

Nama : Kelas :

SULIT
1449/2
Matematik
Kertas 2
Ogos
2019

1449/2



$2\frac{1}{2}$ jam

MAKTAB RENDAH SAINS MARA

PEPERIKSAAN AKHIR SIJIL PENDIDIKAN MRSM 2019

MATEMATIK

Kertas 2

Dua jam tiga puluh minit

@stepsofficial

**JANGAN BUKA KERTAS
PEPERIKSAAN INI SEHINGGA
DIBERITAHU**

1. *Tuliskan nama dan kelas anda pada ruang yang disediakan.*
2. *Kertas peperiksaan ini adalah dalam dwibahasa.*
3. *Soalan dalam bahasa Inggeris mendahului soalan yang sepadan dalam bahasa Melayu.*
4. *Calon dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam bahasa Inggeris atau bahasa Melayu.*
5. *Calon dikehendaki membaca maklumat di halaman belakang kertas peperiksaan ini.*

Bahagian	Soalan	Markah Penuh	Markah Diperoleh
A	1	3	
	2	4	
	3	4	
	4	3	
	5	4	
	6	6	
	7	6	
	8	5	
	9	6	
	10	5	
	11	6	
B	12	12	
	13	12	
	14	12	
	15	12	
	16	12	
Jumlah			

Kertas peperiksaan ini mengandungi 40 halaman bercetak.

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MATHEMATICAL FORMULAE
RUMUS MATEMATIK

The following formulae may be helpful in answering the questions. The symbols given are the ones commonly used.

Rumus-rumus berikut boleh membantu anda menjawab soalan. Simbol-simbol yang diberi adalah yang biasa digunakan.

RELATIONS
PERKAITAN

- | | | | |
|---|---|----|--|
| 1 | $a^m \times a^n = a^{m+n}$ | 10 | Pythagoras Theorem
<i>Teorem Pithagoras</i>
$c^2 = a^2 + b^2$ |
| 2 | $a^m \div a^n = a^{m-n}$ | | |
| 3 | $(a^m)^n = a^{mn}$ | 11 | $P(A) = \frac{n(A)}{n(S)}$ |
| 4 | $A^{-1} = \frac{1}{ad-bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$ | 12 | $P(A') = 1 - P(A)$ |
| 5 | Distance / <i>jarak</i>
$= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ | 13 | $m = \frac{y_2 - y_1}{x_2 - x_1}$ |
| 6 | Midpoint / <i>Titik tengah</i>
$(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$ | 14 | $m = -\frac{y - \text{intercept}}{x - \text{intercept}}$

$m = -\frac{\text{pintasan} - y}{\text{pintasan} - x}$ |
| 7 | Average speed = $\frac{\text{distance travelled}}{\text{time taken}}$
<i>Purata laju = $\frac{\text{jarak yang dilalui}}{\text{masa yang diambil}}$</i> | | |
| 8 | Mean = $\frac{\text{sum of data}}{\text{number of data}}$

<i>Min = $\frac{\text{hasil tambah nilai data}}{\text{bilangan data}}$</i> | | |
| 9 | Mean = $\frac{\text{sum of (midpoint} \times \text{frequency)}}{\text{sum of frequencies}}$

<i>Min = $\frac{\text{hasil tambah (nilai titik tengah kelas} \times \text{kekerapan)}}{\text{hasil tambah kekerapan}}$</i> | | |

**SHAPES AND SPACE
BENTUK DAN RUANG**

- 1 Area of trapezium = $\frac{1}{2} \times \text{sum of parallel sides} \times \text{height}$
Luas trapezium = $\frac{1}{2} \times \text{hasil tambah dua sisi selari} \times \text{tinggi}$
- 2 Circumference of circle = $\pi d = 2\pi r$
Lilitan bulatan = $\pi d = 2\pi j$
- 3 Area of circle = πr^2
Luas bulatan = πj^2
- 4 Curved surface area of cylinder = $2\pi rh$
Luas permukaan melengkung silinder = $2\pi jt$
- 5 Surface area of sphere = $4\pi r^2$
Luas permukaan sfera = $4\pi j^2$
- 6 Volume of right prism = cross sectional area \times length
Isi padu prisma tegak = luas keratan rentas \times panjang
- 7 Volume of cylinder = $\pi r^2 h$
Isi padu silinder = $\pi j^2 t$
- 8 Volume of cone = $\frac{1}{3} \pi r^2 h$
Isi padu kon = $\frac{1}{3} \pi j^2 t$
- 9 Volume of sphere = $\frac{4}{3} \pi r^3$
Isi padu sfera = $\frac{4}{3} \pi j^3$
- 10 Volume of right pyramid = $\frac{1}{3} \times \text{base area} \times \text{height}$
Isi padu piramid tegak = $\frac{1}{3} \times \text{luas tapak} \times \text{tinggi}$
- 11 Sum of interior angles of a polygon
Hasil tambah sudut pedalaman poligon
 $= (n - 2) \times 180^\circ$

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- 12
$$\frac{\text{arc length}}{\text{circumference of circle}} = \frac{\text{angle subtended at centre}}{360^\circ}$$
$$\frac{\text{panjang lengkok}}{\text{lilitan bulatan}} = \frac{\text{sudut pusat}}{360^\circ}$$
- 13
$$\frac{\text{area of sector}}{\text{area of circle}} = \frac{\text{angle subtended at centre}}{360^\circ}$$
$$\frac{\text{luas sektor}}{\text{luas bulatan}} = \frac{\text{sudut pusat}}{360^\circ}$$
- 14 Scale factor, $k = \frac{PA'}{PA}$
Faktor skala, $k = \frac{PA'}{PA}$
- 15 Area of image = $k^2 \times$ area of object
Luas imej = $k^2 \times$ luas objek

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HALAMAN KOSONG

6
Section A
Bahagian A

[52 marks]
[52 markah]

Answer **all** questions in this section.
Jawab semua soalan dalam bahagian ini.

1. Diagram 1 shows a shaded region drawn on a Cartesian plane. State three inequalities that define the shaded region.

[3 marks]

Rajah 1 menunjukkan kawasan berlorek dilukis pada satah Cartes. Nyatakan tiga ketaksamaan yang mentakrifkan kawasan tersebut.

[3 markah]

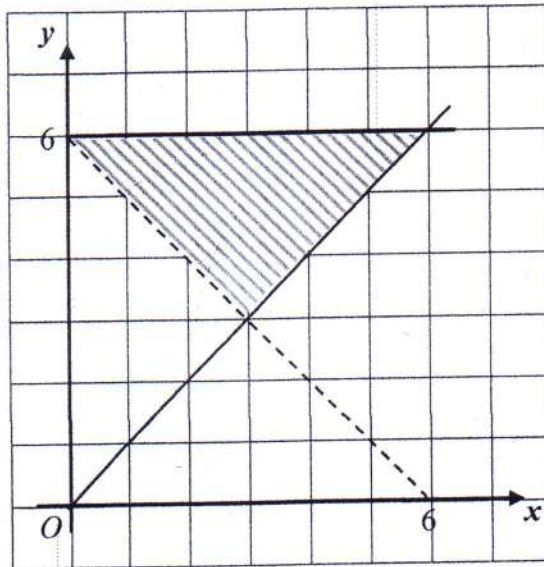


Diagram 1
Rajah 1

Answer / Jawapan :

- 2 A group of boys rent a futsal hall for RM200. If n is the number of boys, the cost, C , to be shared equally among them is given by,

Sekumpulan budak lelaki menyewa sebuah gelanggang futsal dengan harga RM200. Jika n ialah bilangan pelajar, kos, C , yang dikongsi secara sama rata dalam kalangan mereka diberi sebagai,

$$C = \frac{200}{n}$$

If 10 more boys join the group, each boy will pay RM1 less. Calculate the original number of boys in the group.

Jika 10 lagi budak lelaki menyertai kumpulan ini, setiap mereka akan membayar kurang RM1. Hitung bilangan asal budak lelaki dalam kumpulan itu.

[4 marks]

[4 markah]

Answer / Jawapan :

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3 Solving using matrix is not allowed in this question.

Penyelesaian menggunakan kaedah matriks tidak dibenarkan untuk soalan ini.

Khadeeja went to a stationary store to buy a geometry set and several pencils. She found out that the price of geometry set is RM6.10 more than the price of a pencil. She decided to buy 1 geometry set and 5 pencils with the total price of RM10.90.

Find the price, in RM, of a geometry set and a pencil that she bought.

Khadeeja pergi ke kedai alat tulis untuk membeli set geometri dan beberapa batang pensil. Dia mendapati harga satu set geometri adalah RM6.10 lebih daripada harga sebatang pensil. Dia membeli 1 set geometri dan 5 batang pensil dengan jumlah harga RM10.90.

Hitung harga, dalam RM, bagi satu set geometri dan sebatang pensil yang dibeli.

[4 marks]

[4 markah]

Answer / Jawapan :

- 4 Diagram 4 shows a right prism $PQRSTUVW$ with a horizontal rectangular base $PQRS$. Trapezium $PQVU$ is the uniform cross section of the prism.

Rajah 4 menunjukkan sebuah prisma tegak $PQRSTUVW$ dengan tapak mengufuk segiempat tepat $PQRS$. Trapezium $PQVU$ ialah keratan rentas seragam prisma itu.

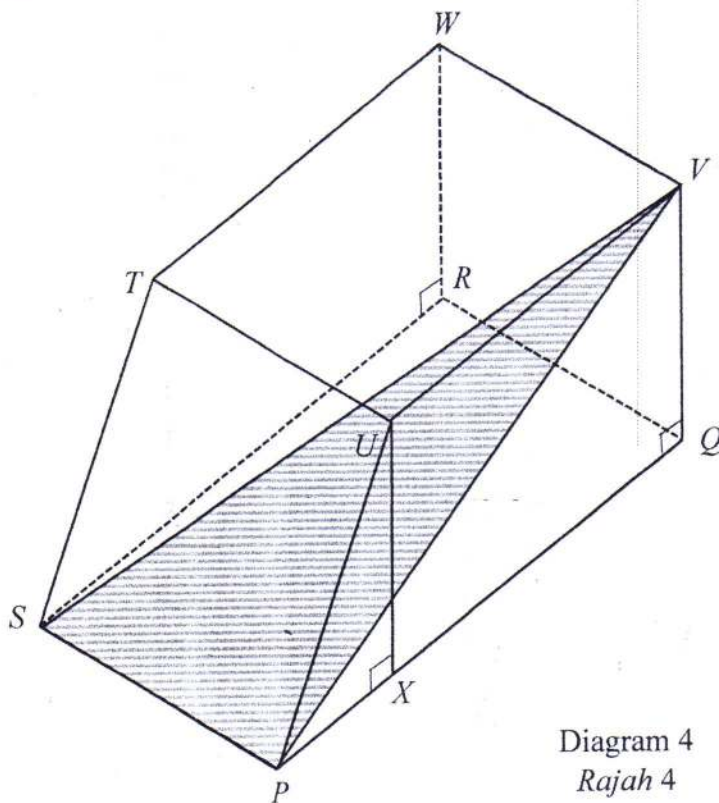


Diagram 4
Rajah 4

Given that $SR = 12$ cm, $PU = 5$ cm and $PX : XQ = 1 : 3$.

Calculate the angle between the plane PVS and the vertical plane $RQVW$.

Diberi bahawa $SR = 12$ cm, $PU = 5$ cm and $PX : XQ = 1 : 3$.

Hitung sudut di antara satah PVS dan satah menegak $RQVW$.

[3 marks]

[3 markah]

Answer / Jawapan:

[Lihat halaman sebelah
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- 5 Diagram 5 shows a composite solid formed by a combination of a three quarter right cylinder and a right prism. Trapezium $ABCD$ is the uniform cross section of the right prism.

Rajah 5 menunjukkan satu gabungan pepejal yang terbentuk daripada cantuman sebuah tiga per empat silinder tegak dan sebuah prisma tegak. $ABCD$ ialah keratan rentas bagi prisma tegak.

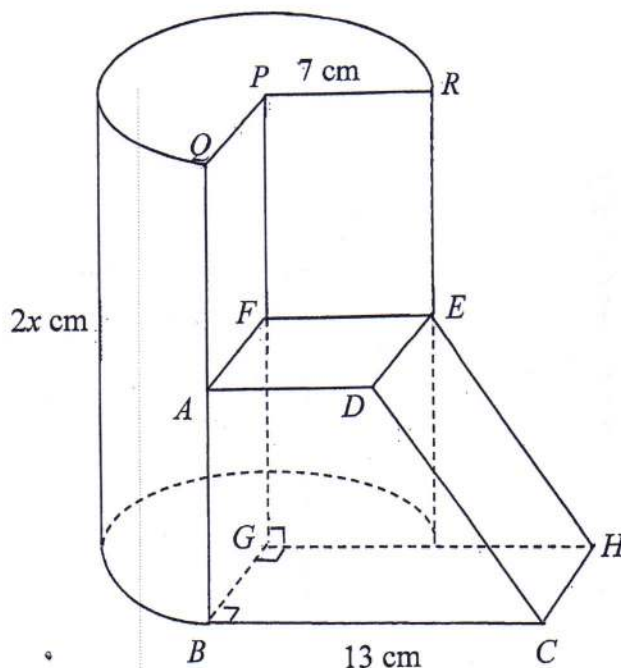


Diagram 5
Rajah 5

Given that the volume of the composite solid is 3311 cm^3 and $QA = AB$.

Using $\pi = \frac{22}{7}$, calculate the value, in cm, of x .

Diberi isipadu gabungan pepejal itu ialah 3311 cm^3 dan $QA = AB$.

Menggunakan $\pi = \frac{22}{7}$, hitung nilai, dalam cm, x .

[4 marks]
[4 markah]

Answer / *Jawapan* :

[*Lihat halaman sebelah*
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- 6 Diagram 6 shows straight lines AB , AC and CD drawn on a Cartesian plane. Straight line AC is parallel to y -axis and AB is parallel to CD . The equation of the straight line CD is $\frac{1}{3}y = x + 2$.

Rajah 6 menunjukkan garis lurus AB , AC dan CD pada suatu satah Cartesian. Garis lurus AC adalah selari dengan paksi- y dan AB adalah selari dengan CD . Persamaan garis lurus CD ialah $\frac{1}{3}y = x + 2$.

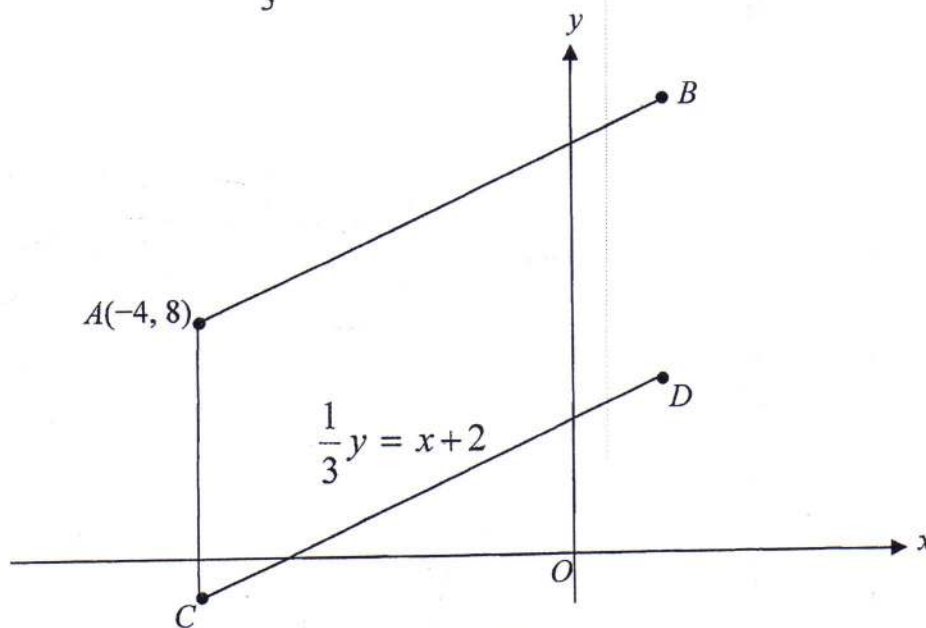


Diagram 6
Rajah 6

- State the equation of straight line AC .
Nyatakan persamaan garis lurus AC .
- Find the equation of the straight line AB .
Cari persamaan bagi garis lurus AB .
- Find x -intercept of the straight line AB .
Cari pintasan- x bagi garis lurus AB .

[6 marks]
[6 markah]

Answer / Jawapan :

(a)

(b)

(c)

[Lihat halaman sebelah
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7

Diagram 7 shows JQL , JPK , KRM and LSM are semicircles. JK , JL , KM and LM are diameters of the circles.

Rajah 7 menunjukkan JQL , JPK , KRM dan LSM ialah semibulatan. JK , JL , KM dan LM ialah diameter kepada bulatan-bulatan.

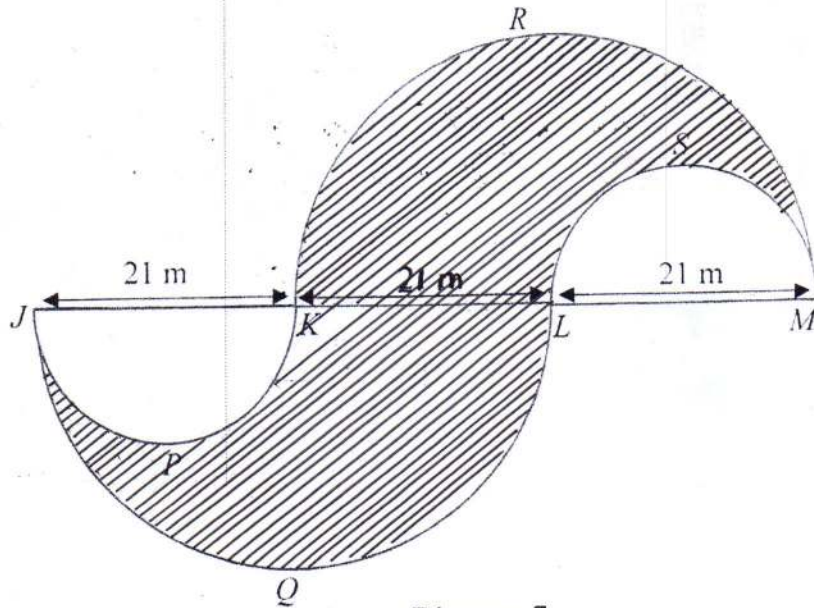


Diagram 7
Rajah 7

Using $\pi = \frac{22}{7}$, calculate

Menggunakan $\pi = \frac{22}{7}$, hitung

- (a) the perimeter, in m, of the shaded region.
perimeter, dalam m, rantau yang berlorek.
- (b) the area, in m^2 , of the shaded region.
luas, dalam m^2 , rantau yang berlorek.

[6 marks]
[6 markah]

Answer / Jawapan :

(a)

(b)

[Lihat halaman sebelah
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- 8 (a) State whether the following statement is true or false.

Nyatakan sama ada pernyataan yang berikut benar atau palsu.

$$\begin{aligned} \{\text{prime number}\} \cap \{\text{even number}\} &= \emptyset \\ \{\text{nombor perdana}\} \cap \{\text{nombor genap}\} &= \emptyset \end{aligned}$$

- (b) Write down two implications based on the following compound statement:
Tulis dua implikasi berdasarkan pernyataan majmuk berikut:

The circumference of a circle is 10π cm if and only if its radius is 5 cm.
Lilitan suatu bulatan adalah 10π cm jika dan hanya jika jejarinya adalah 5 cm.

- (c) It is given that the sum of first n term of a sequence of numbers can be represented by $3n^2 - 2n$, where $n = 1, 2, 3, \dots$

Make one conclusion by deduction for the sum of first 10 term of the sequence.

Diberi bahawa hasil tambah n sebutan pertama bagi suatu jujukan nombor boleh diwakili oleh $3n^2 - 2n$, di mana $n = 1, 2, 3, \dots$

Buat satu kesimpulan secara deduksi bagi hasil tambah 10 sebutan pertama jujukan itu.

[5 marks]
[5 markah]

Answer / Jawapan :

(a)

(b) Implication 1/ *Implikasi 1*

.....
.....
.....

Implication 2 / *Implikasi 2*

.....
.....
.....

(c)

.....
.....

[*Lihat halaman sebelah*
SULIT

- 9 (a) It is given that $G = \begin{pmatrix} m & 3 \\ 2 & 1 \end{pmatrix}$. If matrix G has no inverse, find the value of m .

Diberi bahawa $G = \begin{pmatrix} m & 3 \\ 2 & 1 \end{pmatrix}$. Jika matriks G tiada songsang, cari nilai m .

[2 marks]

[2 markah]

- (b) En. Saidi supplies mangoes to Stall A and Stall B. The types of mangoes that he supplies are Mas Hitam and Chokanan. Table 9 shows the mass of mangoes supplied to stall A and stall B.

En. Saidi membekalkan buah mangga kepada Gerai A dan Gerai B. Jenis mangga yang dibekalkan ialah Mas Hitam dan Chokanan. Jadual 9 menunjukkan jisim mangga yang dibekalkan kepada Gerai A dan Gerai B.

Stall / Gerai	Mass / Jisim (kg)	
	Mas Hitam	Chokanan
A	15	60
B	25	40

Table 9

Jadual 9

The total payment received by En Saidi from Stall A and Stall B are RM 304.50 and RM 285.50 respectively.

By using matrix method, calculate the price of each type of mango.

Jumlah bayaran dari Gerai A dan Gerai B yang di terima oleh En Saidi ialah RM 304.50 dan RM 285.50 masing-masing.

Dengan menggunakan kaedah matrik, hitungkan harga bagi setiap jenis mangga.

[4 marks]

[4 markah]

Answer / Jawapan:

(a)

(b)

[Lihat halaman sebelah
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10 Diagram 10.1 shows the distance-time graph of the particle **A** and Diagram 10.2 shows the speed-time graph of the particle **B** for the period of 60 seconds.

Rajah 10.1 menunjukkan graf jarak-masa bagi zarah **A** dan Rajah 10.2 menunjukkan graf laju-masa bagi zarah **B** dalam tempoh 60 saat.

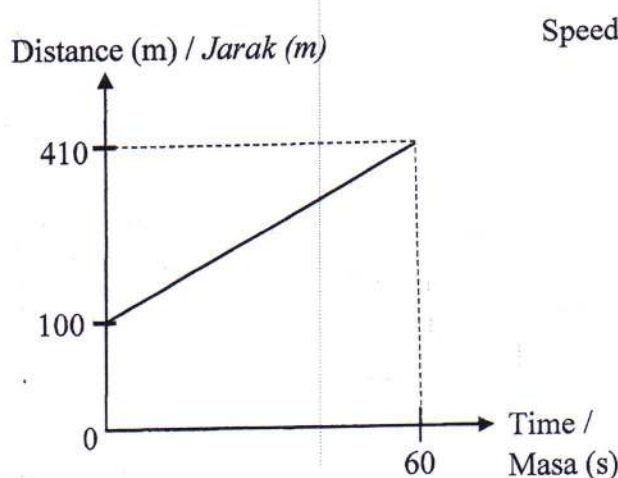


Diagram 10.1
Rajah 10.1

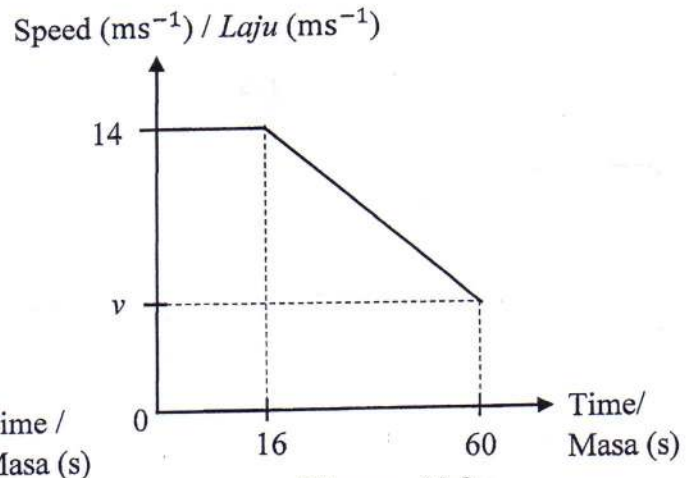


Diagram 10.2
Rajah 10.2

- (a) State the duration of time, in s, for which the particle **B** moves with uniform speed.
*Nyatakan tempoh masa, dalam s, zarah **B** bergerak dengan laju seragam.*
- (b) Find the speed, in ms^{-1} , of particle **A** in 60 seconds.
*Cari laju, dalam ms^{-1} , zarah **A** dalam 60 saat.*
- (c) Calculate the value of v , if the total distance travelled by particle **B** is twice the total distance travelled by particle **A**.
*Hitung nilai v , jika jumlah jarak yang dilalui zarah **B** dua kali ganda jumlah jarak yang dilalui oleh zarah **A**.*

[5 marks]
[5 markah]

Answer / Jawapan :

(a)

(b)

(c)

[Lihat halaman sebelah
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- 11 Table 11.1 shows four types of pizza toppings and three types of sauces listed in a menu served by a pizza truck.

Jadual 11.1 menunjukkan empat jenis topping pizza dan tiga jenis sos yang tersenarai dalam menu yang dihidangkan oleh sebuah trak pizza.

CODE KOD	TOPPING	CODE KOD	SAUCE
T1	Chicken	S1	Spicy Sambal
T2	Beef	S2	Barbeque Sauce
T3	Seafood	S3	Royale Cheese
T4	Vegetable		

Table 11.1
Jadual 11.1

A customer can randomly choose one type of topping and one type of sauce while ordering the pizza.

Setiap pelanggan boleh memilih secara rawak sejenis topping dan sejenis sos semasa memesan setiap pizza.

- (a) By using the code to represent the topping and sauce, complete the possible option a customer would probably choose, in Table 11.2 in the answer space.

Dengan menggunakan kod untuk mewakili topping dan sos, lengkapkan pilihan yang mungkin oleh pelanggan di ruang jawapan pada Jadual 11.2.

[2 marks]

[2 markah]

- (b) By listing down the possible outcomes of the event, find the probability that

Dengan menyenaraikan kesudahan yang mungkin bagi setiap peristiwa, hitung kebarangkalian bagi

- (i) a seafood topping is chosen.
topping 'seafood' dipilih,
- (ii) a chicken topping or barbeque sauce is chosen.
topping 'chicken' atau sos 'barbeque' dipilih.

[4 marks]

[4 markah]

Answer/Jawapan:

(a)

SAUCE TOPPING	S1	S2	S3
T1			(T1,S3)
T2			
T3		(T3,S2)	
T4			

Table 11.2
Jadual 11.2

(b) (i)

(ii)

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Section B
Bahagian B[48 marks]
[48 markah]

Answer any **four** questions from this section.
Jawab mana-mana **empat** soalan dalam bahagian ini.

- 12 (a) Complete Table 12 in the answer space on page 26 for the equation $y = 3x^3 - 4x + 3$ by writing down the values of y when $x = -1$, $x = 0$ and $x = 1.5$.

Lengkapkan Jadual 12 di ruang jawapan pada halaman 26 bagi persamaan $y = 3x^3 - 4x + 3$ dengan menulis nilai-nilai y apabila $x = -1$, $x = 0$ dan $x = 1.5$.

[2 marks]
[2 markah]

- (b) For this part of the question, use the graph paper provided on page 27. You may use a flexible curve rule.

Untuk ceraihan soalan ini, gunakan kertas graf yang disediakan pada halaman 27. Anda boleh menggunakan pembaris fleksibel.

Using a scale of 4 cm to 1 unit on the x -axis and 2 cm to 1 unit on the y -axis, draw the graph of $y = 3x^3 - 4x + 3$ for $-1.5 \leq x \leq 1.5$.

Dengan menggunakan skala 4 cm kepada 1 unit pada paksi- x dan 2 cm kepada 1 unit pada paksi- y , lukis graf $y = 3x^3 - 4x + 3$ untuk $-1.5 \leq x \leq 1.5$.

[4 marks]
[4 markah]

- (c) From the graph in 12(b), find
Dari graf di 12(b), cari

- (i) the value of y when $x = -0.3$,
nilai y apabila $x = -0.3$,
- (ii) the values of x when $y = 2.5$.
nilai-nilai x apabila $y = 2.5$.

[3 marks]
[3 markah]

- (d) Draw a suitable straight line on the graph in 12(b) to find the value of x which satisfy the equation $x^3 = 3x - 2$ for $-1.5 \leq x \leq 1.5$.
State the value of x .

*Lukis satu garis yang sesuai pada graf 12(b) untuk mencari nilai x yang memuaskan persamaan $x^3 = 3x - 2$ untuk $-1.5 \leq x \leq 1.5$.
Nyatakan nilai x ini.*

[3 marks]

[3 marks]

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Answer / Jawapan :

(a) $y = 3x^3 - 4x + 3$

x	-1.5	-1.2	-1.0	-0.6	0	0.6	0.8	1	1.5
y	-1.13	2.62		4.75		1.25	1.34	2.00	

Table 12
Jadual 12

(b) Refer to the graph on page 27.
Rujuk graf di halaman 27.

(c) (i) $y = \dots\dots\dots$

(ii) $x = \dots\dots\dots$

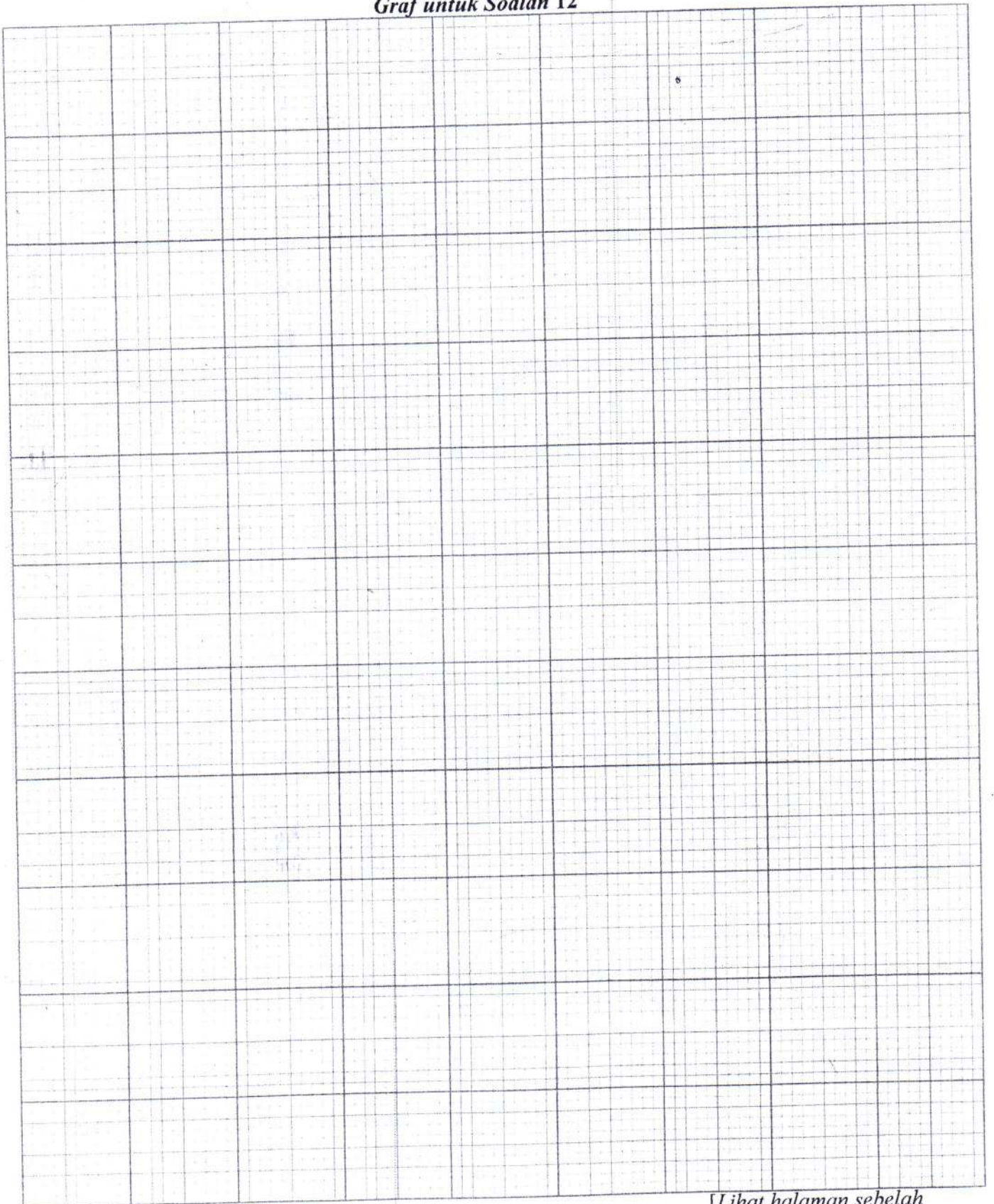
(d)

$x = \dots\dots\dots$

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27
Graph for Question 12
Graf untuk Soalan 12

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- 13 Diagram 13 shows three pentagons $ABCDE$, $FGHIJ$ and $KLMNP$, drawn on a Cartesian plane.

Rajah 13 menunjukkan tiga pentagon $ABCDE$, $FGHIJ$ and $KLMNP$, dilukis pada suatu satah Cartes.

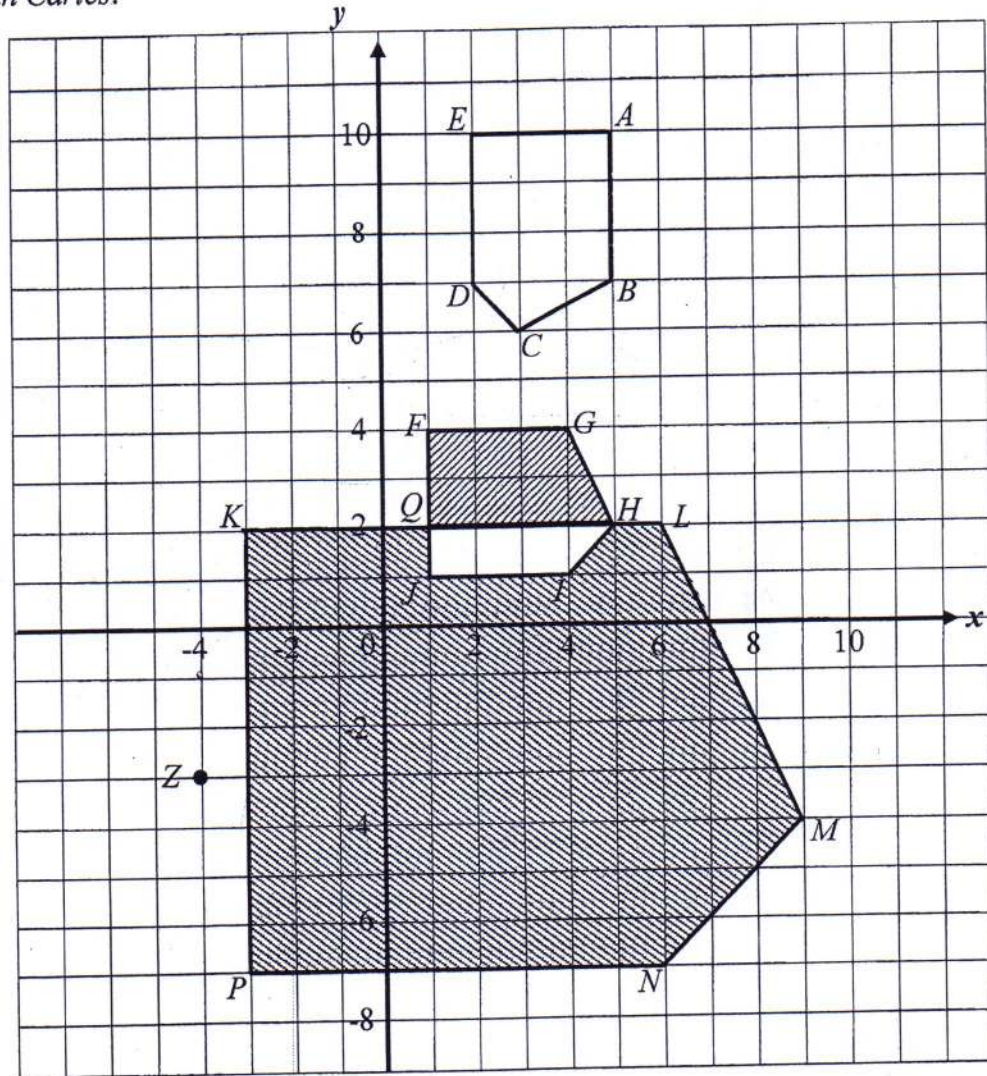


Diagram 13
Rajah 13

- (a) Transformation **T** is a translation $\begin{pmatrix} 5 \\ k \end{pmatrix}$.
Transformation **R** is a reflection in the line $y = -x$.

Penjelmaan T ialah translasi $\begin{pmatrix} 5 \\ k \end{pmatrix}$.

Penjelmaan R ialah pantulan pada garis $y = -x$.

- (i) Point **N** is the image of point **Z** under the combined transformations **T**².
Find the value of *k*.

*Titik N ialah imej bagi titik Z di bawah gabungan penjelmaan T².
Cari nilai bagi k.*

- (ii) Hence, state the coordinates of the image of point $(-6, 3)$ under the combined transformations **TR**.

Seterusnya, nyatakan koordinat imej bagi titik $(-6, 3)$ di bawah gabungan penjelmaan TR.

[3 marks]
[3 markah]

- (b) Pentagon **KLMNP** is the image of pentagon **ABCDE** under the combined transformation **VU**.

Describe, in full, the transformation:

Pentagon KLMNP ialah imej bagi pentagon ABCDE di bawah gabungan penjelmaan VU.

Huraikan selengkapnya penjelmaan:

- (i) **U**,

- (ii) **V**.

[6 marks]
[6 markah]

- (c) It is given that the area of pentagon **ABCDE** is 21 m^2 and the ratio of the area of **FGHQ** to the area **HJQ** is $2 : 1$.
Calculate the area, in m^2 , of the shaded region.

*Diberi bahawa luas pentagon ABCDE 21 m^2 dan nisbah luas kawasan FGHQ kepada luas kawasan HJQ ialah $2 : 1$.
Kira luas, dalam m^2 , kawasan berlorek.*

[3 marks]
[3 markah]

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Answer / Jawapan :

(a) (i)

(ii)

(b) (i) $U =$

(ii) $V =$

(c)

- 14 Table 14.1 shows the frequency distributions of speed, in km h^{-1} , of 40 cars that was recorded in a driving test.

Jadual 14.1 menunjukkan taburan kekerapan laju, dalam km j^{-1} , bagi 40 buah kereta yang direkodkan dalam satu ujian memandu.

Speed Laju (km h^{-1})	45 – 49	50 – 54	55 – 59	60 – 64	65 – 69	70 – 74
Frequency Kekerapan	3	7	13	11	5	1

Table 14.1

Jadual 14.1

- (a) Based on Table 14.1, complete Table 14.2 in the answer space on page 32.
Berdasarkan Jadual 14.1, lengkapkan Jadual 14.2 di ruang jawapan pada halaman 32.
- [3 marks]
[3 markah]
- (b) Calculate the estimated mean, in km h^{-1} , of the speed of a car.
Hitung min anggaran, dalam km j^{-1} , laju bagi sebuah kereta.
- [3 marks]
[3 markah]
- (c) For this part of question, use the graph paper provided on page 33. You may use a flexible curve rule.
Using a scale of 2 cm to 5 km h^{-1} on the horizontal axis and 2 cm to 5 cars on the vertical axis, draw an ogive for the data.
Untuk ceraihan soalan ini, gunakan kertas graf yang disediakan di halaman 33. Anda boleh menggunakan pembaris fleksibel.
Menggunakan skala 2 cm kepada 5 km j^{-1} pada paksi mengufuk dan 2 cm kepada 5 kereta pada paksi mencancang, lukis satu ogif bagi data tersebut.
- [4 marks]
[4 markah]
- (d) Based on the ogive drawn in 14(c), state the interquartile range.
Berdasarkan ogif yang dilukis di 14(c), nyatakan julat antara kuartil.
- [2 marks]
[2 markah]

[Lihat halaman sebelah

SULIT

Answer / Jawapan :

(a)

Speed Laju (km h ⁻¹)	Frequency Kekerapan	Midpoint Titik Tengah	Upper boundary Sempadan atas	Cumulative frequency Kekerapan longgokan
40 – 44	0	42	44.5	
45 – 49	3			
50 – 54	7			
55 – 59	13			
60 – 64	11			
65 – 69	5			
70 – 74	1			

Table 14.2
Jadual 14.2

(b)

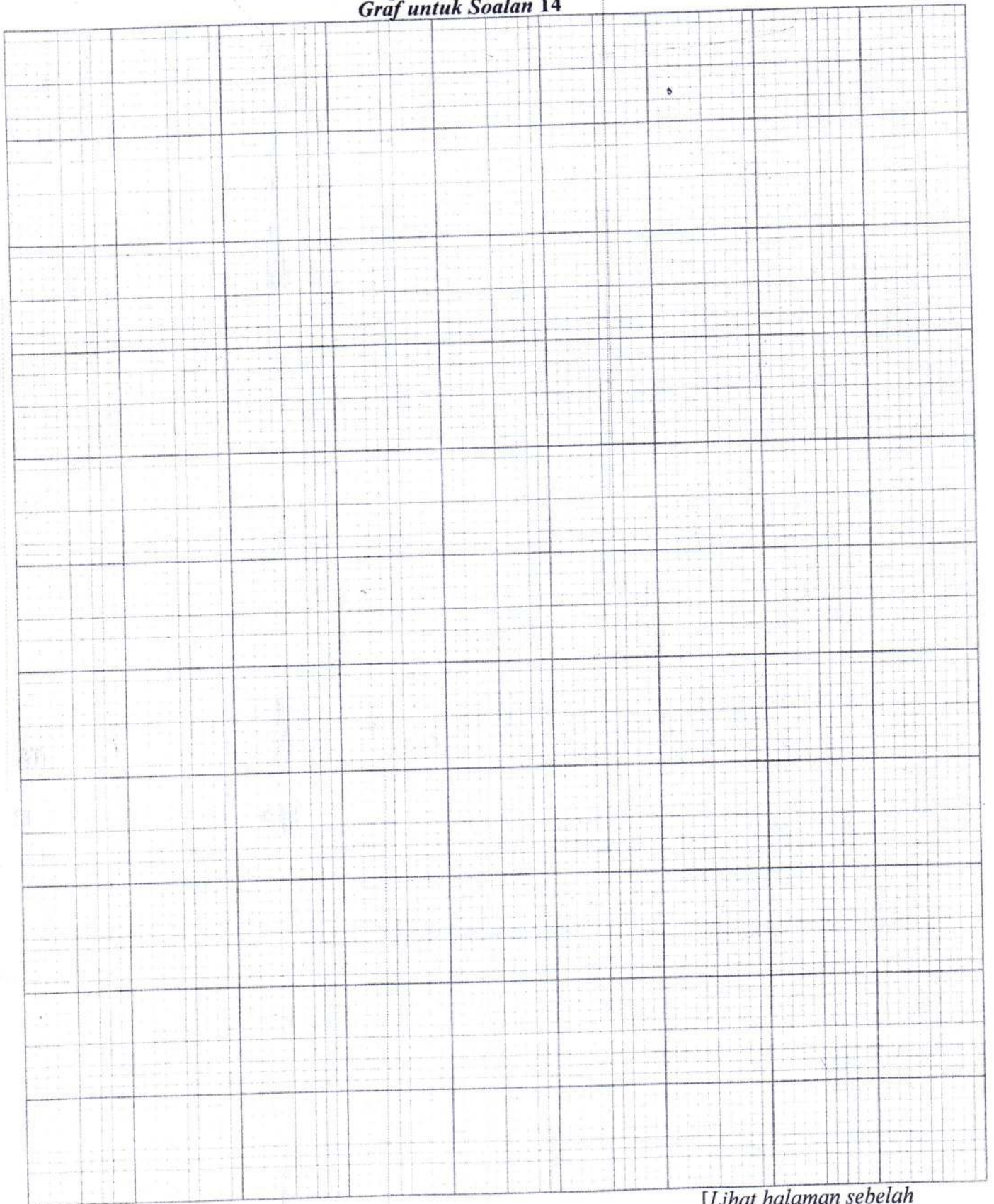
(c) Refer graph on page 33.
Rujuk graf di halaman 33.

(d)

SULIT

33
Graph for Question 14
Graf untuk Soalan 14

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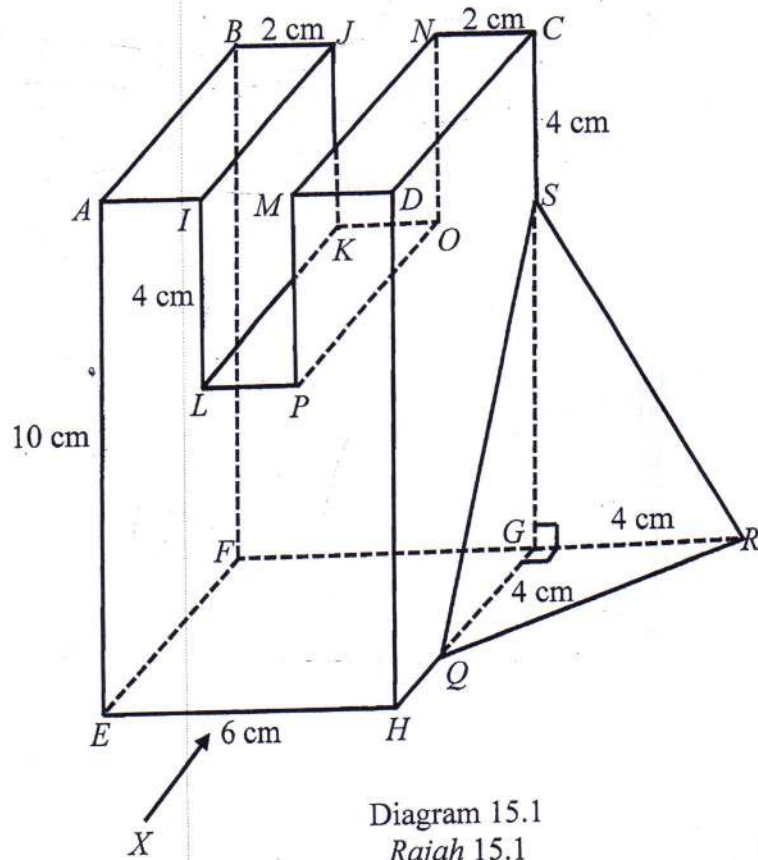


[Lihat halaman sebelah
SULIT

15 You are **not** allowed to use graph paper to answer this question.
Anda tidak dibenarkan menggunakan kertas graf untuk menjawab soalan ini.

- (a) Diagram 15.1 shows a composite solid formed by right prism with a square base $EFGH$ and a pyramid with triangular base GQR on a horizontal plane. The edges EA, FB, HD and GC are vertical.

Rajah 15.1 menunjukkan sebuah pepejal berbentuk prisma tegak dengan tapak segiempat sama $EFGH$ dan sebuah piramid dengan tapak segitiga GQR terletak di atas satah mengufuk. Tepi EA, FB, HD dan GC adalah tegak.



Draw to full scale, the elevation of the solid on a vertical plane parallel to EH as viewed from X .

Lukis dengan skala penuh, dongakan pepejal itu pada satah mencancang yang selari dengan EH sebagaimana dilihat dari X .

[3 marks]
[3 markah]

SULIT

SULIT

35

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*For
Examiner's
Use*

Answer / Jawapan :

(a)

*[Lihat halaman sebelah
SULIT*

SULIT

37

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*For
Examiner's
Use*

Answer / Jawapan :
(b) (i), (ii)

[*Lihat halaman sebelah*
SULIT]

- 16 $P(30^\circ \text{ N}, 25^\circ \text{ W})$, Q , and R are three points which lie on the surface of the earth. PQ is a diameter of the common parallel of latitude 30° N .

$P(30^\circ \text{ N}, 25^\circ \text{ W})$, Q , dan R ialah tiga titik yang terletak pada permukaan bumi. PQ ialah diameter selarian latitud sepunya 30° N .

- (a) State the location of Q .

Nyatakan lokasi Q .

[2 marks]
[2 markah]

- (b) R lies 2400 nautical miles due north of Q measured along the surface of the earth. Calculate the latitude of R .

R terletak 2400 batu nautika ke arah utara Q di ukur pada permukaan bumi.
Hitungkan latitud R .

[3 marks]
[3 markah]

- (c) Calculate the shortest distance, in nautical mile, from R to P measured along the surface of the earth.

Hitungkan jarak terdekat, dalam batu nautika, dari R ke P di ukur sepanjang permukaan bumi.

[3 marks]
[3 markah]

- (d) An aeroplane took off from R and flew due south to Q . Then, it flew due west to P along the common parallel of latitude. The total time taken for the whole flight was 13 hours 42 minutes.

Calculate the average speed, in knot, for the whole flight.

Sebuah kapal terbang berlepas dari R dan terbang arah selatan ke Q . Kemudian, kapal terbang itu terbang ke arah barat ke P sepanjang selarian latitud sepunya. Jumlah masa bagi keseluruhan penerbangan itu ialah 13 jam 42 minit.

Hitung purata laju, dalam knot, bagi keseluruhan penerbangan itu.

[4 marks]
[4 markah]

SULIT

39

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For
Examiner's
Use

Answer / Jawapan :

(a)

(b)

(c)

(d)

END OF QUESTION PAPER
KERTAS PEPERIKSAAN TAMAT
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Kertas 2
Ogos
2019

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MAKTAB RENDAH SAINS MARA

PEPERIKSAAN AKHIR SIJIL PENDIDIKAN MRSM 2019

PERATURAN PEMARKAHAN

MATEMATIK

Kertas 2

Dua jam tiga puluh minit

UNTUK KEGUNAAN PEMERIKSA SAHAJA

AMARAN
INFORMATION ONLY

sesiapa.

Kertas soalan ini mengandungi 12 halaman bercetak.

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[Lihat halaman sebelah
SULIT

Eiump17

Question	Section A	Marks	
		Sub Mark	Mark
1	$y \geq x$ $y \leq 6$ $x + y > 6$	P1 P1 P1	3
2	$C - 1 = \frac{200}{n+10}$ or $C = \frac{200}{n+10} + 1$ $n^2 + 10n - 2000 = 0$ $(n - 40)(n + 50) = 0$ <u>OR</u> $\frac{-10 \pm \sqrt{10^2 - 4(1)(-2000)}}{2(1)}$ (K1) 40 <u>Note :</u> If 2 answers given, N0 Accept without “= 0” for K1 Accept trial and error method with different of payment is RM1.00 E.g : $\left. \begin{array}{l} \frac{200}{40} = 5 \\ \frac{200}{50} = 4 \end{array} \right\} \text{Beza RM 1}$	P1 K1 K1 NI	4
3	$g = p + 6.10$ or $g + 5p = 10.90$ or equivalent Solve simultaneous equation by elimination or substitution. $6p = 4.80$ or equivalent pencil = RM 0.80 geometry set = RM6.90	K1 K1 N1 N1	4

4	<p>$UX = 4$ or $\angle PVQ$ seen</p> <p><u>Note:</u></p> <p>$\angle PVQ$ seen award P1</p> <p>$\tan \theta = \frac{12}{4}$ or equivalent</p> <p>71.57° // $71^\circ 34'$</p>	P1 K1 N1	3
5	<p>$\frac{1}{2} (7 + 13) \times 7 \times x$</p> <p>$\frac{22}{7} (7)^2 \times 2x \times \frac{3}{4}$</p> <p>$\frac{1}{2} (7 + 13) \times 7 \times x + \frac{22}{7} (7)^2 \times 2x \times \frac{3}{4} = 3311$</p> <p>11</p>	K1 K1 K1 N1	4
6 (a)	$x = -4$	P1	6
(b)	<p>$m = 3$</p> <p>$8 = 3(-4) + c$ or equivalent</p> <p>$y = 3x + 20$</p>	P1 K1 N1	
(c)	<p>$0 = 3x + 20$ or $3 = \frac{-20}{x - \text{intercept}}$</p> <p>$x - \text{intercept} = -\frac{20}{3}$</p>	K1 N1	
7 (a)	<p>$2 \times \frac{22}{7} \times \frac{21}{2}$ or $2 \times \frac{22}{7} \times 21$</p> <p>$2 \times \frac{22}{7} \times \frac{21}{2} + 2 \times \frac{22}{7} \times 21$</p> <p>198</p>	K1 K1 N1	6
(b)	<p>$\frac{22}{7} \times 21 \times 21$ or $\frac{22}{7} \times \frac{21}{2} \times \frac{21}{2}$</p> <p>$\frac{22}{7} \times 21 \times 21 - \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2}$ or equivalent</p>	K1 K1	

	$1039 \frac{1}{2}$ // 1039.5 // $\frac{2079}{2}$	N1	
8 (a)	False	P1	
(b)	Implication 1: If the circumference of a circle is 10π cm then its radius is 5 cm	P1	
	Implication 2: If radius of a circle is 5 cm then its circumference is 10π cm.	P1	
(c)	$3(10)^2 - 2(10)$	K1	
	280	N1	5
9 (a)	$m = 6$	P1	
(b)	$15m + 60n = 304.5$ or $25m + 40n = 285.5$	K1	
	$\begin{pmatrix} 15 & 60 \\ 25 & 40 \end{pmatrix} \begin{pmatrix} m \\ n \end{pmatrix} = \begin{pmatrix} 304.5 \\ 285.5 \end{pmatrix}$	K1	
	$\frac{1}{(15)(40) - (25)(60)} \begin{pmatrix} 40 & -60 \\ -25 & 15 \end{pmatrix} \begin{pmatrix} 304.5 \\ 285.5 \end{pmatrix}$	K1	
	Mas Hitam = RM 5.50 Chokanan = RM 3.70	N1 N1	6
10 (a)	16	P1	
(b)	$\frac{410 - 100}{60 - 0}$	K1	
	$5\frac{1}{6}$ or 5.17 ms^{-1}	N1	
(c)	$620 = 14(16) + \frac{1}{2}(14+v)(60-16)$	K1	
	$v = 4$	N1	5

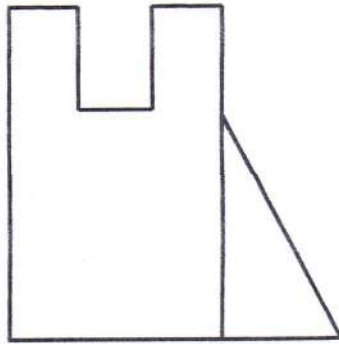
11 (a)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="5">SAUCE</th> </tr> <tr> <th></th> <th>S1</th> <th>S2</th> <th>S3</th> <th></th> </tr> </thead> <tbody> <tr> <th rowspan="4" style="writing-mode: vertical-rl; transform: rotate(180deg);">TOPPING</th> <td>T1</td> <td>(T1,S1)</td> <td>(T1,S2)</td> <td>(T1,S3)</td> </tr> <tr> <td>T2</td> <td>(T2,S1)</td> <td>(T2,S2)</td> <td>(T2,S3)</td> </tr> <tr> <td>T3</td> <td>(T3,S1)</td> <td>(T3,S2)</td> <td>(T3,S3)</td> </tr> <tr> <td>T4</td> <td>(T4,S1)</td> <td>(T4,S2)</td> <td>(T4,S3)</td> </tr> </tbody> </table>				SAUCE						S1	S2	S3		TOPPING	T1	(T1,S1)	(T1,S2)	(T1,S3)	T2	(T2,S1)	(T2,S2)	(T2,S3)	T3	(T3,S1)	(T3,S2)	(T3,S3)	T4	(T4,S1)	(T4,S2)	(T4,S3)		
	SAUCE																																
	S1	S2	S3																														
TOPPING	T1	(T1,S1)	(T1,S2)	(T1,S3)																													
	T2	(T2,S1)	(T2,S2)	(T2,S3)																													
	T3	(T3,S1)	(T3,S2)	(T3,S3)																													
	T4	(T4,S1)	(T4,S2)	(T4,S3)																													
(b) (i)	$\{(T3,S1), (T3,S2), (T3,S3)\}$ $\frac{3}{12} // \frac{1}{4}$				P2																												
(ii)	$\{(T1,S1), (T1,S2), (T1,S3), (T2,S2), (T3,S2), (T4,S2)\}$ $\frac{6}{12} // \frac{1}{2}$				K1 N1																												
					K1 N1	6																											

12 (a)	<table style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td style="padding-right: 20px;">x</td> <td style="padding-right: 20px;">-1.0</td> <td style="padding-right: 20px;">0</td> <td>1.5</td> </tr> <tr> <td>y</td> <td>4</td> <td>3</td> <td>7.13</td> </tr> </tbody> </table> <p><u>Note:</u> 1. Correct any 2 points, award K1 2. Allow K2 if all points are plotted correctly on the graph.</p>	x	-1.0	0	1.5	y	4	3	7.13	K2	
x	-1.0	0	1.5								
y	4	3	7.13								
(b)	<p>Graph Axes drawn in the correct direction with uniform scales for $-1.5 \leq x \leq 1.5$ and $-2 \leq y \leq 8$</p> <p>6 points and *3 points correctly plotted or curve passes through all the points for $-1.5 \leq x \leq 1.5$ and $-2 \leq y \leq 8$.</p> <p><u>Note:</u> 7 or 8 points plotted, award K1</p> <p>Smooth and continuous curve without any straight line and passes through all 9 correct points using the given scales.</p> <p><u>Note:</u> Ignore curve out of range</p>	P1 K2									
(c) (i)	$4.05 \leq y \leq 4.15$	P1									
(ii)	$-1.225 \leq x \leq -1.175$, $0.125 \leq x \leq 0.175$, $1.055 \leq x \leq 1.105$	P2									
	<p><u>Note:</u> Correct any 2 points, award P1</p>										
(d)	<p>Identify equation $y = 5x - 3$</p> <p>Straight line $y = 5x - 3$ correctly drawn</p> <p>$0.975 \leq x \leq 1.025$</p> <p><u>Note :</u> 1. Allow N1 marks if value of x are shown on the graph 2. Value of x obtained by calculation, award K0</p>	K1 K1 N1	12								

13(a)				
(i)	$k = -2$		P1	
(ii)	$(-6, 3) \rightarrow (-3, 6) \rightarrow (2, 4)$		P2	
	<u>Note:</u> (2, 4) is marked on the diagram or (-3, 6) seen or (-3, 6) is marked on the diagram, award P1			
(b)(i)	Rotation 90° anticlockwise about centre (6, 5)		P3	
	<u>Note:</u> 1. Rotation, centre (6, 5) // Rotation 90° anticlockwise P2 2. Rotation P1			
(ii)	Enlargement scale factor of 3 at centre (3, 5)		P3	
	<u>Note:</u> 1. Enlargement, centre (3, 5) //Enlargement scale factor of 3. P2 2. Enlargement P1			
(c)	$21 \times (3)^2$		K1	
	$21 \times 3^2 + 14$		K1	
	196		N1	12

<p>14 (a)</p>	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">I Mid point Titik tengah</th> <th style="text-align: center;">II Upper boundary <i>Sempadan atas</i></th> <th style="text-align: center;">III Cumulative frequency <i>Kekerapan longgokan</i></th> </tr> </thead> <tbody> <tr><td style="text-align: center;">42</td><td style="text-align: center;">44.5</td><td style="text-align: center;">0</td></tr> <tr><td style="text-align: center;">47</td><td style="text-align: center;">49.5</td><td style="text-align: center;">3</td></tr> <tr><td style="text-align: center;">52</td><td style="text-align: center;">54.5</td><td style="text-align: center;">10</td></tr> <tr><td style="text-align: center;">57</td><td style="text-align: center;">59.5</td><td style="text-align: center;">23</td></tr> <tr><td style="text-align: center;">62</td><td style="text-align: center;">64.5</td><td style="text-align: center;">34</td></tr> <tr><td style="text-align: center;">67</td><td style="text-align: center;">69.5</td><td style="text-align: center;">39</td></tr> <tr><td style="text-align: center;">72</td><td style="text-align: center;">74.5</td><td style="text-align: center;">40</td></tr> </tbody> </table> <p>All correct for column I</p> <p>All correct for column II</p> <p>All correct for column III</p>	I Mid point Titik tengah	II Upper boundary <i>Sempadan atas</i>	III Cumulative frequency <i>Kekerapan longgokan</i>	42	44.5	0	47	49.5	3	52	54.5	10	57	59.5	23	62	64.5	34	67	69.5	39	72	74.5	40	<p>P1</p> <p>P1</p> <p>P1</p>	
I Mid point Titik tengah	II Upper boundary <i>Sempadan atas</i>	III Cumulative frequency <i>Kekerapan longgokan</i>																									
42	44.5	0																									
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57	59.5	23																									
62	64.5	34																									
67	69.5	39																									
72	74.5	40																									
(b)	$\frac{(47 \times 3) + (52 \times 7) + (57 \times 13) + (62 \times 11) + (67 \times 5) + (72 \times 1)}{40}$	K2																									
	<p><u>note:</u></p> <p>allow 2 mistakes for the product of frequency and midpoint, award K1</p> <p>58.38 // 58.375</p>	N1																									
(c)	<p>Axes drawn in correct direction and uniform scales for $44.5 \leq x \leq 74.5$ and $0 \leq y \leq 40$</p>	P1																									
	<p>All 7 points plotted correctly</p>	K2																									
	<p><u>Note:</u></p> <p>6 or 5 points plotted correctly award K1</p>																										
	<p>Smooth and continuous curve without any straight line and passes through 8 points correctly</p>	N1																									
(d)	<p>62.5 – 54.5</p>	K1																									
	<p>8 (± 0.5)</p>	N1																									
			12																								

15
(a)



Correct shape with octagon AEHDMPLIA and triangle HRS.
All solid lines.

$IL=MP > AI=MD=LP, AE = DH > HS, EH > HR$

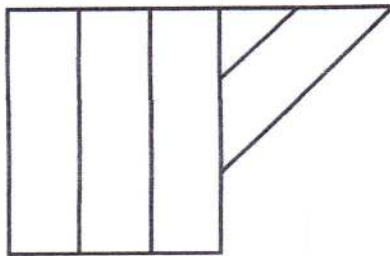
Measurements correct to ± 0.2 cm (one way) and all angles at vertices = $90^\circ \pm 1^\circ$.

K1

K1

N1

(b)



Correct shape with rectangles ABJI, IJNM, MNPC and triangles UTV
and UQR.
All solid lines.

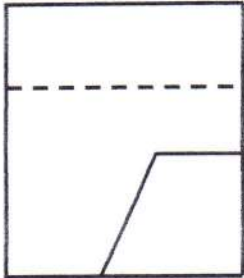
$QR > TV, UR = UQ > UV = UT.$

Measurements correct to ± 0.2 cm (one way) and all angles at vertices = $90^\circ \pm 1^\circ$.

K1

K1

N2

<p>(c)</p>	<div style="text-align: center;">  </div> <p>Correct shape with rectangles DCRH and trapezium TVRQ. All solid lines. (Ignore line PO)</p> <p>PO is joined by dashed line to form rectangles DCOP.</p> <p>$DC > QR > TV = HQ$.</p> <p>Measurements correct to ± 0.2 cm (one way) and all angles at vertices = $90^\circ \pm 1^\circ$.</p>	<p>K1</p> <p>K1</p> <p>K1</p> <p>N2</p>	<p>12</p>
<p>16</p> <p>(a)</p> <p>(b)</p> <p>(c)</p> <p>(d)</p>	<p>$(30^\circ N, 155^\circ E)$</p> <p>Note $155^\circ E$ seen award P1</p> <p>$\frac{2400}{60}$ or 40°</p> <p>$30^\circ + *40^\circ$</p> <p>$70^\circ N$</p> <p>$180^\circ - 70^\circ - 30^\circ$</p> <p>$*80^\circ \times 60$</p> <p>$4800^\circ$</p> <p>$180^\circ$ or $\cos 30^\circ$</p> <p>$\frac{180^\circ \times 60 \times \cos 30^\circ + 2400}{13.7}$</p> <p>857.89</p>	<p>P2</p> <p>K1</p> <p>K1</p> <p>N1</p> <p>K1</p> <p>K1</p> <p>N1</p> <p>P1</p> <p>K1K1</p> <p>N1</p>	<p>12</p>

