

**SULIT**

**PROGRAM PENINGKATAN PRESTASI AKADEMIK SPM**

**TAHUN 2011**

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**MATA PELAJARAN**

**MATEMATIK TAMBAHAN 1**

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**SULIT****3472 / 1**

Name : .....

Form : .....

**PROGRAM PENINGKATAN PRESTASI AKADEMIK SPM 2011  
ADDITIONAL MATHEMATICS****Kertas 1****Ogos 2011****2 jam****Dua jam****JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU**

1. *Tulis nama dan tingkatan anda pada ruangan yang disediakan.*
2. *Kertas soalan ini adalah dalam dwibahasa.*
3. *Soalan dalam bahasa Inggeris mendahului soalan yang sepadan dalam bahasa Melayu.*
4. *Calon dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam bahasa Inggeris atau bahasa Melayu.*
5. *Calon dikehendaki membaca maklumat di halaman belakang kertas soalan ini.*

| <i>Untuk Kegunaan Pemeriksa</i> |              |                   |
|---------------------------------|--------------|-------------------|
| Soalan                          | Markah Penuh | Markah Diperolehi |
| 1                               | 2            |                   |
| 2                               | 3            |                   |
| 3                               | 4            |                   |
| 4                               | 3            |                   |
| 5                               | 3            |                   |
| 6                               | 3            |                   |
| 7                               | 3            |                   |
| 8                               | 3            |                   |
| 9                               | 2            |                   |
| 10                              | 3            |                   |
| 11                              | 3            |                   |
| 12                              | 3            |                   |
| 13                              | 3            |                   |
| 14                              | 4            |                   |
| 15                              | 2            |                   |
| 16                              | 3            |                   |
| 17                              | 4            |                   |
| 18                              | 4            |                   |
| 19                              | 3            |                   |
| 20                              | 4            |                   |
| 21                              | 4            |                   |
| 22                              | 3            |                   |
| 23                              | 3            |                   |
| 24                              | 4            |                   |
| 25                              | 4            |                   |
| <b>TOTAL</b>                    | <b>80</b>    |                   |

Kertas soalan ini mengandungi 20 halaman bercetak

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

**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**

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

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

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

4 Area under a curve

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

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

5 Volume generated

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

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

**GEOMETRY**

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

2 Midpoint

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

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

$$4 \quad \hat{r} = \frac{x\hat{i} + y\hat{j}}{\sqrt{x^2 + y^2}}$$

5 A point dividing a segment of a line

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

6 Area of triangle

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

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**3472/1****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 
$${}^n P_r = \frac{n!}{(n-r)!}$$

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 
$$\text{Mean } \mu = np$$

13 
$$\sigma = \sqrt{npq}$$

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

**TRIGONOMETRY**

1 Arc length,  $s = r\theta$

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

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 
$$\begin{aligned} \cos 2A &= \cos^2 A - \sin^2 A \\ &= 2 \cos^2 A - 1 \\ &= 1 - 2 \sin^2 A \end{aligned}$$

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

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Answer all questions.  
Jawab semua soalan.

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

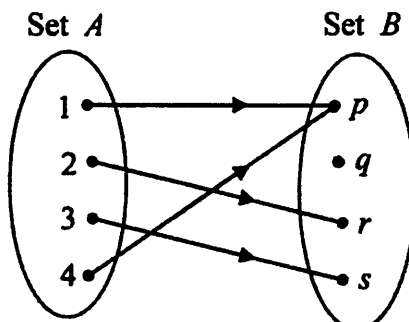


Diagram 1

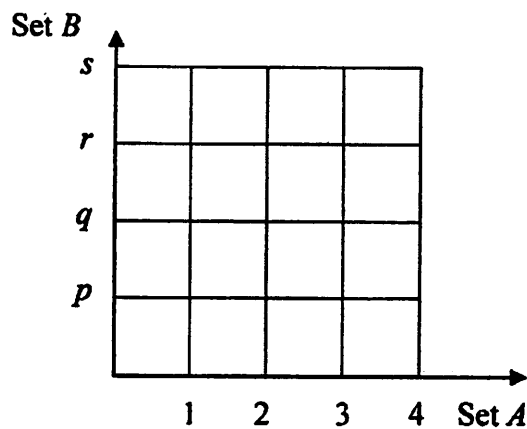
Rajah 1

- (a) Plot the relation in the graph form,  
*Plotkan hubungan itu dalam bentuk graf.*
- (b) State the type of the relation .  
*Nyatakan jenis hubungan itu .*

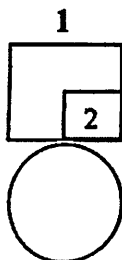
[2 marks]  
[2 markah]

Answer/Jawapan:

- (a)



- (b)



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- 2 Given the function  $h:x \rightarrow |3x-5|$ .  
Diberi fungsi  $h:x \rightarrow |3x-5|$ .

Find  
Cari

- (a) the image of  $-2$ ,  
imej bagi  $-2$ ,
- (b) the values of  $x$  such that  $h(x)=4$ .  
nilai-nilai  $x$  dengan keadaan  $h(x)=4$ .

[3 marks]  
[3 markah]

Answer/Jawapan:

(a)

(b)

2

|   |
|---|
|   |
| 3 |

- 3 Given the function  $h(x)=2+3x$  and  $k(x)=px-15$ , find  
Diberi fungsi  $h(x)=2+3x$  dan  $k(x)=px-15$ , cari

- (a)  $h^{-1}(7)$ ,
- (b) the value of  $p$  such that  $kh(4)=13$ .  
nilai bagi  $p$  dengan keadaan  $kh(4)=13$ .

[4 marks]  
[4 markah]

Answer/Jawapan:

(a)

(b)

3

|   |
|---|
|   |
| 4 |

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- 4 Diagram 4 shows the graph of the function  $f(x) = 2(x - p)^2 - 5$ .

Rajah 4 menunjukkan graf bagi fungsi  $f(x) = 2(x - p)^2 - 5$ .

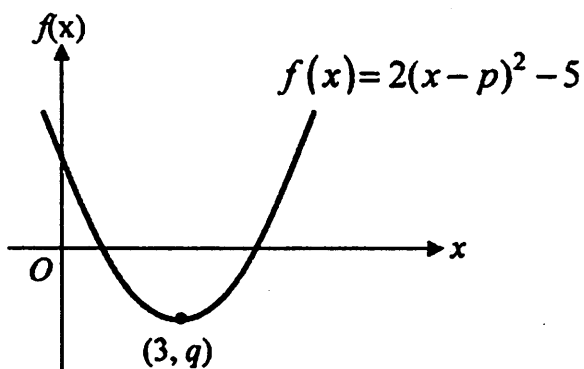


Diagram 4  
Rajah 4

The curve has the minimum point  $(3, q)$ .

Lengkung tersebut mempunyai titik minimum  $(3, q)$ .

State

Nyatakan

- the value of  $p$ ,  
nilai bagi  $p$ ,
- the value of  $q$ ,  
nilai bagi  $q$ ,
- the equation of the axis of symmetry.  
persamaan bagi paksi simetri.

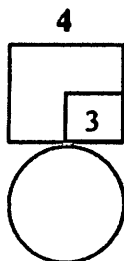
[3 marks]  
[3 markah]

Answer/Jawapan:

(a)

(b)

(c)



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use only

- 5 Given that  $\alpha$  and  $\beta$  are the roots of the quadratic equation  $2x^2 + 5x + k = 0$ , where  $k$  is a constant.

Diberi  $\alpha$  dan  $\beta$  adalah punca-punca bagi persamaan kuadratik  $2x^2 + 5x + k = 0$ , dengan keadaan  $k$  ialah pemalar.

Find

Cari

- (a) the value of  $\alpha + \beta$ ,  
nilai bagi  $\alpha + \beta$ ,
- (b) the value of  $k$  such that  $\alpha\beta = 3$ .  
nilai bagi  $k$  dengan keadaan  $\alpha\beta = 3$ .

[3 marks]  
[3 markah]

Answer/Jawapan:

(a)

(b)

5

|   |
|---|
|   |
| 3 |

- 6 Find the range of values of  $x$  for which  $4x^2 \geq 3 - 4x$ .

[3 marks]

Cari julat nilai-nilai  $x$  bagi  $4x^2 \geq 3 - 4x$ .

[3 markah]

Answer/Jawapan:

6

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| 3 |





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use only*

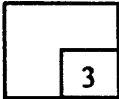
- 7 Solve the equation :  
*Selesaikan persamaan :*

$$2^x = 5(2^{x+1}) - 144$$

[3 marks]  
[3 markah]

*Answer/Jawapan:*

7



- 8 Solve the equation  $\log_5 x = 1 + \log_5(x - 4)$  .

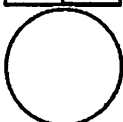
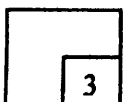
[3 marks]

*Selesaikan persamaan*  $\log_5 x = 1 + \log_5(x - 4)$  .

[3 markah]

*Answer/Jawapan:*

8



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- 9 The  $n^{\text{th}}$  term of an arithmetic progression is given by  $T_n = 11 - 3n$ . Find the common difference of the progression.

*Diberi sebutan ke- $n$  bagi suatu jangjang aritmetik ialah  $T_n = 11 - 3n$ . Cari beza sepunya bagi jangjang ini.*

[2 marks]  
[2 markah]

Answer/Jawapan:

9

|   |
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|   |
| 2 |

- 10 Given that 12, 6, 3, ... is a geometric progression, find the sum of the first 7 terms after the 3<sup>rd</sup> term of the progression.

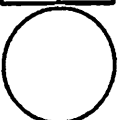
*Diberi 12, 6, 3, ... ialah suatu jangjang geometri, cari hasil tambah 7 sebutan pertama selepas sebutan ke-3.*

[3 marks]  
[3 markah]

Answer/Jawapan:

10

|   |
|---|
|   |
| 3 |



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11 Given  $0.471 + 0.000471 + 0.000000471 + \dots = \frac{P}{333}$ . Find the value of  $p$ .

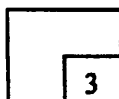
Diberi  $0.471 + 0.000471 + 0.000000471 + \dots = \frac{P}{333}$ . Cari nilai bagi  $p$ .

[3 marks]

[3 markah]

Answer/Jawapan:

11



12 Diagram 12 shows the straight line graph obtained by plotting  $\log_{10} y$  against  $\log_{10} x$ .  
Rajah 12 menunjukkan graf garis lurus yang diperolehi dengan memplot  $\log_{10} y$  melawan  $\log_{10} x$ .

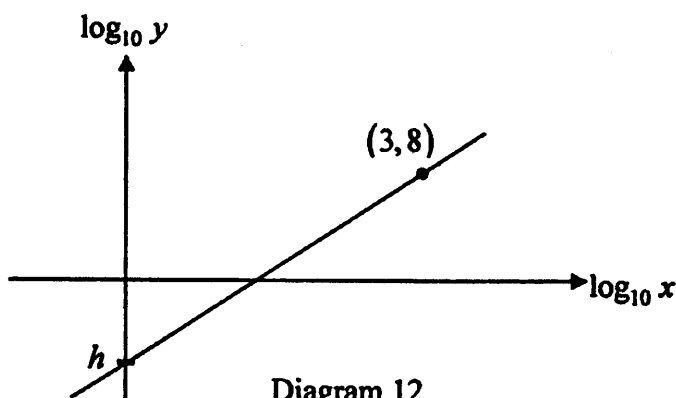


Diagram 12  
Rajah 12

The variables  $x$  and  $y$  are related by the equation  $y = \frac{x^k}{10}$  where  $k$  is a constant. Find the value of  $h$  and of  $k$ .

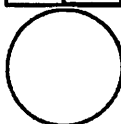
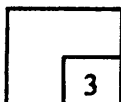
Pembolehubah  $x$  dan  $y$  dihubungkan oleh persamaan  $y = \frac{x^k}{10}$ , dengan keadaan  $k$  ialah pemalar. Cari nilai  $h$  dan nilai  $k$ .

[3 marks]

[3 markah]

Answer/Jawapan:

12



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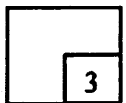
- 13 Find the equation of a straight line that passes through the point (5, 3) and perpendicular to the straight line  $2y - 4x = 7$ .

*Cari suatu persamaan garis lurus yang melalui titik (5, 3) dan berserenjang dengan garis lurus  $2y - 4x = 7$ .*

[3 marks]  
[3 markah]

*Answer/Jawapan:*

13



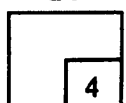
- 14 Given points  $A(k, 3k)$ ,  $B(-2, 1)$  and  $C(3, 2)$ . Find the values of  $k$  if the area of the triangle  $ABC$  is  $10.5 \text{ unit}^2$ .

*Diberi titik  $A(k, 3k)$ ,  $B(-2, 1)$  dan  $C(3, 2)$ . Cari nilai-nilai bagi  $k$  jika luas segi tiga  $ABC$  ialah  $10.5 \text{ unit}^2$ .*

[4 marks]  
[4 markah]

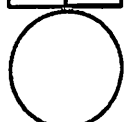
*Answer/Jawapan:*

14



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15 Diagram 15 shows two vectors,  $\overline{OA}$  and  $\overline{OB}$ .

Rajah 15 menunjukkan dua vektor,  $\overline{OA}$  dan  $\overline{OB}$ .

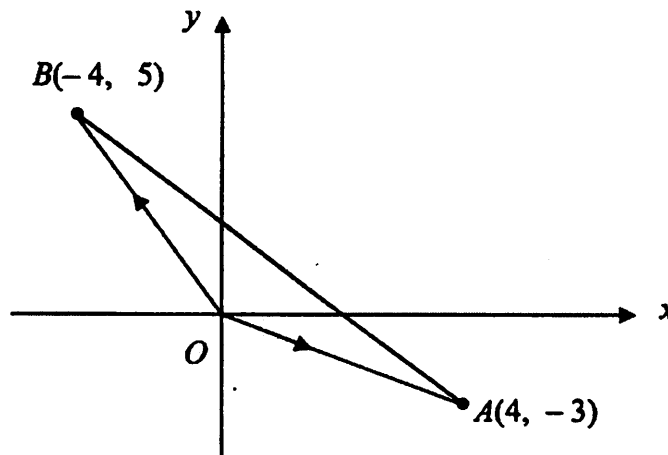


Diagram 15  
Rajah 15

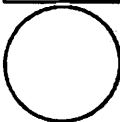
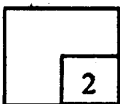
Express  $\overline{BA}$  in the form  $x\underline{i} + y\underline{j}$ .

Ungkapkan  $\overline{BA}$  dalam bentuk  $x\underline{i} + y\underline{j}$ .

[2 marks]  
[2 markah]

Answer/Jawapan:

15



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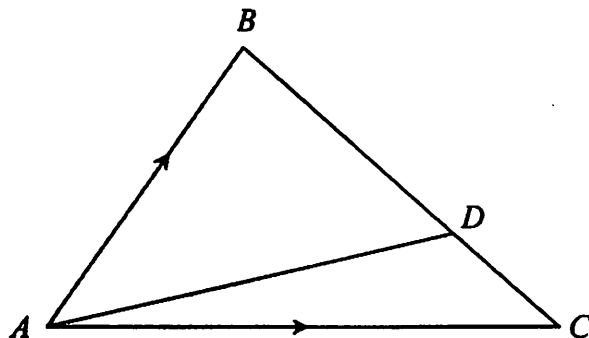


Diagram 16  
Rajah 16

Diagram 16 shows a triangle  $ABC$  and  $D$  is a point on  $BC$ . Given  $\overline{AB} = 3\mathbf{i} + 7\mathbf{j}$ ,  $\overline{AC} = 11\mathbf{i} + 3\mathbf{j}$  and  $BD = 3DC$ , find  $\overline{AD}$ .

Rajah 16 menunjukkan segi tiga  $ABC$  dan  $D$  ialah satu titik pada  $BC$ . Diberi  $\overline{AB} = 3\mathbf{i} + 7\mathbf{j}$ ,  $\overline{AC} = 11\mathbf{i} + 3\mathbf{j}$  dan  $BD = 3DC$ , cari  $\overline{AD}$ .

[3 marks]  
[3 markah]

Answer/Jawapan:

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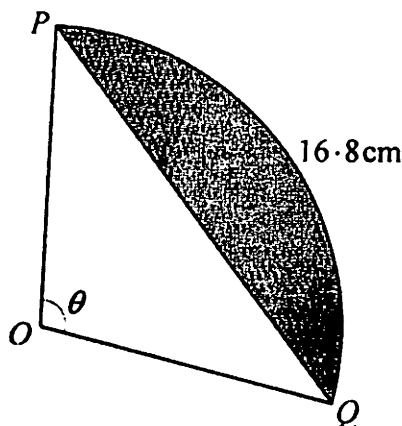


Diagram 17  
Rajah 17

Diagram 17 shows a sector  $OPQ$  of a circle with centre  $O$  and radius of  $7$  cm. Given the length of the arc  $PQ$  is  $16.8$  cm.

Rajah 17 menunjukkan sektor  $OPQ$  bagi sebuah bulatan berpusat  $O$  dan jejari  $7$  cm. Diberi panjang lengkok  $PQ$  ialah  $16.8$  cm.

Find  
Cari

- (a) the value of  $\theta$  in radians,  
nilai bagi  $\theta$  dalam radian,
- (b) the area, in  $\text{cm}^2$ , of the shaded region.  
luas, dalam  $\text{cm}^2$ , kawasan berlorek.

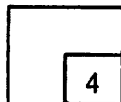
[4 marks]  
[4 markah]

Answer/Jawapan:

(a)

(b)

17



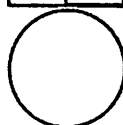
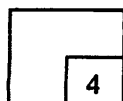
18 Solve the equation  $3\sin 2x = 2\cos x$  for  $0^\circ \leq x \leq 360^\circ$ .

Selesaikan persamaan  $3\sin 2x = 2\cos x$  bagi  $0^\circ \leq x \leq 360^\circ$ .

[4 marks]  
[4 markah]

Answer/Jawapan:

18



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19 Given  $\int_1^3 f(x)dx = 5$  and  $\int_3^1 g(x)dx = 2$ . Find the value of  $\int_1^3 [2f(x) - g(x)]dx$ .

Diberi  $\int_1^3 f(x)dx = 5$  dan  $\int_3^1 g(x)dx = 2$ . Cari nilai  $\int_1^3 [2f(x) - g(x)]dx$ .

[3 marks]

[3 markah]

Answer/Jawapan:

19

3

20 It is given that  $y = \frac{2x+1}{x-3}$ ,  $x \neq 3$ .

Diberi bahawa  $y = \frac{2x+1}{x-3}$ ,  $x \neq 3$ .

Find  
Cari

(a) the value of  $\frac{dy}{dx}$  when  $x = 4$ ,

nilai bagi  $\frac{dy}{dx}$  apabila  $x = 4$ ,

(b) the approximate change in  $y$  when  $x$  increases from 4 to 4.01.  
perubahan kecil bagi  $y$  apabila  $x$  bertambah dari 4 kepada 4.01.

[4 marks]

[4 markah]

Answer/Jawapan:

(a)

(b)

20

4





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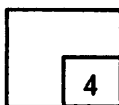
- 21 Point  $A$  lies on the curve  $y = 2x^4 - x$ , find the coordinates of point  $A$  where the gradient of the normal at point  $A$  is  $-\frac{1}{7}$ .

*Titik  $A$  terletak pada lengkung  $y = 2x^4 - x$ , cari koordinat bagi titik  $A$  dengan keadaan kecerunan normal pada titik  $A$  ialah  $-\frac{1}{7}$ .*

[4 marks]  
[4 markah]

Answer/Jawapan:

21



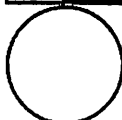
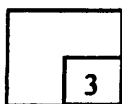
- 22 The standard deviation of a set of six numbers is  $\sqrt{15}$ . Given that the sum of square for the set of numbers is 144. Find the new mean when a number 10 is added to this set.

*Sisihan piawai bagi satu set yang terdiri daripada enam nombor ialah  $\sqrt{15}$ . Diberi bahawa hasil tambah kuasa dua bagi nombor-nombor tersebut ialah 144. Cari min baru apabila satu nombor 10 ditambah kepada set ini.*

[3 marks]  
[3 markah]

Answer/Jawapan:

22



3472/1

**SULIT**

**SULIT**

17

3472/1

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- 23 Diagram 23 shows 3 letters and 4 digits.  
*Rajah 23 menunjukkan 3 huruf dan 4 angka.*

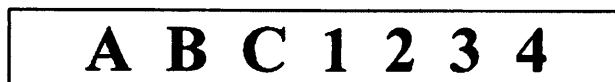


Diagram 23  
*Rajah 23*

A code is to be formed using those letters and digits. The code must consist of 2 letters followed by 3 digits. How many codes can be formed if no letter or digit is repeated in each code?

*Satu kod dibentuk menggunakan huruf-huruf dan angka-angka berkenaan. Kod ini mesti menggunakan 2 huruf dan diikuti dengan 3 angka. Berapa kod yang boleh dibentuk dengan tiada huruf dan angka yang berulang?*

[3 marks]  
[3 markah]

Answer/Jawapan:

23

|   |
|---|
|   |
| 3 |

- 24 In an athletic championship, the probability that an athlete is being chosen to take part in the 100 m event is  $\frac{3}{7}$  and in the 800 m event is  $\frac{2}{5}$ .

*Dalam satu kejohanan olahraga, kebarangkalian bahawa seorang peserta dipilih untuk mengambil bahagian dalam acara 100 m ialah  $\frac{3}{7}$  dan acara 800 m ialah  $\frac{2}{5}$ .*

Find the probability that the athlete will be chosen to take part in

*Cari kebarangkalian peserta itu dipilih untuk mengambil bahagian dalam*

- (a) both the events,  
*kedua-dua acara,*
- (b) at least one event.  
*sekurang-kurangnya satu acara.*

[4 marks]  
[4 markah]

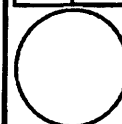
Answer/Jawapan:

(a)

(b)

24

|   |
|---|
|   |
| 4 |



For  
examiner's  
use only

**SULIT**

18

3472/1

- 25 The random variable  $X$  is normally distributed with a mean of 62 and a standard deviation of 3.

*Pembolehubah rawak  $X$  bertaburan normal dengan min 62 dan sisihan piawai 3.*

Find the value of

*Cari nilai bagi*

(a)  $P(X > 65)$ ,

(b)  $k$  if  $P(X > k) = 0.6915$ .

*k jika  $P(X > k) = 0.6915$ .*

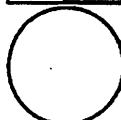
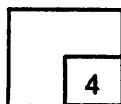
[4 marks]  
[4 markah]

Answer/Jawapan:

(a)

(b)

25



END OF QUESTION PAPER  
KERTAS SOALAN TAMAT

3472/1

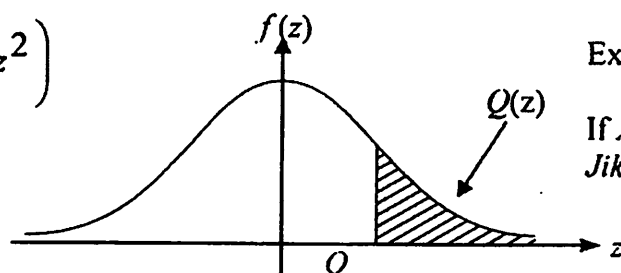
**SULIT**

**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   |         |         |         |         |         |         |         |         |         | Minus / Tolak |   |   |    |    |    |    |    |    |    |
|-----|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------------|---|---|----|----|----|----|----|----|----|
|     | 0       | 1       | 2       | 3       | 4       | 5       | 6       | 7       | 8       | 9             | 1 | 2 | 3  | 4  | 5  | 6  | 7  | 8  | 9  |
| 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  $P(X > k) = Q(k)$   
 Jika  $X \sim N(0, 1)$ , maka  $P(X > k) = Q(k)$

**INFORMATION FOR CANDIDATES  
MAKLUMAT UNTUK CALON**

1. This question paper consists of 25 questions.  
*Kertas soalan ini mengandungi 25 soalan.*
2. Answer all questions.  
*Jawab semua soalan.*
3. Write your answers in the spaces provided in the question paper.  
*Tulis jawapan anda dalam ruang yang disediakan dalam kertas soalan.*
4. Show your working. It may help you to get marks.  
*Tunjukkan langkah-langkah penting dalam kerja mengira anda. Ini boleh membantu anda untuk mendapatkan markah.*
5. If you wish to change your answer, cross out the answer that you have done. Then write down the new answer.  
*Sekiranya anda hendak menukar jawapan, batalkan jawapan yang telah dibuat. Kemudian tulis jawapan yang baru.*
6. The diagrams in the questions provided are not drawn to scale unless stated.  
*Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.*
7. The marks allocated for each question are shown in brackets.  
*Markah yang diperuntukkan bagi setiap soalan ditunjukkan dalam kurungan.*
8. A list of formulae is provided on pages 2 and 3.  
*Satu senarai rumus disediakan di halaman 2 dan 3.*
9. A booklet of four-figure mathematical tables is provided.  
*Sebuah buku sifir matematik empat angka disediakan.*
10. You may use a non-programmable scientific calculator.  
*Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogram.*
11. Hand in this question paper to the invigilator at the end of the examination.  
*Serahkan kertas soalan ini kepada pengawas peperiksaan di akhir peperiksaan.*