BAHAN KECEMERLANGAN
SPM 2015

BK 1

MATEMATIK TAMBAHAN
KERTAS 1

NAMA : .....

KELAS : .....

DIBIAYAI OLEH
KERAJAAN NEGERI TERENGGANU

BAHAN KECEMERLANGAN
BK 1
TINGKATAN 5

NAMA : .....

TINGKATAN : .....

ADDITIONAL MATHEMATICS

Kertas 1

Dua jam

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Tulis nombor kad pengenalan dan angka giliran anda pada petak yang disediakan.*
2. *Kertas soalan ini adalah dalam dwibahasa.*
3. *Soalan dalam bahasa Inggeris mendahului soalan yang sepadan dalam bahasa Melayu.*
4. *Pelajar dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam bahasa Inggeris atau bahasa Melayu.*
5. *Calon dikehendaki membaca maklumat di halaman belakang kertas soalan ini.*

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

Kertas soalan ini mengandungi 21 halaman bercetak.

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

CALCULUS / KALKULUS

1. $y = uv$

   $\dfrac{dy}{dx} = u\dfrac{dv}{dx} + v\dfrac{du}{dx}$

2. $y = \dfrac{u}{v}, \quad \dfrac{dy}{dx} = \dfrac{v\dfrac{du}{dx} - u\dfrac{dv}{dx}}{v^2}$

3. $\dfrac{dy}{dx} = \dfrac{dy}{du} \times \dfrac{du}{dx}$

4. Area under a curve
   Luas di bawah lengkung

   $= \int_a^b y \, dx$ or / *atau*

   $= \int_a^b x \, dy$

5. Volume generated
   Isipadu janaan

   $= \int_a^b \pi y^2 \, dx$ or / *atau*

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

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

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

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

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

12. Mean / *Min* $= np$

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

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

GEOMETRI (GEOMETRY)

1. Distance / *Jarak*

   $= \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

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 segi tiga*

   $\frac{1}{2}\left|(x_1y_2 + x_2y_3 + x_3y_1) - (x_2y_1 + x_3y_2 + x_1y_3)\right|$

5. $|\mathbf{r}| = \sqrt{x^2 + y^2}$

6. $\hat{r} = \frac{x\mathbf{i} + y\mathbf{j}}{\sqrt{x^2 + y^2}}$

TRIGONOMETRY / TRIGONOMETRI

1. Arc length, $s = r\theta$

   Panjang lengkok, $s = j\theta$

2. Area of sector $= \frac{1}{2} r^2\theta$

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

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

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

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 segi tiga*

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

For examiner's use only

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

1 Diagram 1 shows the relation between set A and set B in the arrow diagram form.
Rajah 1 *menunjukkan hubungan antara set A dan set B dalam bentuk rajah anak panah.*

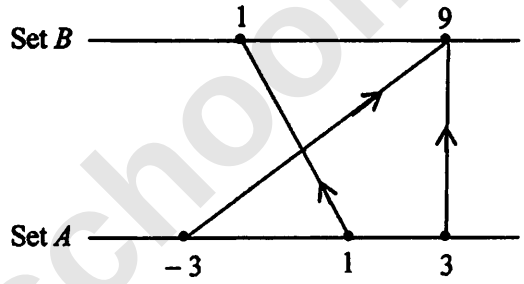


Diagram 1 / *Rajah* 1

(*a*) Represent the relation in the form of ordered pairs.
Wakilkan hubungan itu dalam bentuk pasangan tertib.

(*b*) State the domain of the relation.
Nyatakan domain hubungan itu.

[2 *marks*]
[2 *markah*]

Answer/*Jawapan* :

(*a*)

(*b*)

1
2

For examiner's use only

2 Diagram 2 shows the function $f: x \to x - 3m$, where m is a constant.
Rajah 2 menunjukkan suatu fungsi $f: x \to x - 3m$, *dengan keadaan m ialah pemalar.*

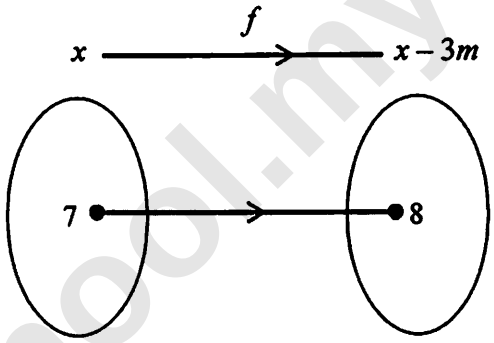


Diagram 2 / *Rajah* 2

Find the value of m. [2 *marks*]
Cari nilai m. [2 *markah*]

Answer / *Jawapan* :

2
2

---

3 Given that $h: x \to 3 - \frac{x}{2}$, find $h^{-1}(x)$. [2 *marks*]
Diberi fungsi $h: x \to 3 - \frac{x}{2}$, *cari* $h^{-1}(x)$. [2 *markah*]

Answer/*Jawapan* :

3
2

For examiner use only

4 Diagram 4 shows the graph of the quadratic function $f(x) = (x-2)^2 - 25$.
Rajah 4 menunjukkan graf fungsi kuadratik $f(x) = (x-2)^2 - 25$.

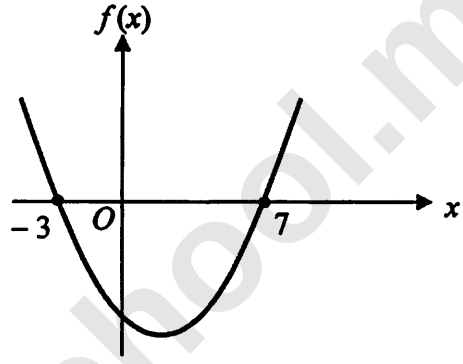


Diagram 4 / *Rajah* 4

State / *Nyatakan*

(*a*) the coordinates of the minimum point of the curve.
koordinat titik minimum bagi lengkung itu.

(*b*) the equation of the axis of symmetry of the curve.
persamaan paksi simetri bagi lengkung itu.

(*c*) the range of values of x when $f(x)$ is negative.
julat nilai x apabila $f(x)$ *ialah negatif.*

[3 *marks*]
[3 *markah*]

Answer / *Jawapan* :

(*a*)

(*b*)

(*c*)

4
3

For examiner's use only

5 Given the quadratic equation $2x^2 + mx - 21 = 0$, where m is a constant, find the value of m if
Diberi persamaan kuadratik $2x^2 + mx - 21 = 0$, *dengan keadaan m ialah pemalar, cari nilai m jika*

(*a*) one of the roots of the equation is 3
satu daripada punca-punca persamaan itu ialah 3.
(*b*) the sum of roots of the equation is – 1.
hasil tambah punca-punca persamaan itu ialah – 1.

[4 *marks*]
[4 *markah*]

Answer/*Jawapan* :

(*a*)

5
4

(*b*)

6 Given the quadratic equation $(1 - a)x^2 - 3x - 2 = 0$ has no roots, find the range of values of a. [2 *marks*]

Diberi persamaan kuadratik $(1 - a)x^2 - 3x - 2 = 0$ *tidak mempunyai punca, cari julat nilai a.* [2 *markah*]

Answer/*Jawapan* :

6
2

For examiner use only

7 Find the range of values of x where $2x \geq (2x-5)(x+3)$. [3 *marks*]
Cari julat nilai x *dengan keadaan* $2x \geq (2x-5)(x+3)$. [3 *markah*]

Answer/*Jawapan* :

7
3

8 Given $\log_k 9 = 2$, find the value of
Diberi $\log_k 9 = 2$, *cari nilai*

(*a*) k

(*b*) $\log_9\left(\frac{1}{k}\right)$

[4 *marks*]
[4 *markah*]

Answer / *Jawapan*:

(*a*)

(*b*)

8
4

For examiner's use only

9 Solve the equation / *Selesaikan persamaan*

$$\log_9\left(18-y^2\right) = \log_3 y$$

[4 *marks*]
[4 *markah*]

Answer/*Jawapan* :

9
4

---

10 It is given the sum of the first n terms of a geometric progression is $S_n = \frac{5}{2}\left(3^n - 1\right)$

Diberi hasil tambah n sebutan pertama suatu janjang geometri ialah $S_n = \frac{5}{2}\left(3^n - 1\right)$.

Find / *Cari*

(*a*) the first term of the progression
sebutan pertama janjang itu

(*b*) the common ratio of the progression
nisbah sepunya janjang itu

[3 *marks*]
[3 *markah*]

Answer / *Jawapan*:

(*a*)

10
3

(*b*)

11 Simplify / *Permudahkan*

$$\frac{(6x^4y^3)^2}{9x^5y},$$

[2 *marks*]
[2 *markah*]

Answer/*Jawapan* :

For examiner's use only

11
2

12 Given that 36, 24, 16 are three consecutive terms in a geometric progression and the fifth term is 16. Find
Diberi 36, 24, 16 *adalah tiga sebutan berturutan dalam suatu janjang geometri dan* 16 *adalah sebutan yang kelima. Cari*

(*a*) the first term,
sebutan pertama,

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

[4 *marks*]
[4 *markah*]

Answer / *jawapan*:

(*a*)

(*b*)

12
4

For examiner's use only

13 Diagram 13 shows a circle with centre O which is divided into eight sectors.
Rajah 13 *menunjukkan sebuah bulatan dengan pusat O dibahagi kepada lapan sektor.*

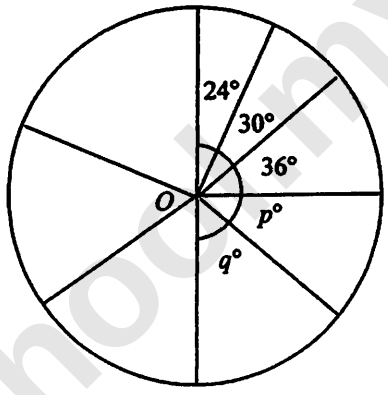


Diagram 13 / *Rajah* 13

The angles of the sectors form a progression with the first term of 24°.
Sudut sektor-sektor itu membentuk suatu janjang dengan sebutan pertama 24°.
State / *Nyatakan*

(*a*) whether the progression is an arithmetic progression or a geometric progression,
sama ada janjang itu suatu janjang aritmetik atau janjang geometri,

(*b*) the value of $p° + q°$,
nilai $p° + q°$

(*c*) the sum of all terms in the progression.
hasil tambah semua sebutan dalam janjang itu.

[3 *marks*]
[3 *markah*]

Answer / *Jawapan*:
(*a*)

13
3

(*b*)

(*c*)

14 The variables x and y are related by the equation $xy = 4x - 2x^3$. Diagram 14 shows the straight line PQ obtained by plotting y against x^2.
Pembolehubah x dan y dihubungkan oleh persamaan $xy = 4x - 2x^3$. *Rajah* 14 *menunjukkan graf garis lurus PQ yang diperoleh dengan memplot y melawan* x^2.

For examiner's use only

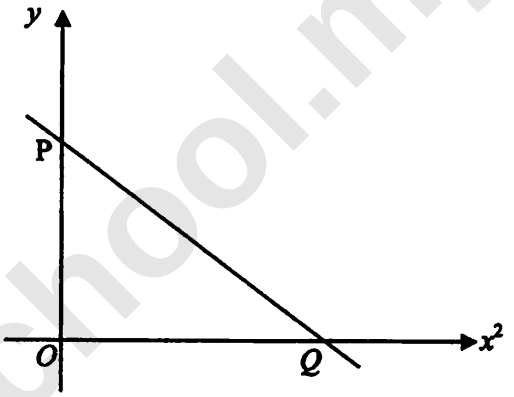


Diagram 14 / *Rajah* 14

(*a*) Express the equation $xy = 4x - 2x^3$ in its linear form used to obtain the straight line graph shown in Diagram 14.
Ungkapkan persamaan $xy = 4x - 2x^3$ *dalam bentuk linear yang digunakan untuk memperoleh graf garis lurus seperti ditunjukkan dalam Rajah* 14.

(*b*) State / *Nyatakan*
(i) the gradient of the straight line PQ.
kecerunan bagi garis lurus PQ.

(ii) the coordinate of P.
koordinat P

[3 *marks*]
[3 *markah*]

Answer / *Jawapan*:
(*a*)

(*b*) (i)

(ii)

14

3

For examiner's use only

15 Diagram 15 shows the straight line PQ with equation $\frac{x}{5}+\frac{y}{7}=1$ intersects the straight line AB at point P.

Rajah 15 *menunjukkan satu garis lurus PQ dengan persamaan* $\frac{x}{5}+\frac{y}{7}=1$ *bersilang dengan garis lurus AB pada titik P.*

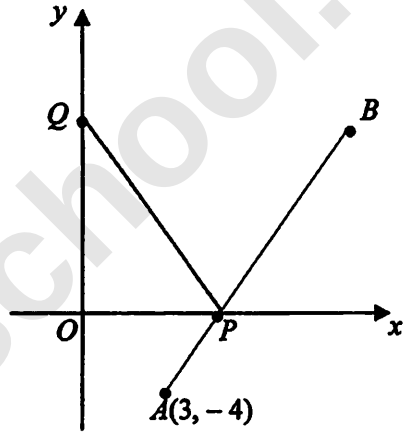


Diagram 15 / *Rajah* 15

(*a*) State the y-intercept of PQ,
Nyatakan pintasan-y bagi PQ,

(*b*) Find the coordinates of B if $BP = 2PA$.
Cari koordinat B jika $BP = 2PA$.

[3 *marks*]
[3 *markah*]

Answer / *Jawapan*:

(*a*)

(*b*)

15

3

For examiner's use only

16 The straight line $y = -3x + 8$ is parallel to the straight line $y = (k + 2)x + 7$, where k is a constant. Determine the value of k. [2 *marks*]

Garis lurus $y = -3x + 8$ *adalah selari dengan garis lurus* $y = (k + 2)x + 7$, *dengan keadaan* k *ialah pemalar. Tentukan nilai* k. [2 *markah*]

Answer / *Jawapan*:

16

2

17 Given $x = t^2 + 3$ and $\frac{dy}{dt} = 14t^3$, find

Diberi $x = t^2 + 3$ *dan* $\frac{dy}{dt} = 14t^3$, *cari*

(*a*) $\frac{dx}{dt}$,

(*b*) $\frac{dy}{dx}$, in terms of x.

$\frac{dy}{dx}$, *dalam sebutan* x.

[4 *marks*]
[4 *markah*]

Answer / *Jawapan*:

(*a*)

(*b*)

17

4

For examiner's use only

18 Diagram 18 shows the straight line graph obtained by plotting $\log_{10} y$ against $\log_{10} x$.
Rajah 18 *menunjukkan graf garis lurus yang didapati dengan memplotkan* $\log_{10} y$ *melawan* $\log_{10} x$.

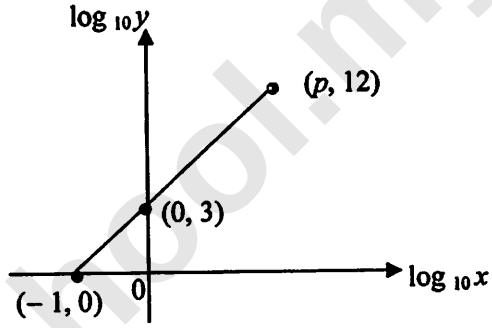


Diagram 18 / *Rajah* 18

(*a*) Calculate the value of *p*.
Hitungkan nilai p.

(*b*) Express *y* in terms of *x*.
Ungkapkan y dalam sebutan x.

[4 *marks*]
[4 *markah*]

Answer / *Jawapan*:

(a)

(b)

18

4

For examiner's use only

19 Due to the high living cost, Siva has planted several types of vegetables for his own consumption on a rectangular shape empty plot of land behind his house. He plans to fence the land which has a dimension of $6x$ m and $(4 - x)$ m.
Find the length, in m, the fence he has to buy when the area of the land is maximum.
[4 *marks*]

Akibat daripada peningkatan kos sara hidup, Siva telah menanam beberapa jenis sayur untuk kegunaan sendiri di kawasan lapang berbentuk segi empat tepat di belakang rumahnya. Dia bercadang untuk memagar kawasan tersebut yang berukuran $6x$ m dan $(4 - x)$ m. Cari panjang, dalam m, pagar yang perlu dia beli apabila luas kawasan itu adalah maksimum.
Cari panjang, dalam m, pagar yang dia perlu dibeli apabila luas kawasan itu adalah maksimum.
[4 *markah*]

Answer / *Jawapan*:

19
4

20 Given the coordinates $P(1, 0)$ and $Q(-3, 2)$. Find the equation of the straight line perpendicular to the straight line PQ and passes through $R(4, 5)$. [3 *marks*]

Diberi koordinat $P(1, 0)$ dan $Q(-3, 2)$. Cari persamaan garis lurus yang berserenjang dengan garis lurus PQ dan melalui titik $R(4, 5)$. [3 *markah*]

Answer / *Jawapan*:

20
3

For examiner's use only

21 Diagram 21 shows two arcs PS and QR, centre O.
Rajah 21 *menunjukkan dua lengkok* PS *dan* QR *berpusat* O.

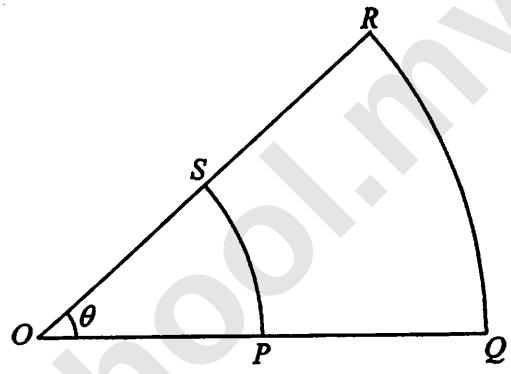


Diagram 21 / *Rajah* 21

Given that $OP = PQ = 5$ cm and the arc length $PS = 4$ cm, find
Diberi $OP = PQ = 5$ *cm dan panjang lengkok* $PS = 4$ *cm, cari*

(*a*) the value of θ in radian,
nilai θ *dalam radian,*

(*b*) the perimeter of $PQRS$.
perimeter $PQRS$.

[4 *marks*]
[4 *markah*]

Answer / *Jawapan*:

(*a*)

(*b*)

21
4

22 Diagram 20 shows part of the front view of a square shape mural art on a wall in a school building. *PT* is an arc of a circle with a centre *Q* and *QT* is an arc of circle with a centre *P*.
Rajah 20 *menunjukkan pandangan hadapan sebahagian lukisan mural berbentuk segi empat sama pada dinding bangunan sekolah. PT adalah lengkok bulatan dengan pusat Q dan QT adalah lengkok bulatan dengan pusat P.*

For examiner's use only

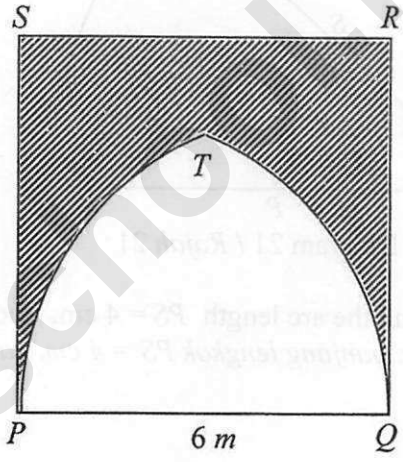


Diagram 20 / *Rajah* 20

The shaded region shows the part that needs to be repainted. Cheng and his friends decided to paint the area with red colour. Calculate the area, in m^2, of the region.
Kawasan berlorek menunjukkan bahagian yang perlu dicat semula. Cheng bersama rakannya bercadang untuk mengecat kawasan itu dengan warna merah. Kira luas, dalam m^2 *, kawasan itu.*

[4 *marks*]
[4 *markah*]

Answer / *Jawapan*:

22
4

For examiner's use only

23 A set of data consists of 9, 2, 7, $x^2 - 1$ and 4. Given the means is 6, find
Suatu set data terdiri daripada 9, 2, 7, $x^2 - 1$ *dan* 4. *Diberi min ialah* 6, *cari*

(*a*) the positive value of x,
nilai positif bagi x

(*b*) the median using the value of x in 21(*a*).
median menggunakan nilai di 21(*a*).

[4 *marks*]
[4 *markah*]

Answer / *Jawapan*:

(*a*)

(*b*)

23 4

24 A set of data with 30 students has mean 65 and standard deviation 6.
Calculate
Suatu set data dengan 30 *pelajar mempunyai markah min* 65 *dan sisihan piawai* 6.
Hitung

(*a*) the sum of the student's mark,
hasil tambah markah calon,
(*b*) the sum of the squares of the student's mark.
hasil tambah kuasa dua markah calon.

[4 *marks*]
[4 *markah*]

Answer / *Jawapan*:

24 4

(*a*)

(*b*)

25 Table 25 shows the scores collected by the participants in a telematch.
Given that the mode score is 3.
Jadual 25 menunjukkan skor yang diperoleh peserta-peserta dalam suatu sukaneka.
Diberi skor mod ialah 3

For examiner's use only

Score / Markah	1	2	3	4	5
No. of participants / Bilangan peserta	0	1	$2+x$	3	2

Table 25 / *Jadual* 25

(*a*) State the minimum value of x.
Nyatakan nilai minimum bagi x.

(*b*) Hence, calculate the mean score.
Seterusnya, hitungkan min skor.

[3 *marks*]
[3 *markah*]

Answer / *Jawapan*:

(*a*)

(*b*)

25

3

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

BAHAN KECEMERLANGAN

SPM 2015

Skema
BK 1

MATEMATIK TAMBAHAN

DIBIAYAI OLEH
KERAJAAN NEGERI TERENGGANU

BAHAN KECEMERLANGAN
BK 1
TINGKATAN 5

ADDITIONAL MATHEMATICS

KERTAS 1

PERATURAN PEMARKAHAN

Peraturan pemarkahan ini mengandungi 7 halaman bercetak.

INSTRUCTIONS FOR EXAMINERS

1. MARKING GUIDE

1.1 Mark all the answers.

1.2 Do not mark working / answer that has been cancelled.

1.3 Answer written in the answer space or at the end of the working is considered the final answer.

1.4 Full mark is given for the correct answer without referring to the working.

1.5 If the final answer is wrong, award the corresponding maximum mark as stated in the marking scheme.

1.6 If more then one final answer is given, choose the answer with the highest mark unless stated otherwise in the marking scheme.

1.7 If the final answer is correct, but stated wrongly in the answer space, full mark is not awarded.

2. NOTATION

2.1 Full mark for each question in this paper is either 2, 3 or 4.

2.2 If full mark is not awarded, the following system is used :

B3 – 3 marks is awarded if the answer at this stage is correct.

B2 – 2 marks is awarded if the answer at this stage is correct.

B1 – 1 mark is awarded if the answer at this stage is correct.

2.3 Only one out of B3, B2 or B1 is awarded for each question or part of a question.

3. Accept answers correct to 4 significant figures unless stated otherwise in the marking scheme.

4. Accept other correct methods which are not given in the marking scheme.

5. Accept answers in Bahasa Melayu.

6. Calculating total marks.

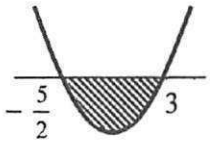
$$\frac{\sum \text{Score for Paper 1} + \sum \text{Score for Paper 2}}{180} \times 100\%$$

BK1 2015

MARK SCHEME FOR ADDITIONAL MATHS. PAPER 1

No.	Mark Scheme		Σ Marks
1	(*a*) $\{(-3,9),(1,1),(3,9)\}$	1	2
	(*b*) $\{-3, 1, 3\}$	1	
2	$m = -\frac{1}{3}$	2	2
	$7 - 3m = 8$	B1	
3	$6 - 2x$	2	2
	$3 - \frac{x}{2} = u$ dan cuba cari x dalam sebutan u	B1	
4	(*a*) $(2, -25)$	1	3
	(*b*) $x = 2$	1	
	(*c*) $-3 < x < 7$	1	
5	(*a*) $m = 1$	2	4
	$2(3)2 + m(3) - 21 = 0$	B1	
	(*b*) $m = 2$	1	
	$-\frac{m}{2} = -1$	B1	
6	$a > \frac{17}{8}$	2	2
	$(-3)^2 - 4(1-a)(-2) < 0$	B1	

[Lihat sebelah

7	$-\frac{5}{2} \le x \le 3$	**3**	**3**
	$(2x+5)(x-3) \le 0$ *or* 	**B2**	
	$x = -\frac{5}{2}$ *and* $x = 3$	**B1**	
8	(*a*) 3	**2**	**4**
	$k^2 = 9$	**B1**	
	(*b*) $-\frac{1}{2}$	**2**	
	$\log_9 1 - \log_9 k$ *or* $0 - \frac{\log_3 3}{\log_3 9}$	**B1**	
9	3	**4**	**4**
	$18 = 2y^2$ *or* $18 - y^2 = y^2$	**B3**	
	$\log_3 (18-y^2) = 2\log_3 y$	**B2**	
	$\frac{\log_3 (18-y^2)}{\log_3 9}$	**B1**	
10	(*a*) 5	**1**	**3**
	(*b*) 3	**2**	
	$S_2 = 20$ *or* $5 + T_2 = 20$	**B1**	
11	$4x^3y^5$	**2**	**2**
	$\frac{36x^8y^6}{9x^5y}$	**B1**	

12	(*a*)	81	**2**	**4**
		$ar^4 = 16$	**B1**	
	(*b*)	243	**2**	
		$\frac{81}{1-\frac{2}{3}}$	**B1**	
13	(*a*)	arithmetic progression	**1**	**3**
	(*b*)	90°	**1**	
	(*c*)	360°	**1**	
14	(*a*)	$y = -2x^2 + 4$	**1**	**3**
	(*b*)	(i) -2	**1**	
		(ii) $P(0,4)$	**1**	
15	(*a*)	7	**1**	**3**
	(*b*)	(9 , 8)	**2**	
		$\frac{(1)(x)+(2)(3)}{3} = 5$ atau $\frac{(1)(y)+(2)(-4)}{3} = 0$	**B1**	
16		-5	**2**	**2**
		$k + 2 = -3$	**B1**	

17	(a) 2t	1	4
	(b) $7x-21$ atau $7(x-3)$	3	
	$14t^3 \times \frac{1}{2t}$	B2	
	$\frac{dt}{dx}=\frac{1}{2t}$	B1	
18	(a) 3	2	4
	$\frac{12-3}{p-0}=3$	B1	
	(b) $y=1000x^3$	2	
	$\log_{10} y = 3\log_{10} x + 3$	B1	
19	28	4	4
	$24-12x=0$ dan $x=2$	B3	
	$\frac{dA}{dx}=24-12x$	B2	
	Luas, $A = 6x(4-x)$ atau Perimeter $= 6x + 6x + (4-x) + (4-x)$	B1	
20	$y=-2x+13$	3	3
	kecerunan serenjang $= -2$	B2	
	kecerunan $PQ=\frac{1}{2}$	B1	
21	(a) 0.8 rad	2	4
	$4=5\theta$	B1	
	(b) 22	2	
	$s_{QR} = (10)(0.8)$	B1	

[Lihat sebelah

22	13.896 // 13.9		**4**	**4**
	Luas segmen = 3.258 ***or*** luas kws tak berlorek = 22.105		**B3**	
	Luas sektor = $\frac{1}{2}(6)^2(1.047)$ ***or*** luas segitiga = $\frac{1}{2}(6)(6)\sin 60$		**B2**	
	60° ***or*** 1.047 rad ***or*** luas $PQRS = 36$		**B1**	
23	(*a*) 3		**2**	**4**
	$\frac{21+x^2}{5} = 6$		**B1**	
	(*b*) 7		**2**	
	Arrangement : 2, 4, 7, 8, 9		**B1**	
24	(*a*) 1950		**2**	**4**
	$\frac{\Sigma x}{30} = 65$		**B1**	
	(*b*) 127830		**2**	
	$36 = \frac{\Sigma x^2}{30} - 65^2$		**B1**	
25	(a) 2		1	**3**
	(b) 3.6		**2**	
	$\frac{1(0)+2(1)+3(4)+4(3)+5(2)}{10}$		**B1**	

END OF MARK SCHEME

BAHAN KECEMERLANGAN
SPM 2015

BK 1

MATEMATIK TAMBAHAN
KERTAS 2

NAMA : .....

KELAS : .....

DIBIAYAI OLEH
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BK 1
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ADDITIONAL MATHEMATICS

Kertas 2

Dua jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Bahan ini adalah dalam dwibahasa*
2. *Bahan dalam bahasa Inggeris mendahului bahan yang sepadan dalam bahasa Melayu.*

Kertas soalan ini mengandungi 18 halaman bercetak.

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

CALCULUS / KALKULUS

1. $y = uv$

   $\dfrac{dy}{dx} = u\dfrac{dv}{dx} + v\dfrac{du}{dx}$

2. $y = \dfrac{u}{v}, \quad \dfrac{dy}{dx} = \dfrac{v\dfrac{du}{dx} - u\dfrac{dv}{dx}}{v^2}$

3. $\dfrac{dy}{dx} = \dfrac{dy}{du} \times \dfrac{du}{dx}$

4. Area under a curve
   Luas di bawah lengkung

   $= \int_a^b y \, dx$ or / *atau*

   $= \int_a^b x \, dy$

5. Volume generated
   Isipadu janaan

   $= \int_a^b \pi y^2 \, dx$ or / *atau*

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

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

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

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

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

12. Mean / *Min* $= np$

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

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

GEOMETRI (GEOMETRY)

1. Distance / *Jarak*

   $= \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

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 segi tiga*

   $\frac{1}{2}\left|(x_1y_2 + x_2y_3 + x_3y_1) - (x_2y_1 + x_3y_2 + x_1y_3)\right|$

5. $|\mathbf{r}| = \sqrt{x^2 + y^2}$

6. $\hat{r} = \frac{x\mathbf{i} + y\mathbf{j}}{\sqrt{x^2 + y^2}}$

TRIGONOMETRY / TRIGONOMETRI

1. Arc length, $s = r\theta$

   Panjang lengkok, $s = j\theta$

2. Area of sector $= \frac{1}{2} r^2\theta$

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

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

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

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 segi tiga*

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

Section A

Bahagian A

[40 *marks*]
[40 *markah*]

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

1 Solve the following simultaneous equations:

Selesaikan persamaan serentak berikut:

$$y - 2x + 1 = 0 \ , \ x^2 - 2y^2 - 3y + 2 = 0$$

Give your answers correct to three decimal places.

Beri jawapan anda betul kepada tiga tempat perpuluhan.

[5 *marks*]
[5 *markah*]

2 It is given that $p = 2^x$ and $q = 2^y$.

Diberi bahawa $p = 2^x$ *dan* $q = 2^y$.

(*a*) Express $\dfrac{8^{x+y}}{4^x}$ in terms of p and q. [3 *marks*]

Ungkapkan $\dfrac{8^{x+y}}{4^x}$ *dalam sebutan p dan q.* [3 *markah*]

(*b*) Find $\log_4 \dfrac{4p^2}{q}$ in terms of x and y. [5 *marks*]

Cari $\log_4 \dfrac{4p^2}{q}$ *dalam sebutan x dan y.* [5 *markah*]

3 In Diagram 3, the function f maps set A to set B and the function g maps set B to set C.
Dalam Rajah 3, *fungsi f memetakan set A kepada set B dan fungsi g memetakan set B kepada set C.*

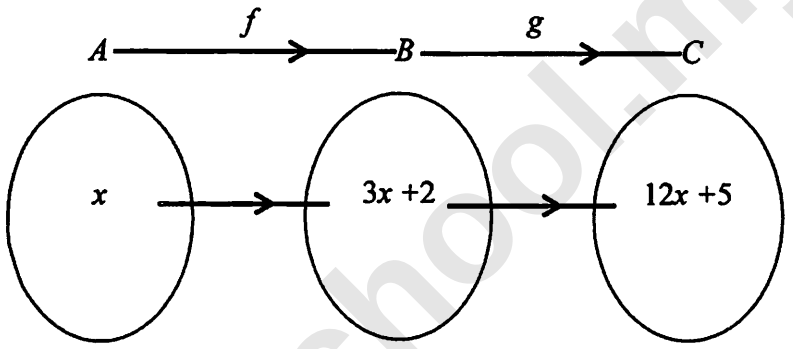


Diagram 3 / *Rajah* 3

Find / *Cari*

(*a*) the function in terms of x,
fungsi dalam sebutan x,

(*i*) which maps set B to set A
yang memetakan set B kepada set A

(*ii*) $g(x)$

[5 *marks*]
[5 *markah*]

(*b*) the value of x such that $fg(x) = 8x + 1$. [2 *marks*]
nilai x dengan keadaan $fg(x) = 8x + 1$. [2 *markah*]

4 (*a*) The variables x and y are increasing such that when $x = -2$, the rate of increase with respect to time of y is twice the rate of increase of x.

Given that $y = kx^2 + 3x$, where k is a constant, find the value of k. [3 *marks*]

Pembolehubah x dan y bertambah dengan keadaan apabila $x = -2$, *kadar pertambahan y terhadap masa adalah dua kali kadar perubahan x.*

Diberi bahawa $y = kx^2 + 3x$ *dengan keadaan k ialah pemalar, cari nilai k.* [3 *markah*]

(*b*) Given that $y = 3x^2 + \frac{2}{x}$, find

Diberi $y = 3x^2 + \frac{2}{x}$, *cari*

(*i*) the value of $\frac{dy}{dx}$ when $x = 2$

nilai $\frac{dy}{dx}$ apabila $x = 2$

(*ii*) the approximate value of y if x increases from 2 to 2·01.

nilai hampir bagi y apabila x menokok dari 2 *kepada* 2·01.

[4 *marks*]

[4 *markah*]

5 It is given that ....., 4374, x, 486, ... is part of a geometric progression with positive terms and the sum of the first **four** terms is 19 440.

Diberi bahawa ....., 4374, x, 486, ... *ialah sebahagian daripada suatu janjang geometri dengan sebutan-sebutan positif dan hasil tambah empat sebutan pertama janjang itu ialah* 19 440.

Find / *Cari*,

(*a*) the common ratio, [3 *marks*]
nisbah sepunya, [3 *markah*]

(*b*) the first term, [2 *marks*]
sebutan pertama, [2 *markah*]

(*c*) the smallest value of n such that the n^{th} term is less than 0.01. [2 *marks*]
nilai n yang terkecil supaya sebutan ke-n adalah kurang daripada 0.01. [2 *markah*]

6 Given that $f(x) = x^2 - 6x - 7 = (x + p)^2 + h$, where h and p are constants.

Diberi bahawa $f(x) = x^2 - 6x - 7 = (x + p)^2 + h$, *di mana h dan p adalah pemalar.*

(*a*) Find / *Cari*

(i) the values of p and of h
nilai p dan nilai h

(ii) the values of x if $f(x) = 0$
nilai-nilai x jika $f(x) = 0$

[3 *marks*]
[3 *markah*]

(*b*) Sketch the graph of $y = f(x)$ and state the range of $f(x)$ with domain $0 \le x \le 6$.
Lakar graf $y = f(x)$ *dan nyatakan julat bagi* $f(x)$ *dengan domain* $0 \le x \le 6$.

[3 *marks*]
[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.

Guna kertas graf untuk menjawab soalan ini.

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

The variables x and y are related by the equation $y = \frac{h}{k^x}$, where h and k are constants.

Jadual 7 menunjukkan nilai-nilai bagi dua pembolehubah, x dan y, yang diperoleh daripada satu eksperimen. Pembolehubah x dan y dihubungkan oleh persamaan $y = \frac{h}{k^x}$, *dengan keadaan p dan k ialah pemalar.*

x	4	6	8	10	12	14
y	2.82	2.05	1.58	1.23	0.89	0.66

Table 7/*Jadual 7*

(a) Based on Table 7, construct a table for the values of $\log_{10} y$. [1 *mark*]

Berdasarkan Jadual 7, bina satu jadual bagi nilai-nilai $\log_{10} y$. [1 *markah*]

(b) Plot $\log_{10} y$ against x, using a scale of 2 cm to 2 units on the x-axis and 2 cm to 0.1 units on the $\log_{10} y$-axis. Hence, draw the line of best fit. [3 *marks*]

Plot $\log_{10} y$ *melawan x, menggunakan skala* 2 cm *kepada* 2 *unit pada paksi- x dan* 2 cm *kepada* 0.1 unit *pada paksi-* $\log_{10} y$. *Seterusnya, lukis garis lurus penyuaian terbaik.* [3 *markah*]

(c) Using the graph in 7(b), find the value of
Menggunakan graf di 7(b), *cari nilai*

(i) y when $x = 2$,
y *apabila* $x = 2$,

(ii) h,

(iii) k. [6 *marks*]

[6 *markah*]

8 (*a*) Diagram 8 is a histogram which represents the distribution of the marks obtained by 40 pupils in a test.

Rajah 8 *di bawah ialah histogram yang mewakili taburan markah bagi* 40 *orang murid dalam suatu ujian.*

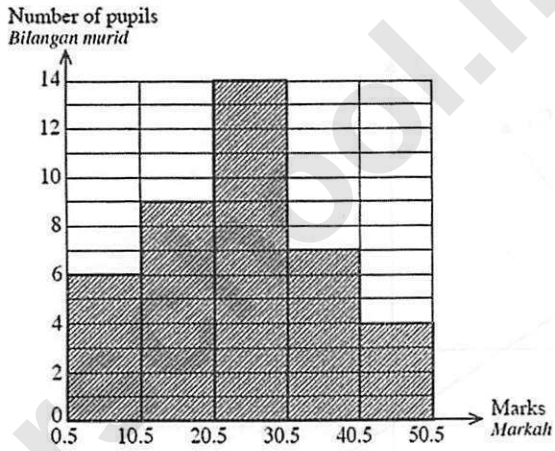


Diagram 8 / *Rajah* 8

(i) Without using an ogive, calculate the median mark. [3 *marks*]

Tanpa menggunakan ogif, hitungkan markah median. [3 *markah*]

(ii) Calculate the standard deviation of the distribution. [5 *marks*]

Hitungkan sisihan piawai bagi taburan markah itu. [5 *markah*]

(*b*) A set of game score x_1 , x_2 , x_3 , x_4 and x_5 has the mean 6 and standard deviation 1·2.

Suatu set skor bagi suatu permainan x_1 , x_2 , x_3 , x_4 *dan* x_5 *mempunyai min* 6 *dan sisihan piawai* 1·2.

If each score is multiplied by 3 and than 2 is added to it, find the mean and variance of the new score.

Jika setiap skor itu didarabkan dengan 3 *dan ditambah dengan* 2, *cari min dan varians bagi set skor yang baru.*

[2 *marks*]

[2 *markah*]

9 Solutions by scale drawing is not accepted.

Penyelesaian secara lukisan berskala tidak diterima.

In Diagram 9, $\angle ABC = 90°$ and the equation of straight line BC is $2y + x + 6 = 0$.

Dalam Rajah 9, $\angle ABC = 90°$ dan persamaan garis lurus BC ialah $2y + x + 6 = 0$.

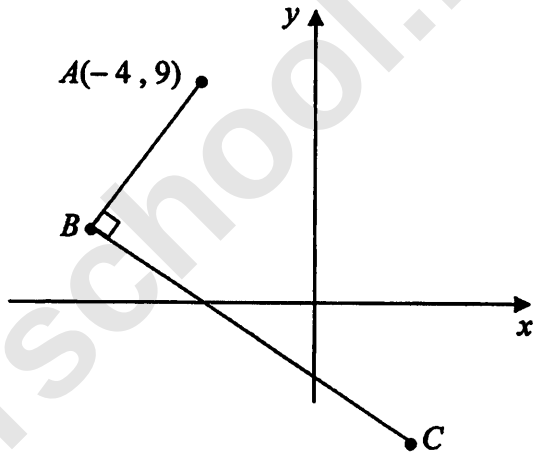


Diagram 9 / *Rajah 9*

(*a*) Find / *Carikan*

(i) the equation of the straight line AB. [2 *marks*]

persamaan garis lurus AB. [2 *markah*]

(ii) the coordinates of B. [3 *marks*]

koordinat B. [3 *markah*]

(*b*) The straight line AB is extended to a point D such that $AB : BD = 2 : 3$.

Find the coordinates of D. [2 *marks*]

Garis lurus AB dipanjangkan ke suatu titik D dengan keadaan $AB : BD = 2 : 3$.

Carikan koordinat D. [2 *markah*]

(*c*) A point P moves such that its distance from point A is always 5 units.

Find the equation of the locus of P. [3 *marks*]

Suatu titik P bergerak dengan keadaan jaraknya dari titik A adalah sentiasa 5 unit. Carikan persamaan lokus bagi P. [3 *markah*]

10 (*a*) Find the equation of tangent to the curve $y = 3x^2 - \frac{1}{x}$ at the point (– 1, 4).

Cari persamaan tangen kepada lengkung $y = 3x^2 - \frac{1}{x}$ *pada titik* (–1, 4).

[3 *marks*]
[3 *markah*]

(*b*) A piece of wire of length 360 cm is used to make a frame in the form of a cuboid. The base of the cuboid has sides measuring x cm by $2x$ cm. The height is h cm.
Seutas dawai dengan panjang 360 *cm digunakan untuk membuat sebuah bingkai berbentuk kuboid. Tapak kuboid itu berukuran* x *cm dan* $2x$ *cm. Tingginya ialah* h *cm.*

(i) Show that the volume of the cuboid, in cm^3, is $V = 180x^2 - 6x^3$.
Tunjukkan bahawa isipadu kuboid itu, dalam cm^3, *diberi oleh* $V = 180x^2 - 6x^3$.

(ii) Find the maximum volume of the cuboid.
Cari isipadu maksimum kuboid itu.

[4 *marks*]
[4 *markah*]

(*c*) Given that $f(x) = \frac{4}{(x-2)^2}$, find $f''(0)$.

Diberi $f(x) = \frac{4}{(x-2)^2}$, *cari* $f''(0)$.

[3 *marks*]
[3 *markah*]

11 Diagram 11 shows a semicircle *PTS*, with centre *O* and radius 8 cm. *QST* is sector of a circle with centre *S* and *R* is the midpoint of *OP*.

Rajah 11 *menunjukkan semi bulatan PTS dengan pusat O dan jejari* 8 cm. *QST ialah sektor sebuah bulatan dengan pusat S dan R ialah titik tengah OP.*

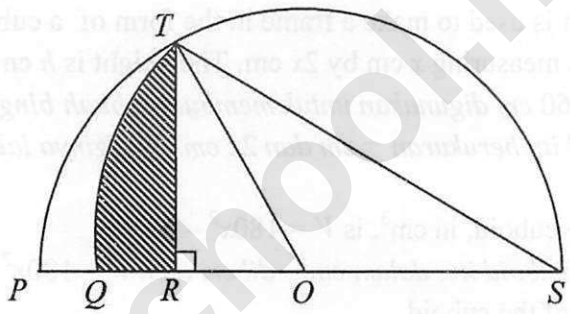


Diagram 11 / *Rajah* 11

[Use /*Guna* $\pi = 3{\cdot}142$]

Calculate / *Hitung*

(*a*) $\angle TOR$, in radians, [2 *marks*]

$\angle TOR$, *dalam radian,* [2 *markah*]

(*b*) the length, in cm, of the arc *TQ*, [4 *marks*]

panjang, dalam cm, *lengkuk TQ,* [4 *markah*]

(*c*) the area, in cm^2, of the shaded region. [4 *marks*]

luas, dalam cm^2, *kawasan berlorek itu.* [4 *markah*]

Section C / *Bahagian* C

[20 *marks* / 20 *markah*]

Answer any **two** question/ *Jawab mana-mana* ***dua*** *soalan*

12 Diagram 12 shows two triangles *ABC* and *BDE*.

Rajah 12 *menunjukkan dua buah segi tiga ABC dan BDE.*

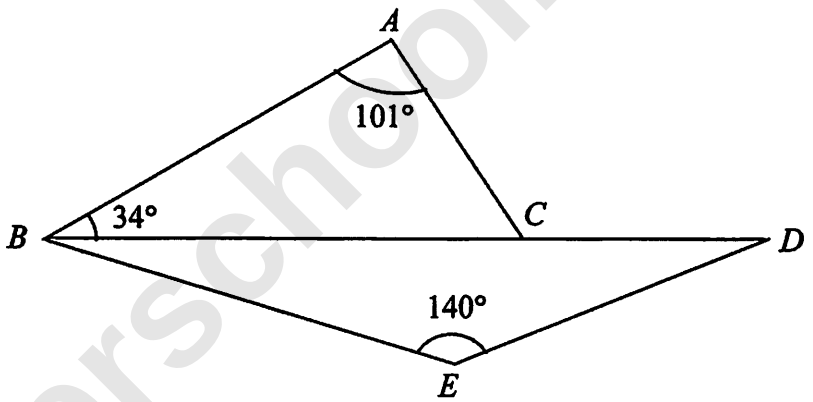


Diagram 12 / *Rajah* 12

It is given that $BE = 8.5$ cm, $DE = 4.6$ cm and $AC = 5.8$ cm.

Diberi bahawa $BE = 8.5$ cm, $DE = 4.6$ cm *dan* $AC = 5.8$ cm.

(*a*) Calculate / *Hitung*

(i) the length, in cm, of *BC*,

panjang, dalam cm, *bagi BC.*

(ii) the length, in cm, of *CD*.

panjang, dalam cm, *bagi CD.*

(iii) the area, in cm^2, of ΔABC.

luas, dalam cm^2, *bagi* ΔABC. [8 marks]

[8 *markah*]

(b) (i) Sketch a $\Delta A'B'C'$ which has a different shape from ΔABC such that $A'B' = AB$, $A'C' = AC$ and $\angle A'B'C' = \angle ABC$.

Lakarkan sebuah $\Delta A'B'C'$ *yang mempunyai bentuk yang berbeza dari* ΔABC *dengan keadaan* $A'B' = AB$, $A'C' = AC$ *dan* $\angle A'B'C' = \angle ABC$.

(ii) Hence, state the size of $\angle B'A'C'$

Seterusnya, nyatakan saiz $\angle B'A'C'$ [2 *marks*]

[2 *markah*]

13 Table 13 shows the price indices and the weightages of four ingredients, *P*, *Q*, *R* and *S*, used in the making of a cake. The composite index for the cost of making the cake in the year 2014 based on the year 2012 is 106.

Jadual 13 *menunjukkan indeks harga dan pemberat bagi empat jenis bahan P, Q, R* dan *S, digunakan untuk membuat sejenis kek. Indeks gubahan bagi kos membuat kek itu pada tahun* 2014 *berasaskan tahun* 2012 *ialah* 106.

Ingredient *Bahan*	Price index in the year 2014 based on the year 2012 *Indeks harga pada tahun* 2014 *berasaskan tahun* 2012	Weightage *Pemberat*
P	115	3
Q	95	1
R	100	4
S	*M*	2

Table 13 / *Jadual* 13

(*a*) Calculate the price of ingredient *Q* in the year 2014 if its price in the year 2012 is RM20. [2 *marks*]

Hitung harga bahan Q pada tahun 2014 *jika harganya pada tahun* 2012 *ialah* RM20. [2 *markah*]

(b) Find the percentage of price change from year 2012 to the year 2014 for ingredient *S*. [4 *marks*]

Cari peratus perubahan harga dari tahun 2012 *ke tahun* 2014 *bagi bahan S.* [4 *markah*]

(c) The composite index for the cost of making the cake increased by 10% from the year 2014 to the year 2015, calculate
Indeks gubahan bagi kos membuat kek bertambah sebanyak 10% *dari tahun* 2014 *ke tahun* 2015, *hitung*

(i) the composite index for the expenses in the year 2015 base on the year 2012.
indeks gubahan bagi perbelanjaan pada tahun 2015 *berasaskan tahun* 2012.

(ii) the price of the cake in the year 2015 if its corresponding price in the year 2012 is RM75.
harga kek itu pada tahun 2015 *jika harga yang sepadan pada tahun* 2012 *ialah* RM75.

[4 *marks*]
[4 *markah*]

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

A tuition centre offers two subjects, Additional Mathematics and Physics. So far there are x students for Additional Mathematics and y students for Physics. The enrolment of the students is based on the following constraints :
Sebuah pusat tuisyen menawarkan dua mata pelajaran, Matematik Tambahan dan Fizik. Mereka mempunyai seramai x pelajar yang mengambil Matematik Tambahan dan y pelajar yang mengambil Fizik. Jumlah pelajar yang perlu diambil adalah berdasarkan kekangan-kekangan berikut :

I The total number of students is not more than 80.
Jumlah pelajar tidak melebihi 80.

II The number of students for Physics is not less than half the number for Additional Mathematics.
Bilangan pelajar yang mengambil Fizik tidak kurang dari separuh bilangan pelajar yang mengambil Matematik Tambahan.

III The number of students for Physics must exceed the number of students for Additional Mathematics by at most 20.
Bilangan pelajar yang mengambil Fizik melebihi bilangan pelajar yang mengambil Matematik Tambahan selebih-lebihnya 20.

(*a*) Write three inequalities, other than $x \geq 0$ and $y \geq 0$, which satisfy all the above constraints. [3 *marks*]
Tulis tiga ketaksamaan, selain $x \geq 0$ *dan* $y \geq 0$, *yang memuaskan kekangan-kekangan di atas.* [3 *markah*]

(*b*) By using a scale of 2 cm to 10 students on both axes, construct and shade the region R that satisfies all the above constraints. [3 *marks*]
Dengan menggunakan skala 2 cm *kepada* 10 *pelajar untuk setiap paksi, bina dan lorekkan rantau R yang memuaskan kekangan-kekangan di atas.* [3 *markah*]

(*c*) By using your graph, find
Dengan menggunakan graf anda, cari

(i) the range of the number of students for Additional Mathematics if there are 30 students in Physics.
julat bilangan pelajar yang mengambil Matematik Tambahan jika terdapat 30 *pelajar yang mengambil Fizik.*

(ii) The maximum profit obtained by the tuition centre if the monthly fees for Additional Mathematics and Physics are RM50 and RM 75 respectively. [4 *marks*]
keuntungan maksimum yang diperolehi pusat tuisyen itu jika yuran bulanan untuk mata pelajaran Matematik Tambahan dan Fizik adalah masing-masing RM50 *dan* RM 75. [4 *markah*]

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

KEM KECEMERLANGAN
BK 1
TINGKATAN 5

ADDITIONAL MATHEMATICS

KERTAS 2

PERATURAN PEMARKAHAN

Peraturan pemarkahan ini mengandungi 11 halaman bercetak.

INSTRUCTIONS FOR EXAMINERS

1. MARKING GUIDE

1.1 Mark all the answers.

1.2 Do not mark working / answer that has been cancelled.

1.3 Give the mark P / K / N in line with steps of calculation given by the students.

1.4 Give the mark P0 / K0 / N0 for the incorrect working / answer.

1.5 If more than one final answer is given, mark all the solution and choose the answer with the highest mark.

1.6 Accept other corect methods which are not given in the marking scheme.

2. NOTATION

P – The mark is given if the working / answer in accordance with the **Knowledge** assessed as stated in the marking scheme.

K – The mark is given if the working / answer in accordance with the **Skills** assessed as stated in the marking scheme.

N – The mark is given if the working / answer in accordance with the **Values** assessed as stated in the marking scheme.

PA – Subtract 1 mark (only once) from the **N** mark when students make an early rounding of numbers.

KP – Subtract 1 mark (only once) from the **P** mark or **N** mark when students do not write the important steps of the calculations.

3. Accept answers correct to 4 significant figures unless stated otherwise in the marking scheme.

4. Accept other correct methods which are not given in the marking scheme.

5. Accept answers in Bahasa Melayu.

6. Calculating total marks.

$$\frac{\sum \text{Score for Paper 1} + \sum \text{Score for Paper 2}}{180} \times 100\%$$

BK1 2015
MARK SCHEME ADDITIONAL MATHEMATICS 2

SECTION *A* [40 MARKS]		
No.	**MARK SCHEME**	**Σ MARKS**
1	$y = 2x - 1$ **P1** $x^2 - 2(2x-1)^2 - 3(2x-1) + 2 = 0$ **K1** $7x^2 - 2x - 3 = 0$ $x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(7)(-3)}}{2(7)}$ **K1** $x = 0.813 ; -0.527$ **N1** $y = 0.626 ; -2.054$ **N1** **OR** $x = \frac{y+1}{2}$ **P1** $\left(\frac{y+1}{2}\right)^2 - 2y^2 - 3y + 2 = 0$ **K1** $7y^2 + 10y - 9 = 0$ $y = \frac{-(10) \pm \sqrt{(10)^2 - 4(7)(-9)}}{2(7)}$ **K1** $y = 0.626 ; -2.054$ **N1** $x = 0.813 ; -0.527$ **N1**	**5**

No.	MARK SCHEME	Σ MARKS
2	(*a*) $\frac{2^{3(x+y)}}{2^{2x}}$ **K1** tukar asas 2 $\frac{2^{3x+3y}}{2^{2x}}$ @ $2^{3x+3y-2x}$ **K1** guna hukum $a^m \times a^n = a^{m+n}$ atau $a^m \div a^n = a^{m-n}$ pq^3 **N1**	**8**
	(*b*) $\log_4 4p^2 - \log_4 q$ **K1** guna hukum $\log_a mn = \log_a m + \log_a n$ atau $\log_a \frac{m}{n} = \log_a m - \log_a n$ $\log_4 4 + 2\log_4 p - \log_4 q$ **K1** guna hukum $\log_a m^n = n \log_a m$ $1 + 2\frac{\log_2 p}{\log_2 4} - \frac{\log_2 q}{\log_2 4}$ **K1** guna hukum $\log_a b = \frac{\log_c b}{\log_c a}$ $1 + 2\frac{\log_2 2^x}{\log_2 4} - \frac{\log_2 2^y}{\log_2 4}$ **K1** ganti $p=2^x$ dan $q=2^y$ $1 + x - \frac{y}{2}$ **N1**	

3	(*a*) $f(x) = 3x + 2 = u$ **K1(cuba cari u dalam sebutan x)** $f^{-1}(x) = \dfrac{x-2}{3}$ **N1** (*b*) (i) $gf(x) = 12x + 5$ **P1** $gff^{-1} = 12\left(\dfrac{x-2}{3}\right) + 5$ **K1** $g(x) = 4x - 3$ **N1** (ii) $fg(x) = 8x + 1$ $3(4x - 3) + 2 = 8x + 1$ **K1(cari fg)** $x = 2$ **N1**	**7**
4	(*a*) $\dfrac{dy}{dx} = 2kx + 3$ **K1** $2\dfrac{dx}{dt} = [2k(-2) + 3] \times \dfrac{dx}{dt}$ **K1** $k = 0.25$ **N1** (*b*) (i) $\dfrac{dy}{dx} = 6x - 2x^{-2}$ **K1** $= 11.5$ **N1** (ii) $\delta y = (11.5)(0.01)$ dan $y_{asal} = 13$ **K1** $y = 13.115$ **N1**	**7**

5

(*a*) $r = \frac{x}{4374} = \frac{486}{x}$ **K1**

$x = 1458$ **N1**

$r = \frac{1}{3}$ **N1**

(*b*) $a\left(\frac{1-\left(\frac{1}{3}\right)^4}{1-\frac{1}{3}}\right) = 19440$ **K1**

$a = 13122$ **N1**

(*c*) $(n-1)\log_{10}\left(\frac{1}{3}\right) < \log_{10}\left(\frac{0.01}{13122}\right)$ **K1**

$n = 14$ **N1**

7

6

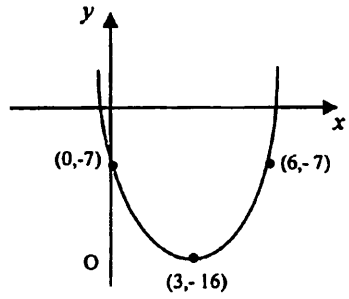
(*a*) $f(x) = x^2 - 6x - 7$

$= x^2 - 6x + \left(\frac{-6}{2}\right)^2 - \left(\frac{-6}{2}\right)^2 - 7$ or $(x-3)^2 - 9 - 7$ **K1**

(i) $p = -3$ dan $h = -16$ **N1**

(ii) $x = -1\ ;\ 7$ **N1**

(*b*)



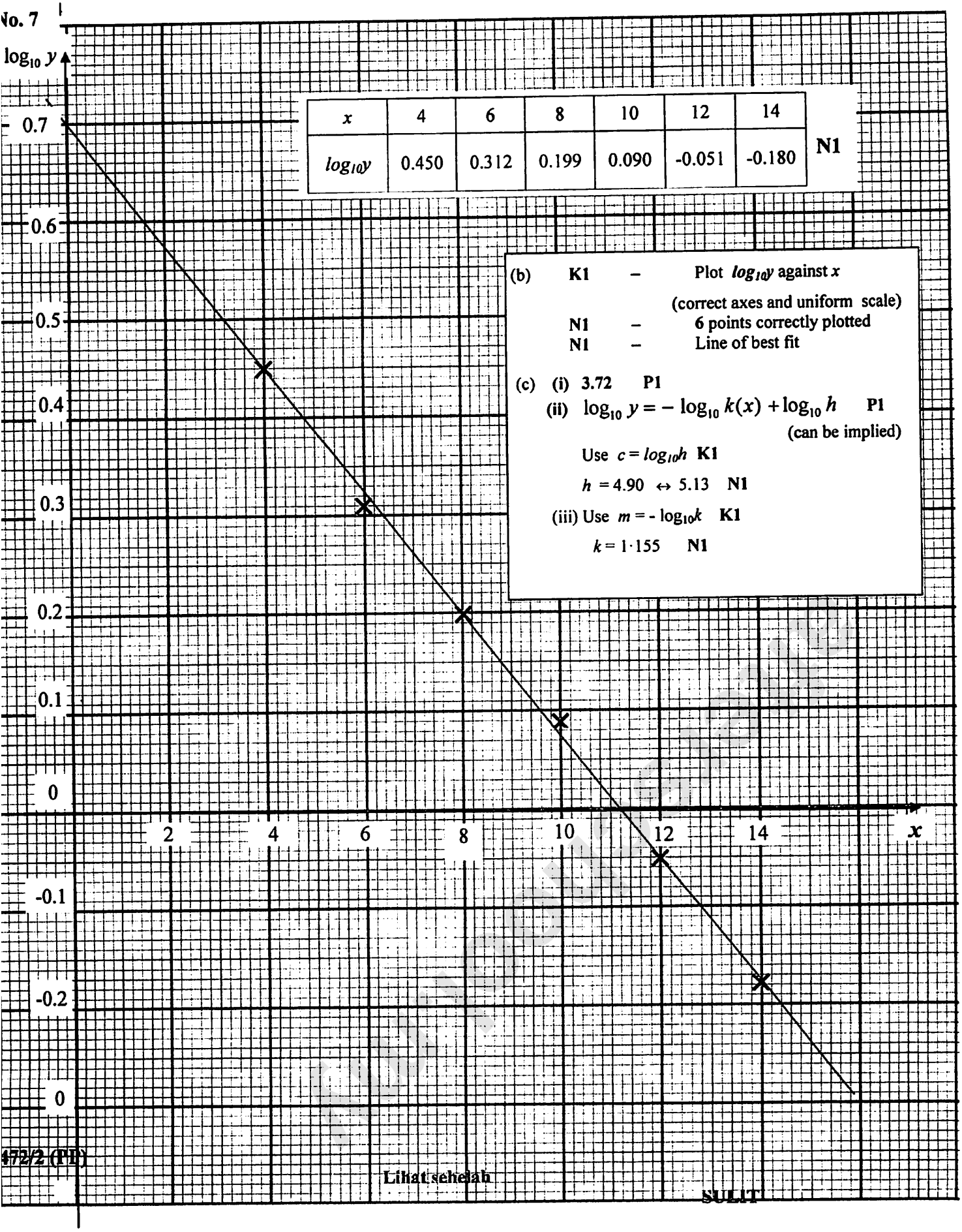
P1 for maximum shape

P1 for maximum point (3,-16) and 2 other points

Range : $-7 \le f(x) \le -16$. **N1**

6

No. 7



x	4	6	8	10	12	14
$log_{10}y$	0.450	0.312	0.199	0.090	-0.051	-0.180

N1

(b) **K1** – Plot $log_{10}y$ against x
(correct axes and uniform scale)
N1 – 6 points correctly plotted
N1 – Line of best fit

(c) (i) **3.72** **P1**

(ii) $\log_{10} y = -\log_{10} k(x) + \log_{10} h$ **P1**
(can be implied)

Use $c = log_{10}h$ **K1**

$h = 4.90 \leftrightarrow 5.13$ **N1**

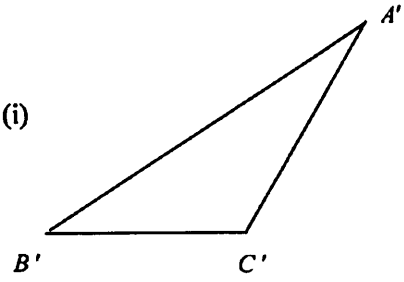
(iii) Use $m = -\log_{10}k$ **K1**

$k = 1{\cdot}155$ **N1**

SECTION *B* [40 MARKS]		
No.	**MARK SCHEME**	**Σ MARKS**
7	Refer graph	
8	(*a*) $M = 20.5 + \left(\frac{\frac{40}{2} - 15}{14}\right)10$ **K1** **P1** utk L dan F @ f_m 24.07 **N1** (*b*) $\frac{(5.5)(6) + (15.5)(9) + (25.5)(14) + (35.5)(7) + (45.5)(4)}{40}$ **K1** Mean = 24 **N1** $\sigma = \sqrt{\frac{28550}{40} - 24^2}$ **K1** **P1** untuk $\Sigma x^2 = 28550$ = 11.74 **N1** (*c*) new mean = 20 **P1** New variance = 12.96 **P1**	**10**
9	(*a*) (i) $y - 9 = 2(x + 4)$ **K1** $y = 2x + 17$ **N1** (ii) $2y + x + 6 = 0$ dan $y = 2x + 17$ **K1** **selesaikan** $2(2x + 17) + x + 6 = 0$ **N1** $B(-8,1)$ **N1** (*b*) $A(-4,9)$ $B(-8,1)$ $C(x,y)$ $\frac{(2)(x)+(3)(-4)}{5} = -8$ atau $\frac{(2)(y)+(3)(9)}{5} = 1$ **K1** $(-14, -11)$ **N1** (*c*) PA = 5 $\sqrt{(x+4)^2 + (y-9)^2} = 5$ **K1** $(x + 4)^2 + (y - 9)^2 = 25$ **N1** $x^2 + y^2 + 8x - 18y + 72 = 0$ **N1**	**10**

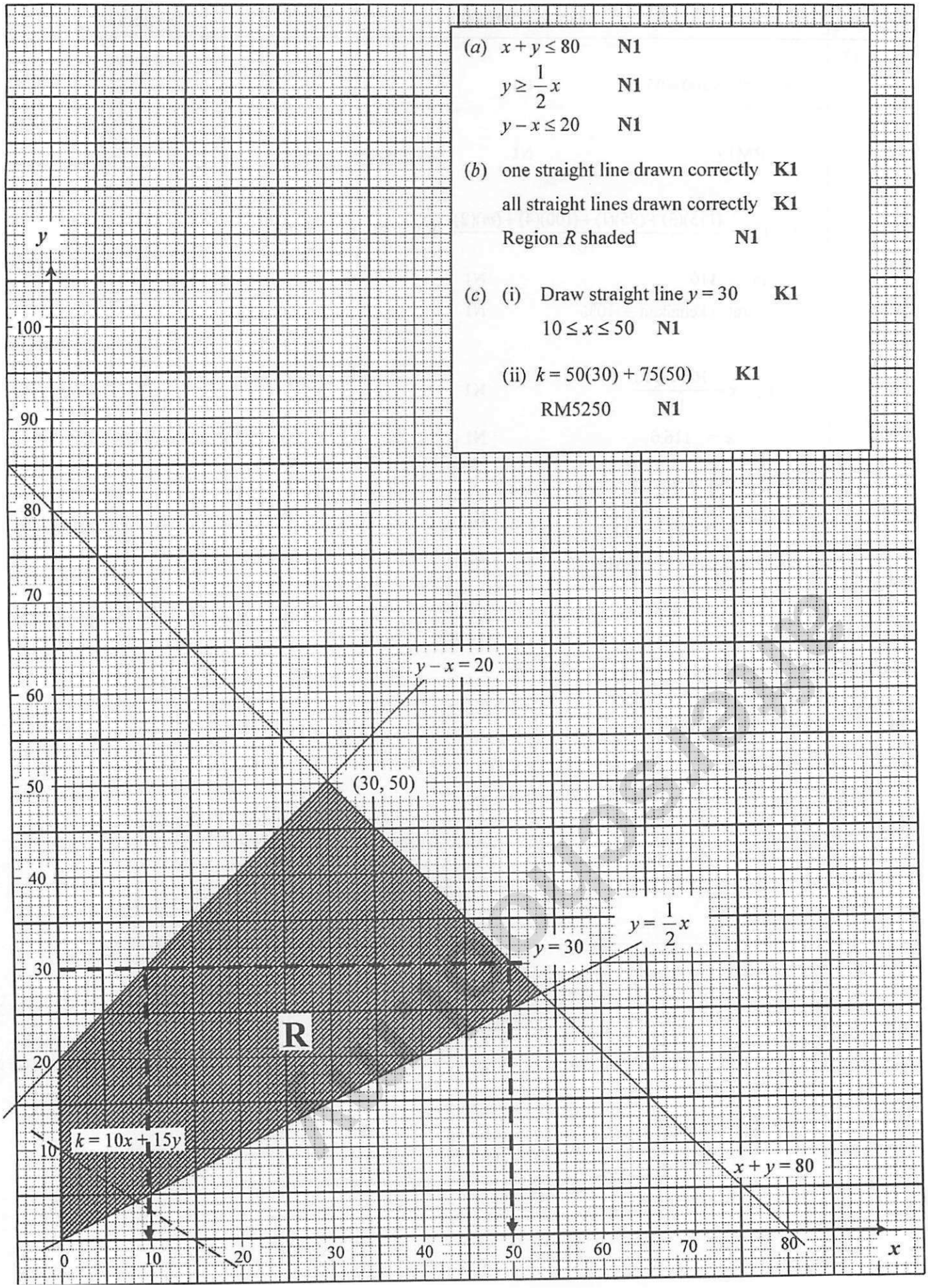
[Lihat sebelah

No.	MARK SCHEME	Σ MARKS
10	(*a*) $\frac{dy}{dx} = 6x + x^{-2}$ **K1** $m = -5$ N1 $y = -5x - 1$ N1 (*b*) $360 = 12x + 4h$ atau $V = 2x^2h$ dan $V = 2x^2(90 - 3x)$ **K1** $V = 180x^2 - 6x^3$ **N1** $\frac{dV}{dx} = 360x - 18x^2 = 0$ **K1** $x = 20$ $V_{max} = 24\,000\ \text{cm}^3$ **N1** (*c*) $f'(x) = -8(x-2)^{-3}$ **K1** $f''(x) = 24(x-2)^{-4}$ **N1** $f''(0) = 1.5$ **N1**	**10**
11	(*a*) $\cos\angle TOR = \frac{4}{8}$ **K1** $\theta = 1.0473$ **N1** (*b*) $TS^2 = 8^2 + 8^2 - 2(8)(8)\cos 120$ **K1** $TS = 13.856$ **N1** $S_{BE} = (13.856)(0.5237)$ **K1** $= 7.256$ **N1** (*c*) $A_1 = \frac{1}{2} \times (13.856)^2 \times 0.5237$ **K1** $= 50.272$ **N1** $A_2 = \frac{1}{2} \times 13.856 \times 12 \times \sin 30$ **K1** Area shaded region = 8.704 **N1**	**10**

SECTION *C* [20 MARKS]		
No.	**MARK SCHEME**	**Σ MARKS**
12	(a) (i) $\frac{BC}{\sin 101°} = \frac{5.8}{\sin 34°}$ **K1 petua sinus** $BC = 10{\cdot}182$ cm **N1** (ii) $BD^2 = 8.5^2 + 4.6^2 - 2(8.5)(4.6)\cos 140°$ **K1 petus kosinus** $BD = 12.382$ cm **N1** $CD = 2.20$ cm **N1** (iii) $L = \frac{1}{2}(10.182)(5.8)\sin 45°$ **K1** **P1** untuk 45° $= 20{\cdot}88$ cm^2 **N1** (b) (i)  **P1** rajah ($\angle A'C'B'$ obtuse) (ii) 11° **P1**	**10**

No.	MARK SCHEME	Σ MARKS
13	(*a*) $\frac{P_{2014}}{20}\times 100 = 95$ **K1** RM19 **N1** (*b*) $106 = \frac{(115)(3)+(95)(1)+(100)(4)+(m)(2)}{10}$ **K1** **P1** solve to find *m* m = 110 **N1** peratus kenaikan = 10% **N1** (*c*) (i) $x = \frac{106 \times 110}{100}$ **K1** x = 116.6 **N1** (ii) $\frac{P_{2015}}{75} = \frac{116.6}{100}$ **K1** P_{2015} = RM87.45 **N1**	**10**

No. 14



(*a*) $x + y \leq 80$ **N1**

$y \geq \frac{1}{2}x$ **N1**

$y - x \leq 20$ **N1**

(*b*) one straight line drawn correctly **K1**

all straight lines drawn correctly **K1**

Region *R* shaded **N1**

(*c*) (i) Draw straight line $y = 30$ **K1**

$10 \leq x \leq 50$ **N1**

(ii) $k = 50(30) + 75(50)$ **K1**

RM5250 **N1**