



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

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**PEPERIKSAAN PERCUBAAN  
SIJIL PELAJARAN MALAYSIA 2010**

**MATEMATIK TAMBAHAN**

**Kertas 2**

**Dua jam tiga puluh minit**

**JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU**

- 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.*
- 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.*
- Give only one answer/solution to each question.***  
*Bagi setiap soalan, berikan satu jawapan / penyelesaian sahaja.*
- 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.*
- The diagrams in the questions provided are not drawn to scale unless stated.***  
*Rajah yang mengiringi soalan tidak dilukiskan mengikut skala kecuali dinyatakan.*
- The marks allocated for each question and sub-part of a question are shown in brackets***  
*Markah yang diperuntukkan bagi setiap soalan dan ceraihan soalan ditunjukkan dalam kurungan.*
- A list of formulae is provided on pages 2 and 3.***  
*Satu senarai rumus disediakan di halaman 2 dan 3.*
- A booklet of four-figure mathematical tables is provided.***  
*Buku sifir matematik empat angka boleh digunakan.*
- You may use a non-programmable scientific calculator.***  
*Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogram.*

Kertas soalan ini mengandungi 17 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

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

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

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

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

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

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

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

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

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

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

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

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

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

## CALCULUS (Kalkulus)

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

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

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

4 Area under a curve  
(Luas dibawah lengkung)

$$= \int_a^b y \, dx \quad \text{or (atau)}$$

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

5 Volume generated  
(Isipadu janaan)

$$= \int_a^b \pi y^2 \, dx \quad \text{or}$$

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

## GEOMETRY

1 Distance (Jarak)

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

2 Midpoint (Titik tengah)

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

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

$$4 \quad r = \frac{xi + yj}{\sqrt{x^2 + y^2}}$$

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5. A point dividing segment of a line

(Titik yang membahagi suatu tembereng garis)

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

6. Area of triangle (Luas segitiga) =

$$\frac{1}{2} |(x_1 y_2 + x_2 y_3 + x_3 y_1) - (x_2 y_1 + x_3 y_2 + x_1 y_3)|$$

## STATISTICS (STATISTIK)

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 
$$\bar{I} = \frac{\sum w_1 I_1}{\sum w_1}$$

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

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

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

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

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,  $A = \frac{1}{2}r^2\theta$   
(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  $\operatorname{cosec}^2 A = 1 + \cot^2 A$

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

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

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

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

## Section A

[40 marks]

[40 markah]

Answer all questions in this section.  
Jawab semua soalan dalam bahagian ini.

- 1 Solve the following simultaneous equations:

Selesaikan persamaan serentak berikut

$$4m + n + 8 = m^2 + m - n = 2$$

[5 marks]

[5 markah]

- 2 *Solution by scale drawing will not be accepted*  
*Penyelesaian secara lukisan berskala tidak diterima.*

Diagram 2 shows the rhombus  $ABCD$  with vertex  $A(-1, 5)$ . The vertex  $B$  lies on the  $x$ -axis.  
Rajah 2 menunjukkan sebuah rombus  $ABCD$  dengan bucu  $A(-1, 5)$ . Bucu  $B$  terletak pada paksi  $x$

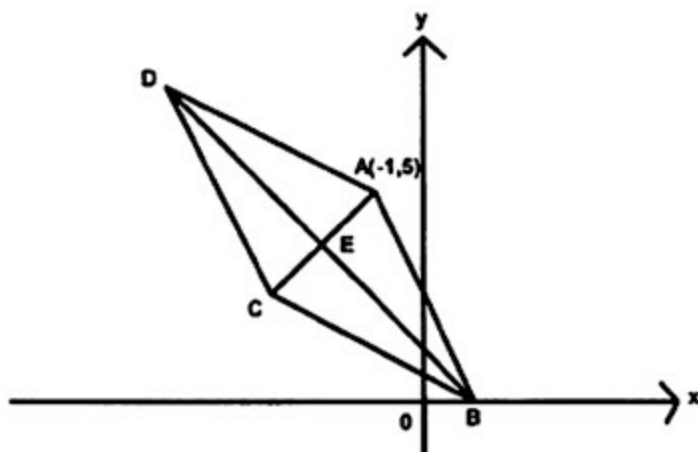


Diagram 2

Rajah 2

The equation of the straight line  $BD$  is  $x + 2y = 4$ . The diagonals  $AC$  and  $BD$  intersect at point  $E$ .  
Persamaan bagi garislurus  $BD$  ialah  $x + 2y = 4$ . Garis pepenjuru  $AC$  dan  $BD$  bersilang pada titik  $E$ .

Find

Cari

- (a) the equation of the straight line  $AC$  [3 marks]  
persamaan bagi garislurus  $AC$  [3 markah]
- (b) the coordinates of the point  $E$  [2 marks]  
koordinat bagi titik  $E$  [2 markah]
- (c) the coordinates of the point  $C$  [2 marks]  
koordinat bagi titik  $C$  [2 markah]

3 (a) Sketch the graph of  $y = 3\sin 2x + 1$  for  $0 \leq x \leq \frac{3}{2}\pi$  [4 marks]

Lakarkan graf  $y = 3\sin 2x + 1$  bagi  $0 \leq x \leq \frac{3}{2}\pi$  [4 markah]

(b) Hence, using the same axes, sketch a suitable straight line to find the number of solutions for the equation  $3\pi \sin 2x = 2x$  for  $0 \leq x \leq \frac{3}{2}\pi$ . State the number of solutions [3 marks]

Seterusnya, gunakan paksi yang sama, lakarkan garislurus yang sesuai untuk mencari bilangan penyelesaian persamaan  $3\pi \sin 2x = 2x$  bagi  $0 \leq x \leq \frac{3}{2}\pi$ .

Nyatakan bilangan penyelesaian. [3 markah]

4 The gradient function of a curve is  $kx^2 - x$ , where  $k$  is a constant. The equation of the normal to the curve at point  $(1, -2)$  is  $5y + x = 7$ .

Fungsi kecerunan bagi suatu lengkung ialah  $kx^2 - x$ , di mana  $k$  ialah pemalar. Persamaan garis normal kepada lengkung di titik  $(1, -2)$  ialah  $5y + x = 7$ .

Find

Cari

(a) the value of  $k$ , [4 marks]  
nilai  $k$ . [4 markah]

(b) the equation of the curve, [3marks]  
persamaan lengkung itu, [3 markah]

- 5 Table 5 shows the frequency distribution of the ages of a group of villagers in a village.  
Jadual 5 menunjukkan taburan kekerapan umur bagi sekumpulan penghuni di sebuah kampung.

Age/Umur (year/tahun)	Number of villagers/ bilangan penghuni kampung
1 - 10	25
11 - 20	32
21 - 30	28
31 - 40	9
41 - 50	6

Table 5  
Jadual 5

- (a) (i) Without drawing an ogive, calculate the third quartile  
Tanpa melukis ogif, hitungkan kuartil ketiga [3 marks]  
[3 markah]
- (ii) Calculate the standard deviation of the distribution  
Hitungkan sisihan piawai bagi taburan itu. [3 marks]  
[3 markah]
- (b) If two villagers with the ages of 20 and 40 year's old respectively were shifted out from the village, find the new variance. [2 marks]  
Sekiranya dua orang penghuni kampung itu yang berumur 20 dan 40 tahun masing-masing telah berpindah keluar dari kampung itu, cari varians yang baru. [2 markah]

- 6 Diagram 6 shows the waves formed when a stone is thrown into the water. Each wave has the shape of a circle and is  $r$  cm away from the one before it.  
Rajah 6 menunjukkan gelombang yang terbentuk apabila seketul batu telah dibaling ke dalam air. Setiap gelombang berbentuk bulatan dengan jaraknya  $r$  cm jauh daripada bulatan sebelumnya.

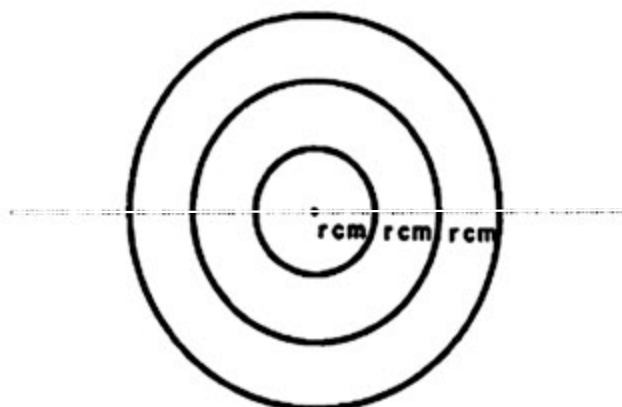


Diagram 6  
Rajah 6

- (a) show that the circumferences of the waves form an arithmetic progression and find the common difference. [3 marks]  
Tunjukkan bahawa lilitan bulatan gelombang itu membentuk satu jangjang aritmetik dan carikan beza sepunya. [3 markah]
- (b) If the radius of the smallest wave is 4 cm, find the radius of the tenth wave . Hence, find its circumference in terms of  $\pi$  . [3marks]  
Sekiranya jejari bagi gelombang terkecil ialah 4 cm, hitungkan jejari bagi gelombang yang kesepuluh. Seterusnya, cari lilitan bulatan gelombang kesepuluh dalam sebutan  $\pi$  . [3 markah]

## Section B

[40 marks]

[40 markah]

Answer four questions from this section.

Jawab empat soalan dalam bahagian ini

- 7 Table 7 shows the values of two variables,  $x$  and  $y$ , obtained from an experiment. The variables are related by the equation  $x^{2k}y = p$ , where  $k$  and  $p$  are constants.  
 Jadual 7 menunjukkan nilai-nilai bagi dua pemboleh ubah,  $x$  dan  $y$ , yang diperolehi dari suatu eksperimen. Pemboleh ubah-pemboleh ubah itu dihubungkan oleh persamaan  $x^{2k}y = p$ , di mana  $k$  dan  $p$  adalah pemalar.

$x$	1.4	1.9	2.5	3.2	4.1	5.5
$y$	3.3	5.3	7.9	12	15.8	26.3

Table 7

Jadual 7

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

[2 marks]

Berdasarkan Jadual 7, bina satu jadual bagi nilai-nilai  $\log_{10}y$  and  $\log_{10}x$ 

[2 markah]

- (b) Plot  $\log_{10}y$  against  $\log_{10}x$  by using a scale of 2 cm to 0.1 unit on the  $\log_{10}x$ -axis and 2 cm to 0.2 unit on the  $\log_{10}y$ -axis. Hence, draw the line of best fit.

[3 marks]

Plotkan  $\log_{10}y$  lawan  $\log_{10}x$  dengan menggunakan skala 2 cm kepada 0.1 unit pada paksi- $\log_{10}x$  dan 2 cm kepada 0.2 unit pada paksi- $\log_{10}y$ . Seterusnya lukiskan garis penyuaian terbaik.

[3 markah]

- (c) Use your graph in (a) to find the value of  
Gunakan graf anda di (a) untuk cari nilai

(i)  $k$ (ii)  $p$ 

[5 marks]

[5 markah]

- 8 Diagram 8 shows  $ODC$ ,  $OEA$ ,  $BDE$  and  $ACB$  are straight lines.  
Rajah 8 menunjukkan  $ODC$ ,  $OEA$ ,  $BDE$  dan  $ACB$  ialah garis-garis lurus.

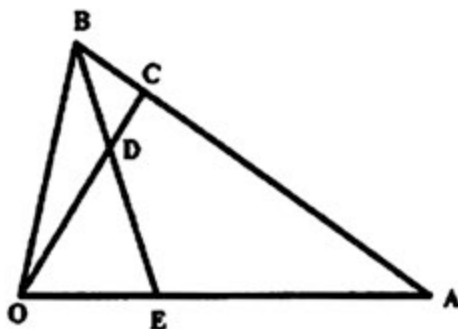


Diagram 8  
Rajah 8

It is given that  $\overline{OA} = 6\underline{x}$ ,  $\overline{OB} = 3\underline{y}$ ,  $OE : OA = 1 : 3$ , and  $DE = 3BD$ .

Diberi bahawa  $\overline{OA} = 6\underline{x}$ ,  $\overline{OB} = 3\underline{y}$ ,  $OE : OA = 1 : 3$ , dan  $DE = 3BD$ .

- (a) Express in terms of  $\underline{x}$  and  $\underline{y}$   
Ungkapkan dalam sebutan  $\underline{x}$  dan  $\underline{y}$
- $\overline{AB}$
  - $\overline{OD}$

[3 marks]  
[3 markah]

- (b) If  $\overline{OC} = m\overline{OD}$  and  $\overline{BC} = n\overline{BA}$ , where  $m$  and  $n$  are constants. Find the value of  $m$  and  $n$ .

[5 marks]

Jika  $\overline{OC} = m\overline{OD}$  dan  $\overline{BC} = n\overline{BA}$ , di mana  $m$  dan  $n$  ialah pemalar. Cari nilai bagi  $m$  dan  $n$ .

[5 markah]

- (c) Given that  $|\underline{x}| = 4$  unit and the area of the triangle  $OBE$  is  $20 \text{ unit}^2$ . Find the perpendicular distance from  $B$  to  $OA$

[2 marks]

Diberi bahawa  $|\underline{x}| = 4$  unit dan luas segitiga  $OBE$  ialah  $20 \text{ unit}^2$ . Kirakan jarak serenjang dari  $B$  ke  $OA$ .

[2 markah]

- 9 Diagram 9 shows  $OQRS$  is a sector of a circle with centre  $O$ .  $SOP$  is a straight line and  $OPQ$  is a right angle triangle.

Rajah 9 menunjukkan  $OQRS$  ialah sebuah sektor bulatan yang berpusat di  $O$ .  $SOP$  ialah garislurus dan  $OPQ$  ialah sebuah segitiga bersudut tegak.

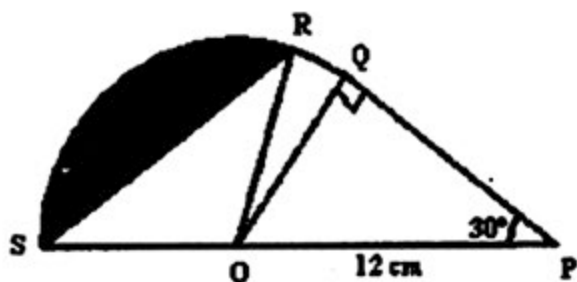


Diagram 9  
Rajah 9

Given that  $OP = 12$  cm,  $\angle OPQ = 30^\circ$  and the length of the arc  $QR$  is  $\frac{\pi}{2}$  cm.

Diberi  $OP = 12$  cm,  $\angle OPQ = 30^\circ$  dan panjang lengkok  $QR$  ialah  $\frac{\pi}{2}$  cm.

Find,

Cari,

- |   |                         |
|---|-------------------------|
| (a) the length, in cm, of $OQ$<br>panjang, dalam cm, bagi $OQ$  | [2 marks]<br>[2 markah] |
| (b) $\angle QOR$ , in radians,<br>$\angle QOR$ , dalam radian,  | [2 marks]<br>[2 markah] |
| (c) the area, in $\text{cm}^2$ , of the sector $ROS$ ,<br>luas, dalam $\text{cm}^2$ , bagi sektor $ROS$ , | [3 marks]<br>[3 markah] |
| (d) the perimeter, in cm, of the shaded region.<br>perimeter, dalam cm, bagi rantau berlorok.             | [3 marks]<br>[3 markah] |

- 10 Diagram 10 shows the straight line  $y = -x + k$  touching the curve  $y = 3x - x^2$  at point  $A$ .  
Rajah 10 menunjukkan garislurus  $y = -x + k$  menyentuh lengkung  $y = 3x - x^2$  pada titik  $A$ .

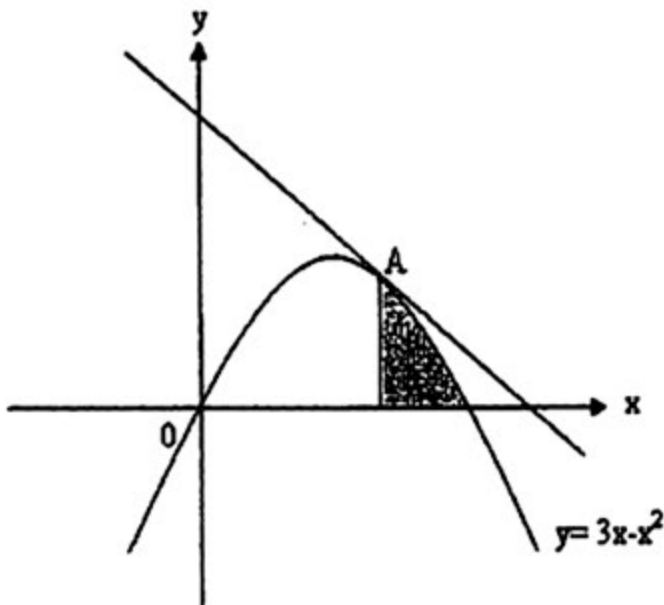


Diagram 10  
Rajah 10

Find,  
Cari,

- (a) the value of  $k$   
nilai  $k$  [2 marks]  
[2 markah]
- (b) the coordinates of point  $A$   
titik koordinat  $A$  [2 marks]  
[2 markah]
- (c) the area of the shaded region  
luas rantau berlorek [3 marks]  
[3 markah]
- (d) the volume generated, in terms of  $\pi$ , when the region bounded by the curve  $y = 3x - x^2$  and the  $x$ -axis is revolved through  $360^\circ$  about the  $x$ -axis.  
isipadu janaan apabila rantau yang dibatasi oleh lengkung  $y = 3x - x^2$  dan paksi  $x$  dikisarkan melalui  $360^\circ$  pada paksi  $x$ . [3 marks]  
[3 markah]

11 (a) In a survey carried out in a school, it is found that 3 out of 5 students have computer at home. If 10 students from that school are chosen at random, calculate the probability that  
Dalam suatu soalselidik yang telah dijalankan di sebuah sekolah, didapati 3 daripada 5 orang pelajar mempunyai komputer di rumah. Sekiranya 10 orang pelajar dipilih secara rawak, hitung kebarangkalian

- (i) exactly 7 students have computer at home  
tepat 7 orang pelajar mempunyai komputer di rumah
- (ii) at least 2 students have computer at home  
sekurang-kurangnya 2 orang pelajar mempunyai komputer di rumah

[ 5 marks]

[5 markah]

(b) The mass of a packet of cake produced by a factory is normally distributed with the mean of 350g and a variance of  $25g^2$ .

Jisim bagi sebungkus kek yang dihasilkan oleh sebuah kilang bertaburan normal, dengan minnya ialah 350g dan varians  $25g^2$ .

Find,  
Cari,

- (i) the probability that the mass of a packet of cake chosen at random will be less than 345g,  
kebarangkalian sebungkus kek yang dipilih secara rawak mempunyai jisim kurang daripada 345g.
- (ii) the number of the packet of cakes whose masses exceed 342g if the factory produced 1500 packets of cake daily.  
Bilangan bungkus kek yang berjisim lebih daripada 342g yang dapat dihasilkan oleh kilang itu jika ia menghasilkan 1500 bungkus kek sehari.

[5 marks]

[5 markah]

## Section C

[20 marks]

[ 20 markah]

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

- 12 A product is made up of four components, *A*, *B*, *C* and *D*. Table 12 shows the prices of the four components in the year 2004 and 2005 as well as their respective weightages.

Suatu keluaran dihasilkan daripada gabungan empat komponen iaitu *A*, *B*, *C* dan *D*. Jadual 12 menunjukkan harga setiap komponen pada tahun 2004 dan 2005 serta pemberat masing-masing.

Component komponen	Price/harga(RM)		Price index for the year 2005 based on the year 2004 Index harga tahun 2005 berdasarkan tahun 2004	Weightage pemberat
	Year/tahun 2004	Year/tahun 2005		
A	90	$x$	150	2
B	60	90	150	$m$
C	$y$	100	125	4
D	30	42	$z$	8

Table 12

Jadual 12

- (a) Calculate the values of  $x$ ,  $y$  and  $z$  [3 marks]  
Hitungkan nilai bagi  $x$ ,  $y$ , dan  $z$  [3 markah]
- (b) Given that the composite index of the product in the year 2005 based on the year 2004 was 141, find the value of  $m$ . [3 marks]  
Diberi indeks gubahan bagi keluaran itu pada tahun 2005 berdasarkan tahun 2004 ialah 141, Cari nilai  $m$ . [3 markah]
- (c) If the product is sold for RM350 a unit in the year 2004. Calculate the selling price of the product in the year 2005 in order to maintain the same profit. [2 marks]  
Sekiranya keluaran itu dijual dengan harga RM350 pada tahun 2004. Hitungkan harganya pada tahun 2005 jika keuntungan yang sama dikekalkan. [2 markah]
- (d) If the prices of all components of the product was increased by 50% from the year 2004 to the year 2006, find the composite index of the product in the year 2006 based on the year 2005. [2 marks]  
Sekiranya harga bagi semua komponen keluaran itu meningkat sebanyak 50% dari tahun 2004 ke tahun 2006, cari indeks gubahan bagi keluaran itu pada tahun 2006 berdasarkan tahun 2005. [2 markah]

- 13 Diagram 13 shows a pyramid with a triangular base. The peak  $V$  is vertically above  $P$ .  
Rajah 13 menunjukkan sebuah piramid dengan tapak berbentuk segitiga. Puncak  $V$  terletak tegak di atas  $P$ .

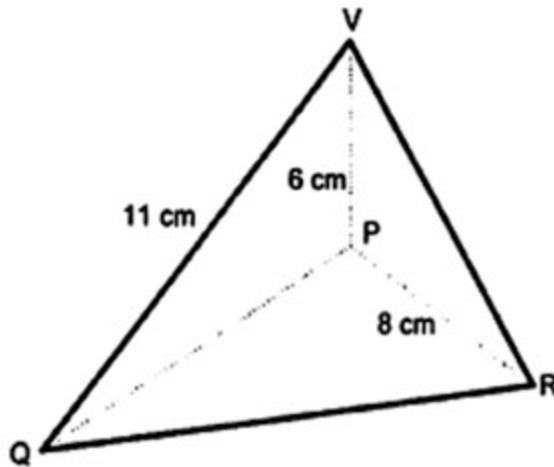


Diagram 13  
Rajah 13

Given that  $PR = 8$  cm,  $PV = 6$  cm,  $VQ = 11$  cm and  $\angle PQR = 40^\circ$ ,  
Diberi  $PR = 8$  cm,  $PV = 6$  cm,  $VQ = 11$  cm dan  $\angle PQR = 40^\circ$ ,

Find,  
Cari,

- |     |   |                         |
|-----|---|-------------------------|
| (a) | the length, in cm, of $PQ$ ; correct to 2 decimal places<br>panjang $PQ$ , dalam cm; betul kepada 2 tempat perpuluhan | [2 marks]<br>[2 markah] |
| (b) | the length, in cm, of $QR$<br>panjang $QR$ , dalam cm   | [4 marks]<br>[4 markah] |
| (c) | the area, in $\text{cm}^2$ , of the inclined plane $QVR$<br>luas, dalam $\text{cm}^2$ bagi permukaan condong $QVR$    | [4 marks]<br>[4 markah] |

## 14 Use graph paper to answer this question.

*Gunakan kertas graf untuk menjawab soalan ini.*

On a particular ferry trip to Langkawi, the passengers in the ferry comprise  $x$  adults and  $y$  children, with each adult paying a fare of RM40 and each children paying a fare of RM30. This particular ferry trip is based on the following constraints.

Pada suatu perjalanan feri pergi ke Langkawi, penumpang feri itu mengandungi  $x$  orang dewasa dan  $y$  orang kanak-kanak di mana setiap dewasa dan kanak-kanak perlu membayar tambang RM40 dan RM30 masing-masing. Perjalanan feri itu perlu mematuhi syarat-syarat berikut.

- I : The ferry can accommodate up to 40 passengers only  
Feri itu boleh muat sebanyak 40 orang penumpang sahaja.
- II : The amount collected from the passenger's fares must at least RM360, in order for the ferry company to make profit.  
Jumlah tambang yang dikutip daripada penumpang mesti sekurang-kurangnya RM360 supaya syarikat feri itu boleh memperoleh keuntungan daripada perjalanan itu.
- III : The number of adult passengers is not more than twice the number of children  
Bilangan penumpang dewasa tidak lebih daripada dua kali ganda bilangan penumpang kanak-kanak.

(a) Write three inequalities, other than  $x \geq 0$  and  $y \geq 0$ , which satisfy the above constraints.

[3 marks]

Tulis tiga ketaksamaan, selain daripada  $x \geq 0$  dan  $y \geq 0$ , yang mematuhi syarat-syarat di atas.

[3 markah]

(b) Using a scale of 2 cm to 5 passengers on both axes, construct and shade the region R, which satisfies all the above constraints.

[3 marks]

Dengan menggunakan skala 2 cm kepada 5 orang penumpang bagi kedua-dua paksi, bina dan lorekkan rantau R yang mematuhi semua syarat-syarat di atas.

[3 markah]

(c) By using your graph from (b), find

Dengan menggunakan graf anda dari (b), cari

- (i) the minimum number of passengers on this ferry trip if there are five adult passengers only.  
bilangan minima penumpang dalam perjalanan feri ini jika hanya ada lima orang penumpang dewasa sahaja.
- (ii) the maximum amount collected from the fares of the passengers.  
amaun maksima tambang penumpang

[4 marks]

[4 markah]

- 15 A particle moves along a straight line and passes through a fixed point  $O$ . Its velocity,  $V \text{ ms}^{-1}$ , is given by  $v = t^2 - 9t + 18$ , where  $t$  is the time in second after passing through  $O$ .

[Assume motion to the right is positive]

Suatu zarah bergerak sepanjang garislurus dan melalui titik tetap  $O$ . Diberi halaju zarah itu,  $V \text{ ms}^{-1}$ , ialah  $v = t^2 - 9t + 18$ . Di mana  $t$  ialah masa dalam saat selepas zarah itu melalui titik  $O$ .

[Anggap gerakan ke kanan sebagai positif]

Find,  
Cari,

- |     |   |                         |
|-----|---|-------------------------|
| (a) | the initial velocity, in $\text{ms}^{-1}$ , of the particle.<br>halaju awal, dalam $\text{ms}^{-1}$ , bagi zarah itu                                  | [1 mark]<br>[1markah]   |
| (b) | the maximum velocity, in $\text{ms}^{-1}$ , of the particle.<br>halaju maksima, dalam $\text{ms}^{-1}$ , bagi zarah itu                               | [3 marks]<br>[3markah]  |
| (c) | the range of values of $t$ when the particle moves to the left<br>Julat nilai $t$ apabila zarah itu bergerak ke arah kiri                             | [2 marks]<br>[2 markah] |
| (d) | the total distance, in m, travelled by the particle in the first 5 seconds<br>Jumlah jarak, dalam m, yang dilalui oleh zarah itu dalam 5 saat pertama | [4 marks]<br>[4 markah] |

END OF QUESTION PAPER  
KERTAS SOALAN TAMAT

UPPER TAIL PROBABILITIES  $Q(z)$  OF THE  
NORMAL DISTRIBUTION No. 11

z											SUBTRACT								
	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641	4	3	2	1	0	0	0	0	0
0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247	4	2	1	0	0	0	0	0	0
0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859	4	1	0	0	0	0	0	0	0
0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483	4	0	0	0	0	0	0	0	0
0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121	4	0	0	0	0	0	0	0	0
0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776	3	0	0	0	0	0	0	0	0
0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451	3	0	0	0	0	0	0	0	0
0.7	.2420	.2387	.2355	.2323	.2291	.2260	.2229	.2198	.2167	.2137	3	0	0	0	0	0	0	0	0
0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867	3	0	0	0	0	0	0	0	0
0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611	3	0	0	0	0	0	0	0	0
1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379	2	0	0	0	0	0	0	0	0
1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170	2	0	0	0	0	0	0	0	0
1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985	2	0	0	0	0	0	0	0	0
1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823	2	0	0	0	0	0	0	0	0
1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681	1	0	0	0	0	0	0	0	0
1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559	1	0	0	0	0	0	0	0	0
1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455	1	0	0	0	0	0	0	0	0
1.7	.0440	.0430	.0420	.0410	.0400	.0391	.0382	.0374	.0365	.0357	1	0	0	0	0	0	0	0	0
1.8	.0350	.0341	.0332	.0323	.0314	.0306	.0298	.0290	.0282	.0274	1	0	0	0	0	0	0	0	0
1.9	.0277	.0269	.0261	.0253	.0245	.0237	.0230	.0222	.0214	.0207	1	0	0	0	0	0	0	0	0
2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183	0	1	1	1	1	1	1	1	1
2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143	0	1	1	1	1	1	1	1	1
2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110	0	1	1	1	1	1	1	1	1
2.3	.0107	.0104	.0102	.0099	.0096	.0093	.0091	.0088	.0086	.0084	0	1	1	1	1	1	1	1	1
2.4	.0082	.0079	.0076	.0075	.0073	.0071	.0069	.0067	.0065	.0063	0	1	1	1	1	1	1	1	1
2.5	.0061	.0060	.0058	.0057	.0055	.0053	.0052	.0050	.0049	.0048	0	1	1	1	1	1	1	1	1
2.6	.0046	.0045	.0044	.0042	.0041	.0040	.0039	.0037	.0036	.0035	0	1	1	1	1	1	1	1	1
2.7	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026	.0025	0	1	1	1	1	1	1	1	1
2.8	.0025	.0024	.0024	.0023	.0022	.0021	.0021	.0020	.0019	.0019	0	1	1	1	1	1	1	1	1
2.9	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014	.0013	0	1	1	1	1	1	1	1	1
3.0	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010	.0010	0	1	1	1	1	1	1	1	1
3.1	.0008	.0008	.0008	.0007	.0007	.0007	.0006	.0006	.0006	.0005	0	1	1	1	1	1	1	1	1
3.2	.0005	.0005	.0004	.0004	.0004	.0003	.0003	.0003	.0003	.0002	0	1	1	1	1	1	1	1	1
3.3	.0003	.0003	.0003	.0002	.0002	.0002	.0001	.0001	.0001	.0001	0	1	1	1	1	1	1	1	1
3.4	.0002	.0002	.0002	.0001	.0001	.0001	.0000	.0000	.0000	.0000	0	1	1	1	1	1	1	1	1
3.5	.0001	.0001	.0001	.0000	.0000	.0000	.0000	.0000	.0000	.0000	0	1	1	1	1	1	1	1	1
3.6	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	0	1	1	1	1	1	1	1	1
3.7	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	0	1	1	1	1	1	1	1	1
3.8	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	0	1	1	1	1	1	1	1	1
3.9	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	0	1	1	1	1	1	1	1	1

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

UPPER QUANTILES  $z_{(P)}$  OF THE NORMAL DISTRIBUTION No.11

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	0.4	3.153
.55	.45	0.126	.86	.14	1.080	.976	.024	1.977	.991	.009	2.366	0.3	3.432
.60	.40	0.253	.87	.13	1.126	.977	.023	1.995	.992	.008	2.404	0.2	3.540
.65	.35	0.385	.88	.12	1.175	.978	.022	2.014	.993	.007	2.441	0.1	3.719
.70	.30	0.524	.89	.11	1.227	.979	.021	2.034	.994	.006	2.512	0.5	3.891
.75	.25	0.674	.90	.10	1.282	.980	.020	2.054	.995	.005	2.576	0.1	4.265
.76	.24	0.706	.91	.09	1.341	.981	.019	2.075	.996	.004	2.652	0.5	4.417
.77	.23	0.741	.92	.08	1.404	.982	.018	2.097	.997	.003	2.748	0.1	4.751
.78	.22	0.772	.93	.07	1.476	.983	.017	2.120	.998	.002	2.878	0.5	4.842
.79	.21	0.806	.94	.06	1.555	.984	.016	2.144	.999	.001	3.090	0.1	5.199
.80	.20	0.842	.950	.050	1.645	.985	.015	2.170	.9991	0.000	3.121	0.5	5.327
.81	.19	0.878	.955	.045	1.695	.986	.014	2.197	.9992	0.000	3.156	0.1	5.612
.82	.18	0.915	.960	.040	1.751	.987	.013	2.226	.9993	0.000	3.195	0.5	5.731
.83	.17	0.954	.965	.035	1.812	.988	.012	2.257	.9994	0.000	3.239	0.1	5.998
.84	.16	0.994	.970	.030	1.881	.989	.011	2.290	.9995	0.000	3.291	0.5	6.109

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

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

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

PROBABILITY DENSITY  $\phi(z)$  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.	0.000134	.00009	.000059	.000039	.000025	.000016	.000010	0.000064	0.000040	0.000024

For  $z < 0$  use the relation:

$$\phi(z) = \phi(-z)$$

The tabulated functions are defined thus:

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

$$Q(z) = \int_z^{\infty} \phi(u) du$$

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

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  $N(\mu, \sigma^2)$  is

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

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

