

SULIT

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Name :

Form :



**PROGRAM PENINGKATAN PRESTASI AKADEMIK SPM 2012
ADDITIONAL MATHEMATICS**

**Kertas 1
Sept 2012
2 jam**

Dua jam

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

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

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

Kertas soalan ini mengandungi 20 halaman bercetak

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<http://fb.me/edu.joshuatly>

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

ALGEBRA

$$1 \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$2 \quad a^m \times a^n = a^{m+n}$$

$$3 \quad a^m \div a^n = a^{m-n}$$

$$4 \quad (a^m)^n = a^{mn}$$

$$5 \quad \log_a mn = \log_a m + \log_a n$$

$$6 \quad \log_a \frac{m}{n} = \log_a m - \log_a n$$

$$7 \quad \log_a m^n = n \log_a m$$

$$8 \quad \log_a b = \frac{\log_c b}{\log_c a}$$

$$9 \quad T_n = a + (n-1)d$$

$$10 \quad S_n = \frac{n}{2}[2a + (n-1)d]$$

$$11 \quad T_n = ar^{n-1}$$

$$12 \quad S_n = \frac{a(r^n - 1)}{r - 1} = \frac{a(1 - r^n)}{1 - r}, \quad (r \neq 1)$$

$$13 \quad S_\infty = \frac{a}{1 - r}, \quad |r| < 1$$

CALCULUS

$$1 \quad y = uv, \quad \frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$$

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

$$3 \quad \frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

4 Area under a curve

$$= \int_a^b y \, dx \quad \text{or}$$

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

5 Volume generated

$$= \int_a^b \pi y^2 \, dx \quad \text{or}$$

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

GEOMETRY

$$1 \quad \text{Distance} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

2 Midpoint

$$(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$3 \quad |r| = \sqrt{x^2 + y^2}$$

$$4 \quad \hat{r} = \frac{x\hat{i} + y\hat{j}}{\sqrt{x^2 + y^2}}$$

5 A point dividing a segment of a line

$$(x, y) = \left(\frac{nx_1 + mx_2}{m+n}, \frac{ny_1 + my_2}{m+n} \right)$$

6 Area of triangle

$$= \frac{1}{2} |(x_1 y_2 + x_2 y_3 + x_3 y_1) - (x_2 y_1 + x_3 y_2 + x_1 y_3)|$$

STATISTICS

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

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

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

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

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

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

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

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

12. Mean $\mu = np$

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

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

TRIGONOMETRY

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

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

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

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

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

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

7. $\begin{aligned} \cos 2A &= \cos^2 A - \sin^2 A \\ &= 2 \cos^2 A - 1 \\ &= 1 - 2 \sin^2 A \end{aligned}$

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

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

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

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

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

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

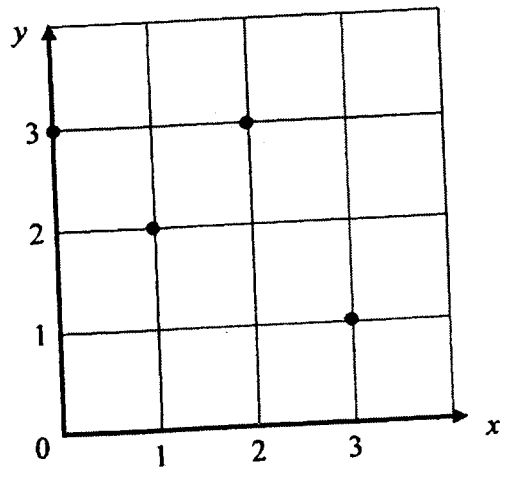
14. Area of triangle = $\frac{1}{2} ab \sin C$

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Answer all questions.
Jawab semua soalan.

1



The graph above shows the relation between x and y . State

- (a) the type of relation,
- (b) the objects of 3.

[2 marks]

Graf diatas menunjukkan hubungan antara x dan y . Nyatakan

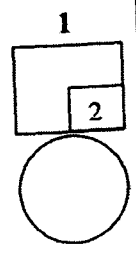
- (a) jenis hubungan itu,
- (b) objek-objek bagi 3.

[2 markah]

Answer/Jawapan:

(a)

(b)



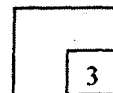
- 2 Given that function $g(x) = 2x + m$ and $g^2(x) = nx + 15$ where m and n are constants. Find the value of m and n .

Diberi fungsi $g(x) = 2x + m$ dan $g^2(x) = nx + 15$ dengan keadaan m dan n ialah pemalar. Cari nilai m dan n .

[3 marks]
[3 markah]

Answer/Jawapan:

2



- 3 Given the function $h(x) = \frac{x+5}{2}$, find

Diberi fungsi $h(x) = \frac{x+5}{2}$, cari

- (a) $h^{-1}(2)$,
(b) the value of p when $h^{-1}(p) = 7$.
nilai bagi p apabila $h^{-1}(p) = 7$.

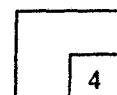
[4 marks]
[4 markah]

Answer/Jawapan:

(a)

(b)

3



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- 4 Given -2 and 3 are the roots of the quadratic equation $2x^2 + hx - 3k = 0$. Find the value of h and of k .

[3 marks]

Diberi -2 dan 3 ialah punca-punca persamaan kuadratik $2x^2 + hx - 3k = 0$. Cari nilai h dan nilai k .

[3 markah]

Answer/Jawapan:

4
3

- 5 The graph of the quadratic function $f(x) = a(x-2)^2 + q$ has a minimum point $(p, -8)$ where a, p and q are constants.

Graf bagi fungsi kuadratik $f(x) = a(x-2)^2 + q$ mempunyai titik minimum $(p, -8)$ dengan keadaan a, p dan q ialah pemalar.

State
Nyatakan

- (a) the value of p ,
nilai bagi p ,
- (b) the value of q ,
nilai bagi q ,
- (c) the range of values of a .
julat nilai-nilai a .

[3 marks]
[3 markah]

Answer/Jawapan:

(a)

(b)

(c)

5
3

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SULIT

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6 Find the range of values of x for $3x - 1 \geq \frac{4x}{x+2}$.

[3 marks]

Cari julat nilai-nilai x bagi $3x - 1 \geq \frac{4x}{x+2}$.

[3 markah]

Answer/Jawapan:

6

3

7 Solve the equation :
Selesaikan persamaan :

$$5^{3x} \times 8^x = 100$$

[3 marks]
[3 markah]

Answer/Jawapan:

7

3



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8

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8 Given $8\log_x 2 + \log_x y - 2\log_x 4 = 3$, express y in terms of x . [4 marks]

Diberi $8\log_x 2 + \log_x y - 2\log_x 4 = 3$, ungkapkan y dalam sebutan x . [4 markah]

Answer/Jawapan:

8

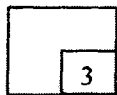


9 If 27, $3k$ and 48 are three consecutive terms in a geometric progression. Find the values of k . [3 marks]

Jika 27, $3k$ dan 48 ialah tiga sebutan berturut-turut bagi janjang geometri. Cari nilai-nilai bagi k . [3 markah]

Answer/Jawapan:

9



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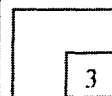
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- 10 51, 58, 65, ... 191 are the first n terms of an arithmetic progression. Find the common difference of the progression and the value of n .

51, 58, 65, ... 191 ialah n sebutan pertama bagi suatu jangjang aritmetik. Cari beza sepunya bagi jangjang tersebut dan nilai bagi n .

[3 marks]
[3 markah]

Answer/Jawapan:

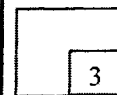
10

- 11 Given the geometric progression $10, -5, \frac{5}{2}, \dots$. Find the sum to infinity of the progression.

Diberi suatu jangjang geometri $10, -5, \frac{5}{2}, \dots$. Cari hasil tambah hingga sebutan ketakterhinggaan bagi jangjang tersebut.

[3 marks]
[3 markah]

Answer/Jawapan:

11

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12 Diagram 12 shows the straight line graph obtained by plotting $\frac{y}{x^2}$ against x .

Rajah 12 menunjukkan graf garis lurus yang diperolehi dengan memplot $\frac{y}{x^2}$ melawan x .

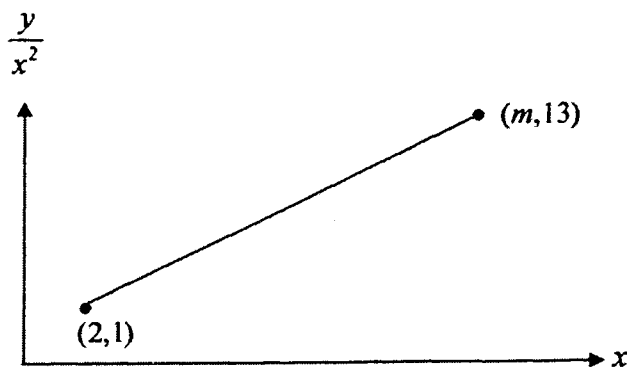


Diagram 12
Rajah 12

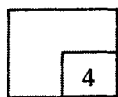
The variables x and y are related by the equation $y = 3x^3 + kx^2$ where k is a constant. Find the value of k and of m .

Pembolehubah x dan y dihubungkan oleh persamaan $y = 3x^3 + kx^2$, dengan keadaan k ialah pemalar. Cari nilai k dan nilai m .

[4 marks]
[4 markah]

Answer/Jawapan:

12



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SULIT

13

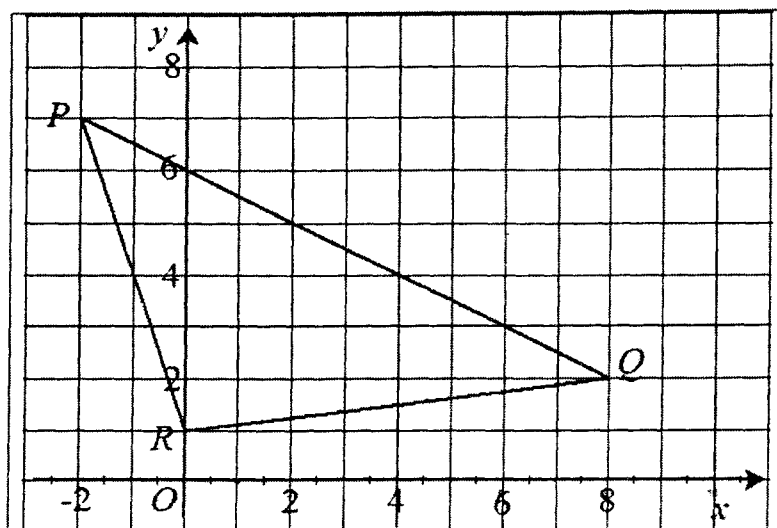


Diagram 13
Rajah 13

Diagram 13 shows a triangle PQR drawn on a Cartesian plane. Find

- (a) the equation of the straight line PQ ,
- (b) the area of the triangle PQR . [4 marks]

Rajah 13 menunjukkan sebuah segitiga PQR dilukis di atas satah Cartesan. Cari

- (a) persamaan garis lurus PQ ,
- (b) luas bagi segitiga PQR . [4 markah]

Answer/Jawapan:

13

4

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12

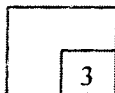
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- 14 Given that equation of a straight line $2y = (k-1)x + 7$ with gradient -3 and passes through point $(1, t)$. Find the value of k and of t . [3 marks]

Diberi suatu persamaan garis lurus $2y = (k-1)x + 7$ dengan kecerunan -3 dan melalui titik $(1, t)$. Cari nilai k dan nilai t . [3 markah]

Answer/Jawapan:

14

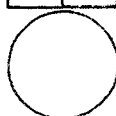
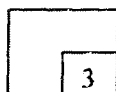


- 15 Given the curve $y = x(x-2)^2$ has two turning points. Find the values of x for those turning points. [3 marks]

Diberi lengkung $y = x(x-2)^2$ mempunyai dua titik pusingan. Cari nilai-nilai x bagi kedua-dua titik pusingan itu. [3 markah]

Answer/Jawapan:

15



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- 16 Diagram 16 shows a trapezium $ABCD$. Given that BC is parallel to AD , $\overrightarrow{BC} = 5\mathbf{i} + 2\mathbf{j}$, $\overrightarrow{CD} = 3\mathbf{i} - 7\mathbf{j}$ and $\overrightarrow{AD} = 2\overrightarrow{BC}$.

Rajah 16 menunjukkan satu trapezium $ABCD$. Diberi BC selari dengan AD , $\overrightarrow{BC} = 5\mathbf{i} + 2\mathbf{j}$, $\overrightarrow{CD} = 3\mathbf{i} - 7\mathbf{j}$ dan $\overrightarrow{AD} = 2\overrightarrow{BC}$.

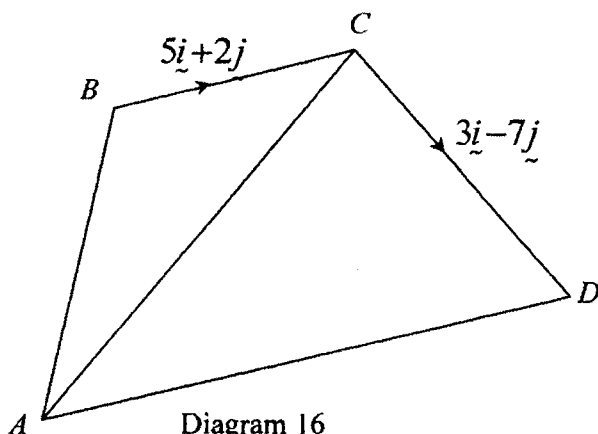


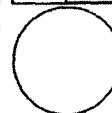
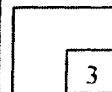
Diagram 16
Rajah 16

Find \overrightarrow{AC} .
Cari \overrightarrow{AC} .

[3 marks]
[3 markah]

Answer/Jawapan:

16



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17

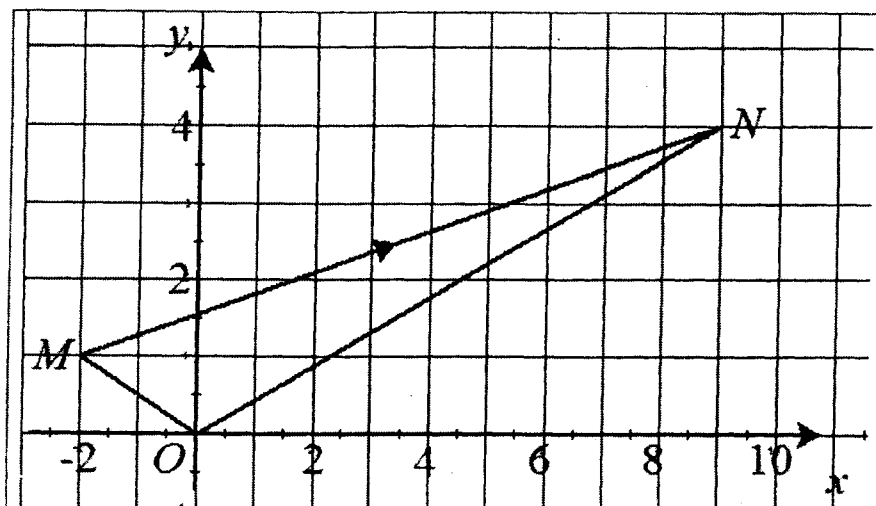


Diagram 17
Rajah 17

Diagram 17 shows vector \overline{MN} drawn on a Cartesian plane.

- (a) Express \overline{MN} in the form of $\begin{pmatrix} x \\ y \end{pmatrix}$.
- (b) Find the unit vector in the direction of \overline{MN} .

[3 marks]

Rajah 17 menunjukkan vektor \overline{MN} dilukis di atas satah Cartesian.

- (a) Ungkapkan \overline{MN} dalam bentuk $\begin{pmatrix} x \\ y \end{pmatrix}$.
- (b) Cari vektor unit dalam arah \overline{MN} .

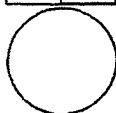
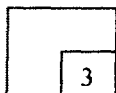
[3 markah]

Answer/Jawapan:

(a)

(b)

17



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18 x_1, x_2, x_3, x_4, x_5 and x_6 is a group of data with standard deviation and variance as 2 and 4 respectively. When each data above is multiplied by 5, find

x_1, x_2, x_3, x_4, x_5 dan x_6 ialah satu kumpulan data dengan sisihan piawai dan varians masing-masing ialah 2 dan 4. Apabila setiap data tersebut didarab dengan 5, cari

- (a) the new standard deviation,
sisihan piawai baru,
- (b) the new variance.
variens baru.

[2 marks]
[2 markah]

Answer/Jawapan:

- (a)
- (b)

18

18
2

19 Solve the equation $\sin x - \cos 2x = 0$ for $0^\circ \leq x \leq 360^\circ$.

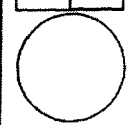
Selesaikan persamaan $\sin x - \cos 2x = 0$ bagi $0^\circ \leq x \leq 360^\circ$.

[4 marks]
[4 markah]

Answer/Jawapan:

19

19
4



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16

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20

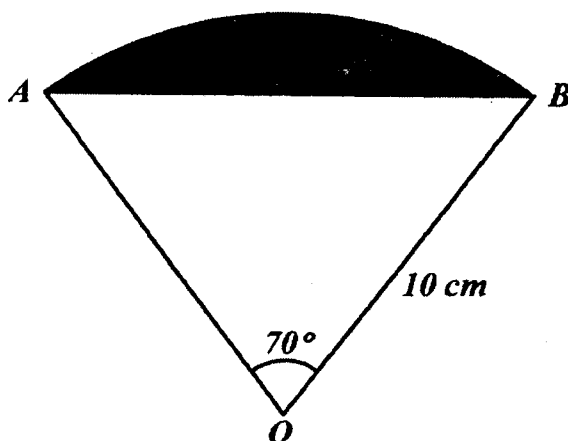
Diagram 20
Rajah 20

Diagram 20 shows a sector OAB of a circle with centre O . Find the area of the shaded segment.

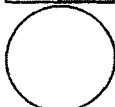
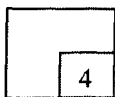
[4 marks]

Rajah 20 menunjukkan sebuah sektor OAB bagi sebuah bulatan berpusat O . Cari luas bagi tembereng berlorek.

[4 markah]

Answer/Jawapan:

20



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21 Given $y = (4x - 7)^2$ and the rate of change of x is 3 units per second. Find the rate of change of y when $x = 2$.

Diberi $y = (4x - 7)^2$ dan kadar perubahan x ialah 3 unit per saat. Cari kadar perubahan y apabila $x = 2$.

[3 marks]
[3 markah]

Answer/Jawapan:

21

3

22 Given that $\int_{-2}^1 f(x) dx = 6$ and $\int_{-2}^1 g(x) dx = 9$. Find the value of

(a) $\int_1^{-2} 5f(x) dx$

(b) h if $\int_{-2}^1 [3h - 2f(x) + g(x)] dx = 15$.

[3 marks]

Diberi $\int_{-2}^1 f(x) dx = 6$ dan $\int_{-2}^1 g(x) dx = 9$. Cari nilai bagi

(a) $\int_1^{-2} 5f(x) dx$

(b) h jika $\int_{-2}^1 [3h - 2f(x) + g(x)] dx = 15$.

[3 markah]

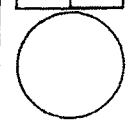
Answer/Jawapan:

(a)

(b)

22

3



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- 23 A teacher wants to select 3 students to represent school in an essay-writing competition. These 3 students are selected from a group of 5 boys and 2 girls. Find the number of possible selections if
- (a) there are no condition for the selection,
 - (b) the selection must consist boy and girl. [4 marks]

Seorang guru ingin memilih 3 orang murid untuk mewakili sekolah dalam pertandingan menulis karangan. 3 orang murid ini dipilih daripada sekumpulan 5 orang murid lelaki dan 2 orang murid perempuan. Cari bilangan pilihan yang mungkin jika

- (a) tiada syarat bagi pemilihan itu,
- (b) pemilihan itu mesti mempunyai murid lelaki dan murid perempuan. [4 markah]

Answer/Jawapan:

- (a)
- (b)

23

	4
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- 24 The probability that Chin Loong will get distinction in a Mathematics quiz is $\frac{5}{6}$ and the probability that he will get distinction in a Chemistry quiz is $\frac{2}{3}$. Find the probability that Chin Loong gets distinction in
- (a) both quiz,
 - (b) at least one quiz. [3 marks]

Kebarangkalian Chin Loong mendapat cemerlang dalam kuiz Matematik ialah $\frac{5}{6}$ dan kebarangkalian mendapat cemerlang dalam kuiz Kimia ialah $\frac{2}{3}$. Cari kebarangkalian

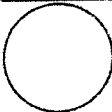
- Chin Loong mendapat cemerlang dalam*
- (a) kedua-dua quiz,
 - (b) sekurang-kurang satu quiz. [3 markah]

Answer/Jawapan:

- (a)
- (b)

24

	3
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25 Diagram 25 shows the graph of a binomial distribution of X .
Rajah 25 menunjukkan graf suatu taburan binomial bagi X .

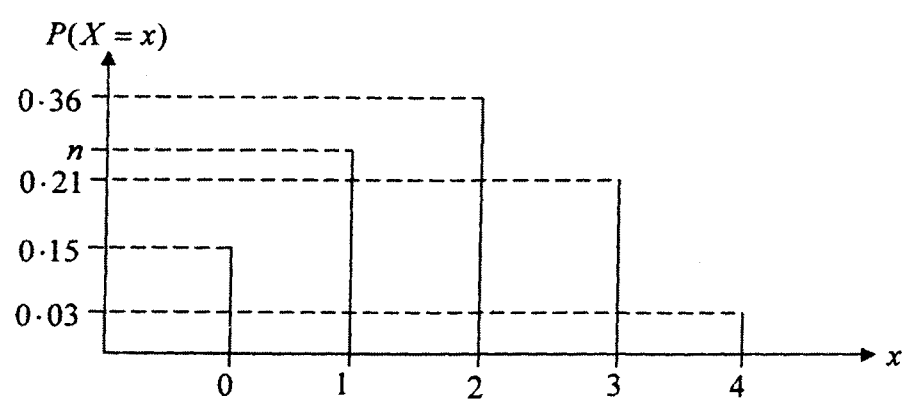


Diagram 25
Rajah 25

Find

Cari

(a) the value of n ,
nilai n ,

(b) $P(X \geq 2)$.

[3 marks]
[3 markah]

Answer/*Jawapan:*

(a)

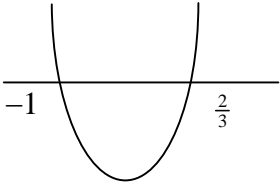
(b)

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

25

INFORMATION FOR CANDIDATES
MAKLUMAT UNTUK CALON

1. This question paper consists of **25** questions.
Kertas soalan ini mengandungi 25 soalan.
2. Answer **all** questions.
Jawab semua soalan.
3. Write your answers in the spaces provided in the question paper.
Tulis jawapan anda dalam ruang yang disediakan dalam kertas soalan.
4. Show your working. It may help you to get marks.
Tunjukkan langkah-langkah penting dalam kerja mengira anda. Ini boleh membantu anda untuk mendapatkan markah.
5. If you wish to change your answer, cross out the answer that you have done. Then write down the new answer.
Sekiranya anda hendak menukar jawapan, batalkan jawapan yang telah dibuat. Kemudian tulis jawapan yang 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 and 3.
Satu senarai rumus disediakan di halaman 2 dan 3.
9. A booklet of four-figure mathematical tables is provided.
Sebuah 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.

Question	Solution/ Marking Scheme	Answer	Marks
1		(a) many-to-one (b) 0 and 2	1 1
2	B2 : $m = 5$ or $n = 4$ B1: $2(2x+m)+m$	$m = 5$ and $n = 4$	3
3	(a) B1: $\frac{a+5}{2} = 2$ (b) B1: $h(7) = p$ or $14a - 15$	(a) -1 (b) $p = 6$	2 2
4	B2 : $h = -2$ or $k = 4$ B1: $-2+3 = -\frac{h}{2}$ or $(-2)(3) = -\frac{3}{2}k$ or $(x+2)(x-3) = 0$	$h = -2$ and $k = 4$	3
5		(a) 2 (b) -8 (c) $a > 0$	1 1 1
6	B2 :  or $x = \frac{2}{3}$, $x = -1$ B1: $(3x-2)(x+1)$	$x \geq \frac{2}{3}$, $x \leq -1$	3
7	B2 : $1000^x = 100$ or $10^{3x} = 10^2$ B1 : $125^x \times 8^x = 100$ or $5^{3x} \times 2^{3x} = 100$	$x = \frac{2}{3}$	3

Question	Solution/ Marking Scheme	Answer	Marks
8	B3 : $\frac{2^8 \times y}{4^2} = x^3$ B2 : $\log_x \frac{2^8 \times y}{4^2} = 3$ B1 : $\log_x 2^8$ or $\log_x 4^2$	$y = \frac{x^3}{16}$	4
9	B2: $k^2 = 144$ B1: $\frac{48}{3k} = \frac{3k}{27}$	$k = 12$ and -12	3
10	B2 : $d = 7$ or $n = 21$ B1 : $51 + (n-1) = 191$	$d = 7$ and $n = 21$	3
11	B2 : $S_{\infty} = \frac{10}{1 - \left(-\frac{1}{2}\right)}$ B1 : $r = -\frac{1}{2}$	$\frac{20}{3}$	3
12	B3 : $k = -5$ or $m = 6$ B2: $1 = 3(2) + k$ or $13 = 3m + k$ B1 : $\frac{y}{x^2} = 3x + k$	$k = -5$ and $m = 6$	4
13	(a) B1: $m_{PQ} = -\frac{1}{2}$ (b) B1: $A = \frac{1}{2} 8(7) + (-2)(1) - 8(1) - (-2)(2) $ OR equivalent	(a) $y = -\frac{1}{2}x + 6$ (b) 25	2 2
14	B2 : $k = -5$ or $t = \frac{1}{2}$ B1 : $\frac{k-1}{2} = -3$ or $2t = (k-1)(1) + 7$	$k = -5$ and $t = \frac{1}{2}$	3

Question	Solution/ Marking Scheme	Answer	Marks
15	B2 : $x = 2$ or $x = \frac{2}{3}$ B1: $1(x-2)^2 + 2(x-2)x$ OR $3x^2 - 8x + 4$	$x = 2$ and $x = \frac{2}{3}$	3
16	B2 : $\overline{AC} = 2\overline{BC} - \overline{CD}$ OR $\overline{AD} = 2\overline{BC} - \overline{CD}$ B1 : $\overline{AC} = \overline{AD} + \overline{DC}$ or $\overline{AD} = \begin{pmatrix} 10 \\ 4 \end{pmatrix}$ OR $\overline{AC} = \overline{AB} + \overline{BC}$ or $\overline{AB} = \begin{pmatrix} 2 \\ 9 \end{pmatrix}$	$7\hat{i} + 11\hat{j}$ or $\begin{pmatrix} 7 \\ 11 \end{pmatrix}$	3
17	(a) B1 : $\overline{MN} = \overline{ON} - \overline{OM}$	(a) $\begin{pmatrix} 11 \\ 3 \end{pmatrix}$ (b) $\frac{1}{\sqrt{130}} \begin{pmatrix} 11 \\ 3 \end{pmatrix}$	2 1
18		(a) 10 (b) 100	1 1
19	B3 : $30^\circ, 150^\circ, 270^\circ$ (any 2 correct answer) B2: $\sin x = \frac{1}{2}$ or $\sin x = -1$ B1: $\sin x - (1 - 2\sin^2 x) = 0$	$30^\circ, 150^\circ, 270^\circ$	4
20	B3 : $\frac{1}{2}(10)^2(1.22) - \frac{1}{2}(10)^2 \sin 70^\circ$ B2: $\frac{1}{2}(10)^2(1.22)$ or $\frac{1}{2}(10)^2 \sin 70^\circ$ B1: $\frac{70^\circ}{180^\circ} \times \pi = 1.22\text{rad}$	14.02	4

Question	Solution/ Marking Scheme	Answer	Marks
21	B2: $\frac{dy}{dt} = 8 \times 3$ B1: $\frac{dy}{dt} = \frac{dy}{dx} \times \frac{dx}{dt}$ or $\frac{dy}{dx} = 2(2x-7) \bullet 4$	24	3
22	(b) B1: $3h[x]_{-2}^1$ or $2(6)$ or 9	(a) -30 (b) $h = 2$	1 2
23	(a) B1: 7C_3 (b) B1: ${}^5C_2 \times {}^2C_1$ or ${}^5C_1 \times {}^2C_2$	(a) 35 (b) 25	2 2
24	(b) B1: $\left(\frac{5}{6} \times \frac{1}{3}\right)$ or $\left(\frac{1}{6} \times \frac{2}{3}\right)$	(a) $\frac{5}{9}$ (b) $\frac{17}{18}$	1 2
25	(a) B1: $0 \cdot 15 + n + 0 \cdot 36 + 0 \cdot 21 + 0 \cdot 03 = 1$	(a) $n = 0 \cdot 25$ (b) $0 \cdot 6$	2 1

END OF MARKING SCHEME

SULIT



PROGRAM PENINGKATAN PRESTASI AKADEMIK SPM

TAHUN 2012

MATA PELAJARAN

ADDITIONAL MATHEMATICS

Kertas 2

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.*
2. *Answer all questions in Section A, four questions from Section B and two questions from Section C.*
3. *Give only one answer/solution to each question.*
4. *Show your working. It may help you to get your marks.*
5. *The diagrams provided are not drawn according to scale unless stated.*
6. *The marks allocated for each question and sub - part of a question are shown in brackets.*
7. *You may use a non-programmable scientific calculator.*
8. *A list of formulae is provided in page 2 and 3.*

This question paper consists of 19 printed pages.

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[Lihat halaman sebelah
SULIT

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

$$1. x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$2. a^m \times a^n = a^{m+n}$$

$$3. a^m \div a^n = a^{m-n}$$

$$4. (a^m)^n = a^{mn}$$

$$5. \log_a mn = \log_a m + \log_a n$$

$$6. \log_a \frac{m}{n} = \log_a m - \log_a n$$

$$7. \log_a m^n = n \log_a m$$

ALGEBRA

$$8. \log_a b = \frac{\log_c b}{\log_c a}$$

$$9. T_n = a + (n-1)d$$

$$10. S_n = \frac{n}{2}[2a + (n-1)d]$$

$$11. T_n = ar^{n-1}$$

$$12. S_n = \frac{a(r^n - 1)}{r - 1} = \frac{a(1 - r^n)}{1 - r}, r \neq 1$$

$$13. S_\infty = \frac{a}{1 - r}, |r| < 1$$

CALCULUS

$$1. y = uv, \quad \frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$$

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

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

$$4. \text{Area under a curve}$$

$$= \int_a^b y \, dx \quad \text{or}$$

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

$$5. \text{Volume of revolution}$$

$$= \int_a^b \pi y^2 \, dx \quad \text{or}$$

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

GEOMETRY

$$1. \text{Distance} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$2. \text{Midpoint}$$

$$(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$3. \text{Division of line segment by a point}$$

$$(x, y) = \left(\frac{nx_1 + mx_2}{m+n}, \frac{ny_1 + my_2}{m+n} \right)$$

$$4. \text{Area of triangle}$$

$$= \frac{1}{2} |(x_1 y_2 + x_2 y_3 + x_3 y_1) - (x_2 y_1 + x_3 y_2 + x_1 y_3)|$$

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

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

STATISTICS

1. $\bar{x} = \frac{\sum x}{N}$
2. $\bar{x} = \frac{\sum fx}{\sum f}$
3. $\sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{N}} = \sqrt{\frac{\sum x^2}{N} - \bar{x}^2}$
4. $\sigma = \sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f}} = \sqrt{\frac{\sum fx^2}{\sum f} - \bar{x}^2}$
5. $m = L + \left(\frac{\frac{1}{2}N - F}{f_m} \right) C$
6. $I = \frac{Q_1}{Q_0} \times 100$
7. $\bar{I} = \frac{\sum W_i I_i}{\sum W_i}$
8. ${}^n P_r = \frac{n!}{(n-r)!}$
9. ${}^n C_r = \frac{n!}{(n-r)!r!}$
10. $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
11. $P(X = r) = {}^n C_r p^r q^{n-r}, p + q = 1$
12. Mean, $\mu = np$
13. $\sigma = \sqrt{npq}$
14. $Z = \frac{X - \mu}{\sigma}$

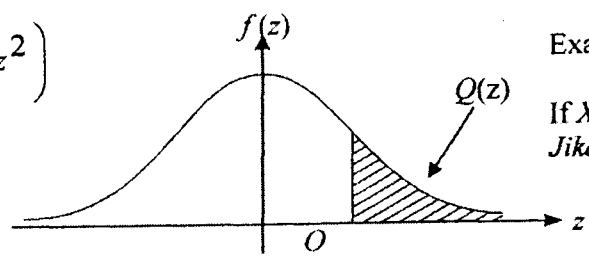
TRIGONOMETRY

1. Arc length, $s = r\theta$
2. Area of sector, $A = \frac{1}{2}r^2\theta$
3. $\sin^2 A + \cos^2 A = 1$
4. $\sec^2 A = 1 + \tan^2 A$
5. $\operatorname{cosec}^2 A = 1 + \cot^2 A$
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 = $\frac{1}{2}ab \sin C$

THE UPPER TAIL PROBABILITY Q(z) FOR THE NORMAL DISTRIBUTION N(0,1)
KEBARANGKALIAN HUJUNG ATAS Q(z) BAGI TABURAN NORMAL N(0, 1)

Table with columns for z (0.0 to 3.0) and rows for Q(z) values. Includes a 'Minus / Tolak' section for z > 3.0.

f(z) = 1/sqrt(2pi) * exp(-1/2 * z^2)
Q(z) = integral from k to infinity of f(z) dz



Example / Contoh:
If X ~ N(0, 1), then P(X > k) = Q(k)
Jika X ~ N(0, 1), maka P(X > k) = Q(k)

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Section A
Bahagian A

[40 marks]

[40 markah]

Answer all questions.

Jawab semua soalan.

- 1 Solve the following simultaneous equations $3x + y = 6$ and $2x^2 + y^2 + 3xy = 6$.
Give the answers correct to three decimal places. [5 marks]

Selesaikan persamaan serentak $3x + y = 6$ dan $2x^2 + y^2 + 3xy = 6$.

Beri jawapan betul kepada tiga tempat perpuluhan. [5 markah]

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

State the number of solutions. [3 marks]

- (a) Lakar graf bagi $y = -3\sin 2x$ untuk $0 \leq x \leq 2\pi$. [4 markah]
(b) Seterusnya, dengan menggunakan paksi yang sama, lakar satu garis lurus yang sesuai untuk mencari bilangan penyelesaian bagi persamaan $\frac{x}{3\pi} = -\sin 2x$ untuk $0 \leq x \leq 2\pi$.
Nyatakan bilangan penyelesaian itu. [3 markah]

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SULIT

SULIT
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3 The quadratic equation $2x^2 - 11x + 12 = 0$ has roots h and k , where $h > k$.

Find

(a) the value of h and of k ,

(b) the range of x if $2x^2 - 10x + 12$ always positive.

[5 marks]

Persamaan kuadratik $2x^2 - 11x + 12 = 0$ mempunyai punca-punca h dan k , dengan keadaan $h > k$. Cari

(a) nilai h dan nilai k ,

(b) julat nilai x jika $2x^2 - 10x + 12$ sentiasa positif.

[5 markah]

4 (a) The table shows the marks obtained by a group of students in a test.

Marks <i>Markah</i>	Number of students <i>Bilangan murid</i>
20 - 29	2
30 - 39	3
40 - 49	7
50 - 59	12
60 - 69	14
70 - 79	9
80 - 89	3

Without drawing an ogive, calculate the median mark.

[3 marks]

(b) The mean of a set of number 2, k , 5, $k + 2$ and 7 is 4.

Find the value of k and the variance.

[4 marks]

(a) Jadual di atas menunjukkan markah yang diperoleh sekumpulan murid dalam satu ujian. Tanpa melukis ogif, hitungkan markah median.

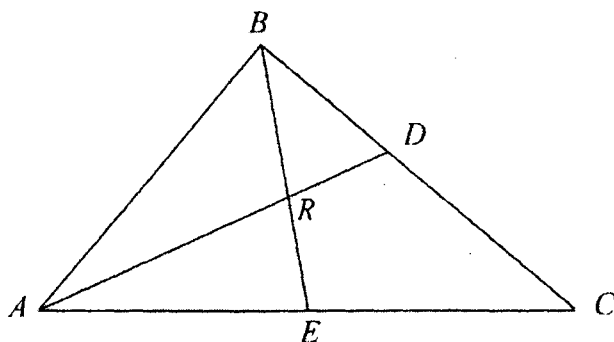
[3 markah]

(b) Min bagi satu set nombor 2, k , 5, $k + 2$ dan 7 ialah 4. Cari nilai k dan varians.

[4 markah]

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SULIT



The diagram shows a triangle ABC . Point D lies on the straight line BC such that $BD : DC = 1 : 2$. Point E is the midpoint of line AC . The straight line AD intersects the straight line BE at point R . It is given that $\overline{AB} = 6x$ and $\overline{AC} = 8y$.

(a) Express in terms of x and y of

(i) \overline{BC} ,

(ii) \overline{AD} .

[3 marks]

(b) It is given that $\overline{AR} = h\overline{AD}$, and $\overline{AR} = \overline{AB} + k\overline{BE}$, where h and k are constants.

Find the value of h and of k .

[5 marks]

Rajah menunjukkan suatu segi tiga ABC . Titik D terletak pada garis BC dengan keadaan $BD : DC = 1 : 2$. Titik E ialah titik tengah garis AC . Garis lurus AD bersilang dengan garis lurus BE pada titik R . Diberi bahawa $\overline{AB} = 6x$ dan $\overline{AC} = 8y$.

(a) Ungkapkan dalam sebutan x dan y bagi

(i) \overline{BC} ,

(ii) \overline{AD} .

[3 markah]

(b) Diberi bahawa $\overline{AR} = h\overline{AD}$ dan $\overline{AR} = \overline{AB} + k\overline{BE}$ dengan keadaan h dan k adalah pemalar. Cari nilai h dan nilai k .

[5 markah]

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8

- 6 (a) The sum of the first n terms of an arithmetic progression is given by

$$S_n = \frac{n}{2}(9 + 3n).$$

Find

- (i) the first term,
- (ii) the common difference.

[4 marks]

- (b) Three consecutive terms in a geometric progression are $x + 1$, $4x$ and $11x + 3$ respectively. It is given that x is a positive integer.

Find

- (i) the value of x ,
- (ii) the common ratio.

[4 marks]

- (a) Jumlah n sebutan pertama suatu jangjang aritmetik ialah $S_n = \frac{n}{2}(9 + 3n)$.

Cari

- (i) sebutan pertama,
- (ii) beza sepunya.

[4 markah]

- (b) Tiga sebutan yang berturutan dalam suatu jangjang geometri ialah $x + 1$, $4x$ dan $11x + 3$. Diberi x ialah suatu integer positif.

Cari

- (i) nilai x ,
- (ii) nisbah sepunya.

[4 markah]

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SULIT

Section B
Bahagian B

[40 marks]
[40 markah]

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

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

<i>x</i>	1	2	3	4	5	6
<i>y</i>	7.69	5.92	4.55	3.54	2.69	2.07

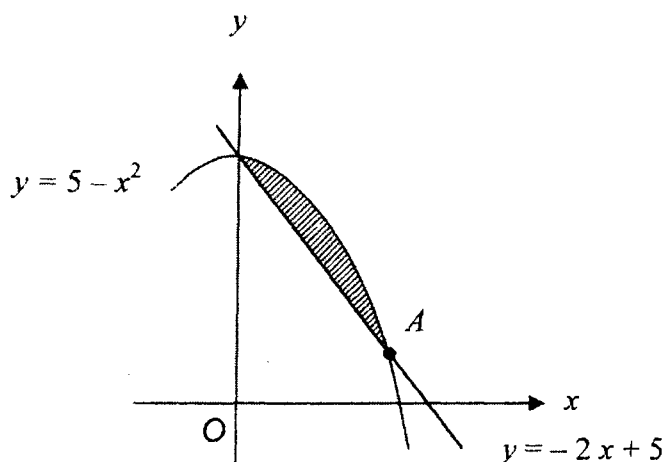
The table above shows the values of two variables, *x* and *y*, obtained from an experiment. Variables *x* and *y* are related by the equation $y = \frac{p}{q^x}$, where *p* and *q* are constants.

- (a) Plot $\log_{10} y$ against *x*, using a scale of 2 cm to 1 unit on the *x*-axis and 2 cm to 0.1 unit on the $\log_{10} y$ -axis. Hence, draw the line of best fit.
[4 marks]

- (b) Use your graph in 7(a) to find the value of
(i) *p*,
(ii) *q*,
(iii) *y* when *x* = 3.5.
[6 marks]

Jadual di atas menunjukkan nilai-nilai bagi dua pembolehubah, x dan y, yang diperolehi daripada satu eksperimen. Pembolehubah x dan y dihubungkan oleh persamaan $y = \frac{p}{q^x}$, dengan keadaan p dan q ialah pemalar.

- (a) Plot $\log_{10} y$ melawan *x*, dengan menggunakan skala 2 cm kepada 1 unit pada paksi-*x* dan 2 cm kepada 0.1 unit pada paksi $-\log_{10} y$. Seterusnya, lukis garis lurus penyuaian terbaik.
[4 markah]
- (b) Gunakan graf di 7(a) untuk mencari nilai
(i) *p*,
(ii) *q*,
(iii) *y* apabila *x* = 3.5.
[6 markah]



The diagram above shows a shaded region bounded by the curve $y = 5 - x^2$ and the straight line $y = -2x + 5$.

Find

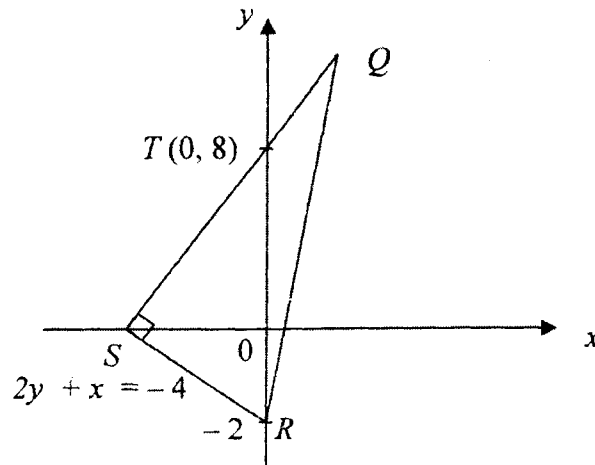
- (a) the coordinates of A , [3 marks]
- (b) the area of the shaded region, [4 marks]
- (c) the volume of revolution, in terms of π , when the region bounded by the curve, the x -axis and the y -axis, is revolved through 360° about the y -axis. [3 marks]

Rajah di atas menunjukkan kawasan berlorek yang dibatasi oleh lengkung $y = 5 - x^2$ dan garis lurus $y = -2x + 5$.

Cari

- (a) *koordinat A* , [3 markah]
- (b) *luas rantau yang berlorek*, [4 markah]
- (c) *isipadu kisanan, dalam sebutan π , apabila rantau yang dibatasi oleh lengkung, paksi- x dan paksi- y , dikisarkan melalui 360° pada paksi- y .* [3 markah]

- 9 Solution by scale drawing is not accepted.
Penyelesaian secara lukisan berskala tidak diterima.



The diagram above shows a triangle QRS . The line RS is perpendicular to the line QS . Point S lies on the x -axis and point R lies on the y -axis. The equation of RS is $2y + x = -4$.

- (a) Find
- the coordinates of S , [1 mark]
 - the equation of the straight line QS . [2 marks]
- (b) Given that $ST : TQ = 2 : 1$, find the coordinates of Q . [2 marks]
- (c) Calculate the area of triangle QRS . [2 marks]
- (d) Point $P(x, y)$ moves such that its distance from S is always twice its distance from R . Find the equation of the locus of P . [3 marks]

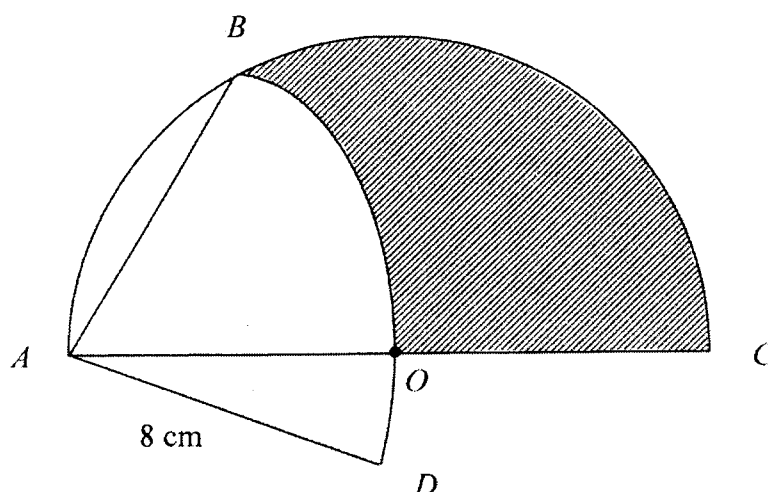
Rajah di atas menunjukkan sebuah segi tiga QRS . Garis RS adalah berserenjang dengan garis QS . Titik S terletak pada paksi- x dan titik R terletak pada paksi- y . Persamaan RS adalah $2y + x = -4$.

- (a) Cari
- koordinat S , [1 markah]
 - persamaan garis lurus QS . [2 markah]
- (b) Diberi $ST : TQ = 2 : 1$, cari koordinat Q . [2 markah]
- (c) Hitung luas segi tiga QRS . [2 markah]
- (d) Titik $P(x, y)$ bergerak dengan keadaan jaraknya dari S adalah sentiasa dua kali ganda jaraknya dari R . Cari persamaan lokus bagi P . [3 markah]

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10



The diagram above shows a semicircle ABC with centre O and radius 8 cm. $ABOD$ is a sector of circle with centre A and a perimeter of 27.20 cm.
[Use $\pi = 3.142$]

Calculate

- (a) the arc length, in cm of BD , [1 mark]
- (b) $\angle OAD$, in radians, [3 marks]
- (c) the area, in cm^2 of sector OAD , [2 marks]
- (d) the perimeter of the shaded region. [4 marks]

Rajah di atas menunjukkan sebuah semi bulatan ABC dengan pusat O dan jejari 8 cm. $ABOD$ ialah sebuah sektor bulatan dengan pusat A dan perimeter 27.20 cm.

[Guna $\pi = 3.142$]

Hitung

- (a) panjang lengkok, dalam cm bagi BD , [1 markah]
- (b) $\angle OAD$, dalam radian, [3 markah]
- (c) luas, dalam cm^2 , sektor OAD , [2 markah]
- (d) perimeter, dalam cm, kawasan berlorek. [4 markah]

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SULIT

SULIT
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13

11 (a) It is found that 30% of the students in a school wear spectacles. If 10 students from the school are selected at random, find the probability that

- (i) exactly two students wear spectacles,
- (ii) at least three students wear spectacles.

[5 marks]

(b) In a town, the heights of women are normally distributed with mean 165 cm and a standard deviation of 4 cm.

- (i) If a woman is selected at random, find the probability that her height is less than 162 cm.
- (ii) Given 20 % of the women have a height of more than m cm. Find the value of m .

[5 marks]

(a) Didapati bahawa 30% daripada pelajar di sebuah sekolah memakai cermin mata. Jika 10 orang pelajar dari sekolah itu dipilih secara rawak, cari kebarangkalian bahawa

- (i) tepat dua orang pelajar memakai cermin mata,
- (ii) sekurang-kurang tiga orang pelajar memakai cermin mata.

[5 markah]

(b) Di sebuah bandar, tinggi bagi wanita adalah mengikut taburan normal dengan min 165 cm dan sisihan piawai 4 cm.

- (i) Jika seorang wanita dipilih secara rawak, cari kebarangkalian bahawa tingginya kurang dari 162 cm.
- (ii) Diberi 20% daripada wanita tersebut mempunyai ketinggian lebih daripada m cm. Cari nilai m .

[5 markah]

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14

Section C
Bahagian C

[20 marks]

[20 markah]

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

- 12 A particle moves along a straight line and passes through a fixed point O . The velocity of the particle, $v \text{ m s}^{-1}$, is given by $v = 16 + 6t - t^2$, where t is the time, in seconds, after leaving O .

[Assume motion to the right is positive]

Find

- (a) the initial velocity, in m s^{-1} , of the particle, [1 mark]
 (b) the value of t , in seconds, when the particle stops instantaneously, [2 marks]
 (c) the maximum velocity, in m s^{-1} , of the particle, [3 marks]
 (d) the total distance, in m, travelled by the particle in the first 9 seconds. [4 marks]

Satu zarah bergerak di sepanjang suatu garis lurus melalui satu titik tetap O . Halaju zarah itu, $v \text{ m s}^{-1}$, diberi oleh $v = 16 + 6t - t^2$, dengan keadaan t ialah masa, dalam saat, selepas melalui O .

[Anggapkan gerakan ke arah kanan sebagai positif]

Cari

- (a) halaju awal, dalam m s^{-1} , zarah itu, [1 markah]
 (b) nilai bagi t , dalam saat, apabila zarah berhenti seketika, [2 markah]
 (c) halaju maksimum, dalam m s^{-1} , zarah itu, [3 markah]
 (d) jumlah jarak, dalam m, yang dilalui oleh zarah itu dalam 9 saat pertama. [4 markah]

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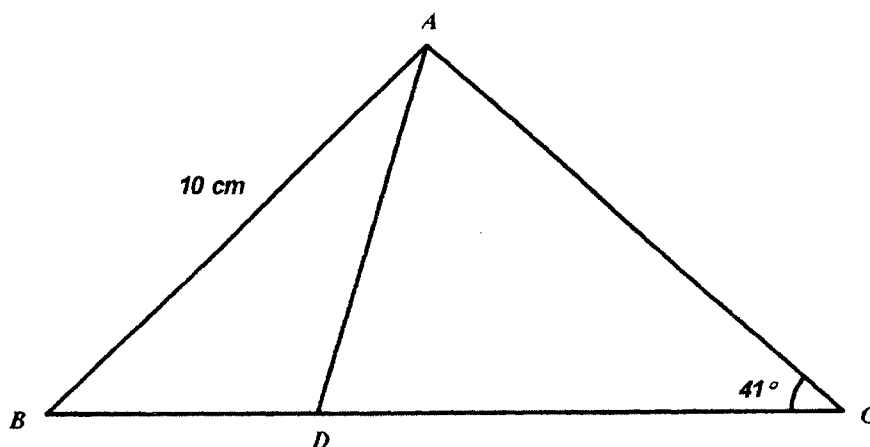
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15

13 The diagram below shows a triangle ABC where BDC is a straight line. Given

$AB = 10$ cm, $\angle ACB = 41^\circ$, $BD = \frac{1}{2}DC$ and $\tan \angle ABC = 1$ where $\angle ABC$ is acute.



Calculate

- (a) the length, in cm, of AC , [3 marks]
 (b) the length, in cm, of BD . [4 marks]
 (c) the area, in cm^2 , of triangle ACD . [3 marks]

Rajah di atas menunjukkan segi tiga ABC di mana BDC ialah garis lurus. Diberi $AB=10$ cm, $\angle ACB = 41^\circ$, $BD = \frac{1}{2}DC$ dan $\tan \angle ABC = 1$ dengan $\angle ABC$ ialah sudut tirus. Hitung

- (a) panjang, dalam cm, bagi AC , [3 markah]
 (b) panjang, dalam cm, bagi BD , [4 markah]
 (c) luas, dalam cm^2 , bagi segi tiga ACD . [3 markah]

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14 Use graph paper to answer this question.

A factory produces two different circuit boards of smart phones, S and T . The factory produces x units of circuit board S and y units of circuit board T daily. The circuit board S needs 3 minutes to produce while the circuit board T needs 9 minutes to produce. However, the production of the circuit boards is based on the following constraints:

- I The maximum number of daily production of circuit boards is 160.
 - II The number of circuit board T is at most three times the number of circuit board S .
 - III The total time taken to produce the circuit boards daily is at least 12 hours.
- (a) Write down three inequalities, other than $x \geq 0$ and $y \geq 0$, which satisfy all the above constraints. [3 marks]
- (b) Using a scale of 2 cm to 20 units on both axes, construct and shade the region R which satisfies all of the above constraints. [3 marks]
- (c) Using the graph constructed in 14(b), find
- (i) the minimum number of circuit board S produced if the number of circuit board T produced is 84.
 - (ii) the maximum total profit made by the factory daily if the profit from the sales of a unit of circuit board S is RM35 and the profit from the sales of a unit of circuit board T is RM95.
- [4 marks]

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17

Gunakan kertas graf untuk menjawab soalan ini.

Sebuah kilang menghasilkan dua jenis papan litar untuk telefon pintar, S dan T. Kilang tersebut dapat menghasilkan x unit bagi papan litar S dan y unit bagi papan litar T setiap hari. Papan litar S memerlukan 3 minit untuk dihasilkan sementara papan litar T memerlukan 9 minit untuk dihasilkan. Walau bagaimanapun, penghasilan papan litar tersebut adalah berdasarkan kekangan berikut:

- I Penghasilan harian maksimum bagi kedua-dua papan litar tersebut ialah 160.
 - II Bilangan unit bagi papan litar T adalah selebih-lebihnya tiga kali ganda bilangan unit bagi papan litar S.
 - III Jumlah masa diambil untuk menghasilkan kedua-dua papan litar tersebut adalah sekurang-kurangnya 12 jam setiap hari.
- (a) Tuliskan tiga ketaksamaan, selain $x \geq 0$ dan $y \geq 0$, yang memenuhi semua kekangan di atas. [3 markah]
 - (b) Menggunakan skala 2 cm kepada 20 unit pada kedua-dua paksi, bina dan lorek rantau R yang memenuhi semua kekangan di atas. [3 markah]
 - (c) Dengan menggunakan graf yang dibina di 14(b), cari
 - (i) bilangan minimum bagi papan litar S yang dihasilkan jika bilangan papan litar T yang dihasilkan ialah 84.
 - (ii) jumlah keuntungan maksimum yang diperolehi kilang tersebut setiap hari jika keuntungan hasil daripada jualan seunit papan litar S adalah sebanyak RM35 dan keuntungan hasil daripada jualan seunit papan litar T adalah sebanyak RM95.

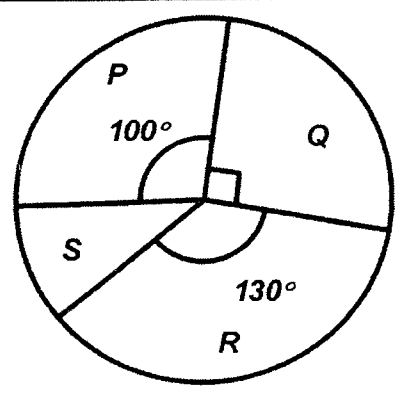
[4 markah]

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15 The table shows the prices and the price indices of four different materials, P , Q , R and S , used in the making of a kind of biscuit. The diagram shows a pie chart which represents the relative quantities of the materials used.

Material <i>Bahan</i>	Price (RM) per kg <i>Harga (RM) per kg</i>		Price index in the year 2010 based on the year 2008 <i>Indeks harga pada tahun 2010 berasaskan tahun 2008</i>
	2008	2010	
P	4.00	5.00	125
Q	x	3.60	120
R	5.00	7.50	y
S	3.00	2.70	90



- (a) Find the values of x and y . [3 marks]
- (b) Calculate the composite index for the cost of making the biscuit in the year 2010 based on the year 2008. [3 marks]
- (c) The price of each material increases by 20 % from the year 2010 to the year 2011.
 - (i) Find composite index for the year 2011 based on the year 2008.
 - (ii) Given the cost of making a packet of the biscuit in the year 2008 is RM4.75. Calculate the corresponding cost in the year 2011. [4 marks]

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Jadual di sebelah menunjukkan harga dan indeks harga bagi empat bahan P, Q, R dan S dalam penghasilan suatu jenis biskut. Rajah berbentuk carta pai menunjukkan kuantiti yang digunakan oleh bahan-bahan tersebut.

- (a) *Cari nilai x dan y.* [3 markah]
- (b) *Hitung indeks gubahan bagi kos membuat biskut itu pada tahun 2010 berasaskan tahun 2008.* [3 markah]
- (c) *Harga bagi setiap bahan meningkat sebanyak 20% dari tahun 2010 ke tahun 2011.*
- (i) *Cari indeks gubahan bagi tahun 2011 berasaskan tahun 2008.*
- (ii) *Diberi kos membuat sepeket biskut itu dalam tahun 2008 ialah RM4.75. Hitung kos yang sepadan pada tahun 2011.*

[4 markah]

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

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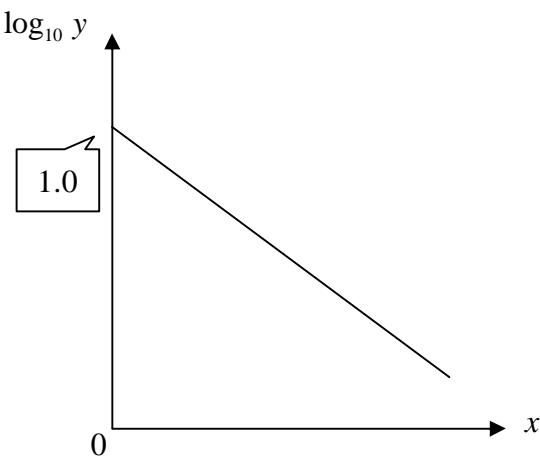
<http://edu.joshuatly.com/>
<http://fb.me/edu.joshuatly>

MARKING SCHEME
ADDITIONAL MATHEMATICS PAPER 2

N0.	SOLUTION	MARKS
1	$y = 6 - 3x \quad \text{or} \quad x = \frac{6-y}{3}$ $2x^2 - 18x + 30 = 0 / x^2 - 9x + 15 = 0$ $x = \frac{-(-9) \pm \sqrt{21}}{2}$ $x = 6.791 \quad \text{and} \quad x = 2.209 \quad (\text{both})$ $y = -14.373 \quad \text{and} \quad y = -0.627 \quad (\text{both})$	<p>P1</p> <p>K1 Eliminate y</p> <p>K1 Solve quadratic equation</p> <p>N1</p> <p>N1</p>
		5
2	<p>(a) </p> <p>(b) $y = \frac{x}{\pi}$</p> <p>draw the straight line $y = \frac{x}{\pi}$</p> <p>Number of solutions = 5</p>	<p>P1 sin shape correct.</p> <p>P1 Amplitude = 3 [Maximum = 3 and Minimum = -3]</p> <p>P1 2 full cycle in $0 \leq x \leq 2\pi$</p> <p>P1 reflection of the graph</p> <p>N1 For equation</p> <p>K1 Sketch the straight line</p> <p>N1</p>
		7
3	<p>$2x^2 - 11x + 12 = 0$</p> <p>$(2x - 3)(x - 4) = 0$</p> <p>$x = \frac{3}{2} \quad \text{or} \quad x = 4$</p> <p>(a) $k = \frac{3}{2}, \quad h = 4$</p> <p>(b) $2x^2 - 11x + 12 > 0$</p> <p>$x < \frac{3}{2} \quad \text{and} \quad x > 4$</p>	<p>K1</p> <p>N1 N1</p> <p>K1</p> <p>N1 (both)</p>
		5

<p>4</p> <p>(a)</p> $\text{median} = 59.5 + \left[\frac{\frac{1}{2}(50) - 24}{14} \right] (10)$ $= 60.22$ <p>(b)</p> $\frac{2k + 16}{5} = 4$ $k = 2$ $\sigma^2 = \frac{98}{5} - 4^2$ $= 3.6$		<p>P1 for L=59.5 or F=24 or f_m=14</p> <p>K1 use correct formula</p> <p>N1</p> <p>K1</p> <p>N1</p> <p>K1</p> <p>N1</p>
7		
<p>5</p> <p>(a)</p> <p>$\overline{BC} = \overline{BA} + \overline{AC}$ or $\overline{AD} = \overline{AB} + \overline{BD}$</p> <p>(i) $\overline{BC} = -6\tilde{x} + 8\tilde{y}$</p> <p>(ii) $\overline{AD} = 4\tilde{x} + \frac{8}{3}\tilde{y}$</p> <p>(b)</p> <p>$\overline{AR} = h\overline{AD} = 4h\tilde{x} + \frac{8}{3}h\tilde{y}$</p> <p>$\overline{AR} = \overline{AB} + k\overline{BE} = (6 - 6k)\tilde{x} + 4k\tilde{y}$</p> <p>$6 - 6k = 4h, \frac{8}{3} = 4h$</p> <p>$h = \frac{3}{4}, k = \frac{1}{2}$</p>		<p>K1</p> <p>N1</p> <p>N1</p> <p>N1</p> <p>N1</p> <p>K1 elimiate h/k</p> <p>N1 N1</p>
7		

<p>6</p> <p>(a)</p> <p>(i) $a = \frac{1}{2}(9+3)$ $a = 6$</p> <p>(ii) $S_2 = \frac{2}{2}(9+3(2))$ $S_2 = 15$</p> <p>$T_2 = 15 - 6 = 9$ $d = 9 - 6 = 3$</p> <p>(b) (i)</p> <p>$(4x)^2 = (x+1)(11x+3)$ $(5x+1)(x-3) = 0$</p> <p>$x = -\frac{1}{5}, \quad x = 3$</p> <p>(not accepted)</p> <p>(ii)</p> <p>$r = \frac{4(3)}{3+1}$</p> <p>$r = 3$</p>		<p>K1</p> <p>N1</p> <p>K1</p> <p>N1</p> <p>K1</p> <p>N1(both)</p> <p>K1</p> <p>N1</p> <p>8</p>
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<p>7</p> <p>(a)</p> <p>(b)</p> <p>(c)</p> <p>(i)</p> <p>(ii)</p> <p>(iii)</p>	<table border="1" data-bbox="231 235 1125 421"> <tr> <td>x</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>$\log_{10} y$</td> <td>0.89</td> <td>0.77</td> <td>0.66</td> <td>0.55</td> <td>0.43</td> <td>0.32</td> </tr> </table>  <p>$\log y = \log p - x \log q$</p> <p>$\log_{10} p = \text{*y-intercept}$</p> <p>$p = 10.0$</p> <p>$-\log_{10} q = \text{*gradient}$</p> <p>$= 1.30$</p> <p>$y = 3.98$</p>	x	1	2	3	4	5	6	$\log_{10} y$	0.89	0.77	0.66	0.55	0.43	0.32	<p>N1 6 correct values of $\log y$</p> <p>K1 Plot $\log_{10} y$ vs x. Correct axes & uniform scale</p> <p>N1 6 points plotted correctly</p> <p>N1 Line of best-fit</p> <p>P1</p> <p>K1</p> <p>N1</p> <p>K1</p> <p>N1</p> <p>N1</p> <p>10</p>
x	1	2	3	4	5	6										
$\log_{10} y$	0.89	0.77	0.66	0.55	0.43	0.32										

N0.	SOLUTION	MARKS
<p>8</p> <p>(a)</p> <p>$-2x+5=5-x^2$</p> <p>$x(x-2)=0$</p> <p>$(2,1)$</p> <p>(b)</p> $A = \int_0^2 [(5-x^2) - (-2x+5)] dx$ $= \int_0^2 (-x^2+2x) dx$ $= \left[-\frac{x^3}{3} + x^2 \right]_0^2$ $= \left[-\frac{(2)^3}{3} + (2)^2 \right] - \left[-\frac{(0)^3}{3} + (0)^2 \right]$ $= 1\frac{1}{3}$ <p><i>Note : If use area of trapezium and $\int y dx$, give marks accordingly.</i></p> <p>(c)</p> $V = \pi \int_0^5 (5-y) dy$ $= \pi \left[5y - \frac{y^2}{2} \right]_0^5$ $= 12\frac{1}{2}\pi \quad \text{or } 12.5\pi$	<p>K1</p> <p>K1 for solving quad.eqn.</p> <p>N1</p> <p>K1 use</p> $\int (y_2 - y_1) dx$ <p>K1 integrate correctly</p> <p>K1 Sub. the limit correctly</p> <p>N1</p> <p>K1 correct limit</p> <p>K1 integrate correctly</p> <p>N1</p>	<p>10</p>

N0.	SOLUTION	MARKS
9	<p>(a) (i) $(-4, 0)$</p> <p>(ii) $-\frac{1}{2} \times m = -1$</p> $y = 2x + 8$ <p>(b) $\frac{2x-4}{3} = 0$ or $\frac{2y+0}{3} = 8$</p> $(2, 12)$ <p>(c)</p> $\text{Area of } \Delta = \frac{1}{2} \begin{vmatrix} 2 & -4 & 0 & 2 \\ 12 & 0 & -2 & 12 \end{vmatrix}$ $= \frac{1}{2} [8 - (-48 - 4)]$ $= 30 \text{ unit}^2$ <p>(d) $PS = 2PR$</p> $\sqrt{(x+4)^2 + y^2} = 2\sqrt{x^2 + (y+2)^2}$ $3x^2 + 3y^2 - 8x + 16y = 0$	<p>N1</p> <p>K1</p> <p>N1</p> <p>K1</p> <p>N1</p> <p>K1 use area formula correctly</p> <p>N1</p> <p>P1</p> <p>K1</p> <p>N1</p>
		10

N0.	SOLUTION	MARKS
10.	<p>(a) 11.2 cm</p> <p>(b) $8\theta = 11.2$</p> $\angle OAD = 1.4 - \frac{60}{180} \times \pi$ $= 0.3527 \text{ rad.}$ <p>(c) Area of sector $OAD = \frac{1}{2}(8)^2(0.3527)$</p> $= 11.29 \text{ cm}^2$ <p>(d) $OB = 8.38 \text{ cm}$ $BC = 16.76 \text{ cm}$</p> <p>Perimeter $= 8.38 + 16.76 + 8$</p> $= 33.14 \text{ cm}$	<p>N1</p> <p>K1 Use $s = r\theta$</p> <p>K1</p> <p>N1</p> <p>K1 Use formula $A = \frac{1}{2}r^2\theta$</p> <p>N1</p> <p>K1</p> <p>K1</p> <p>K1</p> <p>N1</p> <p>10</p>

N0.	SOLUTION	MARKS
11 (a) (i) (ii) (b) (i) (ii)	$p = 0.3, n = 10$ $P(X = 2) = {}^{10}C_2 (0.3)^2 (0.7)^8$ $= 0.2335$ $P(X \geq 3) = P(x = 3) + P(x = 4) + \dots + P(X = 10)$ or $= 1 - P(x = 2) - P(x = 1) - P(X = 0)$ $= 0.6172$ $\mu = 162, \sigma = 4$ $P(X < 162) = P\left(Z < \frac{162 - 165}{4}\right)$ $= P(Z < -0.75)$ $= 0.2266$ $\frac{m - 165}{4} = 0.842$ $m = 168.4 \text{ cm}$	 K1 Use $P(X=r) = {}^nC_r p^r q^{n-r}$ N1 K1 K1 Use $P(X=r) = {}^nC_r p^r q^{n-r}$ N1 K1 Use $Z = \frac{X - \mu}{\sigma}$ N1 K1K1 N1
		10

NO.	SOLUTION	MARKS
12 (a) (b) (c) (d)	$v_{initial} = 16 \text{ m s}^{-1}$ $v = 0$ $t^2 - 6t - 16 = 0$ $(t - 8)(t + 2) = 0$ $t = 8 \quad t = -2 \text{ (not accepted)}$ $6 - 2t = 0$ $t = 3$ $V_{max} = 16 + 6(3) - (3)^2$ $= 25 \text{ m s}^{-1}$ <p>Total distance</p> $= \int_0^8 v dt + \left \int_8^9 v dt \right $ $= \left[16t - 3t^2 - \frac{t^3}{3} \right]_0^8 + \left[16t - 3t^2 - \frac{t^3}{3} \right]_8^9$ $= \left[\left(16(8) + 3(64) - \frac{512}{3} \right) - (0) \right] + \left[\left(16(9) + 3(81) - \frac{729}{3} \right) - \left(16(8) + 3(64) - \frac{512}{3} \right) \right]$ $= 154 \frac{2}{3} \text{ m}$	N1 K1 N1 K1 K1 N1 K1 for $\int_0^8 \text{ and } \int_8^9$ K1 (for Integration; either one) K1 (for use and summation) N1
		10

NO.	SOLUTION	MARKS
13 (a)	$\angle ABC = 45^\circ$ $\frac{AC}{\sin 45^\circ} = \frac{10}{\sin 41^\circ}$ $AC = 10.78 \text{ cm}$	N1 K1 N1
(b)	$\angle BAC = 180^\circ - 41^\circ - 45^\circ$ $= 94^\circ$ $BC^2 = 10^2 + 10.78^2 - 2(10)(10.78) \cos 94^\circ$ $BC = 15.21 \text{ cm}$ $\therefore BD = \frac{15.21}{3}$ $= 5.07 \text{ cm}$	K1 K1 K1 N1
(c)	$DC = 15.21 - 5.07$ $= 10.14 \text{ cm}$ $\text{Area } \triangle ACD = \frac{1}{2}(10.14)(10.78) \sin 41^\circ$ $= 35.86 \text{ cm}^2$ <p>or equivalent</p>	K1 K1 N1
		10

N0.	SOLUTION	MARKS
14		
(a)	$x + y \leq 160$ $y \leq 3x$ $3x + 9y \geq 720$ or $x + 3y \geq 240$	N1 N1 N1
(b)	<p>The graph shows a coordinate system with x and y axes. The x-axis is labeled from 0 to 180 in increments of 20. The y-axis is labeled from 0 to 180 in increments of 20. Three lines are plotted: a line with a negative slope passing through (0, 160) and (160, 0); a line with a positive slope passing through the origin (0,0) and (60, 180); and a line with a negative slope passing through (0, 80) and (240, 0). The feasible region is shaded and bounded by the x-axis, the line x = 28, the line y = 84, and the line x + y = 160. The vertices of the shaded region are (0,0), (28,0), (28,84), (40,120), and (120,40).</p> <ul style="list-style-type: none"> At least one straight line is drawn correctly from inequalities involving x and y. K1 All the three straight lines are drawn correctly. N1 Region is correctly shaded. N1 <p>(c)(i) 28 N1</p> <p>(ii) Maximum point (40, 120) N1</p> <p>Maximum profit = $35(40) + 95(120)$ K1</p> <p style="text-align: center;">= RM 12800 N1</p>	K1 N1 N1 N1 N1 K1 N1
		10

NO.	SOLUTION	MARKS
15 (a)	$\frac{3.6}{x}(100)=120 \quad \text{atau} \quad \frac{7.5}{5.0}(100)=y$ $x = \text{RM } 3$ $y = 150$	K1 N1 N1
(b)	$40^\circ \text{ (can be seen)}$ $\bar{I} = \frac{(125 \times 100) + (120 \times 90) + (150 \times 130) + (90 \times 40)}{360}$ $= \frac{46400}{360}$ $= 128.9$	N1 K1 N1
(c) (i)	$\bar{I}_{\frac{11}{08}} = 128.9 \times 1.2$ $= 154.68$	K1 N1
(ii)	$P_{11} = 4.75 \times 1.289 \times 1.2$ $= \text{RM}7.35$	K1 N1
		10

END OF MARKING SCHEME