Nama : .....

Tingkatan: .....

SULIT

3472/1
Matematik Tambahan
Kertas 1
Sept 2010
2 jam

PERSIDANGAN KEBANGSAAN PENGETUA-PENGETUA
SEKOLAH MENENGAH MALAYSIA (PKPSM) CAWANGAN MELAKA
DENGAN KERJASAMA
JABATAN PELAJARAN MELAKA

PEPERIKSAAN PERCUBAAN
SIJIL PELAJARAN MALAYSIA 2010

MATEMATIK TAMBAHAN

Kertas 1
Dua Jam

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

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

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

3. ***Give only* one *answer for each question***
   Bagi setiap soalan berikan SATU jawapan sahaja.

4. ***Write the answers clearly in the space provided in the question paper.***
   Jawapan hendaklah ditulis pada ruang yang disediakan dalam kertas soalan.

5. ***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.

6. ***If you wish to change your answer, cross out the work that you have done. Then write down the new answer.***
   Sekiranya anda hendak menukar jawapan, batalkan kerja mengira yang telah dibuat. Kemudian tulis jawapan yang baru.

7. ***The diagram in the questions provided are not drawn to scale unless stated.***
   Rajah yang mengiringi soalan ini tidak dilukiskan mengikut skala kecuali dinyatakan.

8. ***The marks allocated for each question and sub-part of a question are shown in brackets.***
   Markah yang diperuntukkan bagi setiap soalan atau ceraian soalan ditunjukkan dalam kurungan.

9. ***A list of formulae is provided on page* 2 *to* 3**
   Satu senarai rumus disediakan di halaman 2 hingga 3

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

11. ***This question paper must be handed in at the end of the examination.***
    Kertas soalan ini hendaklah diserahkan pada akhir peperiksaan .

Kod Pemeriksa		
Soalan	Markah Penuh	Markah Diperoleh
1	2	
2	2	
3	4	
4	3	
5	3	
6	3	
7	3	
8	4	
9	3	
10	4	
11	4	
12	4	
13	3	
14	3	
15	4	
16	3	
17	4	
18	3	
19	3	
20	3	
21	3	
22	3	
23	3	
24	3	
25	3	
Jumlah	80	

Kertas soalan ini mengandungi **18** halaman bercetak

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

Rumus-rumus berikut boleh digunakan untuk 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 $(a^m)^n = a^{nm}$

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

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

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

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

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

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

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

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

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

CALCULUS(*KALKULUS*)

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

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

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

4 Area under a curve (*Luas dibawah lengkung)*

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

$= \int_a^b x \, dy$

5 Volume generated (*Isipadu Janaan)*

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

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

GEOMETRY

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

2 Midpoint (*Titik Tengah*)

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

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

Titik yang membahagi suatu tembereng garis

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

6 Area of triangle (*Luas Segitiga*)

$= \dfrac{1}{2}\left| (x_1y_2 + x_2y_3 + x_3y_{1_1}) - (x_2y_1 + x_3y_2 + x_1y_3) \right|$

STATISTICS

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

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

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

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

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

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

7 $\bar{I} = \frac{\sum w_i I_i}{\sum w_i}$

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

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

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 $z = \frac{x-\mu}{\sigma}$

TRIGONOMETRY

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

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

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

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

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

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

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

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

14 Area of triangle $= \frac{1}{2}ab\sin C$
(*Luas Segitiga*)

For examiner's use only

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

1 Diagram 1 shows the relation between two sets of number .
Rajah 1 menunjukkan satu hubungan diantara dua set nombor.

$P = \{ -3, -2, -1, 0, 1, 2 \}$

$Q = \{ -1, 0, 1, 2, 3 \}$

Diagram 1
Rajah 1

Based on the above information, the relation between P and Q is defined by the set of ordered pairs $\{ (-2, 1), (-1, 0), (0, 1), (1, 2), (2, 3) \}$.
Berdasarkan maklumat diatas hubungan antara P dan Q ditarifkan sebagai set pasangan tertib $\{ (-2, 1), (-1, 0), (0, 1), (1, 2), (2, 3) \}$.

State,
Nyatakan,
(a) the image of 2.
imej bagi 2
(b) the object of 0.
imej bagi 0

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

1 / 2

Answer/*Jawapan*: (a) .....

(b) .....

---

2 Given the function $g : x \rightarrow x^2 + 1$, find the values of $g^{-1}(10)$
Di beri $g : x \rightarrow x^2 + 1$. Cari nilai –nilai bagi $g^{-1}(10)$

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

2 / 2

Answer/*Jawapan*: .....

For examiner's use only

3 The function f is defined by $f: x \to kx^2 + p$ and the function g is defined by $g: x \to 1 + 2x$. Given the composite function $fg: x \to x^2 + x + 6$, find the values of k and p.
Fungsi f ditakrifkan sebagai $f: x \to kx^2 + p$ dan fungsi g ditarifkan sebagai $g: x \to 1 + 2x$
Diberi fungsi gubahan $fg: x \to x^2 + x + 6$, cari nilai k dan nilai p

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

3

4

Answer/ Jawapan : k = ...p = ...

---

4 Given that $\frac{1}{p}$ is one of the roots of the quadratic equation $px^2 + 7x - 2p = 0$, find the values of p.

Diberi bahawa $\frac{1}{p}$ ialah salah satu punca bagi persamaan kuadratik $px^2 + 7x - 2p = 0$, cari nilai-nilai bagi p

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

4

3

Answer/*Jawapan:* .....

For examiner's use only

5 Diagram 5 shows the graph of a quadratic function $f(x) = 3(x + p)^2 + 2$, where p is a constant. The curve $y = f(x)$ has the minimum point $(4, q)$, where q is a constant.
Rajah 5 menunjukkan graf fungsi kuadratik $f(x) = 3(x + p)^2 + 2$, dimana p ialah pemalar Lengkung $y = f(x)$ mempunyai titik minimum $(4, q)$, dimana q ialah satu pemalar.

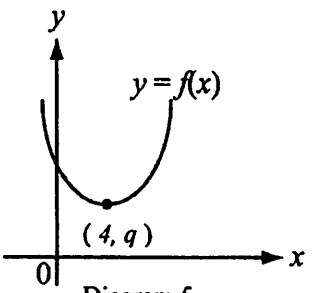

Diagram 5
Rajah 5

State,
Nyatakan,

(a) the value of p,
nilai p
(b) the value of q,
nilai q
(c) the equation of the axis of symmetry.
persamaan paksi semetri

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

Answer : *(a)* .....

(b) .....

(c).....

5
3

For examiner use only

6 Find the range of values of x for which $x(x-6) \leq 27$.
Cari julat nilai- nilai x dimana $x(x-6) \leq 27$

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

Answer/ *Jawapan*: .....

6
3

---

7 Solve the equation $81^{x+1} - 27^{2x-3} = 0$.
Selesaikan persamaan $81^{x+1} - 27^{2x-3} = 0$

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

Answer /*Jawapan*: $x =$ .....

7
3

---

8 Given $\log_7 2 = h$ and $\log_7 5 = k$. Express $\log_7 2.8$ in terms of h and k.
Diberi $\log_7 2 = h$ dan $\log_7 5 = k$. Ungkapkan $\log_7 2.8$ dalam sebutan h dan k.

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

Answer /*Jawapan* : = ...

8
4

9 Solve $\log_3(4x) - \log_3(x+1) = 1$

Selesaikan $\log_3(4x) - \log_3(x+1) = 1$

[3 marks]
[3 markah]

9
3

Answer/*Jawapan*: .....

---

10 The first three terms of an arithmetic progression are $6, t-2, 14, ...$

Tiga sebutan pertama satu janjang arithmatik ialah $6, t-2, 14, ...$

find,
cari,

(a) the value of t,
nilai t

(b) the sum of the first ten term
hasil tambah sepuluh sebutan pertama

[4 marks]
[4 markah]

10
4

Answer /*Jawapan*: (a).....

(b) .....

---

11 The sum of the first n terms of the geometric progression, 64, 32, 16, ... is 126.

Hasil tambah n sebutan pertama suatu janjang geometri, 64, 32, 16, ... ialah 126

Find,
Cari,

(a) the value of n,
nilai n

(b) the sum to infinity of the geometric progression.
hasil tambah ketakterhingaan janjang geometri ini,

[4 marks]
[4 markah]

11
4

Answer/*Jawapan*: (a) n = ...

(b).....

For examiner's use only

12 x and y are related by the equation $x+\frac{m}{x}=ny$, where m and n are constants.

A straight line is obtained by plotting xy against x^2, as shown in Diagram 12 .

x dan y dihubungkan oleh persamaan $x+\frac{m}{x}=ny$, dimana m dan n ialah pemalar.

Satu garislurus diperolehi dengan memplotkan xy melawan x^2, sebagaimana ditunjukkan dalam Rajah 12

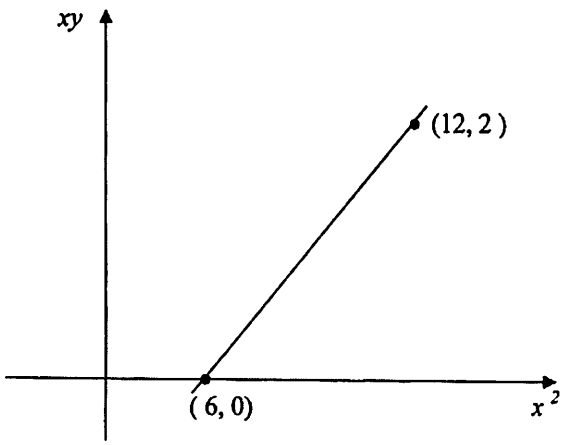

Diagram 12
Rajah 12

Calculate the value of m and of n.
Kira nilai m dan nilai n

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

12

4

Answer/*Jawapan*: m =.....

n =.....

For examiner's use only

13 Given that the point $P(-2,3)$ divides the line segment that joining $A(-4,t)$ and $B(r,8)$ in the ratio $AP : PB = 1 : 4$. Find the value of r and of t.
Diberi bahawa titik $P(-2,3)$ membahagi segmen garis yang menghubungkan $A(-4,t)$ dan $B(r,8)$ dalam nisbah $AP : PB = 1 : 4$. *Cari nilai* r dan nilai t.

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

13
3

Answer/Jawapan: .....

---

14 Given that $\underset{\sim}{a} = -2\underset{\sim}{i} + 2\underset{\sim}{j}$, $\underset{\sim}{b} = 2\underset{\sim}{i} - 3\underset{\sim}{j}$ and $\underset{\sim}{c} = \underset{\sim}{a} - 2\underset{\sim}{b}$.
Diberi bahawa $\underset{\sim}{a} = -2\underset{\sim}{i} + 2\underset{\sim}{j}$, $\underset{\sim}{b} = 2\underset{\sim}{i} - 3\underset{\sim}{j}$ dan $\underset{\sim}{c} = \underset{\sim}{a} - 2\underset{\sim}{b}$.
Find,
Cari,

(*a*) $|\underset{\sim}{c}|$

(*b*) unit vector in the direction of $\underset{\sim}{c}$.
vektor unit dalam arah $\underset{\sim}{c}$

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

14
3

Answer : (*a*).....

(*b*)... .....

15 Diagram 15 shows a triangle POQ
Rajah 15 menunjukkan segitiga POQ

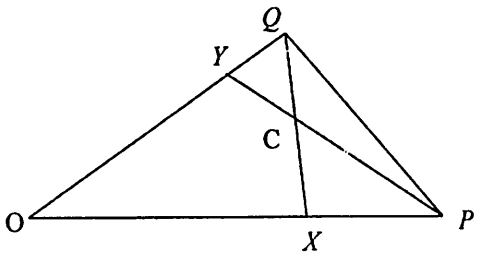

Diagram 15
Rajah 15.

Given that $\overrightarrow{OP} = \underline{p}$ and $\overrightarrow{OQ} = \underline{q}$. Point X is lies on OP where $OX : XP = 2 : 1$ and point Y is lies on OQ where $OY : YQ = 3 : 1$. Straight line QX and line PY intersect at point C.

Diberi $\overrightarrow{OP} = \underline{p}$ dan $\overrightarrow{OQ} = \underline{q}$. Titik X terletak pada OP di mana $OX : XP = 2 : 1$ dan titik Y adalah titik pada OQ di mana $OY : YQ = 3 : 1$. Garis lurus QX dan garis lurus PY bersilang pada titik C.

Express in terms of $\underline{p}$ and $\underline{q}$
Ungkapkan dalam sebutan $\underline{p}$ dan $\underline{q}$

(a) $\overrightarrow{PY}$

(b) $\overrightarrow{QX}$

[4 marks]
[4 *markah*]

15

4

Answer/*Jawapan*: (a) .....

(b) .....

For examiner's use only

16 Given that θ is an acute angle and $\sin\theta = \frac{p}{q}$, find in terms of p and /or q

Diberi bahawa θ ialah sudut tirus dan $\sin\theta = \frac{p}{q}$, cari dalam sebutan p dan/atau q

a) $\cos\theta$
kos θ

b) *tan (180 - θ)*

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

Answer /Jawapan (a) .....

(b) .....

16 | 3

17 Solve $3\cos 2\theta + 4\cos\theta + 1 = 0$ for $0^\circ \le \theta \le 360^\circ$
Selesaikan $3\cos 2\theta + 4\cos\theta + 1 = 0$ untuk $0^\circ \le \theta \le 360^\circ$

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

17 | 4

Answer/*Jawapan*: .....

For examiner use only

18 Diagram 18 shows a circle ABC with centre O, of radius 8 cm. SR is an arc of a circle with center O. The reflex angle AOC is 1.6π radian.

Rajah 18 menunjukkan satu bulatan ABC dengan pusat O dan berjejari 8 cm, SR ialah lengkuk sebuah bulatan berpusat di O. Sudut reflek AOC ialah 1.6π radian.

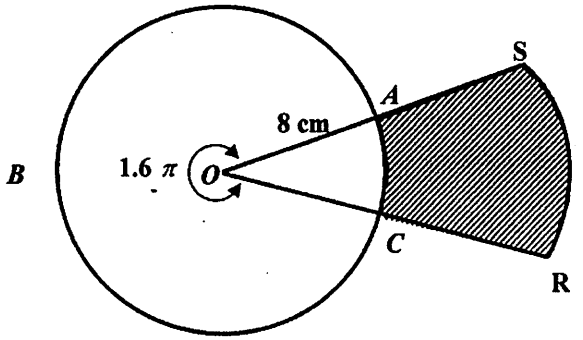

Diagram 18
Rajah 18

Given that A and C are midpoints of OS and OR respectively, find the area of shaded region, in terms of π.
Diberi bahawa A dan C ialah titik tengah kepada OS dan OR, cari luas kawasan berlorek dalam sebutan π

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

18

3

Answer / Jawapan : ..... cm^2

---

19 The radius of circle decreases at the rate of $0.5 cms^{-1}$. Find the rate of change of the area of a circle when the radius is 4 *cm*. .[Given the area of a circle is $A = \pi r^2$]
Jejari sebuah bulatan berkurang dengan kadar 0.5 cms^{-1}.Cari kadar perubahan luas bulatan apabila jejarinya ialah 4 cm, [Diberi luas bulatan $A = \pi r^2$]

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

19

3

Answer/*Jawapan*: .....

20 Given that $\int_1^5 g(x)dx = 5$, find the value of m if $\int_1^5 [mx - 2g(x)]dx = -3m$

Diberi bahawa $\int_1^5 g(x)dx = 5$, cari nilai m jika $\int_1^5 [mx - 2g(x)]dx = -3m$

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

20

3

Answer / Jawapan :.....

21 A set of numbers $x_1, x_2, x_3, x_4, ..., x_n$ has a median of 5 and a standard deviation of 2. Find the median and the variance for the set of numbers $6x_1 + 1, 6x_2 + 1, 6x_3 + 1, ..., 6x_n + 1$.

Satu set nombor $x_1, x_2, x_3, x_4, ..., x_n$ mempunyai median 5 dan sisihan piawai 2. Cari median dan variance bagi set nombor $6x_1 + 1, 6x_2 + 1, 6x_3 + 1, ..., 6x_n + 1$.

[3 *marks*]
[3 markah]

21

3

Answer /Jawapan : median = ...

variance =.....

For examiner's use only

22 A box contains 6 black balls and p white balls. If a ball is taken out randomly from the box, the probability of getting a white ball is $\frac{4}{7}$. Find the value of p.

Sebuah kotak mengandungi 6 biji bola hitam dan p biji bola putih . Jika sebiji bola diambil secara rawak dari kotak itu kebarangkalian mendapat sebiji bola putih ialah $\frac{4}{7}$. Cari nilai p.

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

Answer/*Jawapan*: .....

22
3

23 An expedition team consisting of 10 members to be chosen from a group of 4 teachers and 12 students.
Satu kumpulan ekspedisi mengandungi 10 ahli yang akan dipilih daripada kumpulan 4 orang guru dan 12 orang pelajar.

(a) Calculate the number of teams that can be formed.
Kira bilangan kumpulan yang boleh dibentuk .

(b) If the team must consist of at least 2 teachers, calculate the numbers of teams that could be formed.
Jika kumpulan ekspedisi itu mesti mengandungi sekurang-kurangnya 2 orang guru kira bilangan kumpulan yang boleh dibentuk.

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

Answer/ *Jawapan*: (a) .....

(b) .....

23
3

For examiner's use only

24 In a survey, the probability that a family having one unit of computer is 0.6. N families were selected at random. The standard deviation of the numbers of family having one unit of computer is $\sqrt{\frac{24}{5}}$

Dalam satu tinjauan , kebarangkalian sebuah keluarga mempunyai satu unit komputer ialah 0.6. N keluarga dipilih secara rawak . Sisihan piawai keluarga yang mempunyai komputer ialah $\sqrt{\frac{24}{5}}$

Find,
Cari,

(a) the value of N
nilai N

(b) the mean of the numbers of family having one unit of computer.
min keluarga yang mempunyai satu unit komputer

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

24

3

Answer/*Jawapan*: (*a*) .....

(b) .....

For examiner's use only

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

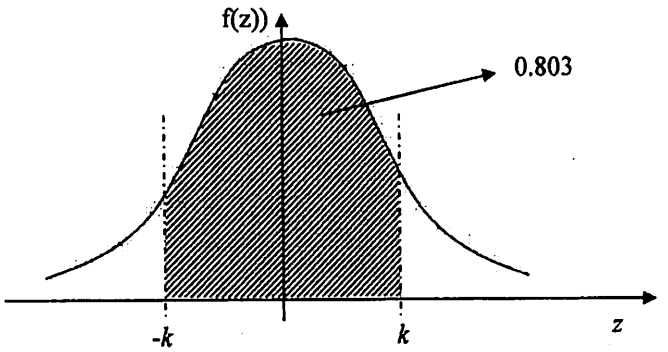

Diagram 25
Rajah 25

The probability represented by the area of the shaded region is 0.803.
Kebarangkalian yang diwakili oleh kawasan berlorek ialah 0.803

(a) Find the value of $P(Z > k)$
Cari nilai $P(Z > k)$

(b) X is a continuous random variable which is normally distributed with a mean of μ and a standard deviation of 2. If the value of X is 85 when the Z-*score* is k, find the value of μ.
X ialah pembolehubah rawak selanjar yang bertabur secara normal piawai dengan min μ dan sisihan piawai 2. Jika nilai X ialah 85 bila skor- Z ialah k, cari nilai μ.

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

Answer : (*a*).....

(*b*)... .....

25
3

END OF THE QUESTION PAPER
KERTAS SOALAN TAMAT

UPPER TAIL PROBABILITIES $Q(z)$ OF 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	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641	4 8 12	16 20 24	28 32 36
0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247	4 8 12	16 20 24	28 32 36
0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859	4 8 12	15 19 23	27 31 35
0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483	4 7 11	15 19 22	26 30 34
0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121	4 7 11	14 18 22	25 29 32
0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776	3 7 10	14 17 20	24 27 31
0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451	3 7 10	13 16 19	23 26 29
0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148	3 6 9	12 15 18	21 24 27
0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867	3 5 8	11 14 16	19 22 25
0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611	3 5 8	10 13 15	18 20 23
1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379	2 5 7	9 12 14	16 19 21
1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170	2 4 6	8 10 12	14 16 18
1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985	2 4 6	7 9 11	13 15 17
1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823	2 3 5	6 8 10	11 13 14
1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681	1 3 4	6 7 8	10 11 13
1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559	1 2 4	5 6 7	8 10 11
1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455	1 2 3	4 5 6	7 8 9
1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367	1 2 3	4 4 5	6 7 8
1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294	1 1 2	3 4 4	5 6 6
1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233	1 1 2	2 3 4	4 5 5
2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183	0 1 1	2 2 3	3 4 4
2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143	0 1 1	2 2 2	3 3 4
2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110	0 1 1	1 2 2	2 3 3
2.3	.0107	.0104	.0102								0 1 1	1 1 2	2 2 2
				$.0^2990$	$.0^2964$	$.0^2939$	$.0^2914$				3 5 8	10 13 15	18 20 23
								$.0^2889$	$.0^2866$	$.0^2842$	2 5 7	9 12 14	16 18 21
2.4	$.0^2820$	$.0^2798$	$.0^2776$	$.0^2755$	$.0^2734$						2 4 6	8 11 13	15 17 19
						$.0^2714$	$.0^2695$	$.0^2676$	$.0^2657$	$.0^2639$	2 4 6	7 9 11	13 15 17
2.5	$.0^2621$	$.0^2604$	$.0^2587$	$.0^2570$	$.0^2554$	$.0^2539$	$.0^2523$	$.0^2508$	$.0^2494$	$.0^2480$	2 3 5	6 8 9	11 12 14
2.6	$.0^2466$	$.0^2453$	$.0^2440$	$.0^2427$	$.0^2415$	$.0^2402$	$.0^2391$	$.0^2379$	$.0^2368$	$.0^2357$	1 2 3	5 6 7	8 9 10
2.7	$.0^2347$	$.0^2336$	$.0^2326$	$.0^2317$	$.0^2307$	$.0^2298$	$.0^2289$	$.0^2280$	$.0^2272$	$.0^2264$	1 2 3	4 5 6	7 8 9
2.8	$.0^2256$	$.0^2248$	$.0^2240$	$.0^2233$	$.0^2226$	$.0^2219$	$.0^2212$	$.0^2205$	$.0^2199$	$.0^2193$	1 1 2	3 4 4	5 6 6
2.9	$.0^2187$	$.0^2181$	$.0^2175$	$.0^2169$	$.0^2164$	$.0^2159$	$.0^2154$	$.0^2149$	$.0^2144$	$.0^2139$	0 1 1	2 2 3	3 4 4
3.0	$.0^2135$	$.0^2131$	$.0^2126$	$.0^2122$	$.0^2118$	$.0^2114$	$.0^2111$	$.0^2107$	$.0^2104$	$.0^2100$	0 1 1	2 2 2	3 3 4
3.1	$.0^3968$	$.0^3935$	$.0^3904$								3 6 9	13 16 19	22 25 28
				$.0^3874$	$.0^3845$	$.0^3816$	$.0^3789$				3 6 8	11 14 17	20 22 25
								$.0^3762$	$.0^3736$	$.0^3711$	2 5 7	10 12 15	17 20 22
3.2	$.0^3687$	$.0^3664$	$.0^3641$	$.0^3619$	$.0^3598$						2 4 7	9 11 13	15 18 20
						$.0^3577$	$.0^3557$	$.0^3538$	$.0^3519$	$.0^3501$	2 4 6	8 9 11	13 15 17
3.3	$.0^3483$	$.0^3466$	$.0^3450$	$.0^3434$	$.0^3419$						2 3 5	6 8 10	11 13 14
						$.0^3404$	$.0^3390$	$.0^3376$	$.0^3362$	$.0^3349$	1 3 4	5 7 8	9 10 12
3.4	$.0^3337$	$.0^3325$	$.0^3313$	$.0^3302$	$.0^3291$	$.0^3280$	$.0^3270$	$.0^3260$	$.0^3251$	$.0^3242$	1 2 3	4 5 6	7 8 9
3.5	$.0^3233$	$.0^3224$	$.0^3216$	$.0^3208$	$.0^3200$	$.0^3193$	$.0^3185$	$.0^3178$	$.0^3172$	$.0^3165$	1 1 2	3 4 4	5 6 7
3.6	$.0^3159$	$.0^3153$	$.0^3147$	$.0^3142$	$.0^3136$	$.0^3131$	$.0^3126$	$.0^3121$	$.0^3117$	$.0^3112$	0 1 1	2 2 3	3 4 5
3.7	$.0^3108$	$.0^3104$	$.0^3100$	$.0^496$	$.0^492$	$.0^488$	$.0^485$	$.0^482$	$.0^478$	$.0^475$			
3.8	$.0^472$	$.0^469$	$.0^467$	$.0^464$	$.0^462$	$.0^459$	$.0^457$	$.0^454$	$.0^452$	$.0^450$			
3.9	$.0^448$	$.0^446$	$.0^444$	$.0^442$	$.0^441$	$.0^439$	$.0^437$	$.0^436$	$.0^434$	$.0^433$			

For negative z use the relation:

$$Q(z) = 1 - Q(-z) = P(-z)$$

Example: if $u \sim$ N (0,1), *find* (*a*) Prob ($u > 2$), (*b*) Prob ($0 < u < 2$), (*c*) Prob ($|u| > 2$), (*d*) Prob ($|u| < 2$). The desired probabilities are (*a*) $Q(2) = .0228$, (*b*) $Q(0) - Q(2) = .5000 - .0228 = .4772$, (*c*) $2Q(2) = .0456$, (*d*) $1 - 2Q(2) = .9544$.

If $v \sim N(\mu,\sigma^2)$, Prob ($v > x$) is given by $Q(z)$ with $z = (x - \mu)/\sigma$.

UPPER QUANTILES $z_{(P)}$ OF THE NORMAL DISTRIBUTION N(0,1)

P	Q	z	P	Q	z	P	Q	z	P	Q	z	Q	z
.50	.50	0.000	.85	.15	1.036	.975	.025	1.960	.990	.010	2.326	0^34	3.353
.55	.45	0.126	.86	.14	1.080	.976	.024	1.977	.991	.009	2.366	0^33	3.432
.60	.40	0.253	.87	.13	1.126	.977	.023	1.995	.992	.008	2.409	0^32	3.540
.65	.35	0.385	.88	.12	1.175	.978	.022	2.014	.993	.007	2.457	0^31	3.719
.70	.30	0.524	.89	.11	1.227	.979	.021	2.034	.994	.006	2.512	0^45	3.891
.75	.25	0.674	.90	.10	1.282	.980	.020	2.054	.995	.005	2.576	0^41	4.265
.76	.24	0.706	.91	.09	1.341	.981	.019	2.075	.996	.004	2.652	0^35	4.417
.77	.23	0.739	.92	.08	1.405	.982	.018	2.097	.997	.003	2.748	0^31	4.753
.78	.22	0.772	.93	.07	1.476	.983	.017	2.120	.998	.002	2.878	0^65	4.892
.79	.21	0.806	.94	.06	1.555	.984	.016	2.144	.999	.001	3.090	0^61	5.199
.80	.20	0.842	.950	.050	1.645	.985	.015	2.170	.9991	$.0^39$	3.121	0^75	5.327
.81	.19	0.878	.955	.045	1.695	.986	.014	2.197	.9992	0^38	3.156	0^71	5.612
.82	.18	0.915	.960	.040	1.751	.987	.013	2.226	.9993	0^37	3.195	0^85	5.731
.83	.17	0.954	.965	.035	1.812	.988	.012	2.257	.9994	0^36	3.239	0^81	5.998
.84	.16	0.994	.970	.030	1.881	.989	.011	2.290	.9995	0^35	3.291	0^95	6.109

The tabulated function is $z_{(P)}$: if $u \sim$ N(0,1), Prob ($u < z_{(P)}$) = P, Prob ($u > z_{(P)}$) = $1 - P = Q$, and (for $P > \frac{1}{2}$) Prob ($|u| > z_{(P)}$) = $2Q$.

Lower quantiles ($P < \frac{1}{2}$) are given by:

$$z_{(P)} = -z_{(1-P)}$$

PROBABILITY DENSITY $\varphi(z)$ OF THE NORMAL DISTRIBUTION N(0,1)

z	0	1	2	3	4	5	6	7	8	9
0.	0.399	.397	.391	.381	.368	.352	.333	.312	.290	.266
1.	0.242	.218	.194	.171	.150	.130	.111	.094	.079	.066
2.	0.0540	.0440	.0355	.0283	.0224	.0175	.0136	.0104	.0079	.0060
3.	0.00443	.00327	.00238	.00172	.00123	.00087	.00061	.00042	.00029	.00020
4.	0.0^3134	$.0^489$	$.0^459$	$.0^439$	$.0^425$	$.0^416$	$.0^410$	$.0^364$	$.0^340$	$.0^324$

For $z < 0$ use the relation:

$$\varphi(z) = \varphi(-z)$$

The tabulated functions are defined thus:

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

$$Q(z) = \int_z^\infty \varphi(u)\,du$$

$$\int_{-\infty}^{z_{(P)}} \varphi(u)\,du = P$$

In the figure the probability density is represented by the ordinate of the graph, and the tail probabilities are represented by areas under the graph.

The probability density of the distribution N(μ, σ^2) is

$$f(x) = \frac{1}{\sigma}\varphi(z)$$

with $z = (x - \mu)/\sigma$.