Answer **all** questions.

*Jawab **semua** soalan.*

1 Diagram 1 shows the linear function g.
Rajah 1 menunjukkan fungsi linear g.

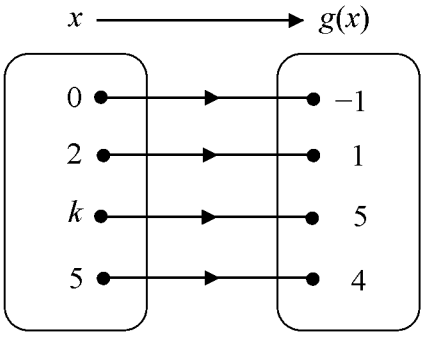


Diagram 1 / *Rajah* 1

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

(*b*) Using the function notation, express g in terms of x.
Menggunakan tata tanda fungsi, ungkapkan g dalam sebutan x.

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

Answer / *Jawapan* :

For Examiner's Use

1
2

For Examiner's Use

2 Given the functions $f: x \to 4x + n$ and $f^{-1}: x \to 2mx + \frac{7}{4}$, where m and n are constants, find the value of m and of n. [3 *marks*]

Diberi fungsi $f: x \to 4x + n$ *dan* $f^{-1}: x \to 2mx + \frac{7}{4}$, *dengan keadaan m dan n adalah pemalar, cari nilai m dan nilai n.* [3 *markah*]

Answer / *Jawapan* :

2

3

3 It is given that -1 is one of the roots of the quadratic equation $3x(2x-1) = 5-2p$.
Find the value of p. [2 *marks*]
Diberi bahawa -1 *ialah satu daripada punca persamaan kuadratik*
$3x(2x-1) = 5-2p$. *Cari nilai* p [2 *markah*]

Answer / *Jawapan* :

3

2

4 The quadratic equation $2x^2 - (6 + k)x + 2 = 0$, where k is a constant, has two different roots. Find the range of values of k. [3 *marks*]
Persamaan kuadratik $2x^2 - (6 + k)x + 2 = 0$, *dengan keadaan k ialah pemalar, mempunyai dua punca yang berbeza. Cari julat nilai k.* [3 *markah*]

Answer / *Jawapan* :

4

3

5 Find the range of values of x for $3x^2 - 2 < 5x$. [3 *marks*]
Cari julat nilai x bagi $3x^2 - 2 < 5x$. [3 *markah*]

For Examiner's Use

Answer / *Jawapan* :

5
3

6 Diagram 6 shows the graph of quadratic function $f(x) = -(x+p)^2 + k$.
Rajah 6 *menunjukkan graf fungsi kuadratik* $f(x) = -(x+p)^2 + k$.

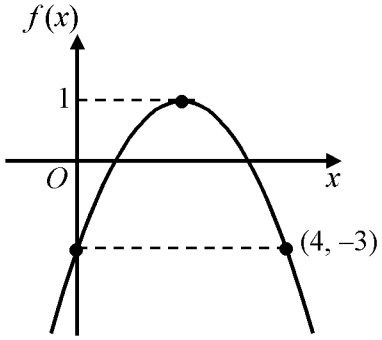


Diagram 6 / *Rajah* 6

State / *Nyatakan*
(*a*) the values of k and p,
nilai k dan nilai p,
(*b*) the equation of the axis of symmetry.
persamaan paksi simetri.

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

Answer / *Jawapan* :

(*a*)

(*b*)

6
3

For Examiner's Use

7 A point $P(x, y)$ moves such that $2PA = PB$. Given that $A(-3, 2)$ and $B(0, 4)$, find the equation of the locus of P. [3 *marks*]
Suatu titik $P(x, y)$ *bergerak dengan keadaan* $2PA = PB$. *Diberi* $A(-3, 2)$ *dan* $B(0, 4)$, *cari persamaan lokus* P. [3 *markah*]

Answer / *Jawapan* :

7

3

For Examiner's Use

8 Diagram 8 shows a sector *OPQ* with radius 10 cm and Δ *ORQ* is a right-angled triangle.
Rajah 8 *menunjukkan sektor OPQ dengan jejari* 10 cm *dan* Δ *ORQ adalah segitiga bersudut tegak.*

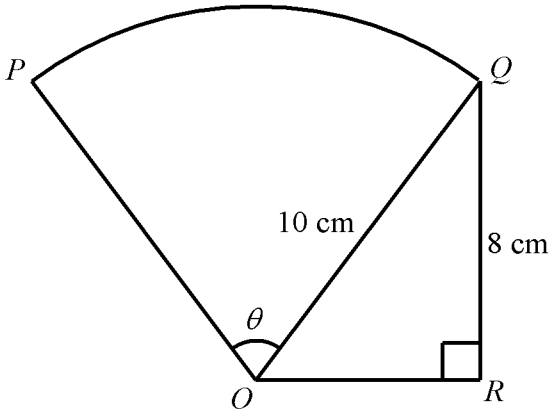


Diagram 8 / *Rajah* 8

Given that the area of sector *OPQ* is equal to the area of Δ *ORQ*, find the value of θ in radians.
Diberi bahawa luas sektor OPQ adalah sama dengan luas segitiga ORQ, cari nilai θ *dalam radian.*
[Use / *Guna* $\pi = 3{\cdot}142$]

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

Answer / *Jawapan* :

8

3

For Examiner's Use

9 Given that the first three terms of an arithmetic progression are $2k$, $3k + 3$ and $5k + 1$.
Diberi tiga sebutan pertama bagi suatu janjang arithmetik ialah $2k$, $3k + 3$ *dan* $5k + 1$
Find / *Cari*

(*a*) the value of k,
nilai k,

(*b*) the sum of the first 4 terms.
hasil tambah 4 *sebutan pertama*.

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

Answer / *Jawapan* :

(*a*)

(*b*)

9

4

10 The sum to infinity of a geometric progression is 8. Given that the first term is 2.
Hasil tambah sehingga ketakterhinggaan bagi suatu janjang geometri ialah 8.
Diberi sebutan pertama ialah 2.

For Examiner's Use

Find / *Cari*

(*a*) the common ratio,
nisbah sepunya,

(*b*) the 2nd term.
sebutan ke-2.

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

Answer / *Jawapan* :

(*a*)

(*b*)

10

3

For Examiner's Use

11 Solve the equation $5^{2x} = 100 + 5^{2x-1}$. [4 *marks*]

Selesaikan persamaan $5^{2x} = 100 + 5^{2x-1}$. [4 *markah*]

Answer / *Jawapan* :

11

4

12 If $\log_5 x = a$ and $\log_5 y = b$, express $\log_5 \left(\frac{625x}{\sqrt{y}} \right)$ in terms of a and b. [4 *marks*]

Jika $\log_5 x = a$ *dan* $\log_5 y = b$, *ungkapkan* $\log_5 \left(\frac{625x}{\sqrt{y}} \right)$ *dalam sebutan a dan b.*

[4 *markah*]

Answer / *Jawapan* :

12

4

For Examiner's Use

13 Solve the equation $\log_3 2 + \log_9 (x + 3) = 1$. [4 *marks*]
Selesaikan persamaan $\log_3 2 + \log_9 (x + 3) = 1$. [4 *markah*]

Answer / *Jawapan* :

13

4

14 The mean of five numbers is 3. The sum of the squares of the numbers is p and the standard deviation is 2. Find the value of p. [3 *marks*]
Min bagi lima nombor ialah 3. *Hasil tambah kuasa dua nombor-nombor itu ialah* p *dan sisihan piawai ialah* 2. *Cari nilai bagi* p. [3 *markah*]

Answer / *Jawapan* :

14

3

15 A point R lies on the curve $y=(x-5)^2$. It is given that the gradient of the normal at R is parallel to the straight line $4y=x+8$. Find the coordinates of R.

[3 *marks*]

Titik R terletak pada lengkung $y=(x-5)^2$. *Diberi kecerunan normal pada R adalah selari dengan garis lurus* $4y=x+8$. *Cari koordinat R.* [3 *markah*]

Answer / *Jawapan* :

For Examiner's Use

15

3

For Examiner's Use

16 Given that $f(x) = \frac{4x}{2x-1}$, evaluate $f''(0)$. [4 *marks*]

Diberi $f(x) = \frac{4x}{2x-1}$, *nilaikan* $f''(0)$. [4 *markah*]

Answer / *Jawapan* :

16

4

For Examiner's Use

17 Given that $y = \dfrac{2x^2 - 1}{x^2}$, such that $\dfrac{dy}{dx} = 4f(x)$, where $f(x)$ is a function of x.

Evaluate $\int_1^2 f(x)\, dx$. [3 *marks*]

Diberi bahawa $y = \dfrac{2x^2 - 1}{x^2}$, supaya $\dfrac{dy}{dx} = 4f(x)$, *dengan keadaan* $f(x)$ *ialah fungsi bagi* x. *Nilaikan* $\int_1^2 f(x)\, dx$. [3 *markah*]

Answer / *Jawapan* :

17

3

For Examiner's Use

18 Given that $\int_1^2 f(x)\,dx = 4$ and $\int_2^4 f(x)\,dx = 6$, find the value of

Diberi bahawa $\int_1^2 f(x)\,dx = 4$ *dan* $\int_2^4 f(x)\,dx = 6$, *cari nilai bagi*

(*a*) $\int_1^2 f(x)\,dx + \int_2^4 f(x)\,dx$,

(*b*) k if $\int_1^2 [kx - f(x)]\,dx = 14$.

k *jika* $\int_1^2 [kx - f(x)]\,dx = 14$.

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

Answer / *Jawapan* :

(*a*)

(*b*)

18

4

19 Solve the trigonometric equation $\cot x - 2\cos x = 0$ for $0° \le x \le 360°$.
[3 *marks*]

Selesaikan persamaan trigonometri $\text{kot}\, x - 2\,\text{kos}\, x = 0$ *untuk* $0° \le x \le 360°$.
[3 *markah*]

For Examiner's Use

Answer / *Jawapan* :

19

3

For Examiner's Use

20 Diagram 20 shows a straight line graph $\frac{y}{x^2}$ against x.

Rajah 20 *menunjukkan graf garis lurus* $\frac{y}{x^2}$ *melawan* x.

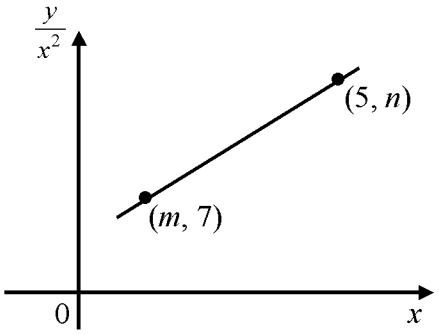


Diagram 20 / *Rajah* 20

Given that $y=4x^2+3x^3$, calculate the value of m and of n.

Diberi $y=4x^2+3x^3$, *hitungkan nilai m dan nilai n.*

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

Answer / *Jawapan* :

20

3

21 Diagram 21 shows two vectors, $\overrightarrow{OQ}$ and $\overrightarrow{OR}$.

Rajah 21 *menunjukkan dua vektor,* $\overrightarrow{OQ}$ *dan* $\overrightarrow{OR}$.

For Examiner's Use

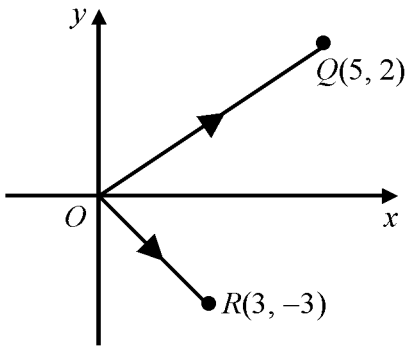


Diagram 21 / *Rajah* 21

(*a*) Express $\overrightarrow{RQ}$ in the form $x\mathbf{i} + y\mathbf{j}$,

Ungkapkan $\overrightarrow{RQ}$ *dalam bentuk* $x\mathbf{i} + y\mathbf{j}$.

(*b*) Find the unit vector in the direction of $\overrightarrow{RQ}$.

Cari vektor unit dalam arah $\overrightarrow{RQ}$.

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

Answer / *Jawapan* :

(*a*)

(*b*)

21

3

For Examiner's Use

22 A box contains 10 cards with numbers 10, 11,12, 13,14, 15, 16, 17, 18 and 19 written on each card respectively. Two cards are drawn randomly from the box. Find the probability that the sum of the digits for both cards drawn is greater than 8.

[3 *marks*]

Sebuah kotak mengandungi 10 *keping kad bernombor* 10, 11, 12, 13, 14, 15, 16, 17, 18 *dan* 19 *yang ditulis masing-masing diatas kad tersebut. Dua keping kad dikeluarkan secara rawak daripada kotak itu.*
Cari kebarangkalian bahawa jumlah digit bagi kedua-dua kad yang dikeluarkan adalah lebih besar daripada 8.

[3 *markah*]

Answer / *Jawapan* :

22

3

23 A student was asked to arrange three Mathematics books and four English books on a shelf. Find the different ways of arrangement if
Seorang pelajar dikehendaki menyusun tiga buah buku Matematik dan empat buah buku Bahasa Inggeris di atas rak. Cari bilangan cara susunan yang berlainan jika

(*a*) there is no restriction
tiada syarat dikenakan

(*b*) the Mathematics books are side by side.
buku Matematik hendaklah berada sebelah menyebelah.

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

For Examiner's Use

Answer / *Jawapan* :

(*a*)

(*b*)

23

3

For Examiner's Use

24 A group of 6 students has to be chosen from 7 boys and 5 girls to form debating team. In how many ways can this be done if it consists of
Sekumpulan 6 *orang pelajar hendak dipilih daripada* 7 *lelaki dan* 5 *perempuan untuk membentuk pasukan debat. Berapa carakah ia boleh dilakukan jika ia mesti mengandungi*

(*a*) exactly 4 boys,
tepat 4 *pelajar lelaki*,

(*b*) at least 4 girls.
sekurang-kurangnya 4 *pelajar perempuan*.

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

Answer / *Jawapan* :

(*a*)

(*b*)

24

4

25 Diagram 25 shows a standard normal distribution graph.
Rajah 25 *menunjukkan graf taburan normal piawai.*

For Examiner's Use

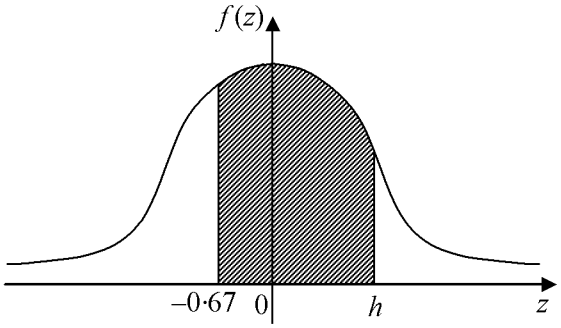


Diagram 25 / *Rajah* 25

The probability represented by the area of the shaded region is 0·6335.
Kebarangkalian yang diwakili oleh luas kawasan berlorek ialah 0·6335.

Find the value of *h*.
Cari nilai bagi h.

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

Answer / *Jawapan*:

25

3

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

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. Ia boleh membantu anda untuk mendapatkan markah.

5. If you wish to change your answer, cross out the answer work that you have done. Then write down the new answer.
   Sekiranya anda hendak menukar jawapan, batalkan jawapan yang telah dibuat. Kemudian tulis jawapan yang baru.

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 2 to 4.
   Satu senarai rumus disediakan di halaman 2 *hingga* 4.

9. Graph paper and a booklet of four-figure mathematical tables are provided.
   Kertas graf dan buku sifir matematik empat angka disediakan.

10. You may use a non-programmable scientific calculator.
    Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogram.

11. Hand in this question paper to the invigilator at the end of the examination.
    Serahkan kertas soalan ini kepada pengawas peperiksaan di 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.

$$2x - y = 6$$

$$x^2 - y^2 + x = 4y$$

Give your answers correct to two decimal places.
Beri jawapan anda betul kepada dua tempat perpuluhan.

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

2 (*a*) Sketch the graph of $y = |2\cos 2x|$ for $0 \le x \le \pi$. [4 *marks*]

Lakarkan graf $y = |2\cos 2x|$ *untuk* $0 \le x \le \pi$. [4 *markah*]

(*b*) (i) Using the same axes, sketch a suitable straight line to solve the equation $2\pi|2\cos 2x| = x + \frac{\pi}{2}$ for $0 \le x \le \pi$.

Dengan menggunakan paksi yang sama, lakar satu garis lurus yang sesuai bagi menyelesaikan persamaan $2\pi|2\cos 2x| = x + \frac{\pi}{2}$ *untuk* $0 \le x \le \pi$.

(ii) Hence, state the number of solutions.

Seterusnya, nyatakan bilangan penyelesaian itu.

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

3 A roll of rope is to be cut into several pieces. The first piece of the rope is 25 cm in length and the length of each subsequent piece is 2 cm longer than the preceding piece.
Segulung tali dipotong kepada beberapa bahagian. Panjang bahagian pertama ialah 25 cm *dan panjang bahagian yang berikutnya adalah* 2 cm *lebih panjang daripada bahagian yang sebelumnya.*

(*a*) Find the length of the 9th piece of the rope.
Cari panjang keratan yang ke-9 tali itu.

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

(*b*) If the length of a roll of rope is 13 m,
Jika panjang segulung tali ialah 13 m,

find / *cari*

(i) the number of pieces of rope that can be cut from the roll of the rope.
bilangan bahagian keratan tali yang dapat dipotong daripada gulungan paip itu.

(ii) the length of the longest part of the rope.
panjang bahagian tali yang terpanjang.

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

4 Given $y = 2p - p^2$ and $x = 3 - p$
Diberi $y = 2p - p^2$ *dan* $x = 3 - p$

(*a*) Find $\frac{dy}{dx}$ in terms of x. [2 *marks*]

Cari $\frac{dy}{dx}$ *dalam sebutan* x. [2 *markah*]

(*b*) Given that y increases at a constant rate of 0·6 unit s^{-1}, find the rate of change of x when $x = 1$. [3 *marks*]
Diberi bahawa y *bertambah dengan kadar malar* 0·6 unit s^{-1}, *cari kadar perubahan* x *apabila* $x = 1$.
[3 *markah*]

(*c*) Find the small change in y when p decreases from 2 to 1·96. [3 *marks*]
Cari perubahan kecil dalam y *apabila* p *menyusut daripada* 2 *to* 1·96. [3 *marks*]

5 It is given that a set of numbers: 5, k, $3k$, 11, 15, 21.
Diberi bahawa satu set nombor : 5, k, $3k$, 11, 15, 21.

The numbers of the set are arranged in ascending order and the mean of numbers is m.
If each number is reduced by 3, the median of the new set of numbers becomes $\frac{3m}{4}$.
Set nombor itu disusun mengikut tertib menaik dan min nombor-nombor itu ialah m.
Jika setiap nombor itu dikurangkan sebanyak 3, *median set nombor-nombor baru menjadi* $\frac{3m}{4}$.

Find / *Cari*

(a) the values of m and k,
nilai m dan nilai k,

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

(b) the variance of the original set of numbers.
varians bagi set nombor yang asal.

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

6 In Diagram 6, *OABC* is a quadrilateral. *OQB* and *AQP* are straight lines.
Dalam Rajah 6, OABC ialah sebuah sisiempat. OQB dan AQP ialah garis lurus.

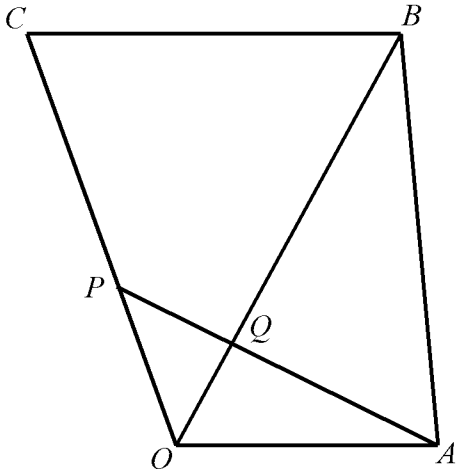


Diagram 6 / *Rajah 6*

It is given that $\overrightarrow{OP} = 2\underset{\sim}{x}$, $\overrightarrow{OA} = 6\underset{\sim}{y}$, $2OP = PC$ and $CB = \frac{3}{2}OA$.

Diberi bahawa $\overrightarrow{OP} = 2\underset{\sim}{x}$, $\overrightarrow{OA} = 6\underset{\sim}{y}$, $2OP = PC$ and $CB = \frac{3}{2}OA$.

(*a*) Express in terms of $\underset{\sim}{x}$ and / or $\underset{\sim}{y}$:
Ungkapkan dalam sebutan $\underset{\sim}{x}$ *dan / atau* $\underset{\sim}{y}$:

(i) $\overrightarrow{PA}$,

(ii) $\overrightarrow{OB}$.

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

(*b*) Given that $\overrightarrow{QA} = m\overrightarrow{PA}$ and $\overrightarrow{QB} = n\overrightarrow{OB}$, where *m* and *n* are constants.
Diberi $\overrightarrow{QA} = m\overrightarrow{PA}$ *dan* $\overrightarrow{QB} = n\overrightarrow{OB}$, *dengan keadaan m dan n ialah pemalar.*

Express $\overrightarrow{OQ}$ in terms of
Ungkapkan $\overrightarrow{OQ}$ *dalam sebutan*

(i) *m*, $\underset{\sim}{x}$ and $\underset{\sim}{y}$.

(ii) *n*, $\underset{\sim}{x}$ and $\underset{\sim}{y}$.

Hence, find the values of *m* and *n*.
Seterusnya, cari nilai bagi m dan n.

[6 *marks*]
[6 *markah*]

Section *B* / *Bahagian B*

[40 *marks* / 40 *markah*]

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

7 Solution by scale drawing will **not** be accepted.
Penyelesaian secara lukisan berskala ***tidak*** *akan diterima.*

Diagram 7 shows a triangle OPQ. The line OP is perpendicular to the line PQ, which intersects y- axis at the point T. It is given that the equation of OP is $2y + x = 0$ and the equation of PQ is $4y - kx = 40$.

Rajah 7 menunjukkan sebuah segitiga OPQ. Garis OP berserenjang dengan garis PQ, yang bersilang dengan paksi- y pada titik T. Diberi bahawa persamaan OP ialah $2y + x = 0$ *dan persamaan PQ ialah* $4y - kx = 40$.

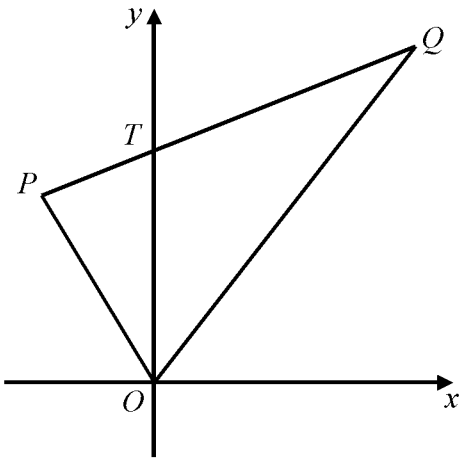


Diagram 7 / *Rajah 7*

(*a*) Find / *Cari*
(i) the value of k
nilai k
(ii) the coordinates of P
koordinat P

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

(*b*) Given $5PT = 2TQ$, find
Diberi $5PT = 2TQ$, *cari*

(i) the coordinates of Q
koordinat Q

(ii) the equation of the straight line which passes through point Q and perpendicular to PQ.
persamaan garis lurus yang melalui titik Q dan berserenjang dengan PQ.

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

(*c*) Hence, calculate the area, in unit^2, of triangle OPQ. [2 *marks*]
Seterusnya, hitung luas, dalam unit^2, *bagi segitiga OPQ.* [2 *markah*]

8 Diagram 8 shows part of the curve $y = 3(x^2 - 4)$ and a straight line $y = 2x + 9$.

Rajah 8 *menunjukkan sebahagian lengkung* $y = 3(x^2 - 4)$ *dan garis lurus* $y = 2x + 9$.

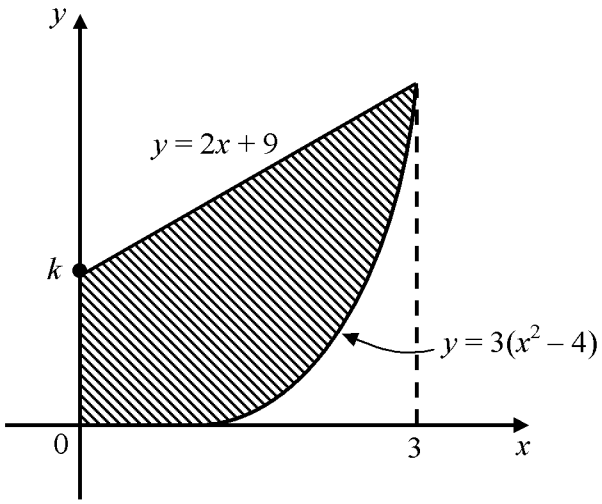


Diagram 8 / *Rajah* 8

(*a*) Calculate the area of the shaded region. [6 *marks*]

Hitung luas rantau berlorek. [6 *markah*]

(*b*) The region enclosed by the curve, the x-axis, the y-axis and the straight line $y = k$ is revolved through 360° about the y-axis. Find the volume of revolution, in terms of π.
[4 *marks*]

Rantau yang dibatasi oleh lengkung, paksi-x, paksi-y dan garis lurus $y = k$ *dikisarkan melalui* 360° *pada paksi-y. Cari isipadu kisaran, dalam sebutan* π.
[4 *markah*]

9 Table 9 shows the values of two variables, x and y, obtained from an experiment.
The variables x and y are related by the equation $y = pq^{-2x}$, where p and q are constants.
Jadual 9 menunjukkan nilai-nilai dua pembolehubah x dan y yang diperolehi daripada satu eksperimen. Pembolehubah x dan y dihubungkan oleh persamaan $y = pq^{-2x}$, *dengan keadaan p dan q ialah pemalar.*

x	4	6	8	10	12	14
y	14·5	10·0	6·9	4·6	3·2	2·2

Table 9 / *Jadual* 9

(*a*) Plot $\log_{10} y$ against x, using a scale of 2 cm to 2 unit on the x-axis and 2cm to 0·2 unit on the $\log_{10} y$-axis. Hence, draw the line of best fit.

[4 *marks*]

Plot $\log_{10} y$ *melawan x, dengan menggunakan skala* 2 cm *kepada* 2 unit *pada paksi-x dan* 2 cm *kepada* 0·2 unit *pada paksi-*$\log_{10} y$. *Seterusnya, lukis garis lurus penyuaian terbaik.*

[4 *markah*]

(*b*) Use the graph in 9(*a*) to find the value of
Gunakan graf di 9(*a*) *untuk mencari nilai*

(i) p
(ii) q
(iii) y when $x = 8·4$
y *apabila* $x = 8·4$

[6 *marks*]
[6 *markah*]

10 Diagram 10 shows a sector *OPQ* with centre *O* and a right-angled triangle *OPS*.
Rajah 10 *menunjukkan sektor OPQ berpusat di O dan segitiga sudut tegak OPS.*

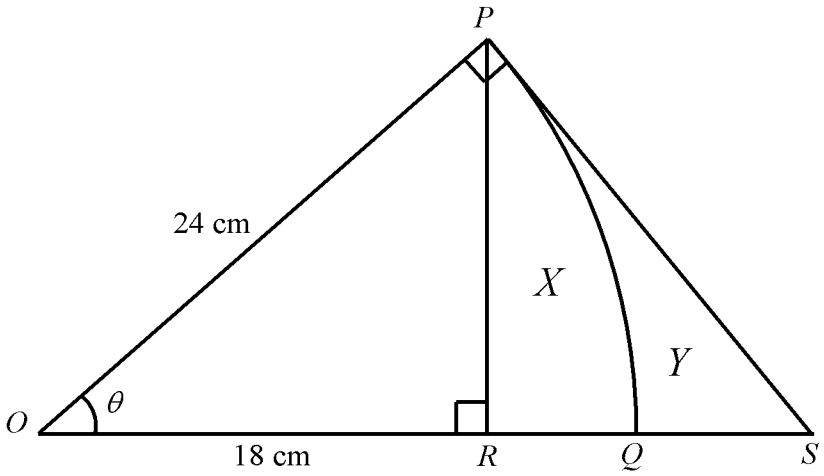


Diagram 10 / *Rajah* 10

PR is perpendicular to *OS* where *ORQS* is a straight line. Given that *OR* = 18 cm and *OP* = 24 cm, find
PR adalah berserenjang dengan OS dengan keadaan ORQS adalah garis lurus. Diberi OR = 18 cm *dan OP* = 24 cm, *cari*

(*a*) the value of θ in radians, [2 *marks*]
nilai θ *dalam radian*. [2 *markah*]

(*b*) the perimeter of the region *PRQ*, marked *X*. [3 *marks*]
perimeter kawasan PRQ, bertanda X. [3 *markah*]

(*c*) the area of the region *PQS*, marked *Y*. [5 *marks*]
luas kawasan PQS, bertanda Y. [5 *markah*]

11 (*a*) In a housing estate, 85% of the residents have computers. If 7 residents of the housing estate are chosen at random, calculate the probability that
Di sebuah taman perumahan, 85% *daripada penduduk mempunyai komputer. Jika* 7 *orang penduduk dipilih secara rawak, hitung kebarangkalian bahawa*

(i) exactly 3 residents have computers,
tepat 3 *orang penduduk mempunyai komputer*,
(ii) at least 2 residents have computers.
sekurang-kurangnya 2 *orang penduduk mempunyai komputer*.

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

(*b*) The masses of students in a school are normally distributed with a mean 50 kg and variance 36 kg^2.
Jisim bagi pelajar-pelajar di sebuah sekolah bertaburan secara normal dengan min 50 *kg dan varians* 36 kg^2.

(i) Find the probability that a student chosen randomly has mass less than 45 kg.
Cari kebarangkalian bahawa seorang pelajar dipilih secara rawak mempunyai jisim kurang daripada 45 *kg*.

(ii) Given that 65% of the students have a mass of more than *m* kg, find the value of *m*.
Diberi bahawa 65% *daripada pelajar mempunyai jisim lebih daripada m kg, cari nilai bagi m*.

[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 A particle P moves along a straight line and passes through a fixed point O, with velocity of -9 ms^{-2}. Its acceleration, a ms^{-2}, is given by $a = 6t - 6$, where t is in seconds. The particle stops after k seconds.

Satu zarah bergerak di sepanjang suatu garis lurus dan melalui titik tetap O, dengan halaju -9 ms^{-2} *. Pecutannya,* a ms^{-2}, *diberi oleh* $a = 6t - 6$, *dengan keadaan t adalah masa, dalam saat. Zarah itu berhenti selepas k saat.*

Find / *Cari*

(a) the time, in seconds, when its acceleration is zero, [1 *mark*]
masa, dalam saat, ketika pecutannya sifar, [1 *markah*]

(b) the minimum velocity, in ms^{-1}, of the particle, [3 *marks*]
halaju minimum, dalam ms^{-1}, *bagi zarah itu,* [3 *markah*]

(c) the value of k, [2 *marks*]
nilai bagi k, [2 *markah*]

(d) the total distance, in m, travelled by the particle in the first 4 seconds. [4 *marks*]
jumlah jarak, dalam m, *yang dilalui oleh zarah itu dalam* 4 *saat pertama.* [4 *markah*]

13 Table 13 shows the prices and the price indices of four types of foodstuffs in 2011 based on 2009. Diagram 13 shows the pie chart that reflects the proportion of expenditure of Puan Alia in 2009.
Jadual 13 *menunjukkan harga dan indeks harga bagi empat jenis makanan dalam tahun* 2011 *berasaskan tahun* 2009. *Rajah* 13 *menunjukkan carta pai bagi perbandingan sebahagian perbelanjaan Puan Alia pada tahun* 2009.

Foodstuff *Jenis makanan*	Price (RM) per kg *Harga* (RM) *per kg*		Price index in the year 2011 based on the year 2009 *Indeks harga dalam tahun* 2011 *berasaskan tahun* 2009
	2009	2011	
Fish/*ikan*	x	12·30	120
Crab/*ketam*	18·00	y	110
Prawn/*udang*	12·00	16·20	135
Chicken/*ayam*	6·50	8·00	z

Table 13/ *Jadual* 13

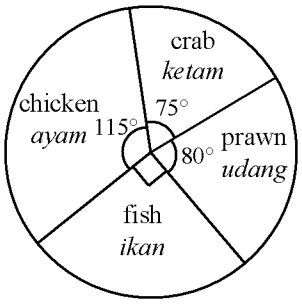


Diagram 13 / *Rajah* 13

(*a*) Find the value of x, of y and of z. [3 *marks*]
Cari nilai x, *nilai* y *dan nilai* z. [3 *markah*]

(*b*) (i) Calculate the composite index for the expenditure of foodstuffs in the year 2011 based on the year 2009.
Hitung indeks gubahan perbelanjaan bagi jenis makanan itu pada tahun 2011 *berasaskan tahun* 2009.

(ii) Hence, calculate Puan Alia's total yearly expenses for the foodstuff in the year 2011 if the corresponding expenses for the year 2009 is RM 550.
Seterusnya, hitung jumlah perbelanjaan tahunan Puan Alia untuk jenis makanan tersebut pada tahun 2011 *jika perbelanjaan yang sepadan pada tahun* 2009 *ialah* RM 550. [5 *marks*]
[5 *markah*]

(*c*) The expenses increases 42% from the year 2009 to 2012. Find the composite index number in the year 2012 based on the year 2011. [2 *marks*]
Kos barangan itu meningkat 42% *dari tahun* 2009 *ke tahun* 2012. *Cari nombor indeks gubahan tahun* 2012 *berasaskan tahun* 2011. [2 *markah*]

14 A factory produces two types of computer chips P and Q using machine M and machine N. Machine M requires 100 minutes to produce a unit of chip P and 50 minutes for a unit of chip Q.While machine N requires 30 minutes to produce a unit of chip P and 90 minutes for a chip Q.
Sebuah kilang menghasilkan dua jenis cip komputer P dan Q menggunakan mesin M dan mesin N. Mesin M memerlukan 100 minit untuk menghasilkan satu unit cip P dan 50 minit *untuk satu unit cip Q.Manakala mesin N memerlukan 30 minit untuk menghasilkan satu unit cip P dan* 90 minit *untuk satu unit cip Q.*
The factory produces x units of chip P and y units of chip Q in a week. The production of computer chips in a week is based on the following constraints :
Kilang itu menghasilkan x unit cip P dan y unit cip Q dalam seminggu.Penghasilan cip komputer itu dalam seminggu adalah berdasarkan kepada kekangan berikut :

I : The total time usage of machine M is not more than 5000 minutes.
Jumlah penggunaan masa bagi mesin M tidak melebihi 5000 minit.

II : The total time usage of machine N is at least 1800 minutes.
Jumlah penggunaan masa bagi mesin N adalah sekurang-kurangnya 1800 minit.

III : The production of chip Q is at most than two times the production of chip P.
Penghasilan cip Q adalah selebih-lebihnya dua kali penghasilan cip P.

(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 memenuhi semua kekangan di atas.* [3 *markah*]

(b) Using a scale of 2 cm to 10 chips on both axes, construct and shade the region R which satisfies all of the above constraints. [3 *marks*]
Dengan menggunakan skala 2 cm *kepada* 10 *cip pada kedua-dua paksi, bina dan lorek rantau R yang memenuhi semua kekangan di atas.* [3 *markah*]

(c) Use your graph in 14(b) to find
Guna graf anda di 14(*b*) *untuk mencari*
(i) the maximum number of units of chip P produced in a week if the number of units of chip P is two times the number of units of chip Q.
bilangan maksimum bagi unit cip P yang dihasilkan dalam seminggu jika bilangan unit cip P adalah dua kali bilangan unit cip Q.
(ii) the maximum profit that can be obtained in a week if the profits from the sales of a unit of chip P and a unit of chip Q are RM20 and RM10 respectively.
keuntungan maksimum yang diperolehi dalam seminggu jika keuntungan jualan dari satu unit cip P dan satu unit cip Q adalah RM20 *dan* RM10 *masing-masing.*
[4 *marks*]
[4 *markah*]

15 Diagram 15 shows a quadrilateral $PQRS$ where $\angle PQR$ is acute and $\angle PRS$ is obtuse.
Rajah 15 *menunjukkan sisiempat* $PQRS$ *dengan keadaan* $\angle PQR$ *adalah tirus dan* $\angle PRS$ *adalah cakah.*

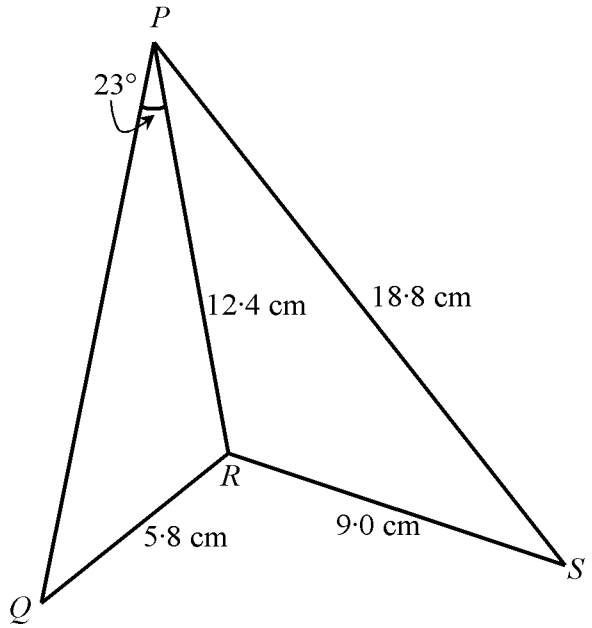


Diagram 15 / *Rajah* 15

(*a*) Calculate / *Hitung*
(i) $\angle PQR$,
(ii) $\angle PRS$,
(iii) the length of PQ.
panjang sisi PQ.

[6 *marks*]
[6 *markah*]

(*b*) A new triangle $P'Q'R'$ is formed where $P'R' = 12{\cdot}4$ cm, $Q'R' = 5{\cdot}8$ cm and $\angle Q'P'R' = 23°$.
Sebuah segitiga baru $P'Q'R'$ *terbentuk dengan keadaan* $P'R' = 12{\cdot}4$ cm, $Q'R' = 5{\cdot}8$ cm *dan* $\angle Q'P'R' = 23°$.

(i) Sketch the triangle $P'Q'R'$ and state $\angle P'Q'R'$.
Lakarkan segitiga $P'Q'R'$ *dan nyatakan* $\angle P'Q'R'$.

(ii) Calculate the area of $\Delta P'Q'R'$.
Hitung luas $\Delta P'Q'R'$.

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

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

NAMA : ……..

TINGKATAN : ……..

Arahan Kepada Calon

1. Tulis Nama dan Tingkatan anda.
2. Tandakan (✓) untuk soalan yang dijawab.
3. Ceraikan helaian ini dan ikat sebagai muka hadapan bersama-sama dengan kertas jawapan.

Bahagian	Soalan	Soalan Dijawab	Markah Penuh	Markah Diperoleh (*Untuk Kegunaan Pemeriksa*)
A	**1**		5	
	2		7	
	3			
	4		8	
	5		7	
	6		8	
B	**7**		10	
	8		10	
	9		10	
	10		10	
	11		10	
C	**12**		10	
	13		10	
	14		10	
	15		10	
Jumlah				

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 foolscap papers provided.

   Tulis jawapan anda pada kertas jawapan yang disediakan.

4. Show your working. It may help you to get marks.

   Tunjukkan langkah-langkah penting dalam kerja mengira anda. Ia 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 ceraian soalan ditunjukkan dalam kurungan.

7. A list of formulae is provided on pages 3 to 5.

   Satu senarai rumus disediakan di halaman 3 *hingga* 5.

8. Graph paper and a booklet of four-figure mathematical tables is provided.

   Kertas graf dan buku sifir matematik empat angka disediakan.

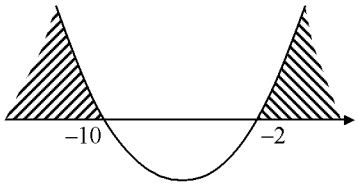
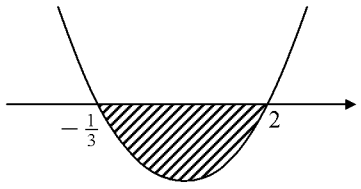
9. You may use a non-programmable scientific calculator.

   Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogram.

10. Tie the 'helaian tambahan' and the graph papers together with the answer sheets and hand in to the invigilator at the end of the examination.

    Ikatkan helaian tambahan dan kertas graf bersama-sama dengan kertas jawapan dan serahkan kepada pengawas peperiksaan pada akhir peperiksaan.

TRIAL EXAM SPM 2012
MARK SCHEME FOR ADDITIONAL MATHS. PAPER 1

No.	Mark Scheme	Σ Mark
1	(a) $k = 6$ **[1]** (b) $g(x) = x - 1$ or $g : x \to x - 1$ **[1]**	2
2	$m = \frac{1}{8}$, $n = -7$ (both) **[3]** $\frac{1}{4} = 2m$ or $\frac{-n}{4} = \frac{7}{4}$ **B2** $\frac{x-n}{4}$ or equivalent **B1**	3
3	$p = -2$ **2** $3(-1)\left[2(-1)-1\right] = 5 - 2p$ **B1**	2
4	$k < -10$, $k > -2$ **3**  **B2** $(-6-k)^2 - 4(2)(2) > 0$ **B1** use $b^2 - 4ac > 0$	3
5	$-\frac{1}{3} < x < 2$ **[3]**  **B2** $x = -\frac{1}{3}$, 2 **B1**	3
6	(a) $k = 1$ **[1]** $p = -2$ **[1]** (b) $x = 2$ **[1]**	3

No.	Mark Scheme	Σ Mark
7	$3x^2+3y^2+24x-8y+36=0$ **[3]** $2\sqrt{(x+3)^2+(y-2)^2}=\sqrt{(x-0)^2+(y-4)^2}=4$ **or** equivalent **B2** $\sqrt{(x+3)^2+(y-2)^2}$ or $\sqrt{(x-0)^2+(y-4)^2}$ **B1**	**3**
8	$\theta = 0{\cdot}48$ **[3]** $\frac{1}{2}(10)^2\theta = \frac{1}{2}(6)(8)$ **B2** $\frac{1}{2}(10)^2\theta$ **or** $\frac{1}{2}(6)(8)$ **B1**	**3**
9	(a) $k=5$ **[2]** $3k+3-2k=5k+1-(3k+3)$ **B1** (b) 88 **[2]** $\frac{4}{2}[2(10)+(4-1)8]$ **B1** follow thro'	**4**
10	(a) $\frac{3}{4}$ **[2]** $8=\frac{2}{1-r}$ **B1** (b) $\frac{3}{2}$ **[1]**	**3**
11	$x=\frac{3}{2}$ **[4]** $5^{2x}=5^3$ **B3** $5^{2x}=125$ **B2** $5^{2x}=100+\frac{5^{2x}}{5}$ **B1**	**4**

No.	Mark Scheme	Σ Mark
12	$4 + a - \frac{b}{2}$ **[4]** $4\log_5 5 + \log_5 x - \frac{1}{2}\log_5 y$ **B3** $\log_5 625 + \log_5 x - \log_5 \sqrt{y}$ **B2** $\log_5 625x - \log_5 \sqrt{y}$ **B1**	**4**
13	$x = -\frac{3}{4}$ **[4]** $4(x+3) = 9$ **B3** $\log_9 4(x+3) = 1$ **B2** $\log_9 4 + \log_9(x+3) = 1$ or $\log_3 2 + \frac{\log_3(x+3)}{\log_3 9} = 1$ **B1**	**4**
14	65 **[3]** $4 = \frac{p}{5} - 9$ **B2** $\sigma = \sqrt{\frac{p}{5} - 9}$ or $\sigma^2 = \frac{p}{5} - 9$ **B1**	**3**
15	$(3, 4)$ **[3]** $2(x-5) = -4$ **B2** $\frac{dy}{dx} = 2x - 10$ *or* $m_2 = \frac{1}{4}$ **B1**	**3**
16	-16 **[4]** $f''(x) = 8(2x-1)^{-3}(2)$ *or* equivalent **B3** $f'(x) = \frac{-4}{(2x-1)^2}$ *or* equivalent **B2** $\frac{(2x-1)(4) - 4x(2)}{(2x-1)^2}$ *or* $(2x-1)(4)$ *or* $4x(2)$ **B1**	**4**

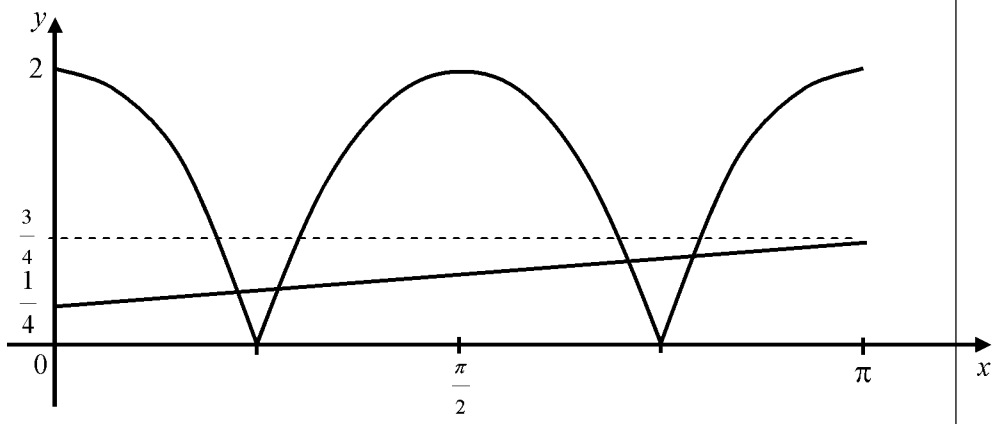
No.	Mark Scheme	Σ Mark
17	$\frac{3}{16}$ **[3]** $\int_1^2 f(x)\,dx = \frac{1}{4}\left[\frac{2x^2-1}{x^2}\right]_1^2$ **OR** $\int_1^2 f(x)\,dx = \frac{1}{2}\left[\frac{x^{-2}}{-2}\right]_1^2$ **B2** $\frac{1}{4}\left[\frac{2x^2-1}{x^2}\right]_1^2$ **OR** $f(x) = \frac{1}{2}x^{-3}$ **B1** ignore the limits	**3**
18	(*a*) 10 **[1]** (*b*) $k = 12$ **[3]** $\left[\frac{kx^2}{2}\right]_1^2$ **B2** for integrate $\int_1^2 kx\,dx - \int_1^2 f(x)\,dx$ **B1** (separate)	**4**
19	$x = 30°, 90°, 150°, 270°$ **[3]** $\cos x = 0$, $\sin x = \frac{1}{2}$ **B2** $\cos x\,(1 - 2\sin x) = 0$ $\cos x - 2\sin x \cos x = 0$ **B1**	**3**
20	$m = 1, n = 19$ (both) **[3]** $m = 1$ or $n = 19$ **B2** OR $7 = 3(m) + 4$, $n = 3(5) + 4$ (both) **B2** $\frac{y}{x^2} = 4 + 3x$ **B1**	**3**

No.	Mark Scheme	Σ Mark
21	(a) $2\mathbf{i} + 5\mathbf{j}$ **[1]** (b) $\frac{2\mathbf{i}+5\mathbf{j}}{\sqrt{29}}$ **[2]** $\sqrt{2^2+5^2}$ **B1**	3
22	$\frac{1}{45}$ **[3]** $\frac{2}{10}\times\frac{1}{9}$ **B2** $\frac{2}{10}$ or $\frac{1}{9}$ **B1**	3
23	(a) 5040 **[1]** (b) 720 **[2]** $5! \times 3!$ or ${}^5P_5 \times {}^3P_3$ or $5\times4\times3\times2\times1 \times 3\times2\times1$ **B1**	3
24	(a) 350 **[2]** ${}^7C_4 \times {}^5C_2$ **B1** (b) 112 **[2]** ${}^5C_4 \times {}^7C_2$ or ${}^5C_5 \times {}^7C_1$ **B1**	4
25	$h = 1{\cdot}2$ **[3]** 0·1151 seen **B2** 0·2514 or 0·8849 **B1**	3

END OF MARK SCHEME

SPM TRIAL EXAM 2011
MARK SCHEME ADDITIONAL MATHEMATICS 2

SECTION *A* [40 MARKS]		
No.	**MARK SCHEME**	**Σ MARK**
1	$y = 2x - 6$ **P1** $x^2 - (2x - 6)^2 + x = 4(2x - 6)$ **K1** $3x^2 - 17x + 12 = 0$ $x = \frac{-(-17) \pm \sqrt{(-17)^2 - 4(3)(12)}}{2(3)}$ **K1** $x = 4.84$, $x = 0.83$ **N1** $y = 3.68$, $y = -4.35$ **N1** **OR** $x = \frac{y+6}{2}$ **P1** $-3y^2 - 2y + 48 = 0$ $y = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(-3)(48)}}{2(-3)}$ **K1** $y = 3.68, -4.35$ **N1** $x = 4.84, 0.83$ **N1**	**5**

No.	MARK SCHEME	Σ MARK
2	(a) and (b)  - shape of cos graph **P1** - amplitude (max = 2) **P1** - absolute (modulus) **P1** - period/cycle in $0 \le x \le \pi$ **P1** (ignore range greater than π) $y = \frac{x}{2\pi} + \frac{1}{4}$ **K1** (equation of straight line) **K1** (any straight line with positive gradient **or** y-intercept of $\frac{1}{4}$) No. of solutions = 4 **N1** (without any mistake done)	7

No.	MARK SCHEME	Σ MARK
3	(a) $a = 25,\ d = 2$ $T_9 = 25 + (9-1)\,2$ **K1** $= 41$ **N1** (b) i. $\frac{n}{2}[2(25)+(n-1)2] = 1300$ **K1** $(n-26)(n+50) = 0$ **K1** $n = 26$ **N1** ii. $T_{26} = 25 + (26-1)\,2$ $= 75$ **N1**	6
4	(a) $(2-2p)\times(-1)$ **K1** $\frac{dy}{dx} = \frac{dy}{dp}\times\frac{dp}{dx}$ $4 - 2x$ **N1** **OR** $y = 2(3-x)-(3-x)^2$ and try to differentiate (for 4 or $-2x$) **K1** $\frac{dy}{dx} = 4 - 2x$ **N1** (b) $\frac{dy}{dt} = 0.6$ **P1** $0.6 = [4-2(1)]\times\frac{dx}{dt}$ **K1** using $\frac{dy}{dt} = \frac{dy}{dx}\times\frac{dx}{dt}$ $\frac{dx}{dt} = 0.3$ **N1** (c) $\delta p = -0.04$ **P1** $\delta y = [2-2(2)](-0.04)$ **K1** 0.08 **N1**	8

No.	MARK SCHEME	Σ MARK
5	$\frac{4k+52}{6}=m$ **or** $\frac{3k-3+11-3}{2}=\frac{3m}{4}$ **K1** Try to solve simultaneous equations (until one varaible left) **K1** $k=4$ **N1** $m=\frac{34}{3}$ **N1** Data : 5, 4, 12, 11, 15, 21 Varians $=\frac{4^2+5^2+11^2+12^2+15^2+21^2}{6}-\left(\frac{34}{3}\right)^2$ **K1** $=33{\cdot}56$ **N1**	6
6	(a) (i) $\overrightarrow{PA}=-2\underset{\sim}{x}+6\underset{\sim}{y}$ **N1** (ii) $\overrightarrow{OB}=6\underset{\sim}{x}+9\underset{\sim}{y}$ **N1** (b) (i) $\overrightarrow{QA}=m(-2\underset{\sim}{x}+6\underset{\sim}{y})$ $\overrightarrow{OQ}=6\underset{\sim}{y}+m(2\underset{\sim}{x}-6\underset{\sim}{y})$ **N1** (ii) $\overrightarrow{OQ}=6\underset{\sim}{x}+9\underset{\sim}{y}+n(-9\underset{\sim}{y}-6\underset{\sim}{x})$ or equivalent **N1** $2m=6(1-n)$ or $6(1-m)=9(1-n)$ **K1** Solve simultaneous equations **K1** $m=\frac{2}{3}$, $n=\frac{7}{9}$ **N1, N1**	8

SECTION *B* [40 MARKS]		
No.	**MARK SCHEME**	**Σ MARK**
7	(a) (i) $\frac{k}{4} = 2$ **K1** $k = 8$ **N1** (ii) $-\frac{1}{2}x = 2x + 10$ **K1** simultaneous OP and PQ_{nya} $P(-4, 2)$ **N1** (b) (i) $\frac{5(-4) + 2a}{7} = 0$ OR $\frac{5(2) + 2b}{7} = 10$ **K1** Q(10, 30) **N1** (ii) $m = -\frac{1}{2}$ **K1** $y = -\frac{1}{2}x + 35$ or equivalent **N1** (c) $\frac{1}{2}\lvert 0(2) + (-4)(30) + 10(0) - 0(-4) - 2(10) - 30(0) \rvert$ **K1** 70 unit^2 **N1**	**10**

No.	MARK SCHEME	Σ MARK
8	(a) $A_1 = \int_2^3 3(x^2-4)\,dx$ **K1** **P1** for limit $\int_2^3 dx$ $= \left[\frac{3x^3}{3} - 12x\right]_2^3$ **K1** (integrate) $= 7$ $A_2 = \frac{1}{2}(9+15)(3)$ **K1** $A_2 - A_1$ **K1** $36 - 7$ $= 29 \text{ unit}^2$ **N1**	**10**
	(b) $V = \pi \int_0^9 \left(\frac{y}{3} + 4\right) dx$ **K1** **P1** for limit $\int_0^9 dx$ $= \pi \left[\frac{y^2}{6} + 4y\right]_0^9$ **K1** (integrate) $= \frac{99}{2}\pi \text{ unit}^3$ **N1**	

No.	MARK SCHEME	Σ MARK
9	Linear law	10

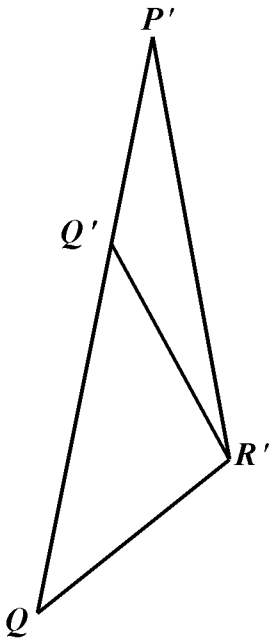
No.	MARK SCHEME	Σ MARK
10	(a) $\cos\theta = \frac{18}{24}$ **K1** $\theta = 0{\cdot}7228$ **N1** (b) Use sin **or** tan **or** pythagoras theorem to find PR **or** $s = 24\theta$ to find PQ **K1** $PR + RQ + PQ$ **K1** $= 39{\cdot}22$ cm **N1** (c) Use tan to find PS $PS = 21{\cdot}17$ **P1** Area of $\Delta OPS = \frac{1}{2} \times 24 \times PS$ **K1** Area of sector $OPQ = \frac{1}{2}(24)^2(0{\cdot}7228)$ **K1** Area of Y = Area of ΔOPS – Area of sector OPQ **K1** $= 45{\cdot}87$ cm^2 **N1**	**10**

No.	MARK SCHEME	Σ MARK
11	(a) $p = 0.85, q = 0.15, n = 7$ (i) $P(X = 3) = {}^7C_3 (0.85)^3 (0.15)^4$ **K1** $= 0.01088$ **N1** (ii) $P(X \geq 2) = 1 - P(X = 0) - P(X = 1)$ **K1** $= 1 - {}^7C_0 (0.85)^0 (0.15)^7 - {}^7C_1 (0.85)^1 (0.15)^6$ **K1** $= 0.9999$ **N1** (b) (i) $P(X < 45)$ $= P\left(Z < \frac{45-50}{6}\right)$ **K1** $= P(Z < -0.8333)$ $= 0.20234$ **N1** (ii) $P(X > m) = 0.65$ $P\left(Z > \frac{m-50}{6}\right) = 0.65$ **K1** $\frac{m-50}{6} = -0.385$ **K1** $m = 47.69$ **N1**	**10**

SECTION *C* [20 MARKS]		
No.	**MARK SCHEME**	**Σ MARK**
12	(a) t = 1 N1 (b) $v = \int 6t - 6\,dt$ $= \frac{6}{2}t^2 - 6t + c$ K1 t = 0, v = – 9 so c = –9 $v = 3t^2 - 6t - 9$ K1 a = 1 $v_{min} = 3(1)^2 - 6(1) - 9$ $= -12\ ms^{-1}$ N1 (c) v = 0, $3t^2 - 6t - 9 = 0$ K1 t = 3 s N1 (d) Distance = $\left\lvert \int_0^3 3t^2 - 6t - 9\,dt \right\rvert + \int_3^4 3t^2 - 6t - 9\,dt$ K1 $= \left\lvert \frac{3t^3}{3} - \frac{6t^2}{2} - 9t \right\rvert_0^3 + \left\lvert \frac{3t^3}{3} - \frac{6t^2}{2} - 9t \right\rvert_3^4$ K1 $\left\lvert [(3)^3 - 3(3)^2 - 9(3)] \right\rvert + [(4)^3 - 3(4)^2 - 9(4)] - [(3)^3 - 3(3)^2 - 9(3)]$ K1 = 34 m. N1	**10**

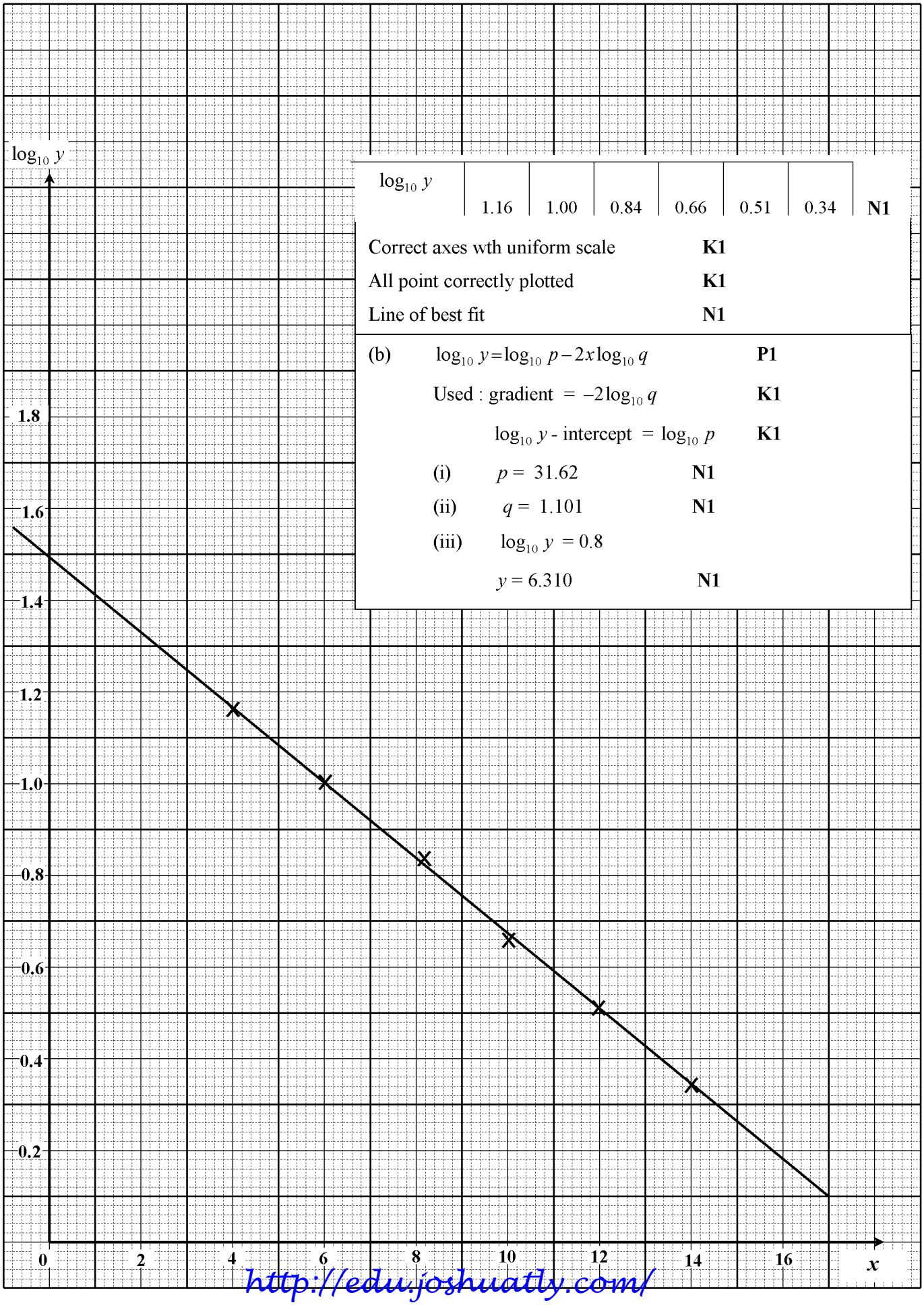
No.	MARK SCHEME	Σ MARK
13	(a) $\frac{12.30}{x}\times 100 = 120$ **or** $\frac{y}{18}\times 100 = 110$ **or** $\frac{8}{6.50}\times 100 = z$ **K1** x = RM 10.25 **N2,1** y = RM 19.80 z = 123.1 (b) (i) $\sum W_i = 360^\circ$ **P1** $\bar{I} = \frac{120(90)+110(75)+135(80)+123.1(115)}{360}$ **K1** = 122.2 **N1** (ii) $P_{2011} = \frac{122.2\times 550}{100}$ **K1** = RM 672.10 **N1** (Accept RM672.28 or RM672.27 or RM672.16) (c) $I_{12/11} = \frac{142}{122.2}\times 100$ or equivalent **K1** = 116.2 **N1**	**10**

14	**Linear Prog**	10

No.	MARK SCHEME	Σ MARK
15	(a) (i) $\frac{5.8}{\sin 23^\circ} = \frac{12.4}{\sin Q}$ **K1** $Q = 56{\cdot}65$ **N1** (ii) $18{\cdot}8^2 = 12{\cdot}4^2 + 9^2 - 2(12{\cdot}4)(9)\cos R$ **K1** $R = 122{\cdot}12^\circ$ **N1** (iii) $PQ^2 = 5{\cdot}8^2 + 12{\cdot}4^2 - 2(5{\cdot}8)(12{\cdot}4)\cos\angle PRQ$ **K1** $= 14{\cdot}6$ cm **N1** (b) (i)  **P1** $123{\cdot}35^\circ$ **N1** (ii) Area $= \frac{1}{2}(5.8)(12.4)\sin 33{\cdot}65$ **K1** $= 19{\cdot}93$ cm^2 **N1**	**10**

END OF MARK SCHEME

No.9

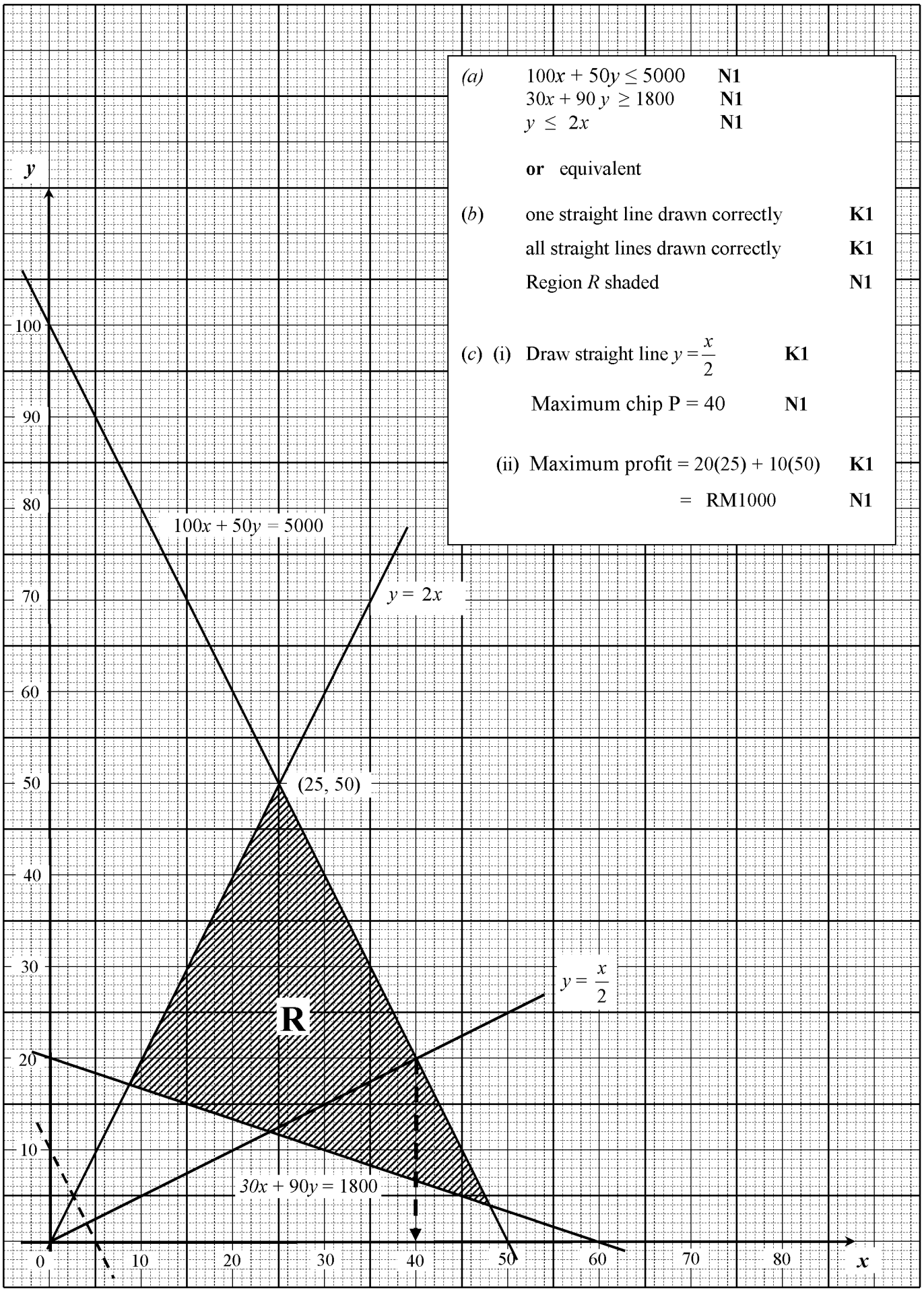


$\log_{10} y$	1.16	1.00	0.84	0.66	0.51	0.34	**N1**

Correct axes wth uniform scale		**K1**
All point correctly plotted		**K1**
Line of best fit		**N1**

(b)	$\log_{10} y = \log_{10} p - 2x\log_{10} q$	**P1**
	Used : gradient $= -2\log_{10} q$	**K1**
	$\log_{10} y$ - intercept $= \log_{10} p$	**K1**
	(i) $p = 31.62$	**N1**
	(ii) $q = 1.101$	**N1**
	(iii) $\log_{10} y = 0.8$	
	$y = 6.310$	**N1**

No. 14



(a)	$100x + 50y \leq 5000$	**N1**
	$30x + 90y \geq 1800$	**N1**
	$y \leq 2x$	**N1**
	or equivalent	
(b)	one straight line drawn correctly	**K1**
	all straight lines drawn correctly	**K1**
	Region *R* shaded	**N1**
(c) (i)	Draw straight line $y = \frac{x}{2}$	**K1**
	Maximum chip P = 40	**N1**
(ii)	Maximum profit = 20(25) + 10(50)	**K1**
	= RM1000	**N1**