

Name :



Form :

PROGRAM PENINGKATAN PRESTASI AKADEMIK SPM 2014
MAJLIS PENGETUA SEKOLAH MALAYSIA (KEDAH)

ADDITIONAL MATHEMATICS**Kertas 1****Mei 2014****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	3	
2	4	
3	4	
4	3	
5	3	
6	2	
7	3	
8	3	
9	3	
10	3	
11	3	
12	2	
13	3	
14	3	
15	4	
16	3	
17	4	
18	4	
19	3	
20	3	
21	3	
22	3	
23	4	
24	3	
25	4	
TOTAL	80	

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

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

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

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

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

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

STATISTICS

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

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

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

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

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

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

$$7 \quad \bar{I} = \frac{\sum W_i I_i}{\sum W_i}$$

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

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

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

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

$$12 \quad \text{Mean } \mu = np$$

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

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

TRIGONOMETRY

$$1 \quad \text{Arc length, } s = r\theta$$

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

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

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

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

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

$$7 \quad \begin{aligned} \cos 2A &= \cos^2 A - \sin^2 A \\ &= 2 \cos^2 A - 1 \\ &= 1 - 2 \sin^2 A \end{aligned}$$

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

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

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

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

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

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

$$14 \quad \text{Area of triangle} = \frac{1}{2} ab \sin C$$

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

1 Diagram 1 shows the relation between set X and set Y .

Rajah 1 menunjukkan hubungan antara set X dan set Y .

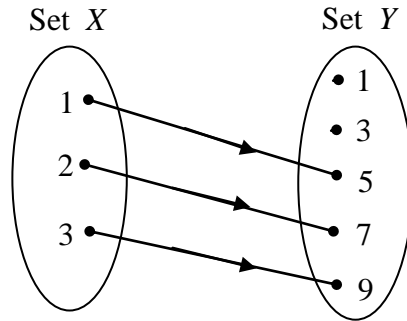


Diagram 1

Rajah 1

State

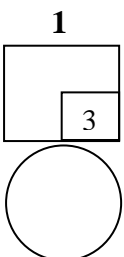
Nyatakan

- (a) the image of 1,
imej bagi 1,
- (b) the range of the relation,
julat bagi hubungan itu,
- (c) the codomain of the relation.
kodomain bagi hubungan itu.

[3 marks]
[3 markah]

Answer/*Jawapan:*

- (a)
- (b)
- (c)



- 2** Given function $f(x) = 3x + 2$ and $g(x) = 2x - 9$, find

Diberi fungsi $f(x) = 3x + 2$ dan $g(x) = 2x - 9$, cari

Cari

(a) $f^{-1}(x)$.

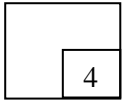
(b) $f^{-1}g(7)$.

[4 marks]
[4 markah]

Answer/Jawapan:

(a)

(b)

2

- 3** Given that the function $g(x) = 3x + 7$ and $fg(x) = 6x + 5$, find

Diberi fungsi $g(x) = 3x + 7$ dan $fg(x) = 6x + 5$, cari

(a) $fg(-2)$.

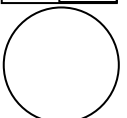
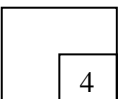
(b) $f(x)$.

[4 marks]
[4 markah]

Answer/Jawapan:

(a)

(b)

3

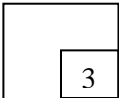
- 4 Solve the quadratic equation $2x^2 + 3 = 5(x + 1) + 2$. Give your answer correct to three decimal places.

Selesaikan persamaan kuadratik $2x^2 + 3 = 5(x + 1) + 2$. Berikan jawapan anda betul kepada tiga tempat perpuluhan.

[3 marks]
[3 markah]

Answer/Jawapan:

4



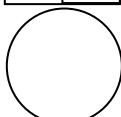
- 5 A quadratic equation $3x^2 + 4x - 6 = 0$ has roots α and β . Form the quadratic equation which has the roots 3α and 3β .

*Persamaan kuadratik $3x^2 + 4x - 6 = 0$ mempunyai punca-punca α dan β .
Bentukkan persamaan kuadratik yang mempunyai punca-punca 3α dan 3β .*

[3 marks]
[3 markah]

Answer/Jawapan:

5



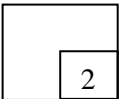
- 6 Given that the graph of the quadratic function $f(x) = (x - m)^2 + 3t - 8$, where m and t are constants, has a minimum point at $(4, 1)$. Find the value of m and t .

Diberi graf fungsi kuadratik $f(x) = (x - m)^2 + 3t - 8$, dengan keadaan m dan t ialah pemalar, mempunyai titik minimum di $(4, 1)$. Cari nilai bagi m dan t .

[2 marks]
[2 markah]

Answer/Jawapan:

6



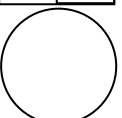
- 7 Given that $f(x) = 3x^2 - 2x - 8$, find the range of values of x for $f(x)$ is negative.

Diberi $f(x) = 3x^2 - 2x - 8$, cari julat nilai x untuk $f(x)$ ialah negatif.

[3 marks]
[3 markah]

Answer/Jawapan:

7



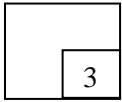
For
examiner's
use only

- 8** Solve the equation :
Selesaikan persamaan :

$$3(5^{m+1}) - 10(5^m) = 625$$

[3 marks]
[3 markah]

Answer/Jawapan:

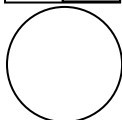
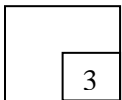
8

- 9** Solve the equation :
Selesaikan persamaan :

$$\log_3 y - \log_3 (4 - y) = 1$$

[3 marks]
[3 markah]

Answer/Jawapan:

9

- 10 Solve the equation :
Selesaikan persamaan :

$$\log_2 x - 2\log_x 4 = 0$$

[3 marks]
[3 markah]

Answer/Jawapan:

10

3

- 11 The sum of the first n terms of an arithmetic progression is given by $S_n = 5n - 2n^2$. Find
Hasil tambah n sebutan pertama bagi suatu jangjang aritmetik ialah $S_n = 5n - 2n^2$. Cari

- (a) the first term of the progression.
sebutan pertama jangjang itu.
- (b) the common difference of the progression.
beza sepunya jangjang itu.

[3 marks]
[3 markah]

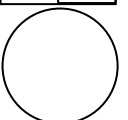
Answer/Jawapan:

(a)

(b)

11

3



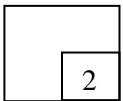
- 12** Given that the first three terms of a geometric progression are q , 6 , $4q$. Find the possible values of q .

Diberi tiga sebutan pertama bagi satu jangjang geometri ialah q , 6 , $4q$. Cari nilai-nilai yang mungkin bagi q .

[2 marks]
[2 markah]

Answer/Jawapan:

12



- 13** Given the geometric progression $2, -\frac{4}{3}, \frac{8}{9}, \dots$, find

Diberi jangjang geometri $2, -\frac{4}{3}, \frac{8}{9}, \dots$, cari

- (a) the common ratio ,
nisbah sepunya ,
- (b) the sum of the progression when $r^n \approx 0$.
hasil tambah jangjang itu apabila $r^n \approx 0$.

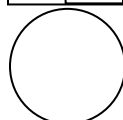
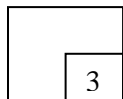
[3 marks]
[3 markah]

Answer/Jawapan:

(a)

(b)

13



- 14 The variables x and y are related by equation $y = \frac{k}{3^x}$, where k is a constant.
Diagram 14 shows the straight line graph obtained by plotting $\log_{10} y$ against x .

Pemboleh ubah x dan y dihubungkan oleh persamaan $y = \frac{k}{3^x}$, dengan keadaan k ialah pemalar. Rajah 14 menunjukkan graf garis lurus yang diperolehi dengan memplot $\log_{10} y$ melawan x .

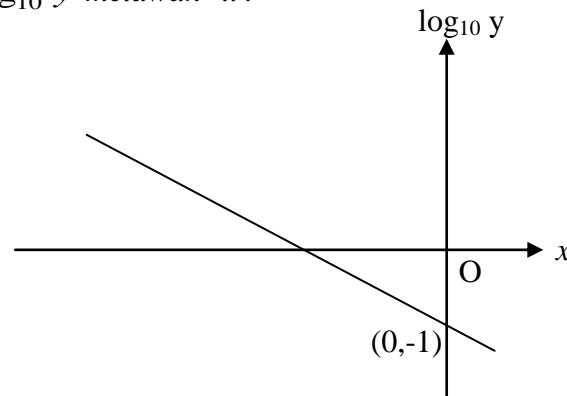


Diagram 14
Rajah 14

- (a) Express the equation $y = \frac{k}{3^x}$ in linear form used to obtain the straight line graph shown in Diagram 14.

Ungkapkan persamaan $y = \frac{k}{3^x}$ dalam bentuk linear yang digunakan untuk memperoleh graf garis lurus seperti ditunjukkan dalam Rajah 14.

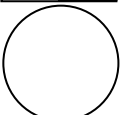
- (b) Find the value of k .
Cari nilai k .

[3 marks]
[3 markah]

Answer/Jawapan:

(a)

(b)



- 15 The point $P(2, 5)$, $Q(-3, 1)$ and $R(m, -1)$ are the vertices of a triangle. Find the values of m if the area of the triangle PQR is 21 unit^2 .

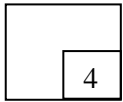
Titik-titik $P(2, 5)$, $Q(-3, 1)$ dan $R(m, -1)$ ialah bucu-bucu sebuah segi tiga. Cari nilai-nilai bagi m jika luas bagi segi tiga PQR ialah 21 unit^2 .

[4 marks]

[4 markah]

Answer/Jawapan:

15



- 16 A point P moves such that its distance from point $A(-3, 4)$ is always twice its distance from point $B(6, -2)$. Find the equation of the locus of point P .

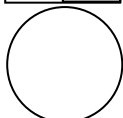
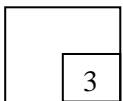
Titik P bergerak dengan keadaan jaraknya dari titik $A(-3, 4)$ sentiasa dua kali ganda jaraknya dari titik $B(6, -2)$. Cari persamaan lokus bagi titik P .

[3 marks]

[3 markah]

Answer/Jawapan:

16



- 17 Diagram 17 shows a circle with centre O . The radius of the circle is 2.5 cm and the area of the shaded region is 6.25 cm^2 .

Rajah 17 menunjukkan sebuah bulatan berpusat O . Diberi jejari bulatan ialah 2.5 cm dan luas kawasan berlorek ialah 6.25 cm^2 .

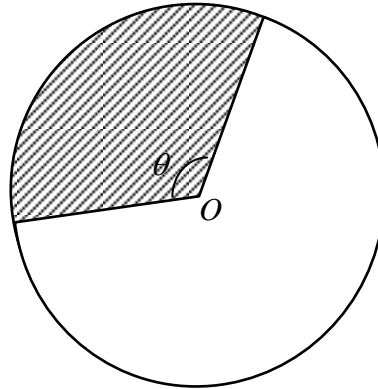


Diagram 17
Rajah 17

Calculate the perimeter of shaded region .

Hitungkan perimeter bagi kawasan berlorek .

[4 marks]
[4 markah]

Answer/Jawapan:

- 18 Diagram 18 shows a triangle, OAB , drawn on a Cartesian plane.
Rajah 18 menunjukkan sebuah segitiga, OAB , dilukis pada suatu satah Cartesan.

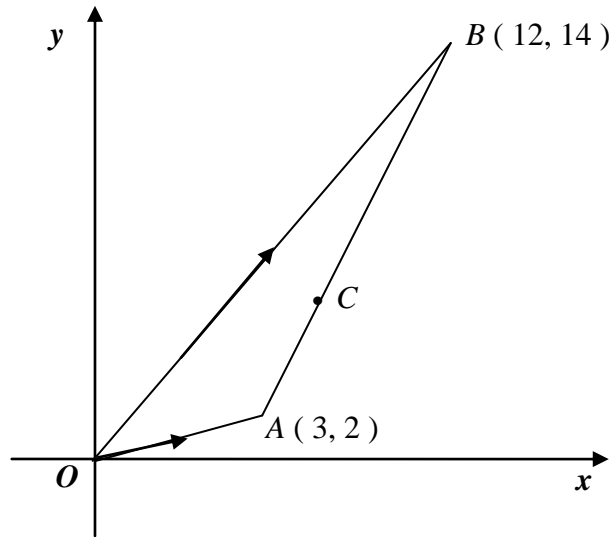


Diagram 18
Rajah 18

It is given that $\vec{AC} = \frac{1}{3} \vec{AB}$. Find

Diberi bahawa $\vec{AC} = \frac{1}{3} \vec{AB}$. Cari

- (a) \vec{AB}
(b) the unit vector in the direction of \vec{AC} .
vektor unit dalam arah \vec{AC} .

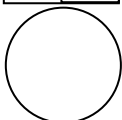
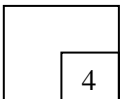
[4 marks]
[4 markah]

Answer/Jawapan:

(a)

(b)

18



19

Given that $\overrightarrow{OA} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$ and $\overrightarrow{AB} = \begin{pmatrix} 7 \\ 4 \end{pmatrix}$.

- (a) Find \overrightarrow{OB} .
 (b) State the coordinates of point B .

Diberi $\overrightarrow{OA} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$ dan $\overrightarrow{AB} = \begin{pmatrix} 7 \\ 4 \end{pmatrix}$.

- (a) Cari \overrightarrow{OB} .
 (b) Nyatakan koordinat bagi titik B .

[3 marks]
 [3 markah]

Answer/Jawapan:

(a)

(b)

19



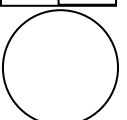
- 20 The mean of ten numbers is \sqrt{p} and the sum of the squares is 70. The variance of the numbers is $4q$. Express p in terms of q .

Min bagi sepuluh nombor ialah \sqrt{p} dan hasil tambah kuasa dua nombor-nombor itu ialah 70. Varians nombor-nombor itu ialah $4q$. Ungkapkan p dalam sebutan q .

[3 marks]
 [3 markah]

Answer/Jawapan:

20



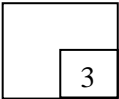
- 21** Find the equation of a straight line that passes through the point (3, 1) and perpendicular to the straight line $2y + 3x = 16$.

Cari suatu persamaan garis lurus yang melalui titik (3, 1) dan berserenjang dengan garis lurus $2y + 3x = 16$.

[3 marks]
[3 markah]

Answer/Jawapan:

21



- 22** It is given that $\cos A = -\frac{8}{17}$, where A is a reflex angle. Find

Diberi bahawa $\cos A = -\frac{8}{17}$, dengan keadaan A ialah sudut refleks. Cari

- (a) $\sin A$,
(b) $\cot A$.
 $\text{kot } A$.

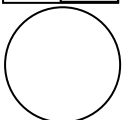
[3 marks]
[3 markah]

Answer/Jawapan:

(a)

(b)

22



23

Given that $y = \left(\frac{x}{2} - 7\right)^2$, find

Diberi $y = \left(\frac{x}{2} - 7\right)^2$, 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 increase from 4 to $4 + p$.
perubahan kecil bagi y apabila x bertambah dari 4 kepada $4 + p$.

[4 marks]

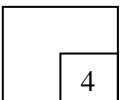
[4 markah]

Answer/Jawapan:

(a)

(b)

23



24 When a spherical ball bearing is heated, its surface area increases at a constant rate of $3 \cdot 2 \pi \text{ cm}^2 \text{ s}^{-1}$. Find the rate of change of the radius of the ball bearing when its radius is 5 cm.

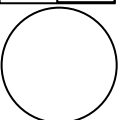
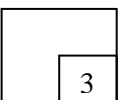
Apabila sebiji bebola berbentuk sfera dipanaskan, luas permukaannya bertambah dengan kadar $3 \cdot 2 \pi \text{ cm}^2 \text{ s}^{-1}$. Cari kadar perubahan jejari bebola apabila jejarinya 5 cm.

[3 marks]

[3 markah]

Answer/Jawapan:

24



25 Given that $\int_0^4 f(x)dx = 8$, find

Diberi $\int_0^4 f(x)dx = 8$, cari

(a) the value of $\int_4^0 \frac{1}{2} f(x)dx$,

nilai $\int_4^0 \frac{1}{2} f(x)dx$,

(b) the value of m if $\int_0^2 f(x)dx + \int_2^4 [f(x) + m] dx = 12$.

nilai m jika $\int_0^2 f(x)dx + \int_2^4 [f(x) + m] dx = 12$.

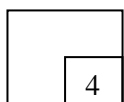
[4 marks]
[4 markah]

Answer/Jawapan:

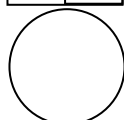
(a)

(b)

25



4



END OF QUESTION PAPER
KERTAS SOALAN TAMAT

INFORMATION FOR CANDIDATES
MAKLUMAT UNTUK CALON

1. This question paper consists of **25** questions.
Kertas soalan ini mengandungi 25 soalan.
2. Answer **all** questions.
*Jawab **semua** soalan.*
3. Write your answers in the spaces provided in the question paper.
Tulis jawapan anda dalam ruang yang disediakan dalam kertas soalan.
4. Show your working. It may help you to get marks.
Tunjukkan langkah-langkah penting dalam kerja mengira anda. Ini boleh membantu anda untuk mendapatkan markah.
5. If you wish to change your answer, cross out the answer that you have done. Then write down the new answer.
Sekiranya anda hendak menukar jawapan, batalkan jawapan yang telah dibuat. Kemudian tulis jawapan yang baru.
6. The diagrams in the questions provided are not drawn to scale unless stated.
Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.
7. The marks allocated for each question are shown in brackets.
Markah yang diperuntukkan bagi setiap soalan ditunjukkan dalam kurungan.
8. A list of formulae is provided on pages 2 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.