3472/2
Matematik
Tambahan
Kertas 2
2 ½ jam
Sept 2011

SEKOLAH-SEKOLAH MENENGAH ZON A KUCHING

PEPERIKSAAN PERCUBAAN
SIJIL PELAJARAN MALAYSIA 2011

MATEMATIK TAMBAHAN

Kertas 2

Dua jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

MARKING SCHEME

Skema Pemarkahan ini mengandungi **13** halaman bercetak

3472/1
Matematik Tambahan
Kertas 1
Sept 2011
2 Jam

Name : ……..……

Form : ……..……

SEKOLAH-SEKOLAH MENENGAH ZON A KUCHING
LEMBAGA PEPERIKSAAN
PEPERIKSAAN PERCUBAAN SPM 2011

MATEMATIK TAMBAHAN
Kertas 1
Dua jam

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1 *This question paper consists of* **25** questions.

2. *Answer* **all** *questions.*

3. *Give only* **one** *answer for each question.*

4. *Write your answers clearly in the spaces provided in the question paper.*

5. *Show your working. It may help you to get marks.*

6. *If you wish to change your answer, cross out the work that you have done. Then write down the new answer.*

7. *The diagrams in the questions provided are not drawn to scale unless stated.*

8. *The marks allocated for each question and sub-part of a question are shown in brackets.*

9. *A list of formulae is provided on pages 2 to 3.*

10. *A booklet of four-figure mathematical tables is provided.*

.

11 *You may use a non-programmable scientific calculator.*

12 *This question paper must be handed in at the end of the examination .*

For examiner's use only		
Question	**Total Marks**	**Marks Obtained**
1	2	
2	3	
3	4	
4	3	
5	3	
6	3	
7	3	
8	4	
9	3	
10	3	
11	4	
12	3	
13	3	
14	3	
15	3	
16	3	
17	4	
18	3	
19	3	
20	3	
21	3	
22	3	
23	4	
24	3	
25	4	
TOTAL	**80**	

Kertas soalan ini mengandungi 16 halaman bercetak

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

ALGEBRA

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

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

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

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

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

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

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

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

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

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

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

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

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

CALCULUS

1 $y = uv$,

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

$\dfrac{dy}{dx} = u\dfrac{dv}{dx} + v\dfrac{du}{dx}$

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

4 Area under a curve

$= \int_a^b y \, dx$ or

$= \int_a^b x \, dy$

5 Volume generated

$= \int_a^b \pi y^2 \, dx$ or

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

GEOMETRY

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

2 Midpoint

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

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

4 $\hat{r} = \dfrac{xi + yj}{\sqrt{x^2 + y^2}}$

5 A point dividing a segment of a line

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

6 Area of triangle

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

STATISTIC

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

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

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

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

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

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

7 $\bar{I} = \dfrac{\sum w_1 I_1}{\sum w_1}$

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

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

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

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

12 Mean $\mu = np$

13 $\sigma = \sqrt{npq}$

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

TRIGONOMETRY

1 Arc length, $s = r\theta$

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

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

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

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

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

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

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

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

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

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

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

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

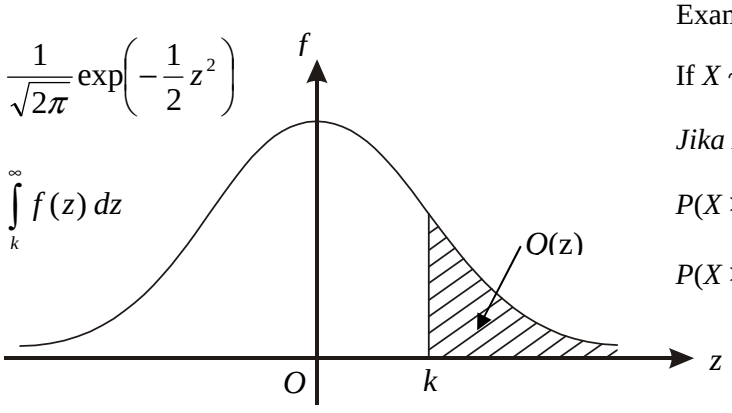
14 Area of triangle $= \dfrac{1}{2}ab\sin C$

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

z	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
											Minus / *Tolak*								
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641	4	8	12	16	20	24	28	32	36
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247	4	8	12	16	20	24	28	32	36
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859	4	8	12	15	19	23	27	31	35
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483	4	7	11	15	19	22	26	30	34
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121	4	7	11	15	18	22	25	29	32
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776	3	7	10	14	17	20	24	27	31
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451	3	7	10	13	16	19	23	26	29
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148	3	6	9	12	15	18	21	24	27
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867	3	5	8	11	14	16	19	22	25
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611	3	5	8	10	13	15	18	20	23
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379	2	5	7	9	12	14	16	19	21
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170	2	4	6	8	10	12	14	16	18
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985	2	4	6	7	9	11	13	15	17
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823	2	3	5	6	8	10	11	13	14
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681	1	3	4	6	7	8	10	11	13
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559	1	2	4	5	6	7	8	10	11
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0..0475	0.0465	0.0455	1	2	3	4	5	6	7	8	9
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367	1	2	3	4	4	5	6	7	8
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294	1	1	2	3	4	4	5	6	6
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233	1	1	2	2	3	4	4	5	5
2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183	0	1	1	2	2	3	3	4	4
2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143	0	1	1	2	2	2	3	3	4
2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110	0	1	1	1	2	2	2	3	3
2.3	0.0107	0.0104	0.0102								0	1	1	1	1	2	2	2	2
				0.00990	0.00964	0.00939	0.00914				3	5	8	10	13	15	18	20	23
								0.00889	0.00866	0.00842	2	5	7	9	12	14	16	16	21
2.4	0.00820	0.00798	0.00776	0.00755	0.00734						2	4	6	8	11	13	15	17	19
						0.00714	0.00695	0.00676	0.00657	0.00639	2	4	6	7	9	11	13	15	17
2.5	0.00621	0.00604	0.00587	0.00570	0.00554	0.00539	0.00523	0.00508	0.00494	0.00480	2	3	5	6	8	9	11	12	14
2.6	0.00466	0.00453	0.00440	0.00427	0.00415	0.00402	0.00391	0.00379	0.00368	0.00357	1	2	3	5	6	7	9	9	10
2.7	0.00347	0.00336	0.00326	0.00317	0.00307	0.00298	0.00289	0.00280	0.00272	0.00264	1	2	3	4	5	6	7	8	9
2.8	0.00256	0.00248	0.00240	0.00233	0.00226	0.00219	0.00212	0.00205	0.00199	0.00193	1	1	2	3	4	4	5	6	6
2.9	0.00187	0.00181	0.00175	0.00169	0.00164	0.00159	0.00154	0.00149	0.00144	0.00139	0	1	1	2	2	3	3	4	4
3.0	0.00135	0.00131	0.00126	0.00122	0.00118	0.00114	0.00111	0.00107	0.00104	0.00100	0	1	1	2	2	2	3	3	4

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

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



Example / *Contoh*:

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

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

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

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

[Lihat sebelah
SULIT

For examiner's use only

Answer **all** *questions.*

1. Diagram 1 shows the graph of the function $f(x) = (x - 1)^2$.

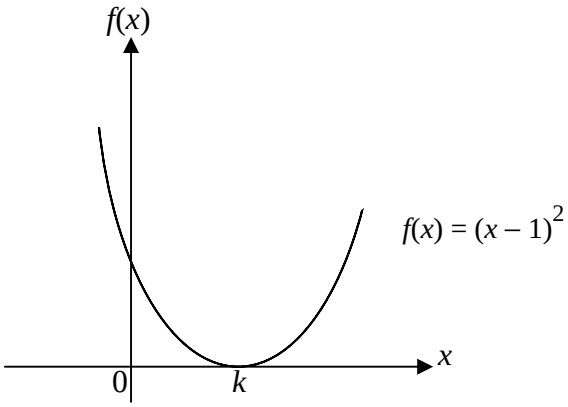


Diagram 1

State
(*a*) the type of relation,
(*b*) the value of *k*.

[2 *marks*]

Answer :
(*a*)

(*b*)

1
2

2. The function f^{-1} is defined by $f^{-1}(x) = \frac{3}{x-2}$, $x \neq k$.

(*a*) State the value of *k*.
(*b*) Find the function f.

[3 *marks*]

Answer :
(*a*)

(*b*)

2
3

3. Given the function $f : x \to 2x - 3$ and composite function $fg : x \to 6x^2 - 4x + 1$. Find

(*a*) $g(x)$,
(*b*) the value of $gf(-1)$.

[4 *marks*]

Answer :
(*a*)

(*b*)

3
4

---

4. Given the equation $x^2 + 2x = -k$ has two distinct roots, find the range of values of k.

[3 *marks*]

Answer :

4
3

[Lihat sebelah
SULIT

For examiner's use only

5. Diagram 5 shows the graph of function $y = (x - 2)^2 + q$, where q is a constant. Given that the line $y = 3$ is the tangent to the curve.

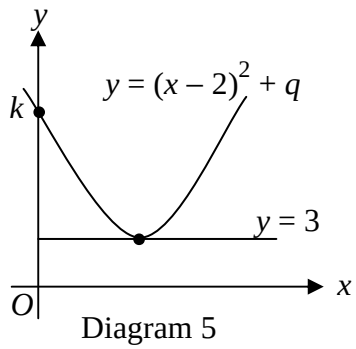


Diagram 5

(*a*) State the equation of axis of symmetry.

(*b*) State the value of q.

(*c*) Find the value of k.

[3 *marks*]

Answer :

(*a*)

(*b*)

(*c*)

5

3

---

6. Find the range of values of x which satisfies $4x \quad 5\ x^2 \leq -1$ [3 *marks*]

Answer :

6

3

For examiner's use only

7. Solve the equation $64^{x+3} = 8^x 4^{x+1}$. [3 *marks*]

Answer :

7 | 3

---

8. Given that $\log_2 m = r$ and $\log_2 n = t$, express $\log_8 \left(\frac{m}{16n^3} \right)$ in terms of r and / or t.

[4 *marks*]

Answer :

8 | 4

---

9. If 3, x, y and 15 are consecutive terms of an arithmetic progression, find the value of x and y. [3 *marks*]

Answer :

9 | 3

For examiner's use only

10. The third and sixth terms of a geometric progression are 1 and 8 respectively. Find the first term and common ratio of the progression. [3 *marks*]

Answer :

10

3

---

11. Express 0.363636... in the form of $\frac{p}{q}$ where p and q are positive integers. Hence express 2.363636... as a single fraction. [4 *marks*]

Answer :

11

4

For examiner's use only

12. The variables x and y are related by the equation $y = 7x - 2x^2$. A straight line graph is obtained by plotting $\frac{y}{x}$ against x, as shown in Diagram 12.

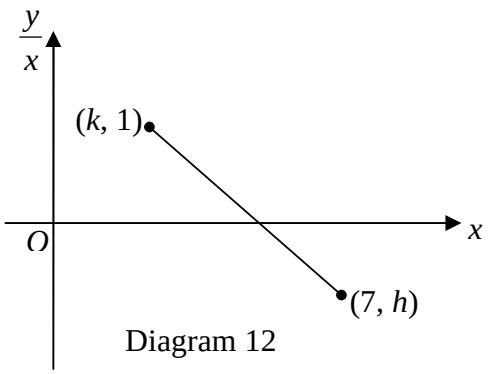


Diagram 12

Find the value of h and of k. [3 *marks*]

Answer :

12

3

---

13. Diagram 13 shows a quadrilateral $PQRS$.

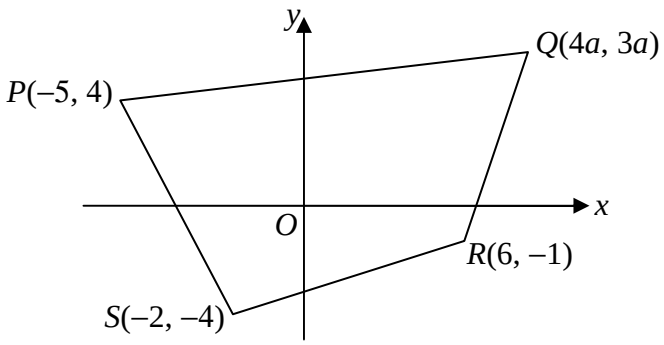


Diagram 13

Given the area of the quadrilateral is 80 unit^2, find the value of a. [3 *marks*]

Answer :

13

3

For examiner's use only

14. Given $A(5, k)$, $B(1, 6)$, $C(1, 5)$. Find the possible values of k if $AB = 2BC$.

[3 *marks*]

Answer :

14

3

---

15. Diagram 15 shows vector $\overrightarrow{OA}$ drawn on a Cartesian plane.

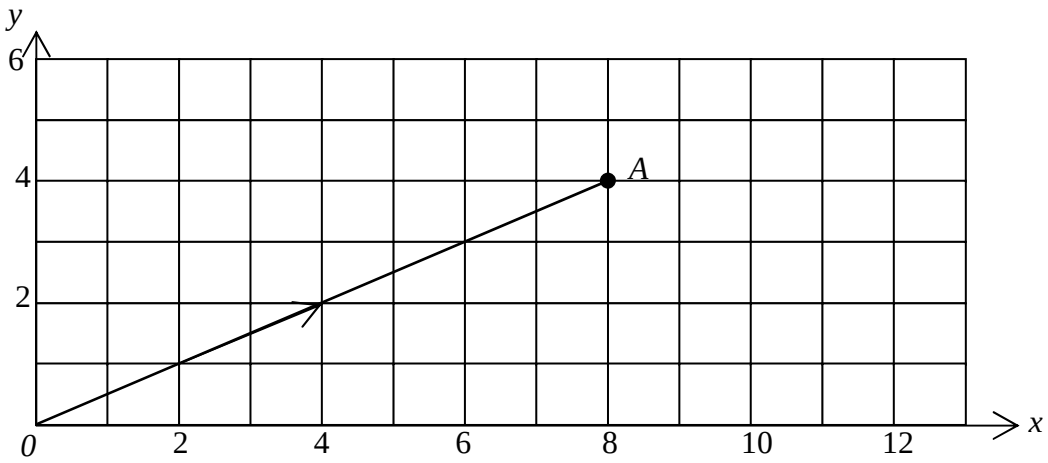


Diagram 15

(*a*) Express $\overrightarrow{OA}$ in the form $\begin{pmatrix} x \\ y \end{pmatrix}$.

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

[3 *marks*]

Answer :

(*a*)

(*b*)

15

3

For examiner's use only

16 . Given that $\underline{\mathbf{a}} = (2k-1)\underline{\mathbf{i}} + 3\underline{\mathbf{j}}$ and $\underline{\mathbf{b}} = 4\underline{\mathbf{i}} + 5\underline{\mathbf{j}}$.

Find the value of k if $2\underline{\mathbf{a}} + 3\underline{\mathbf{b}}$ is parallel to y-axis. [3 *marks*]

Answer :

16

3

.

---

17. It is given that $\tan\theta = \frac{5}{12}$ and θ is an acute angle.

Find the value of each of the following

(*a*) $\tan(-\theta)$,

(*b*) $\sec\theta + \sin\theta$.

[4 *marks*]

Answer :

(*a*)

(*b*)

17

4

[Lihat sebelah
SULIT

For examiner's use only

18.

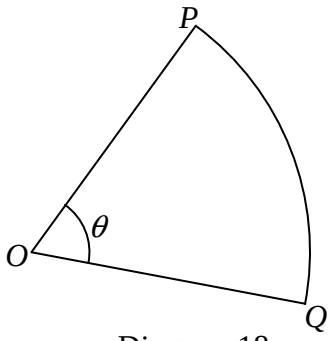


Diagram 18

Diagram 18 above shows a sector *POQ* with centre *O*. The perimeter of sector *POQ* is 40 cm. Given that the radius of the sector is 15 cm, find the value of θ, in radians.

[3 *marks*]

Answer :

18

3

---

19. Given that $y = 6x^2 - 4x$, find the small approximate change in y when x increases from 1 to 1.05.

[3 *marks*]

Answer :

19

3

For examiner's use only

20. Given $\int_2^5 f(x)\,dx = 6$ and $-\int_0^2 f(x)\,dx = 2$. Find $\int_5^0 f(x)\,dx$. [3 *marks*]

Answer :

20
3

---

21. Diagram 21 shows the graph of $y^2 = (x - 3)$ and $x = 5$.

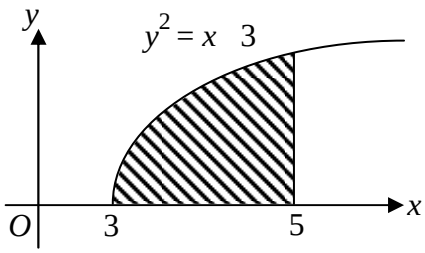


Diagram 21

Find the volume generated when the shaded region is rotated through 360° about x-axis. [3 *marks*]

Answer :

21
3

---

22. Given that the mean and the standard deviation of a set of numbers are 7 and 2. If each of the numbers is multiplied by 3, find

(*a*) the mean,
(*b*) the variance

of the new set of numbers. [3 *marks*]

Answer :

22
3

For examiner's use only

23. The number of ways in which a group of 4 men and 3 women can be seated in a row of

(*a*) 8 chairs,
(*b*) 8 chairs if the first two chairs in the row are occupied by the men.

[4 *marks*]

Answer :

23

4

---

24. A box contains 40 marbles. The colours of the marbles are yellow and blue. If a marble is drawn from the box, the probability that a yellow marble drawn is $\frac{2}{5}$.

Find the number of blue marbles that have to be added to the box such that the probability of obtaining a blue marble becomes $\frac{5}{7}$. [3 *marks*]

Answer :

24

3

For examiner's use only

25. The continuous random variable X is distributed normally with mean μ and variance 25. Given that $P(X < 20) = 0.7881$, find the value of μ. [4 *marks*]

Answer :

25

4

END OF QUESTION PAPER

3472/1
Matematik
Tambahan
Kertas 1
2 jam
Sept 2011

SEKOLAH-SEKOLAH MENENGAH ZON A KUCHING

PEPERIKSAAN PERCUBAAN
SIJIL PELAJARAN MALAYSIA 2011

MATEMATIK TAMBAHAN

Kertas 1

Dua jam

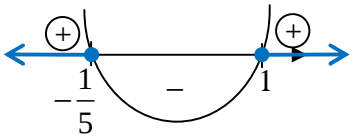
JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

MARKING SCHEME

Skema Pemarkahan ini mengandungi 7 halaman bercetak

MARKING SCHEME FOR PAPER 1 -2011
ZON A

No	Solution and marking scheme	Sub Marks	Total Marks
1.	**(a)** many to one relation **(b)** 1	**1** **1**	**2**
2.	**(a)** $k = 2$ **(b)** $f(x) = \frac{3+2x}{x}, x \neq 0.$ $y = \frac{3}{x-2}$	**1** **2** **B1**	**3**
3.	**(a)** $g(x) = 3x^2 - 2x + 2$ $2g(x) - 3 = 6x^2 - 4x + 1$ @ $f^{-1}(fg(x)) = f^{-1}(6x^2 - 4x + 1)$ **(b)** 87 $f(-1) = -5$	**2** **B1** **2** **B1**	**4**
4.	$k > 1$ $-4k > -4$ or $4 < 4k$ $(2)^2 - 4(1)(-k) > 0$	**3** **B2** **B1**	**3**

No	Solution and marking scheme	Sub Marks	Total Marks
5.	**(a)** $x = 2$ **(b)** $q = 3$ **(c)** $k = 7$	**1** **1** **1**	**3**
6.	$x \le -\frac{1}{5}, x \ge 1$  $(5x+1)(x-1) \ge 0$	**3** **B2** **B1**	**3**
7.	$x = -16$ $6x + 18 = 5x + 2$ $2^{6(x+3)} = 2^{3x}\,2^{2x+2}$	**3** **B2** **B1**	**3**
8.	$\frac{r-4-3t}{3}$ $\frac{r-\log_2 2^4-3\log_2 n}{3}$ $\frac{\log_2 m-\log_2 16-\log_2 n^3}{3}$ $\frac{\log_2\left(\frac{m}{16n^3}\right)}{\log_2 2^3}$	**4** **B3** **B2** **B1**	**4**
9.	$x = 7, y = 11$ Solving equation or $x = 7$ @ $y = 11$ $x - 3 = y - x$ or $x - 3 = 15 - y$ or $d = 4$	**3** **B2** **B1**	**3**

No	Solution and marking scheme	Sub Marks	Total Marks
10.	$r = 2$, $a = \frac{1}{4}$ $r = 2$ @ $a = \frac{1}{4}$ $ar^2 = 1$ ---------- (1) or $ar^5 = 8$ ----------(2)	**3** **B2** **B1**	**3**
11.	$\frac{26}{11}$ $2.363636\ldots = 2 + 0.363636\ldots = 2 + 4/11$ $S_\infty = \frac{0.36}{1-0.01}$ @ $\frac{4}{11}$ $a = 0.36$ and $r = 0.0036/0.36 = 0.01$	**4** **B3** **B2** **B1**	**4**
12.	$h = -7$, $k = 3$ $h = -7$ @ $k = 3$ $\frac{y}{x} = 7 - 2x$ or $\frac{y}{x} = -2x + 7$	**3** **B2** **B1**	**3**
13.	$a = 2$ $\frac{1}{2}(53a + 54) = 80$ $\frac{1}{2}[-5(-4) + (-2)(-1) + 6 \times 3a + 4a \times 4 - (-2)4 - 6(-4) - 4a(-1) - (-5)(3a)] = 80$	**3** **B2** **B1**	**3**
14.	$k =$ 16, 28 $(k-6)^2 = 484$ @ $k - 6 = \pm 22$ @ $(k+16)(k-28) = 0$ $\sqrt{(-5-(-1))^2 + (k-6)^2} = 2\sqrt{(-1-1)^2 + (6-(-5))^2}$	**3** **B2** **B1**	**3**

No	Solution and marking scheme	Sub Marks	Total Marks
15.	.		
	(a) $\overrightarrow{OA} = \begin{pmatrix} 8 \\ 4 \end{pmatrix}$ or $8\underline{\mathbf{i}} + 4\underline{\mathbf{j}}$	**1**	**3**
	(b) $\frac{1}{\sqrt{80}}\begin{pmatrix} 8 \\ 4 \end{pmatrix}$ @ $\frac{8\underline{\mathbf{i}} + 4\underline{\mathbf{j}}}{\sqrt{80}}$	**2**	
	$\left\|\overrightarrow{OA}\right\| = \sqrt{8^2 + 4^2} = 4\sqrt{5}$ @ $\sqrt{80}$	**B1**	
16.	$k = -\frac{5}{2}$	**3**	**3**
	$4k + 10 = 0$	**B2**	
	$2\underline{a} + 3\underline{b} = (4k + 10)i + 21j$	**B1**	
17.	(a) $\tan(-\theta) = -\tan\theta$		
	$= -\frac{5}{12}$	**1**	**4**
	(b) $1\frac{73}{156}$ or $\frac{229}{156}$	**3**	
	$\sec\theta = \frac{13}{12}$ or $\sec\theta + \sin\theta = \frac{13}{12} + \frac{5}{13}$	**B2**	
	$\sin\theta = \frac{5}{13}$ @ $\cos\theta = \frac{12}{13}$	**B1**	
18.	$\theta = \frac{2}{3} rad$	**3**	**3**
	$10 = 15\theta$	**B2**	
	$s_{PQ} = 10$ cm	**B1**	

No	Solution and marking scheme	Sub Marks	Total Marks
19.	$\partial y \approx 0.4$ $\partial y \approx (12(1)-4)(0.05)$ $\frac{dy}{dx} = 12x - 4$ or $\partial x = 1.05 - 1 = 0.05$	**1** **B2** **B1**	**3**
20.	4 $\int_0^2 f(x)dx - \int_5^2 f(x)dx$ $\int_0^2 f(x)dx + \int_2^5 f(x)dx$	**3** **B2** **B1**	**3**
21.	2 $\left(\frac{5^2}{5} - 3\times 5\right) - \left(\frac{3^2}{5} - 3\times 3\right)$ $\left(\frac{x^2}{2} - 3x\right)_3^5$	**3** **B2** **B1**	**3**
22.	variance = 36, mean = 21 Variance = 36 @ Mean = 21 Variance = $3^2 \times 2^2$ @ Mean = 3×7 @ SD = 3×2 @ $\sigma = 6$	**3** **B2** **B1**	**3**
23.	(a) 40320 $^8P_7$ (b) 8640 $^4P_2 \times {}^6P_5$	**2** **B1** **2** **B1**	**4**

No	Solution and marking scheme	Sub Marks	Total Marks
24.	16 $168+7x=200+5x$ @ $\frac{24+x}{40+x}=\frac{5}{7}$ $n(B) = 24 + x$ and $n(S) = 40 + x$	**3** **B2** **B1**	**3**
25.	$\mu = 16$ $\frac{20-\mu}{5} = 0.8$ (from table) $P(Z \geq \frac{20-\mu}{5}) = 0.2119$ $P(X \geq 20) = 0.2119$	**4** **B3** **B2** **B1**	**4**

3472/2
Matematik
Tambahan
Kertas 2
2 ½ jam
2011

SEKOLAH-SEKOLAH MENENGAH ZON A KUCHING

PEPERIKSAAN PERCUBAAN
SIJIL PELAJARAN MALAYSIA 2011

MATEMATIK TAMBAHAN

Kertas 2

Dua jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *This question paper consists of three sections* : **Section *A***, **Section *B*** *and* **Section *C*.**
2. *Answer* **all** *question in* **Section *A* , four** *questions from* **Section *B*** *and* **two** *questions from* **Section *C*.**
3. *Give only* **one** *answer / solution to each question.*
4. *Show your working. It may help you to get marks.*
5. *The diagram in the questions provided are not drawn to scale unless stated.*
6. *The marks allocated for each question and sub-part of a question are shown in brackets..*
7. *A list of formulae is provided on pages 2 to 3.*
8. *A booklet of four-figure mathematical tables is provided.*
9. *You may use a non-programmable scientific calculator.*

Kertas soalan ini mengandungi **13** halaman bercetak

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

ALGEBRA

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

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

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

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

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

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

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

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

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

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

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

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

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

CALCULUS

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

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

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

4 Area under a curve

$= \int_a^b y \, dx$ or

$= \int_a^b x \, dy$

5 Volume generated

$= \int_a^b \pi y^2 \, dx$ or

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

GEOM ETRY

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

2 Midpoint

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

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

4 $\hat{r} = \dfrac{xi + yj}{\sqrt{x^2 + y^2}}$

5 A point dividing a segment of a line

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

6. Area of triangle =

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

STATISTICS

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

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

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

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

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

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

7 $\bar{I} = \dfrac{\sum w_1 I_1}{\sum w_1}$

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

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

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

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

12 Mean $\mu = np$

13 $\sigma = \sqrt{npq}$

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

TRIGONOMETRY

1 Arc length, $s = r\theta$

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

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

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

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

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

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

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

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

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

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

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

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

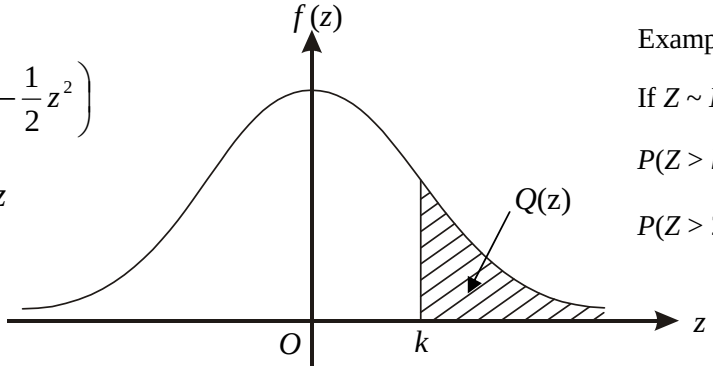
14 Area of triangle $= \dfrac{1}{2}ab\sin C$

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

z	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
											Subtract								
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641	4	8	12	16	20	24	28	32	36
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247	4	8	12	16	20	24	28	32	36
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859	4	8	12	15	19	23	27	31	35
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483	4	7	11	15	19	22	26	30	34
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121	4	7	11	15	18	22	25	29	32
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776	3	7	10	14	17	20	24	27	31
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451	3	7	10	13	16	19	23	26	29
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148	3	6	9	12	15	18	21	24	27
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867	3	5	8	11	14	16	19	22	25
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611	3	5	8	10	13	15	18	20	23
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379	2	5	7	9	12	14	16	19	21
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170	2	4	6	8	10	12	14	16	18
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985	2	4	6	7	9	11	13	15	17
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823	2	3	5	6	8	10	11	13	14
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681	1	3	4	6	7	8	10	11	13
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559	1	2	4	5	6	7	8	10	11
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0..0475	0.0465	0.0455	1	2	3	4	5	6	7	8	9
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367	1	2	3	4	4	5	6	7	8
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294	1	1	2	3	4	4	5	6	6
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233	1	1	2	2	3	4	4	5	5
2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183	0	1	1	2	2	3	3	4	4
2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143	0	1	1	2	2	2	3	3	4
2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110	0	1	1	1	2	2	2	3	3
2.3	0.0107	0.0104	0.0102								0	1	1	1	1	2	2	2	2
				0.00990	0.00964	0.00939	0.00914				3	5	8	10	13	15	18	20	23
								0.00889	0.00866	0.00842	2	5	7	9	12	14	16	16	21
2.4	0.00820	0.00798	0.00776	0.00755	0.00734						2	4	6	8	11	13	15	17	19
						0.00714	0.00695	0.00676	0.00657	0.00639	2	4	6	7	9	11	13	15	17
2.5	0.00621	0.00604	0.00587	0.00570	0.00554	0.00539	0.00523	0.00508	0.00494	0.00480	2	3	5	6	8	9	11	12	14
2.6	0.00466	0.00453	0.00440	0.00427	0.00415	0.00402	0.00391	0.00379	0.00368	0.00357	1	2	3	5	6	7	9	9	10
2.7	0.00347	0.00336	0.00326	0.00317	0.00307	0.00298	0.00289	0.00280	0.00272	0.00264	1	2	3	4	5	6	7	8	9
2.8	0.00256	0.00248	0.00240	0.00233	0.00226	0.00219	0.00212	0.00205	0.00199	0.00193	1	1	2	3	4	4	5	6	6
2.9	0.00187	0.00181	0.00175	0.00169	0.00164	0.00159	0.00154	0.00149	0.00144	0.00139	0	1	1	2	2	3	3	4	4
3.0	0.00135	0.00131	0.00126	0.00122	0.00118	0.00114	0.00111	0.00107	0.00104	0.00100	0	1	1	2	2	2	3	3	4

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

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



Example:

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

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

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

SECTION A

[40 *marks*]

Answer **all** questions.

1 Solve the simultaneous equations $x \quad 2y = 1$ and $x^2 \quad xy = 3$.

[5 *marks*]

2 Given the quadratic function $f(x) = 3x^2 - 12x + 7$.

(*a*) By using completing the square method, express $f(x)$ in the form $a(x + p)^2 + q$ where a, p and q are constants. [2 *marks*]

(*b*) State the minimum / maximum point. [1 *mark*]

(*c*) Sketch the graph of $f(x) = 3x^2 - 12x + 7$ for $-1 \leq x \leq 4$. [3 *marks*]

3 Diagram 3 shows several rectangles with a fixed base of 8 cm. The height of the first rectangle is 100 cm, and the height of each subsequent rectangle decreases by 4 cm.

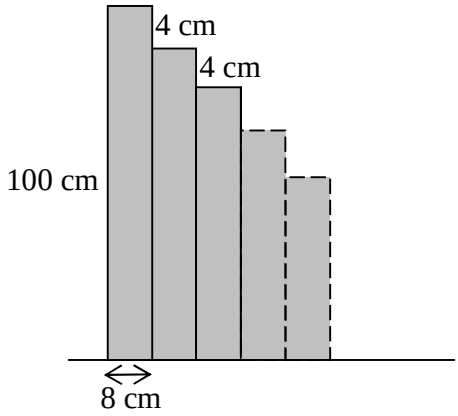


Diagram 3

(*a*) Calculate the area, in cm^2, of the 10^{th} rectangle. [2 *marks*]

(*b*) Determine how many rectangles can be formed. [2 *marks*]

(*c*) Given that the total area of the first n^{th} rectangles is 8 640 cm^2, find the value of n. [3 *marks*]

4 (*a*) Sketch the graph of $y = 1 - 2\sin x$ for $0 \le x \le 2\pi$. [4 *marks*]

(*b*) Hence, using the same axes, sketch a suitable straight line to find the number of solutions for the equation $5\pi(1 - 2\sin x) = 4x$ for $0 \le x \le 2\pi$. State the number of solutions. [3 *marks*]

5 Table 5 shows the length of leaves collected from a type of tree.

Length (cm)	Frequency
41 – 45	2
46 – 50	4
51 – 55	8
56 – 60	11
61 – 65	9
66 – 70	4
71 – 75	2

Table 5

(*a*) Find the mean lengths of leaves collected from the tree. [3 *marks*]

(*b*) Without drawing an ogive, find the interquartile range of the distribution. [4 *marks*]

6 Diagram 6 shows a sector *OABC* with centre *O* and the arc *OB* with centre *C* where $\angle AOC = 100°$. It is given that *OC* = 10 cm.
[Use $\pi = 3.142$]

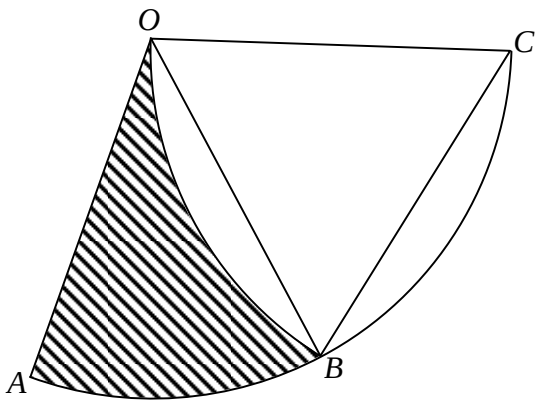


Diagram 6

Calculate

(*a*) $\angle BCO$ and $\angle AOB$ in radians, [3 *marks*]

(*b*) the area, in cm^2, of the sector *OCB* and the sector *AOB*, [2 *marks*]

(*c*) the area, in cm^2, of the shaded region. [3 *marks*]

SECTION B

[40 *marks*]

Answer any **four** questions from this section.

7 *Use graph paper to answer this question.*

Table 7 shows the value of two variables, x and y, obtain from an experiment. The variables x and y are related by the equation $y = (p+1)x^n$, where p and n are constants.

x	2	3	4	6	7	9
y	8.5	20	37	87	118	203

Table 7

(*a*) Based on Table 1, construct a table for the values of $\log_{10} x$ and $\log_{10} y$. [1 *mark*]

(*b*) Plot $\log_{10} y$ against $\log_{10} x$, using a scale of 2 cm to 0.10 unit on the $\log_{10} x$ - axis and 2 cm to 0.20 unit on the $\log_{10} y$ - axis. Hence, draw the line of best fit. [4 *marks*]

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

(i) y when $x = 5.6$,

(ii) n,

(iii) p.

[5 *marks*]

8 *Solution by scale drawing is not accepted.*

Diagram 8 shows a rectangle $ABCD$.

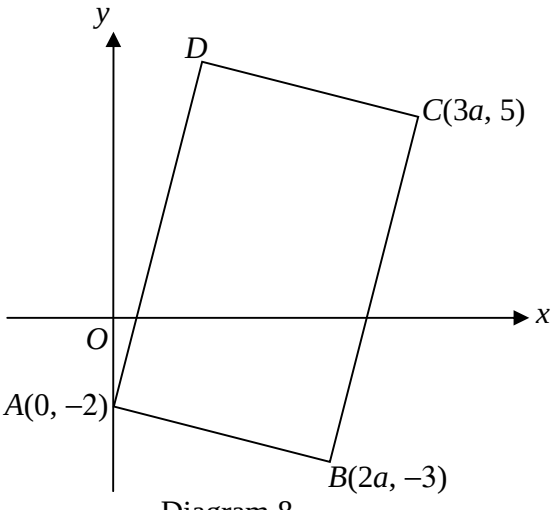


Diagram 8

(*a*) Find

(i) the value of *a*,

(ii) the coordinates of point *D*. [5 *marks*]

(*b*) A point *P* moves such that its distance from point *A* is always 5 units.

(i) Find the equation of the locus of *P*,

(ii) Determine whether this locus intersects straight line *BC*. [5 *marks*]

9 Diagram 9 shows a parallelogram *OLMN*. The midpoint of *MN* is *P* and *LP* meets *OM* at *Q*.

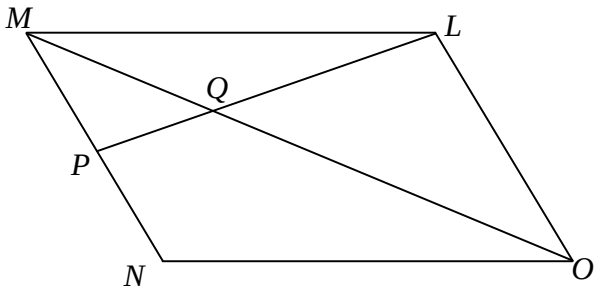


Diagram 9

Given that $\overrightarrow{OL} = \underline{x}$, $\overrightarrow{ON} = \underline{y}$, $\overrightarrow{OQ} = \mu\overrightarrow{OM}$ and $\overrightarrow{LQ} = \lambda\overrightarrow{LP}$.

(*a*) Express $\overrightarrow{OP}$ in terms of $\underline{x}$ and $\underline{y}$. [1 *mark*]

(*b*) Express $\overrightarrow{OQ}$ in terms of

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

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

[4 *marks*]

Hence, find the value of λ and of μ. [3 *marks*]

(*c*) Given that the area of triangle *OQL* is 24 cm^2, find the area of the parallelogram *OLMN*. [2 *marks*]

10 (*a*) Water is being poured into an inverted conical tank as shown in Diagram 10(*a*), at rate of 0.8 $m^3 s^{-1}$. Find the rate of change in the height of the water when the height is 5 m.

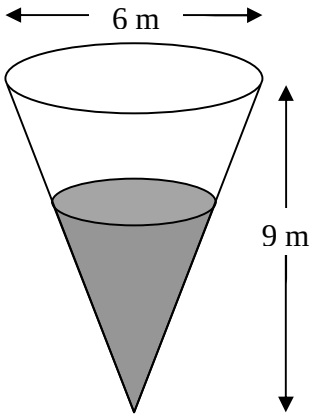


Diagram 10(*a*)

[4 *marks*]

(*b*) Diagram 10(*b*) show the curve of $x = y\,(y + 1)(y \quad 1)$.

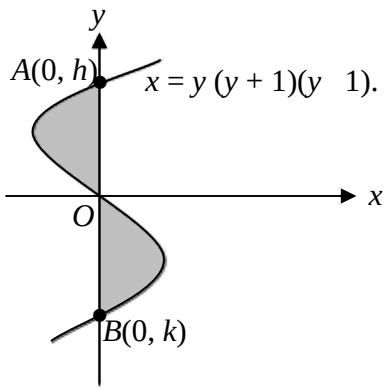


Diagram 10(*b*)

Find

(i) the value of *h* and of *k*. [1 *mark*]

(ii) the area of the shaded region. [5 *marks*]

11. (*a*) The probability that a pen drawn at random from a box of pens is defective is 0.2. If a sample of 5 pens is taken, find the probability that it will contain

(i) no defective pens,

(ii) less than 2 defective pens.

[5 *marks*]

(*b*) A commuter train is scheduled to arrive at the station at 8.05 am but the actual times of arrival are normal distributed about a mean of 8.08 am with a standard deviation of 3.7 minutes.
Find the probability that the train is

(i) late,

(ii) late and arrive before 8.12 am.

[5 *marks*]

SECTION C

[20 *marks*]

Answer any **two** questions from this section.

12 Diagram 12 shows the positions and directions of motion of two objects, *A* and *B*, moving along a straight line and passing through a fixed point O at the same time.

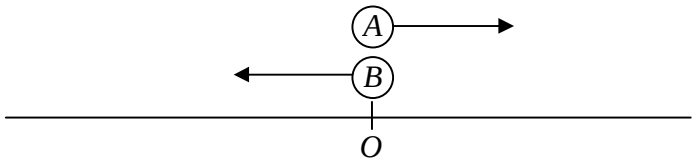


Diagram 12

The velocity of A, v_A ms^{-1}, is given by $v_A = t^2 - 6t + 8$ and the velocity of B, v_B ms^{-1}, is given by $v_B = -t^2 + 5t - 4$, where t is the time, in seconds, after leaving point *O*.
[Assume motion to the right is positive]
Find

(*a*) the initial velocity object *A*, [1 *mark*]

(*b*) the minimum velocity object *B*, [3 *marks*]

(*c*) the values of time, *t*, in seconds, when both the objects stop instantaneously at the same time, [3 *marks*]

(*d*) the distance, in m, of object *A* from *O* when it stops for the first time. [3 *marks*]

13 Table 13 shows the price indices and respective weightages, in the year 2008 based on the year 2006, on four materials, *A*, *B*, *C*, *D* in the production of a type of foaming cleanser.

Material	Price index in the year 2008 based on the year 2006	Weightage
A	125	4
B	120	*n*
C	80	5
D	150	*n* + 3

Table 13

(*a*) If the price of material *A* is in the year 2006 was RM 60.00, calculate its price in the year 2008. [2 *marks*]

(*b*) Given that the composite index for the production cost of the foaming cleanser in the year 2008 based on the year 2006 is 120.
Find

(i) the value of *n*, [3 *marks*]

(ii) the price of the foaming cleanser in the year 2006 if the price in the year 2008 is RM 30.00. [2 *marks*]

(*c*) Given that the price of material *B* is estimated to increase by 15 % from the year 2008 to the year 2009 , while the others remain unchanged. Calculate the composite index of the foaming cleanser in the year 2009 based on the year 2006. [3 *marks*]

14 The diagram 14 shows a quadrilateral *PQRS*.

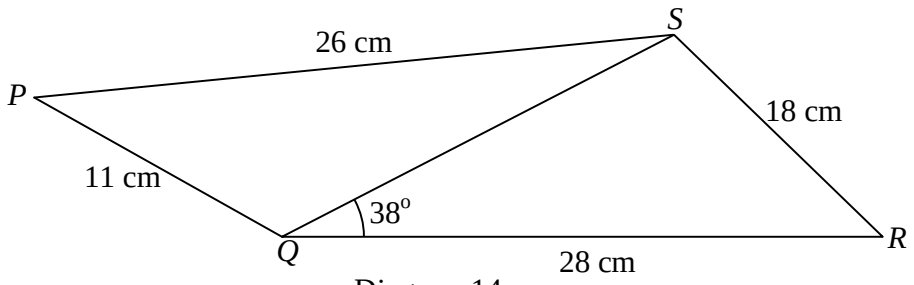


Diagram 14

Given that $\angle QSR$ is an obtuse, PQ = 11 cm, QR = 28 cm, RS = 18 cm, PS = 26 cm and $\angle RQS = 38°$.
Calculate

(*a*) $\angle QSR$, [3 *marks*]

(*b*) the length *QS*, [3 *marks*]

(*c*) the area of triangle *PQR*. [4 *marks*]

15 *Use the graph paper provided to answer this question.*

A factory produces two types of robot *P* and *Q* using two machines, *A* and *B*. Given that machine *A* requires 2 hours to produce one unit of robot *P* and 3 hours to produce one unit of robot *Q* while machine *B* requires $2\frac{1}{2}$ hour to produce one unit of robot *P* and 4 hours to produce one unit of robot *Q*. The machines produce *x* units of robot *P* and *y* units of robot *Q* in a particular day according to the following constraints :

I Machine *A* is function for not more than 2 days.

II Machine *B* is function for at least 1 day.

III The number of robot *P* produced is not more than three times the number of robot *Q* produced.

(*a*) Write down three inequalities, other than $x \geq 0$ and $y \geq 0$, which satisfy the above conditions. [3 *marks*]

(*b*) By using a scale of 2cm to 2 units of commodity on both axes, construct and shade the region *R* that satisfies all the above constraints. [3 *marks*]

(*c*) By using your graph in (*b*), find

(i) the maximum profit obtained if the profit from the sale of one unit of robot *P* and one unit of robot *Q* are RM 500 and RM 300 respectively, assuming all the robots produced are sold.

(ii) The maximum number of units of robot *Q* that can be produced if the factory produced 12 units of robot *P*.

[4 *marks*]

END OF QUESTION PAPER

NO. KAD PENGENALAN

ANGKA GILIRAN

Arahan Kepada Calon

1 Tulis **nombor kad pengenalan** dan **angka giliran** anda pada petak yang disediakan.

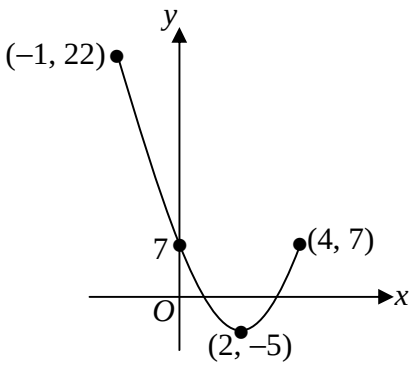
2 Tandakan (✓) untuk soalan yang dijawab.

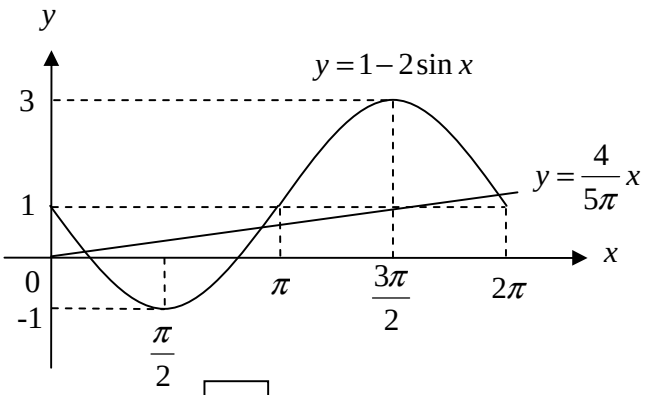
3 Ceraikan helaian ini dan ikat sebagai muka hadapan bersama-sama dengan buku jawapan.

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

ADDITIONAL MATHEMATICS MARKING SCHEME

TRIAL SPM exam Zon A Kuching 2011 – PAPER 2

QUESTION NO.	SOLUTION	MARKS
1	$x = 2y + 1$ P1 $(2y+1)^2 - (2y+1)y = 3$ K1 Eliminate x or y $(2y-1)(y+2) = 0$ K1 Solve the quadratic equation by using the factorization @ quadratic formula @ completing the square must be shown $y = \frac{1}{2}, y = -2$ N1 @ $x = 2, x = -3$ N1 **Note :** **OW– 1** if the working of solving quadratic equation is not shown.	**5** **5**
2 (*a*)	$f(x) = 3[x^2 + 2(-2)x + (-2)^2 - (-2)^2] + 7$ or $3[(x-2)^2 - 4] + 7$ or $3[(x-2)^2 - \frac{5}{3}]$ K1 $= 3(x-2)^2 - 5$ N1	**2**
(*b*)	$(2, -5)_{min}$ N1	**1**
(*c*)	Shape N1 (2, –5) and (0, 7) N1 (–1, 22) and (4, 7) N1  	**3** **6**

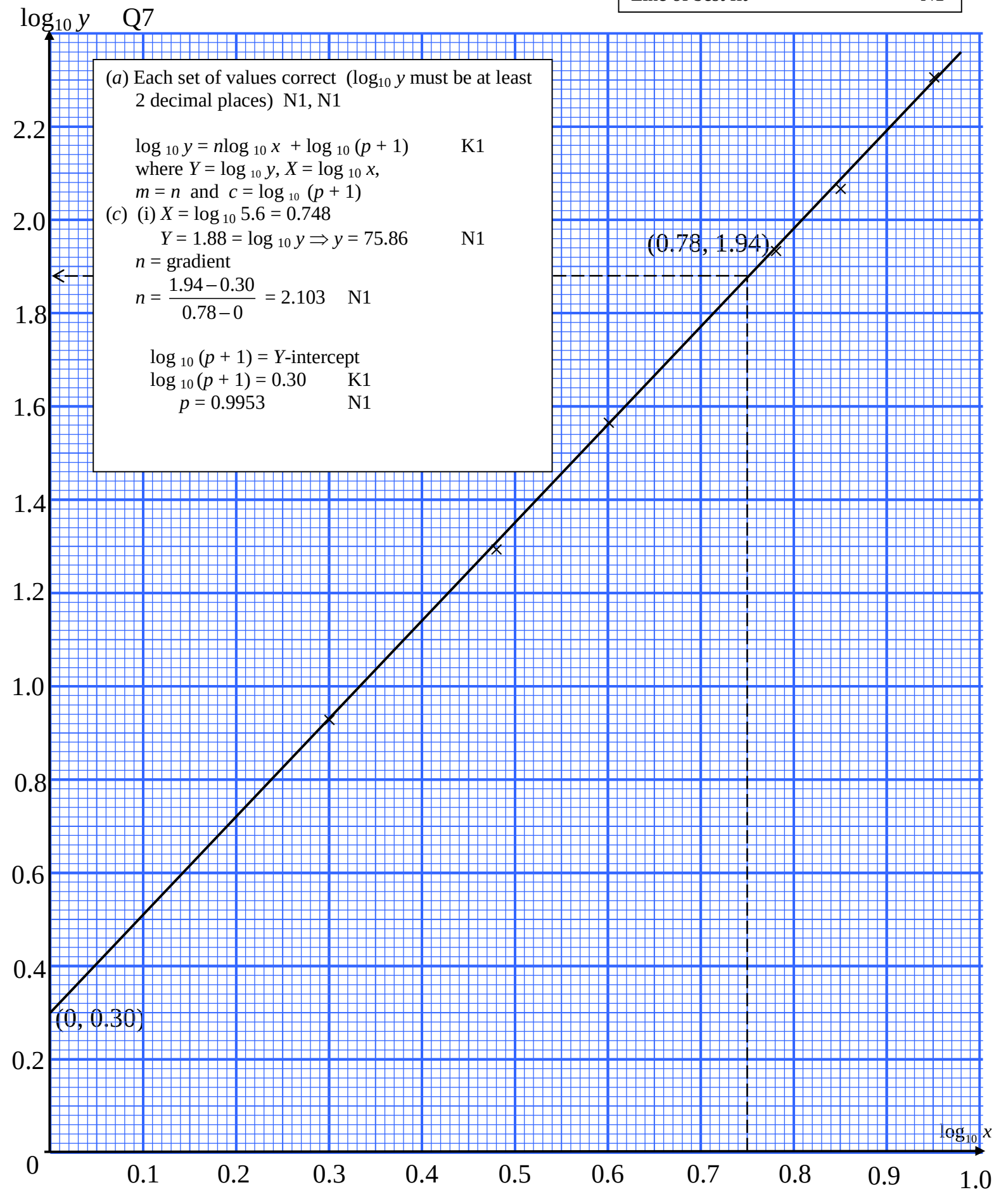
QUESTION NO.	SOLUTION	MARKS
3 (*a*)	$T_{10} = 100 + 9(-4)$ or 64 K1 Area = 512 N1	**2**
(*b*)	$100 + (n-1)(-4) = 4$ or $\frac{100}{4}$ K1 @ $100 + (n-1)(-4) > 0$ $n = 25$ N1	**2**
(*c*)	$\frac{n}{2}[2(100)+(n-1)(-4)] = \frac{8640}{8}$ or 1080 K1 $(n-36)(n-15) = 0$ K1 $n = 15$ N1	**3** **7**
4 (*a*)	 Shape of sine curve P1 Modulus P1 Amplitude or period P1 Translation P1	**4** **3**
(*b*)	$y = \frac{4}{5\pi}x$ K1 Number of solutions = 3 N1 Sketch straight line correctly P1	**3** **7**

QUESTION NO.	SOLUTION	MARKS
5 (*a*)	$\sum fx = 43\times2+48\times4+53\times8+58\times11+63\times9+68\times4+73\times2 = 2325$ $\bar{x} = \frac{2325}{40}$ $= 58.125$ K1 K1 N1	**3**
(*b*)	$Q_3 = 60.5 + \left[\frac{\frac{3}{4}(40)-25}{9}\right]5 = 63.28$ P1 Lower boundary OR $\left[\frac{\frac{3}{4}(40)-25}{9}\right]5$ OR $Q_1 = 50.5+\left[\frac{\frac{1}{4}(40)-6}{8}\right]5$ $= 53$ Interquartile range = 63.28 – 53 = 10.28 K1 K1 N1	**4** **7**
6 (*a*)	$\angle BCO = 60°$ = 1.047 rad $\angle AOB$ = 0.6982 rad K1 N1 N1	**3**
(*b*)	$\frac{1}{2}(10)^2(1.047)$ or 52.35 N1 $\frac{1}{2}(10)^2(0.6982)$ or 34.91 N1	**2**
(*c*)	Area of segment $BC = 52.35 - \frac{1}{2}(10)^2 \sin 1.047^r = 9.237$ Area of the shaded region = 25.673 K1 K1 N1	**3** **7**

$\log_{10} x$	0.30	0.48	0.60	0.78	0.85	0.95	**N1**
$\log_{10} y$	0.93	1.30	1.57	1.94	2.07	2.31	**N1**

Correct both axes (Uniform scale)	K1
All points are plotted correctly	N1
Line of best fit	N1

Q7



(*a*) Each set of values correct ($\log_{10} y$ must be at least 2 decimal places) N1, N1

$\log_{10} y = n\log_{10} x + \log_{10}(p+1)$ K1

where $Y = \log_{10} y$, $X = \log_{10} x$,

$m = n$ and $c = \log_{10}(p+1)$

(*c*) (i) $X = \log_{10} 5.6 = 0.748$

$Y = 1.88 = \log_{10} y \Rightarrow y = 75.86$ N1

n = gradient

$n = \dfrac{1.94 - 0.30}{0.78 - 0} = 2.103$ N1

$\log_{10}(p+1) = Y$-intercept

$\log_{10}(p+1) = 0.30$ K1

$p = 0.9953$ N1

QUESTION NO.	SOLUTION	MARKS
8 (a) (i)	$\frac{8}{a}\times\left(-\frac{1}{2a}\right)=-1$ K1 $2a^2=8$ K1 $a=\pm 2$ $a>0,\ a=2$ N1	**3**
(ii)	$\left(\frac{x+4}{2},\frac{y-3}{2}\right)=\left(\frac{6+0}{2},\frac{5+(-2)}{2}\right)$ K1 $D(2, 6)$ N1 @ Solving the equations $y = 4x - 2$ and $y=-\frac{1}{4}x+\frac{13}{2}$ K1 $D(2, 6)$ N1	**2**
(b) (i)	$\sqrt{(x-0)^2+(y+2)^2}=5$ K1 $x^2+y^2+4y-21=0$ N1	**2**
(ii)	Get equation of BC , $y = 4x - 19$ K1 $x^2+(4x-19)^2+4(4x-19)-21=0$ K1 $17x^2-136x+264=0$ b^2-4ac $=(-136)^2-4(17)(264)$ $=544>0$ N1 The locus intersects the line BC.	**3**
		10

QUESTION NO.	SOLUTION	MARKS
9 (*a*)	$\overrightarrow{OP} = \frac{1}{2}\underline{x} + \underline{y}$ P1	**1**
(b) (i)	$\overrightarrow{OQ} = \lambda\underline{x} + \lambda\underline{y}$ N1	**4**
(ii)	$\overrightarrow{OQ} = \overrightarrow{OL} + \overrightarrow{LQ}$ $= \underline{x} + \mu\overrightarrow{LP}$ $= \underline{x} + \mu\left(\overrightarrow{LM} + \overrightarrow{MP}\right)$ $= \underline{x} + \mu\left(\underline{y} - \frac{1}{2}\underline{x}\right)$ $= \left(1 - \frac{1}{2}\mu\right)\underline{x} + \mu\underline{y}$ K1, K1, N1	
	$\underline{x} : \lambda = 1 - \frac{1}{2}\mu$ $\underline{y} : \lambda = \mu$ $\mu = 1 - \frac{1}{2}\mu$ $\mu = \lambda = \frac{2}{3}$ K1, K1, N1	**3**
(*c*)	Area of triangle $OLM = \frac{3}{2} \times 24 = 36$ K1 Therefore area of parallelogram $OLMN = 72$ N1	**2**
		10

QUESTION NO.	SOLUTION	MARKS
10 (*a*)	$\frac{r}{3}=\frac{h}{9}\Rightarrow r=\frac{h}{3}$ K1 $\frac{dV}{dh}=\frac{\pi h^2}{9}$ K1 $0.8=\frac{\pi h^2}{9}\times\frac{dh}{dt}$ K1 $0.8=\frac{\pi h^2}{9}\times\frac{dh}{dt}$ N1	**4**
(*b*) (i) (ii)	$h = 1$ and $k = -1$ N1 N1 Area of the shaded region $=\left\lvert\int_0^1\left(y^3-y\right)dy\right\rvert+\int_{-1}^0\left(y^3-y\right)dy$ K1 $=\left\lvert\left(\frac{y^4}{4}-\frac{y^2}{2}\right)_0^1\right\rvert+\left(\frac{y^4}{4}-\frac{y^2}{2}\right)_{-1}^0$ K1 $=\left\lvert\left(\frac{1}{4}-\frac{1}{2}-(0-0)\right)\right\rvert+\left(0-0-\left(\frac{(-1)^4}{4}-\frac{1}{2}\right)\right)$ K1 $=\frac{1}{2}$ N1 **Note:** OW – 1 once only for correct answer without showing the process of intergration.	**6** **10**

QUESTION NO.	SOLUTION	MARKS
11(*a*) (i)	$P(X=0) = {}^{5}C_{0}(0.2)^{0}(0.8)^{5}$ $= 0.3277$ K1 N1	**5**
(ii)	$P(X<2) = {}^{5}C_{0}(0.2)^{0}(0.8)^{5} + {}^{5}C_{1}(0.2)^{1}(0.8)^{4}$ K1 K1 $= 0.7373$ N1	
(*b*) (i)	$P(Z > -0.811)$ @ $R(-0.811)$ K1 N1	**5**
(ii)	$= 0.7913$ @ 0.79132 $P(-0.811 < Z < 1.081)$ $= 1 - P(Z \geq 0.811) - P(Z \geq 1.081)$ @ $R(-0.811) - R(1.081)$ $= 0.6514$ @ 0.65147 K1 K1 N1	**10**

QUESTION NO.	SOLUTION	MARKS
12 (*a*)	Initial velocity $v_A = 8$ N1	**1**
(*b*)	$\frac{dv}{dt} = -2t + 5 = 0$ K1 $t = \frac{5}{2}$ $v_B = -\left(\frac{5}{2}\right)^2 + 5\left(\frac{5}{2}\right) - 4$ K1 $= 2\frac{1}{4}$ N1	**3**
(*c*)	$v_A = (t-2)(t-4) = 0$ K1 $v_B = -(t-1)(t-4) = 0$ K1 $\therefore t = 4$ N1	**3**
(*d*)	$s_A = \int t^2 - 3t + 8dt$ $= \frac{t^3}{3} - 3t^2 + 8t$ K1 $= \frac{(2)^3}{3} + 3(2)^2 + 8(2)$ K1 $= 6\frac{2}{3}$ N1	**3**
		10

QUESTION NO.	SOLUTION	MARKS
13 (*a*)	$A: \frac{P_{08}}{60} \times 100 = 125$ K1 $P_{08} = \text{RM}75$ N1	**2**
(*b*)(i)	$120 = \frac{(125\times 4)+(120n)+(80\times 5)+150(n+3)}{12+2n}$ K1 $1440 + 240n = 1350 + 270n$ K1 $n = 3$ N1	**3**
(ii)	$\frac{\text{RM}30}{P_{06}} \times 100 = 120$ K1 $= \text{RM}25$ N1	
(*c*)	$120 + (120 \times 0.15) = 138$ K1 $\bar{I}_{09/06} = \frac{(125\times 4)+(138\times 3)+(80\times 5)+(150\times 6)}{18}$ K1 $= 123$ N1	**3**
		10

QUESTION NO.	SOLUTION	MARKS
14 (*a*)	$\frac{18}{\sin 38^\circ} = \frac{28}{\sin \angle QSR}$ K1 $\angle QSR = 180^\circ - 73^\circ 16'$ N1 $= 106^\circ 44'$ N1	**3**
(*b*)	$\angle QRS = 35^\circ 16'$ K1 $PS^2 = 28^2 + 18^2 - 2(28)(18)\cos 35^\circ 16'$ K1 @ Sine Rule $QS = 16.88$ N1	**3**
(*c*)	$26^2 = 11^2 + 16.88^2 - 2\times 11\times 16.88\times \cos \angle PQS$ K1 $\angle PQS = 136^\circ 39'$ N1 Area of triangle $PQR = \frac{1}{2}\times 11\times 28\times \sin 176^\circ 39'$ K1 $= 8.999$ N1	**2** **10**

Answer for question 15

(a) I. $2x + 3y \geq 48$ N1

II. $5x + 8y \geq 48$ N1

III. $3y \geq x$ N1

(b) **Refer to the graph,**

1 or 2 graph(s) correct
3 graphs correct K1 N1

Correct area N1

(c) ii) max point (15, 6) N1

k = RM($500x + 300y$)
Maximum Profit = RM 500(15) + RM 300(6) K1 N1

= RM 7500

(ii) 8 units N1

10