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

1 The relation between set $A = \{-2m, -3, -1, 1, 3, 4\}$ and set $B = \{1, 3, 4\}$ is defined by the following set of ordered pairs:

Hubungan di antara set $A = \{-2m, -3, -1, 1, 3, 4\}$ *dan set* $B = \{1, 3, 4\}$ *ditakrifkan oleh set pasangan bertertib berikut*:

$$\{(-2m, 4), (-3, 3), (-1, 1), (1, 1), (3, 3), (4, 4)\}$$

State

Nyatakan

(*a*) the value of *m*,
nilai bagi m,

(*b*) the type of the relation.
jenis hubungan itu.

(*c*) Using the function notation, write a relation between set *A* and set *B*.
Dengan menggunakan tata tanda fungsi, tulis satu hubungan antara set A dan set B.

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

Answer / *Jawapan*:

(*a*)

(*b*)

(*c*)

1
3

For Examiner's Use

2 Given the function $f : x \to \frac{x-9}{2}$, find

Diberi fungsi $f : x \to \frac{x-9}{2}$, *cari*

(*a*) $f^{-1}(x)$,

(*b*) the value of *p* such that $f^{-1}(p) = 8$.

nilai bagi p dengan keadaan $f^{-1}(p) = 8$.

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

Answer / *Jawapan*:

(*a*)

(*b*)

2
3

---

3 Given the function $g(x) = 2x + 1$ and the composite function $hg(x) = 1 - 4x$, find $h(x)$.

[3 *marks*]

Diberi fungsi $g(x) = 2x + 1$ *dan fungsi gubahan* $hg(x) = 1 - 4x$, *cari* $h(x)$.

[3 *markah*]

Answer / *Jawapan*:

3
3

4 It is given that -2 and p are the roots of the quadratic equation $x^2+3x-k=0$. State the value of p and of k. [3 *marks*]

Diberi bahawa -2 *dan* p *adalah punca-punca persamaan kuadratik* $x^2+3x-k=0$. *Nyatakan nilai* p *dan nilai* k. [3 *markah*]

Answer / *Jawapan*:

4 3

---

5 The quadratic equation $x^2+px+p=2(x+1)$, where p is a constant, has two different roots.
Find the range of values of p. [3 *marks*]

Persamaan kuadratik $x^2+px+p=2(x+1)$, *dengan keadaan* p *ialah pemalar, mempunyai dua punca berbeza.*
Cari julat nilai p. [3 *markah*]

Answer / *Jawapan*:

5 3

---

6 The quadratic function $f(x) = 2x^2 - 12x + k$ can be expressed in the form of $f(x) = 2(x-h)^2 + 7$, where h and k are constants.
Find the value of h and of k. [3 *marks*]

Fungsi kuadratik $f(x) = 2x^2 - 12x + k$ *boleh diungkapkan dalam bentuk* $f(x) = 2(x-h)^2 + 7$, *dengan keadaan* h *dan* k *ialah pemalar.*
Cari nilai h *dan nilai* k. [3 *markah*]

Answer / *Jawapan*:

6 3

For Examiner's Use

7 Solve the equation:

Selesaikan persamaan:

$$8\left(2^{n-5}\right)=\frac{1}{16^{n}}.$$

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

Answer / *Jawapan*:

7

3

---

8 Solve the equation:

Selesaikan persamaan:

$$\log_4 y+\log_2 y=3$$

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

Answer / *Jawapan*:

8

4

[Lihat halaman sebelah
SULIT

9 Verify whether the following sequence is an arithmetic progression or a geometric progression.

Tentusahkan sama ada jujukan berikut merupakan suatu janjang aritmetik atau janjang geometri.

0.2, 0.06, 0.018, ...

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

Answer / *Jawapan*:

9

2

---

10 In an arithmetic progression, the first term is –19 and the common difference is 6. Given that the number of positive terms is three times the number of negative terms, find the total number of terms in this progression. [3 *marks*]

Dalam suatu janjang aritmetik, sebutan pertama ialah –19 *dan beza sepunya ialah* 6. *Diberi bahawa bilangan sebutan bernilai positif adalah tiga kali ganda bilangan sebutan negatifnya, cari bilangan sebutan bagi janjang itu*. [3 *markah*]

Answer / *Jawapan*:

10

3

For Examiner's Use

11 The first term of a geometric progression is a and the common ratio is r. Given that $a+96r=0$ and the sum to infinity of the progression is 32.

Sebutan pertama suatu janjang geometri ialah a dan nisbah sepunya r. Diberi bahawa $a+96r=0$ *dan hasil tambah hingga ketakterhinggaan bagi janjang ini ialah* 32.

Find

Cari

(a) the value of a and of r,

nilai a dan nilai r,

(b) the 8^{th} term of the progression.

sebutan ke-8 *bagi janjang itu.*

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

Answer / *Jawapan*:

(a)

(b)

11

4

12 Diagram 12 shows part of a straight line graph drawn to represent the equation $hx + ky = xy$.

Rajah 12 *menunjukkan sebahagian daripada graf garis lurus yang mewakili persamaan* $hx + ky = xy$.

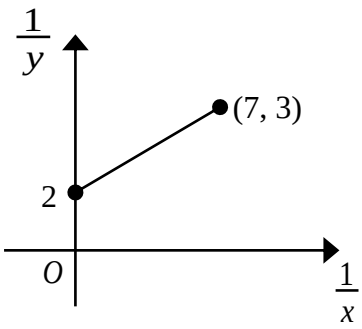


Diagram 12
Rajah 12

Find the value of h and of k.

Cari nilai h dan nilai k.

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

Answer / *Jawapan*:

12

4

For Examiner's Use

13 Diagram 13 shows the straight line *AB*.
Rajah 13 *menunjukkan garis lurus AB.*

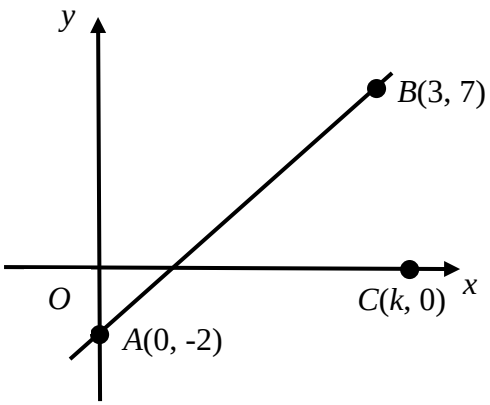


Diagram 13
Rajah 13

(*a*) Find the equation of the straight line *AB*.
Cari persamaan bagi garis lurus AB.

(*b*) The point *C* lies on the *x*-axis and the area of triangle *ABC* is 15 units^2.
Find the value of *k*.
Titik C terletak pada paksi-x dan luas bagi segi tiga ABC ialah 15 *unit*^{2}.
Cari nilai bagi k.

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

Answer / *Jawapan*:

(*a*)

(*b*)

13

4

14 Diagram 14 shows a parallelogram *PQRS* with *QTS* as a straight line.
Rajah 14 *menunjukkan suatu segi empat selari PQRS dengan QTS sebagai suatu garis lurus.*

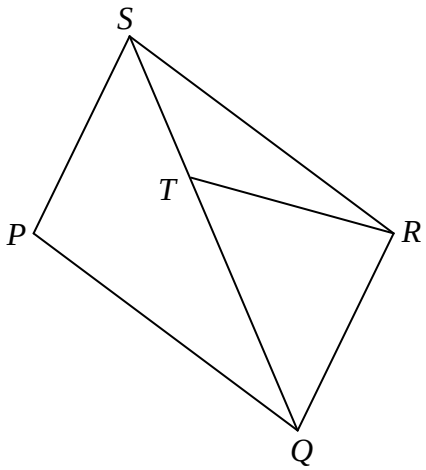


Diagram 14
Rajah 14

Given that $\overrightarrow{PQ} = 5\underline{x}$, $\overrightarrow{QR} = 3\underline{y}$ and $4ST = TQ$.
Diberi bahawa $\overrightarrow{PQ} = 5\underline{x}$, $\overrightarrow{QR} = 3\underline{y}$ *dan* $4ST = TQ$.

Express in terms of $\underline{x}$ and $\underline{y}$.
Ungkapkan dalam sebutan $\underline{x}$ *dan* $\underline{y}$.

(*a*) $\overrightarrow{QS}$

(*b*) $\overrightarrow{TR}$

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

Answer / *Jawapan*:

(*a*)

(*b*)

14

3

For Examiner's Use

15 Given that points $P(2s, 5)$, $Q(t-1, 3)$ and $R(-2, 0)$ are collinear.
Express s in terms of t. [3 *marks*]

Diberi bahawa $P(2s, 5)$, $Q(t-1, 3)$ *dan* $R(-2, 0)$ *adalah segaris.*
Ungkapkan s dalam sebutan t. [3 *markah*]

Answer / *Jawapan*:

15

3

---

16 Given that vector $\underline{p} = 5\underline{i} - 12\underline{j}$ and $\underline{q} = m\underline{i} + 6\underline{j}$, where m is a constant.
Diberi bahawa vektor $\underline{p} = 5\underline{i} - 12\underline{j}$ *dan* $\underline{q} = m\underline{i} + 6\underline{j}$ *dengan keadaan m ialah pemalar.*

Find
Cari

(*a*) the value of m if the vector of $\underline{p}$ and the vector of $\underline{q}$ are parallel,
nilai m jika vektor $\underline{p}$ *dan vektor* $\underline{q}$ *adalah selari,*

(*b*) the unit vector in direction of $\underline{p}$.
vektor unit dalam arah $\underline{p}$.

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

Answer / *Jawapan*:

(*a*)

(*b*)

16

4

For Examiner's Use

17 Diagram 17 shows a triangle *PQR* and sector *PQT* of a circle with centre *P*.
Rajah 17 *menunjukkan suatu segi tiga PQR dan sektor PQT bagi sebuah bulatan berpusat P.*

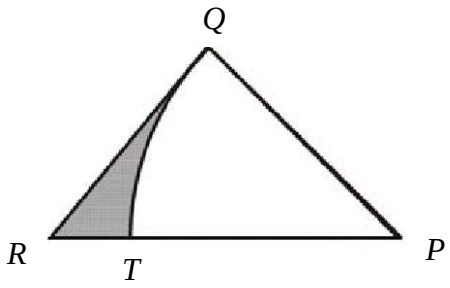


Diagram 17
Rajah 17

It is given that $RQ = QP$, $\angle PQR = \frac{1}{2}\pi$ radians and the area of shaded region is 6.864 cm^2. Find the length, in cm, of the radius of sector *PQT*. [3 *marks*]

Diberi bahawa $RQ = QP$, $\angle PQR = \frac{1}{2}\pi$ *radian dan luas bagi kawasan berlorek ialah* 6.864 cm^2. *Cari panjang, dalam* cm, *bagi jejari sektor PQT*. [3 *markah*]

[Use/*Guna* $\pi = 3.142$]

Answer / *Jawapan*:

17

3

---

18 Solve the equation $3\cos^2 x + \sin 2x = 0$ for $0^o \le x \le 360^o$. [4 *marks*]
Selesaikan persamaan $3kos^2 x + sin\ 2x = 0$ for $0^o \le x \le 360^o$. [4 *markah*]

Answer / *Jawapan*:

18

4

For Examiner's Use

19 Given that $\int_{-2}^{4} f(x)\,dx = 6$ and $\int_{-3}^{1} g(x)\,dx = -4$, find the value of

Diberi bahawa $\int_{-2}^{4} f(x)\,dx = 6$ *dan* $\int_{-3}^{1} g(x)\,dx = -4$, *cari nilai bagi*

(*a*) $\int_{-2}^{4} \frac{f(x)}{2}\,dx$,

(*b*) k if $\int_{1}^{-3} \left[g(x) - kx \right] dx = 44$.

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

Answer / *Jawapan*:

(*a*)

(*b*)

19

3

---

20 Given that the gradient of normal to the curve $y = (3x+5)^2$ at point Q is $-\frac{1}{12}$, find the coordinates of Q. [3 *marks*]

Diberi bahawa kecerunan normal kepada lengkung $y = (3x+5)^2$ *pada titik* Q *ialah* $-\frac{1}{12}$, *cari koordinat bagi* Q. [3 *markah*]

Answer / *Jawapan*:

20

3

For Examiner's Use

21 A cuboid has a square base of sides x cm. The height of the cuboid is two times the length of the sides of its base. If x increases at the rate of 0.003 cm s^{-1}, find the rate of change in the volume of the cuboid when $x = 4$ cm.

[3 *marks*]

Suatu kuboid mempunyai tapak berbentuk segi empat sama dengan sisi x cm. *Tinggi kuboid adalah dua kali panjang sisi tapaknya. Jika* x *bertambah dengan kadar* 0.003 cm s^{-1}, *cari kadar perubahan isipadu kuboid tersebut apabila* $x = 4$ cm.

[3 *markah*]

Answer / *Jawapan*:

21

3

---

22 A set of data consisting of five numbers has a mean of 12 and a standard deviation of 4. When a number, 16, is removed from the set, the new mean is 11.
Find the variance of the remaining set of numbers. [3 *marks*]

Suatu set data terdiri daripada lima nombor mempunyai min 12 *dan sisihan piawai* 4. *Apabila satu nombor*, 16, *dikeluarkan daripada set tersebut, min barunya ialah* 11.
Cari varians bagi set nombor yang tinggal itu. [3 *markah*]

Answer / *Jawapan*:

22

3

For Examiner's Use

23 Find how many 4-digit odd numbers that are greater than 6000 can be formed from the digits 3, 4, 5, 6, 7 and 8 if no repetition of digits is allowed. [3 *marks*]

Cari bilangan nombor ganjil 4 *digit melebihi* 6000 *yang dapat dibentuk daripada digit-digit* 3, 4, 5, 6, 7 *dan* 8 *jika tiada ulangan dibenarkan.* [3 *markah*]

Answer / *Jawapan*:

23

3

---

24 Sharon applies for a job in three companies *P*, *Q* and *R*. The probability of her being offered a job in company *P*, *Q* and *R* are $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{2}{5}$ respectively.
Find the probability that she gets at least one job offer. [3 *marks*]

Sharon memohon pekerjaan di tiga buah syarikat P, Q dan R. Kebarangkalian dia ditawarkan pekerjaan dari syarikat P, Q dan R ialah $\frac{1}{3}$, $\frac{1}{4}$ *dan* $\frac{2}{5}$ *masing-masing.*
Cari kebarangkalian bahawa dia mendapat sekurang-kurangnya satu tawaran pekerjaan. [3 *markah*]

Answer / *Jawapan*:

24

3

For Examiner's Use

25 X is a continuous random variable of a normal distribution with a mean of 4.8 and a standard deviation of 1.2.

X ialah pemboleh ubah rawak selanjar bagi suatu taburan normal dengan min 4.8 *dan sisihan piawai* 1.2.

Find
Cari

(*a*) value of X when z-score is 1.45,
nilai X apabila skor-z ialah 1.45,

(*b*) $P(X \leq 6.54)$

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

Answer / *Jawapan*:

(*a*)

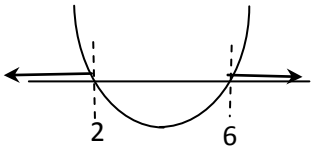
(*b*)

25

3

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

KERTAS JAWAPAN
ADDITIONAL MATHEMATICS PAPER 1
SPM
YEAR 2011

No.	Solution and Mark Scheme	Sub Marks	Total Marks
1(*a*) (*b*) (*c*)	2 Many to one $f : x \mapsto \lvert x \rvert$ *or* $f(x) = \lvert x \rvert$	1 1 1	**3**
2(*a*) (*b*)	$f^{-1}(x) = 2x + 9$ $-\frac{1}{2}$ B1 : $2p + 9 = 8$ **OR** $f(8) = p$	1 2	**3**
3	$h(x) = 3 - 2x$ B2: $1 - 4\left(\frac{x-1}{2}\right)$ **OR** $h(u) = 1 - 4\left(\frac{u-1}{2}\right)$ B1: $g^{-1}(x) = \frac{x-1}{2}$ **OR** $2x + 1 = u$	3	**3**
4	$p = -1$, $k = -2$ (both) B2: $p = -1$ *or* $k = -2$ B1: $-2 + p = -3$ or $-2p = -k$	3	**3**
5	$p < 2$, $p > 6$ B2: $(p - 2)(p - 6) > 0$ **OR** B1: $(p - 2)^2 - 4(1)(p - 2) > 0$ 	3	**3**
6	$h = 3$, $k = 25$ (both) B2: $h = 3$ *or* $k = 25$ B1: $f(x) = 2(x - 3)^2 - 18 + k$ **OR** $f(x) = 2x^2 - 4hx + 2h^2 + 7$ **OR** $4x - 12 = 0$ (using $f'(x) = 0$)	2 1	**3**
7	$n = \frac{2}{5}$ B2: $3 + n - 5 = -4n$ **OR** $n = \frac{\log 32 - \log 8}{\log 2 + \log 16}$ (*any base) B1: $2^3(2^{n-5}) = 2^{-4n}$ **OR** $\log 8 + (n - 5)\log 2 = -n \log 16$	3	**3**

8	$y = 4$ B3: $y^3 = 2^6$ *or* $y^{\frac{3}{2}} = 2^3$ *or* $y = 2^2$ B2: $\log_2 y^3 = 6$ *or* $\log_2 y^{\frac{3}{2}} = 3$ *or* $3\log_2 y = 6$ B1: $\frac{\log_2 y}{\log_2 4} + \log_2 y = 3$ (change base to same base)	4	**4**
9	Geometric Progression or GP, common ratio = 0.3 (both) B1: GP *or* $\frac{T_2}{T_1} = \frac{T_3}{T_2} = 0.3$ *or* $\frac{0.06}{0.2} = \frac{0.018}{0.06} = 0.3$ *or* $r = 0.3$	2	**2**
10	Number of terms = 16 *or* 16 terms *or* $n = 16$ B2: $3 \times 4 = 12$ (number of positive terms) B1: $-19, -13, -7, -1,$ (4 negative terms) **OR** B2: $n = 4$ *or* $3n = 12$ (number of positve terms) B1: $-19 + (n-1)\,6 < 0$	3	**3**
11(*a*) (b)	$a = 48$ and $r = -\frac{1}{2}$ $\frac{-96r}{1-r} = 32$ $-\frac{3}{8}$ B1: $48\left(-\frac{1}{2}\right)^7$	2 2	**4**
12.	$h = \frac{1}{2}$ and $k = -\frac{1}{14}$ B3: $h = \frac{1}{2}$ or $k = -\frac{1}{14}$ B2: $\frac{1}{h} = 2$ or $-\frac{k}{h} = \frac{1}{7}$ B1: $\frac{1}{y} = -\frac{k}{h}\left(\frac{1}{x}\right) + \frac{1}{h}$	4	**4**

13(a) (b)	$y = 3x - 2$ B1: $m = \dfrac{7-(-2)}{3-0}$ or $m = 3$ $k = 4$ B1: $\dfrac{1}{2}\lvert 7k - 6 - (-2k)\rvert = 15$	2 2	**4**
14(a) (b)	$-5\underline{x} + 3\underline{y}$ $4\underline{x} + \dfrac{3}{5}\underline{y}$ B2: $\dfrac{1}{5}(-5\underline{x} + 3\underline{y}) + 5\underline{x}$	1 2	**3**
15	$s = \dfrac{5t-1}{6}$ B2: $\dfrac{5}{2s+2} = \dfrac{3}{t+1}$ B1: $\dfrac{5-0}{2s+2}$ or $\dfrac{3-0}{t-1+2}$ OR: B1: $\dfrac{1}{2}\begin{vmatrix} 2s & t-1 & -2 & 2s \\ 5 & 3 & 0 & 5 \end{vmatrix} = 0$	3	**3**
16(a) (b)	$m = -\dfrac{5}{2}$ B1: $(5\underline{i} - 12\underline{j}) = \lambda(m\underline{i} + 6\underline{j})$ $\dfrac{5\underline{i} - 12\underline{j}}{13}$ B1: Magnitude = 13	2 2	**4**
17	8 B2: $\dfrac{1}{2}r^2 - \dfrac{1}{2}r^2(\dfrac{1}{4}\pi) = 6.864$ or equivalent B1: $\dfrac{1}{2}r^2$ or $\dfrac{1}{2}r^2(\dfrac{1}{4}\pi)$ or equivalent	3	**3**
18	$x = 90°,\ 123.69°,\ 270°,\ 303.69°$ B3: $\cos x = 0,\ \tan x = -\dfrac{3}{2}$ B2: $3\cos x(3\cos x + 2\sin x) = 0$ B1: $3\cos^2 x + 2\sin x \cos x = 0$	4	**4**

19(a) (b)	3 −10 B2: $4-\left[\frac{kx^2}{2}\right]_1^{-3}$ B1: $\int_1^{-3} g(x)\,dx-\int_1^{-3} kx\,dx$ or $\frac{kx^2}{2}$ or $\int_1^{-3} g(x)\,dx=4$	1 3	**4**
20	$(-1,4)$ B2: $2(3x+5)(3)=12$ B1: $\frac{dy}{dx}=2(3x+3)(3)$	3	**3**
21	2.88 B2: $\frac{dV}{dt}=6(4^2)\times 0.03$ B1: $\frac{dV}{dx}=6x^2$	3	**3**
22	15 B2: $\frac{800-16^2}{4}-11^2$ B1: $\sqrt{\frac{\sum x^2}{5}-12^2}=4$	3	**3**
23	96 B2: $1\times4\times3\times1$ and $1\times4\times3\times2$ B1: $1\times4\times3\times1$ or $1\times4\times3\times2$	3	**3**
24	$\frac{7}{10}$ B2: $\frac{2}{3}\times\frac{3}{4}\times\frac{3}{5}$ B1: $\frac{2}{3}$ or $\frac{3}{4}$ or $\frac{3}{5}$	3	**3**
25(a) (b)	$X=6.54$ 0.9625 B1: 0.07353	1 2	**3**

SULIT

NAMA : _____

KELAS : _____

JABATAN PELAJARAN NEGERI SABAH

SIJIL PELAJARAN MALAYSIA **3472/2**
EXCEL 2
ADDITIONAL MATHEMATICS
Paper 2
Ogos 2011

2 hours 30 minutes
2 *jam* 30 *minit*

Two hours thirty minutes
Dua jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. This question paper consists of three sections: **Section A**, **Section B** and **Section C.**
   Kertas ini mengandungi tiga bahagian: ***Bahagian A***, ***Bahagian B*** *dan* ***Bahagian C****.*
2. Answer **all** questions in **Section A**, **four** questions from **Section B** and **two** questions from **Section C**.
   Jawab ***semua*** *soalan dalam* ***Bahagian A***, ***empat*** *soalan dalam* ***Bahagian B*** *dan* ***dua*** *soalan dalam* ***Bahagian C****.*
3. Give only one answer / solution for each question.
   Beri hanya satu jawapan/penyelesaian bagi setiap soalan.
4. Show your working. It may help you to get marks.
   Tunjukkan jalan kerja anda. Ia boleh membantu anda mendapat markah.
5. The diagrams in the questions provided are not drawn to scale unless stated.
   Gambarajah dalam soalan adalah tidak mengikut skala melainkan dinyatakan
6. The marks allocated for each question and sub-part of a question are shown in brackets.
   Markah yang diperuntukkan untuk setiap soalan dan sub-bahagian ditunjukkan dalam kurungan.
7. A list of formulae is provided on pages 2 to 3.
   Senarai rumus diberi dalam muka surat 2 hingga 3.
9. You may use a non-programmable scientific calculator.
   Anda dibenarkan menguna kalkulator saintifik yang tidak boleh diprogramkan.

This paper consists of 16 printed pages.
Kertas ini mengandungi 16 *muka 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. $S_n=\dfrac{a(r^n-1)}{r-1}=\dfrac{a(1-r^n)}{1-r},\ r\neq 1$
13. $S_\infty=\dfrac{a}{1-r},\ |r|<1$

CALCULUS
KALKULUS

1. $y=uv,\quad \dfrac{dy}{dx}=u\dfrac{dv}{dx}+v\dfrac{du}{dx}$
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 kisaran
   $=\int_a^b \pi y^2\,dx$ or (*atau*)
   $=\int_a^b \pi x^2\,dy$

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. $|\underset{\sim}{r}| = \sqrt{x^2 + y^2}$

6. $\hat{\underset{\sim}{r}} = \dfrac{x\underset{\sim}{i} + y\underset{\sim}{j}}{\sqrt{x^2 + y^2}}$

STATISTICS
STATISTIK

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

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

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

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

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

6. $I = \dfrac{Q_1}{Q_o} \times 100$

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

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

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

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*, $\mu = np$

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

14. $Z = \dfrac{x - \mu}{\sigma}$

TRIGONOMETRY
TRIGONOMETRI

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

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

3. $\sin^2 A + \cos^2 A = 1$

4. $\sec^2 A = 1 + \tan^2 A$

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

6. $\sin 2A = 2\sin A\cos A$

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

   $= 2\cos^2 A - 1$

   $= 1 - 2\sin^2 A$

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

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

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

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

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

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

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 simultaneous equations $3x - y - 2 = 0$ and $x^2 + 2y^2 = 5xy$.
Give the answers correct to two decimal places. [5 *marks*]

Selesaikan persamaan serentak $3x - y - 2 = 0$ *dan* $x^2 + 2y^2 = 5xy$.
Beri jawapan betul kepada dua tempat perpuluhan. [5 *markah*]

2 Diagram 1 shows the shaded region bounded by the curve $y = g(x)$ and the x-axis.
Rajah 1 *menunjukkan rantau berlorek yang dibatasi oleh lengkung* $y = g(x)$ *dan paksi-x.*

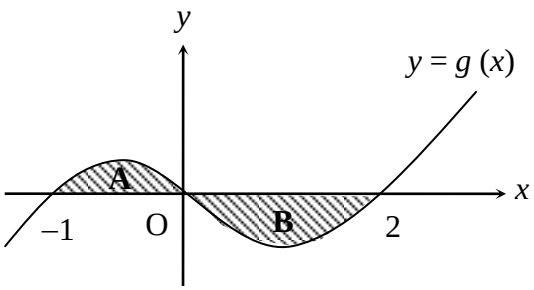


Diagram 1
Rajah 1

It is given that the area of region A is $\frac{5}{12}$ unit^2 and the area of region B is $\frac{8}{3}$ units^2.

Diberi bahawa luas rantau A ialah $\frac{5}{12}$ *unit*^{2} *dan luas rantau B ialah* $\frac{8}{3}$ *unit*^{2}.

(*a*) Find
Cari

(i) $\int_{-1}^{2} g(x)\ dx$.

(ii) $\int_{0}^{2} [\,3\,g(x) + 5\,]\ dx$. [4 *marks*]

[4 *markah*]

(*b*) Given $g'(x) = 3x^2 - 2x - 2$, find $g(x)$ in terms of x. [3 *marks*]
Diberi $g'(x) = 3x^2 - 2x - 2$, *cari* $g(x)$ *dalam sebutan* x. [3 *markah*]

3 (*a*) Sketch the graph of $y = |3\cos 2x| + 1$ for $0 \le x \le 2\pi$. [4 *marks*]
Lakar graf bagi $y = |3\ kos\ 2x| + 1$ *untuk* $0 \le x \le 2\pi$. [4 *markah*]

(*b*) Hence, using the same axes, sketch a suitable straight line to find the number of solutions for the equation $|3\cos 2x| - 2 = 0$ for $0 \le x \le 2\pi$.
State the number of solutions. [3 *marks*]
Seterusnya, dengan menggunakan paksi yang sama, lakar satu garis lurus yang sesuai untuk mencari bilangan penyelesaian bagi persamaan $|3\ kos\ 2x| - 2 = 0$ *untuk* $0 \le x \le 2\pi$.
Nyatakan bilangan penyelesaian itu. [3 *markah*]

4 Agnes is given 250 cubes with sides 5 cm, to form a pyramid as shown in diagram 4. She needs to arrange a cube in the first (top most) row, three cubes in the second row, five cubes in the third row, and so on.

Agnes diberikan 250 *buah kubus dengan sisi* 5 *cm, untuk membentuk sebuah piramid seperti yang ditunjukkan dalam rajah* 4. *Dia dikehendaki menyusun sebuah kubus pada barisan pertama (teratas), tiga kubus pada barisan kedua, lima kubus pada barisan ketiga, dan seterusnya.*

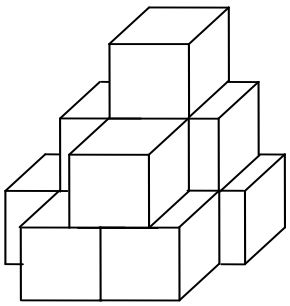


Diagram 4
Rajah 4

Find
Cari

(*a*) the number of cubes in the bottom most row, if the height of the pyramid to be formed is 60 cm. [2 *marks*]
bilangan kubus di barisan terbawah, jika tinggi piramid yang dibentuk ialah 60 cm. [2 *markah*]

(*b*) the maximum height of the piramid. [4 *marks*]
tinggi maksimum bagi piramid itu. [4 *markah*]

5 Table 5 shows the distribution of the scores of 40 students in a quiz.
Jadual 5 menunjukkan taburan skor bagi 40 *orang pelajar dalam satu kuiz.*

Marks ***Markah***	**Number of students** ***Bilangan pelajar***
6 – 10	7
11 – 15	11
16 – 20	*x*
21 – 25	10
26 – 30	*y*

Table 5
Jadual 5

(a) Given that the median score is 16.75, find the value of *x* and of *y*. [4 *marks*]
Diberi skor median ialah 16.75, *cari nilai x dan nilai y.* [4 *markah*]

(b) Calculate the standard deviation of the distribution. [3 *marks*]
Hitungkan sisihan piawai bagi taburan skor itu. [3 *markah*]

(c) What is the standard deviation if the score of each student is multiplied by 3 and then increased by 2 ? [1 *mark*]
Apakah sisihan piawai jika skor setiap murid didarabkan dengan 3 *dan kemudian ditambah sebanyak* 2? [1 *markah*]

6 Diagram 6 shows a trapezium *ABCD*. *R* is the midpoint of *BC*.
AR intersects *BQ* at point *P*.
Rajah 3 *menunjukkan sebuah trapezium ABCD. R ialah titik tengah bagi BC.*
AR bersilang dengan BQ di titik P.

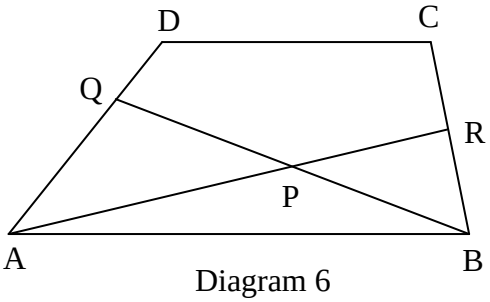


Diagram 6
Rajah 6

It is given that $\overrightarrow{AD} = 3\underline{y}$, $\overrightarrow{AB} = 6\underline{x}$, $\overrightarrow{DC} = \frac{2}{3}\overrightarrow{AB}$, $\overrightarrow{AD} = 3\overrightarrow{QD}$

Diberi bahawa $\overrightarrow{AD} = 3\underline{y}$, $\overrightarrow{AB} = 6\underline{x}$, $\overrightarrow{DC} = \frac{2}{3}\overrightarrow{AB}$, $\overrightarrow{AD} = 3\overrightarrow{QD}$

(*a*) Express in terms of $\underline{x}$ and $\underline{y}$:
Ungkapkan dalam sebutan $\underline{x}$ *dan* $\underline{y}$:

(i) $\overrightarrow{AC}$.

(ii) $\overrightarrow{AR}$. [3 *marks*]
[*3 markah*]

(*b*) It is given that $\overrightarrow{AP} = h\overrightarrow{AR}$ and $\overrightarrow{AP} = \overrightarrow{AQ} + k\overrightarrow{QB}$, where h and k are constants. Find the values of h and of k. [4 *marks*]
Diberi bahawa $\overrightarrow{AP} = h\overrightarrow{AR}$ *dan* $\overrightarrow{AP} = \overrightarrow{AQ} + k\overrightarrow{QB}$, *dengan keadaan h dan k ialah pemalar. Cari nilai h dan nilai k.* [4 *markah*]

Section B
Bahagian B

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

Answer **four** questions.
Jawab **empat** *soalan.*

7 Use graph paper to answer this question.
Guna kertas graf untuk menjawab soalan ini.

x	0.1	0.3	0.4	0.5	0.7	0.8
y	0.78	0.60	0.54	0.50	0.44	0.42

Table 7
Jadual 7

Table 7 shows the values of two variables x and y which are related by the equation $\frac{1}{y} = \sqrt{\frac{x+s}{r}}$, where r and s are constants.

Jadual 7 menunjukkan nilai-nilai bagi dua pemboleh ubah, x dan y yang dihubungkan oleh persamaan $\frac{1}{y} = \sqrt{\frac{x+s}{r}}$, *dengan keadaan r dan s adalah pemalar.*

(*a*) Using a scale of 2 cm to 0.1 unit on the x-axis and 2 cm to 0.5 unit on the $\frac{1}{y^2}$-axis, plot $\frac{1}{y^2}$ against x.
Hence, draw the line of best fit. [5 *marks*]

Dengan menggunakan skala 2 cm *kepada* 0.1 unit *pada paksi-x dan* 2 cm *kepada* 0.5 unit *pada paksi-*$\frac{1}{y^2}$, *plotkan* $\frac{1}{y^2}$ *melawan* x.
Seterusnya, lukis garis lurus penyuaian terbaik. [*5 markah*]

(*b*) Use the graph in 7(*a*) to find the value of
Gunakan graf di 7(*a*) *untuk mencari nilai*

(i) r.

(ii) s.

(ii) y when $x = 0.35$. [5 *marks*]
y *apabila* $x = 0.35$. [5 *markah*]

8 Diagram 8 shows a semi circle *EFG* with centre *O*.
Rajah 8 *menunjukkan semi bulatan EFG berpusat O*.

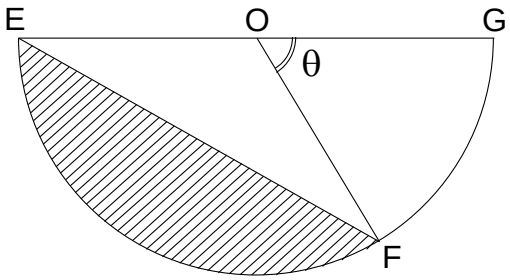


Diagram 8
Rajah 8

Given that the length of arc *EF* is twice that of arc *FG* and the area of sector *FOG* is 231 cm^2, find

Diberi bahawa panjang lengkok EF adalah dua kali lengkuk FG dan luas sektor FOG ialah 231 cm^2, *cari*

[Use/ *Guna* $\pi = \frac{22}{7}$]

(*a*) the value of θ, in terms of π. [1 *mark*]
nilai θ, *dalam sebutan* π. . [1 *markah*]

(*b*) the length, in cm, of *OE* . [2 *marks*]
panjang, dalam cm, *bagi OE.* [2 *markah*]

(*c*) the area, in cm^2 , of the shaded region. [3 *marks*]
luas , dalam cm^2, *rantau berlorek.* [3 *markah*]

(*d*) the perimeter, in cm, of the shaded region . [4 *marks*]
perimeter, dalam cm, *rantau berlorek.* [4 *markah*]

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

Diagram 9 shows three points P, $Q(-1, 2)$ and R which lie on the straight line $y = 1 - x$, such that $PQ : QR = 1 : 2$.
Rajah 9 *menunjukkan tiga titik* P, $Q(-1, 2)$ *dan* R *yang terletak pada garis lurus* $y = 1 - x$, *dengan keadaan* $PQ : QR = 1 : 2$.

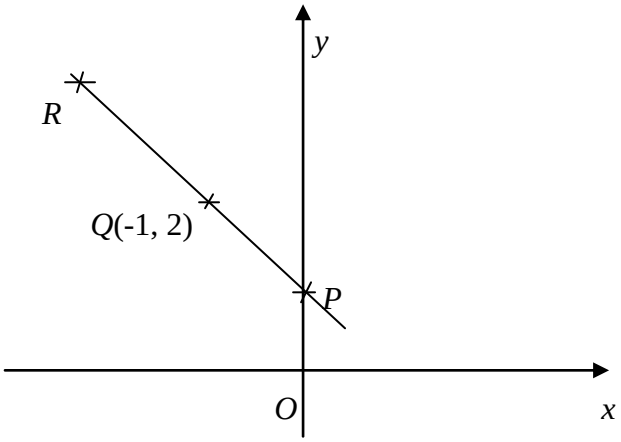


Diagram 9
Rajah 9

(*a*) Find
Cari

(i) the coordinates of P. [1 *mark*]
koordinat P. [1 *markah*]

(ii) the equation of the straight line which passes through Q and is perpendicular to the line RP. [2 *marks*]
persamaan garis lurus yang melalui Q *dan berserenjang kepada garis* RP. [2 *markah*]

(iii) the coordinates of R. [2 *marks*]
koordinat R. [2 *markah*]

(*b*) A point S moves such that its distance from Q is always 2 units. Find
Suatu titik S *bergerak dengan keadaan supaya jaraknya dari* Q *sentiasa* 2 unit.
Cari

(i) the equation of the locus of S. [3 *marks*]
persamaan lokus bagi S. [3 *markah*]

(ii) the coordinates of the point(s) of intersection of locus S with the x-axis. [2 *marks*]
koordinat titik/titik-titik persilangan lokus S *dengan paksi-x.* [2 *markah*]

10 (*a*) Given that the probability of passing a particular science test, is $\frac{3}{4}$.

If 8 candidates are chosen at random , calculate

Diberi bahawa kebarangkalian lulus suatu ujian sains ialah $\frac{3}{4}$.

Jika 8 *orang calon dipilih secara rawak, hitungkan*

(i) the standard deviation of passing this test. [1 *mark*]
sisihan piawai lulus ujian itu. [1 *markah*]

(ii) the probability that exactly 7 students pass. [2 *marks*]
kebarangkalian bahawa tepat 7 *orang calon lulus*. [2 *markah*]

(iii) the probability that less than 7 students pass. [2 *marks*]
kebarangkalian bahawa kurang daripada 7 *orang calon lulus*. [2 *markah*]

(*b*) The masses of papayas in Eco Orchard forms a normal distribution, with a mean of 950g and a standard deviation of 65g. Papayas with mass more than 850g are exported.

Jisim buah betik di Dusun Eco didapati bertaburan normal dengan min 950g *dan sisihan piawai* 65g. *Buah betik yang jisimnya melebihi* 850g *akan diekspot*.

(i) Find the probability that a papaya chosen at random from Eco Orchard will be exported. [2 *marks*]
Cari kebarangkalian bahawa sebuah betik yang dipilih secara rawak dari Dusun Eco akan diekspot. [2 *markah*]

(ii) Determine the number of papayas that will not be exported out of a sample of 200 papayas. [1 *mark*]
Tentukan bilangan buah betik yang tidak akan diekspot dari suatu sampel 200 *buah betik*. [1 *markah*]

(iii) Given that 20% of the papayas have a mass greater than w g , find the value of w . [2 *marks*]
Diberi bahawa 20% *buah betik mempunyai jisim lebih daripada* w g, *cari nilai* w. [2 *markah*]

.

11 Diagram 11 shows the tangent to the curve $y = 25 - x^2$, which passes through point $R(3, 16)$. The tangent intersects the x-axis at point Q.

Rajah 11 *menunjukkan tangen kepada lengkung* $y = 25 - x^2$, *yang melalui titik* $R(3, 16)$. *Tangen itu bersilang dengan paksi-x pada titik Q.*

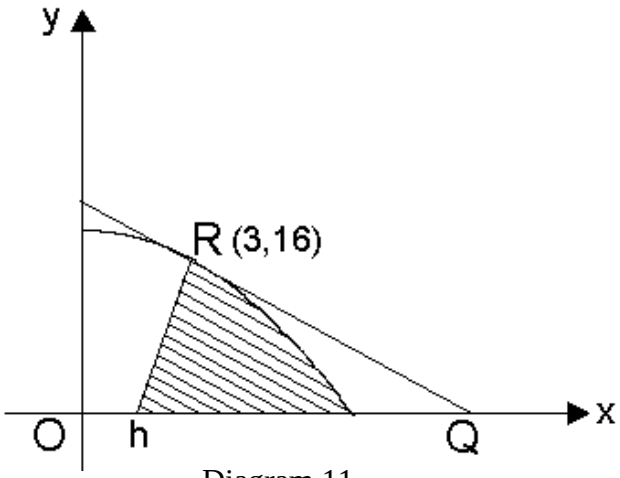


Diagram 11
Rajah 11

(*a*) Find the gradient of the curve at R. [2 *marks*]
Cari kecerunan lengkung pada R. [2 *markah*]

(*b*) Determine the coordinates of Q. [2 *marks*]
Tentukan koordinat Q. [2 *markah*]

(*c*) Find the equation of the normal to the curve at R. [2 *marks*]
Carikan persamaan garis normal kepada lengkung pada R. [2 *markah*]

(*d*) Given that the area of the shaded region is $33\frac{1}{3}$ unit^2, find the value of h.
[4 *marks*]

Diberi bahawa luas rantau berlorek ialah $33\frac{1}{3}$ unit^2, *cari nilai* h. [4 *markah*]

Section C
Bahagian C

[20 *marks*]
[20 *markah*]

Answer **two** questions.
*Jawab **dua** soalan.*

12 A particle moves along a straight line and passes through a fixed point *O*. Its velocity, v m s^{-1}, is given by $v = t^2 - 6t + 5$, where t is the time in seconds after passing through *O*. [Assume motion to the right is positive]

Suatu zarah bergerak di sepanjang suatu garis lurus dan melalui satu titik tetap O. Halajunya, v m s^{-1}, diberi oleh $v = t^2 - 6t + 5$, dengan keadaan t ialah masa dalam saat selepas melalui O.
[Anggap bahawa gerakan ke arah kanan ialah positif].

Find
Cari

(*a*) the initial velocity, in m s^{-1}. [1 *mark*]
halaju awal, dalam m s^{-1}. [1 *markah*]

(*b*) the minimum velocity, in m s^{-1}. [3 *marks*]
halaju minimum, dalam m s^{-1} . [3 *markah*]

(*c*) the range of values of t during which the particle moves to the left. [2 *marks*]
julat nilai t ketika zarah bergerak ke arah kiri. [2 *markah*]

(*d*) the total distance, in m, travelled by the particle in the first 5 seconds. [4 *marks*]
jumlah jarak, dalam m, *yang dilalui oleh zarah dalam* 5 *saat pertama.* [4 *markah*]

13 Use graph paper to answer this question.
Gunakan kertas graf untuk menjawab soalan ini.

A tuition centre offers tuition in Chemistry and Mathematics. The number of students taking Chemistry is x and the number taking Mathematics is y. The enrolment of the students is based on the following conditions:

Sebuah pusat tuition menawarkan subjek Kimia dan Matematik. Bilangan pelajar bagi subjek Kimia ialah x orang dan bilangan pelajar subjek Matematik ialah y orang. Bilangan pelajar adalah berdasarkan kekangan yang berikut:

I : The total number of students is not more than 200.
I : *Jumlah pelajar tidak melebihi* 200 *orang.*

II : The number of students taking Mathematics is not more than three times the number of students taking Chemistry.
II : *Bilangan pelajar subjek Matematik tidak melebihi tiga kali bilangan pelajar subjek Kimia.*

III : The number of students taking Mathematics must exceed the number of students taking Chemistry by at least 10.
III : *Bilangan pelajar subjek Matematik mesti melebihi bilangan pelajar Kimia sekurang-kurangnya* 10 *orang.*

(*a*) Write three inequalities, other than $x \geq 0$ and $y \geq 0$, which satisfy all the above constraints. [3 *marks*]
Tuliskan 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 20 students on both axes, construct and shade the region R which satisfies all the above constraints. [3 *marks*]
Dengan menggunakan skala 2cm *kepada* 20 *pelajar pada kedua-dua paksi, bina dan lorek rantau R yang memenuhi semua kekangan di atas.* [3 *markah*]

(*c*) Using the graph from (*b*), find
Dengan mengunakan graf di (*b*), *cari*

(i) the range of number of students taking Mathematics if 40 students enrolled for Chemistry . [1 *mark*]
julat pelajar Matematik jika 40 *pelajar telah mendaftar untuk Kimia.* [1 *markah*]

(ii) the maximum total fees collected per month if the monthly fees per student for Chemistry and Mathematics are RM30 and RM35 respectively. [3 *marks*]
Jumlah maksimum kutipan yuran sebulan jika yuran sebulan bagi seorang pelajar Kimia dan Matematik ialah RM30 *dan* RM35 *masing-masing.* [3 *markah*]

14 Diagram 14 shows a trapezium *PQRS* where *PQ* is parallel to *SR*. Given that *PQ* = 4.8 cm, *PR* = 10.2 cm, ∠*SPR* = 105°, and ∠*PSR* = 37°, calculate
[Give all answers correct to 4 significant figures]

Rajah 14 *menunjukkan sebuah trapezium PQRS di mana PQ ialah selari dengan SR. Diberikan PQ* = 4.8 cm, *PR* = 10.2 cm, ∠*SPR* = 105°, *dan* ∠*PSR* = 37°, *hitungkan*
[Berikan semua jawapan betul kepada 4 *angka bererti]*

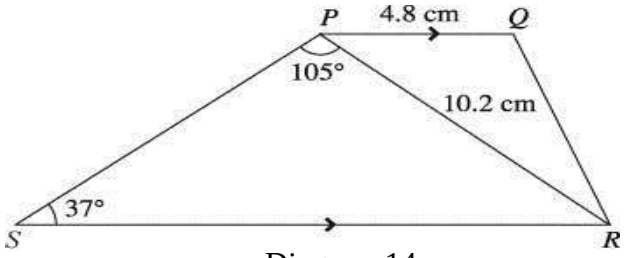


Diagram 14
Rajah 14

(*a*) the length, in cm, of *PS*. [3 *marks*]
panjang, dalam cm, *PS*. [3 *markah*]

(*b*) the length, in cm, of *QR*. [2 *marks*]
panjang, dalam cm, *QR*. [2 *markah*]

(*c*) the area, in cm^2, of trapezium *PQRS*. [3 *marks*]
luas, dalam cm^2, *trapezium PQRS*. [3 *markah*]

(*d*) Sketch triangle *P'S'R'* which has a different shape from triangle *PSR* such that *P'S'*= *PS*, *P'R'*= *PR* and $\angle P'S'R' = \angle PSR$. Hence find ∠ *PR'S*. [2 *marks*]

Lakar segi tiga P'S'R' yang mempunyai bentuk yang berlainan daripada segi tiga PSR dengan keadaan P'S'= PS, P'R'=PR dan $\angle P'S'R' = \angle PSR$. *Seterusnya cari* ∠ *PR'S*. [2 *markah*]

15 Table 15 shows the price indices and the percentages of usage for four ingredients used to make a kind of dessert.
Jadual 15 *menunjukkan indeks harga dan peratusan kegunaan bagi empat jenis bahan yang digunakan untuk membuat sejenis pencuci mulut.*

Ingredient ***Bahan***	**Price index in the year 2007 based on the year 2005** ***Indeks harga dalam tahun 2007 berasaskan tahun 2005***	**Percentage (%)** ***Peratusan (%)***
C	160	30
D	150	10
E	*x*	20
F	135	40

Table 15
Jadual 15

(*a*) Calculate
Hitungkan

(i) the cost of ingredient *C* in the year 2005 if the cost in the year 2007 was RM400.
kos bagi bahan C pada tahun 2005 *jika kosnya pada tahun* 2007 *ialah* RM400.

(ii) the price index of ingredient *D* in the year 2007 based on year 2006 if its price index in the year 2006 based on the year 2005 was 140.
indeks harga bagi bahan D pada tahun 2007 *berasaskan tahun* 2006 *jika indeks harganya pada tahun* 2006 *berasaskan tahun* 2005 *ialah* 140.

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

(*b*) The composite index for the cost of making the dessert in the year 2007 based on the year 2005 is 142.
Indeks gubahan kos pembuatan pencuci mulut itu pada tahun 2007 *berasaskan tahun* 2005 *ialah* 142.

(i) Calculate the value of *x*.
Hitungkan nilai bagi x.

(ii) Find the cost of making the dessert in the year 2007 if the cost in the year 2005 was RM52.
Cari kos pembuatan pencuci mulut itu pada tahun 2007 *jika kosnya pada tahun* 2005 *ialah* RM52.

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

(*c*) The cost of making the dessert increased by 50% from year 2007 to year 2010. Calculate the composite index for the cost of making the dessert in the year 2010 based on the year 2005. [2 *marks*]
Kos membuat pencuci mulut itu telah meningkat sebanyak 50% *dari tahun* 2007 *ke tahun* 2010. *Hitungkan indeks gubahan membuat pencuci mulut itu pada tahun* 2010 *berdasarkan tahun* 2005 . [2 *markah*]

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

NO. KAD PENGENALAN

ANGKA GILIRAN

Arahan Kepada Calon

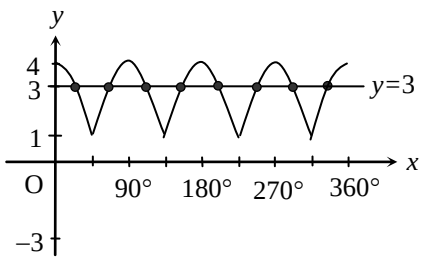
1 Tulis **nombor kad pengenalan** dan **angka giliran** anda pada ruang yang disediakan.
2 Tandakan (√) untuk soalan yang dijawab.
3 Ceraikan helaian ini dan ikat sebagai muka hadapan bersama-sama dengan buku jawapan.

Kod Pemeriksa				
Bahagian	Soalan	Soalan Dijawab	Markah Penuh	Markah Diperoleh (*Untuk Kegunaan Pemeriksa*)
A	1	1	5	
	2	2a (i)	4	
		2a (ii)		
		2b	3	
	3	3a	4	
		3b	3	
	4	4a	2	
		4b	4	
	5	5a	4	
		5b	3	
		5c	1	
	6	6a (i)	3	
		6a (ii)		
		6b	4	
B	7	7a	5	
		7b (i)	5	
		7b (ii)		
		7b (iii)		
	8	8a	1	
		8b	2	
		8c	3	
		8d	4	

Bahagian	Soalan	Soalan Dijawab	Markah Penuh	Markah Diperoleh (*Untuk Kegunaan Pemeriksa*)
B	9	9a (i)	1	
		9a (ii)	2	
		9a (iii)	2	
		9b (i)	3	
		9b (ii)	2	
	10	10a (i)	1	
		10a (ii)	2	
		10a (iii)	2	
		10b (i)	2	
		10b (ii)	1	
		10b (iii)	2	
	11	11a	2	
		11b	1	
		11c	2	
		11d	5	
C	12	12a	1	
		12b	3	
		12c	2	
		12d	4	
	13	13a	3	
		13b	3	
		13c (i)	1	
		13c (ii)	3	
	14	14a	2	
		14b	3	
		14c	3	
		14d	2	
	15	15a (i)	4	
		15a (ii)		
		15b (i)	4	
		15b (ii)		
		15c	2	
TOTAL				

KERTAS JAWAPAN
ADDITIONAL MATHEMATICS PAPER 2
SPM
YEAR 2011

No.	Solution and Mark Scheme	Sub Marks	Total Marks
1	$y = 3x - 2$ **OR** $x = \frac{y+2}{3}$ **(P1)** substitute correctly : $x^2 + 2(3x-2) = 5x(3x-2)$ **OR** $\left(\frac{y+2}{3}\right)^2 + 2y = 5\left(\frac{y+2}{3}\right)(y)$ **(K1)** Solve the quadratic equation : $x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(2)(4)}}{2(2)}$ **OR** $x = \frac{-(-13) \pm \sqrt{(-13)^2 - 4(2)(2)}}{2(2)}$ **(K1)** $x = 0.72,\ 2.78$ **(N1)** $y = 0.16,\ 6.34$ **(N1)**	5	5
2	(a) (i) $\frac{5}{12} + \left(-\frac{8}{3}\right) = -\frac{9}{4}$ **(P1)** (ii) $3\left(-\frac{8}{3}\right) + \left[5x\right]_0^2$ **(K1)** $= -8 + [5(2) - 5(0)]$ **(K1)** $= 2$ **(N1)** (b) $g(x) = \frac{3x^3}{3} - \frac{2x^2}{2} - 2x + c$ **(K1)** $0 = (-1)^3 - (-1)^2 - 2(-1) + c$ **OR** $0 = (0)^3 - (-0)^2 - 2(0) + c$ **OR** $0 = (2)^3 - (2)^2 - 2(2) + c$ **(K1)** $y = x^3 - x^2 - 2x$ **(N1)**	4 3	7

No.	Solution and Mark Scheme	Sub Marks	Total Marks
3	(a)  Shape of cos x **(P1)** Amplitude 3 and 2 periods for $0 \le x \le 2\pi$. **(P1)** Modulus cos x **(P1)** (Modulus cos x) + 1 **(P1)** (b) $y = 3$ **(K1)** draw the straight line $y = 3$ **(K1)** No. of solutions = 8 **(N1)**	4 3	7
4	(a) $T_{12} = 1 + 11(2)$ **(K1)** $= 23$ **(N1)** (b) $\frac{n}{2}[2(1) + (n-1)(2)] \le 250$ **(K1)** $\rightarrow$ accept =, < $n_{\text{manimum}} = 15$ **(K1)** Height of pyramid $= 15 \times 5$ **(K1)** $= 75$ **(N1)** **[accept any other Mathematical method for (a) and (b)]**	2 4	6

No.	Solution and Mark Scheme	Sub Marks	Total Marks
5	(a) $L_m = 15.5$, **OR** $f_m = x$ **OR** $F_m = 18$ **OR** $x + y = 12$ **(P1)** $16.75 = 15.5 + \left(\frac{\frac{1}{2}(40) - 18}{x}\right)(5)$ **(K1)** $x = 8$ **(N1)** $y = 4$ **(N1)**	4	
	(b) $\sigma = \sqrt{\frac{7(8)^2 + 11(13)^2 + 8(18)^2 + 10(23)^2 + 4(28)^2}{40} - \left(\frac{7(8) + 11(13) + 8(18) + 10(23 + 4(28)}{40}\right)^2}$ Calculate fx^2 (maximum 1 mistake) **(K1)** Using formula σ **(K1)** $= 6.313$ **(N1)**	3	
	(c) $6.313 \times 3 = 18.939$ / 18.94 **(N1)**	1	8
6	(a) (i) $\overrightarrow{AC} = \overrightarrow{AD} + \overrightarrow{DC}$ $= 3\underset{\sim}{y} + 4\underset{\sim}{x}$ **(P1)**		
	(ii) find $\frac{1}{2}\overrightarrow{BC} \rightarrow \frac{1}{2}(-6\underset{\sim}{x} + 3\underset{\sim}{y} + 4\underset{\sim}{x})$ **OR** find $\frac{1}{2}\overrightarrow{CB} \rightarrow \frac{1}{2}(-4\underset{\sim}{x} - 3\underset{\sim}{y} + 6\underset{\sim}{x})$ **(K1)** $5\underset{\sim}{x} + \frac{3}{2}\underset{\sim}{y}$ **(N1)**	3	
	(b) $\overrightarrow{AP} = h\overrightarrow{AR}$ **OR** $\overrightarrow{AP} = \overrightarrow{AQ} + k\overrightarrow{QB}$ $= 5h\underset{\sim}{x} + \frac{3}{2}h\underset{\sim}{y}$ $= 2\underset{\sim}{y} - 2k\underset{\sim}{y} + 6k\underset{\sim}{x}$ **(K1)** $5h = 6k$ **OR** $\frac{3}{2}h = 2 - 2k$ **(K1)** $h = \frac{12}{19}$ **(N1)** $k = \frac{10}{19}$ **(N1)**	4	7

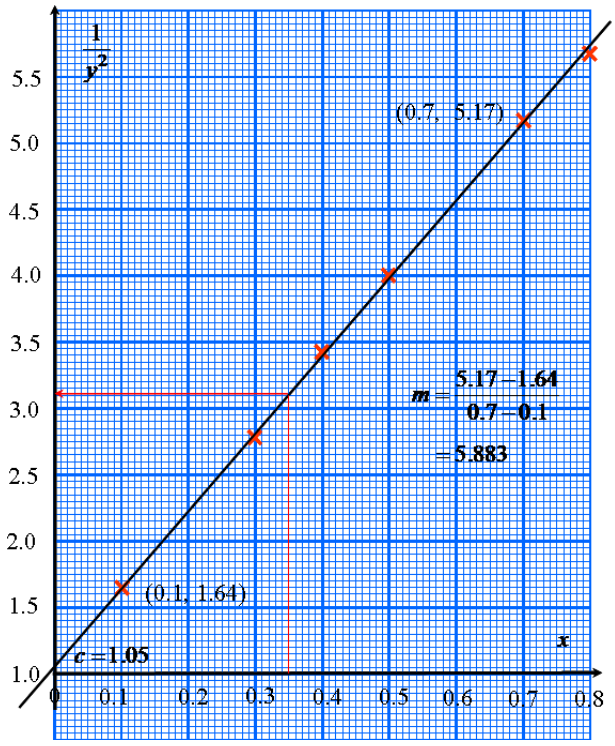
No.	Solution and Mark Scheme	Sub Marks	Total Marks
7	(a)		

$\frac{1}{y^2}$	1.64	2.78	3.43	4	5.17	5.67
x	0.1	0.3	0.4	0.5	0.7	0.8

(N1)

Graph : Using correct, uniform scale and axes
(with at least 1 point seen) **(P1)**
All points plotted correctly **(P1)**
Line of best fit **(P1)**

$\frac{1}{y^2} = \frac{1}{r}(x) + \frac{s}{r}$ **OR** equivalent **(P1)**



(b) (i) Use $\frac{1}{r} = *m$ **(K1)**

r = 0.16 – 0.18 **(N1)**

(ii) Use $\frac{s}{r} = *c$ **(K1)**

s = 0.16 – 0.19 **(N1)**

(iii) y = 0.57 by graphical method **(N1)**

5

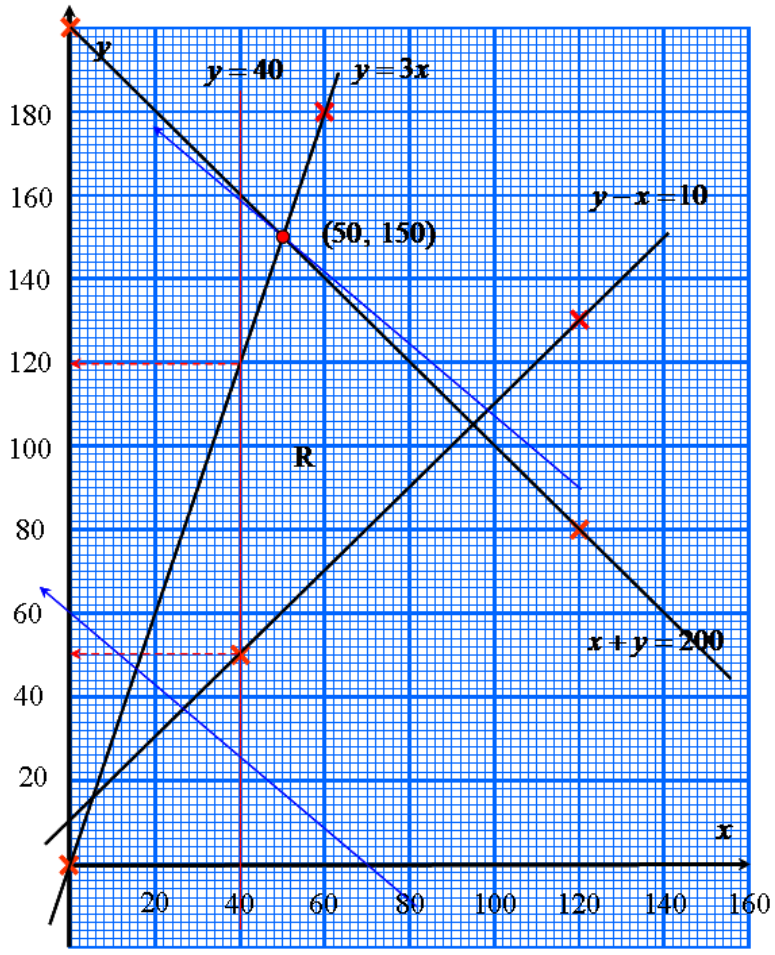
5

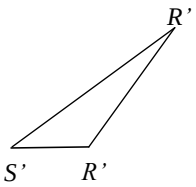
10

No.	Solution and Mark Scheme	Sub Marks	Total Marks
8	(a) $\theta = \frac{\pi}{3}$ rad **(P1)**	1	
	(b) $\frac{1}{2} r^2 \left(\frac{\pi}{3}\right) = 231$ **(K1)**	2	
	$r = 21$ **(N1)**		
	(c) area EOF = $\frac{1}{2}(21)\left(\frac{2\pi}{3}\right)$ **OR** area Δ EOF = $\frac{1}{2}(21)^2 \sin\left(\frac{2\pi}{3}\right)$ **(K1)**		
	area sector EOF – area Δ EOF		
	= $\frac{1}{2}(21)\left(\frac{2\pi}{3}\right) - \frac{1}{2}(21)^2 \sin\left(\frac{2\pi}{3}\right)$ **OR** equivalent **(K1)**		
	= 271.04 **(N1)**	3	
	(d) $21 \cos\frac{\pi}{6}$ **OR** $21 \sin\frac{\pi}{3}$ **OR** equivalent **(K1)**		
	arc EF = $\frac{2\pi}{3}(21)$ **OR** equivalent **(K1)**		
	= $2(21)\cos\frac{\pi}{6} + \frac{2\pi}{3}(21)$ **OR** $2(21)\sin\frac{\pi}{3} + \frac{2\pi}{3}(21)$		
	OR equivalent **(K1)**		
	= 80.37 **OR** 80.38 **(N1)**	4	10
9	(a) (i) P (0,1) **(P1)**		
	(ii) $m' = 1$ **(K1)**		
	$y = x + 3$ **(N1)**		
	(iii) $(-1, 2) = \left(\frac{x+0}{1+2}, \frac{y+2}{1+2}\right)$ **(K1)**		
	R $(-3, 4)$ **(N1)**	5	
	(b) (i) $\sqrt{(x+1)^2 + (y-2)^2}$ **(K1)**		
	$\sqrt{(x+1)^2 + (y-2)^2} = 2$ **(K1)**		
	$x^2 + 2x + y^2 - 4y + 1 = 0$ **(N1)**		
	(ii) $(x+1)(x+1) = 0$ **(K1)**		
	$(-1, 0)$ **(N1)**	5	10

No.	Solution and Mark Scheme	Sub Marks	Total Marks
10	(a) (i) $\sigma = 1.225$ **(P1)** (ii) ${}^8C_7 \left(\frac{3}{4}\right)^7 \left(\frac{1}{4}\right)$ **(K1)** 0.2670 **(N1)** (ii) $1 - {}^8C_7 \left(\frac{3}{4}\right)^7 \left(\frac{1}{4}\right) - {}^8C_8 \left(\frac{3}{4}\right)^8 \left(\frac{1}{4}\right)^0$ **(K1)** 0.6329 **(N1)** (b) (i) $z > -1.538$ **(K1)** 0.9380 **(N1)** (ii) 12 (integer) **(N1)** (iii) $Z > 0.842$ **(K1)** $w = 1004.73$ **OR** 1005 **(N1)**	5 5	10
11	(a) $\frac{dy}{dx} = -2x$ **(K1)** -6 **(N1)** (b) $\frac{16-0}{3-x} = -6$ OR equivalent **(K1)** $Q\left(5\frac{2}{3}, 0\right)$ **(N1)** (c) $m' = \frac{1}{6}$ **(K1)** $y = \frac{1}{6}x + \frac{31}{2}$ **(N1)** (d) $A_1 = \frac{1}{2}(3-h)(16)$ **OR** $A_2 = \left[25x - \frac{x^3}{3}\right]_3^5$ (from $\int_3^5 25 - x^2 dx$) **(K1)** $= \left[25(5) - \frac{5^3}{3}\right] - \left[25(3) - \frac{3^3}{3}\right]$ **(K1)** $8(3-h) + 17\frac{1}{3} = 33\frac{1}{3}$ **OR** equivalent **(K1)** $h = 1$ **(N1)**	2 2 2 4	10

No.	Solution and Mark Scheme	Sub Marks	Total Marks
12	(a) $5\ \text{m s}^{-1}$ **(P1)**	1	
	(b) $\frac{dv}{dt} = 2t - 6$ **(K1)** $0 = 2t - 6$ **(K1)** $t = 3$ $v_{max} = -4$ **(N1)**	3	
	(c) $(t-1)(t-5) < 0$ **(K1)** $\rightarrow$ accept $(t-1)(t-5) = 0$ $1 < t < 5$ **(N1)**	2	
	(d) $= \left\lvert \int_0^1 t^2 - 6t + 5\ dt \right\rvert + \left\lvert \int_1^5 t^2 - 6t + 5\ dt \right\rvert$ **(K1)** $= \left\lvert \left[\frac{t^3}{3} - \frac{6t^2}{2} + 5t \right]_0^1 \right\rvert + \left\lvert \left[\frac{t^3}{3} - \frac{6t^2}{2} + 5t \right]_1^5 \right\rvert$ **(K1)** $= \left\lvert \left(\frac{1^3}{3} - 3(1)^2 + 5(1) \right) - \left(\frac{0^3}{3} - 3(0)^2 + 5(0) \right)_0^1 \right\rvert +$ $+ \left\lvert \left(\frac{5^3}{3} - 3(5)^2 + 5(5) \right) - \left(\frac{1^3}{3} - 3(1)^2 + 5(1) \right)_0^1 \right\rvert$ **OR** equivalent **(K1)** $= 13\ m$ **(N1)**	4	10

No.	Solution and Mark Scheme	Sub Marks	Total Marks
13	(a) $x + y \leq 200$ **OR** equivalent **(N1)** $y \leq 3x$ **OR** equivalent **(N1)** $y - x \geq 10$ **OR** equivalent **(N1)** (b) Draw correctly at least one straight line **(K1)** **OR** Draw correctly all the three straight lines **(K2)** Region R shaded correctly **(K1)**  (c) (i) $50 \leq y \leq 120$ **(N1)** (ii) Maximum fee $= 30x + 35y$ maximum point (50, 150) **(N1)** $= 30(50) + 35(150)$ **(K1)** $=$ RM6750 **(N1)**	3 3 4	10

No.	Solution and Mark Scheme	Sub Marks	Total Marks
14	(a) $\angle PRS = 38°$ **(P1)** $\frac{PS}{\sin 38°} = \frac{10.2}{\sin 37°}$ **(K1)** PS = 10.43 cm **(N1)**	3	
	(b) $QR^2 = 4.8^2 + 10.2^2 - 2(4.8)(10.2)\cos 38°$ **(K1)** QR = 7.065 **(N1)**	2	
	(c) $\frac{1}{2}(10.43)(10.2)\sin 105°$ **OR** $\frac{1}{2}(4.8)(10.2)\sin 38°$ **(K1)** $\frac{1}{2}(10.43)(10.2)\sin 105° + \frac{1}{2}(4.8)(10.2)\sin 38°$ **(K1)** 66.45 **(N1)**	3	
	(d)  **(K1)** 142 **(N1)**	2	10
15	(a) (i) $160 = \frac{400}{P_{2005}} \times 100$ **OR** equivalent **(K1)** P_{2005} = 250 **(N1)**		
	(ii) $\frac{150}{100} \times \frac{100}{140} \times 100$ **OR** equivalent **(K1)** 107.14 **(N1)**	4	
	(b) (i) $\frac{160(30)+150(10)+20(x)+135(40)}{100}$ = 142 **(K1)** x = 125 **(N1)**		
	(ii) $142 = \frac{P_{2007}}{52} \times 100$ **OR** equivalent **(K1)** P_{2007} = 73.84 **(N1)**	4	
	(c) $\frac{150}{100} \times \frac{142}{100} \times 100$ **OR** equivalent **(K1)** 213 **(N1)**	2	10