

No. Kad Pengenalan:

Angka Giliran:

Nama:

Kelas:

Modul Peningkatan Prestasi Subjek SPM Tahun 2015

**PEPERIKSAAN PERCUBAAN
SIJIL PELAJARAN MALAYSIA 2015
MATEMATIK TAMBAHAN
Kertas 1**

3472/1

September
2 jam

Dua jam

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Tulis nombor kad pengenalan, angka giliran, nama dan kelas anda pada ruang yang disediakan.*
2. *Kertas soalan 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 Melayu atau bahasa Inggeris.*
5. *Calon dikehendaki membaca maklumat di halaman yang seterusnya.*

Soalan	Markah Penuh	Markah Diperoleh
1	2	
2	3	
3	4	
4	3	
5	3	
6	4	
7	2	
8	3	
9	4	
10	3	
11	3	
12	4	
13	2	
14	3	
15	4	
16	4	
17	2	
18	3	
19	3	
20	4	
21	3	
22	4	
23	3	
24	3	
25	4	
Jumlah	80	

Kertas soalan ini mengandungi **27** halaman bercetak.

INFORMATION FOR CANDIDATES
MAKLUMAT UNTUK CALON

1. This question paper consists of **25** questions.
Kertas soalan ini mengandungi 25 soalan.
2. Answer **all** questions.
*Jawab **semua** soalan.*
3. Write your answers in the spaces provided in the question paper.
Tulis jawapan anda dalam ruang yang disediakan dalam kertas soalan.
4. Show your working. It may help you to get marks.
Tunjukkan langkah-langkah penting dalam kerja mengira anda. Ini boleh membantu anda untuk mendapatkan markah.
5. If you wish to change your answer, cross out the answer that you have done. Then write down the new answer.
Sekiranya anda hendak menukar jawapan, batalkan jawapan yang telah dibuat. Kemudian tulis jawapan yang baharu.
6. The diagrams in the questions provided are not drawn to scale unless stated.
Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.
7. The marks allocated for each question are shown in brackets.
Markah yang diperuntukkan bagi setiap soalan ditunjukkan dalam kurungan.
8. A list of formulae is provided on pages 3 to 4.
Satu senarai rumus disediakan di halaman 3 hingga 4.
9. The table of upper tail probability $Q(z)$ for normal distribution $N(0,1)$ is provided on page 5.
Jadual kebarangkalian hujung atas $Q(z)$ bagi taburan normal $N(0,1)$ disediakan di halaman 5.
10. You may use a non-programmable scientific calculator.
Anda dibenarkan menggunakan kalkulator saintifik yang tidak dapat diaturcarakan.
11. Hand in this question paper to the invigilator at the end of the examination.
Serahkan kertas soalan ini kepada pengawas peperiksaan pada akhir peperiksaan.

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.

ALGEBRA

1. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
2. $a^m \times a^n = a^{m+n}$
3. $a^m \div a^n = a^{m-n}$
4. $(a^m)^n = a^{mn}$
5. $\log_a mn = \log_a m + \log_a n$
6. $\log_a \frac{m}{n} = \log_a m - \log_a n$
7. $\log_a m^n = n \log_a m$
8. $\log_a b = \frac{\log_c b}{\log_c a}$
9. $T_n = a + (n-1)d$
10. $S_n = \frac{n}{2}[2a + (n-1)d]$
11. $T_n = ar^{n-1}$
12. $S_n = \frac{a(r^n - 1)}{r - 1} = \frac{a(1 - r^n)}{1 - r}$, $r \neq 1$
13. $S_\infty = \frac{a}{1 - r}$, $|r| < 1$

CALCULUS / KALKULUS

1. $y = uv$, $\frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$
2. $y = \frac{u}{v}$, $\frac{dy}{dx} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$
3. $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$
4. Area under a curve / Luas di bawah lengkung

$$= \int_a^b y \, dx$$
 or (atau)

$$= \int_a^b x \, dy$$
5. Volume of revolution / Isipadu kisanan

$$= \int_a^b \pi y^2 \, dx$$
 or (atau)

$$= \int_a^b \pi x^2 \, dy$$

GEOMETRY / GEOMETRI

1. Distance / Jarak

$$= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
2. Midpoint / Titik tengah

$$(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$
3. A point dividing a segment of a line / Titik yang membahagi suatu tembereng garis

$$(x, y) = \left(\frac{nx_1 + mx_2}{m + n}, \frac{ny_1 + my_2}{m + n} \right)$$
4. Area of triangle / Luas segitiga

$$= \frac{1}{2} |(x_1 y_2 + x_2 y_3 + x_3 y_1) - (x_2 y_1 + x_3 y_2 + x_1 y_3)|$$
5. $|\underline{r}| = \sqrt{x^2 + y^2}$
6. $\hat{\underline{r}} = \frac{x\underline{i} + y\underline{j}}{\sqrt{x^2 + y^2}}$

STATISTICS / STATISTIK

1.
$$\bar{x} = \frac{\sum x}{N}$$

2.
$$\bar{x} = \frac{\sum fx}{\sum f}$$

3.
$$\sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{N}} = \sqrt{\frac{\sum x^2}{N} - \bar{x}^2}$$

4.
$$\sigma = \sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f}} = \sqrt{\frac{\sum fx^2}{\sum f} - \bar{x}^2}$$

5.
$$m = L + \left(\frac{\frac{1}{2}N - F}{f_m} \right) C$$

6.
$$I = \frac{Q_1}{Q_0} \times 100$$

7.
$$\bar{I} = \frac{\sum W_i I_i}{\sum W_i}$$

8.
$${}^n P_r = \frac{n!}{(n-r)!}$$

9.
$${}^n C_r = \frac{n!}{(n-r)! r!}$$

10.
$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

11.
$$P(X = r) = {}^n C_r p^r q^{n-r}, \quad p + q = 1$$

12. Mean / Min, $\mu = np$

13.
$$\sigma = \sqrt{npq}$$

14.
$$Z = \frac{X - \mu}{\sigma}$$

TRIGONOMETRY / TRIGONOMETRI

1. Arc length, $s = r\theta$
Panjang lengkok, $s = j\theta$

2. Area of sector, $A = \frac{1}{2} r^2 \theta$
Luas sektor, $L = \frac{1}{2} j^2 \theta$

3. $\sin^2 A + \cos^2 A = 1$
 $\sin^2 A + \text{kos}^2 A = 1$

4. $\sec^2 A = 1 + \tan^2 A$
 $\text{sek}^2 A = 1 + \tan^2 A$

5. $\text{cosec}^2 A = 1 + \cot^2 A$
 $\text{kosek}^2 A = 1 + \text{kot}^2 A$

6. $\sin 2A = 2 \sin A \cos A$
 $\sin 2A = 2 \sin A \text{kos} A$

7. $\cos 2A = \cos^2 A - \sin^2 A$
 $= 2 \cos^2 A - 1$
 $= 1 - 2 \sin^2 A$

$$\text{kos} 2A = \text{kos}^2 A - \sin^2 A$$

$$= 2 \text{kos}^2 A - 1$$

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

8. $\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$
 $\sin(A \pm B) = \sin A \text{kos} B \pm \text{kos} A \sin B$

9. $\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$
 $\text{kos}(A \pm B) = \text{kos} A \text{kos} B \mp \sin A \sin B$

10.
$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$

11.
$$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$$

12.
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

13.
$$a^2 = b^2 + c^2 - 2bc \cos A$$

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

14. Area of triangle / Luas segitiga
$$= \frac{1}{2} ab \sin C$$

- 1 Diagram 1 shows the relation between set P and set Q in the graph form.
Rajah 1 menunjukkan hubungan antara set P dan set Q dalam bentuk graf.

For
Examiner's
Use

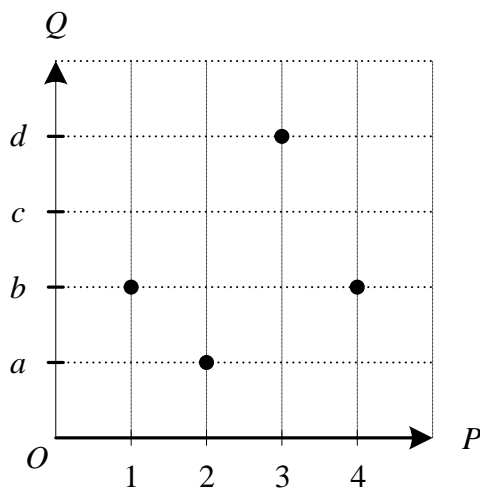


Diagram 1
Rajah 1

Nyatakan

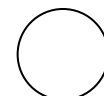
State

- (a) the type of the relation,
jenis hubungan itu,
- (b) the range of the relation.
julat hubungan itu.

[2 marks]
 [2 markah]

Answer / *Jawapan:*

1
 2



For
Examiner's
Use

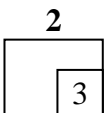
2 Given that $g(x) = \frac{3x}{2x+5}$, $x \neq k$. Find

Diberi $g(x) = \frac{3x}{2x+5}$, $x \neq k$. Cari

- (a) the value of k ,
nilai k ,
- (b) $g^{-1}(x)$.

[3 marks]
[3 markah]

Answer / *Jawapan:*



- 3 Mr. Ravi is a roti canai hawker. The daily profit that he can obtain, in RM, is given by $f : x \rightarrow \frac{6x-42}{5}$, where x is the number of roti canai sold in a day. Determine

En. Ravi adalah seorang penjaja roti canai. Keuntungan harian yang dapat diperolehinya, dalam RM, diberi oleh $f : x \rightarrow \frac{6x-42}{5}$, dengan keadaan x ialah bilangan roti canai yang dijual dalam sehari. Tentukan

- (a) The average daily profit obtained by Mr. Ravi if he has sold 231 roti canai in a week,

Purata keuntungan harian yang diperolehi En. Ravi jika dia telah menjual 231 buah roti canai dalam seminggu,

- (b) The minimum number of roti canai that must be sold in a day so that Mr. Ravi won't experience any loss.

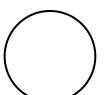
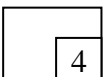
Bilangan minimum roti canai yang kena dijual dalam sehari supaya En. Ravi tidak mengalami sebarang kerugian.

[4 marks]

[4 markah]

Answer / Jawapan:

3



For
Examiner's
Use

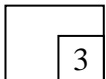
- 4 Given that the quadratic equation $x^2 + (2p + 1)x + 15 = 0$ has roots of 5 and $q - 1$. Find the value of p and of q . [3 marks]

Diberi persamaan kuadratik $x^2 + (2p + 1)x + 15 = 0$ mempunyai punca 5 dan $q - 1$.

Cari nilai p dan nilai q . [3 markah]

Answer / Jawapan:

4



- 5 Diagram 5 shows a graph of quadratic function $f(x) = (x + p)^2 + 4$, where p is a constant. The curve has a minimum point $(2, q)$ where q is a constant and intersects y -axis at A .

Rajah 5 menunjukkan graf bagi fungsi kuadratik $f(x) = (x + p)^2 + 4$ dengan p ialah pemalar. Lengkung itu mempunyai titik minimum $(2, q)$ dengan q ialah pemalar dan memotong paksi- y di A .

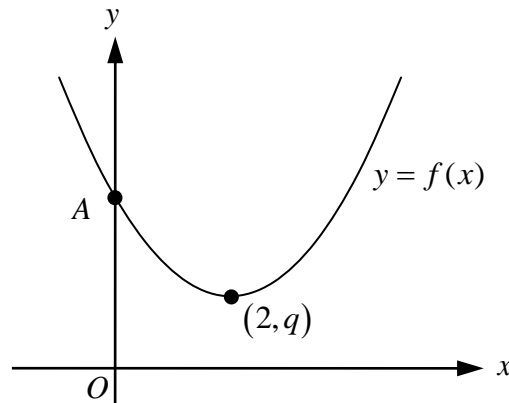


Diagram 5
Rajah 5

State

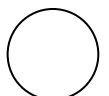
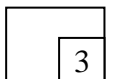
Nyatakan

- (a) the value of p and of q ,
nilai p dan nilai q ,
- (b) coordinates of A ,
koordinat A ,

[3 marks]
[3 markah]

Answer / *Jawapan:*

5



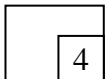
For
Examiner's
Use

- 6 Given the quadratic equation $x^2 + 2x = kx - k^2$, where k is a constant, has two different roots. Find the range of values of k . [4 marks]

Diberi persamaan kuadratik $x^2 + 2x = kx - k^2$, dengan keadaan k ialah pemalar, mempunyai dua punca yang berlainan. Cari julat nilai k . [4 markah]

Answer / Jawapan:

6



- 7 Simplify the following expression:
Permudahkan ungkapan yang berikut:

$$\frac{3^{4n+2} \times 81^n}{3^{6n-1}}$$

Answer / *Jawapan:*

[2 marks]
[2 markah]

For
Examiner's
Use

7

2

- 8 Solve the following equation:
Selesaikan persamaan yang berikut:

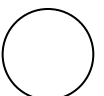
$$\log_2 x^2 = 4 + \log_2(x - 3)$$

Answer / *Jawapan:*

[3 marks]
[3 markah]

8

3



For
Examiner's
Use

9 Given that $\log_n 3 = r$ and $\log_n 4 = s$, express, in terms of r and s ,

Diberi bahawa $\log_n 3 = r$ dan $\log_n 4 = s$, ungkapkan, dalam sebutan r dan s ,

a) $\log_n 9$,

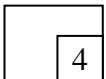
b) $\log_9 \frac{64n^2}{27}$.

[4 marks]

[4 markah]

Answer / Jawapan:

9



For
Examiner's
Use

- 10 PQR is a straight line where the coordinates of P and Q are $(-2, -1)$ and $(1, 2)$ respectively. If Q divides the straight line PR in the ratio $3:2$, find the coordinates of point R . [3 marks]

PQR ialah garis lurus dengan koordinat P dan Q masing-masing ialah $(-2, -1)$ dan $(1, 2)$. Jika Q membahagi garis lurus PR dengan nisbah $3:2$, cari koordinat titik R . [3 markah]

Answer / Jawapan:

10

3

- 11 The set of positive integers $2, 5, 7, 9, 11, m, n$ has a mean 8 and median 9. Find the value of m and of n if $n > m$. [3 marks]

Satu set integer positif $2, 5, 7, 9, 11, m, n$ mempunyai min 8 dan median 9. Cari nilai m dan nilai n jika $n > m$. [3 markah]

Answer / Jawapan:

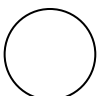
$$\frac{2+5+7+9+11+m+n}{7} = 8$$

$$m+n = ?$$

2, 5, 7, 9, 11, m, n

11

3



For
Examiner's
Use

- 12 Diagram 12 shows a right-angled triangle ABC . BD is an arc of sector ABD with A as its centre and AB as its radius.

Rajah 12 menunjukkan sebuah segi tiga bersudut tegak ABC . BD ialah lengkok bagi sektor ABD berpusat A dan berjajari AB .

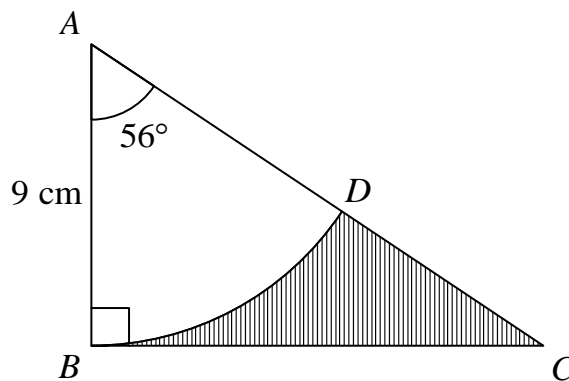


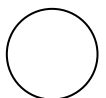
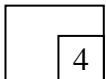
Diagram 12
Rajah 12

Given that $AB = 9$ cm and $\angle BAC = 56^\circ$, calculate the area, in cm^2 , of the shaded region. (Use $\pi = 3.142$) [4 marks]

Diberi bahawa $AB = 9$ cm dan $\angle BAC = 56^\circ$, hitung luas, dalam cm^2 , rantau berlorek. (Guna $\pi = 3.142$) [4 markah]

Answer / Jawapan:

12



- 13** It is given that the first four terms of a geometric progression are 3, -6 , 12 and x .
Find the value of x . [2 marks]
*Diberi bahawa empat sebutan pertama suatu jantang geometri ialah 3, -6 , 12 dan x .
Cari nilai x . [2 markah]*

Answer / Jawapan:

For
Examiner's
Use

13

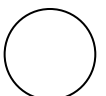
2

- 14** The fourth and the seventh terms of a geometric progression are 18 and 486 respectively. Find the third term. [3 marks]
Sebutan keempat dan ketujuh bagi suatu jantang geometri ialah 18 dan 486 masing-masing. Cari sebutan ketiga. [3 markah]

Answer / Jawapan:

14

3



For
Examiner's
Use

- 15 Siti had just finished her SPM assessment. She applied for a job from two different companies. ABC Company offered her an initial salary of RM 11 400 per annum with 5% yearly increment from the basic salary. XYZ Company offered an initial salary of RM 10 800 per annum with 9% yearly increment from the basic salary. Siti decided to choose the company which offered her higher income and save 30% of her salary for further study after working for 5 years.

Siti baru sahaja selesai penilaian SPM. Dia memohon pekerjaan daripada dua syarikat yang berbeza. Syarikat ABC menawarkan dia gaji permulaan sebanyak RM 11 400 setahun dengan 5% kenaikan gaji tahunan daripada gaji pokok. Syarikat XYZ pula menawarkan gaji permulaan sebanyak RM 10 800 setahun dengan 9% kenaikan gaji tahunan daripada gaji pokok. Siti mengambil keputusan untuk memilih syarikat yang menawarkan pendapatan yang lebih tinggi dan menyimpan 30% daripada gajinya untuk pembelajaran lanjutan selepas bekerja selama 5 tahun.

Which company should Siti choose and how much is her total savings for her studies after 5 years of working?

Syarikat manakah yang patut Siti memilih dan berapa banyak jumlah simpanannya bagi pelajaran selepas 5 tahun bekerja?

[Round off your answer to the nearest RM]

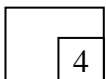
[4 marks]

[Bundarkan jawapan anda kepada RM terhampir]

[4 markah]

Answer / Jawapan:

15



16 x and y are related by the equation $y = x(kx^2 + px)$, where k and p are constants.

The graph of the straight line is obtained by plotting $\frac{y}{x^2}$ against x , as shown in Diagram 16.

x dan y dihubungkan oleh persamaan $y = x(kx^2 + px)$, dengan keadaan k dan p adalah pemalar. Graf garis lurus diperoleh dengan memplot $\frac{y}{x^2}$ melawan x , seperti yang ditunjukkan dalam Rajah 16.

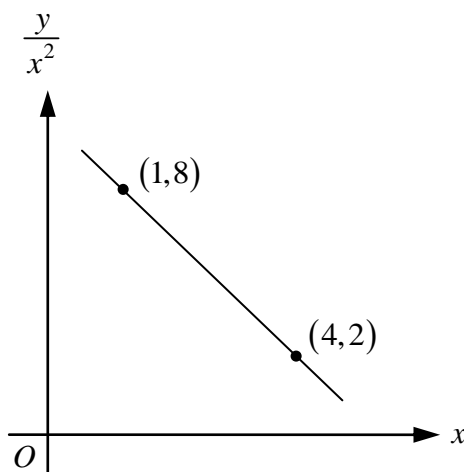


Diagram 16
Rajah 16

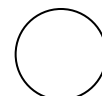
Calculate the value of k and of p .

[4 marks]

Hitungkan nilai k dan nilai p .

[4 markah]

Answer / Jawapan:



For
Examiner's
Use

17 Given $O(0,0)$, $E(2,-5)$, $F(3,1)$, and $\vec{OG} = 2\vec{OE} - \vec{OF}$, find \vec{FG} . [2 marks]

Diberi $O(0,0)$, $E(2,-5)$, $F(3,1)$, dan $\vec{OG} = 2\vec{OE} - \vec{OF}$, cari \vec{FG} . [2 markah]

Answer / Jawapan:

17

2

18 The vector $\begin{pmatrix} a \\ b \end{pmatrix}$ and $\begin{pmatrix} -1 \\ 2 \end{pmatrix}$ are parallel. Given that $\begin{pmatrix} a \\ b \end{pmatrix}$ has a magnitude of $\sqrt{45}$ units and $a > 0$, find the value of a and of b . [3 marks]

Vektor-vektor $\begin{pmatrix} a \\ b \end{pmatrix}$ dan $\begin{pmatrix} -1 \\ 2 \end{pmatrix}$ adalah selari. Diberi bahawa $\begin{pmatrix} a \\ b \end{pmatrix}$ mempunyai magnitud $\sqrt{45}$ unit dan $a > 0$, cari nilai a dan nilai b . [3 markah]

Answer / Jawapan:

18

3

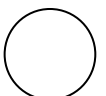
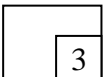
- 19 Given the curve $y = 2kx^2 + 6x$, where k is a constant. The curve has a turning point at $(3, y)$. Find the value of k . [3 marks]

Diberi lengkung $y = 2kx^2 + 6x$, dengan keadaan k ialah pemalar. Lengkung itu mempunyai titik pusingan pada $(3, y)$. Cari nilai k . [3 markah]

Answer / Jawapan:

For
Examiner's
Use

19



For
Examiner's
Use

20 Given that $y = 3x^2 - 4x + 3$, find

Diberi bahawa $y = 3x^2 - 4x + 3$ cari

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

(a) the value of $\frac{dy}{dx}$ at the point (1, 2),

nilai $\frac{dy}{dx}$ pada titik (1, 2),

(b) the approximate small change in x when y increases from 2 to 2.01.

perubahan kecil bagi x apabila y bertambah daripada 2 kepada 2.01.

[4 marks]

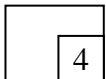
[4 markah]

Answer / Jawapan:

$$\delta x = \left[\frac{dx}{dy} \right] \times \delta y$$

$$= \quad \times 0.01 = \underline{\hspace{2cm}}$$

20



21 Given that $y = \frac{k}{(2x-5)^3}$ and $\frac{dy}{dx} = g(x)$, find the value of k if $\int_1^2 [g(x)+1] dx = -1\frac{8}{9}$.

[3 marks]

Diberi $y = \frac{k}{(2x-5)^3}$ dan $\frac{dy}{dx} = g(x)$, cari nilai k jika $\int_1^2 [g(x)+1] dx = -1\frac{8}{9}$.

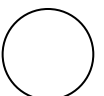
[3 markah]

Answer / Jawapan:

For
Examiner's
Use

21

3

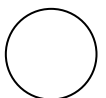
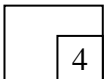


For
Examiner's
Use

- 22 Solve the equation $3\cot^2 x + \operatorname{cosec} x - 1 = 0$ for $0^\circ \leq x \leq 360^\circ$. [4 marks]
Selesaikan persamaan $3\cot^2 x + \operatorname{cosec} x - 1 = 0$ untuk $0^\circ \leq x \leq 360^\circ$. [4 markah]

Answer / Jawapan:

22

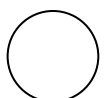
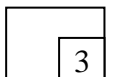


- 23** 12 students are shortlisted to participate in three competitions. 4 students are required to take part in a Sudoku competition, 3 students are required to take part in a chess competition and another 2 students are required to take part in a quiz competition. Find the number of ways these students can be chosen if a student can only participate in one competition only. [3 marks]

12 orang pelajar telah disenaraikan untuk menyertai tiga pertandingan. 4 orang pelajar diperlukan untuk menyertai pertandingan Sudoku, 3 orang pelajar diperlukan untuk menyertai pertandingan catur dan 2 orang pelajar diperlukan untuk menyertai pertandingan kuiz. Cari bilangan cara pelajar-pelajar tersebut boleh dipilih jika seorang pelajar hanya dibenarkan untuk menyertai satu pertandingan sahaja. [3 markah]

Answer / Jawapan:

23



For
Examiner's
Use

- 24 In 100 m race event, the probability that Siti will win the first place is $\frac{2}{5}$ while the probability that Fatimah will win the first place is $\frac{1}{4}$. Find the probability that

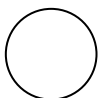
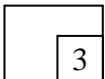
Dalam acara larian 100 m, kebarangkalian Siti akan menang tempat pertama ialah $\frac{2}{5}$ manakala kebarangkalian Fatimah akan menang tempat pertama ialah $\frac{1}{4}$. Cari kebarangkalian bahawa

- (a) both of them fail to win the first place,
kedua-dua gagal menang tempat pertama,
- (b) only one of them will win the first place.
hanya seorang daripada mereka akan menang tempat pertama.

[3 marks]
[3 markah]

Answer / Jawapan:

24



- 25 Diagram 25 shows the graph of a binomial distribution for discrete random variable X .
Rajah 25 menunjukkan graf sebuah taburan binomial bagi pembolehubah rawak diskret X .

For
Examiner's
Use

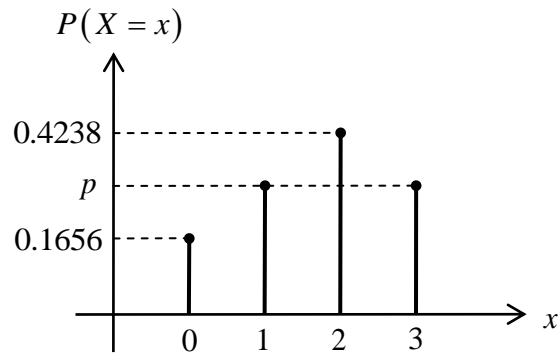


Diagram 25
Rajah 25

Find

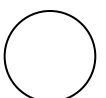
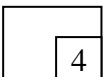
Cari

- (a) the value of p ,
nilai p ,
- (b) $P(X \geq 1)$.

[4 marks]
 [4 markah]

Answer / *Jawapan:*

25



Modul Peningkatan Prestasi Subjek SPM Tahun 2015

PEPERIKSAAN PERCUBAAN
SIJIL PELAJARAN MALAYSIA 2015
MATEMATIK TAMBAHAN
Kertas 2

3472/2

September

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

Dua jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Kertas soalan ini adalah dalam dwibahasa.*
2. *Soalan dalam bahasa Inggeris mendahului soalan yang sepadan dalam bahasa Melayu.*
3. *Calon dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam bahasa Melayu atau bahasa Inggeris.*
4. *Calon dikehendaki membaca maklumat di halaman yang seterusnya.*

Kertas soalan ini mengandungi **21** halaman bercetak.

INFORMATION FOR CANDIDATES
MAKLUMAT UNTUK CALON

1. This question paper consists of three sections: **Section A**, **Section B** and **Section C**.
*Kertas soalan ini mengandungi tiga bahagian: **Bahagian A**, **Bahagian B** dan **Bahagian C**.*
2. Answer **all** questions in **Section A**, any **four** questions from **Section B** and any **two** questions from **Section C**.
*Jawab **semua** soalan dalam **Bahagian A**, mana-mana **empat** soalan daripada **Bahagian B** dan mana-mana **dua** soalan daripada **Bahagian C**.*
3. Write your answers on the answer sheets provided. If the answer sheets are insufficient, you may ask for additional sheets from the invigilator.
Jawapan anda hendaklah ditulis di dalam helaian jawapan yang disediakan. Sekiranya helaian jawapan tidak mencukupi, sila dapatkan helaian tambahan daripada pengawas peperiksaan.
4. Show your working. It may help you to get marks.
Tunjukkan kerja mengira anda. Ini boleh membantu anda untuk mendapatkan markah.
5. The diagrams in the questions provided are not drawn to scale unless stated.
Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.
6. The marks allocated for each question and sub-part of a question are shown in brackets.
Markah yang diperuntukkan bagi setiap soalan dan ceraihan soalan ditunjukkan dalam kurungan.
7. A list of formulae is provided on pages 3 to 4.
Satu senarai rumus disediakan di halaman 3 hingga 4.
8. The table of upper tail probability $Q(z)$ for normal distribution $N(0,1)$ is provided on page 5.
Jadual kebarangkalian hujung atas $Q(z)$ bagi taburan normal $N(0,1)$ disediakan di halaman 5.
9. Graph paper is provided.
Kertas graf disediakan.
10. You may use a non-programmable scientific calculator.
Anda dibenarkan menggunakan kalkulator saintifik yang tidak dapat diaturcarakan.
11. Tie the answer sheets and the graph paper(s) together and hand in to the invigilator at the end of the examination.
Ikat helaian-helaian jawapan dan kertas(-kertas) graf bersama dan serah kepada pengawas peperiksaan pada akhir peperiksaan.

Section A
Bahagian A

[40 marks]
[40 markah]

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

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

$$x + y = 3, \quad x^2 + y^2 - xy = 5$$

Give your answers correct to three decimal places. [5 marks]

Berikan jawapan anda betul kepada tiga tempat perpuluhan. [5 markah]
[$x = 2.457, 0.543$ dan $y = 2.457, 0.543$]

- 2 Diagram 2 shows the arrangement of the first three of an infinite series of similar right-angled triangles. The first triangle has a base of 24 cm and a height of 32 cm. The measurements of the base and the height of each subsequent triangle are half of the measurements of its previous one.

Rajah 2 menunjukkan susunan tiga segitiga bersudut tegak serupa yang pertama daripada suatu siri tak terhingga. Segitiga pertama mempunyai tapak 24 cm dan tinggi 32 cm. Ukuran tapak dan tinggi setiap segitiga berikutnya adalah separuh daripada ukuran yang sebelumnya.

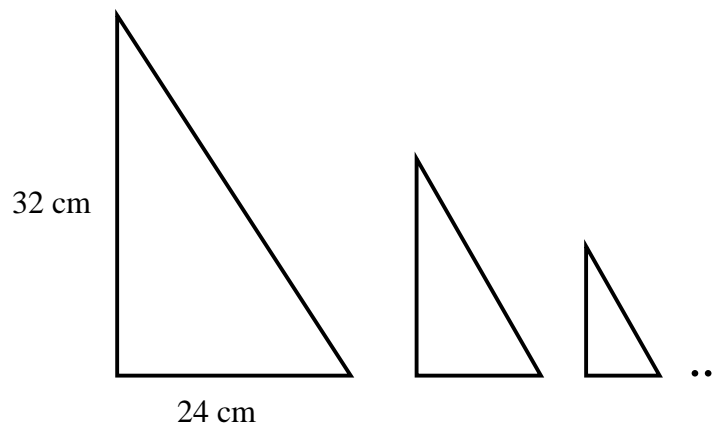


Diagram 2
Rajah 2

- (a) Find the length, in cm, of the base of the fifth triangle. [2 marks]
Cari panjang, dalam cm, tapak segitiga yang kelima. [1.5] [2 markah]
- (b) Show that the areas of the triangles form a geometric progression and state the common ratio. [3 marks]
Tunjukkan bahawa luas segitiga-segitiga tersebut membentuk suatu jangjang geometri dan nyatakan nisbah sepunya. [3 markah]
- (c) Find the sum to infinity of the areas, in cm^2 , of the triangles. [2 marks]
Cari hasil tambah luas hingga tak terhinggaan, dalam cm^2 , bagi segitiga-segitiga itu. [512] [2 markah]

- 3 Table 3 shows the scores obtained by a group of 30 students in a test.

Jadual 3 menunjukkan skor yang diperolehi oleh sekumpulan 30 orang pelajar di dalam satu ujian.

Score <i>Skor</i>	< 15	< 20	< 25	< 30	< 35
Number of students <i>Bilangan pelajar</i>	3	10	15	26	30

Table 3
Jadual 3

- (a) Construct a frequency distribution table starting with class interval of 10–14 .
Hence, calculate the mean score. [4 marks]
*Bina satu jadual taburan kekerapan bermula dengan selang kelas 10–14 .
Seterusnya, hitung skor min. [23][4 markah]*
- (b) Without drawing an ogive, estimate the median score. [3 marks]
Tanpa melukis graf ogif, anggarkan skor median. [24.5][3 markah]
- 4 Diagram 4 shows the curve $y = x^2 + 7$ and the tangent $y = -2x + 6$ to the curve at the point $A(k, 8)$.

Rajah 4 menunjukkan lengkung $y = x^2 + 7$ dan tangen $y = -2x + 6$ kepada lengkung itu pada titik $A(k, 8)$.

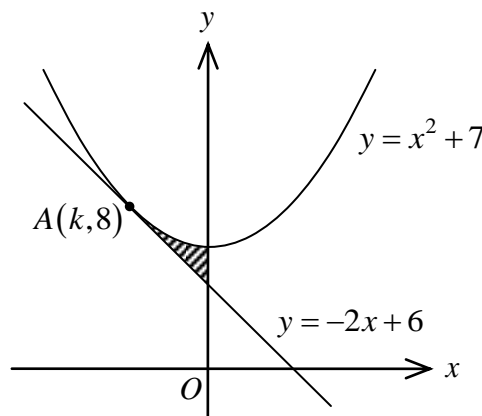


Diagram 4
Rajah 4

Hitung

- (a) the value of k , [1 mark]
nilai k , [-1][1 markah]
- (b) the area of the shaded region, [4 marks]
luas rantau berlorek, [1/3][4 markah]
- (c) the volume of revolution, in terms of π , when the region bounded by the curve and the straight line $y = 9$ is rotated through 360° about the y -axis. [3 marks]
isipadu kisanan, dalam sebutan π , apabila rantau yang dibatasi oleh lengkung itu dan garis lurus $y = 9$ diputarkan melalui 360° pada paksi- y . [2 π][3 markah]

- 5 Diagram 5 shows a triangle KLN . F lies on KN and E lies on KM .

Rajah 5 menunjukkan sebuah segitiga KLN . F terletak pada KN dan E terletak pada KM .

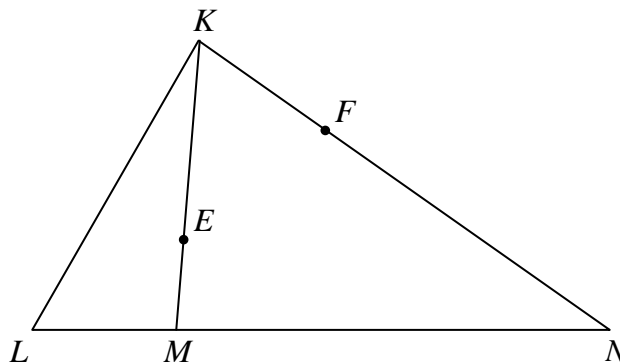


Diagram 5
Rajah 5

It is given that $LN = 4LM$, $KN = 3KF$, $KM = 3EM$, $\vec{LM} = \underline{x}$ and $\vec{LK} = \underline{y}$.

Diberi bahawa $LN = 4LM$, $KN = 3KF$, $KM = 3EM$, $\vec{LM} = \underline{x}$ dan $\vec{LK} = \underline{y}$.

- (a) Express, in terms of \underline{x} and \underline{y} ,

Ungkapkan, dalam sebutan \underline{x} dan \underline{y} ,

(i) \vec{LE} , [2/3x+1/3y]

(ii) \vec{EN} . [10/3x-1/3y] [4 marks]

[4 markah]

- (b) Determine whether the points L , E and F are collinear. [3 marks]

Tentukan sama ada titik-titik L , E dan F adalah segaris. [3 markah]

[3 markah]

- 6 (a) Sketch the graph $y = \frac{3}{2}\sin 2x$ for $0 \leq x \leq \frac{3}{2}\pi$. [3 marks]

Lakar graf $y = \frac{3}{2}\sin 2x$ untuk $0 \leq x \leq \frac{3}{2}\pi$. [3 markah]

- (b) Hence, using the same axis, sketch a suitable straight line to find the number of solutions to the equation $\frac{4}{3\pi}x - \sin 2x = \frac{3}{2}$ for $0 \leq x \leq \frac{3}{2}\pi$. State the number of solutions. [3 marks]

Seterusnya, dengan menggunakan paksi yang sama, lakar satu garis lurus yang sesuai untuk mencari bilangan penyelesaian bagi persamaan $\frac{4}{3\pi}x - \sin 2x = \frac{3}{2}$

untuk $0 \leq x \leq \frac{3}{2}\pi$. Nyatakan bilangan penyelesaian itu. [3][3 markah]

Section B
Bahagian B

[40 marks]
[40 markah]

Answer **four** questions from this section.
Jawab **empat** soalan daripada bahagian ini.

- 7 Use the graph paper to answer this question.

Gunakan kertas untuk menjawab soalan ini.

Table 7 shows the values of two variables, x and y , obtained from an experiment.

Variables x and y are related by the equation $\frac{a}{y} = bx + 2$, where a and b are constants.

Jadual 7 menunjukkan nilai-nilai bagi dua pembolehubah, x dan y , yang diperolehi daripada satu ujikaji. Pembolehubah x dan y dihubungkan oleh persamaan

$\frac{a}{y} = bx + 2$, dengan keadaan a dan b ialah pemalar.

x	0.1	0.2	0.3	0.4	0.5	0.6
y	0.444	0.541	0.671	0.99	1.538	3.999

Table 7
Jadual 7

- (a) Based on Table 7, construct a table for the values of $\frac{1}{y}$. [1 mark]

Berdasarkan Jadual 7, bina satu jadual bagi $\frac{1}{y}$. [1 markah]

- (b) Plot $\frac{1}{y}$ against x , using the scale of 2 cm to 0.1 unit on the x -axis and 2 cm to 0.5 unit on the $\frac{1}{y}$ -axis. Hence, draw the line of best fit. [3 marks]

Plot $\frac{1}{y}$ melawan x , dengan menggunakan skala 2 cm kepada 0.1 unit pada paksi- x dan 2 cm kepada 0.5 unit pada paksi- $\frac{1}{y}$. Seterusnya, lukis garis lurus penyuaian terbaik. [3 markah]

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

- (i) y when $x = 0.46$,
 y apabila $x = 0.46$, [1.25]
- (ii) a , [0.75~0.76]
- (iii) b . [3.00~3.05]

[6 marks]

[6 markah]

- 8 Diagram 8 shows a circle $PQRT$, centre O and radius 7 cm. AQB is a tangent to the circle at point Q . The straight lines, AO and BO , intersect the circle at point P and point R respectively. $OPQR$ is a rhombus. ACB is an arc of a circle at centre O .
- Rajah 8 menunjukkan satu bulatan $PQRT$, berpusat O dan berjajari 7 cm. AQB ialah tangen kepada bulatan di titik Q . Garis lurus, AO dan BO , bersilang dengan bulatan di titik P dan titik R masing-masing. $OPQR$ ialah sebuah rombus. ACB ialah panjang lengkok bulatan berpusat di O .*

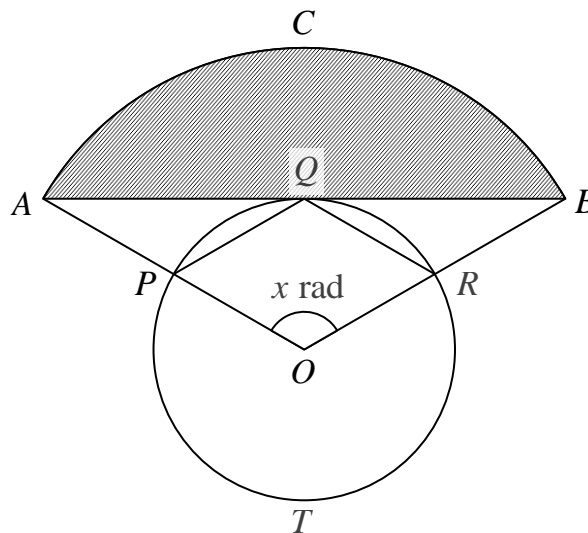


Diagram 8
Rajah 8

[Use / Guna $\pi = 3.142$]

Calculate

Hitung

- | | | |
|--|---------------|-------------------------|
| (a) the angle x , in terms of π ,
<i>sudut bagi x, dalam sebutan π.</i> | [$2/3\pi$] | [3 marks]
[3 markah] |
| (b) the length, in cm, of the arc ACB ,
<i>panjang, dalam cm, lengkok ACB.</i> | [29.32~29.33] | [3 marks]
[3 markah] |
| (c) the area, in cm^2 , of the shaded region.
<i>luas, dalam cm^2, kawasan berlorek.</i> | [120.4] | [4 marks]
[4 markah] |

- 9 Solutions by scale drawing is not accepted.

Penyelesaian secara lukisan berskala tidak diterima.

Diagram 9 shows a trapezium $ABCD$. Given the equation of the straight line CD is $3y - 2x = 2$.

Rajah 9 menunjukkan sebuah trapezium $ABCD$. Diberi persamaan garis lurus CD ialah $3y - 2x = 2$.

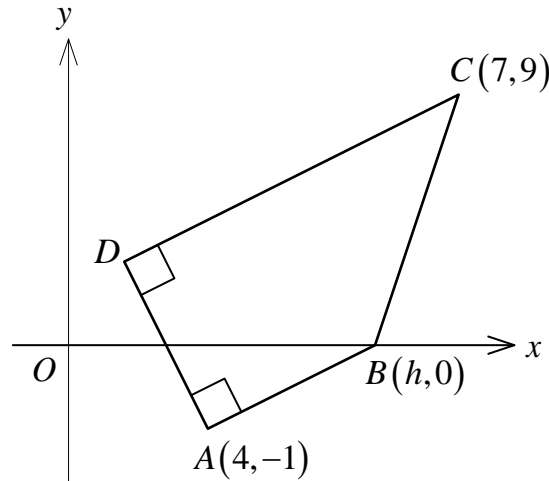


Diagram 9
Rajah 9

- (a) Find the value of h . [11/2] [3 marks]
Cari nilai h . [3 markah]
- (b) Find the equation of AD in gradient form. [$y = -3/2x + 5$] [2 marks]
Cari persamaan AD dalam bentuk kecerunan. [2 markah]
- (c) Given point $E(3, 5)$ lies on straight line CD such that $CE = 2ED$. Find the coordinates of point D . [3 marks]
*Diberi titik $E(3, 5)$ terletak pada garis lurus CD dengan keadaan $CE = 2ED$.
Cari koordinat bagi titik D . [(1, 3)] [3 markah]*
- (d) A point P moves such that it is always equidistant from point A and point C . Find the equation of the locus of P . [2 marks]
Satu titik P bergerak dengan keadaan bahawa jaraknya sentiasa sama dari titik A dan titik C . Cari persamaan lokus bagi P . [$6x + 20y - 113 = 0$] [2 markah]

- 10 The curve $y = x^3 - 6x^2 + 9x + 1$ passes through point $A(2,3)$ and has two turning points, $P(3,1)$ and Q . Find

Lengkung $y = x^3 - 6x^2 + 9x + 1$ melalui titik $A(2,3)$ dan mempunyai dua titik pusingan, $P(3,1)$ dan Q . Cari

- (a) The gradient of the tangent to the curve at point A , [-3][3 marks]
Kecerunan tangen kepada lengkung itu pada titik A , [3 markah]
- (b) The equation of the normal to the curve at point A , [3y-x-7 = 0][3 marks]
Persamaan normal kepada lengkung itu pada titik A , [3 markah]
- (c) The coordinates of point Q and determine whether Q is the maximum or the minimum point. [(1,5), maksimum][4 marks]
Koordinat titik Q dan tentukan sama ada Q ialah titik maksimum atau titik minimum. [4 markah]
- 11 (a) It is found that 85% of the students in a school are either the Manchester United fans or Chelsea fans. If 10 students are chosen randomly, find the probability that
Didapati bahawa 85% daripada pelajar-pelajar di sebuah sekolah adalah sama ada peminat Manchester United atau peminat Chelsea. Jika 10 orang pelajar dipilih secara rawak, cari kebarangkalian bahawa
- (i) exactly 7 of them are either Manchester United fans or Chelsea fans.
tepat 7 orang sama ada peminat Manchester United atau peminat Chelsea.
[0.1298]
- (ii) at least 8 of them are Manchester United fans or Chelsea fans.
sekurang-kurangnya 8 orang peminat Manchester United atau peminat Chelsea.
[0.8202]
[4 marks]
[4 markah]
- (b) A school with 800 students take part in a cross country event. The cross country event started at 0800 hour. Time taken for the students to finish the event is normally distributed with a mean of 50 minutes and a variance of 144 minutes².
Sebuah sekolah yang mempunyai 800 orang pelajar mengambil bahagian dalam acara merentas desa. Acara tersebut bermula pada jam 0800. Tempoh masa untuk pelajar menamatkan acara adalah bertaburan secara normal dengan min 50 minit dan varians 144 minit².
- (i) Find the probability of students who finished the event after 0900 hour.
Cari kebarangkalian pelajar menghabiskan acara merentas desa tersebut selepas jam 0900. [0.2023~0.2025]
- (ii) If 240 students finished the event in less than k minutes, find the value of k .
Jika 240 orang pelajar menamatkan acara merentas desa kurang daripada k minit, cari nilai k . [$k = 43.712$][5 marks]
[5 markah]

Section C
Bahagian C

[20 marks]
[20 markah]

Answer **two** questions from this section.
Jawab **dua** soalan daripada bahagian ini.

- 12 Diagram 12 shows a triangle ABC .
Rajah 12 menunjukkan sebuah segitiga ABC .

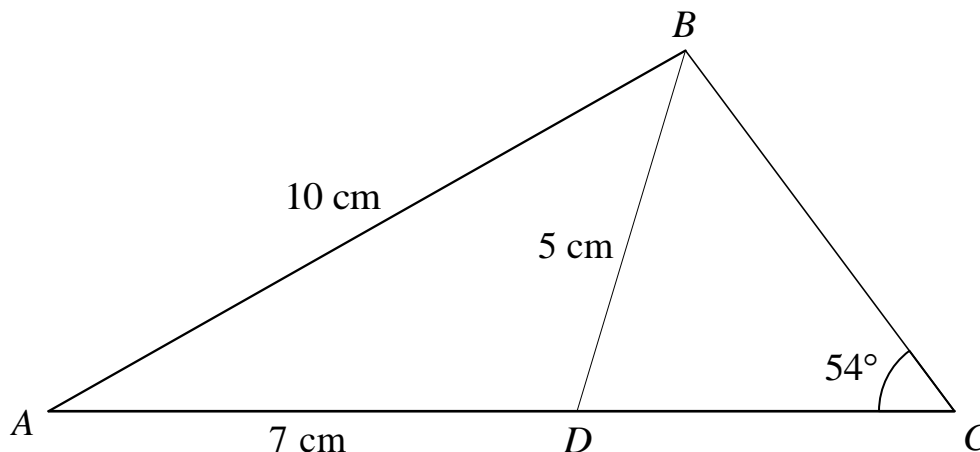


Diagram 12
Rajah 12

It is given $AB = 10$ cm, $AD = 7$ cm, $BD = 5$ cm and $\angle BCD = 54^\circ$. Calculate
Diberi bahawa $AB = 10$ cm, $AD = 7$ cm, $BD = 5$ cm dan $\angle BCD = 54^\circ$. Hitung

- (a) $\angle BDA$, [111^o48'] [2 marks]
[2 markah]
- (b) the length, in cm, of BC , [5.738~5.74] [3 marks]
panjang, dalam cm, bagi BC , [3 markah]
- (c) the length, in cm, of AC , [12.23] [3 marks]
panjang, dalam cm, bagi AC , [3 markah]
- (d) the area, in cm^2 , of $\triangle ABC$, [28.39~28.40] [2 marks]
luas, dalam cm^2 , bagi $\triangle ABC$. [2 markah]

- 13 Table 13 shows the price indices and their corresponding weightages for four types of food in 2014, taking 2012 as the base year.

Jadual 13 menunjukkan indeks harga dan pemberat sepadan bagi empat jenis makanan pada tahun 2014, dengan mengambil tahun 2012 sebagai tahun asas.

Item <i>Bahan</i>	Price Index <i>Indeks Harga</i>	Weightage <i>Pemberat</i>
Vegetables <i>Sayur-sayuran</i>	115	4
Eggs <i>Telur</i>	u	w
Fish <i>Ikan</i>	114	$2w+1$
Meat <i>Daging</i>	150	1

Table 13
Jadual 13

- (a) Given that the price of eggs in 2012 is RM 8.00 per tray and the price increases to RM 10.40 per tray in the year 2014. Calculate the value of u . [2 marks]
Diberi bahawa harga sesangkak telur pada tahun 2012 ialah RM 8.00 sesangkak dan harga naik ke RM 10.40 sesangkak pada tahun 2014. Hitungkan nilai u .
[130][2 markah]
- (b) The composite index representing the four items in the year 2014 based on the year 2012 is 120. Calculate
Indeks gubahan yang mewakili keempat-empat bahan pada tahun 2014 berasaskan tahun 2012 ialah 120. Hitung
- (i) the value of w , [2]
nilai bagi w ,
- (ii) the monthly expenses on the above items in the year 2012 if the monthly expenses on these items in 2014 was RM 1 800.
perbelanjaan bulanan bahan-bahan di atas pada tahun 2012 jika perbelanjaan bulanan bahan-bahan ini pada tahun 2014 ialah RM 1 800.
[1500] [5 marks]
[5 markah]
- (c) The expenses on the above food items increases by 35% from year 2012 to 2015. Find the composite index in year 2015 based on the year 2014. [3 marks]
Perbelanjaan bahan-bahan di atas meningkat sebanyak 35% dari tahun 2012 ke tahun 2015. Cari indeks gubahan pada tahun 2015 berasaskan tahun 2014.
[112.5] [3 markah]

- 14 A particle moves in a straight line and passes through a fixed point O . Its velocity, $v \text{ m s}^{-1}$, is given by $v = 12 + 4t - t^2$, where t is the time, in seconds, after passing through O .

Suatu zarah bergerak di sepanjang suatu garis lurus dan melalui satu titik tetap O .

Halajunya, $v \text{ m s}^{-1}$, diberi oleh $v = 12 + 4t - t^2$, dengan keadaan t ialah masa, dalam saat, selepas melalui O .

[Assume motion to the right is positive]

[Anggap gerakan ke arah kanan sebagai positif]

- (a) Find

Cari

- (i) the initial velocity, in m s^{-1} , of the particle,

halaju awal, dalam m s^{-1} , zarah itu, [12]

- (ii) the time interval during which the particle moves towards the right.

julat masa apabila zarah itu bergerak ke arah kanan. [0 < t < 6]

- (iii) the maximum velocity, in m s^{-1} , of the particle.

halaju maksimum, dalam m s^{-1} , zarah itu. [16]

[5 marks]

[5 markah]

- (b) Sketch the velocity-time graph of the motion of the particle for $0 \leq t \leq 6$.

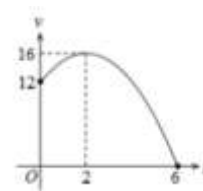
Lakar graf halaju melawan masa bagi pergerakan zarah itu untuk $0 \leq t \leq 6$.

[2 marks]

[2 markah]

- (c) Calculate the total distance, in m, travelled during the first 6 seconds after leaving O .

[3 marks]



Hitung jumlah jarak, dalam m, yang dilalui dalam 6 saat yang pertama selepas melalui O . [72][3 markah]

15 Use the graph paper to answer this question.

Gunakan kertas graf untuk menjawab soalan ini.

A school is given an allocation to purchase x units of type A computers and y units of type B computers for its computer laboratory according to the following constraints:

Sebuah sekolah diberi peruntukan untuk membeli x unit komputer jenis A dan y unit jenis B bagi makmal komputernya berdasarkan kekangan berikut:

I The maximum number of computers of type A is 8 units.

Bilangan maksimum bagi komputer jenis A ialah 8 unit.

II The total number of computers purchased is at least 6 units.

Jumlah bilangan komputer yang dibeli ialah sekurang-kurangnya 6 unit.

III The number of type B computers is less than or equal to the number of type A computers.

Bilangan komputer jenis B adalah kurang daripada atau sama dengan bilangan komputer jenis A .

(a) Write three inequalities, other than $x \geq 0$ and $y \geq 0$, that satisfy all the constraints above. [3 marks]

Tulis tiga ketaksamaan, selain $x \geq 0$ dan $y \geq 0$, yang memenuhi semua kekangan di atas. [3 markah]

(b) Using a scale of 2 cm to 2 computers on both axes, construct and shade the region R which satisfies all the constraints above. [3 marks]

Dengan menggunakan skala 2 cm kepada 2 komputer pada kedua-dua paksi, bina dan lorek rantau R yang memenuhi semua kekangan di atas. [3 markah]

(c) Using your graph constructed in (b), find

Dengan menggunakan graf anda yang dibina di (b), cari

(i) the maximum number of type B computers that can be purchased if the school buys 7 units of type A computers.

bilangan maksimum komputer jenis B dapat dibeli jika sekolah itu membeli 7 unit komputer jenis A . [7]

(ii) If the cost of a unit of type A computer and a unit of type B computer are RM 1 500 and RM 2 000 respectively, find the maximum amount of allocation needed by the school.

Jika kos sebuah komputer jenis A dan sebuah komputer jenis B ialah masing-masing RM 1 500 dan RM 2 000, cari peruntukan maksimum yang diperlukan oleh sekolah itu. [28000]

[4 marks]

[4 markah]

End of Question Paper
Kertas Soalan Tamat

Probability of upper tail $Q(z)$ for normal distribution $N(0,1)$ Kebarangkalian hujung atas $Q(z)$ bagi taburan normal $N(0,1)$

z	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
											SUBTRACT / TOLAK								
0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641	4	8	12	16	20	24	28	32	36
0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247	4	8	12	16	20	24	28	32	36
0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859	4	8	12	15	19	23	27	31	35
0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483	4	7	11	15	19	22	26	30	34
0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121	4	7	11	14	18	22	25	29	32
0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776	3	7	10	14	17	20	24	27	31
0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451	3	7	10	13	16	19	23	26	29
0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148	3	6	9	12	15	18	21	24	27
0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867	3	5	8	11	14	16	19	22	25
0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611	3	5	8	10	13	15	18	20	23
1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379	2	5	7	9	12	14	16	19	21
1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170	2	4	6	8	10	12	14	16	18
1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985	2	4	6	7	9	11	13	15	17
1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823	2	3	5	6	8	10	11	13	14
1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681	1	3	4	6	7	8	10	11	13
1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559	1	2	4	5	6	7	8	10	11
1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455	1	2	3	4	5	6	7	8	9
1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367	1	2	3	4	4	5	6	7	8
1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294	1	1	2	3	4	4	5	6	6
1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233	1	1	2	2	3	4	4	5	5
2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183	0	1	1	2	2	3	3	4	4
2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143	0	1	1	2	2	2	3	3	4
2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110	0	1	1	1	2	2	2	3	3
2.3	.0107	.0104	.0102								0	1	1	1	1	2	2	2	2
				.0 ² 990	.0 ² 964	.0 ² 939	.0 ² 914				3	5	8	10	13	15	18	20	23
								.0 ² 889	.0 ² 866	.0 ² 842	2	5	7	9	12	14	16	18	21
2.4	.0 ² 820	.0 ² 798	.0 ² 776	.0 ² 755	.0 ² 734						2	4	6	8	11	13	15	17	19
						.0 ² 714	.0 ² 695	.0 ² 676	.0 ² 657	.0 ² 639	2	4	6	7	9	11	13	15	17
2.5	.0 ² 621	.0 ² 604	.0 ² 587	.0 ² 570	.0 ² 554	.0 ² 539	.0 ² 523	.0 ² 508	.0 ² 494	.0 ² 480	2	3	5	6	8	9	11	12	14
2.6	.0 ² 466	.0 ² 453	.0 ² 440	.0 ² 427	.0 ² 415	.0 ² 402	.0 ² 391	.0 ² 379	.0 ² 368	.0 ² 357	1	2	3	5	6	7	8	9	10
2.7	.0 ² 347	.0 ² 336	.0 ² 326	.0 ² 317	.0 ² 307	.0 ² 298	.0 ² 289	.0 ² 280	.0 ² 272	.0 ² 264	1	2	3	4	5	6	7	8	9
2.8	.0 ² 256	.0 ² 248	.0 ² 240	.0 ² 233	.0 ² 226	.0 ² 219	.0 ² 212	.0 ² 205	.0 ² 199	.0 ² 193	1	1	2	3	4	4	5	6	6
2.9	.0 ² 187	.0 ² 181	.0 ² 175	.0 ² 169	.0 ² 164	.0 ² 159	.0 ² 154	.0 ² 149	.0 ² 144	.0 ² 139	0	1	1	2	2	3	3	4	4
3.0	.0 ² 135	.0 ² 131	.0 ² 126	.0 ² 122	.0 ² 118	.0 ² 114	.0 ² 111	.0 ² 107	.0 ² 104	.0 ² 100	0	1	1	2	2	2	3	3	4
3.1	.0 ³ 968	.0 ³ 935	.0 ³ 904								3	6	9	13	16	19	22	25	28
				.0 ³ 874	.0 ³ 845	.0 ³ 816	.0 ³ 789				3	6	8	11	14	17	20	22	25
								.0 ³ 762	.0 ³ 736	.0 ³ 711	2	5	7	10	12	15	17	20	22
3.2	.0 ³ 687	.0 ³ 664	.0 ³ 641	.0 ³ 619	.0 ³ 598						2	4	7	9	11	13	15	18	20
						.0 ³ 577	.0 ³ 557	.0 ³ 538	.0 ³ 519	.0 ³ 501	2	4	6	8	9	11	13	15	17
3.3	.0 ³ 483	.0 ³ 466	.0 ³ 450	.0 ³ 434	.0 ³ 419						2	3	5	6	8	10	11	13	14
						.0 ³ 404	.0 ³ 390	.0 ³ 376	.0 ³ 362	.0 ³ 349	1	3	4	5	7	8	9	10	12
3.4	.0 ³ 337	.0 ³ 325	.0 ³ 313	.0 ³ 302	.0 ³ 291	.0 ³ 280	.0 ³ 270	.0 ³ 260	.0 ³ 251	.0 ³ 242	1	2	3	4	5	6	7	8	9
3.5	.0 ³ 233	.0 ³ 224	.0 ³ 216	.0 ³ 208	.0 ³ 200	.0 ³ 193	.0 ³ 185	.0 ³ 178	.0 ³ 172	.0 ³ 165	1	1	2	3	4	4	5	6	7
3.6	.0 ³ 159	.0 ³ 153	.0 ³ 147	.0 ³ 142	.0 ³ 136	.0 ³ 131	.0 ³ 126	.0 ³ 121	.0 ³ 117	.0 ³ 112	0	1	1	2	2	3	3	4	5
3.7	.0 ³ 108	.0 ³ 104	.0 ³ 100	.0 ⁴ 96	.0 ⁴ 92	.0 ⁴ 88	.0 ⁴ 85	.0 ⁴ 82	.0 ⁴ 78	.0 ⁴ 75									
3.8	.0 ⁴ 72	.0 ⁴ 69	.0 ⁴ 67	.0 ⁴ 64	.0 ⁴ 62	.0 ⁴ 59	.0 ⁴ 57	.0 ⁴ 54	.0 ⁴ 52	.0 ⁴ 50									
3.9	.0 ⁴ 48	.0 ⁴ 46	.0 ⁴ 44	.0 ⁴ 42	.0 ⁴ 41	.0 ⁴ 39	.0 ⁴ 37	.0 ⁴ 36	.0 ⁴ 34	.0 ⁴ 33									

Upper quantile $z_{[P]}$ for normal distribution $N(0,1)$

Kuantil atas $z_{[P]}$ bagi taburan normal $N(0,1)$

<i>P</i>	<i>Q</i>	<i>z</i>	<i>P</i>	<i>Q</i>	<i>z</i>	<i>P</i>	<i>Q</i>	<i>z</i>	<i>P</i>	<i>Q</i>	<i>z</i>	<i>Q</i>	<i>z</i>
.50	.50	0.000	.85	.15	1.036	.975	.025	1.960	.990	.010	2.326	0 ³ 4	3.353
.55	.45	0.126	.86	.14	1.080	.976	.024	1.977	.991	.009	2.366	0 ³ 3	3.432
.60	.40	0.253	.87	.13	1.126	.977	.023	1.995	.992	.008	2.409	0 ³ 2	3.540
.65	.35	0.385	.88	.12	1.175	.978	.022	2.014	.993	.007	2.457	0 ³ 1	3.719
.70	.30	0.524	.89	.11	1.227	.979	.021	2.034	.994	.006	2.512	0 ⁴ 5	3.891
.75	.25	0.674	.90	.10	1.282	.980	.020	2.054	.995	.005	2.576	0 ⁴ 1	4.265
.76	.24	0.706	.91	.09	1.341	.981	.019	2.075	.996	.004	2.652	0 ⁵ 5	4.417
.77	.23	0.739	.92	.08	1.405	.982	.018	2.097	.997	.003	2.748	0 ⁵ 1	4.753
.78	.22	0.772	.93	.07	1.476	.983	.017	2.120	.998	.002	2.878	0 ⁶ 5	4.892
.79	.21	0.806	.94	.06	1.555	.984	.016	2.144	.999	.001	3.090	0 ⁶ 1	5.199
.80	.20	0.842	.950	.050	1.645	.985	.015	2.170	.9991	.0 ³ 9	3.121	0 ⁷ 5	5.327
.81	.19	0.878	.955	.045	1.695	.986	.014	2.197	.9992	.0 ³ 8	3.156	0 ⁷ 1	5.612
.82	.18	0.915	.960	.040	1.751	.987	.013	2.226	.9993	.0 ³ 7	3.195	0 ⁸ 5	5.731
.83	.17	0.954	.965	.035	1.812	.988	.012	2.257	.9994	.0 ³ 6	3.239	0 ⁸ 1	5.998
.84	.16	0.994	.970	.030	1.881	.989	.011	2.290	.9995	.0 ³ 5	3.291	0 ⁹ 5	6.109

Probability density $\phi(z)$ for normal distribution $N(0,1)$

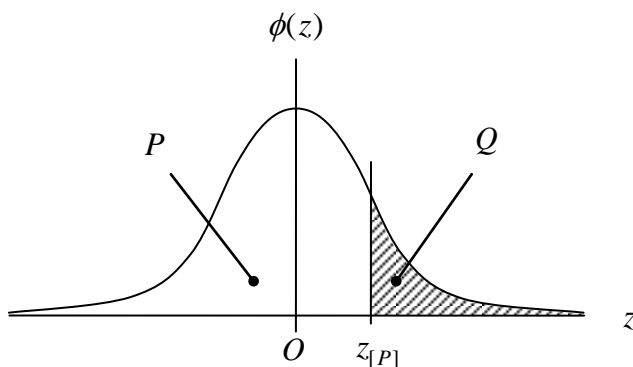
Ketumpatan kebarangkalian $\phi(z)$ bagi taburan normal $N(0,1)$

<i>z</i>	0	1	2	3	4	5	6	7	8	9
0.	0.399	.397	.391	.381	.368	.352	.333	.312	.290	.266
1.	0.242	.218	.194	.171	.150	.130	.111	.094	.079	.066
2.	0.0540	.0440	.0355	.0283	.0224	.0175	.0136	.0104	.0079	.0060
3.	0.0 ² 443	.0 ² 327	.0 ² 238	.0 ² 172	.0 ² 123	.0 ³ 87	.0 ³ 61	.0 ³ 42	.0 ³ 29	.0 ³ 20
4.	0.0 ³ 134	.0 ⁴ 89	.0 ⁴ 59	.0 ⁴ 39	.0 ⁴ 25	.0 ⁴ 16	.0 ⁴ 10	.0 ⁵ 64	.0 ⁵ 40	.0 ⁵ 24

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

$$Q(z_{[P]}) = \int_{z_{[P]}}^{\infty} \phi(u) du$$

$$P = 1 - Q$$



Modul Peningkatan Prestasi Matematik Tambahan (Kertas 1)
SPM 2015 Zon B Kuching Sarawak

Question	Solution and Answer Scheme	Sub-Mk	Full Mk
1 (a)	Many to one // <i>Banyak kepada satu</i>	1	
(b)	$\{a, b, d\}$	1	2
2 (a)	$-\frac{5}{2}$	1	
(b)	$\frac{5x}{3-2x}, x \neq \frac{3}{2}$ <u>or</u> equivalent $3w = x(2w+5)$ <u>or</u> equivalent (attempting inverse operation to express g^{-1})	2 B1	3
3 (a)	RM 31.20 (<u>Note:</u> Do not accept the final answer without RM) $x = 33$	2 B1	
(b)	7 $f(x) \geq 0$ <u>or</u> $f(x) = 0$ (<u>Note:</u> Do not accept wrong inequality)	2 B1	4
4	$p = -\frac{9}{2}, q = 4$ $p = -\frac{9}{2}$ <u>or</u> $q = 4$ $(5)^2 + (2p+1)(5) + 15 = 0$ (Substitute the root into the equation) <u>or</u> $5 + (q-1) = -\frac{2p+1}{1}$ <u>or</u> $5(q-1) = \frac{15}{1}$ (Use SOR or POR)	3 B2 B1	3
5 (a)	$p = -2$ $q = 4$	1 1	
(b)	(0,8)	1	3
6	$-2 < k < \frac{2}{3}$ $-(3k-2)(k+2) > 0$ <u>or</u> equivalent <u>or</u> the roots -2 and $\frac{2}{3}$ are identified $(2-k)^2 - 4(1)(k^2) > 0$ (Substitution into discriminant correctly) $x^2 + (2-k)x + k^2 = 0$ (General form)	4 B3 B2 B1	4
7	3^{2n+3} $\frac{3^{4n+2} \times 3^{4n}}{3^{6n-1}}$ (Change to the same base)	2 B1	2

8 (a)	$x = 4, 12$ $x^2 - 16x + 48 = 0$ (Quadratic equation in general form) $\log_2 x^2 = \log_2 16(x - 3)$ (use product law) <u>or</u> $\log_2 \left(\frac{x^2}{x - 3} \right) = 4$ (use quotient law)	3 B2 B1	3 3
9 (a) (b)	$2r$ $\frac{3s + 2 - 3r}{2r}$ $\frac{\log_n 64n^2}{\log_n 9} - \frac{\log_n 27}{\log_n 9}$ (Change to same base and use product law / quotient law) $\frac{\log_n \frac{64n^2}{27}}{\log_n 9}$ (Change to same base) <u>or</u> $\log_9 64n^2 - \log_9 27$ (Use product law / quotient law)	1 3 B2 B1	4 4
10	$(3, 4)$ $x = 3$ <u>and</u> $y = 4$ $\frac{2(-2) + 3x}{5} = 1$ <u>or</u> $\frac{2(-1) + 3y}{5} = 2$	3 B2 B1	3 3
11	$m = 10$ <u>and</u> $n = 12$ $m = 10$ <u>or</u> $n = 12$ $\frac{2 + 5 + 7 + 9 + 11 + m + n}{7} = 8$ (Mean formula)	3 B2 B1	3 3
12	$20.44 \sim 20.46$ $\frac{81 \tan 56^\circ}{2} - \frac{63}{5}(3.142)$ <u>or</u> $\frac{1}{2}(13.34)(9) - \frac{1}{2}(9)^2(0.9775)$ <u>or</u> equivalent $\frac{1}{2}(9)^2(\tan 56^\circ)$ <u>or</u> $\frac{1}{2}(13.34)(9)$ <u>or</u> equivalent (Area of triangle ABC) <u>or</u> $\frac{1}{2}(9)^2 \left(56^\circ \times \frac{\pi}{180^\circ} \right)$ <u>or</u> $\frac{1}{2}(9)^2(0.9775)$ <u>or</u> equivalent (Area of sector ABD , accept in terms of π) $BC = 13.34$ <u>or</u> $\tan 56^\circ = \frac{BC}{9}$ <u>or</u> $56^\circ = \frac{14}{45}\pi$ rad <u>or</u> 0.9775 rad <u>or</u> equivalent	4 B3 B2 B1	4 4
13	-24 $\frac{x}{12} = \frac{-6}{3}$ <u>or</u> $r = -2$	2 B1	2 2

14	<p>6</p> <p>$r = 3$ <u>or</u> $a = \frac{2}{3}$</p> <p>$\frac{ar^6}{ar^3} = \frac{486}{18}$ <u>or</u> equivalent (attempt to solve simultaneous equations)</p>	3 B2 B1	3
15	<p>XYZ Company</p> <p>$S_5 = \frac{11400(1.05^5 - 1)}{1.05 - 1}$ <u>or</u> $\frac{10800(1.09^5 - 1)}{1.09 - 1}$</p> <p>(attempt to calculate sum of 5 years salary offered by either company)</p> <p>RM 19 390 <u>or</u> RM 19 391</p> <p>*$S_5 \times \frac{30}{100}$ <u>or</u> equivalent</p>	2 B1 2 B1	4
16	<p>$k = -2$ <u>and</u> $p = 10$</p> <p>$k = -2$ <u>or</u> $p = 10$</p> <p>$(8) = k(1) + p$ <u>and</u> $(2) = k(4) + p$ (Create simultaneous equations)</p> <p><u>or</u> $Y = -2X + 10$ <u>or</u> $\frac{y}{x^2} = -2x + 10$ (Equation of the line of best fit)</p> <p>$\frac{y}{x^2} = kx + p$ (Reduce to linear form)</p> <p><u>or</u> $m = -2$ (Obtain gradient from graph)</p>	4 B3 B2 B1	4
17	<p>$\begin{pmatrix} -2 \\ -12 \end{pmatrix}$ <u>or</u> $-2\vec{i} - 12\vec{j}$</p> <p>$\vec{FG} = 2\vec{OE} - 2\vec{OF}$ (Apply vector laws and concepts)</p> <p><u>or</u> $\vec{OG} = \begin{pmatrix} 1 \\ -11 \end{pmatrix}$ <u>or</u> $\vec{i} - 11\vec{j}$ (Find \vec{OG})</p>	2 B1	2
18	<p>$a = 3$ <u>and</u> $b = -6$</p> <p>$a = 3$ <u>or</u> $b = -6$</p> <p>$\frac{b}{a} = \frac{2}{-1}$ <u>or</u> $\begin{pmatrix} a \\ b \end{pmatrix} = k \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ (Interpret parallel vectors)</p> <p><u>or</u> $\sqrt{a^2 + b^2} = \sqrt{45}$ (Interpret magnitude of vector)</p>	3 B2 B1	3
19	<p>$-\frac{1}{2}$</p> <p>$0 = 4k(3) + 6$ (Substitute $x = 3$ and $\frac{dy}{dx} = 0$ into gradient function)</p> <p>$\frac{dy}{dx} = 4kx + 6$ (Differentiate equation of the curve with respect to x)</p>	3 B2 B1	3

<p>20 (a)</p> <p>$\frac{dy}{dx} = 6x - 4$ (Differentiate equation of the curve with respect to x)</p> <p>(b)</p> <p>0.005</p> <p>$(2.01 - 2) = \left(* \frac{dy}{dx} \right) \times \delta x$ <u>or</u> equivalent</p> <p>(Substitute values into formula of small changes correctly)</p>	<p>2</p> <p>B1</p> <p>2</p> <p>B1</p>	<p>2</p> <p>4</p>
<p>21</p> <p>3</p> <p>$\left[\frac{k}{(2x-5)^3} \right]_1^2 + [x]_1^2 = -1 \frac{8}{9}$ <u>or</u> equivalent (Perform the integration)</p> <p>$\int_1^2 g(x) dx + \int_1^2 1 dx = -1 \frac{8}{9}$ (Apply distributive law)</p>	<p>3</p> <p>B2</p> <p>B1</p>	<p>3</p> <p>3</p>
<p>22</p> <p>$90^\circ, 228.59^\circ, 311.41^\circ$ <u>or</u> $90^\circ, 228^\circ 35', 311^\circ 25'$</p> <p>$\sin x = -\frac{3}{4}, 1$</p> <p>$\operatorname{cosec} x = -\frac{4}{3}, 1$ <u>or</u> $(3 \operatorname{cosec} x + 4)(\operatorname{cosec} x - 1) = 0$</p> <p>(Solve quadratic equation)</p> <p>$3(\operatorname{cosec}^2 x - 1) + \operatorname{cosec} x - 1 = 0$ (Use basic identities)</p>	<p>4</p> <p>B3</p> <p>B2</p> <p>B1</p>	<p>4</p> <p>4</p>
<p>23</p> <p>277 200</p> <p>${}^{12}C_4 \times {}^8C_3 \times {}^5C_2$ <u>or</u> $495 \times 56 \times 10$ <u>or</u> equivalent</p> <p>(Correct combination notations / values and multiplication rule)</p> <p>${}^{12}C_4$ <u>or</u> 8C_3 <u>or</u> 5C_2 <u>or</u> 495 <u>or</u> 56 <u>or</u> 10 <u>or</u> equivalent</p> <p>(Correct combination notations / values only)</p>	<p>3</p> <p>B2</p> <p>B1</p>	<p>3</p> <p>3</p>
<p>24 (a)</p> <p>$\frac{9}{20}$</p> <p>(b)</p> <p>$\frac{9}{20}$</p> <p>$\frac{2}{5} \times \frac{3}{4} + \frac{3}{5} \times \frac{1}{4}$ <u>or</u> equivalent</p> <p>(Sum of product of correct probability fractions)</p>	<p>1</p> <p>2</p> <p>B1</p>	<p>3</p> <p>3</p>
<p>25 (a)</p> <p>0.2053</p> <p>$0.1656 + p + 0.4238 + p = 1$ <u>or</u> $p = \frac{1 - (0.1656 + 0.4238)}{2}$ <u>or</u> equivalent (Use $\sum P(X = x) = 1$)</p> <p>(b)</p> <p>0.8344</p> <p>$1 - P(X = 0)$ <u>or</u> $P(X = 1) + P(X = 2) + P(X = 3)$ <u>or</u> equivalent</p> <p>(Sum the probability of correct events)</p>	<p>2</p> <p>B1</p> <p>2</p> <p>B1</p>	<p>4</p> <p>4</p>

Modul Peningkatan Prestasi Matematik Tambahan (Kertas 2)
SPM 2015 Zon B Kuching Sarawak

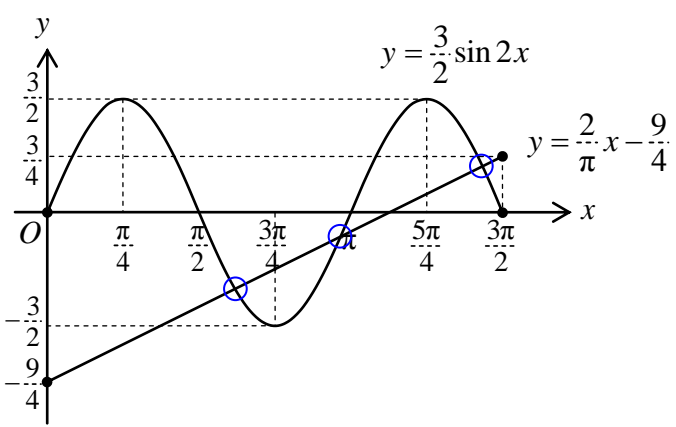
Question	Solution and Answer Scheme	Sub-Mk	Full Mk
1	<p> $y = 3 - x$ <u>or</u> $x = 3 - y$ <u>or</u> equivalent P1 </p> <p style="text-align: center;">Eliminate x or y K1</p> <p> $x^2 + *(3-x)^2 - x*(3-x) = 5$ </p> <p style="text-align: center;"><u>or</u> (respectively)</p> <p> $*(3-y)^2 + y^2 - *(3-y)y = 5$ </p> <p>Solve quadratic equation by: K1</p> <p><u>Quadratic formula</u></p> $x = \frac{-(-9) \pm \sqrt{(-9)^2 - 4(3)(4)}}{2(3)}$ <p style="text-align: center;"><u>or</u> (respectively)</p> $y = \frac{-(-9) \pm \sqrt{(-9)^2 - 4(3)(4)}}{2(3)}$ <p><u>OR</u></p> <p><u>Completing the square</u></p> $\left(x - \frac{9}{2(3)}\right)^2 - \left(\frac{9}{2(3)}\right)^2 + \frac{4}{3} = 0$ <p style="text-align: center;"><u>or</u> (respectively)</p> $\left(y - \frac{9}{2(3)}\right)^2 - \left(\frac{9}{2(3)}\right)^2 + \frac{4}{3} = 0$ <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note:</p> <p>1. If the solutions of x and y are matched wrongly, then SS-1 from full marks.</p> </div>	5	5

Question	Solution and Answer Scheme	Sub-Mk	Full Mk
<p>2 (a)</p>	<p>Use $T_n = ar^{n-1}$ (K1) OR List length of base of each triangle from the first to the fifth</p> <p>$(24)\left(\frac{1}{2}\right)^4$ 24, 12, 6, 3, ...</p> <p>(N1) $\frac{3}{2}$ <u>or</u> $1\frac{1}{2}$ <u>or</u> 1.5</p>	2	
<p>(b)</p>	<p>Find the area of at least three consecutive triangles (P1)</p> <p>384, 96, 24, ...</p> <p>Get at least two ratios of $\frac{*T_n}{*T_{n-1}}$ (K1)</p> <p>$\frac{96}{384}$ <u>or</u> $\frac{24}{96}$ (or equivalent)</p> <p>(N1) $r = \frac{1}{4}$</p>	3	
<p>(c)</p>	<p>Use $S_\infty = \frac{*a}{1-*r}$ (K1)</p> <p>$\frac{384}{1-\frac{1}{4}}$</p> <p>(N1) 512</p>	2	7

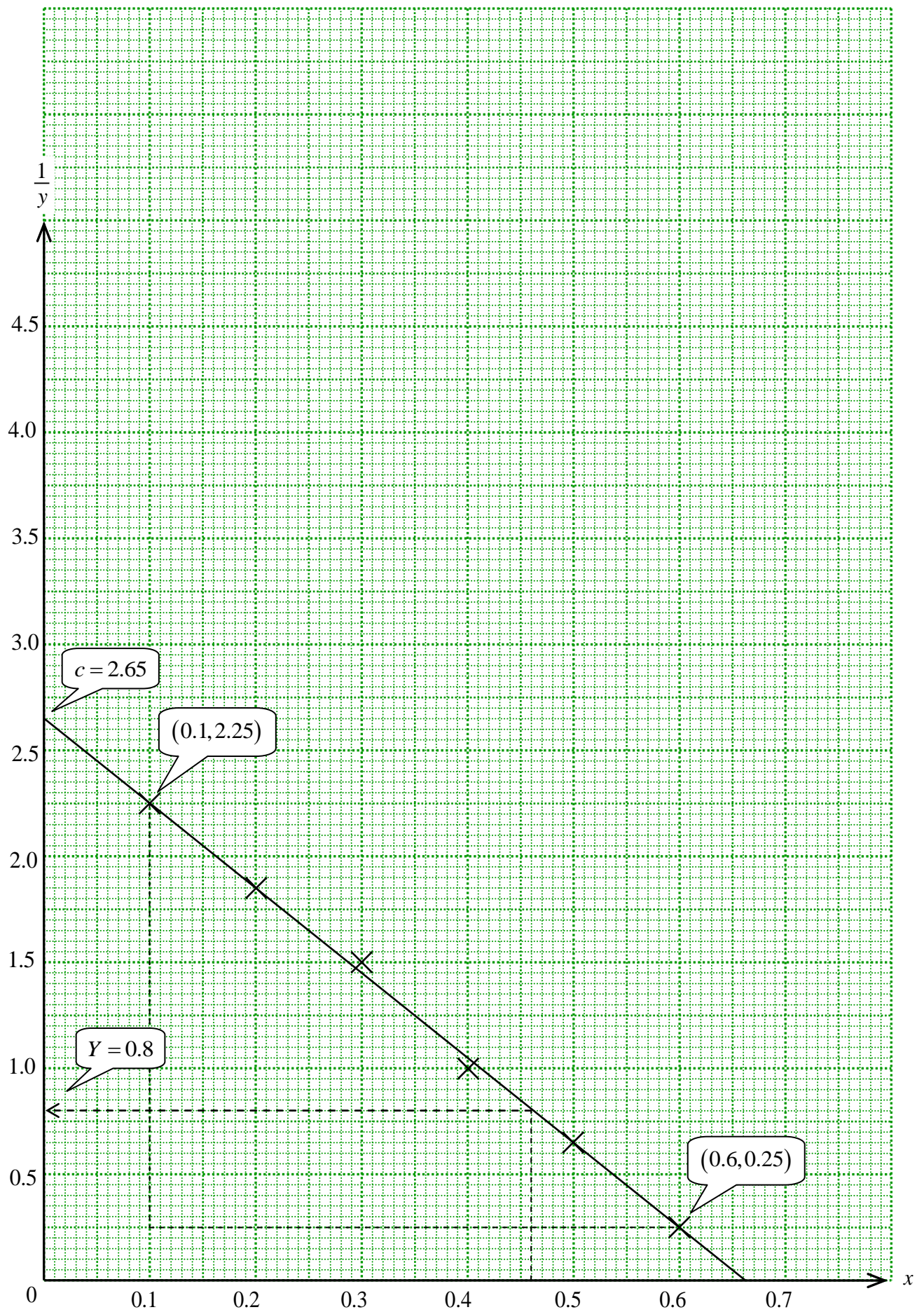
Question	Solution and Answer Scheme	Sub-Mk	Full Mk												
<p>3 (a)</p>	<table border="1" style="display: inline-table; margin-right: 20px;"> <thead> <tr> <th>Score <i>Skor</i></th> <th>Frequency <i>Kekerapan</i></th> </tr> </thead> <tbody> <tr> <td>10 – 14</td> <td>3</td> </tr> <tr> <td>15 – 19</td> <td>7</td> </tr> <tr> <td>20 – 24</td> <td>5</td> </tr> <tr> <td>25 – 29</td> <td>11</td> </tr> <tr> <td>30 – 34</td> <td>4</td> </tr> </tbody> </table> <p style="margin-left: 20px;">I II III IV V</p> <p style="margin-left: 20px;">Score: I to V correct P1</p> <p style="margin-left: 20px;">Frequency: I to V correct P1</p> <p style="margin-left: 20px;">Use $\bar{x} = \frac{\sum *fx}{\sum f}$ K1</p> <p style="margin-left: 20px;">$\frac{*3(12) + *7(17) + *5(22) + *11(27) + *4(32)}{30}$ or $\frac{690}{30}$</p> <p style="margin-left: 20px;">Note: Not \surd if only showing the summed step</p> <p style="margin-left: 20px;">N1 23</p>	Score <i>Skor</i>	Frequency <i>Kekerapan</i>	10 – 14	3	15 – 19	7	20 – 24	5	25 – 29	11	30 – 34	4	4	
Score <i>Skor</i>	Frequency <i>Kekerapan</i>														
10 – 14	3														
15 – 19	7														
20 – 24	5														
25 – 29	11														
30 – 34	4														
	<p>(b)</p> <p style="margin-left: 20px;">Use $m = L + \left(\frac{\frac{1}{2}N - F}{*f_m} \right) C$ K2,1,0</p> <p style="margin-left: 20px;">$19.5 + \left(\frac{\frac{1}{2}(30) - 10}{5} \right) 5$</p> <p style="margin-left: 20px;">N1 24.5</p>	3	7												

Question	Solution and Answer Scheme	Sub-Mk	Full Mk
<p>4 (a)</p>	<p>Substitute the coordinates $A(k,8)$ into equation $y = -2x + 6$</p> $k = -1 \quad \boxed{\text{P1}}$	1	
<p>(b)</p>	<p>Express integration notation with the correct limit \int_a^b (K1)</p> $\int_{-1}^0 (x^2 + 7) dx \quad \underline{\text{or}} \quad \int_{-1}^0 (-2x + 6) dx$ $\underline{\text{or}} \quad \int_6^8 \left(3 - \frac{y}{2}\right) dy \quad \underline{\text{or}} \quad \int_7^8 (y - 7)^{\frac{1}{2}} dy$ <p>Subtract the *integrals (K1)</p> $\int_{-1}^0 (x^2 + 7) dx - \int_{-1}^0 (-2x + 6) dx$ $\underline{\text{or}} \quad \int_6^8 \left(3 - \frac{y}{2}\right) dy - \int_7^8 (y - 7)^{\frac{1}{2}} dy$ <p>Perform integration correctly (K1)</p> $\left[\frac{x^3}{3} + x^2 + x \right]_{-1}^0$ $\underline{\text{or}} \quad \left[3y - \frac{y^2}{4} \right]_6^8 - \left[\frac{(y-7)^{\frac{1}{2}+1}}{\left(\frac{3}{2}\right)(1)} \right]_7^8$ <p><u>or</u> equivalent</p> $\frac{1}{3} \quad \underline{\text{or}} \quad 0.3333 \quad \boxed{\text{N1}}$	4	
<p>(c)</p>	<p>Express integration notation and limit \int_a^b correctly (K1)</p> $\int_7^9 \pi(y - 7) dy$ <p>Perform integration correctly (K1)</p> $\pi \left[\frac{y^2}{2} - 7y \right]_7^9$ <p>$\boxed{\text{N1}} \quad 2\pi$</p>	3	8

Question	Solution and Answer Scheme	Sub-Mk	Full Mk
<p>5 (a)</p> <p>(i)</p> <p>(ii)</p>	<p>Use triangle law (K1)</p> $\vec{LE} = \vec{LM} + \vec{ME}$ <p>or $\vec{EN} = \vec{EM} + \vec{MN}$</p> <p>Replace with parallel vectors of correct scalar coefficient (K1)</p> $\vec{LE} = \vec{LM} + \left(\frac{1}{3}\vec{MK}\right)$ <p>or $\vec{EN} = \left(\frac{1}{3}\vec{KM}\right) + \left(3\vec{LM}\right)$</p> $\vec{LE} = \frac{2}{3}\vec{x} + \frac{1}{3}\vec{z}$ (N1) $\vec{EN} = \frac{10}{3}\vec{x} - \frac{1}{3}\vec{z}$ (N1)	4	
<p>(b)</p>	<p>Express \vec{LF} in terms of \vec{x} and \vec{y} (K1)</p> $\frac{4}{3}\vec{x} + \frac{2}{3}\vec{y}$ <p>Then in terms of \vec{LE} (K1)</p> $\vec{LF} = 2\vec{LE}$ <p>Collinear Segaris (N1)</p>	3	7

Question	Solution and Answer Scheme	Sub-Mk	Full Mk
6 (a)	<p>Sine curve seen P1</p> <p>One and a half cycle in $0 \leq x \leq \frac{3\pi}{2}$ P1</p> <p>Max value = $\frac{3}{2}$, Min value = $-\frac{3}{2}$ P1</p>	3	
6 (b)	<p>$y = \frac{2}{\pi}x - \frac{9}{4}$ OR $\frac{2}{\pi}x - \frac{9}{4} = \frac{3}{2}\sin 2x$ P1</p> <p><u>or equivalent</u></p> <p>Sketching the straight line from the *equation involving x and y. K1</p> <p>Number of solutions = 3 N1</p> <p>Curve and straight line sketched correctly</p> 		3

Question	Solution and Answer Scheme	Sub-Mk	Full Mk														
<p>7</p> <p>(a)</p> <table border="1" data-bbox="347 340 1155 479"> <tr> <td>x</td> <td>0.1</td> <td>0.2</td> <td>0.3</td> <td>0.4</td> <td>0.5</td> <td>0.6</td> </tr> <tr> <td>$\frac{1}{y}$</td> <td>2.2522</td> <td>1.8484</td> <td>1.4903</td> <td>1.0101</td> <td>0.6502</td> <td>0.2501</td> </tr> </table> <p style="text-align: center;"> 2.250 1.850 1.500 1.000 0.650 0.250 </p> <p><u>Note:</u></p> <ol style="list-style-type: none"> In the table, the decimal number being rounded off must not be less precise than the nearest 0.025 for Y. The N mark is given for all correct Y. <p>(b)</p> <p>At least one *point correct using correct axes ($\frac{1}{y}$ against x) in correct direction and orientation, and with uniform scales</p> <p style="text-align: center;">All 6 *points plotted accordingly</p> <p style="text-align: right;">Line of best fit</p> <p>(c)</p> <p>(i)</p> <p>$\frac{1}{y} = 0.8$ (K1)</p> <p>$y = 1.25$ (N1)</p> <p>(ii)</p> <p>$\frac{1}{y} = \frac{b}{a}x + \frac{2}{a}$ (P1)</p> <p>(iii)</p> <p>(or equivalent)</p> <p style="text-align: center;">$*m = \frac{*Y_2 - *Y_1}{*X_2 - *X_1}$ or $*c = 2.65$ (K1)</p> <p>$a = 0.75 \sim 0.76$ (N1) $b = 3.00 \sim 3.05$ (N1)</p> <p><u>Notes:</u></p> <ol style="list-style-type: none"> Graph can only be read with precision until half of the smallest grid division. Do not accept readings obtained by calculation or from the wrong graph. SS-1 from full marks if not using the given scale. 	x	0.1	0.2	0.3	0.4	0.5	0.6	$\frac{1}{y}$	2.2522	1.8484	1.4903	1.0101	0.6502	0.2501	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 2px;">N1</div> <div style="border: 1px solid black; padding: 2px;">1</div> </div> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 100px;"> <div style="border: 1px solid black; padding: 2px;">K1</div> <div style="border: 1px solid black; padding: 2px;">3</div> </div> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 100px;"> <div style="border: 1px solid black; padding: 2px;">K1</div> <div style="border: 1px solid black; padding: 2px;">6</div> </div> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 100px;"> <div style="border: 1px solid black; padding: 2px;">N1</div> <div style="border: 1px solid black; padding: 2px;">10</div> </div>		
x	0.1	0.2	0.3	0.4	0.5	0.6											
$\frac{1}{y}$	2.2522	1.8484	1.4903	1.0101	0.6502	0.2501											



Question	Solution and Answer Scheme	Sub-Mk	Full Mk
<p>8 (a)</p>	<p>Imply that $\angle POR = 120^\circ$ P1 (or other reasoning)</p> <p>Convert *angle to radian K1</p> $120 \times \frac{\pi}{180}$ <div style="text-align: right; margin-right: 50px;"> N1 $\frac{2}{3}\pi$ </div>	3	
<p>(b)</p>	<p>Length of radius of sector $OACB$ K1</p> $\cos 60^\circ = \frac{7 \text{ cm}}{OA}$ $OA = 14 \text{ cm}$ <p>Use $s = *r * \theta$ K1</p> $(14) \left(\frac{2}{3} \pi \right)$ <div style="text-align: right; margin-right: 50px;"> N1 29.32 ~ 29.33 </div>	3	
<p>(c)</p>	<p>Use $\frac{1}{2} * r^2 * \theta$ to find area of sector $OACB$ K1</p> $\frac{1}{2} (*14)^2 \left(\frac{2}{3} \pi \right)$ $= 205.2773$ <p>Area of shaded region K1</p> <p>*A($\square OACB$) - *A($\triangle OAB$)</p> <div style="text-align: right; margin-right: 50px;"> N1 120.4 </div> <div style="margin-left: 200px;"> <p>Use $\frac{1}{2} * a * b \sin * C$ to find area of $\square OAB$ K1</p> $\frac{1}{2} (14)(14) \sin (120^\circ)$ <p>(or equivalent)</p> $= 84.8705$ </div>	4	10

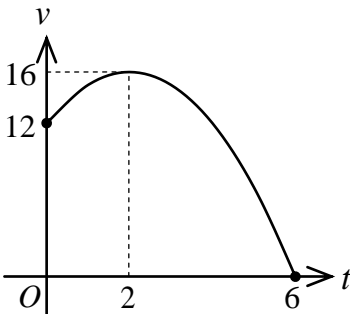
Question	Solution and Answer Scheme	Sub-Mk	Full Mk
<p>9 (a)</p>	<p>Imply gradient of parallel line CD (P1)</p> $y = \frac{2}{3}x + \frac{2}{3} \quad \text{or} \quad m_{CD} = \frac{2}{3}$ <p>Use $m_{AB} = *m_{CD}$ (K1)</p> $\frac{0 - (-1)}{h - 4} = \frac{2}{3}$ <p>(or equivalent)</p> $\frac{11}{2} \quad \text{or} \quad 5\frac{1}{2} \quad \text{or} \quad 5.5 \quad \text{(N1)}$	3	
<p>(b)</p>	<p>Use $m_{AD} = \frac{-1}{*m_{CD}}$ (K1) or use $y - y_A = -\frac{1}{*m_{CD}}(x - x_A)$</p> $m_{AD} = -\frac{3}{2}$ $y - (-1) = -\frac{3}{2}(x - 4)$ <p>(N1) $y = -\frac{3}{2}x + 5$</p>	2	
<p>(c)</p>	<p>Use segment divider formula (K2,1,0)</p> $(3,5) = \left(\frac{2x_D + 1(7)}{3}, \frac{2y_D + 1(9)}{3} \right)$ <p>(or equivalent)</p> <p>(N1) (1,3)</p>	3	
<p>(d)</p>	<p>Use distance formula (K1)</p> $\sqrt{(x-4)^2 + (y-(-1))^2} = \sqrt{(x-7)^2 + (y-9)^2}$ <p>(or equivalent)</p> $6x + 20y - 113 = 0 \quad \text{(N1)}$	2	10

Question	Solution and Answer Scheme	Sub-Mk	Full Mk
<p>10 (a)</p>	<p>Differentiate the equation of the curve with respect to x (K1)</p> $\frac{dy}{dx} = 3x^2 - 12x + 9$ <p>Substitute $x = 2$ into the *gradient function (K1)</p> $m_t = 3(2)^2 - 12(2) + 9$ <p style="text-align: right;">-3 (N1)</p>	3	
<p>(b)</p>	<p>Imply gradient of normal (P1)</p> $m_n \times m_t = -1$ $m_n = \frac{1}{3}$ <p>Equation of normal (K1)</p> $y - 3 = m_n(x - 2)$ <p>(N1) $y = \frac{1}{3}x + \frac{7}{3}$ or $\frac{y}{\left(\frac{7}{3}\right)} - \frac{x}{7} = 1$</p> <p>or $3y - x - 7 = 0$ (or equivalent, integer coefficients)</p>	3	
<p>(c)</p>	<p>Solve quadratic equation for $\frac{dy}{dx} = 0$ (K1)</p> $0 = 3x^2 - 12x + 9$ $x = 1, x = 3$ <p>(N1) $Q(1,5)$</p> <p>Find second *derivative (K1) OR Use *gradient tables</p> $\frac{d^2y}{dx^2} = 6x - 12$ <p>(N1) Maximum Maksimum</p>	4	10

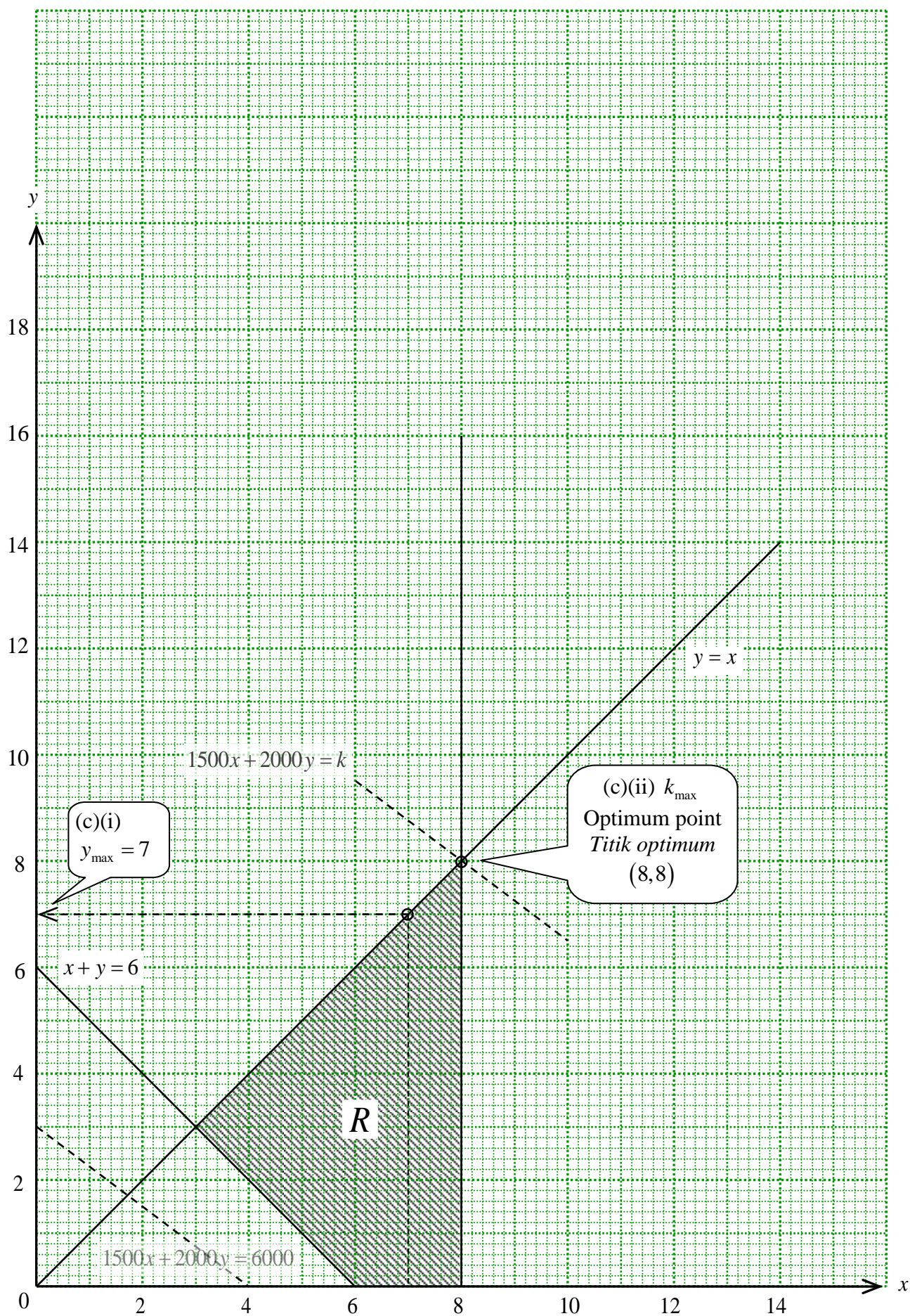
Question	Solution and Answer Scheme	Sub-Mk	Full Mk
<p>11 (a)</p> <p>(i)</p> <p>(ii)</p>	<p>Use $P(X = r) = {}^{10}C_r (0.85)^r (0.15)^{10-r}$</p> <p>${}^{10}C_7 (0.85)^7 (0.15)^3$</p> <p>(or equivalent in (a)(ii))</p> <p>Sum the correct probability</p> <p>$P(X = 8) + P(X = 9) + P(X = 10)$</p>	<p>4</p>	
<p>(b)</p> <p>(i)</p> <p>(ii)</p>	<p>Correct inequality for probability notation</p> <p>$P(X > 60)$</p> <p>Correct probability notation and value</p> <p>$P(X < k) = \frac{240}{800}$</p>		

Question	Solution and Answer Scheme	Sub-Mk	Full Mk
<p>12 (a)</p>	<p>(K1) Use cosine rule $10^2 = 7^2 + 5^2 - 2(7)(5)\cos \angle ADB$ (or equivalent)</p> <p>(N1) $111^\circ 48'$ or 111.80°</p>	2	
<p>(b)</p>	<p>Angles in straight line ADC (P1) $\angle BDC + \angle BDA = 180^\circ$ $\angle BDC = 68^\circ 12'$</p> <p>(K1) Use sine rule $\frac{BC}{\sin \angle BDC} = \frac{5}{\sin 54^\circ}$</p> <p>5.738 ~ 5.74 (N1)</p>	3	
<p>(c)</p>	<p>Interior angles in $\triangle BDC$ (P1) or Use sine rule $\angle CBD + \angle BDC + 54^\circ = 180^\circ$ $\angle CBD = 57^\circ 48'$</p> <p>Sum measurements (K1) $AC = 7 + DC$</p> <p>OR Use cosine rule $\frac{DC}{\sin \angle CBD} = \frac{5}{\sin 54^\circ}$ $DC = 5.230$</p> <p>(N1) 12.23</p>	3	
<p>(d)</p>	<p>Use formula of area of triangle (K1) $\frac{1}{2}(*AC)(*BC)\sin 54^\circ$ $\frac{1}{2}(12.23)(5.738)\sin 54^\circ$ (or equivalent)</p> <p>(N1) 28.39 ~ 28.40</p>	2	10

Question	Solution and Answer Scheme	Sub-Mk	Full Mk
<p>13 (a)</p>	<p>Use $I = \frac{Q_1}{Q_0} \times 100$ (K1)</p> $u = \frac{10.4}{8} \times 100$ <p>(N1) 130</p>	2	
<p>(b) (i)</p>	<p>(K2,1,0) Use $\bar{I} = \frac{\sum W_i I_i}{\sum W_i}$</p> $120 = \frac{4(115) + w(*u) + (2w+1)(114) + 1(150)}{4 + w + (2w+1) + 1}$ $120 = \frac{724 + 358w}{3w + 6}$ <p>Note: Not \surd if only showing the summed step</p> <p>(N1) 2</p>		
<p>(ii)</p>	<p>Use $I = \frac{Q_1}{Q_0} \times 100$ (K1)</p> $120 = \frac{1800}{Q_{12}} \times 100$ <p>(N1) RM 1 500</p>	5	
<p>(c)</p>	<p>Imply composite index in 2015 based on 2012 (P1)</p> $\bar{I}_{15/12} = 135$ <p>Apply chain rule involving three index numbers (K1)</p> $\frac{120 \times \bar{I}_{15/14}}{* \bar{I}_{15/12}} = 100 \quad (\text{or equivalent})$ <p>112.5 (N1)</p>	3	10

Question	Solution and Answer Scheme	Sub-Mk	Full Mk
<p>14 (a) (i)</p> <p>(ii)</p> <p>(iii)</p>	<p>$v_0 = 12$ P1</p> <p>Quadratic inequality in terms of t from velocity function K1</p> <p>$12 + 4t - t^2 > 0$ (or equivalent)</p> <p>$0 \leq t < 6$ N1</p> <p>Get acceleration function to be zero K1 OR Complete the square of velocity function</p> <p>$4 - 2t = 0$</p> <p>$v = -[(t - 2)^2 - (-2)^2] + 12$</p> <p>$v_{\max} = 16$ N1</p>	<p>5</p>	<p></p>
<p>(b)</p>	<p>Parabolic shape \cap P1</p> <p>Curve passes through any two points: P1</p> <p>$(0, *v_0)$, $(*t_{(a)(iii)}, *v_{\max})$ <u>OR</u> $(6, *v_6)$</p> <p><i>Note: Ignore part(s) of the curve outside the range of t</i></p> 	<p>2</p>	<p></p>
<p>(c)</p>	<p>Integrate velocity function w.r.t. t K1</p> <p>$\int_0^6 v \, dt = \left[12t + 2t^2 - \frac{t^3}{3} \right]_0^6$</p> <p>Substitute the limit values into the *integral K1</p> <p>$\left(12(6) + 2(6)^2 - \frac{(6)^3}{3} \right) - 0$</p> <p>N1 72</p>	<p>3</p>	<p>10</p>

Question	Solution and Answer Scheme	Sub-Mk	Full Mk
<p>15 (a)</p>	<p>$x \leq 8$ N1</p> <p>$x + y \geq 6$ N1</p> <p>$y \leq x$ N1</p>	3	
<p>(b)</p>	<p>At least one straight line correct from the *inequalities involving x and y K1</p> <p>Draw all three lines correctly from the *inequalities K1</p> <p><u>Note:</u> Accept dashed lines</p> <p>Shade the correct region N1</p>		
<p>(c) (i)</p>	<p>Project from $x = 7$ in the region *R to find y_{\max} K1</p> <p>N1 $y_{\max} = 7$</p>		
<p>(ii)</p>	<p>Use $1500x + 2000y$ to find the point in the region *R K1</p> <p>$1500x + 2000y = k$</p> <p>N1 $k_{\max} = \text{RM } 28\,000$</p>	4	10
	<p>Notes:</p> <ol style="list-style-type: none"> For (c)(i) and (c)(ii), accept the coordinates only if they are integers. SS-1 if <ul style="list-style-type: none"> in (a), symbol "<", ">" is used instead of "\leq", "\geq" <u>or</u> more than three inequalities are given (except $x \geq 0$ or $y \geq 0$) <p><u>OR</u></p> <p>in (b), not using the given scale <u>or</u> axes are reversed <u>or</u> not using graph paper</p>		



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