutan yang pertama bagi suatu jajang aritmetik diberi oleh $S_n = an^2 + bn$. Hasil tambah tiga sebutan pertama ialah 51 dan hasil tambah lapan sebutan pertama ialah 296.

Given the sum of the first n terms of an arithmetic progression are given by $S_n = an^2 + bn$. The sum of the first three terms is 51 and the sum of the first eight terms is 296.

- (a) cari nilai a dan b

find the values of a and b .

[4 markah/marks]

- (b) cari nilai bagi sebutan pertama dan beza sepunya.

find the value of the first term and the common difference.

[2 markah/marks]

Jawapan/Answer :

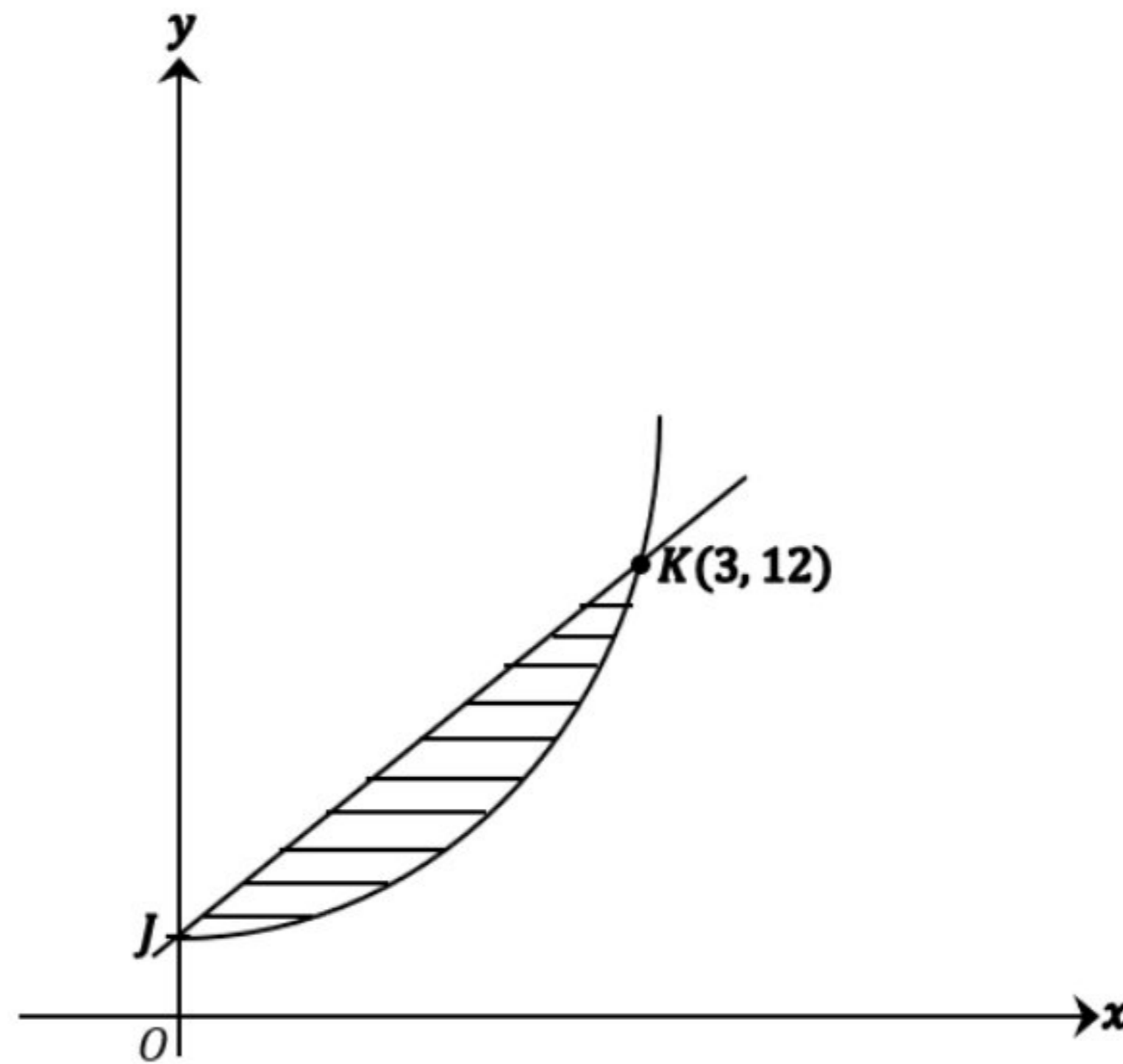
Bahagian B

Section B

Jawab mana-mana **tiga** soalanAnswer any **three** questions.

- 8 Rajah 4 menunjukkan sebahagian daripada lengkung $y = f(x)$ dan garis lurus yang bersilang pada titik J dan titik $K(3, 12)$.

Diagram 4 shows a part of curve $y = f(x)$ and straight line that intersects at point J and $K(3, 12)$.



Rajah 4

Diagram 4

Lengkung $y = f(x)$ mempunyai fungsi kecerunan $2x$

The curve $y = f(x)$ has a gradient function $2x$

Cari

Find

- (a) persamaan lengkung,
the equation of the curve, [3 markah/marks]
- (b) luas kawasan berlorek,
the area of the shaded region, [4 markah/marks]
- (d) isi padu kisanan bagi rantau yang dibatasi oleh lengkung, paksi- y dan $y = t$ diputarakan melalui 360° pada paksi- y . Nyatakan jawapan anda dalam sebutan π dan t .
the volume of revolution when the region bounded by the curve, the y -axis and $y = t$ is rotated through 360° about the y -axis. State your answer in terms of π and t . [3 markah/marks]

Jawapan/Answer :

Jawapan/Answer :

- 9 (a) Sebuah kelab menganjurkan satu sesi latihan sukan senapang angin. Setiap pelajar telah memanah sebanyak 10 kali. Kebarangkalian bahawa seorang pelajar tertentu Berjaya mengena sasaran adalah p . Selepas sesi latihan, didapati bahawa min bagi bilangan cubaan yang Berjaya mengena sasaran adalah 2.8.

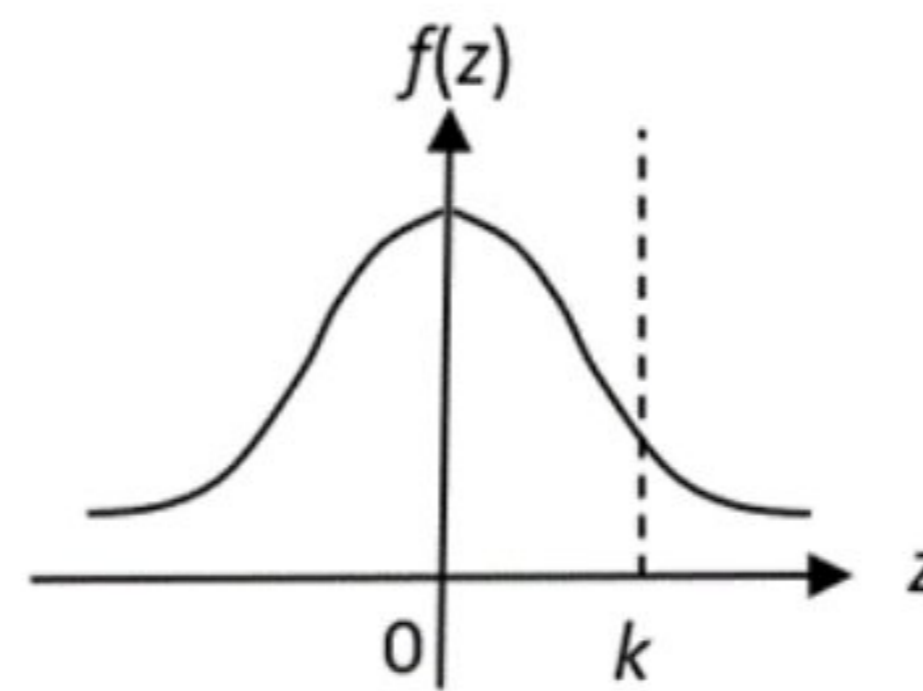
A club organizes a practice session for students on air rifle sport. Each student takes 10 shots. The probability that a particular student makes a successfully shot is p . After the session, it was calculated that the mean number of successful shots for student is 2.8.

- (i) Cari nilai p dan sisihan piawai bagi bilangan cubaan yang berjaya mengena sasaran.
Find the value of p and standard deviation of successful shots.
- (ii) Hitungkan kebarangkalian bahawa pelajar itu melakukan selebih-lebihnya 2 kali kejayaan.
Find the probability that the student makes at most 2 successful shots.

[5 markah/marks]

- (b) Rajah 5 menunjukkan graf taburan normal.

Diagram 5 shows a standard normal distribution graph.



Rajah 5
Diagram 5

Jika $P(0 < z < k) = 0.2806$

If $P(0 < z < k) = 0.2806$

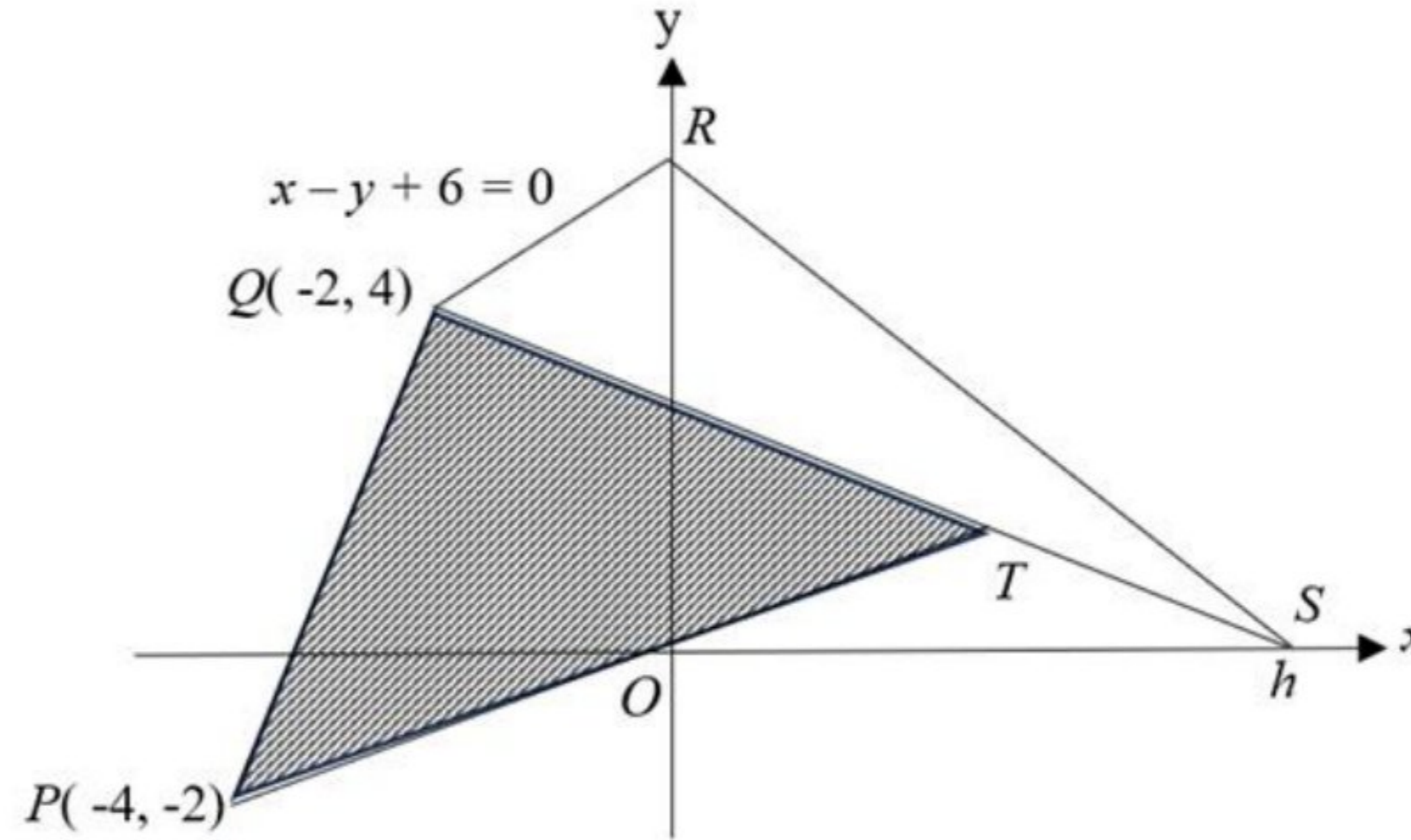
- (i) Cari $P(z > k)$
find $P(z > k)$
- (ii) Cari $P(|z| < k)$
find $P(|z| < k)$

[5 markah/marks]

Jawapan/Answer :

- 10 Rajah 6 menunjukkan dua buah segi tiga PQT dan QRS . Persamaan garis lurus QR ialah $x - y + 6 = 0$ dan $\angle QRS = 90^\circ$

Diagram 6 shows two triangles PQT and QRS . The equation of the straight line QR is $x - y + 6 = 0$ and $\angle QRS = 90^\circ$



Rajah 6
Diagram 6

- (i) nilai h ,
the value of h ,
- (ii) koordinat T di mana $QT : QS = 3 : 4$,
the coordinates of T where $QT : QS = 3 : 4$,
- (iii) luas, dalam unit^2 , rantau berlorek.
the area, in unit^2 , of the shaded region.

[7 markah/ marks]

- (b) Dalam suatu situasi khas, R ialah titik bergerak dengan $\angle QRS = 90^\circ$. Cari persamaan lokus R .
In a special condition, R is a moving point where $\angle QRS = 90^\circ$. Find the equation of locus R .

[3 markah/ marks]

Jawapan/Answer :

- 11** Jadual 1 menunjukkan nilai-nilai bagi dua pemboleh ubah x dan y , yang diperoleh daripada satu eksperimen. Pemboleh ubah x dan y dihubungkan oleh persamaan $y = ax^{2b+1}$, di mana a dan b adalah pemalar.

Table 1 shows the values of two variables, x and y obtained from an experiment. Variable x and y are related by the equation $y = ax^{2b+1}$, where a and b are constants.

x	10	47.86	131.83	557.68	1 015.88	3 162.28
y	141.25	562.34	1 778.28	6 684.22	12 007.00	33 884.42

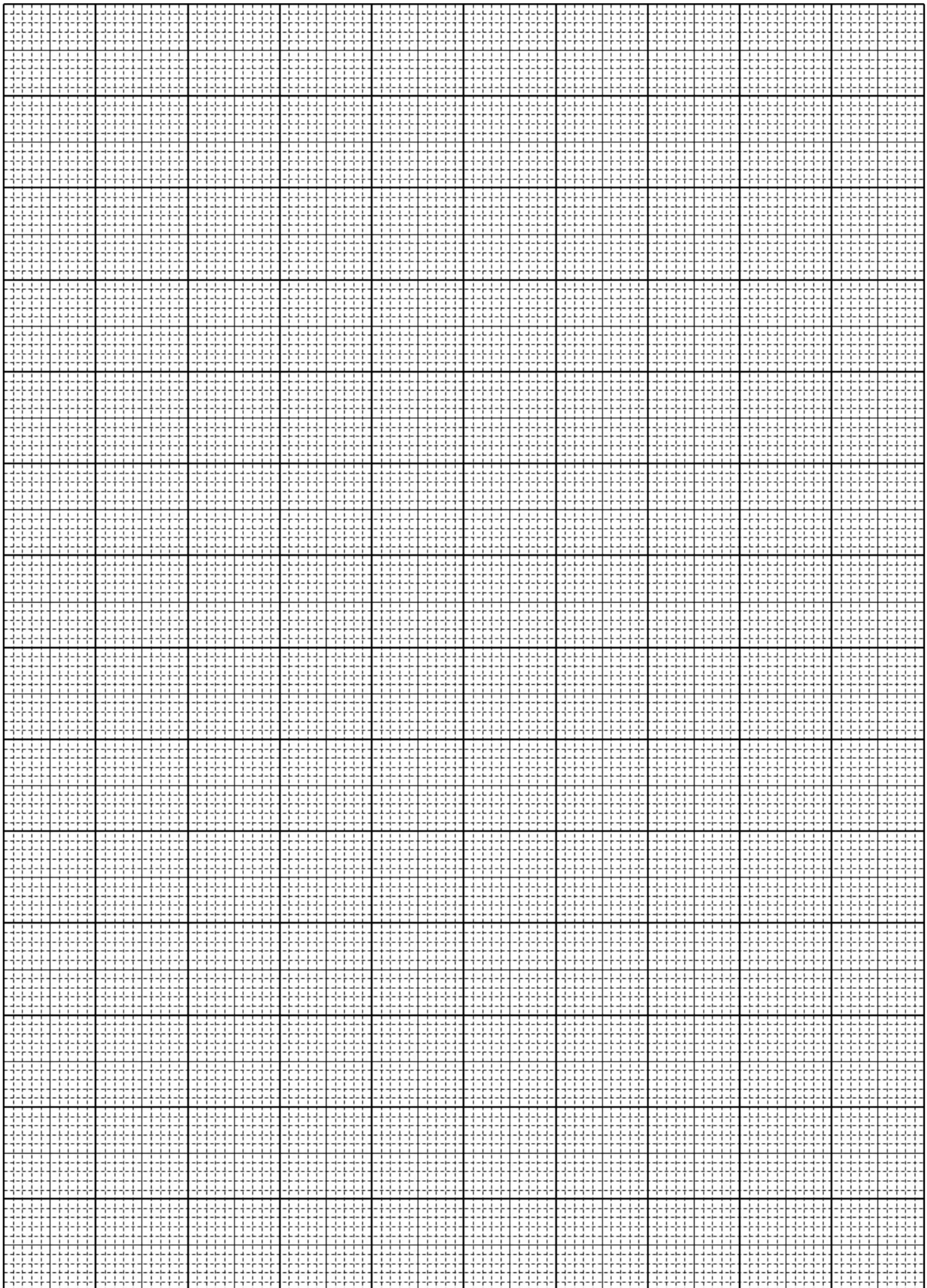
Jadual 1

Table 1

- (a) Berdasarkan Jadual 1, bina satu jadual bagi nilai-nilai $\log_{10}x$ dan $\log_{10}y$.
Base on Table 7, construct a table for the values of $\log_{10}x$ and $\log_{10}y$. [2 markah/ marks]
- (b) Plot sebuah graf $\log_{10}y$ melawan $\log_{10}x$ dengan menggunakan skala 2 cm kepada 0.5 unit pada kedua-dua paksi. Seterusnya, lukiskan garis lurus penyesuaian terbaik.
Plot $\log_{10}y$ against $\log_{10}x$ using a scale of 2 cm to 0.5 units on both axes. Hence, draw the line of best fit. [3 markah/marks]
- (c) Gunakan graf anda di (a), cari
Use your graph in (a), find
- (i) nilai a
the values of a
 - (ii) nilai b
the values of b
 - (iii) nilai x apabila $y = 4\,768$
the value of x when $y = 4\,768$

[5 markah/marks]

Jawapan/ Answer :

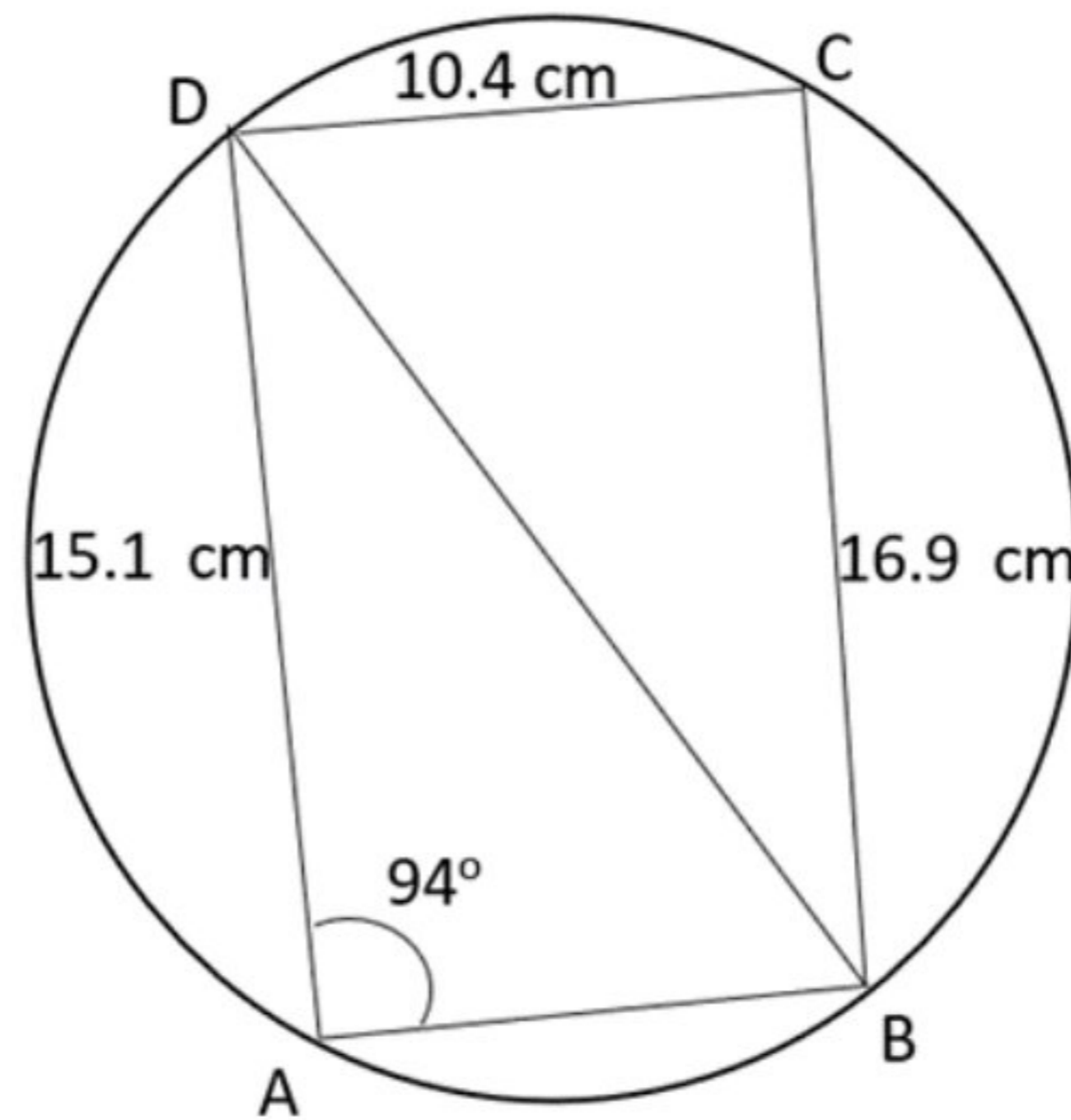


Bahagian C
Section C

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

12 Rajah 7 menunjukkan sisi empat kitaran $ABCD$

Diagram 7 shows a side four cycles $ABCD$



Rajah 7
Diagram 7

(a) Cari

Find

- (i) luas, dalam cm^2 , bagi segi tiga BCD
the area of triangle BCD , in cm^2
- (ii) panjang BD
length of BD
- (iii) jarak terdekat, dalam cm , dari titik C ke BD
shortest distance, in cm , point C to BD

[7 markah/marks]

(b) Hitung $\angle ADC$

Calculate $\angle ADC$

[3 markah/marks]

Jawapan/Answer :

Jawapan/*Answer* :

- 13** Jadual 2 menunjukkan harga, indeks harga dan pemberat bagi empat bahan kek, *A*, *B*, *C* dan *D*, yang digunakan oleh sebuah kedai kek.

Table 2 shows the prices, price indices and weightages of four cake ingredients, A, B, C and D used by a cake house.

Bahan <i>Ingredient</i>	Harga (RM) <i>Price (RM)</i>		Indeks harga pada tahun 2018 berdasarkan tahun 2016 <i>Price index in the year 2018 based on the year 2016</i>	Pemberat <i>Weightage</i>
	2016	2018		
<i>A</i>	<i>p</i>	21	150	15
<i>B</i>	15	24	<i>q</i>	10
<i>C</i>	10	<i>r</i>	150	12
<i>D</i>	20	14	70	13

Jadual 2

Table 2

- (a) Cari nilai-nilai *p*, *q* dan *r*
Find the values of p, q and r
[3 markah/marks]
- (b) Hitung indeks harga bahan *D* pada tahun 2016 berdasarkan 2018
Calculate the price index for ingredient D for the year 2016 based on the year 2018
[1 markah/ marks]
- (c) Hitung indeks gubahan bagi harga empat bahan itu pada tahun 2018 berdasarkan 2016
Calculate the composite index for the prices of four ingredients in the year 2018 based on the year 2016
[2 markah/marks]
- (d) Dari tahun 2018 ke tahun 2022, harga bahan *A* meningkat sebanyak 30%, harga bahan *D* menyusut sebanyak 15%, manakala bahan *B* dan bahan *C* kekal tidak berubah. Hitung indeks gubahan bagi harga bahan itu pada tahun 2022 berdasarkan tahun 2016.
From the year 2018 to the year 2022, the price of ingredient A increased by 30%, the price of ingredient D decreased by 15%, while the prices of ingredients B and C remain unchanged. Calculate the composite index of the ingredients in the year 2022 based on the year 2016.
[4 markah/marks]

Jawapan/Answer :

Jawapan/Answer :

- 14** Encik Amin ingin menanam kubis dan tomato di sebidang tanah miliknya. Kos menanam kubis dan tomato itu masing-masing ialah RM2 400 per km² dan RM1 600 per km². Rancangan pertanian Encik Amin adalah berdasarkan kekangan berikut :

Mr Amin wants to plant cabbages and tomatoes on a lot of land. The costs to plant cabbages and tomatoes are RM2 400 per km² and RM1 600 per km² respectively. Mr Amin's plantation plan is subject to the following constraints :

- I Luas tanah itu ialah 10 km².
The area of the land is 10 km².
- II Modal yang Encik Amin ada ialah RM19 200
The capital that Encik Amin has is RM19 200
- III Luas tanah yang ditanam dengan tomato adalah tidak melebihi dua kali luas tanah yang ditanam dengan kubis.
The area planted with tomatoes is not more than two times the area planted with cabbages.

Encik Amin memperuntukkan x km² untuk menanam kubis dan y km² untuk menanam tomato.

Mr Amin allocates x km² to plant cabbages and y km² to plant tomatoes.

- (a) Tulis tiga ketaksamaan, selain daripada $x \geq 0$ dan $y \geq 0$ yang memenuhi semua kekangan di atas.

Write three inequalities, other than $x \geq 0$ and $y \geq 0$ that satisfy all the above constraints.

[3 markah/ marks]

- (b) Menggunakan skala 2 cm kepada 2 km² pada kedua-dua paksi, bina dan lorek rantau R yang memenuhi semua kekangan di atas.

Using a scale of 2 cm to 2 km² on both axes, construct and shade the region R which satisfies all the above constraints.

[3 markah/ marks]

- (c) Berdasarkan graf di 14(b), jawab soalan-soalan berikut :

Based on the graph in 14(b), answer the following questions :

- (i) Jika luas tanah yang ditanam dengan tomato ialah 4 km², cari julat luas yang ditanam dengan kubis.

If the area planted with tomatoes is 4 km², find the range of values of the area planted with cabbages

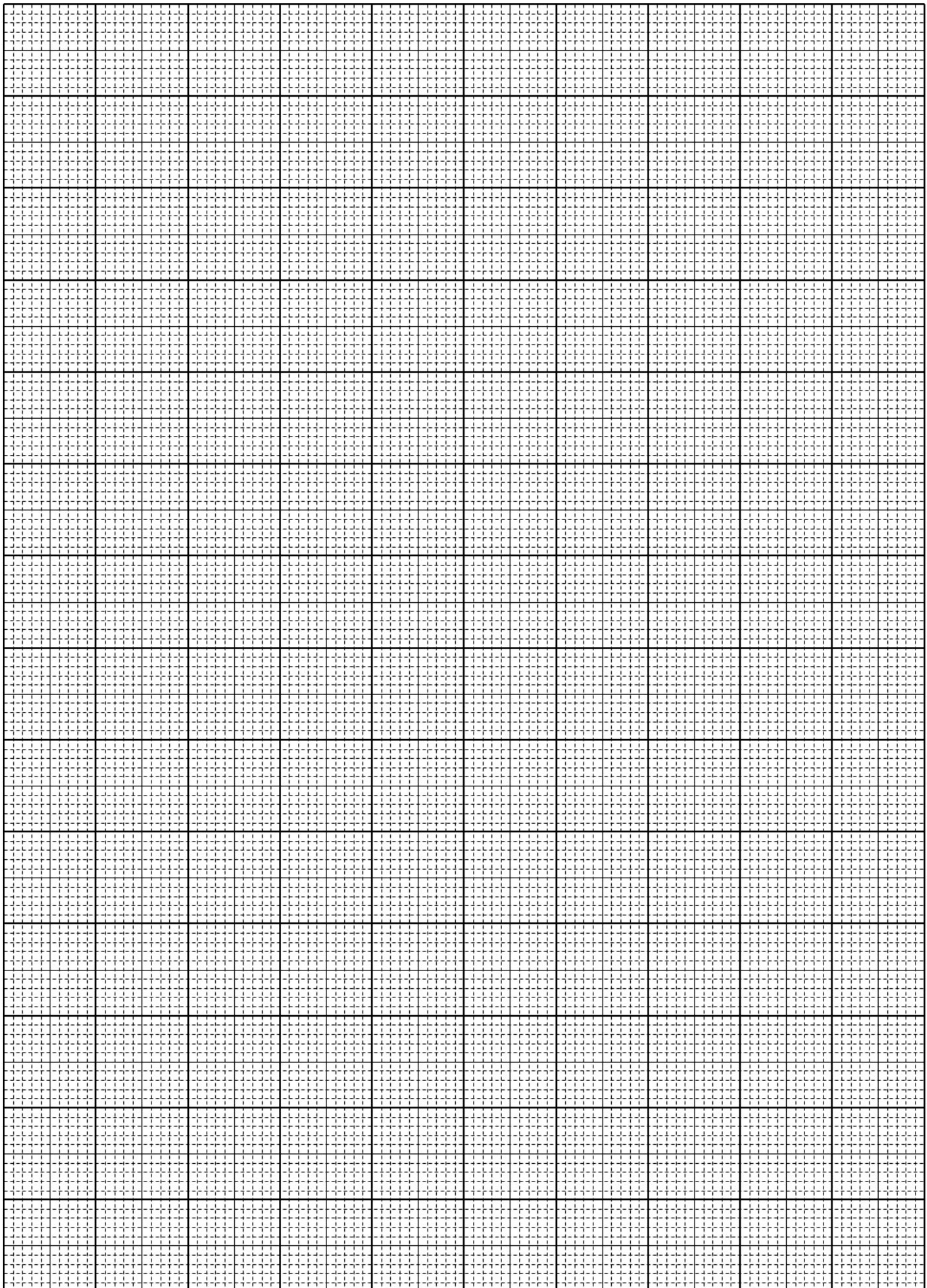
- (ii) Encik Amin memperoleh keuntungan RM280 per km² bagi kubis dan keuntungan RM200 per km² bagi tomato. Cari keuntungan maksimum yang diperolehinya.

Mr Amin obtains a profit of RM280 per km² for cabbages and a profit of RM200 per km² for tomatoes. Find the maximum profit that he can obtain.

[4 markah/marks]

Jawapan/Answer :

Jawapan/Answer :



- 15 Mira dan adik perempuannya, Syafiqa bermain kereta mainan. Rajah 8 di bawah menunjukkan kedudukan dan arah pergerakan bagi dua buah kereta mainan, Mira dan Syafiqa, yang bergerak pada satu garis lurus dan masing-masing melalui dua titik tetap, P dan Q . Kereta Mira melalui titik tetap P dan kereta Syafiqa melalui titik tetap Q secara serentak. Jarak di antara titik P dan Q ialah 40 cm.

Mira and her younger sister, Syafiqa are playing toy car. Diagram 8 below shows the positions and the directions of motion of two toy's car, Mira and Syafiqa, which are moving on a straight line and passing through two fixed point, P and Q respectively. Mira's car passes the fixed point P and Syafiqa's car passes the fixed point Q simultaneously. The distance between point P and Q is 40 cm.



Rajah 8
Diagram 8

Halaju kereta Mira, $V_A \text{ cms}^{-1}$, diberi oleh $V_A = 3 + 2t - t^2$, di mana t ialah masa dalam saat, selepas melalui titik P manakala kereta Syafiqa bergerak dengan halaju malar -4 cms^{-1} . Kereta Mira berhenti seketika pada titik G .

The velocity of Mira's car, $V_A \text{ cms}^{-1}$, is given by $V_A = 3 + 2t - t^2$, where t is the time, in seconds, after passing point P while Syafiqa's car travels with a constant velocity of -4 cms^{-1} . Mira's car stops instantaneously at point G .

[Anggapkan bahawa gerakan ke arah kanan sebagai positif]
[Assume that motion to the right is positive]

Cari / Find

- (a) masa, dalam saat, ketika pecutan kereta Mira adalah sifar.
the time, in seconds, when the acceleration of Mira's car is zero. [2 markah/ marks]
- (b) halaju maksimum, dalam cms^{-1} , kereta Mira,
the maximum velocity, in cms^{-1} , of Mira's car. [2 markah/ marks]
- (c) jarak, dalam cm, titik G dari titik P .
the distance, in cm of point G from point P . [4 markah/ marks]
- (d) jarak, dalam cm, di antara kereta Mira dengan kereta Syafiqa apabila kereta Mira berada di titik G .
the distance, in m, between Mira's car dan Syafiqa's car when Mira's car is at point G . [2 markah/marks]

Jawapan/Answer :

SOALAN PEPERIKSAAN TAMAT

PEPERIKSAAN PERCUBAAN SPM
SESI AKADEMIK 2023/2024
MATEMATIK TAMBAHAN

3472/1

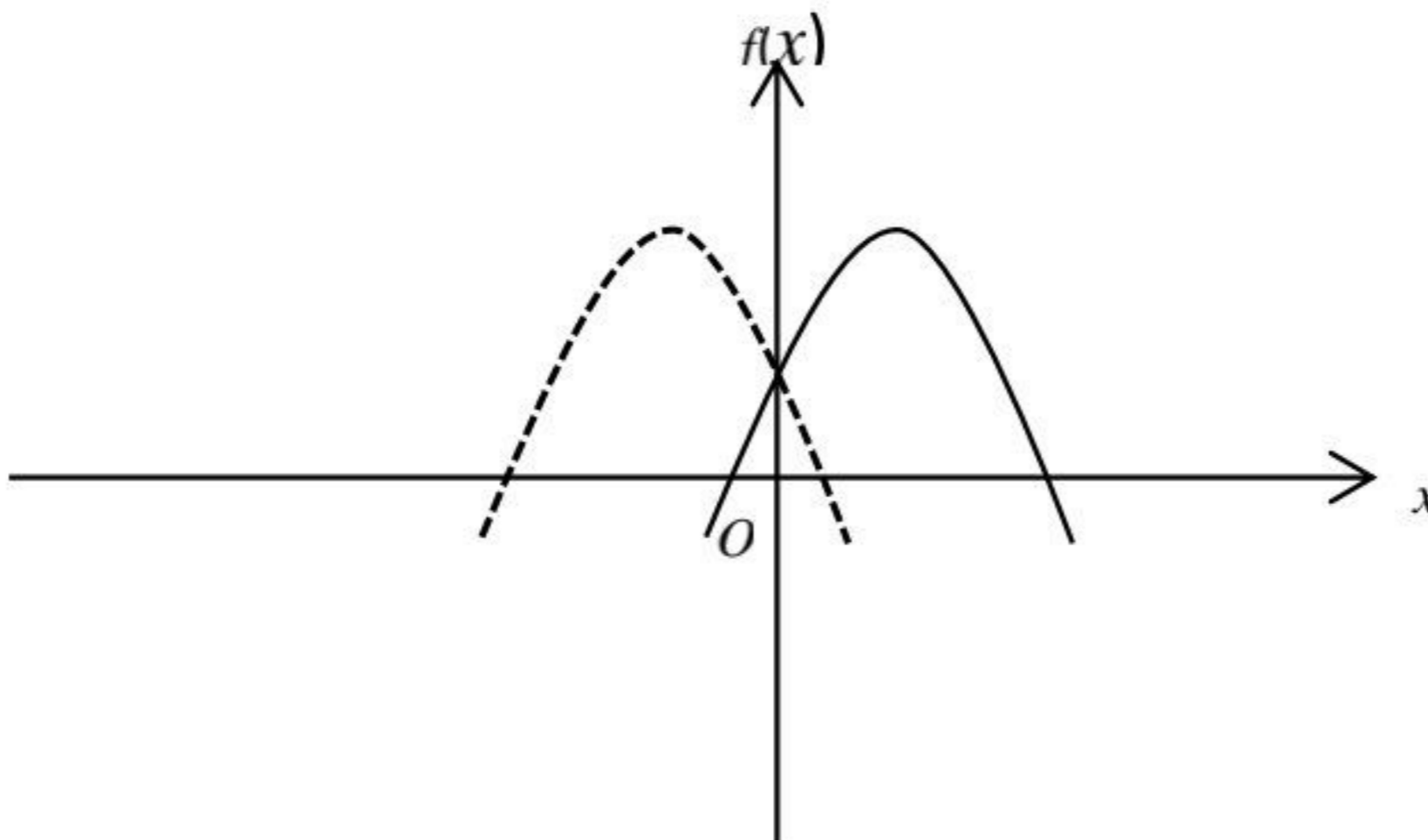
KERTAS 1
NOV

Dua jam

PANDUAN PENSKORAN

Panduan penskoran ini mengandungi 5 halaman bercetak.

PANDUAN PENSKORAN SET 1
Bahagian A

No.	Penyelesaian	Sub Markah	Jumlah
1	<p>(a) $x = \frac{-(-5)}{2(-2)}$</p> <p style="text-align: center;">or</p> $f(x) = -2\left[x^2 + \frac{5}{2}x + \left(\frac{\frac{5}{2}}{2}\right)^2 - \left(\frac{\frac{5}{2}}{2}\right)^2 - \frac{c}{2}\right]$ $f(x) = -2\left[\left(x + \frac{5}{4}\right)^2 - \left(\frac{5}{4}\right)^2 - \frac{c}{2}\right]$ $f(x) = -2\left(x + \frac{5}{4}\right)^2 + \left(\frac{25}{8}\right) + c$ $\frac{-4 + b}{2} = \frac{-5}{4}$ $b = \frac{3}{2}$ $0 = -2(-4)^2 - 5(-4) + c$ $c = 12$ <p>(b) $x = -\frac{5}{4}$</p> $\left(-\frac{5}{4}, \frac{121}{8}\right)$ <p>(c) graf akan dipantulkan pada paksi y, tanpa mengubah bentuk graf.</p>  <p>Graf maksimum beranjak ke kanan</p>	<p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p>	7

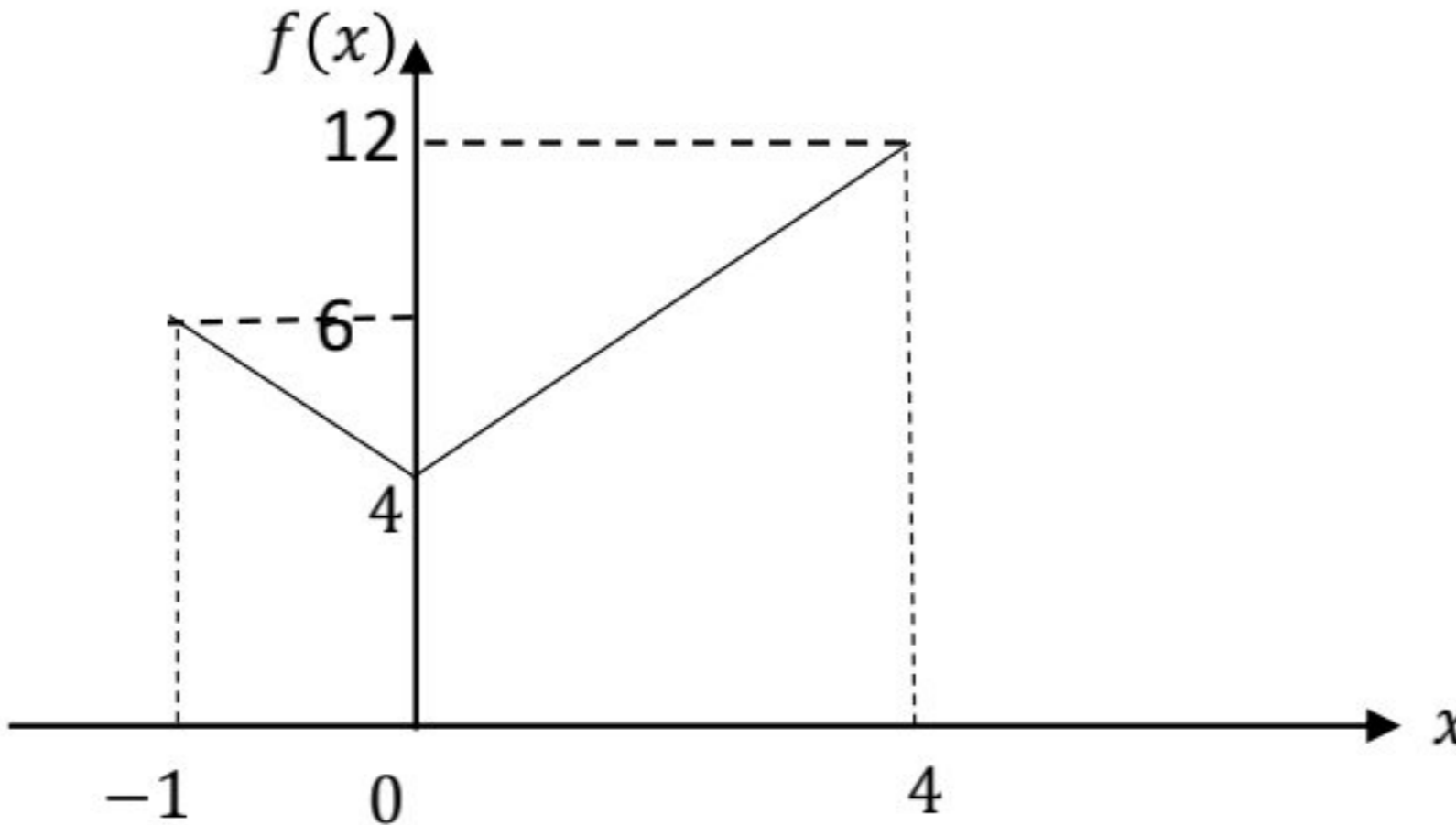
2	<p>(a)</p> $\frac{3^{2n+1}}{3^2} = 3^{2(2n)}$ $3^{2n+1-2} = 3^{4n}$ $2n + 1 - 2 = 4n$ $2n = -1$ $n = -\frac{1}{2}$ <p>(b) i.</p> $\log_{10} 2^{2x+1} = \log_{10} 12$ $(2x + 1) \log_{10} 2 = \log_{10} 12$ $2x + 1 = \frac{\log_{10} 12}{\log_{10} 2}$ $2x + 1 = 3.5850$ $2x = 2.5850$ $x = 1.29$ <p>(ii)</p> $\ln \frac{5\sqrt{3}}{2} = \log_e 5 + \log_e \sqrt{3} - \log_e 2$ $= \log_e 5 + \log_e 3^{\frac{1}{2}} - \log_e 2$ $= r + \frac{1}{2}q - p$	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>8</p>
3	<p>(a)</p> $r = \frac{2}{3}$ <p>(b)</p> $45 = \frac{6k}{1 - \frac{2}{3}}$ $k = 2.5$ $6 \left(\frac{5}{2}\right) \left(\frac{2}{3}\right)^{n-1} < 1$ <p>Gunakan logaritma</p> $n = 8$	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>5</p>

4	(a)	$xy = \frac{h}{p}x^2 + k$	1	4
	(b)	$k = 7$	1	
		$\frac{h}{p} = \frac{7-5}{0-3}$	1	
		$h = -\frac{2}{3}p$	1	

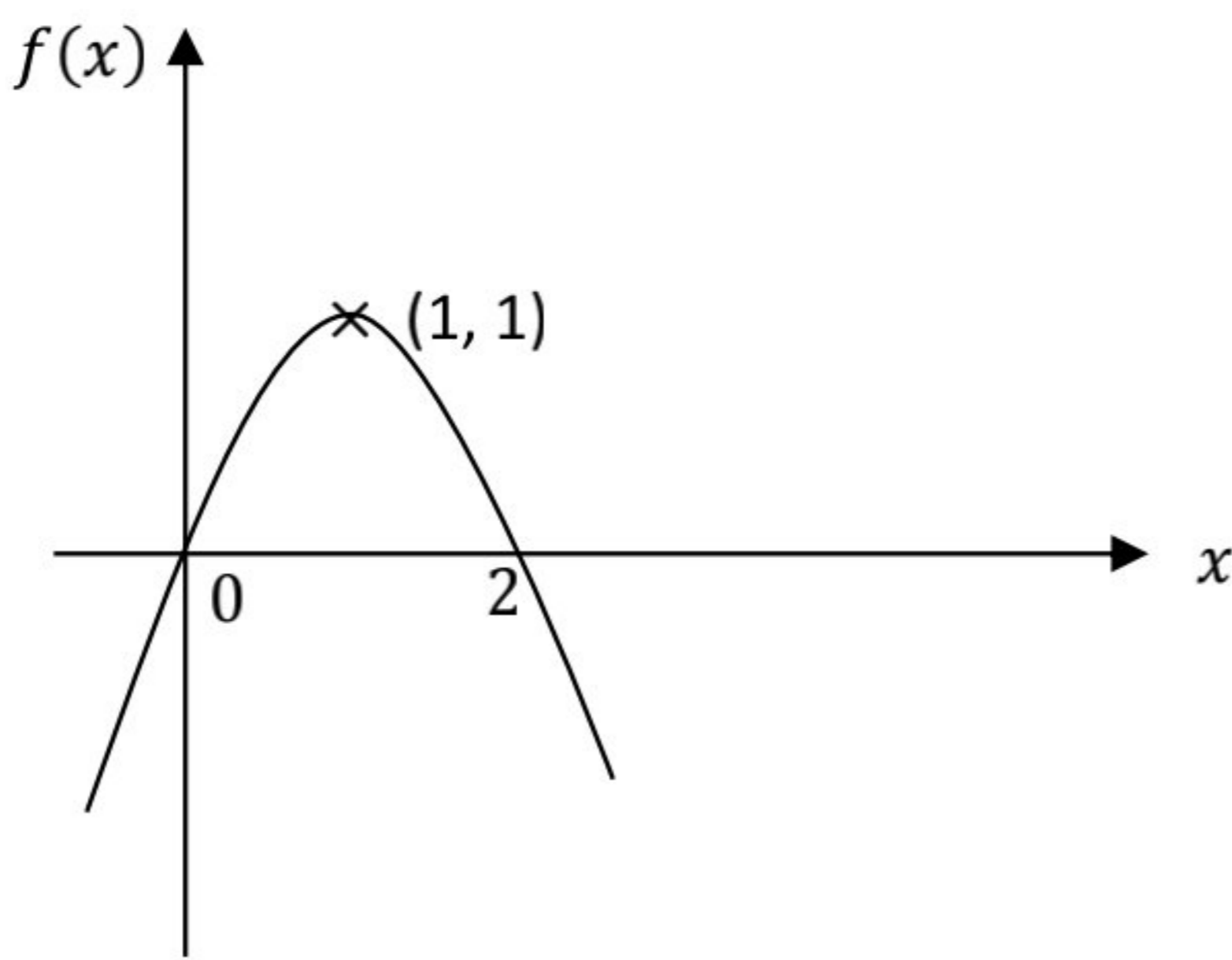
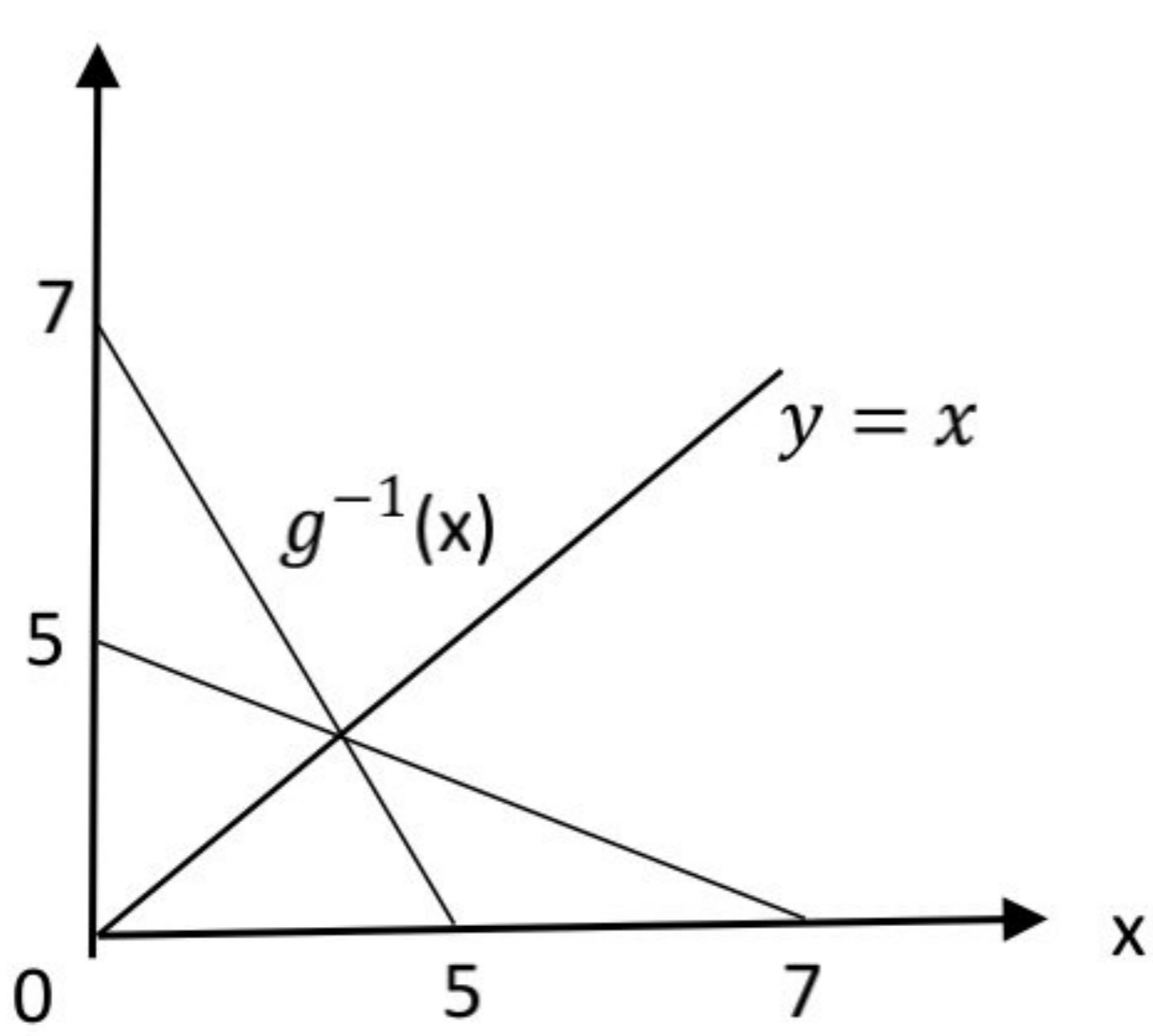
No.	Penyelesaian	Sub Markah	Jumlah
5	$\frac{1}{2} \begin{vmatrix} 2 & 6 & x & 2 \\ -2 & 7 & 0 & -2 \end{vmatrix} = 14$		
	Or $ 14 - 2x + 12 - x = 28$	1	3
	$ -3x + 26 = 28$		
	$-3x + 26 = \pm 28$	1	
	$-3x + 26 = 28$, $-3x + 26 = -28$ $-3x = 28 - 26$ $-3x = 28 + 26$ $x = -\frac{2}{3}$ $x = 18$		
	Maka, koordinat T($-\frac{2}{3}, 0$) atau T(18 , 0)	1	

6	<p>(a) Vektor kedudukan zarah $A = -4\underline{i} + 5\underline{j} + t(2\underline{i} - \underline{j})$ atau</p> <p>Vektor kedudukan zarah $B = -8\underline{i} + 9\underline{j} + t(3\underline{i} - 2\underline{j})$</p> $-4\underline{i} + 5\underline{j} + t(2\underline{i} - \underline{j}) = -8\underline{i} + 9\underline{j} + t(3\underline{i} - 2\underline{j})$ $(2t - 4)\underline{i} + (5 - t)\underline{j} = (3t - 8)\underline{i} + (9 - 2t)\underline{j}$ $2t - 4 = 3t - 8 \quad \text{atau} \quad 5 - t = 9 - 2t$ $t = 4$ <p>(b)</p> <p>Kedudukan zarah $A = -4\underline{i} + 5\underline{j} + 4(2\underline{i} - \underline{j})$ atau</p> <p>Kedudukan zarah $B = -8\underline{i} + 9\underline{j} + 4(3\underline{i} - 2\underline{j})$</p> $4\underline{i} + \underline{j}$ $(4, 1)$	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>6</p>
7	$j + j + j\theta = 30$ $\frac{1}{2}j^2\theta = 50$ $\frac{1}{2}j(30 - 2j) = 50 \text{ atau setara}$ $(j - 10)(j - 5) = 0$ $j = 10 \text{ and } j = 5$ $\theta = 4 \text{ rad and } \theta = 1 \text{ rad}$	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>4</p>
8	<p>(a)</p> <p>(i) 4</p> <p>(ii) had $f(x)$ tidak wujud, sebab had kiri tidak sama dengan had kanan.</p> <p>(b) (i) 2</p> <p>(ii) 3</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>4</p>

9	<p>(a) -7</p> <p>(b) $\int_4^6 [mx - q(x)] dx = 21$</p> $\int_4^6 mx dx - \int_4^6 q(x) dx = 21$ $\left[\frac{mx^2}{2} \right]_4^6 - 7 = 21$ $\frac{m(6)^2}{2} - \frac{m(4)^2}{2} = 28$ $m = \frac{14}{5}$	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>4</p>
10	<p>(a)(i)</p> <p>Bilangan cara:</p> $P = (3 - 1)! \times 3!$ $= 12$ <p>(ii) $\frac{{}^3P_1 \times 6! \times {}^5P_1}{2! 2! 2!} @ \frac{3 \times 6! \times 5}{2! 2! 2!}$</p> $= 1350$ <p>(b) ${}^5C_2 \times {}^3C_1$</p> ${}^3C_2 \times {}^5C_1$ ${}^5C_2 \times {}^3C_1 + {}^3C_2 \times {}^5C_1 @ 30 + 15$ 45	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>8</p>
11	<p>(a)</p> <p>(i) $\mu = \frac{50+60}{2}$</p> $\mu = 55$ <p>(ii) $\sigma_1 > \sigma$, serakan taburan normal lebih besar daripada nilai min, μ dan ketinggian graf berkurang.</p> <p>(b)</p> <p>(i) $P(55 < X < 70) = 0.68 + \frac{0.95-0.68}{2}$</p> $= 0.68 + 0.135$ $= 0.815$	<p>1</p> <p>1</p> <p>1</p>	<p>5</p>

	<p>(ii) $P(X < 50) = \frac{1.00 - 0.95}{2}$</p> $= \frac{0.05}{2}$ $= 0.025$ <p>(iii) $P(X > 75) = \frac{1 - 0.998}{2}$</p> $= \frac{0.002}{2}$ $= 0.001$	1	
12	<p>(a)</p> <p>(i) $x = 1, -1$</p> <p>(ii) $f(4) = 2(4) = 8$</p> $0 \leq f(x) \leq 8$ <p>(b)</p>  $4 \leq f(x) \leq 12$	1 1 1 1 1 1	6

Bahagian B

No.	Penyelesaian	Sub Markah	Jumlah
13	<p>(a)</p>  <p>$f^{-1}(x)$ bukan fungsi.</p> <p>(b)</p> <p>$x \leq -1$ @ $x \geq 1$</p> <p>(c)</p>  <p>Domain $0 \leq x \leq 7$</p> <p>Julat $0 \leq g^{-1}(x) \leq 5$</p>	<p>2</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p>	<p>4</p>

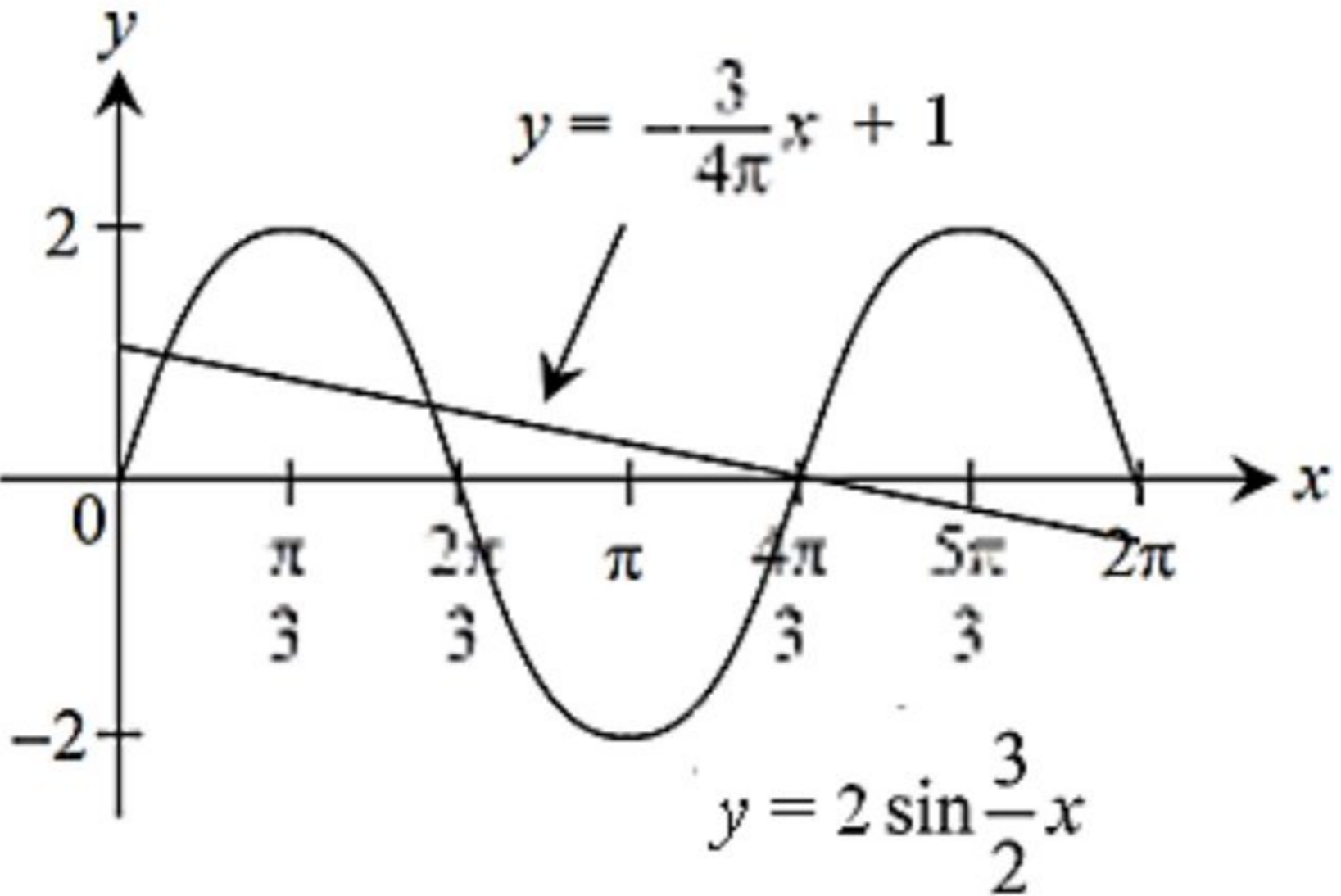
14	<p>(a) $\frac{2 - \sqrt{3}}{2 + \sqrt{3}} \left(\frac{2 - \sqrt{3}}{2 - \sqrt{3}} \right) + \frac{12}{\sqrt{3}} \left(\frac{\sqrt{3}}{\sqrt{3}} \right)$</p> $= \frac{4 - 2\sqrt{3} - 2\sqrt{3} + 3}{4 + 2\sqrt{3} - 2\sqrt{3} - 3} + \frac{12\sqrt{3}}{3}$ $= 7 - 4\sqrt{3} + 4\sqrt{3}$ $= 7$ <p>(b)</p> $2(3 + 5\sqrt{7}) \times (3 + 5\sqrt{7})$ $= (6 + 10\sqrt{7}) \times (3 + 5\sqrt{7})$ $= 18 + 30\sqrt{7} + 30\sqrt{7} + 350$ $= 368 + 60\sqrt{7}m^2$ <p>a = 368; b = 60</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1,1</p>	8
15	<p>(a) (i) $2 \sin \theta \cos \theta$</p> $2 \left(\frac{p}{\sqrt{1+p^2}} \right) \left(\frac{1}{\sqrt{1+p^2}} \right)$ $\frac{2p}{1+p^2}$ <p>(ii)</p> $2 \cos^2 \frac{\theta}{2} - 1 = \cos \theta$ $2 \cos^2 \frac{\theta}{2} = \cos \theta + 1$ $2 \cos^2 \frac{\theta}{2} = \frac{1}{\sqrt{1+p^2}} + 1$ $\cos^2 \frac{\theta}{2} = \frac{1 + \sqrt{1+p^2}}{2\sqrt{1+p^2}}$ <p>(b)</p> $2 \cos^2 \theta - 1 = 5 \cos \theta - 3$ $2 \cos^2 \theta - 5 \cos \theta + 2 = 0$ $(\cos \theta - 2)(2 \cos \theta - 1) = 0$ $\cos \theta = 2 \text{ (tiada penyelesaian) or } 2 \cos \theta = 1$ $\cos \theta = \frac{1}{2}$ <p>$\theta = 60^\circ$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	5

		1	
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PANDUAN PEMARKAHAN KERTAS 2 - SET 1

No.	Skema Pemarkahan	Sub Markah	Jumlah Markah
1	$x + 3y + 2z = 9$ @ $2x + y + 3z = 9$ @ $3x + 4y + z = 14$ Hapus anu pertama dengan kaedah penggantian/ penghapusan $5y + z = 9$ @ $5y + 5z = 13$ Hapus anu kedua dengan kaedah penggantian/ penghapusan $4z = z$ $z = 1$ $x = 2.2$ $y = 1.6$ Pen = RM2.20, Pensel = RM1.60, Pembaris = RM1.00	1 1 1 1 1 1	7 7
2	(a) $f(x) = x^2 + 2kx + \left(\frac{2k}{2}\right)^2 - \left(\frac{2k}{2}\right)^2 + 5k - 3$ $f(x) = (x + k)^2 - k^2 + 5k - 3$ $-k^2 + 5k - 3 = -17$ $k = 7, k = -2$	1 1 1 1	4
	(b) $f(x) = -(x - 2)^2 + 17$ titik maksimum = (2,17)	1 1	2
3	(a) $\overrightarrow{PB} = \overrightarrow{PO} + \overrightarrow{OB}$ atau $\overrightarrow{PB} = \overrightarrow{PA} + \overrightarrow{AB}$ atau $\overrightarrow{OQ} = \overrightarrow{OA} + \overrightarrow{AQ}$ atau setara (guna hukum Δ) (i) $\overrightarrow{PB} = -\frac{2}{3}(9\underline{x}) + 4\underline{y}$ @ $\overrightarrow{PB} = \frac{1}{3}(9\underline{x}) - 9\underline{x} + 4\underline{y}$ $\overrightarrow{PB} = -6\underline{x} + 4\underline{y}$ (ii) $\overrightarrow{OQ} = 9\underline{x} + \frac{1}{2}(-9\underline{x} + 4\underline{y})$ $\overrightarrow{OQ} = \frac{9}{2}\underline{x} + 2\underline{y}$	1 1 1	3
	(b) $\overrightarrow{PR} = -\frac{12}{5}\underline{x} + \frac{8}{5}\underline{y}$ atau setara $\overrightarrow{PR} = \lambda\overrightarrow{PB}$ $-\frac{12}{5}\underline{x} + \frac{8}{5}\underline{y} = \lambda(-6\underline{x} + 4\underline{y})$ Bandingkan pekali \underline{x} dan \underline{y} $-\frac{12}{5} = -6\lambda$ dan $\frac{8}{5} = 4\lambda$ $\lambda = \frac{2}{5}$ atau setara	1 1 1 1	4
			7

4	(a)	$\frac{dy}{dx} = 2x - 3$ $\frac{dy}{dx} = 2(1) - 3$ $\frac{dy}{dx} = -1$ $y - 2 = -1(x - 1)$ $y = -x + 3$	1		
	(b)	$x = 3, \quad \frac{dy}{dx} = 3$ kecerunan normal, $m = -\frac{1}{3}$ $y - 4 = -\frac{1}{3}(x - 3)$ $y = -\frac{1}{3}x + 5$	1		
	(c)	Selesaikan persamaan serentak $-x + 3 = -\frac{1}{3}x + 5$ $x = 3$ $y = -(-3) + 3$ $y = 6$ $C(-3, 6)$	1		
			1	3	8
5	(a)	$RHS : \frac{\sin^2 \theta}{\sin^2 \theta} + 1$ $LHS : \frac{\sin^2 \theta + \cos^2 \theta}{\cos^2 \theta}$ $\frac{1}{\cos^2 \theta} \times \frac{\sin^2 \theta}{\sin^2 \theta}$ $\frac{\sin^2 \theta}{\cos^2 \theta} \times \frac{1}{\sin^2 \theta}$ $\frac{\tan^2 \theta}{\sin^2 \theta}$, LHS dibuktikan.	1		
			1		
			1		3

	(b)	 <p>bentuk graf sinus</p> <p>$\frac{3}{2}$ kitaran pada 2π</p> <p>Amplitud = 2</p> <p>Persamaan garis lurus, $y = -\frac{3}{4\pi}x + 1$</p> <p>Bilangan penyelesaian</p>	1 1 1 1 1	5	8
6	(a)	$\frac{1}{2}(9)^2 \left(90 \times \frac{3.142}{180} \right)$ <p>63.63</p>	1 1	2	
	(b)	$\angle ROS = \pi - \left(45 \times \frac{3.142}{180} \right)$ <p>63.63</p> <p>$S_{RS} = 9(2.3565)$ atau</p> <p>$RS^2 = 9^2 + 9^2 - 2(9)(9) \cos(135^\circ)$ atau</p> <p>$S_{PQ} = 9 \left(90^\circ \times \frac{3.142}{180^\circ} \right)$</p> <p>21.21 + 16.63 + 14.14 + 9 + 9</p> <p>69.98</p>	1 1 1 1 1	4	6
7	(a)	$a(3)^2 + b(3) = 51$ $3a + b = 17 \quad \text{atau}$ <hr/> $a(8)^2 + b(8) = 296$ $8a + b = 37$ <p>Selesaikan persamaan serentak</p> $17 - 3a = 37 - 8a$ $a = 4$ $b = 5$	1 1 1 1	4	
	(b)	$T_1 = S_1 = 4(1)^2 + 5(1)$ $T_2 = 4(2)^2 + 5(2) - 9$ $d = 17 - 9$ $d = 8$	1 1	2	6

8	(a)	$y = \frac{2x^2}{2} + c$ $y = x^2 + c$ $K(3,12)$ $12 = 3^2 + c$ $c = 3$ $y = x^2 + 3$	1	1	1	3	
	(b)	<i>Luas trapezium</i> $\frac{1}{2}(3)(3 + 12)$ <i>Luas di bawah graf</i> $\int_0^3 x^2 + 3 dx$ $\left[\frac{x^3}{3} + 3x\right]_0^3$ $\left[\left(\frac{3^3}{3} + 3(3)\right) - \left(\frac{0^3}{3} + 3(0)\right)\right]$ <i>Luas kawasan berlerek</i> $= \frac{45}{2} - \left[\left(\frac{3^3}{3} + 3(3)\right) - \left(\frac{0^3}{3} + 3(0)\right)\right]$ $= \frac{9}{2}$	1	1	1	1	4
	(c)	$= \pi \left[\frac{y^2}{2} - 3y\right]_3^t$ $= \pi \left[\left(\frac{t^2}{2} - 3t\right) - \left(\frac{3^2}{2} - 3(3)\right)\right]$ $= \pi \left(\frac{t^2}{2} - 3t + \frac{9}{2}\right)$	1	1	1	1	3
9	(a)	(i)	$2.8 = 10p$ $p = 0.28$ <i>sisihan piawai</i> $= \sqrt{10(0.28)(1 - 0.28)}$ 1.4200	1	1		
	(ii)	$P(X = 0) + P(X = 1) + P(X = 2)$ ${}^{10}C_0 (0.28)^0 (0.72)^{10} + {}^{10}C_1 (0.28)^1 (0.72)^9 +$ ${}^{10}C_2 (0.28)^2 (0.72)^8$ 0.4378 $P(-1.4231) - P(-1.8077)$ 0.04202	1	1	1	1	5
	(b)	(i)	$P(z > 0) - P(z > k) = 0.2806$				

		0.5 - 0.2806							1																			
		0.2194							1																			
		(ii) $P(-k < z < k)$																										
		$1 - P(z > k) - P(z < -k)$																										
		$1 - 2P(z > k)$							1																			
		$1 - 2(0.2806)$							1																			
		0.5612							1		5	10																
10	(a)	(i) $\frac{6}{-h} = -1$							1																			
		$h = 6$							1																			
		(ii) $T = \left(\frac{3(6) + 1(-2)}{3 + 1}, \frac{3(0) + 1(4)}{3 + 1} \right)$							1																			
		$T = (4, 1)$							1																			
		(iii) $\frac{1}{2} \begin{vmatrix} 4 & -2 & -4 & 4 \\ 1 & 4 & -2 & 1 \end{vmatrix}$ dan																										
		$\frac{1}{2} (4(4) + (-2)(-2) + (-4)1) - (4(-2) + (-4)4 + (-2)1) $							1																			
		$\frac{1}{2} 42 $							1		7																	
		21							1																			
	(b)	$\left(\frac{y-4}{x+2} \right) \left(\frac{y}{x-6} \right) = -1$							1																			
		$y^2 - 4y = -x^2 + 4x + 12$							1			10																
		$x^2 + y^2 - 4x - 4y - 12 = 0$							1		3																	
11	(a)	<table border="1"> <tbody> <tr> <td>$\log_{10}x$</td> <td>1.0</td> <td>1.68</td> <td>2.12</td> <td>2.75</td> <td>3.01</td> <td>3.50</td> <td></td> </tr> <tr> <td>$\log_{10}y$</td> <td>2.15</td> <td>2.75</td> <td>3.25</td> <td>3.83</td> <td>4.08</td> <td>4.53</td> <td></td> </tr> </tbody> </table>	$\log_{10}x$	1.0	1.68	2.12	2.75	3.01	3.50		$\log_{10}y$	2.15	2.75	3.25	3.83	4.08	4.53								1			10
$\log_{10}x$	1.0	1.68	2.12	2.75	3.01	3.50																						
$\log_{10}y$	2.15	2.75	3.25	3.83	4.08	4.53																						
		$\log_{10}y$							1		2																	
	(b)	(rujuk graf pada muka surat 9)																										
		Plot $\log_{10}y$ melawan $\log_{10}x$ dengan paksi dan skala seragam							1																			
		Salah satu titik diplot dengan betul																										
		Semua titik diplot dengan betul							1		3																	
		Garis lurus penyesuaian terbaik							1																			
	(c)	(i) $\log_{10}y = (2b + 1)\log_{10}x + \log_{10}a$							1																			
		(ii) $\log_{10}a = 1.12$							1																			
		$a = 14.96$							1																			
		(iii) $2b + 1 = \frac{4.53 - 3.83}{3.5 - 2.75}$							1																			
		$2b = -\frac{1}{15}$																										
		$b = -\frac{1}{30}$							1		5																	

12	(a)	(i)	$\angle BCD = 86^\circ$ $Luas BCD = \frac{1}{2}(10.4)(16.9) \sin 86^\circ$ 87.67	1		
		(ii)	$BD^2 = 10.4^2 + 16.9^2 - (10.4)(16.9) \cos 86^\circ$ $BD = 19.22$	1		
		(iii)	Katakan jarak terdekat dari titik C ke BD ialah t $\frac{1}{2}(t)(19.22) = 87.67$ $t = 9.123$	1		
	(b)	$\frac{\sin \angle ABD}{15.1} = \frac{\sin 94^\circ}{19.22}$ $\angle ABD = 51.60^\circ$ $\angle ADB = 34.40^\circ$ $\frac{\sin \angle BDC}{16.9} = \frac{\sin 86^\circ}{19.22}$ $\angle BDC = 61.30^\circ$ $\angle ADC = 34.40^\circ + 61.30^\circ$ $= 95.70^\circ$	1			
					7	
				1		
				1		
				1	3	10
13	(a)		$\frac{21}{p} \times 100 = 150$ $p = 14$ $\frac{24}{15} \times 100 = q$ $q = 160$ $\frac{r}{10} \times 100 = 150$ $r = 15$	1		
		(b)	$\frac{20}{14} \times 100 = 142.86$	1		1
		(c)	$\frac{150(15) + 160(10) + 150(12) + 70(13)}{15 + 10 + 12 + 13}$ 131.20	1		2
	(d)	$A : I_{\frac{22}{16}} = \frac{130 \times 150}{100}$ 195 $D : I_{\frac{22}{16}} = \frac{70 \times 85}{100}$ 59.50 $\frac{195(15) + 160(10) + 150(12) + 13(59.5)}{15 + 10 + 12 + 13}$	1			
				1		
				1		
				1		

		141.97	1	4	10
14	(a)	I) $x + y \leq 10$	1		10
		II) $3x + 2y \leq 24$	1		
	III) $y \leq 2x$	1	3		
	(b)	(rujuk graf pada muka surat 8)			
		Lukis dengan betul sekurang-kurangnya satu garis lurus daripada *ketaksamaan melibatkan x dan y	1		
		Lukis dengan betul semua *garisan lurus daripada *ketaksamaan melibatkan x dan y	1		
		Lorekkan rantau dengan betul	1	3	
(c)	(i)	$2 \leq x \leq 5.4$	1		
	(ii)	Keuntungan = $280x + 200y$ Keuntungan maksimum = $240(4) + 200(6)$ 2320	1 1 1	4	
15	(a)	$v = 3 + 2t - t^2$	1		10
		$a = \frac{dv}{dt} = 2 - 2t$			
	Apabila $a = 0$				
	$2 - 2t = 0$	1	2		
	$t = 1 \text{ s}$				
(b)	$V_{maks} = +2(1) - (1)^2$	1			
	$= 4$	1	2		
(c)	$v = 0$				
	$3 + 2t - t^2 = 0$				
	$t^2 - 2t - 3 = 0$				
	$(t - 3)(t + 1) = 0$				
	$\therefore t = 3$	1			
	$s = \int 3 + 2t - t^2 dt$				
	$= 3t + t^2 - \frac{t^3}{3} + c$	1			
	$t = 0, s = 0, c = 0$				
	$s = 3t + t^2 - \frac{t^3}{3}$				
	Berhenti di G, $t = 3 \text{ s}$				
	$s = 3(3) + (3)^2 - \frac{(3)^3}{3}$	1			
	9	1	4		
(d)	Kereta Syafiq				
	$t = 3, v = -4, s = -4t$				
	$s = -4(3) = -12 \text{ cm}$	1			
	Jarak = $40 - 9 - 12$				
	19	1	2		

