

NAMA : _____

TINGKATAN : _____



MAJLIS PENGETUA SEKOLAH MENENGAH CAWANGAN PULAU PINANG

MODUL PENILAIAN SPM 2012 ADDITIONAL MATHEMATICS

Kertas 1

September

2 jam

3472/1

Dua jam

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. Tuliskan **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.

Untuk Kegunaan Pemeriksa		
Soalan	Markah Penuh	Markah Diperolehi
1	3	
2	2	
3	4	
4	3	
5	3	
6	3	
7	4	
8	3	
9	3	
10	3	
11	3	
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17	3	
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23	4	
24	3	
25	3	
JUMLAH	80	

Kertas soalan ini mengandungi 23 halaman bercetak.

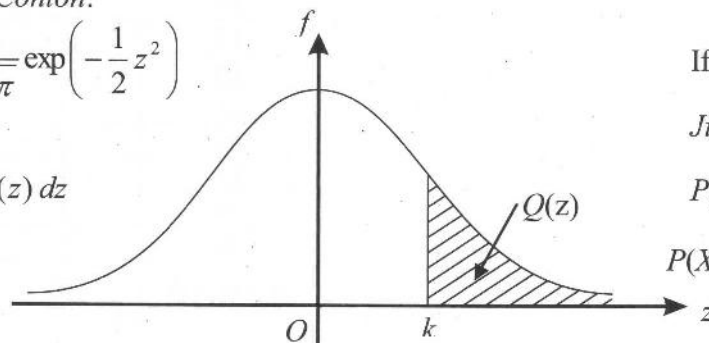
THE UPPER TAIL PROBABILITY $Q(z)$ FOR THE NORMAL DISTRIBUTION $N(0, 1)$
KEBARANGKALIAN Hujung Atas $Q(z)$ BAGI TABURAN NORMAL $N(0, 1)$

z	0	1	2	3	4	5	6	7	8	9	Minus / Tolak								
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641	4	8	12	16	20	24	28	32	36
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247	4	8	12	16	20	24	28	32	36
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859	4	8	12	15	19	23	27	31	35
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483	4	7	11	15	19	22	26	30	34
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121	4	7	11	15	18	22	25	29	32
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776	3	7	10	14	17	20	24	27	31
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451	3	7	10	13	16	19	23	26	29
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148	3	6	9	12	15	18	21	24	27
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867	3	5	8	11	14	16	19	22	25
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611	3	5	8	10	13	15	18	20	23
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379	2	5	7	9	12	14	16	19	21
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170	2	4	6	8	10	12	14	16	18
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985	2	4	6	7	9	11	13	15	17
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823	2	3	5	6	8	10	11	13	14
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681	1	3	4	6	7	8	10	11	13
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559	1	2	4	5	6	7	8	10	11
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455	1	2	3	4	5	6	7	8	9
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367	1	2	3	4	4	5	6	7	8
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294	1	1	2	3	4	4	5	6	6
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233	1	1	2	2	3	4	4	5	5
2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183	0	1	1	2	2	3	3	4	4
2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143	0	1	1	2	2	2	3	3	4
2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110	0	1	1	1	2	2	2	3	3
2.3	0.0107	0.0104	0.0102								0	1	1	1	1	2	2	2	2
			0.00990		0.00964	0.00939	0.00914				3	5	8	10	13	15	18	20	23
								0.00889	0.00866	0.00842	2	5	7	9	12	14	16	16	21
2.4	0.00820	0.00798	0.00776	0.00755	0.00734						2	4	6	8	11	13	15	17	19
						0.00714	0.00695	0.00676	0.00657	0.00639	2	4	6	7	9	11	13	15	17
2.5	0.00621	0.00604	0.00587	0.00570	0.00554	0.00539	0.00523	0.00508	0.00494	0.00480	2	3	5	6	8	9	11	12	14
2.6	0.00466	0.00453	0.00440	0.00427	0.00415	0.00402	0.00391	0.00379	0.00368	0.00357	1	2	3	5	6	7	9	9	10
2.7	0.00347	0.00336	0.00326	0.00317	0.00307	0.00298	0.00289	0.00280	0.00272	0.00264	1	2	3	4	5	6	7	8	9
2.8	0.00256	0.00248	0.00240	0.00233	0.00226	0.00219	0.00212	0.00205	0.00199	0.00193	1	1	2	3	4	4	5	6	6
2.9	0.00187	0.00181	0.00175	0.00169	0.00164	0.00159	0.00154	0.00149	0.00144	0.00139	0	1	1	2	2	3	3	4	4
3.0	0.00135	0.00131	0.00126	0.00122	0.00118	0.00114	0.00111	0.00107	0.00104	0.00100	0	1	1	2	2	2	3	3	4

Example / Contoh:

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

$$Q(z) = \int_k^{\infty} f(z) dz$$



If $X \sim N(0, 1)$, then

Jika $X \sim N(0, 1)$, maka

$$P(X > k) = Q(k)$$

$$P(X > 2.1) = Q(2.1) = 0.0179$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

CALCULUS KALKULUS

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

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

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

$$4 \quad \begin{aligned} &\text{Area under a curve} \\ &\text{Luas di bawah lengkung} \\ &= \int_a^b y \, dx \quad \text{or (atau)} \end{aligned}$$

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

$$5 \quad \begin{aligned} &\text{Volume of revolution} \\ &\text{Isi padu kisanan} \\ &= \int_a^b \pi y^2 \, dx \quad \text{or (atau)} \\ &= \int_a^b \pi x^2 \, dy \end{aligned}$$

STATISTICS STATISTIK

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

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

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

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

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

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

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

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

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

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

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

$$12 \quad \text{Mean / Min, } \mu = np$$

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

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

GEOMETRY GEOMETRI

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

$$2 \quad \text{Midpoint / Titik tengah} \\ (x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$3 \quad \text{A point dividing a segment of a line} \\ \text{Titik yang membahagi suatu tembereng garis}$$

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

$$4 \quad \text{Area of triangle / Luas segi tiga} \\ = \frac{1}{2} |(x_1 y_2 + x_2 y_3 + x_3 y_1) - (x_2 y_1 + x_3 y_2 + x_1 y_3)|$$

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

$$6 \quad \hat{r} = \frac{xi + yj}{\sqrt{x^2 + y^2}}$$

TRIGONOMETRY
TRIGONOMETRI

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

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

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

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

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

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

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

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

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

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

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

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

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

13 $a^2 = b^2 + c^2 - 2bc \cos A$
 $a^2 = b^2 + c^2 - 2bc \text{kos} A$

14 Area of triangle / *Luas segi tiga*
 $= \frac{1}{2} ab \sin C$

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

- 1 Diagram 1 shows the function $g : x \rightarrow px^2 + r$, where p and r are constants.

Rajah 1 menunjukkan fungsi $g : x \rightarrow px^2 + r$, dengan keadaan p dan r ialah pemalar.

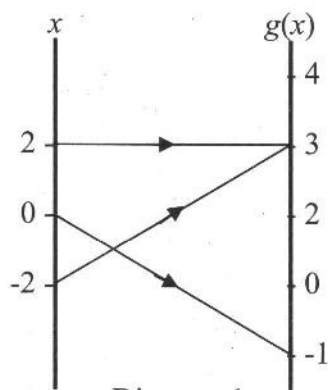


Diagram 1

Rajah 1

Find
Cari

- the objects of 3,
objek-objek bagi 3,
- the value of p and of r .
nilai p dan nilai r .

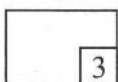
[3 marks]
[3 markah]

Answer / Jawapan :

(a)

(b)

1



- 2 Diagram 2 shows part of the graph of $f(x) = x^2 + 2$ for the domain $-1 \leq x \leq 2$.
Rajah 2 menunjukkan sebahagian graf $f(x) = x^2 + 2$ bagi domain $-1 \leq x \leq 2$.

For
Examiner's
Use

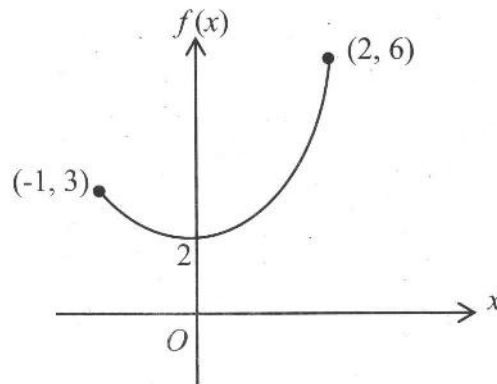


Diagram 2

Rajah 2

State
Nyatakan

- (a) the object when the image is 2,
objek apabila imej ialah 2,
- (b) the range of the above graph .
julat bagi graf di atas.

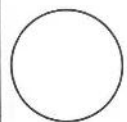
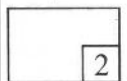
[2 marks]
[2 markah]

Answer / *Jawapan :*

(a)

(b)

2



- 3 Given the function $f^{-1}(x) = m - 3x$, where m is a constant and $f(2) = 3$, find
Diberi fungsi $f^{-1}(x) = m - 3x$, dengan keadaan m ialah pemalar dan $f(2) = 3$,
cari

(a) the value of m ,
nilai m ,

(b) $f^2(x)$.

[4 marks]

[4 markah]

Answer / Jawapan :

(a)

(b)

3

4

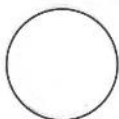
- 4 Given that p and 2 are the roots of the quadratic equation $2x^2 - (m - 2)x + 12 = 0$,
find the value of m and of p . [3 marks]

Diberi p dan 2 ialah punca-punca bagi persamaan kuadratik
 $2x^2 - (m - 2)x + 12 = 0$.
cari nilai m dan nilai p . [3 markah]

Answer / Jawapan :

4

3



- 5 Diagram 5 shows the graph of the function $y = -(x-2)^2 - 8$.

Rajah 5 menunjukkan graf bagi fungsi $y = -(x-2)^2 - 8$.

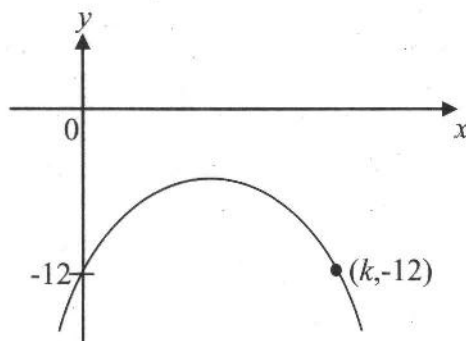


Diagram 5
Rajah 5

Find

Cari

- the value of k ,
nilai k ,
- the equation of the axis of symmetry,
persamaan paksi simetri,
- the coordinates of the maximum point.
koordinat titik maksimum.

[3 marks]

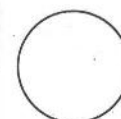
[3 markah]

Answer / Jawapan :

(a)

(b)

(c)



For
Examiner's
Use

- 6 Given that the graph of the quadratic function $f(x) = 2x^2 - 3x + q$ does not intersect the x -axis, find the range of values of q . [3 marks]

Diberi graf bagi fungsi kuadratik $f(x) = 2x^2 - 3x + q$ tidak menyilang paksi- x , cari julat bagi nilai q . [3 markah]

Answer / Jawapan :

6

3

- 7 Solve the equation $\log_2 y = 4\log_y 2$. [4 marks]

Selesaikan persamaan $\log_2 y = 4\log_y 2$. [4 markah]

Answer / Jawapan :

7

4



- 8 Given that $\frac{2^{3n-1}}{8} = 16^n$, find the value of n .

[3 marks]

Diberi $\frac{2^{3n-1}}{8} = 16^n$, cari nilai n .

[3 markah]

Answer / Jawapan :

8

8
3

- 9 The first three terms of an arithmetic progression are 7, 13 and 19.

Tiga sebutan pertama satu jangjang aritmetik ialah 7, 13 dan 19.

Find

Cari

- (a) the common difference,
beza sepunya,
- (b) the sum of the first eight terms of the progression.
hasil tambah lapan sebutan pertama bagi jangjang itu.

[3 marks]

[3 markah]

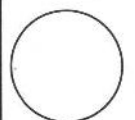
Answer / Jawapan :

(a)

(b)

9

9
3



- 10 The 3rd term and the 5th term of an arithmetic progression are $2p + 6$ and $6p - 4$ respectively, where p is a constant. Given that the common difference of the progression is 3, find the value of p . [3 marks]

Sebutan ke-3 dan sebutan ke-5 suatu jangjang arithmetik adalah $2p + 6$ dan $6p - 4$ masing-masing, dengan keadaan p ialah pemalar. Diberi beza sepunya jangjang arithmetik itu ialah 3, cari nilai p . [3 markah]

Answer / Jawapan :

10

3

- 11 It is given that the first three terms of a geometric progression are $18p$, $6p$ and $2p$.

Diberi bahawa tiga sebutan pertama suatu jangjang geometri adalah $18p$, $6p$ dan $2p$.

Find

Cari

- (a) the common ratio of the progression,
nisbah sepunya jangjang itu,
- (b) the sum to infinity in terms of p .
hasil tambah ketakterhinggaan dalam sebutan p .

[3 marks]
[3 markah]

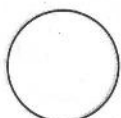
Answer / Jawapan :

(a)

(b)

11

3



- 12 The variables x and y are related by the equation $y = -\frac{1}{3}x + \frac{q}{x}$, where q is a constant. Diagram 12 shows the straight line which is obtained by plotting xy against x^2 .

Pemboleh ubah x dan y dihubungkan oleh persamaan $y = -\frac{1}{3}x + \frac{q}{x}$, dengan keadaan q adalah satu pemalar. Rajah 12 menunjukkan satu garis lurus diperolehi dengan memplotkan xy melawan x^2 .

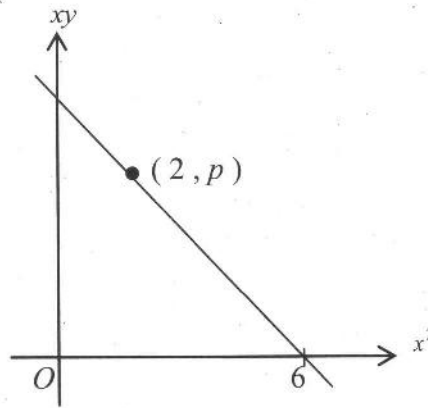


Diagram 12
Rajah 12

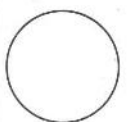
Find the value of p and of q .

Cari nilai p dan nilai q

[4 marks]
[4 markah]

Answer / Jawapan :

12



For
Examiner's
Use

- 13 The points $A(-2, -2)$, $B(q, 3)$ and $C(8, 18)$ are on a straight line. B divides AC internally in the ratio $1 : p$. Find the value of p and of q .

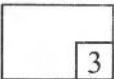
[3 marks]

Titik-titik $A(-2, -2)$, $B(q, 3)$ dan $C(8, 18)$ terletak pada satu garis lurus. Titik B membahagi dalam AC dengan nisbah $1 : p$. Cari nilai p dan nilai q .

[3 markah]

Answer / Jawapan :

13



- 14 Given that $\cos x = h$, where h is a constant and $270^\circ \leq x \leq 360^\circ$, find in terms of h

Diberi $\cos x = h$, dengan keadaan h ialah pemalar dan $270^\circ \leq x \leq 360^\circ$, cari dalam sebutan h

- (a) $\tan x$,
(b) $\sin 2x$.

[4 marks]

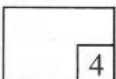
[4 markah]

Answer / Jawapan :

(a)

(b)

14



- 15 Diagram 15 shows a sector AOB of a circle with centre O and radius 10 cm.

Rajah 15 menunjukkan sektor AOB bagi sebuah bulatan berpusat O dan berjejari 10 cm.

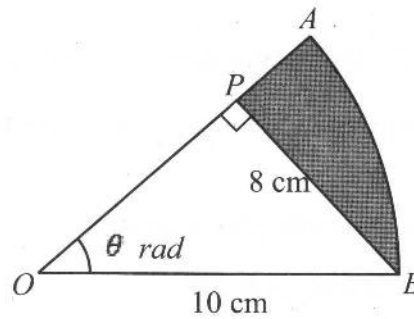


Diagram 15
Rajah 15

It is given that $PB = 8$ cm.

Diberi bahawa $PB = 8$ cm.

[Use / Guna $\pi = 3.142$]

Find

Cari

- the value of θ , in radian, (to three decimal places)
nilai θ , dalam radian, (kepada tiga tempat perpuluhan)
- the area, in cm^2 , of the shaded region.
luas, dalam cm^2 , kawasan berlorek.

[4 marks]

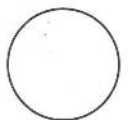
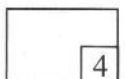
[4 markah]

Answer / Jawapan :

(a)

(b)

15



For
Examiner's
Use

- 16 It is given that $\overrightarrow{OP} = 5\mathbf{i} + 3\mathbf{j}$, where O is the origin.

Diberi bahawa $\overrightarrow{OP} = 5\mathbf{i} + 3\mathbf{j}$, dengan keadaan O ialah asalan.

- (a) Draw $\overrightarrow{OP}$ on the Cartesian plane in the answer space.

Lukis $\overrightarrow{OP}$ pada satah Cartesian di ruang jawapan.

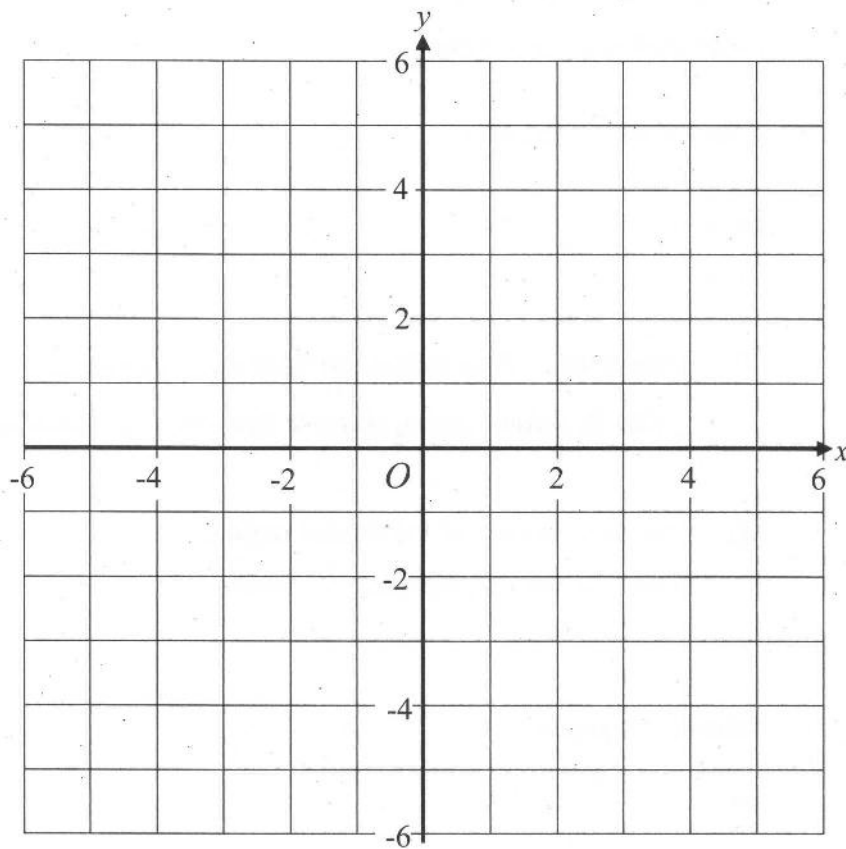
- (b) Find the unit vector in the direction of $\overrightarrow{OP}$.

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

[3 marks]
[3 markah]

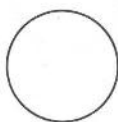
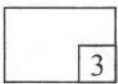
Answer / Jawapan :

- (a)



- (b)

16



- 17 Diagram 17 shows a parallelogram $ABCD$ and point N lies on the straight line BC .

For
Examiner's
Use

Rajah 17 menunjukkan sebuah sisiempat selari $ABCD$ dan titik N terletak pada garis lurus BC .

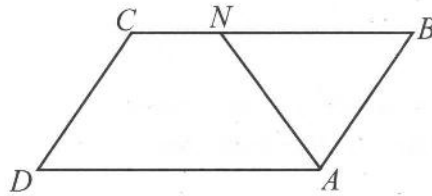


Diagram 17

Rajah 17

Given that $\overrightarrow{AB} = 2\underline{p}$, $\overrightarrow{AD} = 6\underline{q}$ and $BN : NC = 2 : 1$, express in terms of $\underline{p}$ and $\underline{q}$,

Diberi bahawa $\overrightarrow{AB} = 2\underline{p}$, $\overrightarrow{AD} = 6\underline{q}$ dan $BN : NC = 2 : 1$, ungkapkan dalam sebutan $\underline{p}$ dan $\underline{q}$,

(a) $\overrightarrow{BD}$

(b) $\overrightarrow{AN}$

[3 marks]

[3 markah]

Answer / Jawapan :

(a)

(b)

For
Examiner's
Use

18 Given $y = 2x(x - 5)$, find

Diberi $y = 2x(x - 5)$, cari

(a) $\frac{dy}{dx}$

(b) the value of x when y is minimum.
nilai x apabila y adalah minimum.

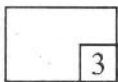
[3 marks]
[3 markah]

Answer / Jawapan :

(a)

(b)

18



19 Two variables x and y are related by the equation $y = 5x + \frac{2}{x}$. Given that y increases at a constant rate of 0.5 units per second. Find the rate of change of x when $x = 2$.

[3 marks]

Dua pemboleh ubah x dan y , dihubungkan oleh persamaan $y = 5x + \frac{2}{x}$.

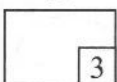
Diberi y bertambah dengan kadar 0.5 unit sesaat.

Cari kadar perubahan dalam x apabila $x = 2$.

[3 markah]

Answer / Jawapan :

19



20 Find $\int \frac{10}{(3x-1)^3} dx$.

Cari $\int \frac{10}{(3x-1)^3} dx$.

[3 marks]

[3 markah]

Answer / Jawapan :

20

3

21 Given that $\int_2^3 f(x) dx = 7$, find

Diberi bahawa $\int_2^3 f(x) dx = 7$, cari

(a) $\int_3^2 f(x) dx$

(b) $\int_2^3 [6 - 2f(x)] dx$

[3 marks]

[3 markah]

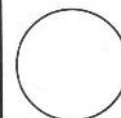
Answer / Jawapan :

(a)

(b)

21

3



- 22 A set of three numbers has a mean of 12. When two positive integers, x and y , ($x > y$) are added to this set, the new mean is 8.
Find the value of x and of y . [3 marks]

*Satu set yang terdiri daripada tiga nombor mempunyai min 12. Apabila dua integer positif, x dan y , ($x > y$) ditambah kepada set ini, min baru ialah 8.
Cari nilai x dan nilai y . [3 markah]*

Answer / Jawapan :

22

3

- 23 There are 6 cupcakes, each with a different flavor to be given out to 2 students.
Find the number of different ways the division of the cupcakes can be done if

Terdapat 6 biji kek cawan yang berlainan perisa untuk diberi kepada 2 orang pelajar. Cari bilangan cara yang berlainan pembahagian kek-kek itu dapat dilakukan jika

- (a) it is to be divided equally between 2 students,
dibahagikan sama banyak antara 2 orang pelajar,
- (b) one of the students must have exactly 4 cupcakes.
salah seorang pelajar mesti mendapat tepat 4 biji kek cawan.

[4 marks]

[4 markah]

Answer / Jawapan :

(a)

(b)

23

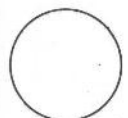
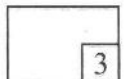
4

- 24 Three bus companies, P , Q and R provide bus services in a city. The probabilities of booking the bus services from companies P , Q and R are $\frac{1}{3}$, $\frac{1}{2}$ and $\frac{1}{6}$ respectively. The probabilities of buses from companies P , Q and R being early are $\frac{1}{5}$, $\frac{3}{10}$ and $\frac{1}{2}$ respectively. If a bus is booked at random, calculate the probability that the bus is early. [3 marks]

Tiga syarikat bas, P , Q dan R menyediakan perkhidmatan bas dalam sebuah bandar. Kebarangkalian penempahan perkhidmatan bas dari syarikat P , Q dan R adalah $\frac{1}{3}$, $\frac{1}{2}$ dan $\frac{1}{6}$ masing-masing. Kebarangkalian bahawa bas dari syarikat P , Q dan R adalah awal ialah $\frac{1}{5}$, $\frac{3}{10}$ dan $\frac{1}{2}$ masing-masing. Jika sebuah bas ditempah secara rawak, hitungkan kebarangkalian bahawa bas itu awal. [3 markah]

Answer / Jawapan :

24



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

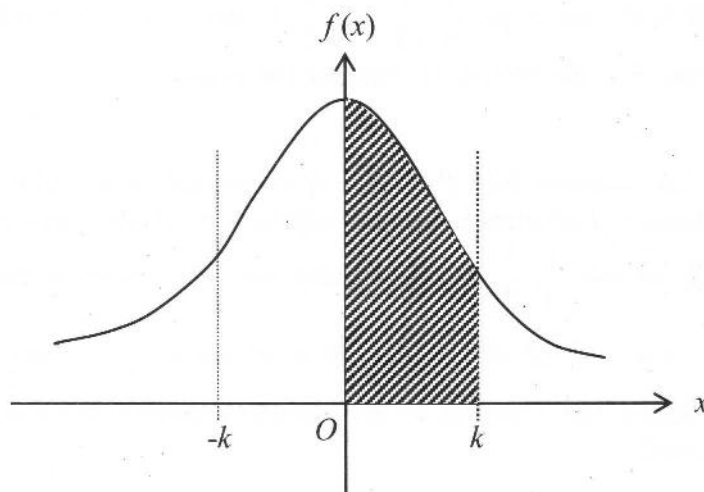


Diagram 25
Rajah 25

If $P(z < -k) = 0.2119$, find
Jika $P(z < -k) = 0.2119$, cari

- the area of the shaded region.
luas kawasan berlorek.
- the value of k .
nilai k .

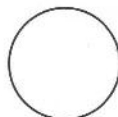
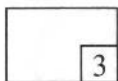
[3 marks]
[3 markah]

Answer / Jawapan :

(a)

(b)

25



END OF QUESTION PAPER
KERTAS SOALAN TAMAT



**MAJLIS PENGETUA SEKOLAH MALAYSIA
CAWANGAN PULAU PINANG**

MODUL PENILAIAN SPM 2012

3472/2

ADDITIONAL MATHEMATICS

Kertas 2

September

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

Dua jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Kertas soalan ini adalah dalam dwibahasa.*
2. *Soalan dalam bahasa Inggeris mendahului soalan yang sepadan dalam bahasa Melayu.*
3. *Calon dikehendaki membaca maklumat di halaman belakang kertas soalan ini.*
4. *Calon dikehendaki menceraikan halaman 19 dan ikat sebagai muka hadapan bersama-sama dengan buku jawapan.*

Kertas soalan ini mengandungi 19 halaman bercetak dan 1 halaman tidak bercetak.

[Lihat halaman sebelah

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Section A
Bahagian A

[40 marks]

[40 markah]

Answer **all** questions.

Jawab **semua** soalan.

- 1 Solve the simultaneous equations $x + y = 2$ and $\frac{1}{x} - \frac{2}{y} = 3$.

Give the answers correct to three decimal places.

[5 marks]

Selesaikan persamaan serentak $x + y = 2$ dan $\frac{1}{x} - \frac{2}{y} = 3$.

Beri jawapan betul kepada tiga tempat perpuluhan.

[5 markah]

- 2 The curve $y = \frac{x^3}{3} + \frac{x^2}{2} - 2x - \frac{1}{3}$ has two turning points, $A(-2, 3)$ and $B(x, y)$.

Lengkung $y = \frac{x^3}{3} + \frac{x^2}{2} - 2x - \frac{1}{3}$ mempunyai dua titik pusingan, $A(-2, 3)$ dan $B(x, y)$.

- (a) Find the coordinates of B .

[3 marks]

Cari koordinat B .

[3 markah]

- (b) Determine whether B is a maximum or a minimum point.

[3 marks]

Tentukan sama ada B adalah titik maksimum atau titik minimum.

[3 markah]

- 3 In an auditorium, there are 30 rows of seats. There are 15 seats in the first row, 17 seats in the second row and the number of seats in each subsequent row increases by 2.

Dalam sebuah auditorium, terdapat 30 baris tempat duduk. Terdapat 15 tempat duduk pada baris pertama, 17 tempat duduk pada baris kedua dan bilangan tempat duduk pada setiap baris berikutnya bertambah sebanyak 2.

Calculate

Hitung

- (a) the number of seats in the 12th row.

[2 marks]

bilangan tempat duduk pada baris ke-12.

[2 markah]

- (b) the total number of seats in the auditorium,

[2 marks]

jumlah tempat duduk dalam auditorium,

[2 markah]

- (c) the number of rows of seats that are required to accommodate 1000 spectators if they have to fill up the seats from the first row onwards.

[3 marks]

bilangan baris tempat duduk yang diperlukan untuk menempatkan 1000 penonton jika mereka mesti penuhkan tempat duduk dari baris pertama dan seterusnya.

[3 markah]

- 4 Table 4 shows the frequency distribution of the masses of 40 football players.
Jadual 4 menunjukkan taburan kekerapan bagi jisim 40 orang pemain bola sepak.

Mass/kg Jisim/kg	45 – 49	50 – 54	55 – 59	60 – 64	65 – 69
Frequency Kekerapan	4	8	15	11	2

Table 4
Jadual 4

- (a) Use graph paper to answer this part of the question.
Gunakan kertas graf untuk menjawab ceraiian soalan ini.

Using a scale of 2 cm to 5 kg on the horizontal axis and 2 cm to 2 football players on the vertical axis, draw a histogram to represent the frequency distribution of the masses.

Hence, find the mode.

[4 marks]

Dengan menggunakan skala 2 cm kepada 5 kg pada paksi mengufuk dan 2 cm kepada 2 orang pemain bola sepak pada paksi mencancang, lukis sebuah histogram untuk mewakili taburan kekerapan bagi jisim.

Seterusnya, cari mod.

[4 markah]

- (b) It is found that an error occur in the reading of the weighing machine. If the mass of each player is decreased by 3 kg, state the new mode. [1 mark]

Didapati berlaku kesilapan dalam bacaan mesin penimbang. Jika jisim setiap pemain bola sepak dikurangkan sebanyak 3 kg, nyatakan mod baru.

[1 markah]

- (c) Without drawing an ogive, determine the first quartile.
Tanpa melukis ogif, tentukan kuartil pertama.

[3 marks]

[3 markah]

[Lihat halaman sebelah]

- 5 Diagram 5 shows the tangent to the curve $y = x^2 + 3$ at $P(2, 7)$. The tangent intersects the y -axis at $Q(0, -1)$.

Rajah 5 menunjukkan tangen kepada lengkung $y = x^2 + 3$ pada $P(2, 7)$. Garis tangen itu menyalang paksi- y di $Q(0, -1)$.

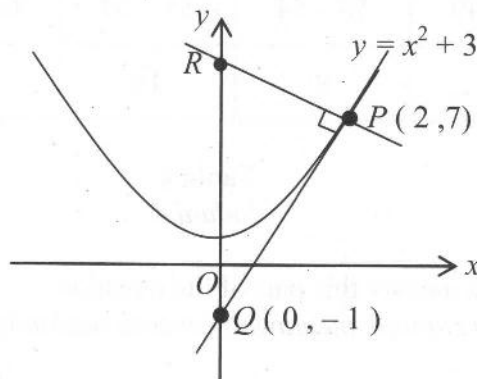


Diagram 5

Rajah 5

- (a) Find the gradient of the tangent to the curve at point P . [1 mark]
 Cari kecerunan tangen kepada lengkung itu pada titik P . [1 markah]
- (b) A straight line which is perpendicular to the tangent passes through P and intersects the y -axis at R .
 Find the equation of the straight line PR . [3 marks]
 Satu garis lurus yang berserenjang dengan garis tangen melalui P dan menyalang paksi- y pada R .
 Cari persamaan garis lurus PR . [3 markah]
- (c) Find the area, in unit^2 , of triangle PQR . [3 marks]
 Cari luas, dalam unit^2 , bagi segi tiga PQR . [3 markah]
- 6 (a) Sketch the graph of $y = \left| 3 \sin \frac{3}{2}x \right|$ for $0 \leq x \leq 2\pi$. [4 marks]
 Lakar graf bagi $y = \left| 3 \sin \frac{3}{2}x \right|$ untuk $0 \leq x \leq 2\pi$. [4 markah]
- (b) Hence, using the same axes, sketch a suitable straight line to find the number of solutions for the equation $2 \left| 3 \sin \frac{3}{2}x \right| - 1 = \frac{x}{\pi}$ for $0 \leq x \leq 2\pi$.
 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 $2 \left| 3 \sin \frac{3}{2}x \right| - 1 = \frac{x}{\pi}$ untuk $0 \leq x \leq 2\pi$.
 Nyatakan bilangan penyelesaian itu. [3 markah]

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 the graph paper to answer this question.

Gunakan kertas graf untuk menjawab soalan ini.

Table 7 shows the values of two variables, x and y obtained from an experiment. Variables x and y are related by the equation $y = pk^{x-2}$, where p and k are constants.

Jadual 7 menunjukkan nilai-nilai bagi dua pembolehubah, x dan y , yang diperolehi daripada satu eksperimen. Pembolehubah x dan y dihubungkan oleh persamaan $y = pk^{x-2}$, dengan keadaan p dan k ialah pemalar.

x	3.0	4.0	5.5	7.0	9.0	10.0
y	8.71	7.41	5.62	4.37	3.02	2.51

Table 7
Jadual 7

- (a) Based on Table 7, construct a table for the values of $(x - 2)$ and $\log_{10} y$.

[2 marks]

Berdasarkan Jadual 7, bina satu jadual bagi nilai-nilai $(x - 2)$ dan $\log_{10} y$.

[2 markah]

- (b) Plot $\log_{10} y$ against $(x - 2)$, using a scale of 2 cm to 1 unit on the $(x - 2)$ -axis and 2 cm to 0.1 unit on the $\log_{10} y$ -axis.

Hence, draw the line of best fit.

[3 marks]

Plot $\log_{10} y$ melawan $(x - 2)$, dengan menggunakan skala 2 cm kepada 1 unit pada paksi- $(x - 2)$ dan 2 cm kepada 0.1 unit pada paksi- $\log_{10} y$.

Seterusnya, lukis garis lurus penyuaian terbaik.

[3 markah]

- (c) Use the graph in 7(b) to find the value of

Guna graf di 7(b) untuk mencari nilai

(i) k ,

(ii) p .

[5 marks]

[5 markah]

[Lihat halaman sebelah]

- 8 Diagram 8 shows the straight line $y = x + 6$ intersecting the curve $3y = x^2$ at point A and point B .

Rajah 8 menunjukkan garis lurus $y = x + 6$ yang menyilang lengkung $3y = x^2$ pada titik A dan titik B

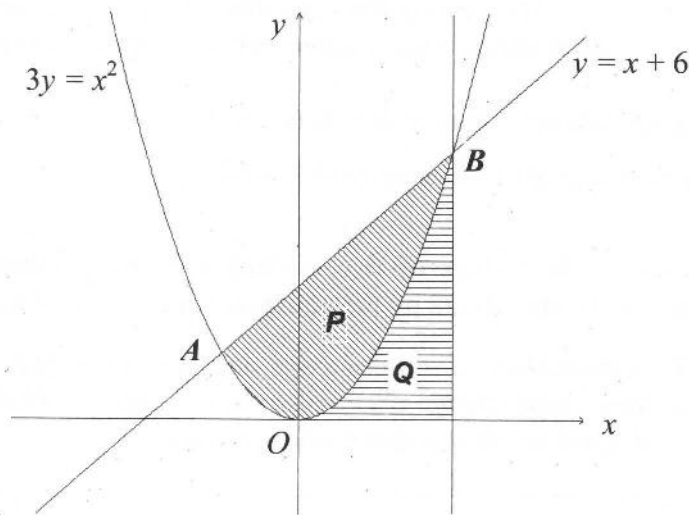


Diagram 8
Rajah 8

Find

Cari

- (a) the coordinates of A and B , [3 marks]
koordinat A dan B , [3 markah]
- (b) the area of the shaded region P , [4 marks]
luas rantau berlorek P , [4 markah]
- (c) the volume of revolution, in terms of π , when the shaded region Q is revolved through 360° about the x -axis. [3 marks]

isi padu kisaran, dalam sebutan π , apabila rantau berlorek Q dikisarkan melalui 360° pada paksi- x . [3 markah]

- 9 Diagram 9 shows a sector PQR of a circle, centre Q and radius 5 cm. $RSPT$ is a quadrant of a circle centre S .

Rajah 9 menunjukkan sektor PQR sebuah bulatan, berpusat Q dan berjejari 5 cm. $RSPT$ ialah sukuan sebuah bulatan berpusat S .

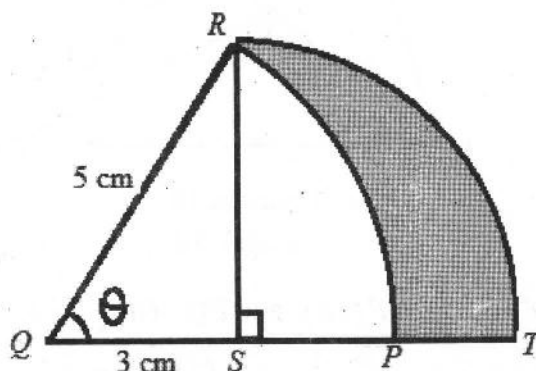


Diagram 9

Rajah 9

[Use / Guna $\pi = 3.142$]

- (a) Show that $\theta = 0.927$ radian (to three decimal places). [2 marks]
 Tunjukkan bahawa $\theta = 0.927$ radian (kepada tiga tempat perpuluhan) [2 markah]
- (b) Calculate the perimeter, in cm, of the shaded region. [3 marks]
 Hitung perimeter, dalam cm, kawasan berlorek. [3 markah]
- (c) Calculate the area, in cm^2 , of the shaded region. [5 marks]
 Hitung luas, dalam cm^2 , kawasan berlorek. [5 markah]

[Lihat halaman sebelah]

- 10 Diagram 10 shows trapezium $OPQR$. The straight lines OQ and PR intersect at point S .
 Rajah 10 menunjukkan trapezium $OPQR$. Garis lurus OQ dan PR bersilang pada titik S .

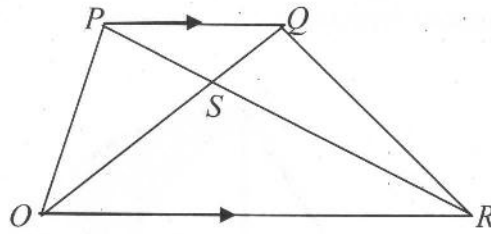


Diagram 10

Rajah 10

It is given that $\overrightarrow{OR} = 10\underline{x}$, $\overrightarrow{OP} = 3\underline{y}$ and $PQ : OR = 2 : 5$.

Diberi bahawa $\overrightarrow{OR} = 10\underline{x}$, $\overrightarrow{OP} = 3\underline{y}$ dan $PQ : OR = 2 : 5$.

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

Ungkapkan dalam sebutan $\underline{x}$ dan $\underline{y}$:

(i) $\overrightarrow{OQ}$,

(ii) $\overrightarrow{PR}$.

[3 marks]

[3 markah]

- (b) Given $\overrightarrow{OS} = h\overrightarrow{OQ}$ and $\overrightarrow{PS} = k\overrightarrow{PR}$, where h and k are constants, express $\overrightarrow{OS}$ in terms of

Diberi $\overrightarrow{OS} = h\overrightarrow{OQ}$ dan $\overrightarrow{PS} = k\overrightarrow{PR}$, dengan keadaan h dan k adalah pemalar, ungkapkan $\overrightarrow{OS}$ dalam sebutan

(i) h , $\underline{x}$ and $\underline{y}$,

(ii) k , $\underline{x}$ and $\underline{y}$.

[2 marks]

[2 markah]

- (c) Hence, find the value of h and of k .

[3 marks]

Seterusnya, cari nilai h dan nilai k .

[3 markah]

- (d) Given $|\underline{x}| = 2$ cm and area of the trapezium is 70 cm^2 , find the perpendicular height from PQ to OR .

Diberi $|\underline{x}| = 2$ cm dan luas trapezium ialah 70 cm^2 , cari tinggi tegak daripada PQ kepada OR .

[2 marks]

[2 markah]

- 11 (a) The result of a study shows that 70% of the candidates who sit for the test on traffic rules will pass. If 8 candidates who sit for that test are chosen at random, calculate the probability that

Hasil sebuah kajian menunjukkan bahawa 70% daripada calon yang menduduki ujian peraturan lalu lintas akan lulus. Jika 8 orang calon yang menduduki ujian tersebut dipilih secara rawak, cari kebarangkalian bahawa

- (i) exactly 6 candidates passed the test,
tepat 6 orang calon lulus ujian,
- (ii) more than 5 candidates passed the test.
lebih daripada 5 orang calon lulus ujian.

[4 marks]

[4 markah]

- (b) The marks obtained by 3200 candidates in an examination follows a normal distribution with a mean of 51 marks and a standard deviation of 10 marks.

Markah yang diperoleh oleh 3200 orang calon dalam satu peperiksaan adalah mengikut taburan normal dengan min 51 markah dan sisihan piawai 10 markah.

- (i) If 75 or more marks is required for a candidate to pass with distinction, calculate the number of candidates who pass with distinction.

Jika markah 75 atau lebih diperlukan untuk lulus dengan cemerlang, hitung bilangan orang calon yang lulus dengan cemerlang.

- (ii) Find the percentage that a candidate selected at random will obtain marks between 46 and 56.

Cari peratus seorang calon dipilih secara rawak akan memperoleh markah antara 46 dan 56.

[6 marks]

[6 markah]

[Lihat halaman sebelah

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 with an initial velocity of 10 m s^{-1} . Its acceleration, $a \text{ m s}^{-2}$ is given by $a = 3 - 2t$, where t is the time, in second, after passing through a fixed point O .

[Assume motion to the right as positive]

Suatu zarah bergerak di sepanjang suatu garis lurus dengan halaju awal 10 m s^{-1} . Pecutannya, $a \text{ m s}^{-2}$, diberi oleh $a = 3 - 2t$, dengan keadaan t ialah masa, dalam saat, selepas melalui titik tetap O .

[Anggapkan gerakan ke arah kanan sebagai positif]

Find

Cari

- (a) the acceleration, in m s^{-2} , of the particle when it passes through O , [1 mark]
 pecutan, dalam m s^{-2} , bagi zarah itu selepas melalui O , [1 markah]
- (b) the maximum velocity, in m s^{-1} , of the particle, [4 marks]
 halaju maksimum, dalam m s^{-1} , bagi zarah itu, [4 markah]
- (c) the time when the particle stops instantaneously, [2 marks]
 masa apabila zarah itu berhenti seketika, [2 markah]
- (d) the total distance, in m, travelled by the particle in the first 7 seconds. [3 marks]
 jumlah jarak, dalam m, yang dilalui oleh zarah itu dalam 7 saat pertama. [3 markah]

- 13 Table 13 shows the price indices and percentage of usage of four ingredients, P , Q , R and S , used in the making of a type of cake.

Jadual 13 menunjukkan indeks harga dan peratus penggunaan bagi empat bahan, P , Q , R dan S , yang digunakan untuk membuat sejenis kek.

Ingredient Bahan	Price index in the year 2009 based on the year 2006 <i>Indeks harga pada tahun 2009 berdasarkan tahun 2006</i>	Percentage of usage (%) <i>Peratus penggunaan bahan (%)</i>
P	110	20
Q	x	40
R	125	30
S	120	10

Table 13
Jadual 13

- (a) Calculate
Hitung

- (i) the price of ingredient P in the year 2009 if its price in the year 2006 is RM 12.00.
harga bahan P pada tahun 2009 jika harganya pada tahun 2006 ialah RM 12.00.

- (ii) the price index of ingredient S in the year 2009 based on the year 2003 if its price index in the year 2006 based on the year 2003 is 105,
indeks harga bagi bahan S pada tahun 2009 berdasarkan tahun 2003 jika indeks harga pada tahun 2006 berdasarkan tahun 2003 ialah 105.

[5 marks]

[5 markah]

- (b) The composite index for the cost of making the cake in the year 2009 based on the year 2006 is 114.5.

Indeks gubahan kos membuat kek itu pada tahun 2009 berdasarkan tahun 2006 ialah 114.5.

- Calculate
Hitung

- (i) the value of x ,
nilai x ,
(ii) the price of a cake in the year 2006 if its corresponding price in the year 2009 is RM 150.00.
harga sebiji kek itu pada tahun 2006 jika harganya pada tahun 2009 ialah RM 150.00.

[5 marks]

[5 markah]

[Lihat halaman sebelah]

- 14 Solution by scale drawing will **not** be accepted.

Penyelesaian secara lukisan berskala tidak diterima.

Diagram 14 shows $\triangle ACD$ and $\triangle ABE$.

Rajah 14 menunjukkan $\triangle ACD$ dan $\triangle ABE$.

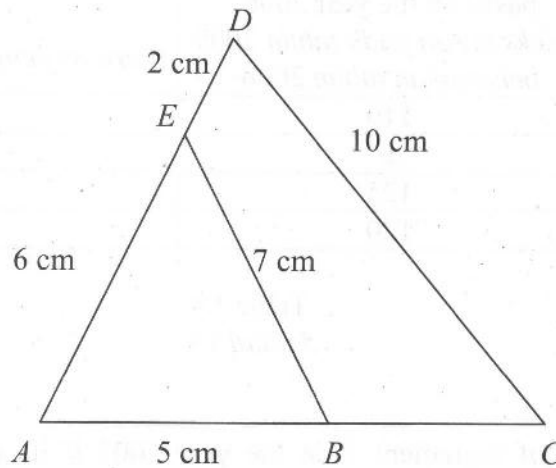


Diagram 14
Rajah 14

It is given that $CD = 10$ cm, $BE = 7$ cm, $AB = 5$ cm, $AE = 6$ cm and $ED = 2$ cm.

Diberi bahawa $CD = 10$ cm, $BE = 7$ cm, $AB = 5$ cm, $AE = 6$ cm dan $ED = 2$ cm.

Calculate

Cari

- (a) $\angle BAE$,

[2 marks]

[2 markah]

- (b) $\angle ADC$,

[3 marks]

[3 markah]

- (c) the length, in cm, of AC.

[2 marks]

panjang, dalam cm, bagi AC.

[2 markah]

- (d) the area, in cm^2 , of quadrilateral BCDE.

[3 marks]

luas, dalam cm^2 , sisi empat BCDE.

[3 markah]

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

The State Education Department intends to organize a course on the teaching of Mathematics and Science. The course will be attended by x Mathematics teachers and y Science teachers, based on the following constraints:

Jabatan Pelajaran Negeri ingin menganjurkan satu kursus pengajaran Matematik dan Sains. Kursus tersebut akan dihadiri oleh x orang guru Matematik dan y orang guru Sains berdasarkan kepada kekangan berikut:

- I The total number of teachers is not more than 90.
Jumlah guru tidak melebihi 90.
 - II The number of Mathematics teachers is at most $\frac{3}{2}$ times the number of Science teachers.
Bilangan guru Matematik selebih-lebihnya adalah $\frac{3}{2}$ kali bilangan guru Sains.
 - III The number of Science teachers exceed the number of Mathematics teachers by at most 30
Bilangan guru Sains melebihi bilangan guru Matematik selebih-lebihnya 30 orang.
- (a) Write three inequalities, other than $x \geq 0$ and $y \geq 0$, which satisfy all the above constraints. [3 marks]
Tulis tiga ketaksamaan, selain daripada $x \geq 0$ dan $y \geq 0$, yang memenuhi semua kekangan di atas [3 markah]
- (b) Using a scale of 2 cm to 10 teachers on both axes, construct and shade the region R which satisfies all the above constraints. [3 marks]
Dengan menggunakan skala 2 cm kepada 10 orang guru pada kedua-dua paksi, bina dan lorek rantau R yang memenuhi semua kekangan di atas [3 markah]
- (c) Use the graph constructed in 15(b), find
Guna graf yang dibina di 15(b), cari
- (i) the range of the number of Science teachers if 15 Mathematics teachers attending the course.
julat bilangan guru Sains jika 15 guru Matematik menyertai kursus itu.
 - (ii) the maximum cost to run the course if the expenditure for a Mathematics teacher is RM 40 and the expenditure for a Science teacher is RM 60.
kos maksimum untuk menjalankan kursus itu jika perbelanjaan seorang guru Matematik ialah RM 40 dan perbelanjaan seorang guru Sains ialah RM 60.
- [4 marks]
[4 markah]

END OF ASSESSMENT MODULE MODUL PENILAIAN TAMAT

3472/1
Additional
Mathematics
Paper 1
September
2012



**MAJLIS PENGETUA SEKOLAH MENENGAH
CAWANGAN PULAU PINANG**

MODUL PENILAIAN SPM 2012

ADDITIONAL MATHEMATICS

Paper 1

MARKING SCHEME

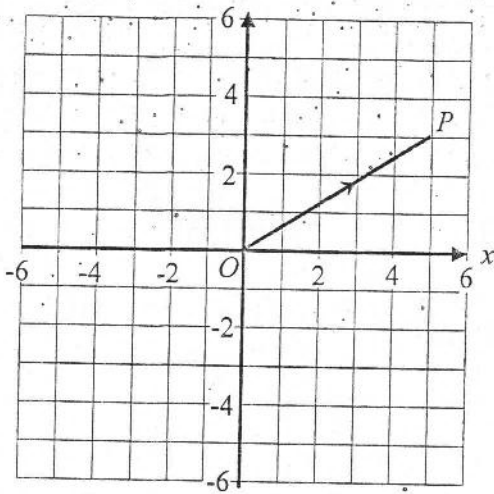
This marking scheme consists of 6 printed pages

ADDITIONAL MATHEMATICS PAPER 1

Question	Solution and Mark Scheme	Sub Marks	Total Mark
1 (a)	-2 and 2 (both)	1	3
(b)	$p = 1$	1	
	$r = -1$	1	
2 (a)	0	1	2
(b)	$2 \leq f(x) \leq 6$	1	
3 (a)	11	2	4
	B1 : $x = \frac{m-y}{3}$ or $f^{-1}(3) = 2$	2	
(b)	$\frac{22+x}{9}$		
	B1 : $\frac{*11 - \left(\frac{11-x}{3}\right)}{3}$		
4	$p = 3$ and $m = 12$	3	3
	B2: $p = 3$ or $m = 12$		
	B1: $2(2)^2 - (m-2)(2) + 12 = 0$ or $2p = 6$		
5 (a)	$k = 4$	1	3
(b)	$x = 2$	1	
(c)	$(2, -8)$	1	

6	$q > \frac{9}{8}$ B2 : $-8q < -9$ or equivalent B1 : $(-3)^2 - 4(2)(q) < 0$	3	3
7	$4, \frac{1}{4}$ B3 : $\log_2 y = 2$ or $\log_2 y = -2$ or $\log_y 2 = \frac{1}{2}$ or $\log_y 2 = -\frac{1}{2}$ B2 : $(\log_2 y)^2 = 4$ or $(\log_y 2)^2 = \frac{1}{4}$ B1 : $\frac{1}{\log_2 y}$ or $\frac{1}{\log_y 2}$	4	4
8	-4 B2 : $3n - 1 - 3 = 4n$ B1 : 2^3 or 2^{4n}	3	3
9 (a)	6	1	
(b)	224 B1 : $\frac{8}{2}(2(7) + 7(6))$ or $(7 + 13 + 19 + 25 + 31 + 37 + 43 + 49)$	2	3
10	4 B2 : $6 = 4p - 10$ B1 : $a + 2d = 2p + 6$ or $a + 4d = 6p - 4$	3	3
11 (a)	$\frac{1}{3}$	1	
(b)	$27p$ B1 : $\frac{18p}{1 - \left(\frac{1}{3}\right)}$	2	3

12	$p = \frac{4}{3}$ and $q = 2$ B3: $p = \frac{4}{3}$ or $q = 2$ B2: $\frac{p-0}{2-6} = -\frac{1}{3}$ or $0 = -\frac{1}{3}(6) + q$ B1: $xy = -\frac{1}{3}x^2 + q$	4	4
13	$p = 3$ and $q = \frac{1}{2}$ B2: $p = 3$ or $q = \frac{1}{2}$ B1: $\frac{-2p+18}{1+p} = 3$ or $\frac{-2p+8}{1+p} = q$	3	3
14 (a)	$-\frac{\sqrt{1-h^2}}{h}$ B1: $\sqrt{1-h^2}$	2	
(b)	$-2h\sqrt{(1-h^2)}$ B1: $2h\sqrt{(1-h^2)}$	2	4
15 (a)	0.927	1	
(b)	22.35 B2: $\frac{1}{2}(10)^2(0.927) - \frac{1}{2}(8)(6)$ B1: $\frac{1}{2}(10)^2(0.927)$ or $\frac{1}{2}(8)(6)$	3	4

16 (a)		1	
(b)	$\frac{5i + 3j}{\sqrt{34}}$ $B1 : \sqrt{5^2 + 3^2}$	2	3
17 (a)	$-2\underline{p} + 6\underline{q}$	1	
(b)	$2\underline{p} + 4\underline{q}$ $B1 : \overrightarrow{AN} = \overrightarrow{AB} + \frac{2}{3}\overrightarrow{BC} \quad \text{or} \quad \overrightarrow{AN} = \overrightarrow{AD} + \overrightarrow{DC} + \frac{1}{3}\overrightarrow{CB}$ $\text{or } \overrightarrow{AN} = \overrightarrow{AC} + \frac{1}{3}\overrightarrow{CB}$	2	3
18 (a)	$4x - 10$	1	
(b)	$\frac{5}{2}$ $B1 : *(4x - 10) = 0$	2	3
19	$\frac{1}{9}$ $B2 : \frac{1}{2} = \frac{9}{2} \times \frac{dx}{dt}$ $B1 : \frac{dy}{dx} = 5 - \frac{2}{x^2}$	3	3

20	$-\frac{5}{3}(3x-1)^{-2} + c$ or equivalent B2 : $\frac{10(3x-1)^{-2}}{(-2)(3)} + c$ or equivalent B1 : $\int 10(3x-1)^{-3} dx$	3	3
21	(a) -7 (b) -8 B1 : $6x$ or 14	1 2	3
22	$x = 3, y = 1$ (both) OR $x = 4, y = 0$ (both) B2 : $x + y = 4$ B1 : $\sum x = 36$	3	3
23	(a) 20 B1 : ${}^6C_3 \times {}^3C_3$ (b) 30 B1 : ${}^6C_4 \times {}^2C_2$	2 2	4
24	$\frac{3}{10}$ B2 : $\left(\frac{1}{3} \times \frac{1}{5}\right) + \left(\frac{1}{2} \times \frac{3}{10}\right) + \left(\frac{1}{6} \times \frac{1}{2}\right)$ B1 : $\frac{1}{3} \times \frac{1}{5}$ or $\frac{1}{2} \times \frac{3}{10}$ or $\frac{1}{6} \times \frac{1}{2}$	3	3
25	(a) 0.2881 B1 : $0.5 - 0.2119$ (b) 0.8	2 1	3



MAJLIS PENGETUA SEKOLAH MALAYSIA
CAWANGAN PULAU PINANG

MODUL PENILAIAN SPM 2012
ADDITIONAL MATHEMATICS

3472/2

Kertas 2
September

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

MARK SCHEME

ADDITIONAL MATHEMATICS

Paper 2

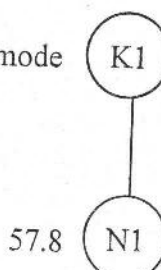
Two hours and thirty minutes

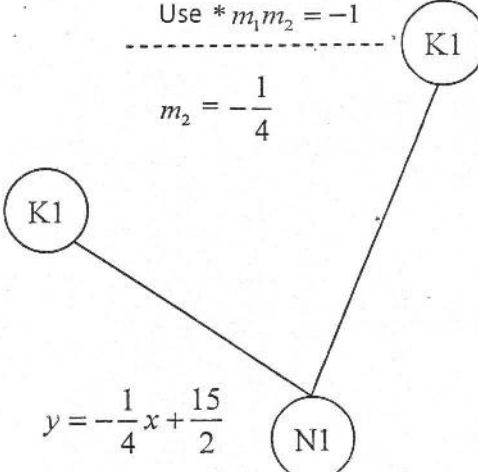
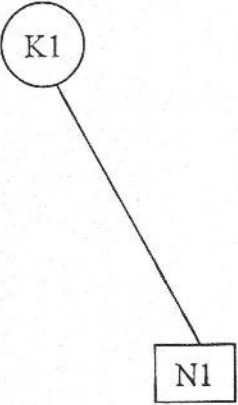
SECTION A (40 MARKS)

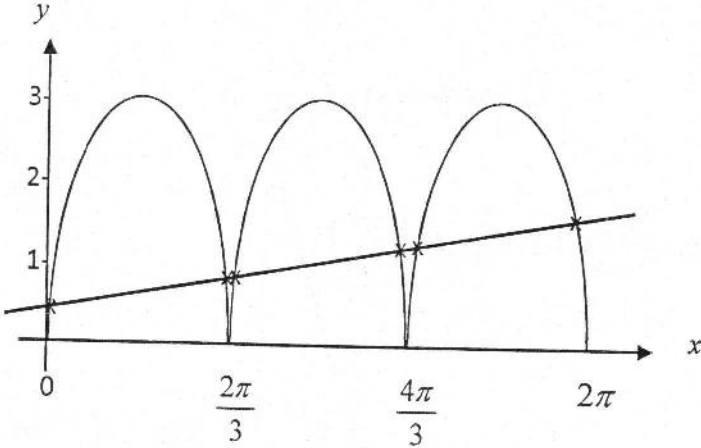
Ques	Mark Scheme	Sub Marks	Total Mark
1.	$x = 2 - y$ or $y = 2 - x$ P1 <u>or</u> $y = \frac{2x}{1-3x}$ or $x = \frac{y}{2+3y}$ <u>Eliminate x or y</u> $y - 2*(2 - y) = 3y*(2 - y)$ <u>or</u> $*(2 - x) - 2x = 3x*(2 - x)$ <u>or</u> $x + \left(\frac{2x}{1-3x}\right) = 2$ <u>or</u> $*\left(\frac{y}{2+3y}\right) + y = 2$ $y = 1.758, -0.758$ <u>or</u> $x = 0.242, 2.758$ $x = 0.242, 2.758$ <u>or</u> $y = 1.758, -0.758$ Note: OW-1 if steps to solve quadratic equation are not shown. N1 N1 K1 K1 <u>Solve the Quadratic Equation</u> <u>Using formula</u> $y = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(3)(-4)}}{2(3)}$ <u>or</u> $x = \frac{-(-9) \pm \sqrt{(-9)^2 - 4(3)(2)}}{2(3)}$ OR <u>Completing the square</u> $3\left(y - \frac{1}{2}\right)^2 - \frac{4}{3} - \left(-\frac{1}{2}\right)^2 = 0$ <u>or</u> $3\left(x - \frac{3}{2}\right)^2 + \frac{2}{3} - \left(-\frac{3}{2}\right)^2 = 0$	5	5

Ques	Mark Scheme	Sub Marks	Total Mark
2.(a)	Find $\frac{dy}{dx}$, and equate to 0 $x^2 + x - 2 = 0$ (K1) (K1) Solve quadratic equation and substitute x into y $(x - 1)(x + 2) = 0$ $x = 1$ $(1, -\frac{3}{2})$ (N1)	3	
(b)	Find $\frac{d^2y}{dx^2}$, OR substitute $x < *1$ and $x > *1$ into $\frac{dy}{dx}$. (K1) (K1) Substitute $x = *1$ into $\frac{d^2y}{dx^2}$ OR valid sketch of gradient $\frac{d^2y}{dx^2} > 0$ and $(1, -\frac{3}{2})$ minimum (N1)	3	6

Ques	Mark Scheme	Sub. Marks	Total Mark
3(a)	Use $T_{12} = a + (n-1)d$ $T_{12} = 15 + (12-1)2$ OR List all the 12 terms correctly. 15, 17, 19, 21,, 37 K1 N1 37	2	
(b)	Use $S_{30} = \frac{n}{2} [2a + (n-1)d]$ $S_{30} = \frac{30}{2} [2(15) + (30-1)2]$ OR Sum up all 30 terms correctly K1 N1 1320	2	
(c)	Use $\frac{n}{2} [2a + (n-1)d] \geq 1000$ (Accept =, >, <) $\frac{n}{2} [2(15) + (n-1)(2)] \geq 1000$ Solve quadratic equation using valid method $n = \frac{-(14) \pm \sqrt{14^2 - 4(1)(-1000)}}{2(1)}$ OR Sum all the terms until 975 or 1040 K1 K1 N1 26 Rows	3	7

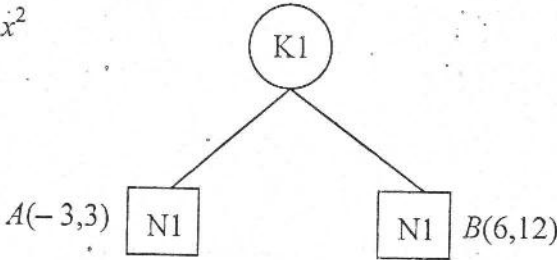
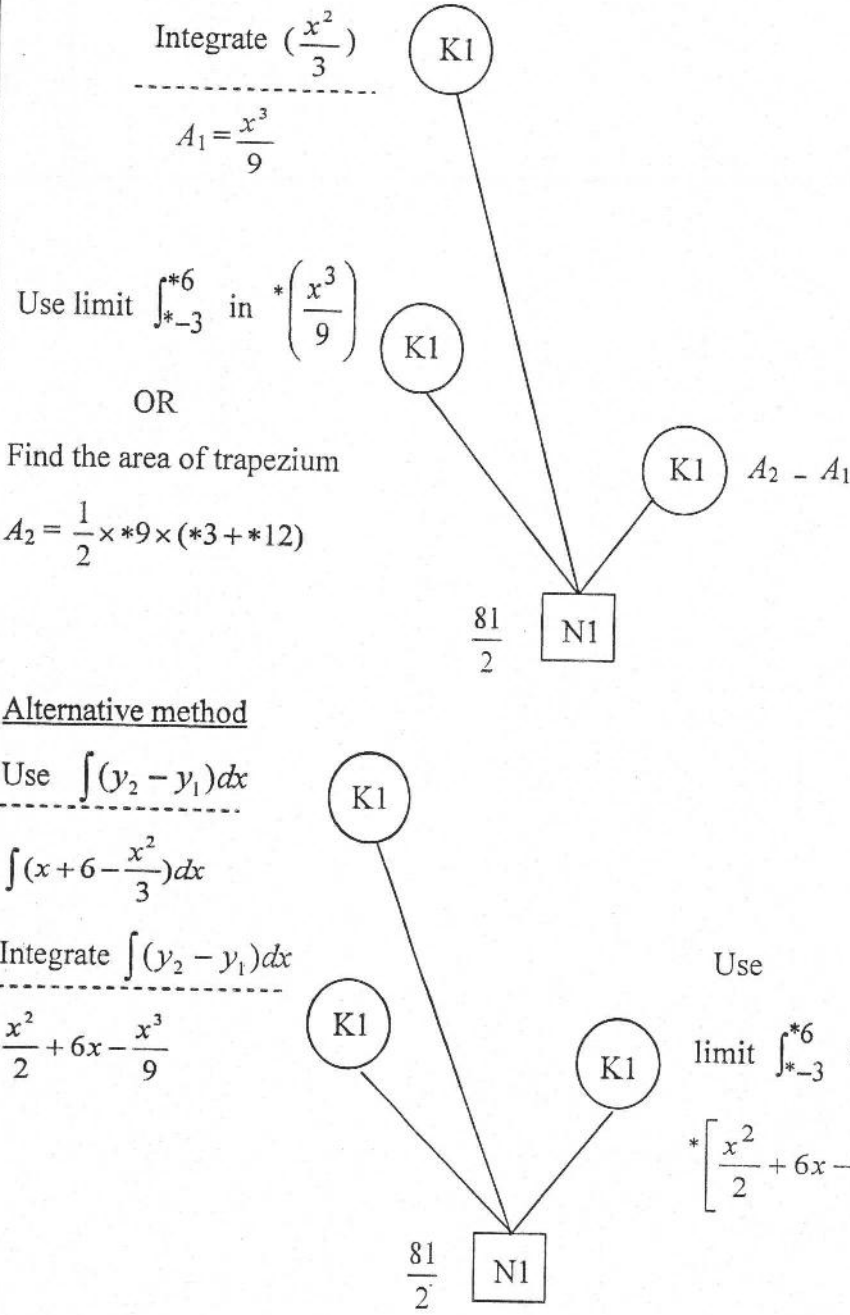
Ques	Mark Scheme	Sub Mark	Total Mark
4(a)	Draw histogram ; Height proportional to the frequencies N1 Label correctly the class boundaries <u>or</u> the midpoints of the classes <u>or</u> the class interval N1 Method of finding mode K1 	4	
(b)		1	
(c)	$L = 49.5$ or $F = 4$ or $f_k = 8$ P1  Use $*L + \left(\frac{\frac{N}{4} - *F}{*f_k} \right) c$ $49.5 + \left(\frac{\frac{40}{4} - 4}{8} \right) (5)$	3	8

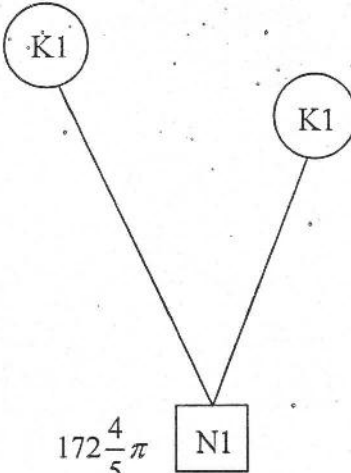
Ques	Mark Scheme	Sub Mark	Total Mark
5.(a)	4 N1	1	
(b)	Use $*m_1m_2 = -1$ $m_2 = -\frac{1}{4}$ use $y - 7 = *m_2(x - 2)$ or $7 = *m_2(2) + c$ $y = -\frac{1}{4}x + \frac{15}{2}$ 	3	
(c)	$R(0, \frac{15}{2})$ N1 Use $\frac{1}{2} \begin{vmatrix} 2 & *0 & 0 & 2 \\ 7 & \frac{15}{2} & -1 & 7 \end{vmatrix}$ until $\frac{1}{2} \left(\begin{vmatrix} 2 & 0 & 2 \\ 7 & -1 & 7 \end{vmatrix} - \begin{vmatrix} 2 & 0 & 2 \\ 7 & 15/2 & 7 \end{vmatrix} \right)$ OR $\frac{1}{2} \times \text{base} \times \text{height}$ N1 $\frac{17}{2}$ 	3	7

Ques	Mark Scheme	Sub Mark	Total Mark
6(a)	Shape of sine x P1 Amplitude of 3 P1 $\frac{3}{2}$ cycles for $0 \leq x \leq 2\pi$ P1 Modulus for $0 \leq x \leq 2\pi$ P1 } Accept cosine graph Note : (1) Do not accept tangent graph (2) Ignore graph outside the range	4	
(b)	 $y = \frac{x}{2\pi} + \frac{1}{2}$ or equivalent N1 Drawing of the straight line from the equation involving x and y. either gradient or y intercept must be correct K1 Graph drawn correctly and number of solution = 6 N1	3	7

SECTION B (40 MARKS)

Ques	Mark Scheme							Sub Mark	Full Mark
7	$x-2$	1	2	3.5	5	7	8	N1	
(a)	$\log_{10}y$	0.94	0.87	0.75	0.64	0.48	0.40	N1	2
(b)	Plot $\log_{10}y$ against $(x-2)$ K1 6 *points plotted correctly N1 Line of best fit N1							3	
(c)	$\log_{10}y = \log_{10}p + (x-2) \log_{10}k$ P1 Use * $m = \log_{10}k$ K1 Use * $c = \log_{10}p$ K1 $k = 0.84$ $0.83 \leftrightarrow 0.84$ N1 $p = 10.59$ $10.47 \leftrightarrow 10.72$ N1							5	10
Note : SS-1 if part of the scale is not uniform or not using the scales given or not using the graph paper									

Ques	Mark Scheme	Sub Mark	Total Mark
8(a)	Solving simultaneous equations $y = x + 6$ and $3y = x^2$	3	
			
(b)	Integrate $\left(\frac{x^2}{3}\right)$ $A_1 = \frac{x^3}{9}$ Use limit $\int_{-3}^{*6}$ in $\left(\frac{x^3}{9}\right)$ OR Find the area of trapezium $A_2 = \frac{1}{2} \times 9 \times (3 + 12)$ <u>Alternative method</u> Use $\int (y_2 - y_1) dx$ $\int \left(x + 6 - \frac{x^2}{3}\right) dx$ Integrate $\int (y_2 - y_1) dx$ $\frac{x^2}{2} + 6x - \frac{x^3}{9}$ Use limit $\int_{-3}^{*6}$ into $\left[\frac{x^2}{2} + 6x - \frac{x^3}{9}\right]$ 	4	

(c)	Integrate $\pi \int \left(\frac{x^2}{3}\right)^2 dx$ $\pi \left[\frac{x^5}{45} \right]$ K1  N1 K2 Use limit $\int_0^{*6}$ in $\pi^* \left[\frac{x^5}{45} \right]$ $172\frac{4}{5}\pi$		
		3	10

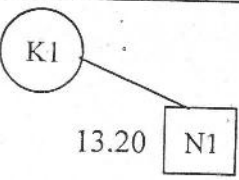
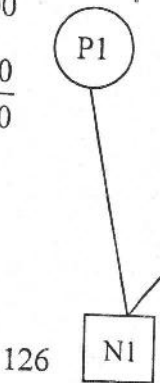
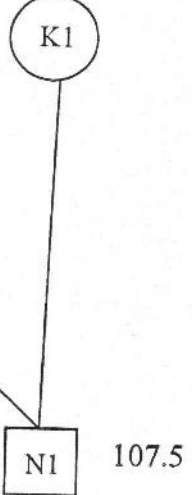
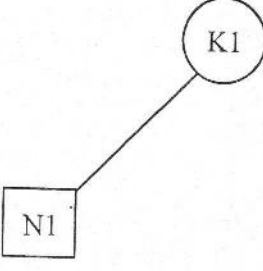
Ques	Marks Scheme	Sub Mark	Full Mark
9.(a)	Use $\cos \theta = \frac{3}{5}$ or $\sin \theta = \frac{4}{5}$ or $\tan \theta = \frac{4}{3}$ (K1) $\theta = 0.927 \text{ rad}$ (N1)	2	
(b)	Use $s = r\theta$ to find arc length of RP or RT (K1) arc $RP = 5(0.927) = 4.635$ or arc $RT = 4\left(\frac{\pi}{2}\right) = 6.284$ (K1) $\frac{S_{RP} + S_{RT} + PT}{*4.635 + *6.284 + 2}$ (K1) 12.92 (N1)	3	
(c)	Find area of $\triangle RQS$ (K1) $A_1 = \frac{1}{2} \times 3 \times 4$ Find area of quadrant (K1) $A_2 = \frac{1}{4} \pi (4)^2$ or $A_2 = \frac{1}{2} (4)^2 \left(\frac{\pi}{2}\right)$ (K1) Use $A = \frac{1}{2} r^2 \theta$ to find area of sector RQP (K1) $A_3 = \frac{1}{2} (5)^2 (0.927)$ $*A_1 + *A_2 - *A_3$ (K1) 6.98 (N1)	5	10

Ques	Mark Scheme	Sub Mark	Full Mark
10 (a)	(i) & (ii) K1 Use Triangle Law for $\overrightarrow{OQ}$ or $\overrightarrow{PR}$ $\overrightarrow{OQ} = 3\underline{y} + 4\underline{x}$ N1 $\overrightarrow{PR} = -3\underline{y} + 10\underline{x}$ N1	3	
(b)	(i) $\overrightarrow{OS} = h(3\underline{y} + 4\underline{x})$ N1 (ii) $\overrightarrow{OS} = 3\underline{y} + k(-3\underline{y} + 10\underline{x})$ N1	2	
(c)	Equate the coefficient of x and y and solve simultaneous $k = \frac{2}{7}$ or $h = \frac{5}{7}$ $h = \frac{5}{7}$ or $k = \frac{2}{7}$ K1 N1 N1	3	
(d)	Use $\frac{1}{2}(a+b)t = 70$ with $x = 2$ $t = 5$ K1 N1	2	10

Ques	Mark Scheme	Sub Mark	Full Mark
11. (a)	(i) Use ${}^8C_6(0.7)^6(0.3)^2$ K1 0.2965 N1 (ii) P1 Write $P(X > 5)$ $= P(X = 6) + P(X = 7)$ $+ P(X = 8)$ N1 0.5517 // 0.5518 // 0.5519	4	
(b)	(i) Use $Z \geq \frac{x-51}{10}$ for K1 (b)(i) or (b)(ii) 0.0082 N1 26 N1 (ii) K1 Use $1 - 2P(Z > 0.5)$ ----- $1 - 2(0.3085)$ N1 0.3830 N1 38.3 %	6	10

SECTION C (20 MARKS)

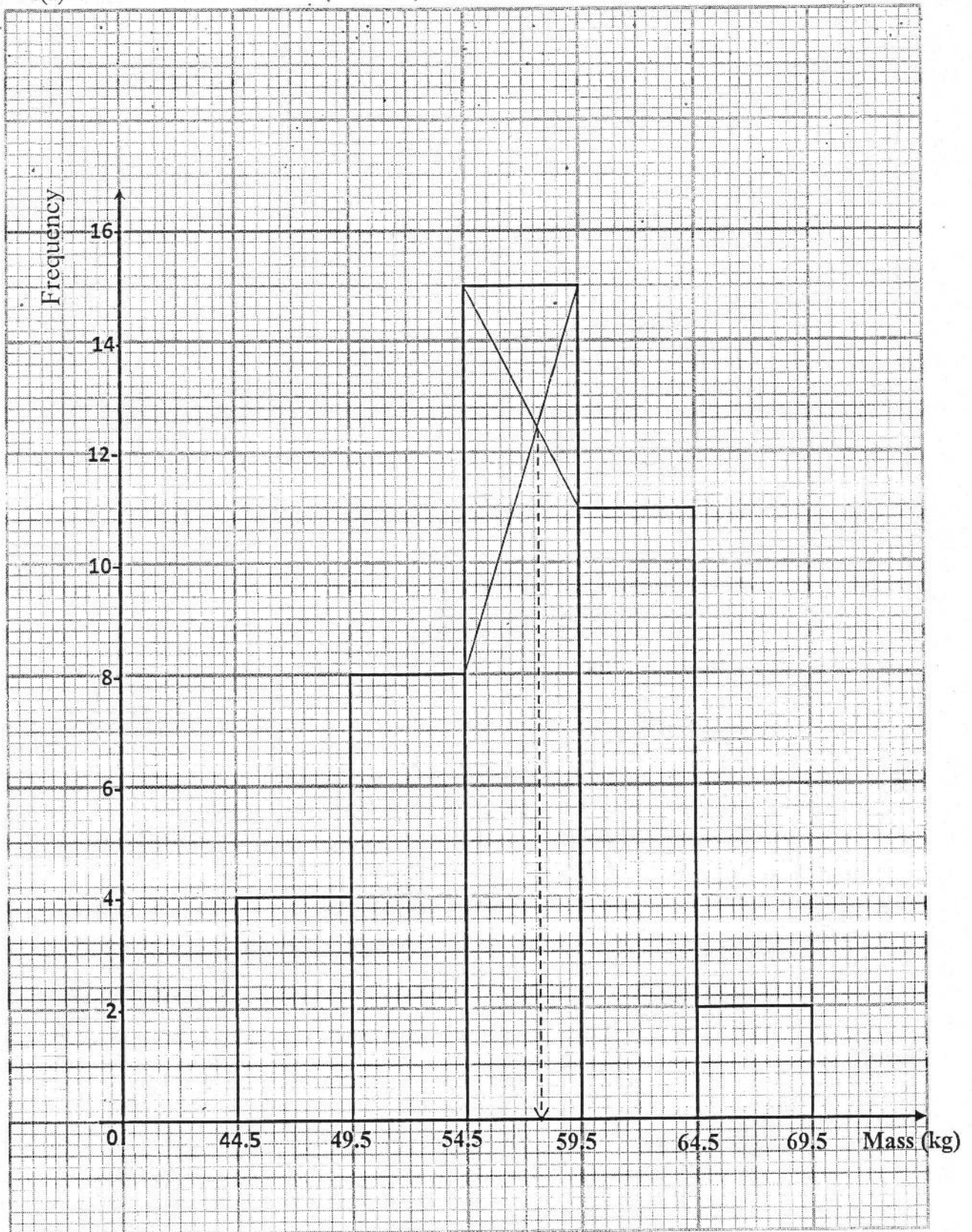
Ques	Mark Scheme	Sub Mark	Full Mark
12. (a)	3 N1	1	
(b)	Solve $a = 0$ K1 $3 - 2t = 0$ $t = 1.5$ Integrate $3 - 2t$ K1 $v = \int 3 - 2t \, dt$ $= 3t - \frac{2t^2}{2} + c$ Substitute $t = 1.5$ K1 in v $3(1.5) - (1.5)^2 + 10$ $12.25 \text{ // } 12\frac{1}{4}$ N1	4	
(c)	Solve $v = 0$ K1 $(t + 2)(t - 5) = 0$ 5 N1	2	
(d)	Find total distance travelled $\int_0^{*5} v \, dt + \left \int_{*5}^7 v \, dt \right$ K1 K1 $s = 10t + \frac{3}{2}t^2 - \frac{1}{3}t^3$ N1 $\frac{375}{6} \text{ // } 62.5 \text{ // } 62\frac{1}{2}$	3	10

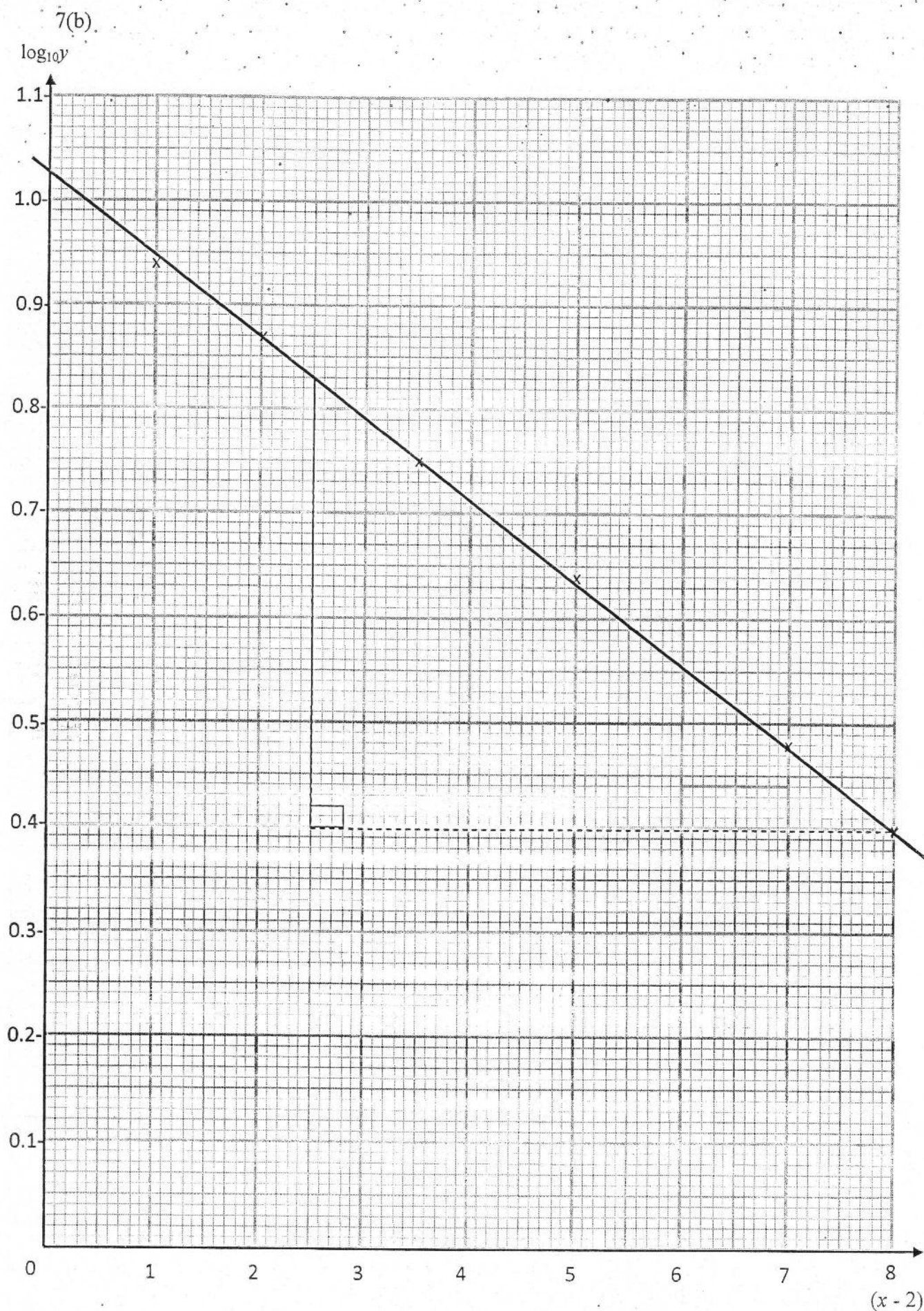
Ques	Mark Scheme	Sub Mark	Full Mark
13.(a)	(i) Use $\frac{Q_1}{Q_0} \times 100$  (ii) $\frac{Q_{2006}}{Q_{2003}} = \frac{105}{100}$ or $\frac{Q_{2009}}{Q_{2006}} = \frac{120}{100}$  $\frac{Q_{2009}}{Q_{2006}} \times \frac{Q_{2006}}{Q_{2003}} \times 100$ or equivalent	2	
(b)	(i) $\bar{I} = \frac{110(20) + x(40) + 125(30) + 120(10)}{20 + 40 + 30 + 10}$  Equate $\bar{I}$ to 114.5 and solve for x (ii) Use $\frac{150.00}{Q_{06}} \times 100 = 114.5$ 	3	
		2	10

Ques	Mark Scheme	Sub Mark	Full Mark
14(a)	Use cosine rule in $\triangle ABE$ to find $\angle BAE$. K1 $\cos \angle BAE = \frac{5^2 + 6^2 - 7^2}{2(5)(6)}$ $\angle BAE = 78.46^\circ // 78^\circ 28'$ N1	2	
(b)	Use sine rule in $\triangle ACD$ to find $\angle ACD$ K1 $\frac{\sin \angle ACD}{8} = \frac{\sin 78.46^\circ}{10}$ $\angle ACD = 51.61^\circ // 51^\circ 37'$ N1 N1 $\angle ADC = 49.93^\circ // 49^\circ 56'$	3	
(c)	Use cosine or sine rule in $\triangle ACD$ to find AC K1 $AC^2 = 10^2 + 8^2 - 2(10)(8) \cos 49.93^\circ$ or $\frac{AC}{\sin 49.93^\circ} = \frac{10}{\sin 78.46^\circ}$ or $\frac{AC}{\sin 49.93^\circ} = \frac{8}{\sin 51.61^\circ}$ N1 7.81	2	
(d)	K1 Use $\frac{1}{2} ab \sin C$ to find area of $\triangle ACD$ or area of $\triangle ABE$ Area of $\triangle ACD$ K1 - Area of $\triangle ABE$ N1 15.91	3	10

Ques	Mark Scheme	Sub Mark	Full Mark
15(a)	$x + y \leq 90$ <u>or</u> equivalent N1 $x \leq \frac{3}{2}y$ <u>or</u> equivalent N1 $y - x \leq 30$ <u>or</u> equivalent N1	3	
(b)	Draw correctly at least one straight line from the *inequalities which involves x and y K1 Draw correctly all the three *straight lines N1 Note : Accept dashed lines The correct region shaded N1	3	
(c)	(i) $10 \leq y \leq 45$ N1 (ii) Maximum point = (30, 60) N1 Use $40x + 60y$ For point in the *region R K1 RM4800 N1 <u>Note:</u> SS-1 if in (a), the symbol "=" is not used at all <u>or</u> more than three inequalities are given in (b), does not use the scale given <u>or</u> does not use graph paper <u>or</u> interchange between x-axis and y-axis	4	10

4(a)





3472/2

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15(b)

