NAMA: ..... TINGKATAN : .....

NO. KAD PENGENALAN

ANGKA GILIRAN

JABATAN PELAJARAN NEGERI WILAYAH PERSEKUTUAN

PEPERIKSAAN PERCUBAAN SPM 2012 3472/1

ADDITIONAL MATHEMATICS

Kertas 1
September
2 jam **Dua jam**

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Tulis **nama, tingkatan, nombor kad pengenalan** dan **angka giliran** anda pada ruang 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 Diperoleh
1	2	
2	3	
3	3	
4	3	
5	3	
6	4	
7	3	
8	3	
9	3	
10	3	
11	4	
12	3	
13	3	
14	4	
15	3	
16	3	
17	3	
18	3	
19	3	
20	3	
21	4	
22	3	
23	4	
24	3	
25	4	
Jumlah	**80**	

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

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

Senarai rumus berikut boleh membantu anda menjawab soalan. Simbol-simbol yang diberi adalah yang biasa digunakan.

ALGEBRA

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

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

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

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

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

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

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

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

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

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

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

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

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

CALCULUS
KALKULUS

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

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

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

4 Area under the curve
Luas di bawah lengkung

$= \int_a^b y\,dx$ or (*atau*)

$= \int_a^b x\,dy$

5 Volume of revolution
Isi padu kisaran

$= \int_a^b \pi y^2\,dx$ or (*atau*)

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

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

12 Mean / *Min*, $\mu = np$

13 $\sigma = \sqrt{npq}$

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

GEOMETRY
GEOMETRI

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

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

3 Point that divides a segment of 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 triangle / *Luas segi tiga*
$= \dfrac{1}{2}\left|(x_1y_2 + x_2y_3 + x_3y_1) - (x_2y_1 + x_3y_2 + x_1y_3)\right|$

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

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

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TRIGONOMETRY
TRIGONOMETRI

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

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

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

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

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*
$= \frac{1}{2}ab\sin C$

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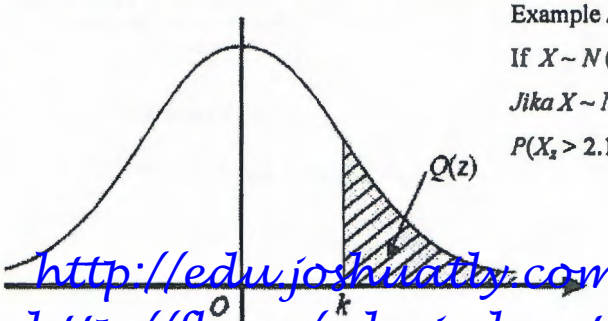
THE UPPER TAIL PROBABILITY Q(z) FOR THE NORMAL DISTRIBUTION N(0, 1)

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	0.0387	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

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

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



Example / *Contoh*:

If $X \sim N(0,1)$, then $P(X > k) = Q(k)$

Jika $X \sim N(0,1)$, *maka* $P(X > k) = Q(k)$

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

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

1 Diagram 1 shows the relation between set *A* and set *B*.
Rajah 1 *menunjukkan hubungan antara set A dan set B.*

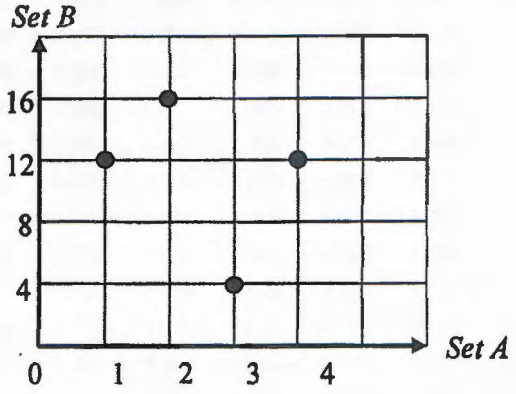

Diagram 1
Rajah 1

State
Nyatakan

(*a*) the object of 16,
objek bagi 16,

(*b*) the range of the relation. [2 *marks*]
julat hubungan itu. [2 *markah*]

Answer/Jawapan :

(*a*)

(*b*)

1
2

---

2 Given the function $g(x) = x + 2$ and $h(x) = ax^2 + b$. If $hg(x) = 2x^2 + 8x - 5$, find the value of *a* and of *b*. [3 *marks*]
Diberi fungsi $g(x) = x + 2$ *dan* $h(x) = ax^2 + b$. *Jika* $hg(x) = 2x^2 + 8x - 5$, *cari nilai bagi a dan b.* [3 *markah*]

Answer / Jawapan:

2
3

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3. Given that $f^{-1} : x \rightarrow \frac{5-x}{6}$, find

Diberi $f^{-1} : x \rightarrow \frac{5-x}{6}$, *cari*

(*a*) function $f(x)$,
fungsi $f(x)$,

(*b*) the value of $f(2)$. [3 *marks*]
nilai $f(2)$. [3 *markah*]

Answer/Jawapan :

(*a*)

(*b*)

3

3

---

4 Find the range of values of x for $2(3x^2 - x) \leq 1 - x$. [3 *marks*]
Cari julat nilai x bagi $2(3x^2 - x) \leq 1 - x$. [3 *markah*]

Answer/Jawapan :

4

3

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5 Given that α and β are the roots of the quadratic equation $2x^2+5x-3=0$, form a quadratic equation which has roots $\frac{1}{2\alpha}$ and $\frac{1}{2\beta}$. [3*marks*]

Diberi bahawa α dan β *adalah punca-punca bagi persamaan kuadratik* $2x^2+5x-3=0$, *bentukkan persamaan kuadratik dengan punca-punca* $\frac{1}{2\alpha}$ dan $\frac{1}{2\beta}$. [3*markah*]

Answer /Jawapan:

5 / 3

6 The quadratic function $f(x)=6-4x-x^2$, can be expressed in the form of $f(x)=a(x+m)^2+n$, where *a*, *m* and *n* are constants. Find the values of a, *m* and *n*. [4 *marks*]

Fungsi kuadratik $f(x)=6-4x-x^2$, *boleh diungkap dalam bentuk* $f(x)=a(x+m)^2+n$ *dengan keadaan a, m dan n ialah pemalar. Cari nilai a, m dan n.* [4 *markah*]

Answer /Jawapan:

6 / 4

7 The straight lines $hy=kx+5$ and $2y+3x-1=0$, where *h* and *k* are constants, are perpendicular. Express *k* in terms of *h*. [3 *marks*]

Persamaan garis lurus $hy=kx+5$ *dan* $2y+3x-1=0$, *dengan keadaan h dan k ialah pemalar, adalah berserenjang. Ungkapkan k dalam sebutan h.* [3 *markah*]

Answer /Jawapan:

7 / 3

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8. Given that $\log_2 x = p$, find $\log_x 16x^3$ in terms of p. [3 *marks*]

Diberi $\log_2 x = p$, *cari* $\log_x 16x^3$ *dalam sebutan* p. [3 *markah*]

Answer /Jawapan:

8

3

---

9 Solve the equation $9^{y+1} = 45$. [3 *marks*]

Selesaikan persamaan $9^{y+1} = 45$. [3 *markah*]

Answer/Jawapan :

9

3

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10 The third term of an arithmetic progression is $10 + 2p$ and the sum of the first 5 terms of the progression is $2p - 6$, where p is a constant. Given that the common difference of the progression is 2, find the value of p. [3 *marks*]

Sebutan ketiga suatu janjang aritmetik ialah $10 + 2p$ *dan hasil tambah 5 sebutan pertama janjang itu ialah* $2p - 9$, *dengan keadaan p ialah pemalar. Diberi beza sepunya janjang aritmetik itu ialah 2, carikan nilai p.* [3 *markah*]

Answer/Jawapan :

10

3

---

11 The 4th term of a geometric progression is -20. The sum of the 4th term and the 5th term is -16.

Sebutan ke-4 suatu janjang geometri ialah -20. *Hasil tambah sebutan ke-4 dan ke-5 ialah* -16.

Find
Cari

(*a*) the common ratio of the progression,
nisbah sepunya janjang itu,

(*b*) the sum to infinity of the progression. [4 *marks*]
hasil tambah ketakterhinggaan janjang itu. [4 *markah*]

Answer/Jawapan :
(*a*)

(*b*)

11

4

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12 The variables x and y are related by the equation $y = \frac{p}{5^x}$, where p is a constant. Diagram 12 shows the straight line graph obtained by plotting $\log_{10} y$ against x.

Pemboleh ubah x dan y dihubungkan oleh persamaan $y = \frac{p}{5^x}$ .dengan keadaan p adalah pemalar. Rajah 12 *menunjukkan graf garis lurus yang diperoleh dengan memplot* $\log_{10} y$ *melawan* x .

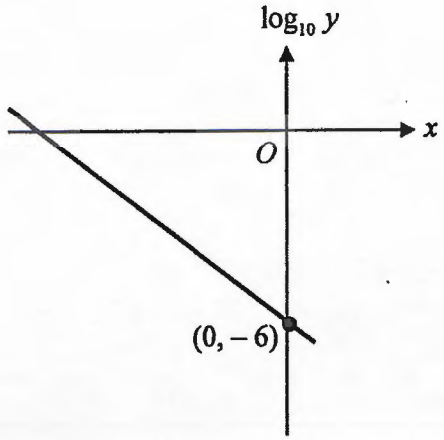

Diagram 12
Rajah 12

(*a*) Express the equation $y = \frac{p}{5^x}$ in the linear form used to obtain the straight line graph shown in Diagram 12.
Ungkapkan persamaan $y = \frac{p}{5^x}$ *dalam bentuk linear yang digunakan untuk memperoleh graf garis lurus seperti ditunjukkan dalam Rajah* 12.

(*b*) Find the value of p. [3 *marks*]
Cari nilai p. [3 *markah*]

Answer / Jawapan :

(*a*)

(*b*)

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13 Given points $A(-6, 10)$ and $B(-10, -8)$. Find the equation of the perpendicular bisector of the straight line AB. [3 *marks*]

Diberi titik-titik $A(-6, 10)$ *dan* $B(-10, -8)$. *Carikan persamaan pembahagi dua sama serenjang bagi garis lurus* AB. [3 *markah*]

Answer /Jawapan:

13

3

14 Solve $\cot 2x = \frac{4}{3}$ for $0° \leq x \leq 360°$. [4 *marks*]

Selesaikan kot $2x = \frac{4}{3}$ *bagi* $0° \leq x \leq 360°$. [4 *markah*]

Answer / Jawapan:

14

4

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15 Given that $\sin A = \frac{5}{13}$ and $\cos B = \frac{8}{10}$, where A is an obtuse angle and B is an acute angle.

Diberi $\sin A = \frac{5}{13}$ *dan* $\kos B = \frac{8}{10}$, *dengan keadaan A ialah sudut cakah dan B ialah sudut tirus.*

Find
Cari

(*a*) $\tan A$

(*b*) $\cos (A + B)$
$\kos (A + B)$

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

Answer /Jawapan:

(*a*)

(*b*)

15

3

---

16 Diagram 16 shows a rectangle *OPQR* and the point *S* lies on the straight line *OQ*.
Rajah 16 *menunjukkan sebuah segi empat tepat OPQR dan titik S terletak pada garis lurus OQ.*

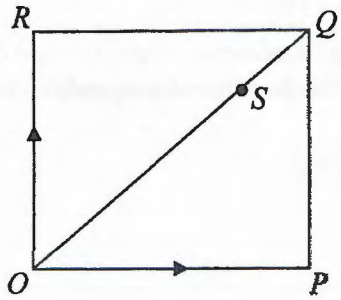

Diagram 16
Rajah 16

It is given that $\overrightarrow{OP} = 13\underset{\sim}{x}$, $\overrightarrow{OR} = 14\underset{\sim}{y}$ and $OS = 3SQ$. Express $\overrightarrow{OS}$ in terms of $\underset{\sim}{x}$ and $\underset{\sim}{y}$.
[3 *marks*]

Diberi bahawa $\overrightarrow{OP} = 13\underset{\sim}{x}$, $\overrightarrow{OR} = 14\underset{\sim}{y}$ dan $OS = 3SQ$. *Ungkapkan* $\overrightarrow{OS}$ *dalam sebutan* $\underset{\sim}{x}$ *dan* $\underset{\sim}{y}$.

[3 *markah*]

Answer /Jawapan:

16

3

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17 It is given that $\overrightarrow{AB} = 18\underset{\sim}{a} - 12\underset{\sim}{b}$ and $\overrightarrow{PQ} = k\underset{\sim}{a} + 16\underset{\sim}{b}$. If $\overrightarrow{AB}$ is parallel to $\overrightarrow{PQ}$, find the value of k. [3 *marks*]

Diberi $\overrightarrow{AB} = 18\underset{\sim}{a} - 12\underset{\sim}{b}$ *dan* $\overrightarrow{PQ} = k\underset{\sim}{a} + 16\underset{\sim}{b}$. *Jika* $\overrightarrow{AB}$ *adalah selari dengan* $\overrightarrow{PQ}$, *cari nilai k.* [3 *markah*]

Answer/ Jawapan:

17

3

---

18 A set of data consists of 8 numbers. The sum of the numbers is 120 and the sum of the squares of the numbers is 2100.

Satu set data mengandungi 8 *nombor. Hasil tambah bagi nombor-nombor itu ialah* 120 *dan hasil tambah kuasa dua bagi nombor-nombor itu ialah* 2100.

Find, for the 5 numbers,

Cari, bagi 5 *nombor itu,*

(*a*) the mean,
min,

(*b*) the variance. [3 *marks*]
varians. [3 *markah*]

Answer / Jawapan :

18

3

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19 Given that $f(x)=\frac{2x+3}{4x-1}$, find the value of $f'(2)$. [3 *marks*]

Diberi $f(x)=\frac{2x+3}{4x-1}$, *cari nilai* $f'(2)$, [3 *markah*]

Answer / Jawapan :

19

3

---

20 Given that $\int_2^6 g(x)\,dx = 5$ and $\int_2^6 [g(x)-kx]\,dx = -17$. Find the value of k. [3 *marks*]

Diberi $\int_2^6 g(x)\,dx = 5$ *dan* $\int_2^6 [g(x)-kx]\,dx = -17$. *Cari nilai k.* [3 *markah*]

Answer / Jawapan:

20

3

---

21 The gradient of the normal to the curve $y = ax+\frac{b}{x}$, where a and b are constants, at the point (2, 14) is $-\frac{1}{3}$. Find the value of a and of b. [4 *marks*]

Kecerunan garis normal kepada lengkung $y = ax+\frac{b}{x}$, *dengan keadaan a dan b adalah pemalar, pada titik* (2, 14) ialah $-\frac{1}{3}$. *Cari nilai a dan nilai b.*

[4 *markah*]

Answer / Jawapan:

21

4

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22 Diagram 22 shows sectors *OPQ* and *ORS* with centre *O*.
Rajah 22 *menunjukkan sektor-sektor OPQ dan ORS dengan pusat O.*

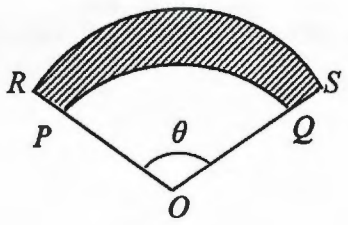

Diagram 22
Rajah 22

Given that *PR* is 2 cm, the length of radius *OR* is 8 cm and the length of arc *PQ* is twice the length of radius *OP*. Find the perimeter of the shaded region. [3 *marks*]

Diberi bahawa PR adalah 2 *cm, panjang jejari OR ialah* 8 *cm dan panjang lengkok PQ adalah dua kali ganda jejari OP. Cari perimeter kawasan berlorek.* [3 *markah*]

Answer / Jawapan:

22
3

---

23 Diagram 23 shows six numbered cards.
Rajah 23 *menunjukkan* enam *keping kad nombor.*

1	2	4	6	8	9

Diagram 23
Rajah 23

A four-digit number is to be formed by using 4 of these cards.
Suatu nombor empat digit hendak dibentuk menggunakan 4 *daripada kad-kad itu.*

Find the number of ways,
Cari bilangan cara,

(*a*) the different numbers can be formed,
nombor yang berlainan yang dapat dibentuk,

(*b*) the different even numbers can be formed. [4 *marks*]
nombor genap yang berlainan yang dapat dibentuk. [4 *markah*]

Answer/Jawapan :

(*a*)

(*b*)

23
4

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24 There are 3 red marbles and 4 blue marbles in a bag. If the marbles are randomly taken out one by one without replacement, find the probability that the second marble is red.
[3 *marks*]

Sebuah beg mengandungi 3 biji guli merah dan 4 biji guli biru. Jika guli itu dikeluarkan secara rawak satu demi satu tanpa dikembalikan, cari kebarangkalian bahawa guli kedua ialah merah. [3 *markah*]

Answer / Jawapan:

24
3

25 Given X is a continuous random variable of a normal distribution with a mean of 38 and a standard deviation of 5.

Diberi X ialah pemboleh ubah rawak selanjar bagi satu taburan normal dengan min 38 *dan sisihan piawai* 5.

Find
Cari

(*a*) the z-score when $X = 47$.
skor-z apabila $X = 47$.

(*b*) the value of m, when $P(Z < m) = 0.2257$. [4 *marks*]
nilai m, apabila $P(Z < m) = 0.2257$. [4 *markah*]

Answer / Jawapan:

(*a*)

25
4

(*b*)

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END OF QUESTION PAPER
KERTAS SOALAN TAMAT

INFORMATION FOR CANDIDATES
MAKLUMAT UNTUK CALON

1. This question paper consists of **25** questions.
Kertas soalan ini mengandungi **25** *soalan.*

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

3. Write your answers in the spaces provided in the question paper.
Tulis jawapan anda dalam ruang yang disediakan dalam kertas soalan.

4. Show your working. It may help you to get *marks.*
Tunjukkan langkah-langkah penting dalam kerja mengira anda. 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 to 4.
Satu senarai rumus disediakan di halaman 2 *hingga* 4.

9. A list of the upper tail probability $Q(z)$ for the normal distribution is provided on page 5.
Satu senarai kebarangkalian hujung atas $Q(z)$ *bagi taburan normal disediakan di halaman* 5.

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

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.

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JABATAN PELAJARAN NEGERI

WILAYAH PERSEKUTUAN

PEPERIKSAAN PERCUBAAN SPM 2012

PERATURAN PEMARKAHAN

ADDITIONAL MATHEMATICS

PAPER 1

This mark scheme consists of 6 printed pages

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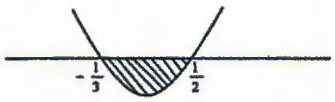
Number	Solution and marking scheme	Sub Marks	Full Marks
1	(*a*) 2 (*b*) {4, 12, 16}	1 1	2
2	$a=2$, $b=-13$ $a=2$ *or* $b=-13$ $2x^2+8x-5=a(x+2)^2+b$	3 B2 B1	3
3	(*a*) $f(x)=5-6x$ $y=\frac{5-x}{6}$ or $x=\frac{5-y}{6}$ (*b*) –7	2 B1 1	3
4	$-\frac{1}{3}\le x\le\frac{1}{2}$ $(2x-1)(3x+1)\le 0$ or  $6x^2-x-1\le 0$	3 B2 B1	3
5	$6x^2-5x-1=0$ $\frac{1}{2\alpha}+\frac{1}{2\beta}=\frac{5}{6}$ or $\left(\frac{1}{2\alpha}\right)\left(\frac{1}{2\beta}\right)=-\frac{1}{6}$ $\alpha+\beta=-\frac{5}{2}$ and $(\alpha)(\beta)=-\frac{3}{2}$	3 B2 B1	3
6	$a=-1$, $m=2$, $n=10$ $a=-1$ and $m=2$ or $n=10$ $-\lfloor (x+2)^2-10 \rfloor$ $-\left[x^2+4x+\left(\frac{4}{2}\right)^2-\left(\frac{4}{2}\right)^2-6 \right]$ or $(x+2)^2$	4 B3 B2 B1	4
7	$k=\frac{2}{3}h$ $\frac{k}{h}\times-\frac{3}{2}=-1$ $m_1=\frac{k}{h}$ *or* $m_2=-\frac{3}{2}$	3 B2 B1	3

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Number	Solution and marking scheme	Sub Marks	Full Marks
8	$\frac{4+3p}{p}$ *or* $\frac{4}{p}+3$	3	3
	$\frac{\log_2 2^4 + \log_2 x^3}{\log_2 x}$ (Use laws of logarithm & change base)	B2	
	$\frac{\log_2 2^4 x^3}{\log_2 x}$ (Use laws of logarithm or change base)	B1	
9	0.7325 (at least 4 sig fig)	3	3
	$y+1=\frac{\log_{10} 45}{\log_{10} 9}$ *or* $y=\frac{\log_{10} 5}{\log_{10} 9}$	B2	
	$(y+1)\log_{10} 9 = \log_{10} 45$ *or* $y \log_{10} 9 = \log_{10} 5$	B1	
10	$p = -7$	3	3
	$5(2p + 6) = 2p - 26$ (Solving Simultaneous Eq)	B2	
	$a = 2p + 6$ or $5a = 2p - 26$	B1	
11	(*a*) $r = -\frac{1}{5}$	2	4
	$ar^3 = -20$ or $-20 + ar^4 = -16$ or $ar^4 = 4$	B1	
	(*b*) $2\,083\frac{1}{3}$ or $\frac{6250}{3}$	2	
	$\frac{2500}{1-(-\frac{1}{5})}$	B1	
12	(*a*) $\log_{10} y = (-\log_{10} 5)x + \log_{10} p$	1	3
	(*b*) $p = 10^{-6}$	2	
	$\log_{10} p = -6$	B1	

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Number	Solution and marking scheme	Sub Marks	Full Marks
13	$2x+9y+7=0$ *or equivalent* Midpoint $(-8, 1)$ and Gradient $=-\frac{2}{9}$ Midpoint $(-8, 1)$ or Gradient $=-\frac{2}{9}$	3 B2 B1	3
14	$x=18.44°, 108.44°, 198.44°, 288.44°$ *(all angles)* $x=18.44°, 108.44°$ or $198.44°, 288.44°$ $2x=36.87, 216.87, 396.87, 576.87$ } *or* $(3\tan x-1)(\tan x+3)=0$ } $\frac{2\tan x}{1-\tan^2 x}=\frac{3}{4}$ *or* $\tan 2x=\frac{3}{4}$	4 B3 B2 B1	4
15	(*a*) $\tan A=-\frac{5}{12}$ (*b*) $-\frac{63}{65}$ $-\frac{12}{13}\times\frac{8}{10}-\frac{5}{13}\times\frac{6}{10}$	1 2 B1	3
16	$\overrightarrow{OS}=\frac{39}{4}\underset{\sim}{x}+\frac{21}{2}\underset{\sim}{y}$ or $\overrightarrow{OS}=\frac{3}{4}(13\underset{\sim}{x}+14\underset{\sim}{y})$ $\overrightarrow{OQ}=14\underset{\sim}{y}+13\underset{\sim}{x}$ $\overrightarrow{OS}=\frac{3}{4}\overrightarrow{OQ}$	3 B2 B1	3
17	$k=-24$ $18\times 16=-12k$ $\frac{18}{k}=\frac{-12}{16}$ OR $k=-24$ $k\lambda=18$ and $16\lambda=-12$ $k\lambda=18$ or $16\lambda=-12$ *OR* $\begin{pmatrix}18\\-12\end{pmatrix}=\lambda\begin{pmatrix}k\\16\end{pmatrix}$	3 B2 B1 3 B2 B1	3

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Number	Solution and marking scheme	Sub Marks	Full Marks
18	(*a*) $\bar{x} = 15$ (*b*) variance = 37.5 $\text{var} = \frac{2100}{8} - 15^2$	1 2 B1	3
19	$-\frac{2}{7}$ $f'(2) = \frac{(4(2)-1)2 - 4(2(2)+3)}{(4(2)-1)^2}$ $f'(x) = \frac{(4x-1)2 - 4(2x+3)}{(4x-1)^2}$	3 B2 B1	3
20	$k = \frac{11}{8}$ $5 - \left[\left(\frac{k(6)^2}{2}\right) - \left(\frac{k(2)^2}{2}\right)\right] = -17$ $5 - \left[\frac{kx^2}{2}\right]_2^6 = -17$	3 B2 B1	3
21	$a = 5$ and $b = 8$ $a = 5$ or $b = 8$ $a - \frac{b}{2^2} = 3$ *or* $4a - b = 12$ *or solve simultaneously* $\frac{dy}{dx} = a - \frac{b}{x^2}$ *or* $14 = a(2) + \frac{b}{2}$	4 B3 B2 B1	4
22	32 $s_{RS} = 2 \times 8 = 16$ $\theta = 2$ rad or s_{PQ}, $12 = 6\theta$	3 B2 B1	3

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Number	Solution and marking scheme	Sub Marks	Full Marks
23	(*a*) 360 $^6P_4$ (*b*) 240 $5\times4\times3\times4$	2 B1 2 B1	4
24	$\frac{3}{7}$ $\left(\frac{3}{7}\times\frac{2}{6}\right)+\left(\frac{4}{7}\times\frac{3}{6}\right)$ $\frac{3}{7}\times\frac{2}{6}$ or $\frac{4}{7}\times\frac{3}{6}$	3 B2 B1	3
25	(*a*) $z=1.8$ $z=\frac{47-38}{5}$ (*b*) $m=-0.753$ 0.753	2 B1 2 B1	4

END OF MARK SCHEME

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TRIAL SPM 2012

ADDITIONAL MATHEMATICS PAPER 1

SUMMARY : TEST SPECIFICATION TABLE

Question	Component	Topics	Knowledge	Understanding	Application	Analysis	Synthesis	Evaluation	Level	Marks
1	A	Function	X						L	2
2	A	Function		X					L	3
3	A	Function		X					L	3
4	A	Quad. Equation			X				I	3
5	A	Quad. Function			X				I	3
6	A	Quad. Function		X					L	4
7	A	Coordinate geometry		X					L	3
8	A	Indices & Log			X				I	3
9	A	Indices & Log			X				L	3
10	A	Progressions			X				I	3
11	A	Progressions			X				H	4
12	A	Linear Law			X				H	3
13	G	Coordinate geometry			X				L	3
14	T	Trigonometry		X					L	4
15	T	Trigonometry			X				I	3
16	G	Vectors			X				L	3
17	G	Vectors		X					I	3
18	S	Statistics			X				L	3
19	C	Differentiation			X				I	3
20	C	Integration		X					I	3
21	C	Differentiation			X				L	4
22	T	Circ. Measures			X				L	3

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Question	Component	Topics	Knowledge	Understanding	Application	Anaylisis	Synthesis	Evaluation	Level	Marks
23	S	Statistics		X					L	4
24	S	Probability		X					I	3
25	S	Probability Distribution			X				H	4
		Frequency	4	9	15	0	0		**Jum**	**80**
		Percentage	14%	32%	54%	0%	0%			
			46%		54%		0%			

Component	Frequency
Algebra	12
Geometry	3
Statistics	4
Calculus	3
Trigonometry	3

Level of Difficulty		Frequency
(H)	High	3
(I)	Intermediate	9
(L)	Low	13

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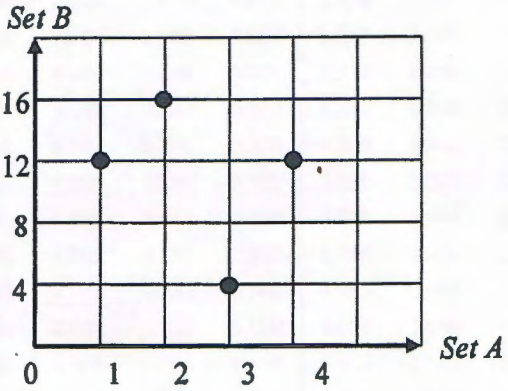
Answer **all** questions.
Jawab **semua** *soalan.*

1 Diagram 1 shows the relation between set *A* and set *B*.
Rajah 1 *menunjukkan hubungan antara set A dan set B.*



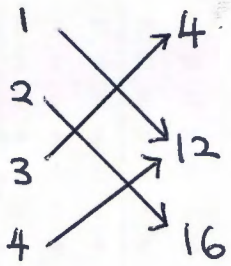


Diagram 1
Rajah 1

State
Nyatakan

(*a*) the object of 16,
objek bagi 16,

(*b*) the range of the relation. [2 *marks*]
julat hubungan itu. [2 *markah*]

Answer/Jawapan :

(*a*) 2 ✓

(*b*) {4, 12, 16} ✓

1
2

---

2 Given the function $g(x) = x+2$ and $h(x) = ax^2 + b$. If $hg(x) = 2x^2 + 8x - 5$, find the value of *a* and of *b*. [3 *marks*]
Diberi fungsi $g(x) = x+2$ *dan* $h(x) = ax^2 + b$. *Jika* $hg(x) = 2x^2 + 8x - 5$, *cari nilai bagi a dan b.* [3 *markah*]

Answer / Jawapan:

$h(x) = ax^2 + b$

$h[g(x)] = a[g(x)]^2 + b$

$hg(x) = a(x+2)^2 + b$

$hg(x) = a(x^2 + 4x + 4) + b$

$hg(x) = ax^2 + 4ax + 4a + b$ ✓

compare:

$hg(x) = 2x^2 + 8x - 5$

$\therefore a = 2$ ✓

$4a + b = -5$

$4(2) + b = -5$

$8 + b = -5$

$b = -5 - 8$

$b = -13$ ✓

2
3

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3. Given that $f^{-1}: x \to \frac{5-x}{6}$, find

Diberi $f^{-1}: x \to \frac{5-x}{6}$, *cari*

(*a*) function $f(x)$,
fungsi $f(x)$,

(*b*) the value of $f(2)$.
nilai $f(2)$.

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

Answer/Jawapan :

(*a*) $f^{-1}: x \to \frac{5-x}{6}$

$f^{-1}(x) = \frac{5-x}{6}$

let $f(x) = Q$

$x = f^{-1}(Q)$

$x = \frac{5-Q}{6}$ ✓

$6x = 5-Q$

$6x+Q = 5$

$Q = 5-6x$

$f(x) = 5-6x$ ✓

(*b*)

$f(x) = 5-6x$

$f(2) = 5-6(2)$

$f(2) = -7$ ✓

3

3

---

4 Find the range of values of x for $2(3x^2 - x) \le 1 - x$.
Cari julat nilai x *bagi* $2(3x^2 - x) \le 1 - x$.

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

Answer/Jawapan :

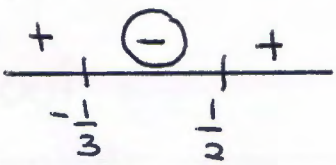
$2(3x^2 - x) \le 1 - x$

$6x^2 - 2x \le 1 - x$

$6x^2 - 2x + x \le 1$

$6x^2 - x - 1 \le 0$ ✓

$(3x+1)(2x-1) \le 0$ ✓



∴ the range is

$-\frac{1}{3} \le x \le \frac{1}{2}$ ✓

Let:

$3x+1=0$ (or) $2x-1=0$

$3x=-1$ $2x=1$

$x=-\frac{1}{3}$ $x=\frac{1}{2}$

4

3

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5 Given that α and β are the roots of the quadratic equation $2x^2+5x-3=0$, form a quadratic equation which has roots $\frac{1}{2\alpha}$ and $\frac{1}{2\beta}$. [3marks]

Diberi bahawa α dan β adalah punca-punca bagi persamaan kuadratik $2x^2+5x-3=0$, bentukkan persamaan kuadratik dengan punca-punca $\frac{1}{2\alpha}$ dan $\frac{1}{2\beta}$. [3markah]

Answer /Jawapan:

$2x^2+5x-3=0$

$x^2+\frac{5}{2}x-\frac{3}{2}=0$

$\alpha+\beta=-\frac{5}{2}$

$\alpha\beta=-\frac{3}{2}$ ✓

$\frac{1}{2\alpha}+\frac{1}{2\beta}$

$=\frac{\beta}{2\alpha\beta}+\frac{\alpha}{2\alpha\beta}$

$=\frac{\alpha+\beta}{2\alpha\beta}$

$=\frac{(-\frac{5}{2})}{2(-\frac{3}{2})}$

$=\frac{5}{6}$

$\frac{1}{2\alpha}\left(\frac{1}{2\beta}\right)$

$=\frac{1}{4\alpha\beta}$

$=\frac{1}{4(-\frac{3}{2})}$

$=-\frac{1}{6}$ ✓

equation:

$x^2-\frac{5}{6}x-\frac{1}{6}=0$

$6x^2-5x-1=0$ ✓

5 | 3

6 The quadratic function $f(x)=6-4x-x^2$, can be expressed in the form of $f(x)=a(x+m)^2+n$, where *a*, *m* and *n* are constants. Find the values of a, *m* and *n*. [4 marks]

Fungsi kuadratik $f(x)=6-4x-x^2$, boleh diungkap dalam bentuk $f(x)=a(x+m)^2+n$ dengan keadaan a, m dan n ialah pemalar. Cari nilai a, m dan n. [4 markah]

Answer /Jawapan:

$f(x)=6-4x-x^2$

$f(x)=-x^2-4x+6$

$f(x)=-(x^2+4x-6)$

$f(x)=-\left[(x+\frac{4}{2})^2-(\frac{4}{2})^2-6\right]$

$f(x)=-\left[(x+2)^2-10\right]$

$f(x)=-(x+2)^2+10$ ✓

compare:

$f(x)=a(x+m)^2+n$

$\therefore a=-1$ ✓

$m=2$ ✓

$n=10$ ✓

6 | 4

7 The straight lines $hy=kx+5$ and $2y+3x-1=0$, where *h* and *k* are constants, are perpendicular. Express *k* in terms of *h*. [3 marks]

Persamaan garis lurus $hy=kx+5$ dan $2y+3x-1=0$, dengan keadaan h dan k ialah pemalar, adalah berserenjang. Ungkapkan k dalam sebutan h. [3 markah]

Answer /Jawapan:

$hy=kx+5$

$y=\frac{kx+5}{h}$

$y=\frac{k}{h}x+\frac{5}{h}$

$m_A=\frac{k}{h}$

$2y+3x-1=0$

$2y=-3x+1$

$y=\frac{-3x+1}{2}$

$y=-\frac{3}{2}x+\frac{1}{2}$

$m_B=-\frac{3}{2}$ ✓

$m_A \times m_B=-1$

$\frac{k}{h}\times(-\frac{3}{2})=-1$ ✓

$\frac{k}{h}=\frac{-1}{(-\frac{3}{2})}$

$\frac{k}{h}=\frac{2}{3}$

$k=\frac{2h}{3}$ ✓

7 | 3

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8. Given that $\log_2 x = p$, find $\log_x 16x^3$ in terms of p. [3 *marks*]

Diberi $\log_2 x = p$, *cari* $\log_x 16x^3$ *dalam sebutan* p. [3 *markah*]

Answer /Jawapan:

$$\log_x 16x^3$$

$$= \frac{\log_2 16x^3}{\log_2 x} \checkmark$$

$$= \frac{\log_2 16 + \log_2 x^3}{\log_2 x} \checkmark$$

$$= \frac{\log_2 2^4 + 3\log_2 x}{\log_2 x}$$

$$= \frac{4 + 3p}{p} \checkmark$$

8 3

---

9 Solve the equation $9^{y+1} = 45$. [3 *marks*]

Selesaikan persamaan $9^{y+1} = 45$. [3 *markah*]

Answer/Jawapan :

$$9^{y+1} = 45$$

$$\log 9^{y+1} = \log 45 \checkmark$$

$$(y+1)\log 9 = \log 45 \checkmark$$

$$y+1 = \frac{\log 45}{\log 9}$$

$$y = \frac{\log 45}{\log 9} - 1$$

$$y = 0.7325 \checkmark$$

9 3

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10 The third term of an arithmetic progression is $10 + 2p$ and the sum of the first 5 terms of the progression is $2p - 6$, where p is a constant. Given that the common difference of the progression is 2, find the value of p. [3 *marks*]

Sebutan ketiga suatu janjang aritmetik ialah $10 + 2p$ *dan hasil tambah 5 sebutan pertama janjang itu ialah* $2p - 9$, *dengan keadaan p ialah pemalar. Diberi beza sepunya janjang aritmetik itu ialah 2, carikan nilai p.* [3 *markah*]

Answer/Jawapan :

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

$T_3 = a + (3-1)(2)$

$T_3 = a + 4$

$10 + 2p = a + 4$

$a + 4 = 10 + 2p$

$a = 10 + 2p - 4$

$a = 6 + 2p$ — (i) ✓

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

$S_5 = \frac{5}{2}(2a + (5-1)(2))$

$S_5 = \frac{5}{2}(2a + 8)$

$S_5 = \frac{5}{2}(2)(a+4)$

$S_5 = 5(a+4)$

$S_5 = 5a + 20$

$S_5 = 5(6+2p) + 20$ ✓

$S_5 = 30 + 10p + 20$

$S_5 = 50 + 10p$

$2p - 6 = 50 + 10p$

$-6 - 50 = 10p - 2p$

$-56 = 8p$

$8p = -56$

$p = -\frac{56}{8}$

$p = -7$ ✓

10

3

---

11 The 4th term of a geometric progression is -20. The sum of the 4th term and the 5th term is -16.

Sebutan ke-4 suatu janjang geometri ialah -20. *Hasil tambah sebutan ke-4 dan ke-5 ialah* -16.

Find
Cari

(*a*) the common ratio of the progression,
nisbah sepunya janjang itu,

(*b*) the sum to infinity of the progression. [4 *marks*]
hasil tambah ketakterhinggaan janjang itu. [4 *markah*]

Answer/Jawapan :

(*a*) $T_4 = -20$

$ar^{4-1} = -20$

$ar^3 = -20$

$a = \frac{-20}{r^3}$ — (i)

$T_4 + T_5 = -16$

$-20 + T_5 = -16$

$T_5 = -16 + 20$

$T_5 = 4$

$ar^{5-1} = 4$

$ar^4 = 4$

$a = \frac{4}{r^4}$ — (ii)

(i) = (ii)

$\frac{-20}{r^3} = \frac{4}{r^4}$ ✓

$\frac{r^4}{r^3} = \frac{4}{-20}$

$r = -\frac{1}{5}$ ✓

(*b*) $a = \frac{-20}{r^3}$

$a = \frac{-20}{(-\frac{1}{5})^3}$

$a = 2500$

$S_\infty = \frac{a}{1-r}$

$S_\infty = \frac{2500}{1-(-\frac{1}{5})}$ ✓

$S_\infty = \frac{2500}{\frac{6}{5}}$

$S_\infty = 2083\frac{1}{3}$ ✓

11

4

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12 The variables x and y are related by the equation $y = \frac{p}{5^x}$, where p is a constant. Diagram 12 shows the straight line graph obtained by plotting $\log_{10} y$ against x.

Pemboleh ubah x dan y dihubungkan oleh persamaan $y = \frac{p}{5^x}$ *.dengan keadaan p adalah pemalar. Rajah* 12 *menunjukkan graf garis lurus yang diperoleh dengan memplot* $\log_{10} y$ *melawan x .*

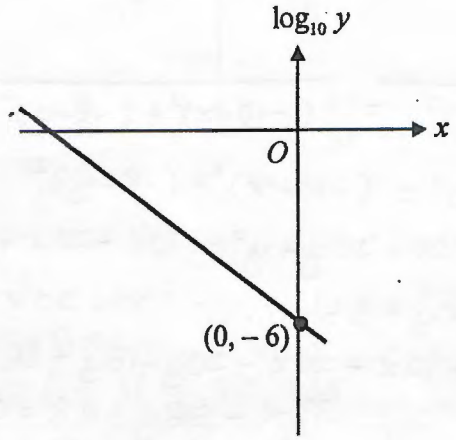

Diagram 12
Rajah 12

(*a*) Express the equation $y = \frac{p}{5^x}$ in the linear form used to obtain the straight line graph shown in Diagram 12.

Ungkapkan persamaan $y = \frac{p}{5^x}$ *dalam bentuk linear yang digunakan untuk memperoleh graf garis lurus seperti ditunjukkan dalam Rajah* 12.

(*b*) Find the value of p.
Cari nilai p.

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

Answer / Jawapan :

(*a*) $y = \frac{p}{5^x}$

$\log y = \log\left(\frac{p}{5^x}\right)$

$\log y = \log p - \log 5^x$

$\log y = \log p - x \log 5$

$\log y = -x \log 5 + \log p$

$\log y = (-\log 5)x + \log p$ ✓

(*b*)

$\log p$ = y-intercept

$\log p = -6$ ✓

$10^{-6} = p$

$p = 10^{-6}$ ✓

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12

3

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13 Given points $A(-6, 10)$ and $B(-10, -8)$. Find the equation of the perpendicular bisector of the straight line AB. [3 *marks*]

Diberi titik-titik $A(-6, 10)$ *dan* $B(-10, -8)$. *Carikan persamaan pembahagi dua sama serenjang bagi garis lurus* AB. [3 *markah*]

Answer /Jawapan:

Let $P(x, y)$

$AP = BP$

$\sqrt{(-6-x)^2+(10-y)^2} = \sqrt{(-10-x)^2+(-8-y)^2}$ ✓

$(-6-x)^2+(10-y)^2 = (-10-x)^2+(-8-y)^2$ ✓

$36+12x+x^2+100-20y+y^2 = 100+20x+x^2+64+16y+y^2$

$x^2+y^2+12x-20y+36+100 = 100+20x+x^2+64+16y+y^2$

$x^2-x^2+y^2-y^2+12x-20x-20y-16y+36+100-100-64=0$

$-8x-36y-28=0$

$-2x-9y-7=0$

$2x+9y+7=0$ ✓

13 ☐ 3

---

14 Solve $\cot 2x = \frac{4}{3}$ for $0° \le x \le 360°$. [4 *marks*]

Selesaikan kot $2x = \frac{4}{3}$ *bagi* $0° \le x \le 360°$. [4 *markah*]

Answer / Jawapan:

$\cot 2x = \frac{4}{3}$

$\frac{1}{\tan 2x} = \frac{4}{3}$

$\tan 2x = \frac{3}{4}$ ✓

$2x = \tan^{-1}\left(\frac{3}{4}\right)$ ✓

$x = 18°26',\ 108°26',\ 198°26',\ 288°26'$

✓ ✓

14 ☐ 4

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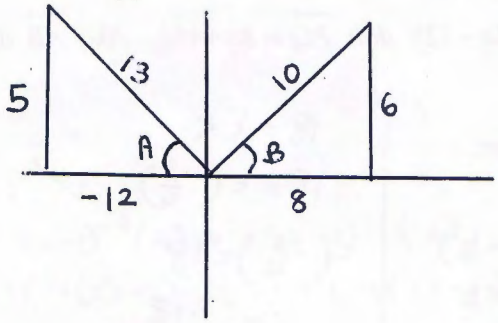
15 Given that $\sin A = \frac{5}{13}$ and $\cos B = \frac{8}{10}$, where A is an obtuse angle and B is an acute angle.

Diberi $\sin A = \frac{5}{13}$ *dan* $\kos B = \frac{8}{10}$, *dengan keadaan A ialah sudut cakah dan B ialah sudut tirus.*



Find
Cari

(*a*) tan *A*

(*b*) cos (*A* + *B*)
kos (*A* + *B*)

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

Answer /Jawapan:

(*a*) $\tan A = \frac{5}{-12}$ ✓

(*b*) $\cos(A+B)$
$= \cos A \cos B - \sin A \sin B$
$= \left(-\frac{12}{13}\right)\left(\frac{8}{10}\right) - \left(\frac{5}{13}\right)\left(\frac{6}{10}\right)$ ✓
$= -\frac{48}{65} - \frac{3}{13}$
$= -\frac{63}{65}$ ✓

15
3

16 Diagram 16 shows a rectangle *OPQR* and the point *S* lies on the straight line *OQ*.
Rajah 16 *menunjukkan sebuah segi empat tepat OPQR dan titik S terletak pada garis lurus OQ.*

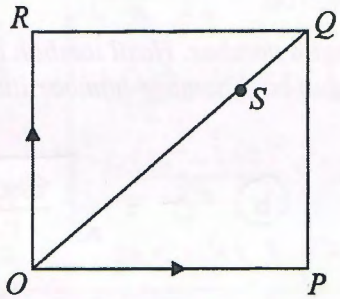


Diagram 16
Rajah 16

It is given that $\overrightarrow{OP} = 13\underset{\sim}{x}$, $\overrightarrow{OR} = 14\underset{\sim}{y}$ and $OS = 3SQ$. Express $\overrightarrow{OS}$ in terms of $\underset{\sim}{x}$ and $\underset{\sim}{y}$.
[3 *marks*]

Diberi bahawa $\overrightarrow{OP} = 13\underset{\sim}{x}$, $\overrightarrow{OR} = 14\underset{\sim}{y}$ dan $OS = 3SQ$. *Ungkapkan* $\overrightarrow{OS}$ *dalam sebutan* $\underset{\sim}{x}$ *dan* $\underset{\sim}{y}$.

[3 *markah*]

Answer /Jawapan:

16
3

$\overrightarrow{OS}$
$= 13\underset{\sim}{x} + 14\underset{\sim}{y} + \frac{1}{4}\overrightarrow{QO}$ ✓
$= 13\underset{\sim}{x} + 14\underset{\sim}{y} + \frac{1}{4}(-\overrightarrow{OQ})$
$= 13\underset{\sim}{x} + 14\underset{\sim}{y} + \frac{1}{4}(-)(14\underset{\sim}{y} + 13\underset{\sim}{x})$ ✓
$= 13\underset{\sim}{x} + 14\underset{\sim}{y} - \frac{13}{4}\underset{\sim}{x} - \frac{14}{4}\underset{\sim}{y}$
$= \frac{39}{4}\underset{\sim}{x} + \frac{21}{2}\underset{\sim}{y}$ ✓

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17 It is given that $\overrightarrow{AB} = 18\underset{\sim}{a} - 12\underset{\sim}{b}$ and $\overrightarrow{PQ} = k\underset{\sim}{a} + 16\underset{\sim}{b}$. If $\overrightarrow{AB}$ is parallel to $\overrightarrow{PQ}$, find the value of k. [3 marks]

Diberi $\overrightarrow{AB} = 18\underset{\sim}{a} - 12\underset{\sim}{b}$ *dan* $\overrightarrow{PQ} = k\underset{\sim}{a} + 16\underset{\sim}{b}$. *Jika* $\overrightarrow{AB}$ *adalah selari dengan* $\overrightarrow{PQ}$, *cari nilai k.* [3 *markah*]

Answer/ Jawapan:

$\overrightarrow{AB} = * \overrightarrow{PQ}$

$18\underset{\sim}{a} - 12\underset{\sim}{b} = *(k\underset{\sim}{a} + 16\underset{\sim}{b})$

$18\underset{\sim}{a} - 12\underset{\sim}{b} = k*\underset{\sim}{a} + 16*\underset{\sim}{b}$

$-12 = 16*$

$16* = -12$

$* = \frac{-12}{16}$

$* = -\frac{3}{4}$

$18 = k*$

$18 = k(-\frac{3}{4})$ ✓

$k(-\frac{3}{4}) = 18$

$k = \frac{18}{(-\frac{3}{4})}$

$k = -24$ ✓

17

3

18 A set of data consists of 8 numbers. The sum of the numbers is 120 and the sum of the squares of the numbers is 2100.

Satu set data mengandungi 8 *nombor. Hasil tambah bagi nombor-nombor itu ialah* 120 *dan hasil tambah kuasa dua bagi nombor-nombor itu ialah* 2100.

Find, for the 5 numbers,

Cari, bagi 5 *nombor itu,*

(*a*) the mean,
min,

(*b*) the variance.
varians.

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

Answer / Jawapan :

(a) $\bar{x} = \frac{\Sigma x}{n}$

$\bar{x} = \frac{120}{8}$

$\bar{x} = 15$ ✓

(b) $\sigma = \sqrt{\frac{\Sigma x^2}{n} - \bar{x}^2}$

$\sigma^2 = \frac{\Sigma x^2}{n} - \bar{x}^2$

Variance $= \frac{2100}{8} - (15)^2$ ✓

Variance $= 37.5$ ✓

18

3

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19 Given that $f(x)=\frac{2x+3}{4x-1}$, find the value of $f'(2)$. [3 marks]

Diberi $f(x)=\frac{2x+3}{4x-1}$, *cari nilai* $f'(2)$, [3 *markah*]

Answer / Jawapan :

$f(x)=\frac{2x+3}{4x-1}$

$f(x)=(2x+3)(4x-1)^{-1}$

$f'(x)=(2x+3)(-1)(4x-1)^{-2}(4)+(4x-1)^{-1}(2)$ ✓

$f'(2)=(2(2)+3)(-1)(4(2)-1)^{-2}(4)+(4(2)-1)^{-1}(2)$ ✓

$f'(2)=-\frac{2}{7}$ ✓

19 [3]

---

20 Given that $\int_2^6 g(x)\,dx=5$ and $\int_2^6 [g(x)-kx]\,dx=-17$. Find the value of k. [3 marks]

Diberi $\int_2^6 g(x)\,dx=5$ *dan* $\int_2^6 [g(x)-kx]\,dx=-17$. *Cari nilai k.* [3 *markah*]

Answer / Jawapan:

$\int_2^6 [g(x)-kx]\,dx=-17$

$\int_2^6 g(x)\,dx-\int_2^6 kx\,dx=-17$

$5-\int_2^6 kx\,dx=-17$ ✓

$-\int_2^6 kx\,dx=-17-5$

$-\int_2^6 kx\,dx=-22$

$\int_2^6 kx\,dx=22$

$\left[\frac{kx^2}{2}\right]_2^6=22$ ✓

$\frac{k(6)^2}{2}-\frac{k(2)^2}{2}=22$

$\frac{k(6)^2-k(2)^2}{2}=22$

$36k-4k=22(2)$

$32k=44$

$k=\frac{44}{32}$

$k=\frac{11}{8}$ ✓

20 [3]

---

21 The gradient of the normal to the curve $y=ax+\frac{b}{x}$, where a and b are constants, at the point (2, 14) is $-\frac{1}{3}$. Find the value of a and of b. [4 marks]

Kecerunan garis normal kepada lengkung $y=ax+\frac{b}{x}$, *dengan keadaan a dan b adalah pemalar, pada titik* (2, 14) *ialah* $-\frac{1}{3}$. *Cari nilai a dan nilai b.* [4 *markah*]

Answer / Jawapan:

$m_{tangent}\times m_{normal}=-1$

$m_{tangent}\times\left(-\frac{1}{3}\right)=-1$

$m_{tangent}=\frac{-1}{\left(-\frac{1}{3}\right)}$

$m_{tangent}=3$

$y=ax+\frac{b}{x}$

$y=ax+bx^{-1}$

$\frac{dy}{dx}=a+(-1)bx^{-2}$

$\frac{dy}{dx}=a-bx^{-2}$

$3=a-bx^{-2}$

$3+bx^{-2}=a$

$a=3+bx^{-2}\quad -(1)$ ✓

at (2, 14), $y=ax+\frac{b}{x}$

$14=a(2)+\frac{b}{2}$

$14=2a+\frac{b}{2}$

$14=\frac{4a+b}{2}$

$14(2)=4a+b$

$28=4a+b$ ✓

$28=4(3+bx^{-2})+b$

$28=4(3+b(2)^{-2})+b$

$28=12+b+b$

$28=12+2b$

$28-12=2b$

$16=2b$

$2b=16$

$b=\frac{16}{2}$

$b=8$ ✓

$a=3+bx^{-2}$

$a=3+8(2)^{-2}$

$a=5$ ✓

21 [4]

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22 Diagram 22 shows sectors *OPQ* and *ORS* with centre *O*.
Rajah 22 menunjukkan sektor-sektor OPQ dan ORS dengan pusat O.

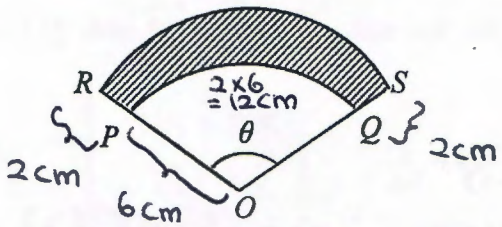

Diagram 22
Rajah 22

Given that *PR* is 2 cm, the length of radius *OR* is 8 cm and the length of arc *PQ* is twice the length of radius *OP*. Find the perimeter of the shaded region. [3 *marks*]

Diberi bahawa PR adalah 2 cm, panjang jejari OR ialah 8 cm dan panjang lengkok PQ adalah dua kali ganda jejari OP. Cari perimeter kawasan berlorek. [3 *markah*]

Answer / Jawapan:

$S = r\theta$
$2 \times 6 = 6\theta$
$12 = 6\theta$

$6\theta = 12$
$\theta = \frac{12}{6}$
$\theta = 2$ rad ✓

$S = r\theta$
$RS = 8(2)$
$RS = 16$cm ✓

Perimeter
$= 2 + 12 + 2 + 16$
$= 32$ cm ✓

22
3

23 Diagram 23 shows six numbered cards.
Rajah 23 menunjukkan enam *keping kad nombor.*

1	2	4	6	8	9

Diagram 23
Rajah 23

A four-digit number is to be formed by using 4 of these cards.
Suatu nombor empat digit hendak dibentuk menggunakan 4 daripada kad-kad itu.

Find the number of ways,
Cari bilangan cara,

(*a*) the different numbers can be formed,
nombor yang berlainan yang dapat dibentuk,

(*b*) the different even numbers can be formed. [4 *marks*]
nombor genap yang berlainan yang dapat dibentuk. [4 *markah*]

Answer/Jawapan : ✓

(*a*) ${}^6P_4 = 360$ ✓

(*b*) ${}^5P_3$ 2 ${}^5P_3$ 6 ∴ ${}^5P_3 \times 4$ ✓
${}^5P_3$ 4 ${}^5P_3$ 8 $= 240$ ✓

23
4

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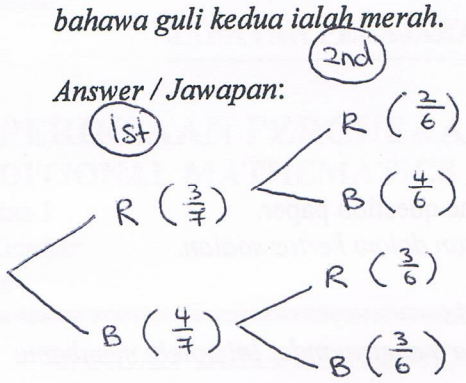
24 There are 3 red marbles and 4 blue marbles in a bag. If the marbles are randomly taken out one by one without replacement, find the probability that the second marble is red.
[3 *marks*]

Sebuah beg mengandungi 3 biji guli merah dan 4 biji guli biru. Jika guli itu dikeluarkan secara rawak satu demi satu tanpa dikembalikan, cari kebarangkalian bahawa guli kedua ialah merah.
[3 *markah*]

Answer / Jawapan:



∴ probability second marble is red
= RR + BR
= $(\frac{3}{7})(\frac{2}{6}) + (\frac{4}{7})(\frac{3}{6})$ ✓ ✓
= $\frac{3}{7}$ ✓

24 | 3

25 Given X is a continuous random variable of a normal distribution with a mean of 38 and a standard deviation of 5.

Diberi X ialah pemboleh ubah rawak selanjar bagi satu taburan normal dengan min 38 *dan sisihan piawai* 5.

Find
Cari

(*a*) the *z*-score when $X = 47$.
skor-z apabila $X = 47$.

(*b*) the value of m, when $P(Z < m) = 0.2257$.
nilai m, apabila $P(Z < m) = 0.2257$.
[4 *marks*]
[4 *markah*]

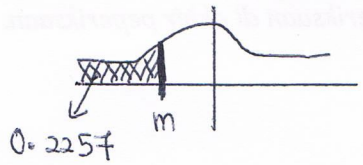
Answer / Jawapan:

(*a*) $Z = \frac{X - \mu}{\sigma}$

$Z = \frac{47 - 38}{5}$ ✓

$Z = 1.8$ ✓

(*b*) $P(z < m) = 0.2257$



∴ $m = -0.753$ ✓ ✓

25 | 4

END OF QUESTION PAPER
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JABATAN PELAJARAN NEGERI WILAYAH PERSEKUTUAN

PEPERIKSAAN PERCUBAAN

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PERATURAN PEMARKAHAN

ADDITIONAL MATHEMATICS

PAPER 2

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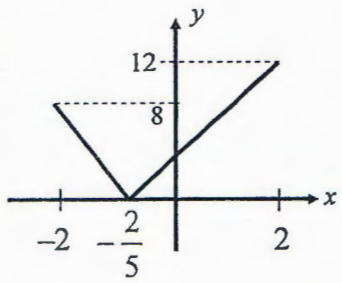
SECTION A

Question	Solution	Sub Mark	Full Mark
1.	$y=\frac{10-2x}{3}$ $4\left(\frac{10-2x}{3}\right)+6x=10x\left(\frac{10-2x}{3}\right)$ $(2x-1)(x-4)=0$ $x=\frac{1}{2}, 4$ $y=3, \frac{2}{3}$ $x=\frac{10-3y}{2}$ $4\left(\frac{10-3y}{2}\right)+6x=10\left(\frac{10-3y}{2}\right)y$ $(3y-2)(y-3)=0$ $y=\frac{2}{3}, 3$ $x=4, \frac{1}{2}$	1 1 1 1 1	[5]
2. **(a)**	(i) Let $y=\frac{4x}{x-2}$ (correct method) $g^{-1}=\frac{-2x}{-x+4}$ or $\frac{2x}{x-4}, x\neq 4$	1 1	2
	(ii) $f(x)=\lvert 2+5(2p)\rvert$, $g^{-1}(3)=12$ any one → $2+10p=12$, $2+10p=-12$ $p=1$, $-\frac{7}{5}$ both correct	1 1 1	3
(b)	 *Shape* : *Three points seen:* (-2, 8), (2, 12), $(-\frac{2}{5}, 0)$ *Range of* $f(x)$: $0 \le f(x) \le 12$	1 1 1	3
			[8]
3. **(a)**	$d=-3$ and $T_8=125$ → $a+7(-3)=125$ $a=146$	1 1 1	3
(b)	$T_n>0$ $146+(n-1)(-3)>0$ $-3n>-149$ $n<49.7$ → $n=49$	1 1	2

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(c)

$S_{10} - S_4$

$S_{10} = \frac{10}{2}[2(146)+9(-3)]$ *or* $S_4 = \frac{4}{2}[2(146)+3(-3)]$ — 1

$\rightarrow S_{10} = 1325, \quad S_4 = 566$

$S_{5 \rightarrow 10} = 1325 - 566$ — 1

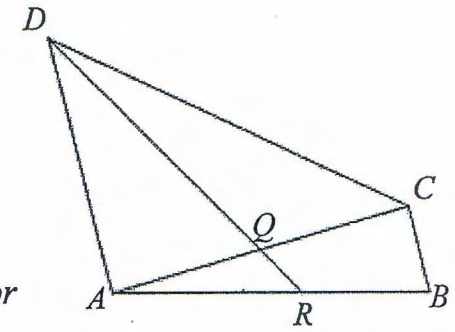
$= 759$ — 1

3

[8]

4.

$AD = 3BC$, $AR:RB = 3:2$



(a)

(i) $AC = AB + BC$

$= 15x + 2y$ ✓ — 1

(ii) $DR = DA + AR$ *or*

$= -6y + 9x$ ✓ — 1, 1

3

(b)

Given $RQ = hRD$, $AQ = kAC$

$RQ = RA + AQ$ *or equivalent*

$h(6y - 9x) = -9x + k(15x + 2y)$ *substitute* — 1

$-9h = -9 + 15k$ } *solve simultaneously* — 1

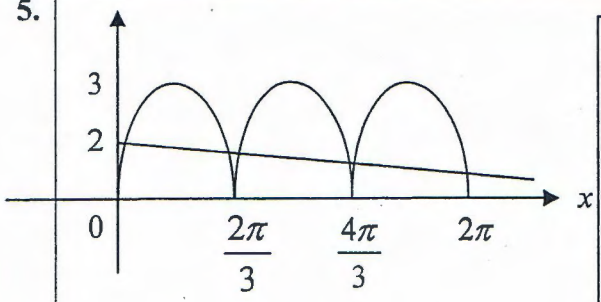
$6h = 2k$

$h = \frac{1}{6}$, $k = \frac{1}{2}$ — 1,1

4

[7]

5.



Shape of sine graph	1
Amplitude = 3	1
1.5 periods	1
Modulus	1
Straight line graph drawn	1
$y = 2 - \frac{x}{2\pi}$ *seen / implied*	1
No of solutions = 6	1

[7]

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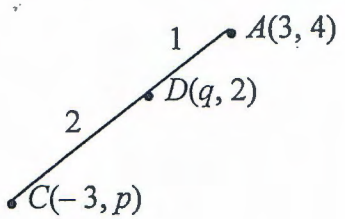
6. (a)	(20.5) or $(34+p)$ or (8 and 10)	1	
	$21.5 = 20.5 + \left(\frac{\frac{1}{4}(34+p)-8}{10}\right)5$	1	3
	$p = 6$	1	
(b)	$\bar{x} = \frac{3(13)+5(18)+10(23)+12(28)+6(33)+4(38)}{40}$	1	2
	$= 26.13$	1	
			[5]

SECTION B

7.	Rujuk Graf		10
8. (a)	$q = \frac{2(3)+1(-3)}{3}$ *or* $2 = \frac{2(4)+1(p)}{3}$	1	
	$p = -2$	1	
	$q = 1$	1	3
(b)	$\frac{1}{2}\begin{vmatrix} 3 & 0 & -3 & 3 \\ 4 & 5 & -2 & 4 \end{vmatrix}$		
	$\frac{1}{2}\lvert\, 3(5)+0+(-3)(4)-0-5(-3)-(-2)(3) \,\rvert$	1	
	$= 12$	1	2
(c)	$m_{AC} = \frac{4-2}{3-1} = 1$	1	
	$y = x + 5$	1	2



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(d)	$PA = AD$ $\sqrt{(y-4)^2+(x-3)^2} = \sqrt{(3-1)^2+(4-2)^2}$ $y^2+x^2-8y-6x+17=0$	1, 1 1	3 [10]
9. (a)	$\frac{dy}{dx} = 2(x+2)$ $m_N = -\frac{1}{2} \rightarrow m_T = 2$ $2(x+2) = 2$ $x = -1 \quad \therefore a = -1$	1 1 1	3
(b)	Area under curve $= \int_0^3 (x+2)^2\, dx$ $\frac{(x+2)^3 3}{3(1)}$ $= \frac{5^3}{3} - \frac{2^3}{3}$ $= 39$ Area of rectangle = 3 x 4 $= 12$ Shaded region = 27 unit^2	1 1 1 1	4
(c)	Volume $= \pi \int_{-1}^{0} (x+2)^4\, dx$ $= \pi \left[\frac{(x+2)^5}{5}\right]_{-1}^{0}$ $= \pi \left[\frac{2^5}{5} - \frac{1^5}{5}\right]$ $= \frac{31}{5}\pi$ unit^3	1 1 1	3 [10]

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10. **(a)**	$2r + 0.88r = 22.55$ $r = 7.83$ cm	1,1 1	3
(b)	$x = 7.83 \sin 0.44^r / \sin 25.21°$ $= 3.335$ cm → length of PSR = 6.67 cm *or* using $PSR^2 = 7.83^2 + 7.83^2 - 2(7.83)(7.83)\cos 0.88^r / \cos 50.41°$ PSR = 6.67 cm	1 1	2
(c)	Area of triangle $= \frac{1}{2}(7.83)^2 \sin 0.88^r$ Area of sector $= \frac{1}{2}(7.83)^2 0.88$ Area of semicircle $= \frac{1}{2}(3.335)^2 (3.142)$ $\frac{1}{2}(3.335)^2 (3.142) - \left[\frac{1}{2}(7.83)^2 0.88 - \frac{1}{2}(7.83)^2 \sin 0.88^r\right]$ $= 14.12$ cm^2	1 1 1 1 1	5 **[10]**
11. **(a)**	(i) $p = \frac{3}{8}$, $q = \frac{5}{8}$ ${}^7C_3 \left(\frac{3}{8}\right)^3 \left(\frac{5}{8}\right)^4$ 0.2816 (ii) ${}^7C_6 \left(\frac{5}{8}\right)^6 \left(\frac{3}{8}\right)^1$ *or* ${}^7C_7 \left(\frac{5}{8}\right)^7 \left(\frac{3}{8}\right)^0$ ${}^7C_6 \left(\frac{5}{8}\right)^6 \left(\frac{3}{8}\right)^1 + {}^7C_7 \left(\frac{5}{8}\right)^7 \left(\frac{3}{8}\right)^0$ = 0.1937	1 1 1 1 1	5

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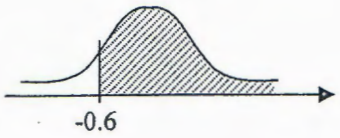
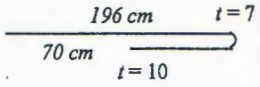
(b)	(i) $z > \frac{3100-3420}{495}$ $z > -0.646$ *or*  0.7409 (calculator) 0.7408 (from table) (ii) $1500 \times (1-0.7409)$ or 1500×0.2591 389	1 1 1 1 1	5 [10]

SECTION C

Question	Solution	Sub Mark	Full Mark
12.			
(a)	(i) $v = -3t^2 + 20t + 7$	1	
	$(3t+11)(t-7) = 0$	1	
	$t = 7$	1	3
	(ii) $s = -t^3 + 10t^2 + 7t$	1	
	$s_{10} = -(10)^3 + 10(10)^2 + 7(10)$ or $s_7 = -(7)^3 + 10(7)^2 + 7(7)$	1	
	 Total distance = $196 + (196 - 70)$	1	4
	$= 322$ m	1	
(b)	$s_Y = t^3 - 9t^2 + 11t$ or substitute $t = 7$	1	
	$= -21$ m		
	Distance between X and $Y = 196 + 21$	1	3
	$= 217$ m	1	
			[10]
13.			
(a)	$\frac{57.20}{P_{08}} \times 100 = 104$	1	
	$P_{08} = RM\ 55$	1	2
(b)	110×130	1	
	$\frac{110 \times 130}{100}$ $\frac{110}{100} \times \frac{130}{100}$	1	3
	$= 143$	1	

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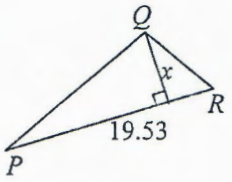
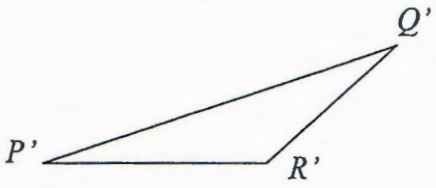
(c)	(i) $40x$ @ $60x$ @ 3900 @ 4160 *(Any one)*	1	
	$\frac{40x + 60x + 3900 + 4160}{100} = 120.6$	1	3
	$x = 40$	1	
	(ii) $\frac{P_{09}}{243.20} \times 100 = 120.6$	1	2
	RM293.30	1	
			[10]
14. (a)	(i) $\frac{1}{2}(12.4)(9.25)\sin Q = 45$	1	
	$\angle PQR = 128.31^\circ$ / $128^\circ 19'$	1	
	(ii) $PR^2 = 12.4^2 + 9.25^2 - 2(12.4)(9.25)\cos 128.31^\circ$	1	
	$PR = 19.53$ cm	1	
	(iii) using Area = $\frac{1}{2}(PR)(x) = 45$ 		
	$\frac{1}{2}(19.53)(x) = 45$	1	6
	$x = 4.608$ cm	1	
	or $\angle QPR = 21.81^\circ$, $\angle QR = 29.88^\circ$		
(b)	(i) 	1	
	(ii) $\frac{\sin PRQ}{12.4} = \frac{\sin 128.31}{19.53}$	1	
	$\angle PRQ = 29.88^\circ$		
	Thus, $\angle P'R'Q' = 180^\circ - 29.88^\circ$	1	4
	$= 150.12^\circ$	1	
			[10]

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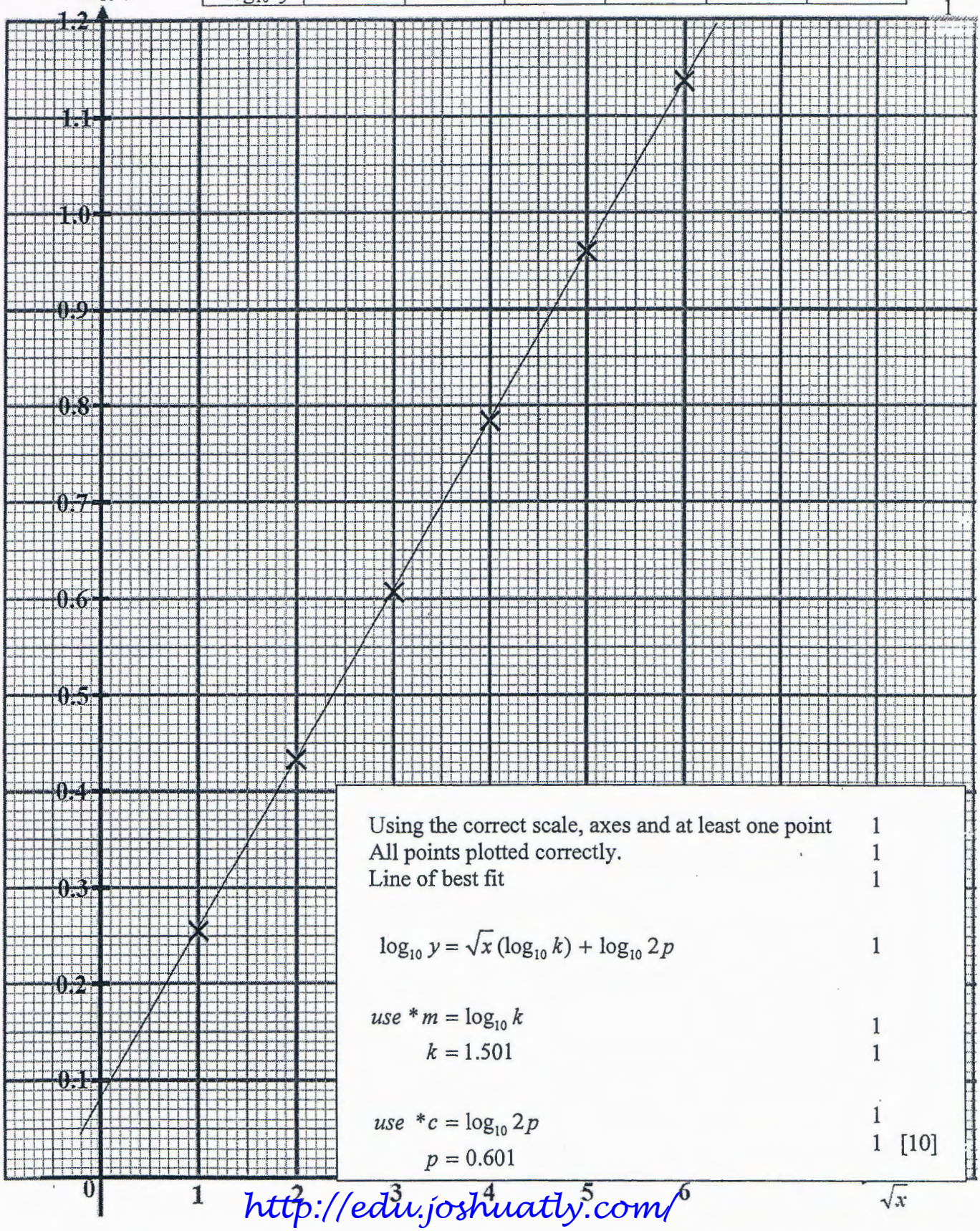
QUESTION 7

$\sqrt{x}$	1	2	3	4	5	6
$\log_{10} y$	0.26	0.43	0.61	0.78	0.96	1.14

1
1



Using the correct scale, axes and at least one point	1
All points plotted correctly.	1
Line of best fit	1
$\log_{10} y = \sqrt{x}(\log_{10} k) + \log_{10} 2p$	1
use $*m = \log_{10} k$	1
$k = 1.501$	1
use $*c = \log_{10} 2p$	1
$p = 0.601$	1 [10]

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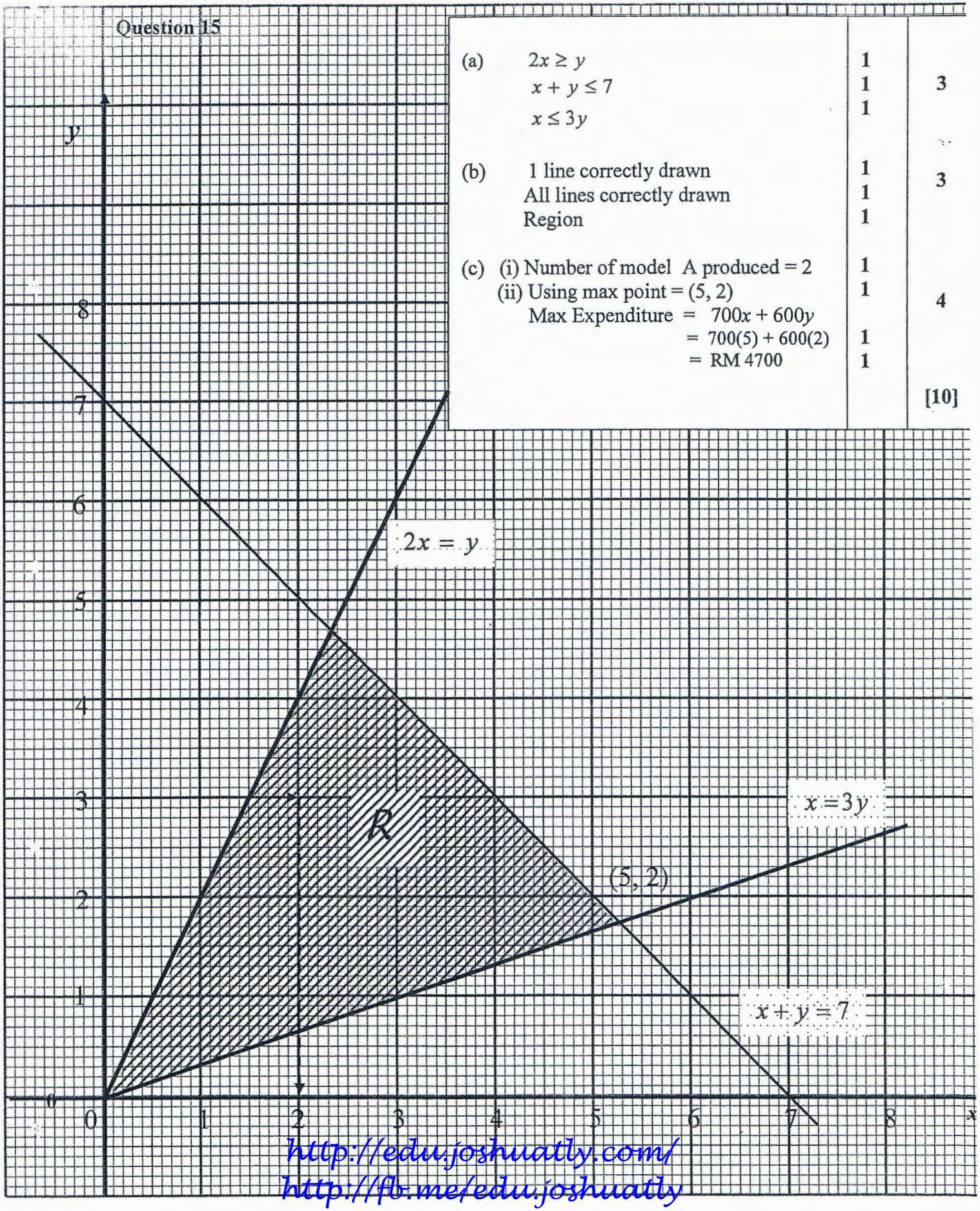
Question 15

(a)	$2x \geq y$	1	
	$x + y \leq 7$	1	3
	$x \leq 3y$	1	
(b)	1 line correctly drawn	1	
	All lines correctly drawn	1	3
	Region	1	
(c)	(i) Number of model A produced = 2	1	
	(ii) Using max point = (5, 2)	1	4
	Max Expenditure = $700x + 600y$		
	= 700(5) + 600(2)	1	
	= RM 4700	1	
			[10]



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Jabatan Pelajaran Negeri Wilayah Persekutuan

TRIAL SPM 2012

ADDITIONAL MATHEMATICS PAPER 2

JADUAL SPESIFIKASI UJIAN

Question	Component	Topics	Knowledge	Understanding	Application	Anaylisis	Synthesis	Evaluation	Level	Marks
1	A	Simulateous Eq.			x				I	5
2	A	Function		x					I	8
3	A	Progression			x				L	8
4	G	Vector		x					L	7
5	T	Trigonometry		x					L	7
6	S	Statistics			x				I	3
7	A	Linear Law			x				H	7
8	G	Geometry Coordinate	x						L	3
9	C	Integration			x				L	2
10	G	Circ. Measures			x				I	8
11	S	Probability Distribution		x					L	2
12	ST	Motion A long Straight Line	x						L	2
13	SS	Index Number			x				L	3
14	ST	Solution of Tri.			x				L	5
15	SS	Linear Programming			x				L	3
		Frequency	2	4	9	0	0		Jum	73
		Percentage	13%	27%	60%	0%	0%			
			40%		60%		0%			

Component	Frequency
Algebra	4
Geometry	3
Statistics	2
Calculus	1
Trigonometry	1
Sains Sosial	2
Sains Teknologi	2

Level of Difficulty		Frequency
(H)	High	1
(I)	Intermediate	4
(L)	Low	10

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JABATAN PELAJARAN NEGERI
WILAYAH PERSEKUTUAN

PEPERIKSAAN PERCUBAAN 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 kertas jawapan.*

Kertas soalan ini mengandungi **20** halaman bercetak.

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[Lihat halaman sebelah

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

Senarai rumus berikut boleh membantu anda menjawab soalan. Simbol-simbol yang diberi adalah yang biasa digunakan.

ALGEBRA

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

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

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

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

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

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

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

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

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

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

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

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

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

CALCULUS
KALKULUS

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

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

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

4 Area under the curve
Luas di bawah lengkung

$= \int_a^b y\,dx$ or (*atau*)

$= \int_a^b x\,dy$

5 Volume of revolution
Isi padu kisaran

$= \int_a^b \pi y^2\,dx$ or (*atau*)

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

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

12 Mean / *Min*, $\mu = np$

13 $\sigma = \sqrt{npq}$

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

GEOMETRY
GEOMETRI

1 Distance / *Jarak*

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

2 Midpoint / *Titik tengah*

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

3 Point that divides a segment of 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 triangle / *Luas segi tiga*

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

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

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

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TRIGONOMETRY
TRIGONOMETRI

1 Arc length, $s = r\theta$

Panjang lengkuk, $s = j\theta$

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

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

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

$sin^2 A + kos^2 A = 1$

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

$sek^2 A = 1 + tan^2 A$

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

$kosek^2 A = 1 + kot^2 A$

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

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

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

$kos\ 2A = kos^2 A - sin^2 A$
$= 2\ kos^2 A - 1$
$= 1 - 2\sin^2 A$

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

$sin(A \pm B) = sin\ A\ kos B \pm kos\ A\ sin\ B$

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

$kos(A \pm B) = kos\ A\ kos\ B \mp sin\ A\ sin\ B$

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

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

14 Area of triangle / *Luas segi tiga*

$= \frac{1}{2} ab \sin C$

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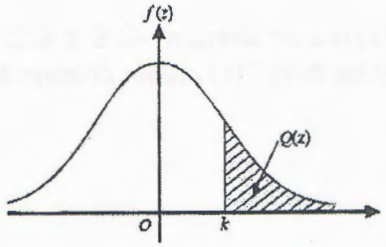
THE UPPER TAIL PROBABILITY Q(z) FOR THE NORMAL DISTRIBUTION N(0, 1)

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	0.0387	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

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

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



Example / *Contoh*:

If $X \sim N(0,1)$, then $P(X > k) = Q(k)$

Jika $X \sim N(0,1)$, *maka* $P(X > k) = Q(k)$

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

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Section A
Bahagian A

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

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

1 Solve the simultaneous equations $2x+3y=\frac{4}{x}+\frac{6}{y}=10$. [5 *marks*]

Selesaikan persamaan serentak $2x+3y=\frac{4}{x}+\frac{6}{y}=10$. [5 *markah*]

2 The functions f and g^{-1} are defined as $f:x \mapsto |2+5x|$ and $g^{-1}:x \mapsto \frac{4x}{x-2}$, $x \neq 2$.

Fungsi f *dan* g^{-1} *ditakrifkan sebagai* $f:x \mapsto |2+5x|$ *dan* $g^{-1}:x \mapsto \frac{4x}{x-2}$, $x \neq 2$.

(*a*) Find
Cari

(*i*) $g(x)$,

(*ii*) the possible values of p if $f(2p)=g^{-1}(3)$.

nilai-nilai p yang mungkin jika $f(2p)=g^{-1}(3)$.

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

(*b*) Sketch the graph of $f(x)$ in the domain of $-2 \leq x \leq 2$.
Hence, state the range of $f(x)$ in the domain. [3 *marks*]

Lakarkan graf bagi $f(x)$ *dalam domain* $-2 \leq x \leq 2$.
Seterusnya, nyatakan julat bagi $f(x)$ *dalam domain itu.* [3 *markah*]

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3 Diagram 3 shows part of the arrangement of circular discs, of the same size, used to decorate a wall. Each subsequent layer is three discs less than the previous ones.

Rajah 3 menunjukkan sebahagian daripada susunan cakera bulat, bersaiz sama, digunakan untuk menghias suatu dinding. Bilangan cakera setiap baris adalah kurang tiga daripada baris yang sebelumnya.

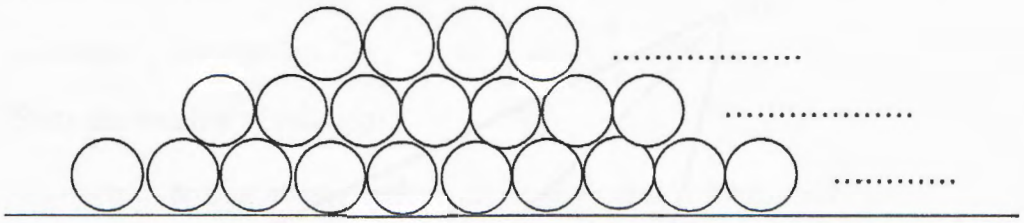

Diagram 3
Rajah 3

Calculate
Hitung

(*a*) the number of discs on the first layer if the number of discs on the eighth layer is 125.

bilangan cakera pada baris pertama jika bilangan cakera pada baris ke lapan adalah 125.

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

(*b*) the number of layers that can be formed.
bilangan baris yang boleh dibentuk.

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

(c) the number of discs from the fifth layer until the tenth layer.
bilangan cakera daripada baris ke lima hingga ke sepuluh.

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

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4 Diagram 4 shows a quadrilateral $ABCD$. The straight lines AC and RD intersect at Q and point R lies on the line AB.

Rajah 4 menunjukkan sisi empat ABCD. Garis-garis lurus AC dan RD bersilang di Q dan titik R terletak pada garis AB.

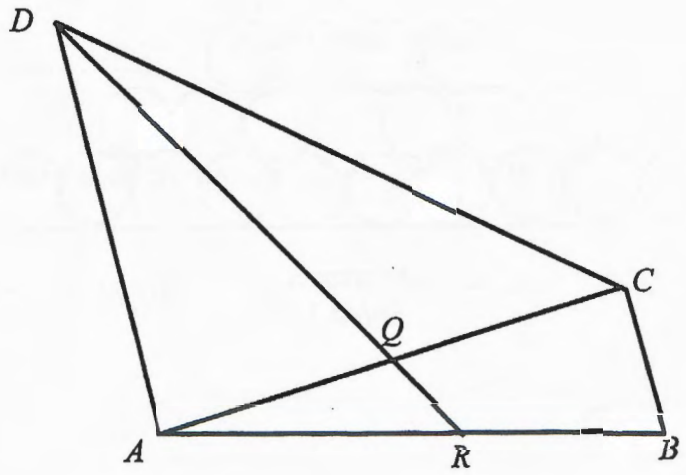

Diagram 4
Rajah 4

Given that $\overrightarrow{AB} = 15\underset{\sim}{x}$, $\overrightarrow{AD} = 6\underset{\sim}{y}$, $\overrightarrow{AD} = 3\overrightarrow{BC}$ and $AR : RB = 3 : 2$.

Diberi bahawa $\overrightarrow{AB} = 15\underset{\sim}{x}$, $\overrightarrow{AD} = 6\underset{\sim}{y}$, $\overrightarrow{AD} = 3\overrightarrow{BC}$ dan $AR : RB = 3 : 2$.

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

(i) $\overrightarrow{AC}$,

(ii) $\overrightarrow{DR}$.

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

(*b*) It is given that $\overrightarrow{RQ} = h\overrightarrow{RD}$ and $\overrightarrow{AQ} = k\overrightarrow{AC}$, where h and k are constants, find the value of h and of k.

[4 *marks*]

Diberi bahawa $\overrightarrow{RQ} = h\overrightarrow{RD}$ *dan* $\overrightarrow{AQ} = k\overrightarrow{AC}$, *dengan h dan k ialah pemalar, cari nilai h dan nilai k.*

[4 *markah*]

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5 (*a*) Sketch the graph of $y = \left| -3 \sin \frac{3}{2} x \right|$ for $0 \le x \le 2\pi$. [4 *marks*]

Lakarkan graf bagi $y = \left| -3 \sin \frac{3}{2} x \right|$ *untuk* $0 \le x \le 2\pi$. [4 *markah*]

(*b*) Hence, using the same axes, sketch a suitable straight line to find the number of solutions to the equation $2 - \left| -3 \sin \frac{3}{2} x \right| = \frac{x}{2\pi}$ for $0 \le x \le 2\pi$.

State the number of solutions. [3 *marks*]

Seterusnya, dengan menggunakan paksi yang sama, lakarkan satu garis lurus yang sesuai untuk mencari bilangan penyelesaian bagi persamaan

$2 - \left| -3 \sin \frac{3}{2} x \right| = \frac{x}{2\pi}$ *untuk* $0 \le x \le 2\pi$.

Nyatakan bilangan penyelesaian itu. [3 *markah*]

6 Table 6 shows the frequency distribution of the ages of a group of tourists who visited Zoo Negara.

Jadual 6 menunjukkan taburan kekerapan umur bagi sekumpulan pelancung yang melawat ke Zoo Negara.

Age (years) *Umur (tahun)*	11 – 15	16 – 20	21 – 25	26 – 30	31 – 35	36 – 40
Frequency *Kekerapan*	3	5	10	12	p	4

Table 6
Jadual 6

(*a*) It is given that the first quartile of the distribution is 21.5 years. Calculate the value of p,
Diberi kuartil pertama bagi taburan itu ialah 21.5 *tahun. Hitung nilai p,*
[3 *marks*]
[3 *markah*]

(*b*) Hence, find the mean of the distribution.
Seterusnya, cari min bagi taburan itu.
[2 *marks*]
[2 *markah*]

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Section B
Bahagian B

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

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

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

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

x	1	4	9	16	25	36
y	1.8	2.7	4.05	6.08	9.11	13.67

Table 7
Jadual 7

(*a*) Based on Table 7, construct a table for the values of $\log_{10} y$ and $\sqrt{x}$.
Berdasarkan Jadual 7, bina satu jadual bagi nilai-nilai $\log_{10} y$ *dan* $\sqrt{x}$

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

(*b*) Plot $\log_{10} y$ against $\sqrt{x}$, using a scale of 2 cm to 1 unit on the $\sqrt{x}$-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* $\sqrt{x}$, *dengan menggunakan skala 2 cm kepada 1 unit pada paksi-*$\sqrt{x}$ *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) p, (ii) k.

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

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8 Solution by scale drawing is **not** accepted.
Penyelesaian secara lukisan berskala **tidak** *diterima.*

Diagram 8 shows a triangle ABC with point D lies on the line AC and B lies on the y-axis.

Rajah 8 menunjukkan sebuah segi tiga ABC dengan titik D terletak pada garis AC dan B terletak pada paksi-y.

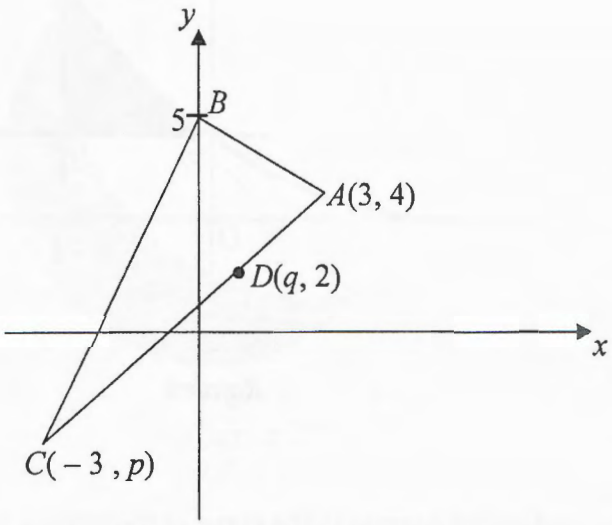

Diagram 8
Rajah 8

(*a*) Given that $AD : DC = 1 : 2$. Find the values of p and q.
Diberi bahawa $AD : DC = 1 : 2$. *Cari nilai p dan nilai q.*

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

(*b*) Calculate the area, in unit^2, of the triangle ABC.
Hitung luas, dalam unit^2, *segi tiga ABC.*

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

(*c*) Find the equation of the line passes through point B and parallel to the line AC.
Cari persamaan garis lurus yang melalui titik B dan selari dengan garis AC.

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

(*d*) Point P moves such that its distance from point A is always a constant and passes through point D. Find the equation of locus of P.
Titik P bergerak dengan keadaan jaraknya dari titik A adalah sentiasa malar dan melalui titik D. Cari persamaan lokus bagi P.

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

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9 Diagram 9 shows part of the curve $y = (x + 2)^2$.
Rajah 9 menunjukkan sebahagian daripada lengkung $y = (x + 2)^2$.

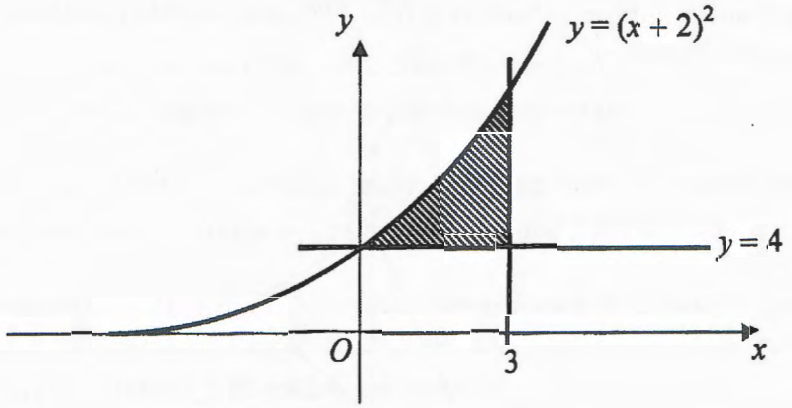

Diagram 9
Rajah 9

(*a*) The gradient of normal to the curve at the point $x = a$ is $-\frac{1}{2}$. Find the value of *a*.

Kecerunan normal bagi lengkung itu pada titik $x = a$ *ialah* $-\frac{1}{2}$. Cari nilai *a*.

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

(*b*) Find the area of the shaded region. [4 *marks*]
Cari luas kawasan yang berlorek. [4 *markah*]

(*c*) The region bounded by the curve, both axes and the line $x = -1$ is rotated through 360° about the *x*-axis. Find the volume of revolution, in terms of π.

Rantau yang disempadani oleh lengkung itu, kedua-dua paksi dan garis $x = -1$ *diputarkan* 360° *pada paksi-x. Cari isi padu kisaran, dalam sebutan* π.

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

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10 Diagram 10 shows a sector of a circle *OPQR* with centre *O* and a semicircle *SPTR* with centre *S*.
Rajah 10 *menunjukkan sebuah sektor bulatan OPQR berpusat O dan sebuah semi bulatan SPTR berpusat S.*

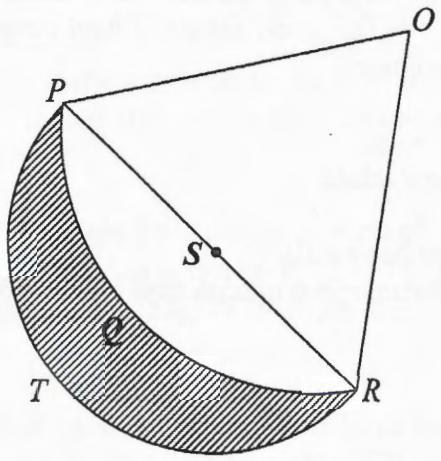

Diagram 10
Rajah 10

It is given that the perimeter of the sector *OPQR* is 22.55 cm and $\angle POR = 0.88$ rad.
Diberi bahawa perimeter sektor bulatan OPQR ialah 22.55 cm *dan* $\angle POR = 0.88$ rad.
[Use / *Guna* $\pi = 3.142$]

Find
Cari

(*a*) the radius, in cm, of sector *OPQR*. [3 *marks*]
jejari, dalam cm, sektor bulatan OPQR. [3 *markah*]

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

(*c*) the area, in cm^2, of the shaded region. [5 *marks*]
luas, dalam cm^2, *rantau berlorek.* [5 *markah*]

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11 (*a*) In a hospital, it is found that the ratio of newborn baby boy and girl is 3 : 5. From a sample of 7 newborns chosen at random from this hospital, calculate the probability, that
Di sebuah hospital, di dapati nisbah bayi lelaki dan perempuan yang baru dilahirkan ialah 3 : 5. *Daripada sampel* 7 *bayi yang dipilih secara rawak, hitung kebarangkalian, bahawa*

(i) 3 are baby boys,
3 *adalah bayi lelaki,*

(ii) at least 6 are baby girls.
sekurang-kurangnya 6 *adalah bayi perempuan.*

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

(*b*) The weight of newborn babies has a normal distribution with a mean of 3420 g and a standard deviation of 495 g. Given that 1500 babies were born in Kuala Lumpur for the month of May 2012, find

Berat bayi baru lahir adalah bertabur secara normal dengan min 3420 g *dan sisihan piawai* 495 g. *Diberi bahawa terdapat* 1500 *orang bayi dilahirkan di Kuala Lumpur dalam bulan Mei* 2012, *hitung*

(i) the probability that a newborn, chosen at random, has a weight more than 3100g,
kebarangkalian bahawa seorang bayi, yang dipilih secara rawak, mempunyai berat lebih daripada 3100 g,

(ii) the number of newborn babies that has a weight less than 3100 g.
bilangan bayi yang beratnya kurang daripada 3100 g.

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

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Section C
Bahagian C

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

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

12 A particle X moves in a straight line and passes through a fixed point O with velocity 7 ms^{-1}. Its acceleration, a ms^{-2}, is given by $a=20-6t$ where t is the time, in seconds, after the particle passes through point O. Particle X changes its direction of motion at point A.

Satu zarah X bergerak di sepanjang suatu garis lurus melalui satu titik tetap O dengan halaju 7 ms^{-1}. Pecutannya, a ms^{-2}, diberi oleh $a=20-6t$ dengan keadaan t ialah masa, dalam saat, selepas zarah X melalui titik O. Zarah X bertukar arah gerakan di titik A.

(*a*) Find
Cari

(i) the time when particle X is at point A, [3 *marks*]
masa apabila zarah X berada di titik A, [3 *markah*]

(ii) the total distance travelled by particle X in the first 10 seconds.
[4 *marks*]
jumlah jarak yang dilalui oleh zarah X dalam 10 saat yang pertama.
[4 *markah*]

(*b*) A particle Y moves, in the same straight line, with a velocity, v ms^{-1}, given by $v=3t^2-18t+11$ where t is the time, in seconds, after the particle passes through point O. Determine the distance between particle X and Y when particle X reaches point A.

[3 *marks*]

Satu zarah Y bergerak, pada garis lurus yang sama, dengan halaju, v ms^{-1}, yang diberi oleh $v=3t^2-18t+11$ dengan keadaan t ialah masa, dalam saat, selepas melalui titik O. Tentukan jarak antara zarah X dan zarah Y ketika zarah X tiba di titik A.

[3 *markah*]

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13 Table 13 shows the price indices and percentages of usage of four items which are needed to make a type of sewing machine.
Jadual 13 *menunjukkan indeks harga dan peratus penggunaan bagi empat jenis barangan yang diperlukan untuk membuat sejenis mesin jahit.*

Item *Barangan*	Price index in 2009 based on 2008 *Indeks harga pada* 2009 *berasaskan* 2008	Percentage of usage (%) *Peratus penggunaan* (%)
P	$4x$	10
Q	$3x$	20
R	130	30
S	104	40

Table 13
Jadual 13

(*a*) Calculate the price of item *S* in the year 2008 if its price in the year 2009 is RM 57.20.
Hitung harga barangan S pada tahun 2008 *jika harganya pada tahun* 2009 *ialah* RM 57.20.

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

(*b*) The price index of item *R* in the year 2008 based on the year 2006 is 110.
Calculate the price index of item *R* in the year 2009 based on the year 2006.

Indeks harga barangan R pada tahun 2008 *berasaskan tahun* 2006 *ialah* 110.
Hitung indeks harga barangan R pada tahun 2009 *berasaskan tahun* 2006.

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

(*c*) The composite index for the cost of production of the sewing machine in the year 2009 based on the year 2008 is 120.6.

Indeks gubahan bagi kos pengeluaran mesin jahit itu pada tahun 2009 *berasaskan tahun* 2008 *ialah* 120.6.

(i) Calculate the value of *x*.
Hitung nilai x.

(ii) Calculate the price of a unit of the sewing machine in the year 2009 if its corresponding price in the year 2008 is RM 243.20.
Hitung harga seunit mesin jahit pada tahun 2009 *jika harganya pada tahun* 2008 *ialah* RM 243.20.

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

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14 Diagram 14 shows a triangle PQR such that $PQ = 12.4$ cm and $QR = 9.25$ cm.

Rajah 14 *menunjukkan segitiga* PQR *dengan keadaan* $PQ = 12.4$ cm *dan* $QR = 9.25$ cm.

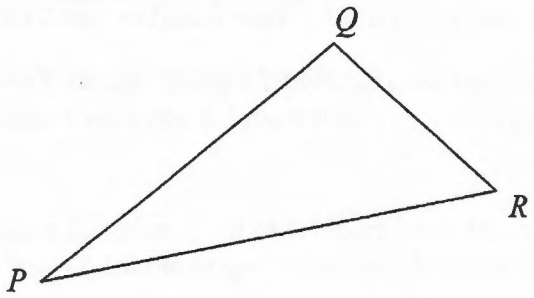

Diagram 14
Rajah 14

It is given that the area of the triangle is 45 cm^2 and $\angle PQR$ is an obtuse angle.

Diberi luas segi tiga ialah 45 cm^2 *dan* $\angle PQR$ *adalah sudut cakah.*

(*a*) Find
Cari

(i) $\angle PQR$,

(ii) the length, in cm, of PR,
Panjang, in cm, PR,

(iii) the shortest length, in cm, from Q to PR.
jarak terpendek, dalam cm, *dari* Q *ke* PR.

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

(*b*) (i) Sketch a triangle $P'Q'R'$ which has a different shape from triangle PQR such that $P'Q' = PQ$, $Q'R' = QR$ and $\angle Q'P'R' = \angle QPR$

Lakarkan sebuah segi tiga $P'Q'R'$ *yang mempunyai bentuk yang berlainan daripada segi tiga* PQR *dengan keadaan* $P'Q' = PQ$, $Q'R' = QR$ *dan* $\angle Q'P'R' = \angle QPR$.

(ii) Calculate $\angle Q'R'P'$.
Hitung $\angle Q'R'P'$.

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

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15 A company produced two models of bicycle, model A and model B. The production, per day, of x unit model A and y unit model B are based on the following constraints:

Sebuah syarikat mengeluarkan dua model basikal, model A dan model B. Setiap hari syarikat tersebut mengeluarkan x unit model A dan y unit model B berdasarkan kekangan berikut:

I The ratio of the number of model A to the number of model B is not less than 1: 2.
Nisbah bilangan model A kepada bilangan model B tidak kurang daripada 1: 2.

II The total number of bicycles produced is at most 7 units.
Jumlah basikal yang dikeluarkan selebih-lebihnya 7 *unit.*

III The number of model A is at most 3 times the number of model B.
Bilangan model A melebihi bilangan model B selebih-lebihnya 3 *kali.*

(*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 daripada $x \geq 0$ dan $y \geq 0$, *yang memenuhi semua kekangan di atas.* [3 *markah*]

(*b*) Using a scale of 2 cm to 1 unit on both axes, construct and shade the region R, which satisfies all the above constraints. [3 *marks*]

Dengan menggunakan skala 2 cm *kepada* 1 *unit pada kedua-dua paksi, bina dan lorek rantau R yang memuaskan 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 minimum number of model A produced if the number of model B is 3 units.
bilangan minimum model A dihasilkan jika bilangan model B ialah 3 *unit.*

(ii) the maximum expenditure in production of bicycle if the production cost of a unit of model A is RM 700 and the cost of model B is RM 600.

perbelanjaan maksimum dalam pengeluaran basikal jika kos pengeluaran seunit model A ialah RM 700 *dan model B ialah* RM 600.

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

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

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Nama : _____ Tingkatan : _

NO. KAD PENGENALAN

ANGKA GILIRAN

Arahan Kepada Calon

1 Tuliskan **nama, tingkatan, nombor kad pengenalan** dan **angka giliran** anda pada ruang yang disediakan.
2 Tandakan (✓) untuk soalan yang dijawab.
3 Ceraikan helaian ini dan ikatkan bersama-sama dengan kertas jawapan, sebagai muka hadapan.

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

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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*** *soalan 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 mendapatkan 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 soalan dan ceraian soalan ditunjukkan dalam kurungan.

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

7. A list of the upper tail probability $Q(z)$ for the normal distribution is provided on page 5.
   Satu senarai kebarangkalian hujung atas $Q(z)$ *bagi taburan normal disediakan di halaman* 5.

8. Graph papers are provided.
   Kertas graf disediakan.

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

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Tingkatan: ..... Perkara: ..... Tuangan sini.

(1)

$2x + 3y = 10$

$3y = 10 - 2x$

$y = \frac{10-2x}{3}$ — (i)

$\frac{4}{x} + \frac{6}{y} = 10$

$\frac{4y + 6x}{xy} = 10$

$4y + 6x = 10xy$

$4\left(\frac{10-2x}{3}\right) + 6x = 10x\left(\frac{10-2x}{3}\right)$

$\frac{4(10-2x) + 3(6x)}{3} = \frac{10x(10-2x)}{3}$

$4(10-2x) + 3(6x) = 10x(10-2x)$

$40 - 8x + 18x = 100x - 20x^2$

$40 + 10x = 100x - 20x^2$

$20x^2 + 10x - 100x + 40 = 0$

$20x^2 - 90x + 40 = 0$

$2x^2 - 9x + 4 = 0$

$(x-4)(2x-1) = 0$

$x - 4 = 0$ or $2x - 1 = 0$

$x = 4$ $\quad$ $2x = 1$

$x = \frac{1}{2}$

$x = 4,$

$y = \frac{10-2x}{3}$

$y = \frac{10-2(4)}{3}$

$y = \frac{2}{3}$

$x = \frac{1}{2}$

$y = \frac{10-2x}{3}$

$y = \frac{10 - 2\left(\frac{1}{2}\right)}{3}$

$y = 3$

$\therefore x = 4, \; y = \frac{2}{3}$

$x = \frac{1}{2}, \; y = 3$

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Tingkatan: ..... Perkara.....

(1) **Second Method**

$2x + 3y = 10$

$2x = 10 - 3y$

$x = \frac{10-3y}{2}$ —(i) ✓

$\frac{4}{x} + \frac{6}{y} = 10$

$\frac{4y + 6x}{xy} = 10$

$4y + 6x = 10xy$

$4y + 6\left(\frac{10-3y}{2}\right) = 10\left(\frac{10-3y}{2}\right)y$ ✓

$4y + 3(10-3y) = 5(10-3y)y$

$4y + 30 - 9y = 5y(10-3y)$

$4y + 30 - 9y = 50y - 15y^2$

$15y^2 + 4y - 9y - 50y + 30 = 0$

$15y^2 - 55y + 30 = 0$

$3y^2 - 11y + 6 = 0$

$(y-3)(3y-2) = 0$ ✓

$y - 3 = 0$ (or) $3y - 2 = 0$

$y = 3$ $\quad 3y = 2$

$y = \frac{2}{3}$

$y = 3$,

$x = \frac{10-3y}{2}$

$x = \frac{10-3(3)}{2}$

$x = \frac{1}{2}$

$y = \frac{2}{3}$,

$x = \frac{10-3y}{2}$

$x = \frac{10-3\left(\frac{2}{3}\right)}{2}$

$x = 4$

$\therefore x = 4, y = \frac{2}{3}$ ✓

$x = \frac{1}{2}, y = 3$ ✓

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Tingkatan: ..... Perkara..... Tandatangan SPM:

(2) (a) (i) given $g^{-1}: x \mapsto \frac{4x}{x-2}$

$$g^{-1}(x) = \frac{4x}{x-2}$$

Let $g(x) = Q$

$$x = g^{-1}(Q)$$

$$x = \frac{4Q}{Q-2}$$

$$x(Q-2) = 4Q$$

$$Qx - 2x = 4Q$$

$$Qx - 4Q = 2x$$

$$Q(x-4) = 2x$$

$$Q = \frac{2x}{x-4}$$

$$g(x) = \frac{2x}{x-4}, \quad x \neq 4$$

✓ ✓

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(2) (a) (ii)

Given $f: x \mapsto |2+5x|$

$f(x) = |2+5x|$

$f(2p) = |2+5(2p)|$

$f(2p) = |2+10p|$

$g^{-1}(x) = \frac{4x}{x-2}$

$g^{-1}(3) = \frac{4(3)}{3-2}$

$g^{-1}(3) = 12$

$\therefore \quad f(2p) = g^{-1}(3)$

$|2+10p| = 12$ ✓

$2+10p = 12$

$10p = 12-2$

$10p = 10$

$p = \frac{10}{10}$

$p = 1$ ✓

(or)

$2+10p = -12$

$10p = -12-2$

$10p = -14$

$p = \frac{-14}{10}$

$p = -\frac{7}{5}$ ✓

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Tingkatan: ..... Perkara ..... Tanggal .....

(2) (b) $f(x) = |2+5x|$

$x = -2$, $f(-2) = |2+5(-2)|$

$f(-2) = |-8|$

$f(-2) = 8$

$(-2, 8)$

$x = 2$, $f(2) = |2+5(2)|$

$f(2) = |12|$

$f(2) = 12$

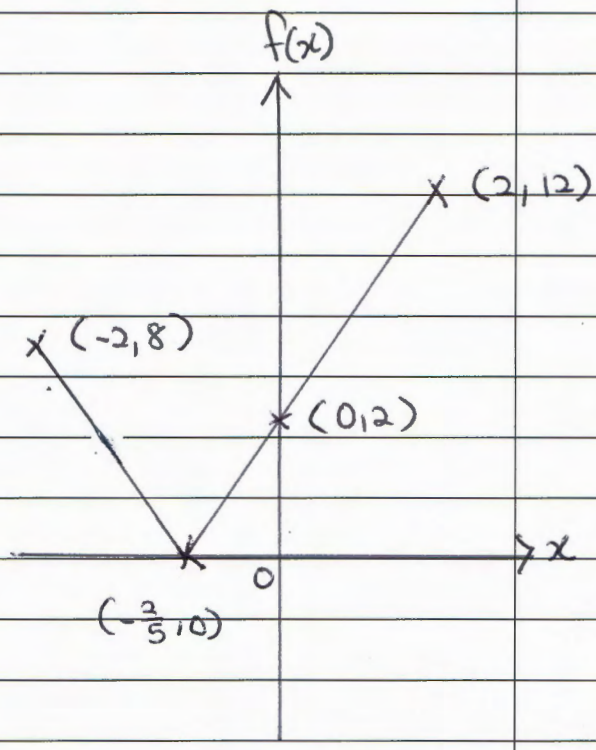
$(2, 12)$

$x = 0$, $f(0) = |2+5(0)|$

$f(0) = |2|$

$f(0) = 2$

$(0, 2)$



$f(x) = 0$, $0 = |2+5x|$

$0^2 = (2+5x)^2$

$0 = (2+5x)(2+5x)$

$2+5x = 0$

$5x = -2$

$x = \frac{-2}{5}$

$\left(-\frac{2}{5}, 0\right)$

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Tingkatan: ..... Perkara..... Tarikh: .....

(3) (a)

$d = -3$ ✓

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

$T_8 = a + (8-1)(-3)$ ✓

$T_8 = a - 21$

$125 = a - 21$

$125 + 21 = a$

$146 = a$

$a = 146$ ✓

(b) $T_n > 0$

$a + (n-1)d > 0$

$146 + (n-1)(-3) > 0$

$146 - 3(n-1) > 0$

$146 - 3n + 3 > 0$

$149 - 3n > 0$

$149 > 3n$

$3n < 149$

$n < \frac{149}{3}$

$n < 49.67$ ✓

∴ number of layers that can be formed is 49 ✓

(c)

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

$S_{10} = \frac{10}{2}(2(146) + (10-1)(-3))$

$S_{10} = 1325$ ✓

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

$S_4 = \frac{4}{2}(2(146) + (4-1)(-3))$

$S_4 = 566$ ✓

∴ number of discs from the fifth layer until the tenth layer

$= S_{10} - S_4$

$= 1325 - 566$

$= 759$ ✓

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Tingkatan: ..... Perkara..... Tarikh: .....

(4) (a) (i)

$\overrightarrow{AC}$

$= \overrightarrow{AB} + \overrightarrow{BC}$

$= 15\underset{\sim}{x} + \frac{1}{3}\overrightarrow{AD}$

$= 15\underset{\sim}{x} + \frac{1}{3}(6\underset{\sim}{y})$

$= 15\underset{\sim}{x} + 2\underset{\sim}{y}$ ✓

(ii) $\overrightarrow{DR}$

$= \overrightarrow{DA} + \overrightarrow{AR}$

$= -\overrightarrow{AD} + \overrightarrow{AR}$

$= -6\underset{\sim}{y} + \frac{3}{5}\overrightarrow{AB}$ ✓

$= -6\underset{\sim}{y} + \frac{3}{5}(15\underset{\sim}{x})$

$= -6\underset{\sim}{y} + 9\underset{\sim}{x}$ ✓

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(4b)

$\overrightarrow{RQ} = h\overrightarrow{RD}$

$\overrightarrow{RQ} = h(-\overrightarrow{DR})$

$\overrightarrow{RQ} = h(-)(-6\underset{\sim}{y} + 9\underset{\sim}{x})$

$\overrightarrow{RQ} = h(6\underset{\sim}{y} - 9\underset{\sim}{x})$

$\overrightarrow{RQ} = 6h\underset{\sim}{y} - 9h\underset{\sim}{x}$

$\overrightarrow{RA} + \overrightarrow{AQ} = 6h\underset{\sim}{y} - 9h\underset{\sim}{x}$

$-\overrightarrow{AR} + \overrightarrow{AQ} = 6h\underset{\sim}{y} - 9h\underset{\sim}{x}$

$-\left(\frac{3}{5}\overrightarrow{AB}\right) + \overrightarrow{AQ} = 6h\underset{\sim}{y} - 9h\underset{\sim}{x}$

$-\left(\frac{3}{5}(15\underset{\sim}{x})\right) + \overrightarrow{AQ} = 6h\underset{\sim}{y} - 9h\underset{\sim}{x}$

$-9\underset{\sim}{x} + \overrightarrow{AQ} = 6h\underset{\sim}{y} - 9h\underset{\sim}{x}$

$-9\underset{\sim}{x} + k\overrightarrow{AC} = 6h\underset{\sim}{y} - 9h\underset{\sim}{x}$

$-9\underset{\sim}{x} + k(15\underset{\sim}{x} + 2\underset{\sim}{y}) = 6h\underset{\sim}{y} - 9h\underset{\sim}{x}$

$-9\underset{\sim}{x} + 15k\underset{\sim}{x} + 2k\underset{\sim}{y} = 6h\underset{\sim}{y} - 9h\underset{\sim}{x}$

$15k\underset{\sim}{x} - 9\underset{\sim}{x} + 2k\underset{\sim}{y} = 6h\underset{\sim}{y} - 9h\underset{\sim}{x}$

$(15k-9)\underset{\sim}{x} + 2k\underset{\sim}{y} = 6h\underset{\sim}{y} - 9h\underset{\sim}{x}$

$(15k-9)\underset{\sim}{x} + 2k\underset{\sim}{y} = -9h\underset{\sim}{x} + 6h\underset{\sim}{y}$ ✓

$2k = 6h$

$k = \frac{6h}{2}$

$k = 3h$ — (i)

$15k - 9 = -9h$ ✓

$(\div 3)\quad 5k - 3 = -3h$

$5(3h) - 3 = -3h$

$15h - 3 = -3h$

$15h + 3h = 3$

$18h = 3$

$h = \frac{3}{18}$

$h = \frac{1}{6}$ ✓

$k = 3h$

$k = 3\left(\frac{1}{6}\right)$

$k = \frac{1}{2}$ ✓

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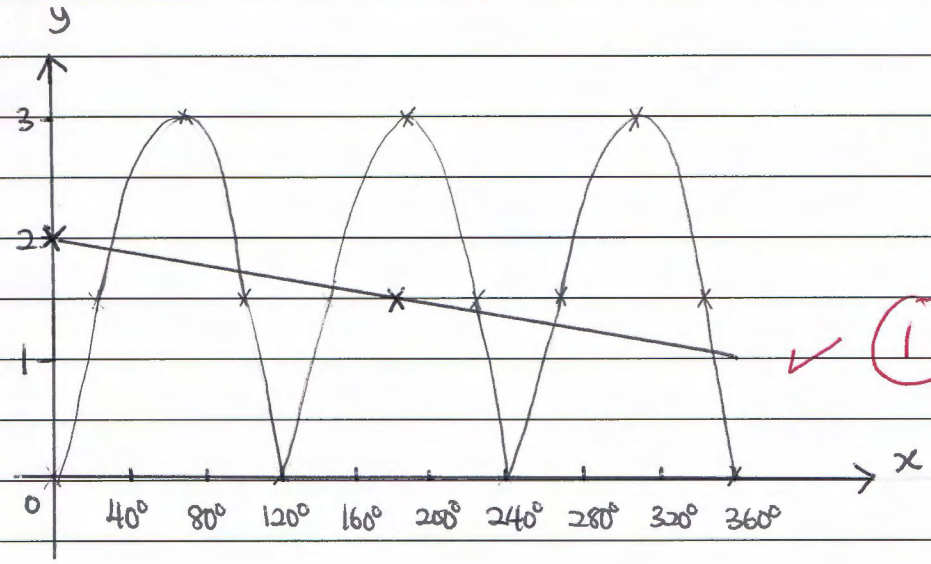
Tingkatan: ..... Perkara..... Tuangan sini.

5 (a) $y = \left| -3 \sin \frac{3}{2}x \right|$

x	0°	20°	60°	100°	120°	140°	180°	220°	240°	260°	300°	340°	360°
y	0	1.5	3	1.5	0	1.5	3	1.5	0	1.5	3	1.5	0



4 marks

1

(b) $y = \left| -3 \sin \frac{3}{2}x \right| + 2 - \left| -3 \sin \frac{3}{2}x \right| - \frac{x}{2\pi}$

$y = 2 - \frac{x}{2\pi}$

$y = 2 - \frac{x}{2(180^\circ)}$

$y = 2 - \frac{x}{360^\circ}$

1

x	0	180°	360°
y	2	1.5	1

Number of solutions = 6

1

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Tingkatan: ..... Perkara..... Tarikh: .....

(6) (a) total frequency, N

$= 3+5+10+12+p+4$

$= 34+p$ ✓

$$Q_1 = L + \frac{\left(\frac{1}{4}N - F\right)}{f_{Q_1}}(c)$$

$$21.5 = 20.5 + \frac{\left(\frac{1}{4}(34+p) - 8\right)}{10}(25.5-20.5)$$ ✓

$$21.5 = 20.5 + \frac{\left(\frac{34+p}{4} - 8\right)}{10}(5)$$

$$21.5 = 20.5 + \frac{\left(\frac{34+p}{4} - 8\right)}{2}$$

$$21.5 - 20.5 = \frac{\left(\frac{34+p}{4} - 8\right)}{2}$$

$$1 = \frac{\left(\frac{34+p}{4} - 8\right)}{2}$$

$$1(2) = \frac{34+p}{4} - 8$$

$$2 = \frac{34+p}{4} - 8$$

$$2+8 = \frac{34+p}{4}$$

$$10 = \frac{34+p}{4}$$

$$10(4) = 34+p$$

$$40 = 34+p$$

$$40-34 = p$$

$$6 = p$$

$$p = 6$$ ✓

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(6) (b)

Age (years)	11-15	16-20	21-25	26-30	31-35	36-40
Frequency	3	5	10	12	6	4
Midpoint	13	18	23	28	33	38

$$\text{mean} = \frac{3(13)+5(18)+10(23)+12(28)+6(33)+4(38)}{3+5+10+12+6+4}$$ ✓

$$\text{mean} = \frac{1045}{40}$$

$$\text{mean} = 26\frac{1}{8}$$

$$\text{mean} = 26.125$$ ✓

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Tingkatan: ..... Perkara..... Tarikh: .....

(7) (a)

x	1	4	9	16	25	36	
y	1.8	2.7	4.05	6.08	9.11	13.67	
$\sqrt{x}$	1	2	3	4	5	6	✓
$\log_{10} y$	0.26	0.43	0.61	0.78	0.96	1.14	✓

$C = 0.08$

(3.5, 0.70) and (0, 0.08)

$m = \dfrac{y_1 - y_2}{x_1 - x_2}$

$m = \dfrac{0.70 - 0.08}{3.5 - 0}$

$m = \dfrac{31}{175}$

equation :

$\log_{10} y = \dfrac{31}{175}(\sqrt{x}) + 0.08$

(c) $y = 2pk^{\sqrt{x}}$

$\log y = \log 2pk^{\sqrt{x}}$

$\log y = \log 2p + \log k^{\sqrt{x}}$

$\log y = \log 2p + \sqrt{x}(\log k)$

$\log y = \sqrt{x}(\log k) + \log 2p$

$\log y = (\log k)(\sqrt{x}) + \log 2p$ ✓

(i) $\log 2p = 0.08$ ✓

$10^{0.08} = 2p$

$\dfrac{10^{0.08}}{2} = p$

$p = 0.6011$ ✓

(ii) $\log k = \dfrac{31}{175}$ ✓

$10^{\frac{31}{175}} = k$

$k = 1.504$ ✓

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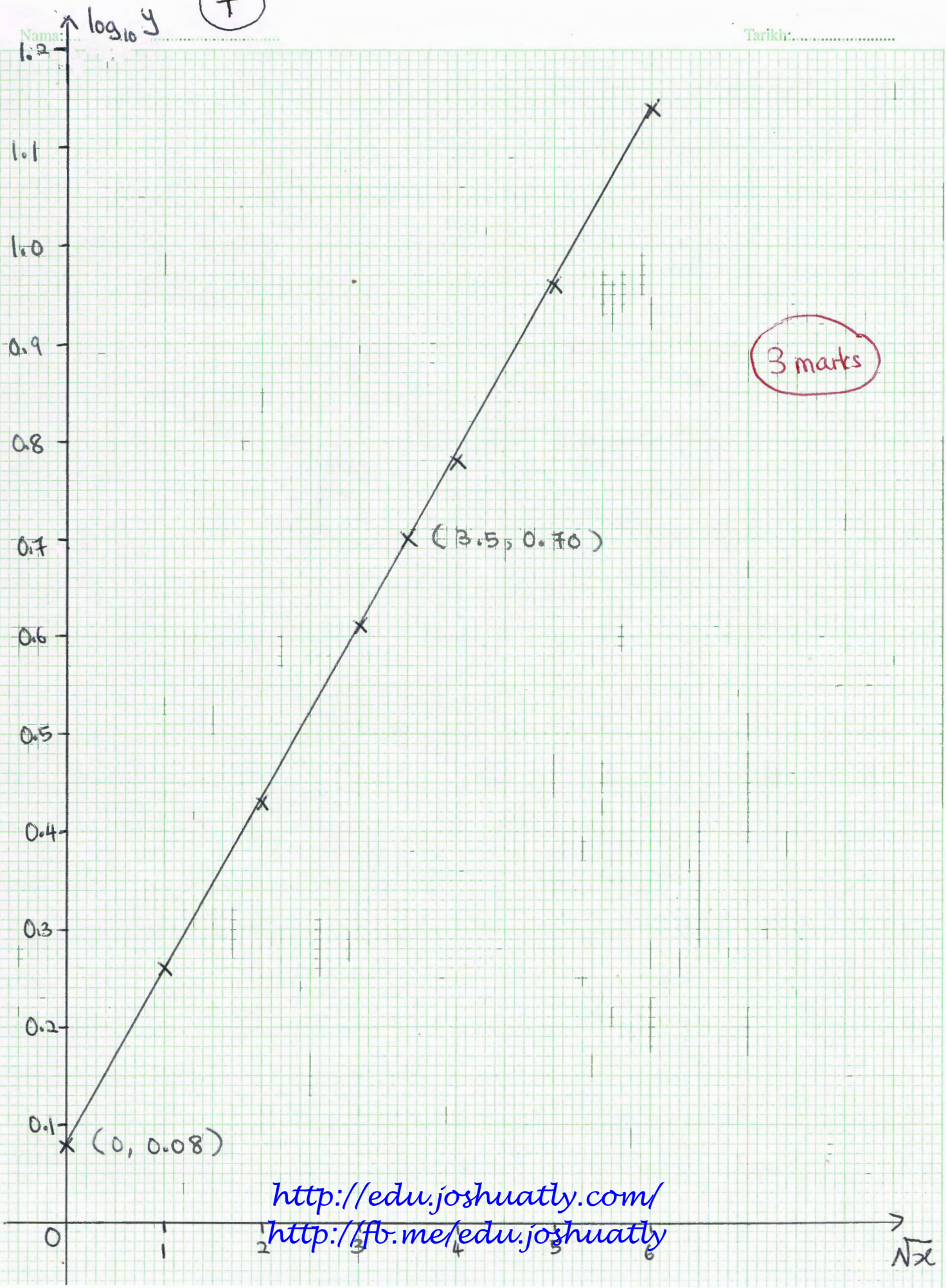
7

Nama: ..... Tarikh: .....



3 marks

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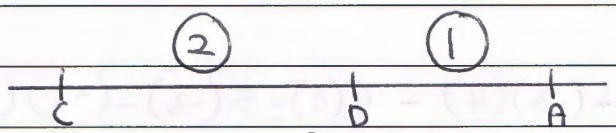
Tingkatan: ..... Perkara..... Tarikh: .....

(8) (a)



$$(q,2) = \left(\frac{-3(1)+3(2)}{2+1} , \frac{p(1)+4(2)}{2+1} \right)$$

$$(q,2) = \left(1 , \frac{p+8}{3} \right) \checkmark$$

$\therefore$ $q = 1$ ✓

$$2 = \frac{p+8}{3}$$

$$2(3) = p+8$$

$$6 = p+8$$

$$p+8 = 6$$

$$p = 6-8$$

$$p = -2 \checkmark$$

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(8) (b) Area of triangle ABC

$$= \frac{1}{2}\begin{vmatrix} 3 & 0 & -3 & 3 \\ 4 & 5 & -2 & 4 \end{vmatrix}$$ ✓

$$= \frac{1}{2}\left| 3(5)+0(-2)+(-3)(4) - 4(0) - 5(-3) - (-2)(3) \right|$$

$$= \frac{1}{2}\left| 24 \right|$$

$$= \frac{1}{2}(24)$$

$$= 12 \text{ unit}^2$$ ✓

(c) $m_{AC} = \frac{y-y}{x-x}$

$$m_{AC} = \frac{4-(-2)}{3-(-3)}$$

$$m_{AC} = 1$$ ✓

at B (0, 5),

$y = mx + c$

$5 = 1(0) + c$

$5 = c$

$c = 5$

∴ equation =

$y = 1(x) + 5$

$y = x + 5$ ✓

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Tingkatan: ..... Perkara..... Tarikh: .....

(8) (d) Let $P = (x, y)$

$PA = DA$

$\sqrt{(x-3)^2 + (y-4)^2} = \sqrt{(1-3)^2 + (2-4)^2}$ ✓✓

$\sqrt{(x-3)^2 + (y-4)^2} = \sqrt{8}$

$(x-3)^2 + (y-4)^2 = 8$

$x^2 - 6x + 9 + y^2 - 8y + 16 = 8$

$x^2 - 6x + y^2 - 8y + 9 + 16 - 8 = 0$

$x^2 + y^2 - 6x - 8y + 17 = 0$ ✓

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Tingkatan: ..... Perkara..... Tarikh: .....

(9) (a) $m_{normal} \times m_{tangent} = -1$

$-\frac{1}{2} \times m_{tangent} = -1$

$m_{tangent} = \frac{-1}{(-\frac{1}{2})}$

$m_{tangent} = 2$ ✓

$y = (x+2)^2$

$\frac{dy}{dx} = 2(x+2)(1)$

$\frac{dy}{dx} = 2(x+2)$ ✓

$m_{tangent} = 2(x+2)$

$2 = 2(x+2)$

$\frac{2}{2} = x+2$

$1 = x+2$

$x+2 = 1$

$x = 1-2$

$x = -1$

$a = -1$ ✓

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(9)(b) Shaded region

$= \int_0^3 y\,dx$ - rectangle

$= \int_0^3 (x+2)^2\,dx - 3(4)$

$= \int_0^3 (x+2)^2\,dx - 12$ ✓

$= \left[\frac{(x+2)^3}{3(1)}\right]_0^3 - 12$ ✓

$= \left[\frac{(x+2)^3}{3}\right]_0^3 - 12$

$= \frac{(3+2)^3}{3} - \frac{(0+2)^3}{3} - 12$ ✓

$= 27 \text{ unit}^2$ ✓

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Tingkatan: ..... Perkara..... Tarikh: .....

(9) (c) volume

$$= \pi \int_{-1}^{0} y^2 \, dx$$

$$= \pi \int_{-1}^{0} \left[(x+2)^2\right]^2 dx$$

$$= \pi \int_{-1}^{0} (x+2)^4 \, dx$$

$$= \pi \left[\frac{(x+2)^5}{5(1)}\right]_{-1}^{0}$$ ✓

$$= \pi \left[\frac{(x+2)^5}{5}\right]_{-1}^{0}$$

$$= \pi \left(\frac{(0+2)^5}{5}\right) - \pi \left(\frac{(-1+2)^5}{5}\right)$$ ✓

$$= \frac{32\pi}{5} - \frac{1\pi}{5}$$

$$= \frac{31\pi}{5} \text{ unit}^3$$ ✓

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Tingkatan: ..... Perkara..... Tarikh: .....

(10) (a) Perimeter = 22.55

$r + r + S = 22.55$

$2r + S = 22.55$

$S = 22.55 - 2r$

$S = r\theta$

$22.55 - 2r = r(0.88)$ ✓ ✓

$22.55 - 2r = 0.88r$

$22.55 = 0.88r + 2r$

$22.55 = 2.88r$

$2.88r = 22.55$

$r = \frac{22.55}{2.88}$

$r = \frac{2255}{288}$

$r = 7.830$ cm ✓

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

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

$$PSR = \sqrt{(OP)^2 + (OR)^2 - 2(OP)(OR)\cos\left(0.88 \times \frac{180^\circ}{\pi}\right)}$$

$$PSR = \sqrt{\left(\frac{2255}{288}\right)^2 + \left(\frac{2255}{288}\right)^2 - 2\left(\frac{2255}{288}\right)\left(\frac{2255}{288}\right)\cos\left(\frac{0.88 \times 180^\circ}{3.142}\right)} \checkmark$$

$PSR = 6.669 \text{ cm}$ ✓

(10) (c) Triangle POR

$= \frac{1}{2} ab \sin C$

$= \frac{1}{2} (OP)(OR) \sin \angle POR$

$= \frac{1}{2}\left(\frac{2255}{288}\right)\left(\frac{2255}{288}\right) \sin\left(\frac{0.88 \times 180^\circ}{3.142}\right)$

$= \frac{1}{2}\left(\frac{2255}{288}\right)^2 \sin\left(\frac{158.4}{3.142}\right)$ ✓

Sector POR

$= \frac{1}{2} r^2 \theta$

$= \frac{1}{2} (OP)^2 (0.88)$

$= \frac{1}{2}\left(\frac{2255}{288}\right)^2 (0.88)$

$= 0.44\left(\frac{2255}{288}\right)^2$ ✓

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Tingkatan: ..... Perkara..... Tarikh: .....

(10) (c) – continue –

Segment PSRQ
= Sector POR – triangle POR

$= 0.44\left(\frac{2255}{288}\right)^2 - \frac{1}{2}\left(\frac{2255}{288}\right)^2 \sin\left(\frac{158.4}{3.142}\right)$

semicircle SPTR
$= \frac{1}{2} r^2 \theta$

$= \frac{1}{2}\left(\frac{1}{2} PSR\right)^2 (\pi)$

$= \frac{1}{2}\left(\frac{PSR}{2}\right)^2 (3.142)$

$= \frac{1}{2}\left(\frac{(PSR)^2}{4}\right)(3.142)$

$= 0.39275\,(PSR)^2$ ✓

– continue –

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Tingkatan: ..... Perkara..... Tarikh: .....

(10) (c) – continue (ii) –

shaded region

= semicircle SPTR – segment PSRQ

$$= 0.39275\,(PSR)^2 - \left[0.144\left(\frac{2255}{288}\right)^2 - \frac{1}{2}\left(\frac{2255}{288}\right)^2 \sin\left(\frac{158.4}{3.142}\right)\right] \checkmark$$

$$= 0.39275\left[\sqrt{\left(\frac{2255}{288}\right)^2 + \left(\frac{2255}{288}\right)^2 - 2\left(\frac{2255}{288}\right)\left(\frac{2255}{288}\right)\cos\left(\frac{0.88\times 180^\circ}{3.142}\right)}\right]^2$$

$$- \left[0.144\left(\frac{2255}{288}\right)^2 - \frac{1}{2}\left(\frac{2255}{288}\right)^2 \sin\left(\frac{158.4}{3.142}\right)\right]$$

$$= 41.13 \text{ cm}^2 \checkmark$$

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Tingkatan: ..... Perkara..... Tarikh: .....

(11) (a) $P(\text{boy}) = \frac{3}{8}$ ✓

$P(\text{girl}) = \frac{5}{8}$

$n = 7$

(i) Probability that 3 are baby boys

$= {}^{7}C_{3}\left(\frac{3}{8}\right)^{3}\left(\frac{5}{8}\right)^{7-3}$ ✓

$= 0.2816$ ✓

(ii) Probability that at least 6 are baby girls

$= P(6 \text{ girls}) + P(7 \text{ girls})$

$= {}^{7}C_{6}\left(\frac{5}{8}\right)^{6}\left(\frac{3}{8}\right)^{7-6} + {}^{7}C_{7}\left(\frac{5}{8}\right)^{7}\left(\frac{3}{8}\right)^{7-7}$ ✓

$= 0.1937$ ✓

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Tingkatan: ..... Perkara..... Tarikh: .....

(11) (b) Mean, $\bar{x} = 3420$

$\sigma = 495$

$n = 1500$

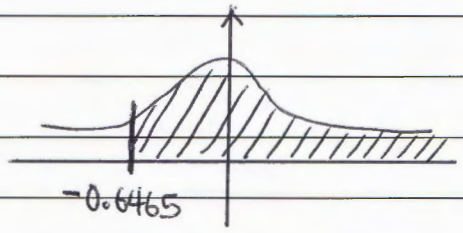
(i) $P(X > 3100)$

$= P\left(\frac{X-\mu}{\sigma} > \frac{3100-\mu}{\sigma}\right)$

$= P\left(z > \frac{3100-3420}{495}\right)$ ✓

$= P\left(z > -\frac{64}{99}\right)$

$= P(z > -0.6465)$ ✓



$= 1 - 0.2592$

$= 0.7408$ ✓

(ii) number of newborn babies that has a weight less than 3100 g

$= 1500\ (1 - 0.7408)$ ✓

$= 388.8$

≈ 389 newborn babies ✓

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(12) $V = 7\ ms^{-1}$

$a = 20 - 6t$

(a) (i) $a = 20 - 6t$

$$\int a\,dt = \int (20 - 6t)\,dt$$

$$V = 20t - \frac{6t^2}{2} + C$$

$$V = 20t - 3t^2 + C$$

when $t = 0$, $V = 7$,

$$V = 20t - 3t^2 + C$$
$$7 = 20(0) - 3(0)^2 + C$$
$$7 = C$$
$$C = 7$$

$\therefore$ $V = 20t - 3t^2 + 7$

$V = -3t^2 + 20t + 7$

at Point A, $V = 0$,

$V = -3t^2 + 20t + 7$ ✓

$0 = -3t^2 + 20t + 7$

$0 = 3t^2 - 20t - 7$

$3t^2 - 20t - 7 = 0$

$(3t + 1)(t - 7) = 0$ ✓

$3t + 1 = 0$

$3t = -1$

$t = -\frac{1}{3}$

(not applicable)

$t - 7 = 0$

$t = 7$

(answer) ✓

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Tingkatan: ..... Perkara..... Tarikh: .....

(12) (a) (ii)

$$v = -3t^2 + 20t + 7$$

$$\int v\,dt = \int (-3t^2 + 20t + 7)\,dt$$

$$s = \frac{-3t^3}{3} + \frac{20t^2}{2} + 7t + C$$

$$s = -t^3 + 10t^2 + 7t + C$$

at $s = 0$, $t = 0$,

$$s = -t^3 + 10t^2 + 7t + C$$
$$0 = -(0)^3 + 10(0)^2 + 7(0) + C$$
$$0 = C$$
$$C = 0$$

$\therefore$ $$s = -t^3 + 10t^2 + 7t + C$$
$$s = -t^3 + 10t^2 + 7t + 0$$
$$s = -t^3 + 10t^2 + 7t$$ ✓

$t = 7$, $$s = -t^3 + 10t^2 + 7t$$
$$s = -(7)^3 + 10(7)^2 + 7(7)$$
$$s = 196 \text{ m}$$ ✓

$t = 10$, $$s = -t^3 + 10t^2 + 7t$$
$$s = -(10)^3 + 10(10)^2 + 7(10)$$
$$s = 70 \text{ m}$$ ✓

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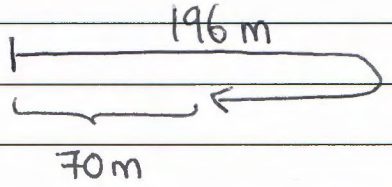
– continue –

Tingkatan: ..... Perkara: .....

(12) (a) (ii) - continue -



∴ total distance
= 196 + (196 - 70)
= 196 + 126
= 322 m ✓

(b) $v = 3t^2 - 18t + 11$

$\int v\,dt = \int (3t^2 - 18t + 11)\,dt$

$s = \frac{3t^3}{3} - \frac{18t^2}{2} + 11t + c$

$s = t^3 - 9t^2 + 11t + c$

$s = 0$, $t = 0$,

$s = t^3 - 9t^2 + 11t + c$

$0 = 0^3 - 9(0)^2 + 11(0) + c$

$0 = c$

$c = 0$

∴ $s = t^3 - 9t^2 + 11t + 0$

$s = t^3 - 9t^2 + 11t$

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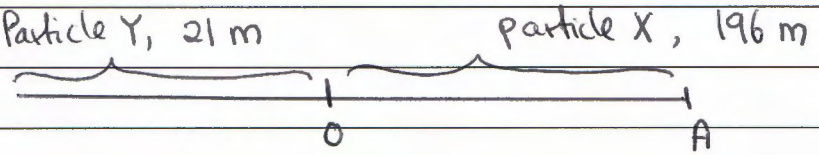
- continue -

(12) (b) – continue –

Particle X reaches point A at $t = 7$,

$$S = t^3 - 9t^2 + 11t$$
$$S = 7^3 - 9(7)^2 + 11(7)$$
$$S = -21 \text{ m}$$



∴ distance between particle X and particle Y
$= 21 + 196$
$= 217$ m

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Tingkatan: ..... Perkara..... Tahun ....

(13) (a) $\frac{P_1}{P_0} \times 100 = I$

$\frac{P_{2009}}{P_{2008}} \times 100 = 104$

$\frac{57.20}{P_{2008}} \times 100 = 104$ ✓

$\frac{5720}{P_{2008}} = 104$

$\frac{P_{2008}}{5720} = \frac{1}{104}$

$P_{2008} = \frac{1}{104}(5720)$

$P_{2008} = RM\ 55$ ✓

(b) $\frac{P_{2008}}{P_{2006}} \times 100 = 110$

$\frac{P_{2008}}{P_{2006}} = \frac{110}{100}$ ✓

$\frac{P_{2009}}{P_{2008}} \times 100 = 130$

$\frac{P_{2009}}{P_{2008}} = \frac{130}{100}$

$\frac{P_{2009}}{P_{2006}} \times 100$

$= \frac{P_{2009}}{P_{2008}} \times \frac{P_{2008}}{P_{2006}} \times 100$

$= \frac{130}{100} \times \frac{110}{100} \times 100$ ✓

$= 143$ ✓

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(13) (c) (i)

$$120.6 = \frac{4x(10) + 3x(20) + 130(30) + 104(40)}{10 + 20 + 30 + 40}$$ ✓✓

$$120.6 = \frac{40x + 60x + 3900 + 4160}{100}$$

$$120.6 = \frac{100x + 8060}{100}$$

$$120.6(100) = 100x + 8060$$

$$12060 = 100x + 8060$$

$$100x + 8060 = 12060$$

$$100x = 12060 - 8060$$

$$100x = 4000$$

$$x = \frac{4000}{100}$$

$$x = 40$$ ✓

(ii) $$\frac{P_{2009}}{P_{2008}} \times 100 = 120.6$$

$$\frac{P_{2009}}{243.20} \times 100 = 120.6$$ ✓

$$P_{2009} = \frac{120.6(243.20)}{100}$$

$$P_{2009} = \text{RM } 293.30$$ ✓

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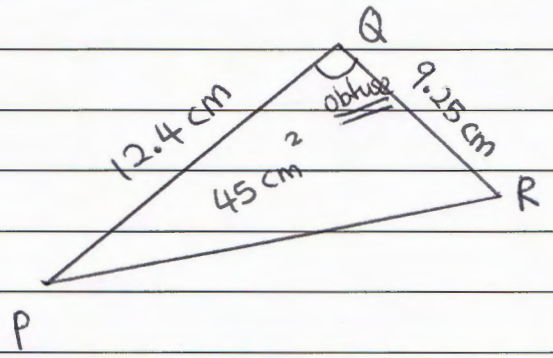
Tingkatan: ..... Perkara..... Tarikh: .....

(14)



(a) (i) Triangle area $= \frac{1}{2} ab \sin C$

$$45 = \frac{1}{2}(12.4)(9.25)\sin \angle PQR$$ ✓

$$45 = 57.35 \sin \angle PQR$$

$$57.35 \sin \angle PQR = 45$$

$$\sin \angle PQR = \frac{45}{57.35}$$

$$\sin \angle PQR = \frac{900}{1147}$$

$$\angle PQR = \sin^{-1}\left(\frac{900}{1147}\right)$$

$$\angle PQR = 180° - \sin^{-1}\left(\frac{900}{1147}\right)$$

$$\underline{\angle PQR = 128° 19'}$$ ✓

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(14) (a) (ii) $a^2 = b^2 + c^2 - 2bc\cos A$

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

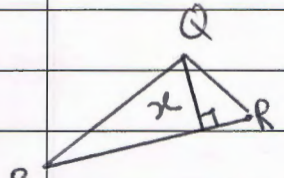
$$PR = \sqrt{(12.4)^2 + (9.25)^2 - 2(12.4)(9.25)\cos\left(180^\circ - \sin^{-1}\left(\frac{900}{1147}\right)\right)}$$ ✓

$$PR = \sqrt{239.3225 - 229.4\cos\left(180^\circ - \sin^{-1}\left(\frac{900}{1147}\right)\right)}$$

$PR = 19.53$ cm ✓

(iii) Triangle area $= \frac{1}{2} \times$ base $\times$ height

$$45 = \frac{1}{2} \times PR \times (x)$$ ✓



$$45(2) = PR \times (x)$$

$$90 = PR \times (x)$$

$$\frac{90}{PR} = x$$

$$x = \frac{90}{PR}$$

$$x = \frac{90}{\sqrt{239.3225 - 229.4\cos\left(180^\circ - \sin^{-1}\left(\frac{900}{1147}\right)\right)}}$$

$x = 4.608$ cm ✓

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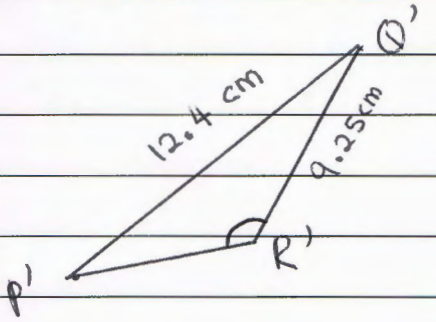
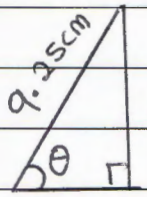
Tingkatan: ..... Perkara..... Tarikh: .....

(14) (b) (i)



(ii)



x = from (a) (iii)

$$\sin\theta = \frac{o}{h}$$

$$\sin\theta = \frac{x}{9.25}$$

$$\theta = \sin^{-1}\left(\frac{x}{9.25}\right)$$

$\therefore \quad \angle Q'R'P' = 180^\circ - \theta$

$= 180^\circ - \sin^{-1}\left(\frac{x}{9.25}\right)$

$= 150^\circ 7'$

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Nama:..... Angka Giliran:.....

Tingkatan: ..... Perkara:.....

Jangan tulis apa-apa di ruangan sini.

(15)

(a)

I	II	III
$x : y \geq 1 : 2$	$x + y \leq 7$	$x \leq 3y$
$\frac{x}{y} \geq \frac{1}{2}$	$y \leq 7 - x$ ✓	$3y \geq x$
$2x \geq y$		$y \geq \frac{x}{3}$ ✓
$y \leq 2x$ ✓		

(b)

I	II	III
(2, 4)	(2, 5)	(3, 1)
(3, 6)	(3, 4)	(6, 2)

(c) (i) minimum number of model A = 2 ✓

(ii) maximum point = (5, 2) ✓

maximum expenditure

$= 700x + 600y$

$= 700(5) + 600(2)$ ✓

$= RM\ 4700$ ✓

$700x + 600y = 0$

$600y = -700x$

$y = \frac{-700x}{600}$

$y = \frac{-7x}{6}$

(0, 0)

(0.6, −0.7)

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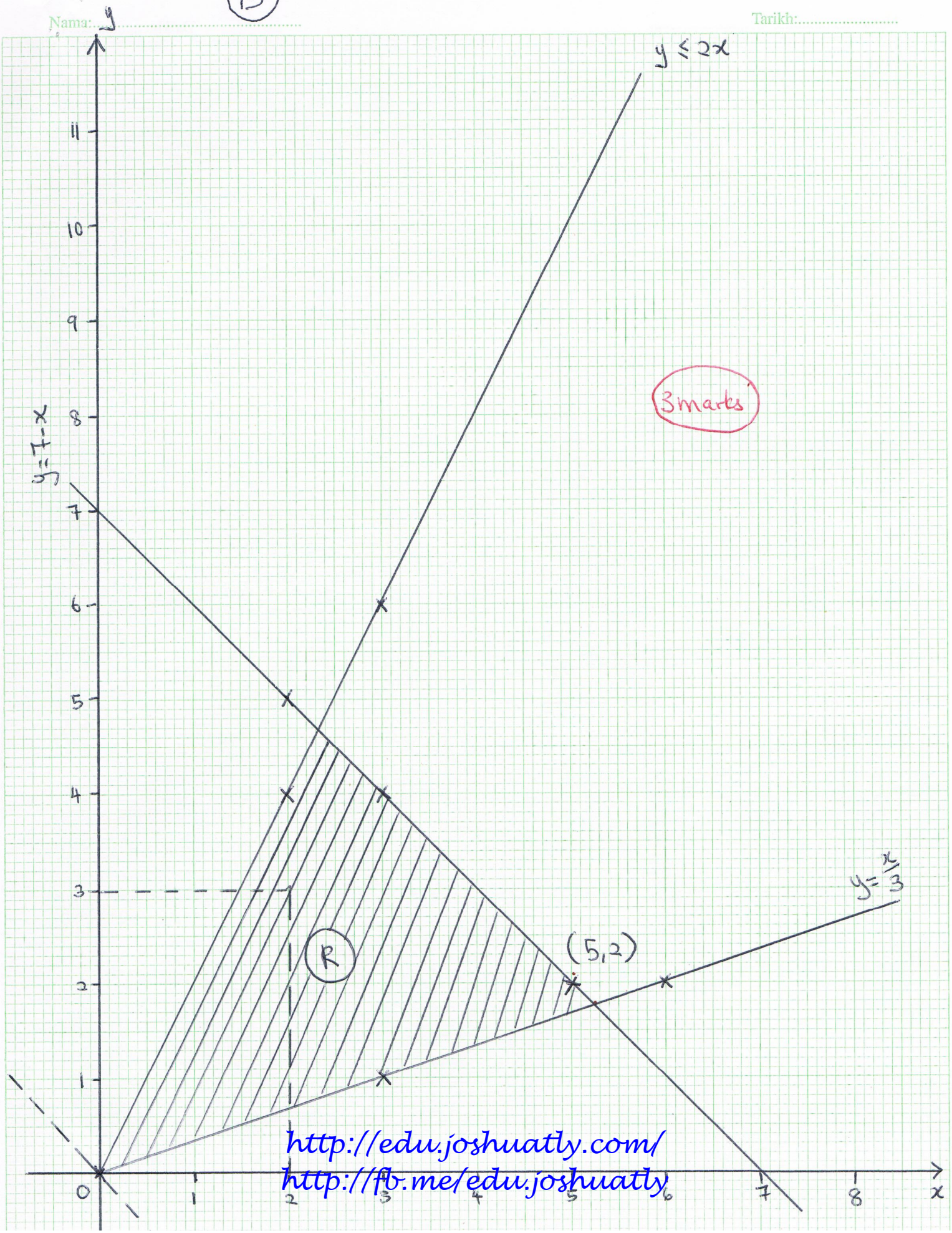
15

Nama:.....

Tarikh:.....



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