3472/2
Form Five
Additional Mathematics
Paper 2
September 2008
2 ½ hours

JPN PAHANG

PEPERIKSAAN PERCUBAAN SPM TAHUN 2008

ADDITIONAL MATHEMATICS

Paper 2
Two hours and thirty minutes

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 Malaysia.*
3. *Calon dikehendaki membaca maklumat di halaman belakang kertas soalan ini.*
4. *Calon dikehendaki menceraikan halaman 21 dan ikat sebagai muka hadapan bersama-sama dengan buku jawapan.*

Kertas soalan ini mengandungi **21** halaman bercetak.

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

ALGEBRA

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

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

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

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

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

6 $\log_a \dfrac{m}{n} = \log_a m - \log_a n$

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

8 $\log_a b = \dfrac{\log_c b}{\log_c a}$

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

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

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

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

13 $S_\infty = \dfrac{a}{1 - r}, \; |r| < 1$

CALCULUS
KALKULUS

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

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

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

4 Area under a curve
Luas di bawah lengkung
$= \int_a^b y \, dx \quad or(atau) \quad \int_a^b x \, dy$

5 Volume generated
Isipadu janaan
$= \int_a^b \pi y^2 \, dx \quad or(atau) \quad \int_a^b \pi x^2 \, dy$

STATISTICS
STATISTIK

1 $\bar{x} = \dfrac{\Sigma x}{N}$

2 $\bar{x} = \dfrac{\Sigma fx}{\Sigma f}$

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

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

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

6 $I = \dfrac{Q_1}{Q_0} \times 100$

7 $\bar{I} = \dfrac{\Sigma W_i I_i}{\Sigma W_i}$

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

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

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

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

12 $Mean / \min,\ \mu = np$

13 $\sigma = \sqrt{npq}$

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

GEOMETRY
GEOMETRI

1 Distance/*jarak*

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

2 Mid point / *Titik tengah*

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

3 A point dividing a segment of a line
Titik yang membahagi suatu tembereng garis

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

4 Area of a triangle/ *Luas segitiga* =

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

5 $\left|\underset{\sim}{r}\right| = \sqrt{x^2 + y^2}$

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

TRIGONOMETRY
TRIGONOMETRI

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

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

Luas sektor, $L = \frac{1}{2}j^2\theta$

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

$\sin^2 A + k\text{os}^2 A = 1$

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

$\text{se}k^2 A = 1 + \tan^2 A$

5 $co\sec^2 A = 1 + \cot^2 A$

$ko\text{se}k^2 A = 1 + k\text{ot}^2 A$

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

$\sin 2A = 2\sin A\ kos\ A$

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

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

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

$\sin(A \pm B) = \sin A\ kos\ B \pm ko\text{s}\ A\sin B$

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

$ko\text{s}(A \pm B) = k\text{os}\ A\ k\text{os}\ B \mp \sin A\sin B$

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

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

$a^2 = b^2 + c^2 - 2bc\ kos\ A$

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

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

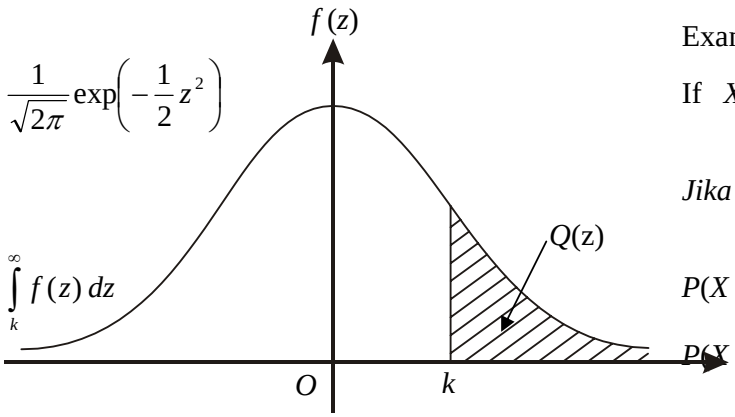
z	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
											Minus / *Tolak*								
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641	4	8	12	16	20	24	28	32	36
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247	4	8	12	16	20	24	28	32	36
0.2	0.4207	0.4168	0.4129	0.4090	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

then

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

maka

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



$Q(2.1) = 0.0179$

Example / *Contoh*:

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

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

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

$P(X > 2.1) = P(z > 2.1) =$

[Lihat sebelah

3472/1 **SULIT**

Section A
Bahagian A

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

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

1 Solve the simultaneous equations $3x + 2y + 1 = x^2 + 9x - y = 8$ [6 *marks*]

Selesaikan persamaan serentak $3x + 2y + 1 = x^2 + 9x - y = 8$ [6 *markah*]

2 In Diagram 1, point *P*, *Q* , *R* and *S* are the vertices of a parallelogram *PQRS.*

Dalam Rajah 1 ,titik P, Q , R dan S adalah bucu-bucu bagi segiempat selari PQRS

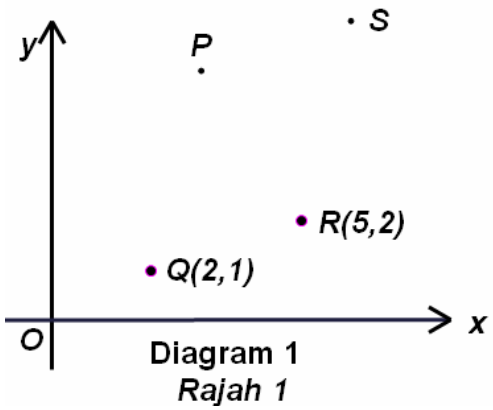


Diagram 1
Rajah 1

Given that , *Q* (2,1), *R*(5,2) and $\overrightarrow{OP} = 3\underset{\sim}{i} + 4\underset{\sim}{j}$, where *O* is the origin,

Diberi Q (2,1), *R*(5,2) *dan* $\overrightarrow{OP} = 3\underset{\sim}{i} + 4\underset{\sim}{j}$ *, di mana O adalah titik asalan,*

express in terms of $\underset{\sim}{i}$ dan $\underset{\sim}{j}$

ungkapkan dalam sebutan $\underset{\sim}{i}$ *dan* $\underset{\sim}{j}$

a) $\overrightarrow{PR}$

b) $\overrightarrow{QS}$ [3 *marks*]

[3 *markah*]

c) The point *P'* is the reflection of *P* in the *x*-axis.
Titik P' adalah pantulan bagi titik P pada paksi-x

Show that the points *P'*, *R* and *S* are collinear and find the ratio *P'R* : *RS*. [3 *marks*]
Tunjukkan bahawa titik P' R dan S adalah segaris dan cari nisbah P'R : RS.
[3 *markah*]

3 a)Prove that $\frac{\sin A}{\sin 2A} + \frac{\cos A}{1+\cos 2A} = \sec A$ [3 *marks*]

Buktikan $\frac{\sin A}{\sin 2A} + \frac{\text{kos}A}{1+\text{kos}2A} = \text{sek } A$ [3 *markah*]

b)Solve the equation $2\tan^2 x = \sec x + 1$ for $0^\circ \le x \le 360^\circ$ [5 *marks*]

Selesaikan persamaan $2\tan^2 x = \text{sek } x + 1$ *bagi* $0^\circ \le x \le 360^\circ$ [5 *markah*]

4 The masses, each to the nearest kg, of luggage collected at an airport were recorded and one entry , *p*, is missing as shown in Table 1.

Jisim-jisim, dalam kg terhampir, untuk bagasi yang dikumpulkan di sebuah lapangan kapal terbang telah direkodkan dan satu data, p, telah hilang seperti yang ditunjukkan di Jadual 1.

Mass *(kg)* *Jisim*	20-24	25-29	30-34	35-39	40-44
Number of luggage *Bilangan Bagasi*	18	22	29	*p*	25

Table 1
Jadual 1

The mean mass of the luggage was 32.75 kg,
min jisim bagasi itu ialah 32.75 kg,

a) Based on the data in Table 1 and without using the graphical method,
Berdasarkan kepada data di Jadual 1 *dan tanpa menggunakan kaedah graf,*

calculate,

hitung,

i. the value *p*,

nilai p,

ii. the median, of this distribution. [4 *marks*]

Median, untuk taburan ini. [4 *markah*]

b) Draw a histogram to represent the data in Table 1 and estimate the modal mass of this luggage distribution. [3 *marks*]

Lukis sebuah histogram bagi mewakili data di Jadual 1 *dan dapatkan nilai mod bagi taburan bagasi tersebut.* [3 *markah*]

5 a) Find the equation of the normal to the curve $y = x^3 + 2x^2$ at the point (1, -1). [3 *marks*]

Cari persamaan normal kepada lengkung $y = x^3 + 2x^2$ *pada titik* (1,-1) [3 *markah*]

b) Given that $y = \frac{8}{x^3}$, find the approximate change in *y* when *x* decreases from 2 to 1.98. [3 *marks*]

Diberi $y = \frac{8}{x^3}$, *cari nilai hampir dalam perubahan y apabila x menyusut dari* 2 *ke* 1.98. [3 *markah*]

6 Tin is extracted from the mineral ore obtained from a mine in Pahang. During the first year of operation the ore obtained yields 8000 kg of tin. With the increasing difficulty of mining, the production of tin in each subsequent year shows a decrease of 10 % on the previous year's production. Assuming that mining continues in the same way for an indefinite period of time,

Timah diekstrak dari bijih logam di sebuah lombong di Pahang. Pada tahun pertama beroperasi, lombong itu berupaya menghasilkan 8000kg *timah setahun. Dengan bertambahnya kesulitan dalam perlombongan, penghasilan timah pada setiap tahun berikutnya telah berkurang sebanyak* 10% *daripada tahun sebelumnya. Anggapkan keadaan perlombongan begini berlanjutan untuk satu tempoh masa yang takterhinggaan.*

Calculate,

Hitung,

a) M, the maximum amount of tin which could possibly be extracted. [*3 marks*]

M, Kuantiti timah yang maksimum yang boleh diekstrakkan. [3 *markah*]

b) For economic reasons, mining will be abandoned once the annual output of tin falls below 1000 kg.

Atas faktor ekonomi, perlombongan timah akan diberhentikan operasinya jika pengeluaran tahunannya kurang daripada 1000 kg.

Calculate the maximum number of complete years the mine will be in operation.

[4 *marks*]

Kira bilangan tahun genap lombong itu akan beroperasi. [4 *markah*]

Section B

Bahagian B

[40 marks]

[40 *markah*]

Answer **four** questions from this section.

Jawab **empat** *soalan daripada bahagian ini.*

7 Use graph paper to answer this question.

Gunakan kertas graf untuk menjawab soalan ini.

Table 2 shows the values of two variables, x and y obtained from an experiment.

Variable x and y are related by the equation $y = 10^{-A} b^{x}$, where A and b are constants.

Jadual 2 *menunjukkan nilai-nilai bagi dua pembolehubah , x dan y , yang diperoleh daripada satu eksperimen. Pembolehubah x dan y dihubungkan oleh persamaan* $y = 10^{-A} b^{x}$, *dengan keadaan A dan b adalah pemalar.*

x	15	20	25	30	35	40
y	0.15	0.38	0.95	2.32	5.90	14.80

Table 2

Jadual 2

a) Plot $\log_{10} y$ against x, using a scale of 2 cm to represent 5 units on the *x-axis* and 2 cm to represent 0.5 units on the $\log_{10} y$-axis.

Hence, draw the line of best fit. [4 *marks*]

Plot $\log_{10} y$ *melawan* x, *dengan menggunakan skala* 2 *cm kepada* 5 *unit pada paksi* - x *dan* 2 *cm kepada* 0.5 *unit pada paksi* - $\log_{10} y$.

Seterusnya, lukis garis lurus penyuaian terbaik. [4 *markah*]

b) Use your graph in 7(a) to find the value of

Gunakan graf anda di 7(a) *untuk mencari nilai*

i. A

ii. b

iii. x when $y = 10$ [6 *marks*]

x *apabila* $y = 10$ [6 *markah*]

8 In Diagram 2, the points *A* (1, 10) and *C*(-3, 2) are opposite corners of a rhombus *ABCD*. The point *B* lies on the *x*-axis.

Dalam Rajah 2, *titik A* (1, 10 *) dan C* (-3,2) *merupakan bucu-bucu yang bertentangan bagi sebuah rhombus ABCD. Titik B berada di atas paksi - x.*

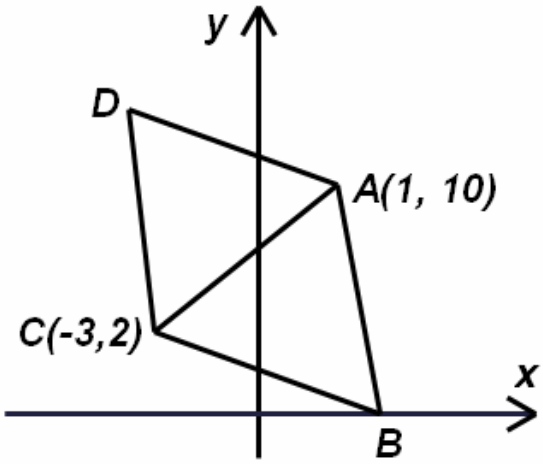


Diagram 2
Rajah 2

Find,

Cari,

a) the equation of the perpendicular bisector of *AC* [4 *marks*]
persamaan pembahagi dua sama serenjaang AC [4 *markah*]

b) the area of the rhombus [3 *marks*]
luas rhombus itu. [3 *markah*]

A point *P* moves such that its distances from point *A* and point *C* are in the ratio 2:1.

Satu titik P bergerak supaya jaraknya dari titik A dan titik C adalah dalam nisbah 2:1.

c) Find the equation of locus of *P*. [3 *marks*]
Cari persamaan lokus P [3 *markah*]

9 In Diagram 3, the region R is bounded by the line $y = 3x$, the curve $y = 4 - x^2$ and the x-axis.

Dalam Rajah 3, *rantau berlorek R dibatasi oleh garis lurus* $y = 3x$, *lengkung* $y = 4 - x^2$ *dan paksi – x.*

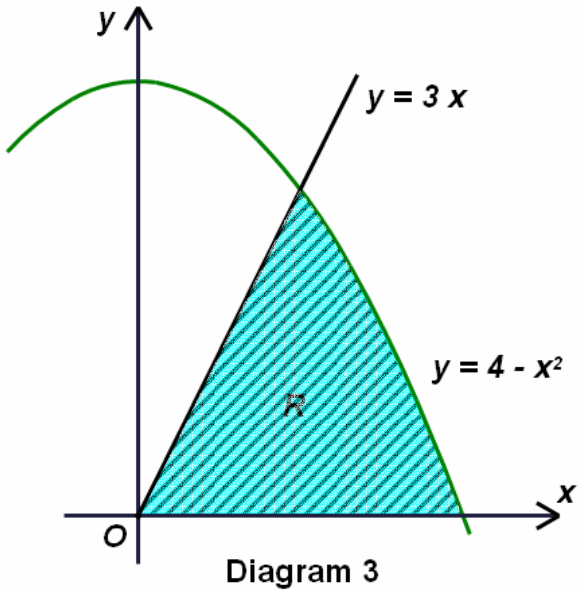


Diagram 3
Rajah 3

Calculate,
Hitung,

a) the area of shaded region R. [5 *marks*]
luas rantau berlorek R. [5 *markah*]

b) the volume generated when the shaded region *R* is revolved 360^0 about the *x*-axis . [5 *marks*]
Isipadu janaan apabila rantau berlorek R dikisarkan melalui 360^0 *pada paksi -x .* [5 *markah*]

10 a) An infectious flu virus is spreading through a school. The probability of a randomly selected student having the flu next week is 0.3.
Sejenis virus selsema berjangkit sedang merebak di sebuah sekolah. Kebarangkalian seorang pelajar dipilih secara rawak akan menghidapi selsema pada minggu hadapan ialah 0.3.

Calculate, out of a class of 30 students, the probability of
Hitung kebarangkalian, daripada kelas yang mempunyai 30 *orang pelajar, bahawa*

i . exactly 5 students will have the flu next week.
tepat 5 *orang pelajar akan menghidapi selsema pada minggu hadapan*

ii less than 2 students will have the flu next week [5 *marks*]
kurang daripada 2 *orang pelajar akan menghidapi selsema pada minggu hadapan.* [5 *markah*]

b) The length of steel rods produced by a machine is normally distributed with a standard deviation of 3 mm. It is found that 2.02 % of all the rods are less than 25mm long.
Panjang batang keluli yang dihasilkan oleh satu mesin tertabur secara normal dengan sisihan piawai 3 mm. *Didapati* 2.02 % *batang keluli itu mempunyai panjang yang kurang dari* 25 mm.

Find,
Hitung,

i .the mean length of rods produced by the machine.
min panjang batang keluli yang dihasilkan oleh mesin itu.

ii. the probability that length of the rod is between 30 mm to 32 mm.
[5 *marks*]
kebarangkalian panjang batang keluli itu yang berada di antara 30 mm *hingga* 32 mm [5 *markah*]

[Lihat sebelah

11 In Diagram 4 , *OAB* is a sector of a circle, centre *O*, of radius 8 cm and angle *AOB* is 0.92 radians.

Dalam Rajah 4, *OAB adalah sebuah sektor bulatan yang berpusat O , berjejari* 8 *cm dan sudut AOB ialah* 0.92 radian.

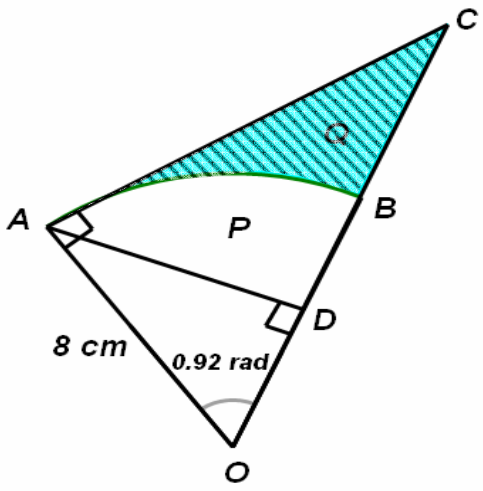


Diagram 4
***Rajah* 4**

The line *AD* is the perpendicular line from *A* to *OB*. *ODBC* is a straight line.
Garis AD adalah garis serenjang dari A ke OB. ODBC ialah satu garis lurus.

[Use/Guna $\pi = 3.142$]

Calculate
Hitung

a) the perimeter of the region ADB, marked P, [5 *marks*]
perimeter untuk rantau ADB, berlabel P [5 *markah*]

b) the area of the shaded region, marked *Q* [5 *marks*]
luas rantau berlorek yang berlabel Q [5 *markah*]

Section C
Bahagian C

[20 marks]
[*20 markah*]

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

12 A particle moves along a straight line and passed through a fixed point O. Its velocity, v ms^{-1}, is given by $v = t^2 - 5t + 4$, where *t* is the time, in seconds, after passing through O.

Suatu zarah bergerak di sepanjang suatu garis lurus dan melalui satu titik tetap O. Halajunya, v ms^{-1}, diberi oleh $v = t^2 - 5t + 4$, *dengan keadaan t ialah masa , dalam saat, selepas melalui O.*

[Assume motion to the right is positive.]
[Anggapkan gerakan ke arah kanan sebagai positif.]

Find ,

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

(b) the maximum velocity, in m s^{-1}, [3 *marks*]
Halaju maksimum, dalam m s^{-1}, [*3 markah*]

(c) the range of time when particle moves to the left, [2 *marks*]
julat masa t bila zarah bergerak ke arah kiri, [*2 markah*]

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

13 Table 3 shows the prices and the price indices of four items, *P*, *Q*, *R* and *S*, used to produce a cake.

Diagram 5 shows a bar charts which represents the relative quantity of item used.

Jadual 3 *menunjukkan harga-harga dan indeks harga bagi empat jenis item P, Q, R dan S yang digunakan dalam penghasilan sebiji kek.*

Rajah 5 *menunjukkan carta bar yang mewakili kuantiti relatif bagi penggunaan item itu.*

Item	Price per kg (RM) *Harga*		Price index for the year 2006 based on the year 2004.
	Year 2004	Year 2006	
P	1.35	*x*	120
Q	2.50	3.8	*y*
R	0.60	0.90	150
S	*z*	4.5	125

Table 3
Jadual 3

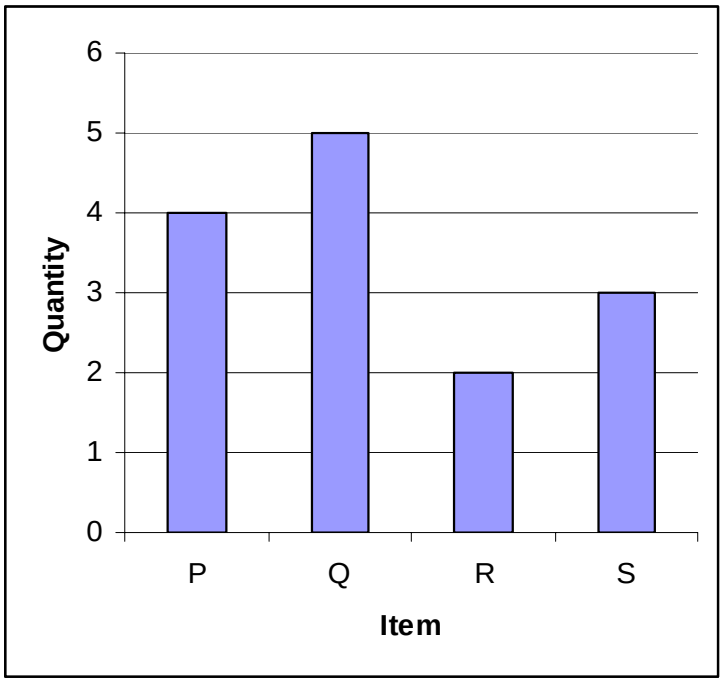


Diagram 5
Rajah 5

(a) Find the value of x, y and z. [4 *marks*]
Cari nilai bagi x, y dan z. [4 *markah*]

(b) Calculate the composite index for the production of the cake of the year 2006 based on the year 2004. [3 *marks*]
Kirakan indeks gubahan bagi kos penghasilan sebiji kek bagi tahun 2006 *berasaskan tahun* 2004. [3 *markah*]

(c) The price of item *P* and *R* increased by 20 % from the year 2006 to the year 2008 whereas the price indices for item *Q* and *S* remains unchanged, find the expected composite index for the year 2008 based on the year 2004. [3 *marks*]
Harga bagi item P dan R bertambah 20 % *dari tahun* 2006 *ke tahun* 2008 *manakala harga item Q dan S tidak berubah, cari indeks gubahan yang sepadan bagi tahun* 2008 *berasaskan tahun* 2004. [3 *markah*]

14 A factory produces two components , *A* and *B*. In a particular day, the factory produced *x* pieces of component *A* and *y* pieces of component *B*. The production of the two components is based on the following constraints.
Sebuah kilang menghasilkan dua komponen, A dan B. Pada satu hari tertentu, kilang itu menghasilkan x keping komponen A dan y keping komponen B. Penghasilan komponen-komponen itu adalah berdasarkan kekangan berikut :

I : The total numbers of component is not more than 500.
Jumlah kedua-dua komponen adalah tidak lebih 500,

II : The number of component *B* produced is at most three times the number of component *A*,
Bilangan komponen B yang dihasilkan adalah selebih-lebihnya tiga kali bilangan komponen A,

III : The minimum number of component B is 200.
Bilangan minimum komponen B ialah 200.

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

(b) Using a scale of 2 cm to 50 components on both axes, construct and shade the region R which satisfies all the above constraints. [3 *marks*]
Menggunakan skala 2 *cm kepada* 50 *komponen pada kedua-dua paksi, bina dan lorek rantau R yang memenuhi semua kekangan di atas.*
[3 *markah*]

(c) Use your graph in 14(b), to find
Gunakan graf anda di 14(b*) untuk mencari,*

(i) the maximum number of component *A* if the number of component *B* produced on a particular day is 300. [1 *mark*]
Bilangan maksimum komponen A jika bilangan komponen B yang dihasilkan pada satu hari tertentu ialah 300. [1 *markah*]

(ii) The maximum total profit per day if RM 25 and RM 20 are the profit from the sales of component A and B respectively. [3 *marks*]
Jumlah keuntungan maksimum sehari jika RM 25 *dan* RM 20 *adalah keuntungan daripada jualan komponen A dan B masing-masing.*
[3 *markah*]

15 Diagram 6 shows quadrilateral PQRS.

Rajah 6 *menunjukkan sisiempat PQRS.*

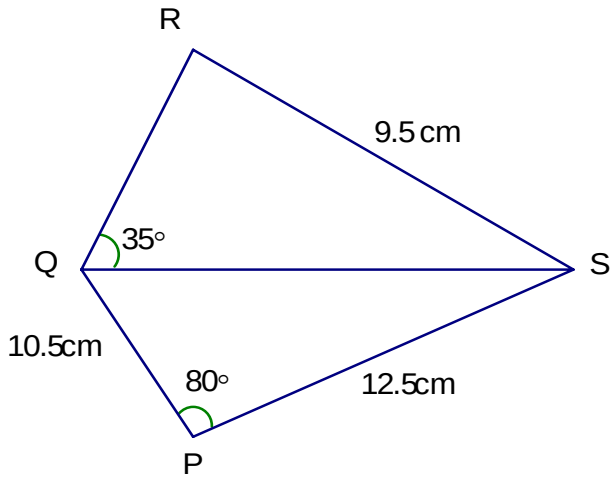


Diagram 6

Rajah 6

(a) Calculate

Hitungkan

(i) the length, in cm, of QS. [2 *marks*]

panjang , dalam cm bagi QS, [2 *markah*]

(ii) $\angle QRS$ if $\angle QRS$ is an obtuse angle. [2 *marks*]

$\angle QRS$ *jika* $\angle QRS$ *adalah sudut cakah.* [*2 markah*]

(b) Point Q' lies on QS such that $PQ' = PQ$.

Titik Q' *terletak di atas QS dengan keadaan* $PQ' = PQ$

(i) Copy ΔQPS and show $\Delta Q'PS$ in ΔQPS. [1 *mark*]

Salin ΔQPS *dan tunujukan* $\Delta Q'PS$ *dalam* ΔQPS. [1 *markah*]

(ii) calculate the area, in cm^2, of $\Delta Q'PS$ [5 *marks*]

Hitung luas , dalam cm^2 *, bagi* $\Delta Q'PS$ [5 m*arkah*]

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

SULIT **20** **3472/2**

NAMA:

KELAS :

NO. KAD PENGENALAN:

ANGKA GILIRAN

Arahan Kepada calon

1 Tulis **nama, kelas, nombor kad pengenalan** dan **angka giliran** anda pada ruang yang disediakan.

2 Tandakan (√) untuk soalan yang dijawab.

3 Ceraikan helaian ini dan ikat sebagai muka hadapan bersama-sama dengan kertas jawapan.

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

INFORMATION FOR CANDIDATES
MAKLUMAT UNTUK CALON

1 This question paper consists of three sections : **Section A, Section B** and **Section C**.
Kertas soalan ini mengandungi tiga bahagian: ***Bahagian A, Bahagian B*** *dan* ***Bahagian C.***

2 Answer **all** questions in **Section A**, **four** questions from **Section B** and **two** questions from **Section C**.
Jawab ***semua*** *soalan dalam* ***Bahagian A, empat*** *solan daripada* ***Bahagian B*** *dan* ***dua*** *soalan daripada* ***Bahagian C.***

3 Show your working. It may help you to get marks.
Tunjukkan langkah-langkah penting dalam kerja mengira anda. Ini boleh membantu anda untuk mendapat markah.

4 The diagrams in the questions provided are not drawn to scale unless stated.
Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.

5 The marks allocated for each question and sub –part of a question are shown in brackets.
Markah yang diperuntukkan bagi setiap solan dan ceraian soalan ditunjukkan dalam kurungan.

6 A list of formulae is provided on page 2 to 4.
Satu senarai rumus disediakan di halaman 2 *hingga* 4

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

SULIT

3472/2
Additional Mathematics
Paper 2
September 2008

SEKTOR PENGURUSAN AKADEMIK
JABATAN PELAJARAN PAHANG

PEPERIKSAAN PERCUBAAN SPM

TAHUN 2008

ADDITIONAL MATHEMATICS

Paper 2

MARKING SCHEME

This marking scheme consists of 12 printed pages

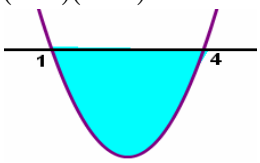
QUESTION	WORKING / SOLUTION	MARKS	TOTAL
1	$3x + 2y +1 =8$ $x^2 + 9x - y = 8$	P1	
	$y = \frac{7-3x}{2}$ or $x = \frac{7-2y}{3}$	P1	
	Substitute $y = \frac{7-3x}{2}$ or $x = \frac{7-2y}{3}$ into non linear equation $x^2 + 9x - (\frac{7-3x}{2}) = 8$ or $(\frac{7-2y}{3})^2 + 9(\frac{7-2y}{3}) - y = 8$	K1	
	(2x+23)(x-1)=0 or (4y-83)(y-2) =0 or solve quadratic equation using formula or completing the squares	K1	
	x = -11.5, x =1	N1	
	y = 20.75, y =2	N1	**6**
2 (a)	$\overrightarrow{PR} = 2\underset{\sim}{i} - 2\underset{\sim}{j}$	N1	
(b)	$\overrightarrow{QS} = \overrightarrow{QR} + \overrightarrow{RS}$ or $\overrightarrow{QS} = \overrightarrow{QR} + \overrightarrow{QP}$	P1	
	$\overrightarrow{QS} = 4\underset{\sim}{i} + 4\underset{\sim}{j}$	N1	
(c)	$\overrightarrow{P'R} = k\overrightarrow{RS}$	K1	
	$\overrightarrow{P'R} = -3\underset{\sim}{i} + 4\underset{\sim}{j} + 5\underset{\sim}{i} + 2\underset{\sim}{j}$		
	$\overrightarrow{P'R} = 2\underset{\sim}{i} + 6\underset{\sim}{j} = 2(\underset{\sim}{i} + 3\underset{\sim}{j})$ => $\overrightarrow{P'R} = 2\overrightarrow{RS}$ =>collinear	N1	
	$P'R : RS = 2:1$	N1	**6**
3(a)	$\frac{\sin A}{2\sin A\cos A} + \frac{\cos A}{1+(2\cos^2 A - 1)}$,	P1	
	use of sin2A = 2 sinA cos A or cos 2A = 2 cos ^{2} A-1		
	$\frac{1}{2\cos A} + \frac{1}{2\cos A} = \frac{1}{\cos A}$	K1	
	= secA	N1	
(b)	2 (sec^{2}x -1) = sec x +1, use of 1 + tan^2 x = sec^2 x	P1	
	(2 sec x – 3) (sec x +1) =0	K1	
	sec x = $\frac{3}{2}$ or sec x = -1	K1	
	cos x = $\frac{2}{3}$ or cos x = -1	K1	
	X = $48.19^\circ, 180^\circ, 311.81^\circ$ or = $48^\circ 11', 180^\circ, 311^\circ 49'$	N1	**8**

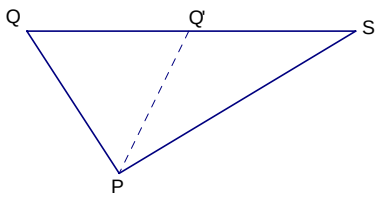
Question	Working / Solution	Marks	Total
4(a)(i)	$\frac{22(18)+27(22)+32(29)+37(p)+42(25)}{18+22+29+p+25}=32.75$	K1	
	p = 26	N1	
(ii)	median $=29.5+(\frac{60-40}{29})(34.5-29.5)$	K1	
	= 32.95	N1	
4(b)	Height of the bars proportional to the frequency or Label the lower and upper boundaries/mid points/class interval correctly.	K1	
	Correct way of finding the value of mode.	K1	
	Modal mass = 33	N1	**7**
5(a)	$\frac{dy}{dx}=3x^2+4x$	K1	
	(1,-1) , $\frac{dy}{dx}=7$		
	Gradient of normal $=-\frac{1}{7}$	K1	
	Equation of normal:		
	y-(-1) $=-\frac{1}{7}$ (x-1)	K1	
	7y+x + 6=0		
5(b)	$\frac{dy}{dx}=-24x^{-4}$	K1	
	$\frac{\delta y}{\delta x}\approx\frac{-24}{2^4}(1.98-2)$	K1	
	≈ 0.03	N1	**6**
6(a)	A =8000		
	8000, 8000(0.9), $8000(0.9)^2$,…		
	r =0.9	P1	
	$s_\alpha=\frac{8000}{1-0.9}$	K1	
	= 80,000	N1	

Question	Working / Solution	Marks	Total
6(b)	$8000(0.9)^{n-1} > 1000$	P1	
	$(n-1)\log_{10}(0.9) > \log_{10}\left(\frac{1}{8}\right)$, taking log both sides	K1	
	$n < 20.74$	K1	
	$n = 20$	N1	**7**
7(a)	<table><tr><td>x</td><td>15</td><td>20</td><td>25</td><td>30</td><td>35</td><td>40</td></tr><tr><td>lg y</td><td>-0.82</td><td>-0.42</td><td>-0.022</td><td>0.37</td><td>0.77</td><td>1.17</td></tr></table>	N1	
	Plot $\log_{10} y$ against x		
	6 points plotted correctly	K1	
	Line of best fit, (passes through as many points as possible and balance in terms of numbers point appear above and below the line, if any .)	N1 N1	
7(b)	$\log_{10} y = -A\log_{10} 10 + x\log_{10} b$	P1	
i.	y-intercept, $c = -A\log_{10} 10$	P1	
	$-2.05 = -A\log_{10} 10$		
	$A = 2.05$	N1	
ii	$m = \log_{10} b = 0.08$	K1	
	$b = 1.2$	N1	
iii.	37.5	N1	**10**
8(a)	Mid point of AC $(\frac{1+(-3)}{2}, \frac{2+10}{2})$		
	(-1 , 6)	N1	
	Gradient of AC $= \frac{10-2}{1-(-3)}$		
	$= 2$		
	Gradient of perpendicular line to AC $= -\frac{1}{2}$		
	Use of $m_1 m_2 = -1$	K1	
	Equation of perpendicular bisector AC		
	$(y-6) = -\frac{1}{2}(x+1)$	K1	
	$2y + x = 11$ or equivalent	N1	
(b)	$y = 0,\ x = 11 \Rightarrow$ B(11, 0)	K1	
	Area of rhombus ABCD $= 2 \times \frac{1}{2}\begin{vmatrix} -3 & 11 & 1 & -3 \\ 2 & 0 & 10 & 2 \end{vmatrix}$	K1	
	$= 120$	N1	

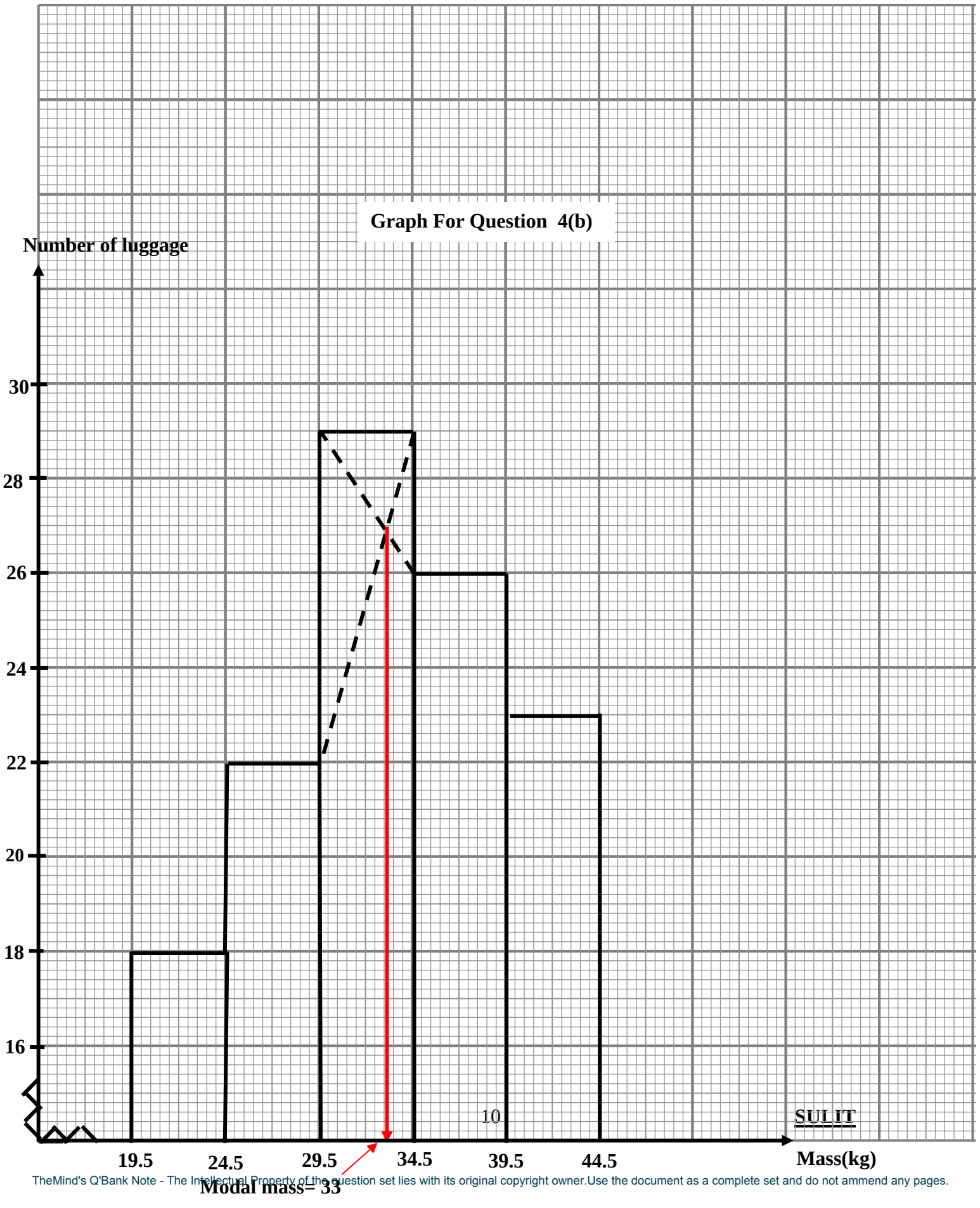
Question	Working / Solution	Marks	Total
8(c)	Use of distance formula for PA or PC PA $=\sqrt{(x-1)^2+(y-10)^2}$ *or* $PC=\sqrt{(x+3)^2+(y-2)^2}$ Use 2PC = PA, $2\sqrt{(x+3)^2+(y-2)^2}=\sqrt{(x-1)^2+(y-10)^2}$ $3x^2+3y^2+26x+4y-49=0$	K1 K1 N1	**10**
9(a)	y =3x , y =4-x^2 (x+4)(x-1)=0 solve simultaneous equation x =1, x = 4 4-x^2 =0, x= ±2 or find the limits of integration Use area of triangle $=\frac{1}{2}(1)(3)=\frac{3}{2}$ or Integrate $\int_0^1(3x)dx$ or $\int_1^2(4-x^2)dx$ $\left[\frac{3x^2}{2}\right]_0^1$ *or* $\left[4x-\frac{x^3}{3}\right]_1^2$ Substitution, $\left[8-\frac{8}{3}\right]-\left[4-\frac{1}{3}\right]$ $=1\frac{2}{3}\text{ unit}^2$ Add up 2 area, $\frac{3}{2}+1\frac{2}{3}$ $3\frac{1}{6}unit^2$	K1 K1 K1 K1 N1	
(b)	Volume of cone $=\frac{1}{3}\pi(3)^2(1)=3\pi$ or $\pi\left[\frac{9x^3}{3}\right]_0^1$ 3π $\pi\int_1^2(4-x^2)^2dx$ $=\pi\left[16x-\frac{8x^3}{3}+\frac{x^5}{5}\right]_1^2$ $=\pi\left\{\left[16(2)-\frac{8(2)^3}{3}+\frac{2^5}{5}\right]-\left[16(1)-\frac{8(1)^3}{3}+\frac{1^3}{5}\right]\right\}$	K1 K1 K1	

Question	Working / Solution	Marks	Total
	$= 3\frac{8}{15}\pi$		
	Volume generated $= 3\pi + 3\frac{8}{15}\pi$	N1	
	$=6\frac{8}{15}\pi$	N1	**10**
10(a)	p = 0.3 or q =0.7	P1	
i.	$P(X=5)={}^{30}C_5(0.3)^5(0.7)^{25}$ Use of $P(X=r)={}^{n}C_r(p)^r(q)^{n-r}$	K1	
	=0.04644	N1	
ii.	P(X<2) = P(X=0) + P(X=1)		
	${}^{30}C_0(0.3)^0(0.7)^{30} + {}^{30}C_1(0.3)^1(0.7)^{29}$	K1	
	$=0.0009660$ or 9.660×10^{-4}	N1	
(b)i	P (z < c) =0.202		
	C =-2.05	N1	
	$-2.05=\frac{25-\mu}{3}$, use of $z=\frac{X-\mu}{\sigma}$	K1	
	$\mu = 31.15mm$	N1	
ii	$P(\frac{30-31.15}{3}<z<\frac{32-31.15}{3})$		
	=1-0.3509-0.3885	K1	
	=0.2607	N1	**10**
11(a)	Arc length AB = 8(0.92)	K1	
	=7.36		
	0.92 rad = 52.71° / $52^\circ\ 42'$		
	$\sin(52.71^\circ)=\frac{AD}{8}$	K1	
	=6.364		
	$\cos(52.71^\circ)=\frac{OD}{8}$	K1	
	=4.848		
	DB = 8- 4.848 = 3.152		
	Perimeter =3.152 + 6.364+7.36 (add all the sides)	K1	
	=16.88	N1	
11(b)	$\tan(52.71^\circ)=\frac{AC}{8}$	K1	
	=10.50		
	Area of OAC $=\frac{1}{2}(8)(10.50)$	K1	
	= 42.01		

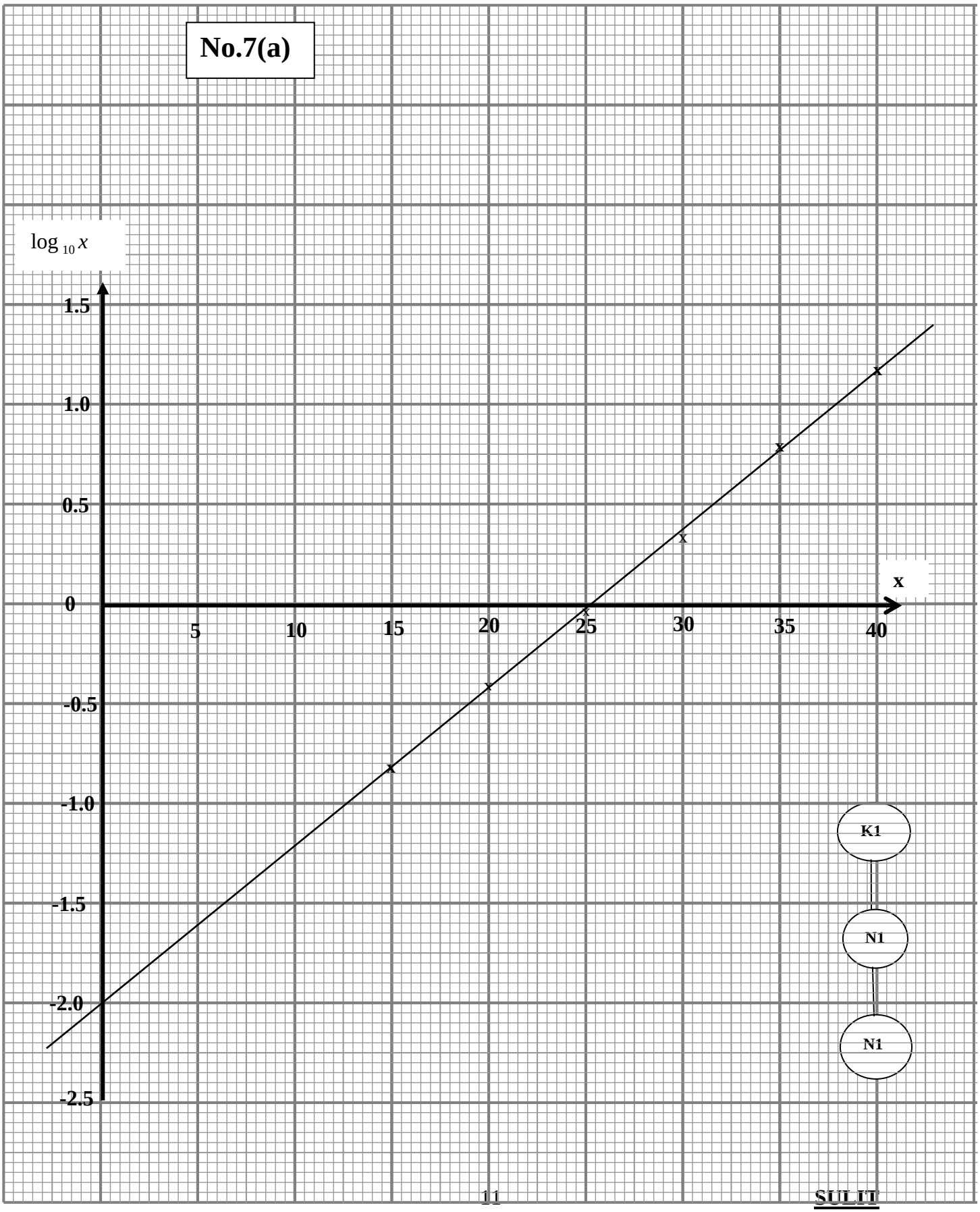
Question	Working / Solution	Marks	Total
11(b)	Area of sector OAB $=\frac{1}{2}(8)^2(0.92)$ use of $A=\frac{1}{2}r^2\theta$ $=29.44$ Area of the shaded region Q, $=42.01-29.44$ $=12.57$	K1 K1 N1	**10**
12	(a) $v=4$ (b) $v_{max}, a=0$ $a=2t-5=0$ $t=\frac{5}{2}s$ $v_{max}=\left(\frac{5}{2}\right)^2-5\left(\frac{5}{2}\right)+4$ $v_{max}=-2\frac{1}{4}ms^{-1}$ (c) used v<0 $t^2-5t+4<0$ $(t-1)(t-4)<0$  $1<t<4$ (d) $s=\int(t^2-5t+4)dt$ $=\left[\frac{t^3}{3}-\frac{5t^2}{2}+4t\right]_0^1+\left\|\left[\frac{t^3}{3}-\frac{5t^2}{2}+4t\right]_1^4\right\|$ Substitute the values of t $=23\frac{2}{3}m$	P1 K1 K1 N1 K1 N1 K1K1 K1 N1	**10**
13	(a) use $\frac{P_1}{P_0}\times 100$ $x=1.62, y=152, z=3.60$ used $\bar{I}=\frac{\sum Iw}{\sum w}$ $\bar{I}=\frac{120(4)+152(5)+150(2)+125(3)}{14}$ $=136.79$	 K1N1N1N1 K1 K1(used *I*) N1	

Question	Working / Solution	Marks	Total
	(c) $I_P = 144, I_R = 180$	P1	
	$\bar{I} = \dfrac{194.4(4)+152(5)+108(2)+125(3)}{14}$	K1	
	= 147.93	N1	**10**
14	(a) I $x + y \le 500$	N1	
	II $y \le 3x$	N1	
	III $y \ge 200$	N1	
	Cannot have sign '='		
	(b) One of graph of straight line is correct	K1	
	All the graph of straight line are correct	K1	
	The shaded region of R is correct	N1	
	(c) (i) 200	N1	
	(ii) maximum point (300,200) – based on the Graph	N1	
	$25(300)+20(200)$	K1	
	- substitute any number based on the value in shaded region		
	11500	N1	**10**
15	(a) used cosine rule		
	$QS^2 = (10.5)^2 + (12.5)^2 - 2(10.5)(12.5)\cos 80^0$	K1	
	QS = 14.86 cm	N1	
	(b) used sine rule		
	$\dfrac{\sin R}{14.86} = \dfrac{\sin 35}{9.5}$	K1	
	sin R = 0.89719		
	$\angle QRS = 116.21^0$	N1	
		N1	
	(i) Can see anywhere in the diagram		
	(ii) Find $\angle PQS$, used sine rule , hence find $\angle QPQ'$	K1	
	$\dfrac{\sin \angle PQS}{12.5} = \dfrac{\sin 80^o}{14.86}$		
	$\angle PQS = 55.93^o$,		
	$\angle QPQ' = 68.14^o$		

Question	Working / Solution	Marks	Total
	Find area of ΔPQS or area of $\Delta PQQ'$ $area\ \Delta PQS = \frac{1}{2}(10.5)(12.5)\sin 80^o$ $= 64.63 cm^2$ $area\ \Delta PQQ' = \frac{1}{2}(10.5)(10.5)\sin 68.14^o$ $= 51.16\ cm^2$	K1 N1	
	Find the area of $\Delta Q'PS$ $= 64.63 - 51.16$ $= 13.47$ Or any other methods	K1 N1	**10**



No.7(a)



SUL IT