NAMA

TINGKATAN

ANGKA GILIRAN

PERSIDANGAN KEBANGSAAN PENGETUA SEK. MEN. MALAYSIA PULAU PINANG

PEPERIKSAAN PERCUBAAN SPM 2010

3472/1

ADDITIONAL MATHEMATICS
Kertas 1
September
2 jam

Dua jam

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Tuliskan* **nama, tingkatan** *dan* **angka giliran** *pada petak yang disediakan 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.*

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

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.

Rumus-rumus berikut boleh 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 $(a^m)^n = a^{mn}$

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

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

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

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

4 Area under a curve
Luas di bawah lengkung
$= \int_a^b y\,dx$ or (*atau*)
$= \int_a^b x\,dy$

5 Volume of revolution
Isi padu kisaran
$= \int_a^b \pi y^2\,dx$ or (*atau*)
$= \int_a^b \pi x^2\,dy$

STATISTICS
STATISTIK

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

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

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

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

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

6 $I = \dfrac{Q_1}{Q_2} \times 100$

7 $\bar{I} = \dfrac{\sum W_i I_i}{\sum W_i}$

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

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

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

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

12 Mean / *Min*, $\mu = np$

13 $\sigma = \sqrt{npq}$

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

GEOMETRY
GEOMETRI

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

2 Midpoint / *Titik Tengah*
$= \left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2} \right)$

3 A point dividing a segment of a line
Titik yang membahagi suatu tembereng garis
$(x, y) = \left(\dfrac{nx_1 + mx_2}{m+n}, \dfrac{ny_1 + my_2}{m+n} \right)$

4 Area of triangle / *Luas segi tiga*
$= \dfrac{1}{2} \left| (x_1y_2 + x_2y_3 + x_3y_1) - (x_2y_1 + x_3y_2 + x_1y_3) \right|$

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

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

TRIGONOMETRY
TRIGONOMETRI

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

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

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

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

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

$kos\,2A = kos^2 A - \sin^2 A$
$= 2kos^2 A - 1$
$= 1 - 2\sin^2 A$

8 $\sin(A \pm B) = \sin A\cos B \pm \cos A\sin B$
$sin(A \pm B) = sinA kosB \pm kosA sinB$

9 $\cos(A \pm B) = \cos A\ \cos B \mp \sin A\ \sin B$
$kos(A \pm B) = kosA\ kosB \mp sinA\ sinB$

10 $\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$

11 $\tan 2A = \frac{2\tan A}{1 - \tan^2 A}$

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

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

14 Area of triangle / *Luas Segi Tiga*
$= \frac{1}{2}ab\sin C$

For Examiner's Use

Answer **all** questions

*Jawab **semua** soalan.*

1

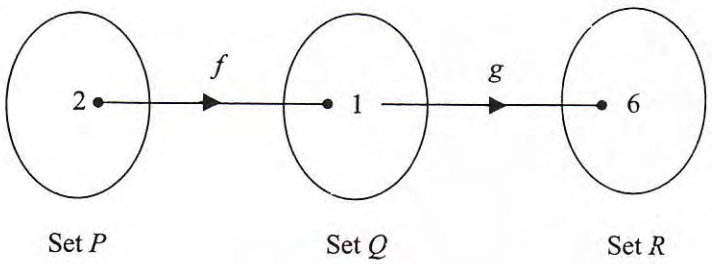

Diagram 1

Rajah 1

In Diagram 1, the function f maps set P to set Q and the function g maps set Q to set R.
Dalam Rajah 1, fungsi f memetakan set P kepada set Q dan fungsi g memetakan set Q kepada set R.

Find
Cari

(a) $f(2)$

(b) $g(1)$

(c) $gf(2)$

[3 marks]
[3 *markah*]

Answer/ *Jawapan*: (a) _____

(b) _____

(c) _____

1

3

2 The following information refers to the functions f and g.
Maklumat berikut adalah merujuk kepada fungsi f dan g.

$$f : x \to 3x - 4 \quad \text{and} \quad g : x \to \frac{5}{x}, x \neq 0$$

Find
Cari

(a) $f(-2)$

(b) $gf(x)$.

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

2

3

Answer/ *Jawapan*: (a) _____

(b) _____

3 Given that $f : x \to 4x + h$ and $f^{-1} : x \to kx + \frac{3}{4}$, find the values of h and k.

Diberi bahawa $f : x \to 4x + h$ *dan* $f^{-1} : x \to kx + \frac{3}{4}$, *cari nilai h dan nilai k.*

[3 marks]
[3 *markah*]

3

3

Answer/ *Jawapan*: h = _____

k= _____

For Examiner's Use

4 A quadratic equation $(k+3)x^2 - 12x + 2k = 0$ has two equal roots. Find the possible values of k.
Persamaan kuadratik $(k+3)x^2 - 12x + 2k = 0$ *mempunyai dua punca yang sama. Cari nilai-nilai yang mungkin bagi k.*

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

Answer / *Jawapan* : $k =$ _____

4
3

5

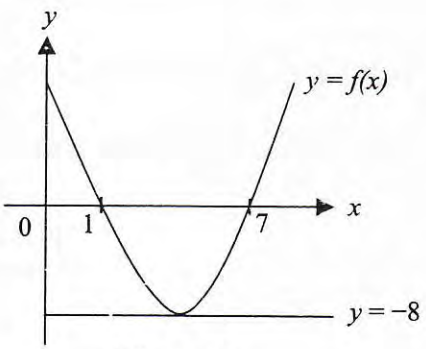

Diagram 2
Rajah 2

(a) Write the equation of the axis of symmetry of the curve.
Tuliskan persamaan paksi simetri bagi lengkungan itu.

(b) Express $f(x)$ in the form of $(x+h)^2 + k$ where h and k are constants.
Ungkapkan f(x) dalam bentuk $(x+h)^2 + k$ *dengan keadaan h dan k adalah pemalar.*

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

Answer / *Jawapan* : (a) _____

(b) _____

5
3

6 Given $27(9^{2p-1}) = 1$, find the value of p.

Diberi $27(9^{2p-1}) = 1$, *cari nilai p.*

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

6

3

Answer / *Jawapan*: $p =$ _____

7 Given that $\log_m 5 = p$ and $\log_m 3 = q$, express $\log_m\left(\frac{25m}{81}\right)$ in terms of p and q.

Diberikan $\log_m 5 = p$ *dan* $\log_m 3 = q$, *ungkapkan* $\log_m\left(\frac{25m}{81}\right)$ *dalam sebutan p dan q.*

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

7

4

Answer / *Jawapan*: _____

For Examiner's Use

8 P and Q are two points with coordinates $(-2, 7)$ and $(5, -3)$ respectively. A is a point on PQ such that $PA : AQ = 3 : 2$. Find the coordinates of point A.

P and Q ialah dua titik dengan koordinat (−2 , 7) dan (5, −3) masing-masing. A ialah titik di atas garis PQ iaitu PA : AQ = 3 : 2. Cari koordinat bagi titik A.

[3 marks]
[*3 markah*]

Answer / *Jawapan* : _____

8 | 3

9 The first three terms of a sequence are $6, x, 24$.
Find the positive value of x so that the sequence is
Tiga sebutan pertama bagi satu jujukan adalah 6 , x, 24.
Carikan nilai positif bagi x supaya jujukan adalah

a) an arithmetic progression
janjang aritmetik

b) a geometric progression
janjang geometri

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

Answer / *Jawapan* : (a) _____

(b) _____

9 | 2

10 Express the recurring decimal $0.\dot{7}\dot{2}$ as a fraction in its simplest form.
Ungkapkan nombor perpuluhan $0.\dot{7}\dot{2}$ *dalam bentuk pecahan terendah.*

[2 marks]
[*2 markah*]

10
2

Answer/*Jawapan* : _____

11 Diagram 3 shows a parallelogram, *OPQR*, drawn on a Cartesian plane.
Rajah 3 menunjukkan sebuah segiempat selari OPQR dilukis di atas satah Cartesan.

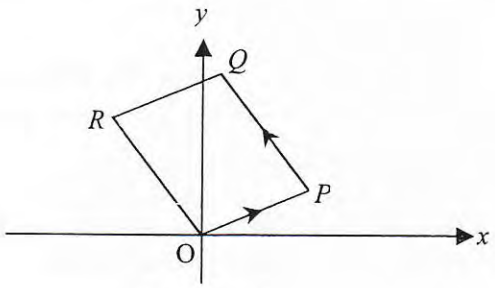

Diagram 3
Rajah 3

It is given that $\overrightarrow{OP} = 7\underset{\sim}{i} + 4\underset{\sim}{j}$ and $\overrightarrow{PQ} = -6\underset{\sim}{i} + 9\underset{\sim}{j}$. Find $\overrightarrow{PR}$.

Diberi $\overrightarrow{OP} = 7\underset{\sim}{i} + 4\underset{\sim}{j}$ *dan* $\overrightarrow{PQ} = -6\underset{\sim}{i} + 9\underset{\sim}{j}$. *Cari* $\overrightarrow{PR}$.

[3 marks]
[*3 markah*]

11
3

Answer / *Jawapan* : _____

For Examiner's Use

12 Diagram 4 shows vector $\overrightarrow{OP}$ drawn on a Cartesian plane.
Rajah 4 menunjukkan vektor $\overrightarrow{OP}$ dilukis pada suatu satah Cartesan.

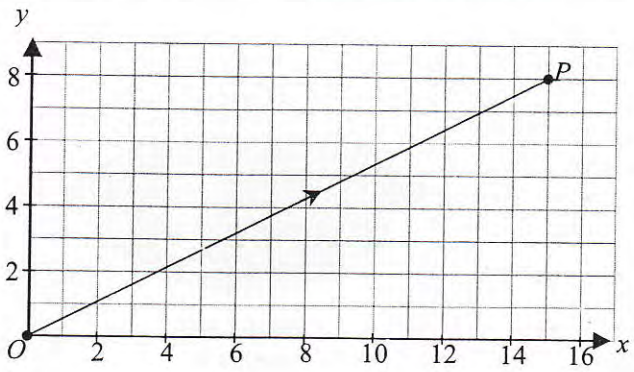

Diagram 4
Rajah 4

(a) Express $\overrightarrow{OP}$ in the form $\begin{pmatrix} x \\ y \end{pmatrix}$,

Ungkapkan $\overrightarrow{OP}$ *dalam bentuk* $\begin{pmatrix} x \\ y \end{pmatrix}$.

(b) Find the unit vector in the direction of $\overrightarrow{OP}$.
Carikan vektor unit dalam arah $\overrightarrow{OP}$.

[3 marks]
[*3 markah*]

Answer/*Jawapan* : (a) _____

(b) _____

12

3

For Examiner's Use

13 Diagram 5 shows a sector *KOL* of a circle with centre *O*.
Rajah 5 menunjukkan sektor KOL suatu bulatan dengan pusat O

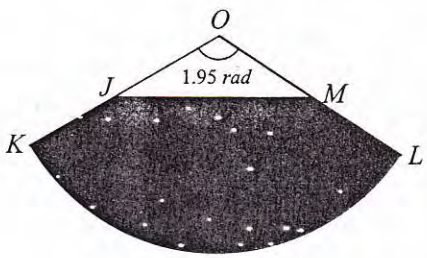

Diagram 5
Rajah 5

It is given that $JM = 13$ cm and $KJ = JO = OM = ML = 9$ cm.
Diberi bahawa $JM = 13$ *cm dan* $KJ = JO = OM = ML = 9$ *cm.*

Find
Carikan

(a) the length, in cm, of the arc *KL*,
panjang dalam cm ,lengkuk KL,

(b) the area, in cm^2, of the coloured region.
luas kawasan berwarna dalam cm^2 .

[4 marks]
[*4 markah*]

13

4

Answer/*Jawapan* : (a) _____ cm

(b) _____ cm^2

For Examiner's Use

14 Solve the equation $4 \tan x = 3 + \cot x$ for $0^0 \le x \le 360^0$.
Selesaikan persamaan $4 \tan x = 3 + kot\, x$ *bagi* $0^0 \le x \le 360^0$.

[3 marks]
[*3 markah*]

Answer/*Jawapan* : _____

14 | 3

---

15 Given that $\tan \theta = t$, where t is a constant where θ is an acute angle.
Diberi $\tan \theta = t$, *dengan keadaan t ialah pemalar dengan keadaan* θ *ialah sudut tirus.*

Find in terms of t :
Cari dalam sebutan t :

(a) $\cot \theta$
$kot\ \theta$

(b) $\sin(90^o - \theta)$

[3 marks]
[*3 markah*]

Answer/*Jawapan* : (a) _____

(b) _____

15 | 3

16 Given that $\int_2^8 h(x)\,dx = 7$, find

Diberi $\int_2^8 h(x)\,dx = 7$, *cari*

(a) $\int_8^2 h(x)\,dx$

(b) $\int_2^8 [10 - h(x)]\,dx$

[4 marks]
[*4 markah*]

16

3

Answer/*Jawapan* : (a) _____

(b) _____

17 Given that $y = 3x^2 + x - 4$,
Diberi $y = 3x^2 + x - 4$,

(a) find the value of $\frac{dy}{dx}$ when $x = 3$,

cari nilai bagi $\frac{dy}{dx}$ *apabila* $x = 3$

(b) express the approximate change in y, when x changes from 3 to 3.02.
ungkapkan perubahan kecil dalam y apabila x berubah daripada 3 kepada 3.02.

[4 marks]
[*4 markah*]

17

4

Answer/*Jawapan* : (a) _____

(b) _____

For Examiner's Use

18 Determine the coordinates of a turning point of the curve $y = -x^2 - 4x + 12$.
State whether it is maximum or minimum point.
Tentukan koordinat titik pusingan bagi garis lengkung $y = -x^2 - 4x + 12$.
Nyatakan sama ada titik itu adalah maksimum atau minimum.

[3 marks]
[*3 markah*]

Answer/*Jawapan* : _____

18

3

19 The probability that Fatimah qualifies for the final of a tennis championship is $\frac{3}{5}$ while the probability that Sarah qualifies is $\frac{1}{3}$.
Kebarangkalian Fatimah layak ke peringkat akhir dalam suatu kejohanan tenis ialah $\frac{3}{5}$ *manakala kebarangkalian Sarah layak ialah* $\frac{1}{3}$.

Find the probability that
Cari kebarangkalian bahawa

(a) both of them qualify for the final,
kedua-duanya layak ke peringkat akhir,

(b) only one of them qualifies for the final.
hanya seorang daripada mereka layak ke peringkat akhir.

[4 marks]
[*4 markah*]

Answer/*Jawapan* : (a) _____

(b) _____

19

4

20 A committee consisting of 5 representatives has to be chosen from the PTA which consist of 6 mothers, 3 teachers and a principal. Find the number of ways the committee can be formed if
Satu jawatan kuasa yang terdiri daripada 5 orang wakil dipilih daripada PIBG yang terdiri daripada 6 orang ibu, 3 orang guru dan seorang pengetua. Cari bilangan cara yang boleh dibentuk jika

(a) there is no restriction,
tiada syarat ditetapkan,

(b) it consists of exactly 3 teachers.
mengandungi tepat 3 orang guru.

[3 marks]
[*3 markah*]

Answer/*Jawapan* : (a) _____

(b) _____

20
3

21 Four letters have to be selected from the word ' **SAMPLE** '. Find the number of different possible arrangements such that
*Empat huruf hendak dipilih daripada perkataan '**SAMPLE**'. Cari bilangan susunan yang mungkin jika*

(a) the arrangement begins with E.
susunan bermula dengan huruf E,

(b) the arrangement has no E.
susunan tanpa huruf E.

[4 marks]
[*4 markah*]

21
4

Answer/*Jawapan* : (a) _____

(c) _____

For Examiner's Use

22 In a school with a population of 850 students, 60% of them stays at the school's hostel. If 10 students are selected at random from the school, find
Di sebuah sekolah dengan jumlah pelajar 850 orang, 60% daripadanya tinggal di asrama. Jika 10 orang pelajar dipilih secara rawak daripada sekolah tersebut, cari

(a) the probability 8 of them stay at the hostel,
kebarangkalian 8 orang tinggal di asrama,

(b) the mean number of students who stays at the hostel.
min bilangan pelajar yang tinggal di asrama.

[4 marks]
[*4 markah*]

Answer/*Jawapan* : (a) _____

(b) _____

22

4

For Examiner's Use

23

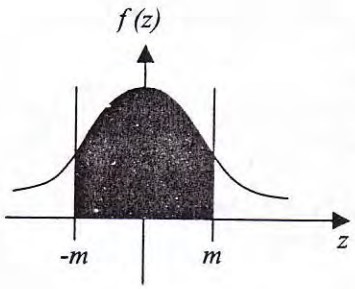

Diagram 6
Rajah 6

Diagram 6 shows a standard normal distribution graph. Given that the area of coloured region in the diagram is 0.7828, calculate the value of $P(X < -m)$.

Rajah 6 menunjukkan suatu lengkungan graf normal. Diberi bahawa luas kawasan berwarna dalam rajah ialah 0.7828, cari nilai bagi $P(X < -m)$.

[2 marks]
[*2markah*]

23 | 2

Answer/*Jawapan* : _____

---

24 The set of data 6 , 8 , 14 , 6 , 12 , 14 , 5 , p , q has a mean of 9, mode of 6 and it is given $p < q$. Find
Satu set data 6 , 8 , 14 , 6 , 12 , 14 , 5 , p , q mempunyai nilai mean 9, mod 6 dan diberi p<q. Cari

(a) the values of p and q
nilai-nilai p dan q

(b) the median
nilai median

[4 marks]
[*4 markah*]

24 | 4

Answer/*Jawapan* : (a) p = _____

q = _____

(b) _____

For Examiner's Use

25 Diagram 7 shows a linear graph of $\frac{y}{x}$ against x^2.

Rajah 7 menunjukkan graf linear $\frac{y}{x}$ *melawan* x^2

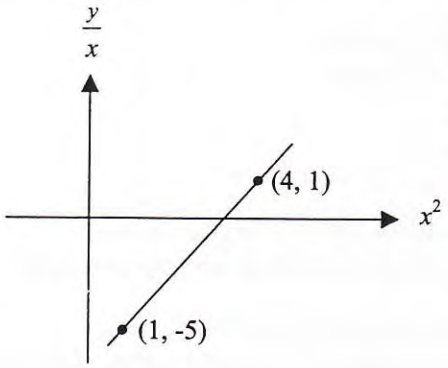

Diagram 7

Rajah 7

Given that $y = hx^3 + kx$, where h and k are constants, calculate the values of h and k.

Diberi $y = hx^3 + kx$, *dengan keadaan* h *dan* k *adalah pemalar, hitung nilai* h *dan nilai* k.

[3 marks]
[*3 markah*]

Answer/ *Jawapan*: h = _____

k = _____

25

3

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

PERSIDANGAN KEBANGSAAN PENGETUA-PENGETUA
SEKOLAH MENENGAH MALAYSIA
CAWANGAN PULAU PINANG

PEPERIKSAAN PERCUBAAN SPM 2010 **3472/2**
ADDITIONAL MATHEMATICS
Kertas 2
Ogos / Sept

$2\frac{1}{2}$ jam **Dua jam tiga puluh minit**

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Kertas soalan ini adalah dalam dwibahasa.*
2. *Soalan dalam Bahasa Inggeris mendahului soalan yang sepadan dalam Bahasa Melayu.*
3. *Calon dikehendaki membaca maklumat di halaman belakang kertas soalan ini.*
4. *Calon dikehendaki menceraikan halaman 22 dan ikat sebagai muka hadapan bersama-sama dengan buku jawapan.*

Kertas soalan ini mengandungi 22 halaman bercetak.

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HALAMAN KOSONG

The following formulae may be helpful in answering the questions. The symbols given are the ones commonly used.
Rumus-rumus berikut boleh 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. $(a^m)^n = a^{mn}$

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

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

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

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

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

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

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

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

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

KALKULUS (CALCULUS)

1. $y = uv$

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

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

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

4. Luas di bawah lengkung
(Area under a curve)

$= \int_a^b y \, dx$ atau (or)

$= \int_a^b x \, dy$

5. Isipadu janaan (Volume of revolution)

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

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

STATISTIK (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. Min (Mean) $= np$

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

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

GEOMETRI (GEOMETRY)

1. Jarak (Distance)

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

2. Titik tengah (Midpoint)

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

3. Titik yang membahagi suatu tembereng garis
   (A point dividing a segment of a line)

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

4. Luas segi tiga (Area of triangle) =

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

5. $|\mathbf{r}| = \sqrt{x^2 + y^2}$

6. $\hat{r} = \frac{x\mathbf{i} + y\mathbf{j}}{\sqrt{x^2 + y^2}}$

TRIGONOMETRI (TRIGONOMETRY)

1. Panjang lengkok, $s = j\theta$

   Arc length, $s = r\theta$

2. Luas sektor, $L = \frac{1}{2} j^2 \theta$

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

3. $\sin^2 A + \text{kos}^2 A = 1$

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

4. $\text{sek}^2 A = 1 + \tan^2 A$

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

5. $\text{kosek}^2 A = 1 + \text{kot}^2 A$

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

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

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

7. $\text{kos } 2A = \text{kos}^2 A - \sin^2 A$
   $= 2 \text{kos}^2 A - 1$
   $= 1 - 2 \sin^2 A$

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

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

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

9. $\text{kos}(A \pm B) = \text{kos}A \text{ kos}B \mp \sin A \sin B$

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

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

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

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

13. $a^2 = b^2 + c^2 - 2bc \text{ kos}A$

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

14. Luas segi tiga (Area of triangle)

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

Section A
Bahagian A

[40 *marks*]
[40 *markah*]

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

1. Solve the simultaneous equations $3p + q = 1$ and $pq + 2p = -6$. [5 *marks*]
Selesaikan persamaan serentak $3p + q = 1$ *and* $pq + 2p = -6$. [5 *markah*]

2. a) Express $5 - x - 2x^2$ in the form $a(x-h)^2 + k$ and hence or otherwise, find its maximum value and the value of x where it occurs. [5 *marks*]

Ungkapkan $5 - x - 2x^2$ *dalam bentuk* $a(x-h)^2 + k$ *dan seterusnya atau dengan cara yang lain, cari nilai maksimum dan nilai x yang sepadan.* [5 *markah*]

b) Find the range of values of p if $p - x + 3x^2$ is always positive. [2 *marks*]

Cari julat nilai bagi p kalau $p - x + 3x^2$ *selalunya positif.* [2 *markah*]

3. a) Two numbers h and k are connected by the relation $h+k=6$. Find the values of h and k which give a stationary point of the function $Z=2h^2+3k^2$. Hence, determine whether that stationary point is a maximum or minimum point. [6 *marks*]

Dua nombor h dan k adalah berhubung secara $h+k=6$. *Cari nilai h dan k supaya fungsi* $Z=2h^2+3k^2$ *mempunyai satu titik pegun. Seterusnya tentukan sama ada titik pegun tersebut ialah titik maksimum atau minimum.* [6 *markah*]

b) If $y=\dfrac{2x^2+3x}{x-4}, x\neq 4$, find the value of $f'(-3)$. [2 *marks*]

Jika $y=\dfrac{2x^2+3x}{x-4}, x\neq 4$, *cari nilai bagi* $f'(-3)$. [2 *markah*]

4 a) Sketch the graph of $y = \tan 2x$ for $0\leq x\leq \pi$. [2 *marks*]

Lakarkan graf $y = \tan 2x$ untuk $0\leq x\leq \pi$. [2 *markah*]

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

Seterusnya, dengan menggunakan paksi yang sama, lakar satu garis lurus yang sesuai untuk mencari bilangan penyelesaian bagi persamaan $\pi \tan 2x - 3x = 0$ *untuk* $0\leq x\leq \pi$.
Nyatakan bilangan penyelesaian itu. [3 *markah*]

5.

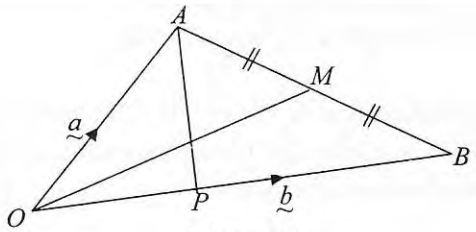


Diagram 5
Rajah 5

In diagram 5, $\overrightarrow{OA} = \underset{\sim}{a}$, $\overrightarrow{OB} = \underset{\sim}{b}$, $\overrightarrow{AM} = \overrightarrow{MB}$ and $\overrightarrow{OP} = \frac{1}{3}\overrightarrow{OB}$.

Dalam rajah 5, $\overrightarrow{OA} = \underset{\sim}{a}$, $\overrightarrow{OB} = \underset{\sim}{b}$, $\overrightarrow{AM} = \overrightarrow{MB}$ and $\overrightarrow{OP} = \frac{1}{3}\overrightarrow{OB}$.

a) Express $\overrightarrow{AP}$ and $\overrightarrow{OM}$ in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$. [3 *marks*]

Ungkapkan $\overrightarrow{AP}$ dan $\overrightarrow{OM}$ dalam sebutan $\underset{\sim}{a}$ dan $\underset{\sim}{b}$. [3 *markah*]

b) Given that $\overrightarrow{OQ} = \lambda\overrightarrow{OM}$, express $\overrightarrow{OQ}$ in terms of λ, $\underset{\sim}{a}$ and $\underset{\sim}{b}$. [1 *mark*]

Diberi bahawa $\overrightarrow{OQ} = \lambda\overrightarrow{OM}$, ungkapkan $\overrightarrow{OQ}$ dalam sebutan λ, $\underset{\sim}{a}$ dan $\underset{\sim}{b}$. [1 *markah*]

c) Given that $\overrightarrow{AQ} = \mu\overrightarrow{AP}$, express $\overrightarrow{OQ}$ in terms of μ, $\underset{\sim}{a}$ and $\underset{\sim}{b}$.
Hence find the value of λ and of μ. [5 *marks*]

Diberi bahawa $\overrightarrow{AQ} = \mu\overrightarrow{AP}$, ungkapkan $\overrightarrow{OQ}$ dalam sebutan μ, $\underset{\sim}{a}$ dan $\underset{\sim}{b}$.
Seterusnya, cari nilai bagi λ dan μ. [5 *markah*]

6. a) Two objects are launched simultaneously at rest and move towards one another from two opposite ends along a straight rail of length 10 *m*. One of the objects moved 51 cm in the first second, 49 cm in the 2nd second, 47 cm in the 3rd second and so on. The other object, moved 25 cm in the first second, 24 cm in the 2nd second, and 23 cm in the 3rd second and so on.
Find the time when the two objects collide with each other. [4 *marks*]

Dua objek dilancarkan serentak dari rehat dan menuju ke arah satu sama lain dari dua hujung yang bertentangan pada satu lintasan lurus sepanjang 10 m. Salah satu objek bergerak sebanyak 51 cm pada saat pertama, 49 cm dalam saat kedua, dan 47 cm dalam saat ketiga dan seterusnya. Objek yang satu lagi bergerak 25 cm dalam saat pertama, 24 cm dalam saat kedua, 23 cm dalam saat ketiga dan seterusnya.
Cari masa bila dua objek itu berlanggar satu sama lain. [4 *markah*]

b) Find the positive value of x so that 3, x, 4 are consecutive terms of a Geometric Progression. [2 *marks*]

Cari nilai positif x supaya 3, x, 4 *merupakan satu turutan sebutan dalam satu Janjang Geometri.* [2 *markah*]

Section B
Bahagian B

[40 *marks*]
[40 *markah*]

Answer any **four** questions from this section.
Jawab mana-mana ***empat soalan daripada bahagian ini.***

7. Diagram 7 shows the curve $x = (y-2)^2$ and the straight line $x = 1$. The curve touches the y- axis at $y = k$.

Rajah 7 menunjukkan lengkung $x = (y-2)^2$ *dan garis lurus* $x = 1$. *Lengkung tersebut menyentuh paksi-y pada* $y = k$.

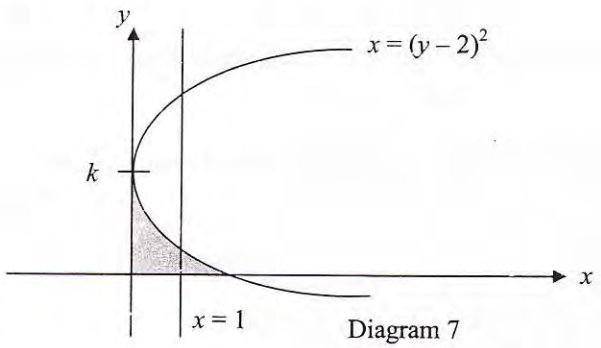


Diagram 7
Rajah 7

Calculate
Hitung

a) the value of k,
nilai bagi k
[2 *marks*]
[2 *markah*]

b) the area of the shaded region.
Luas kawasan berlorek.
[3 *marks*]
[3 *markah*]

c) the volume of revolutions, in the terms of π, when the region bounded by the curve and the straight line $x = 1$ is revolved through 360° about the y- axis. [5 *marks*]

Isi padu kisaran, dalam sebutan π, *apabila rantau yang dibatasi oleh lengkung itu dan garis lurus* $x = 1$ *dikisarkan melalui* 360^0 *pada paksi-y.* [5 *markah*]

8. Use the graph paper to answer the question.
Gunakan kertas graf untuk menjawab soalan ini.

Table 8 shows the values of two variables, x and y, obtained from an experiment. The variables x and y are related by the equation $y = h^x k^3$, where h and k are constants.

Jadual 8 menunjukkan nilai-nilai bagi dua pembolehubah, x dan y, yeng diperoleh daripada satu eksperimen. Pembolehubah x dan y dihubungkan oleh persamaan $y = h^x k^3$, dengan keadaan h dan k ialah pemalar.

x	1	2	3	4	5	6
y	0.25	0.5	1	2	4	8

Table 8
Jadual 8

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

Berdasarkan jadual 1, bina satu jadual bagi nilai-nilai $\log_{10} y$. [1 *markah*]

b) Plot $\log_{10} y$ against x using a scale of 2 cm to 1unit on the x-axis and 2 cm to 0.3 unit on the $\log_{10} y$ - axis.
Hence, draw the line of best fit. [3 *marks*]

Plot $\log_{10} y$ *melawan x, menggunakan skala 2 cm kepada 1 unit pada paksi-x dan 2 cm kepada 0.3 cm pada paksi -* $\log_{10} y$.
Seterusnya, lukis satu garis lurus penyuaian terbaik. [3 *markah*]

c) Use the graph in 8(b) to find the value of
Guna graf di 8(b) untuk mencari nilai

i) h,

ii) k,

iii) x when $y = 0.355$. [6 marks]
x *bila* $y = 0.355$. [6 *markah*]

9. The straight line $y = 2x - 4$ cuts the curve $y = x^2 - x - 2$ at points A and B.

Garis lurus $y = 2x - 4$ memotong lengkung $y = x^2 - x - 2$ pada titik A dan B.

a) Calculate

Kira

i) the coordinates for point A and point B. [3 *marks*]

koordinat titik A dan koordinat titik B. [3 *markah*]

ii) the area of triangle OAB where O is the origin. [2 *marks*]

luas bagi segi tiga OAB dimana O ialah asalan. [2 *markah*]

b) Given the point $K\left(\frac{6}{5}, p\right)$ lies on the line AB. Find

Diberi titik $K\left(\frac{6}{5}, p\right)$ berada di atas garis AB. Cari

i) the value of p, [2 *marks*]

nilai bagi p, [2 *markah*]

ii) the ratio of $AK : KB$. [3 *marks*]

nisbah bagi AK : KB. [3 *markah*]

10.

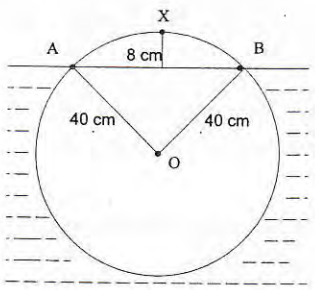


Diagram 10
Rajah 10

Diagram 10 shows the circular cross-section of a uniform log with radius 40 cm floating in the water. The points A and B are on the surface and the highest point X is 8 cm above the surface.

Rajah 10 menunjukkan suatu keratan rentas membulat bagi sebatang kayu berjejari 40 cm yang terapung dalam air. Titik-titik A dan B berada pada permukaan air dan titik tertinggi X terletak 8 cm di atas permukaan air.

Show that $\angle AOB$ is approximately 1.29 radians. [3 *marks*]
Tunjukkan bahawa $\angle AOB$ *ialah 1.29 radian.* [3 *markah*]

Calculate
Kira

i) the length of the arc AXB. [2 *marks*]
panjang lengkok AXB, [2 *markah*]

ii) the area of the cross-section below the surface. [3 *marks*]
luas keratan rentas di bawah permukaan air, [3 *markah*]

iii) the percentage of the volume of the log below the surface. [2 *marks*]
peratus isi padu kayu di bawah permukaan air. [2 *markah*]

11 a) In a study carried out in a school, it is found that 3 out of 5 students attend Bahasa Melayu tuition.

Dalam suatu kajian yang telah dijalankan di sebuah sekolah, didapati 3 daripada 5 orang pelajar mengikuti kelas tambahan Bahasa Melayu.

i) If 5 students are chosen at random, calculate the probability that 2 or more students attend Bahasa Melayu tuition. [3 *marks*]

Jika 5 orang pelajar dipilih secara rawak, hitung kebarangkalian 2 atau lebih pelajar mengikuti kelas tambahan Bahasa Melayu. [3 *markah*]

ii) If there are 1020 students in the school, calculate the standard deviation of the number of students who attend Bahasa Melayu tuition. [2 *marks*]

Jika terdapat 1020 orang pelajar di sekolah, hitung sisihan piawai bagi bilangan pelajar yang mengikuti kelas tambahan Bahasa Melayu.
[2 *markah*]

b) The mass of the school bag of primary school students has a normal distribution with a mean of 15 kg and a standard deviation of 3 kg.

Jisim beg sekolah bagi pelajar-pelajar sekolah rendah adalah mengikut taburan normal dengan min 15 kg dan sisihan piawai 3 kg.

i) Find the probability that the mass of a schoolbag chosen at random will be less than 19 kg. [2 *marks*]

Cari kebarangkalian bahawa jisim bagi sebuah beg yang dipilih secara rawak adalah kurang daripada 19 kg. [2 *markah*]

ii) If 30 out of 150 school bags have mass of more than m kg, find the value of m. [3 *marks*]

Jika 30 daripada 150 beg sekolah mempunyai jisim lebih daripada m kg, cari nilai m. [3 *markah*]

Section C
Bahagian C

[20 *marks*]
[20 *markah*]

Answer any **two** questions from this section.
*Jawab mana-mana **dua** soalan daripada bahagian ini.*

12. Diagram 12 shows quadrilateral $ABCD$ and $BD = 9.5$ cm.
Rajah 12 menunjukkan sisi empat ABCD dan BD = 9.5 cm.

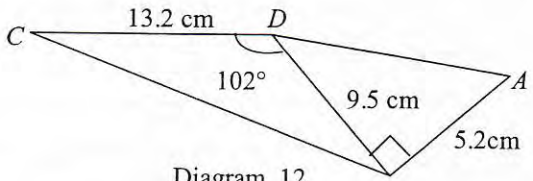


Diagram 12
Rajah 12

(a) Calculate
Hitungkan

i) $\angle ADB$, [2 *marks*]
$\angle ADB$, [2 *markah*]

ii) the length, in cm, of BC, [2 *marks*]
panjang, dalam cm, BC, [2 *markah*]

iii) the area, in cm^2, of quadrilateral $ABCD$. [4 *marks*]
luas, dalam cm^2, sisi empat ABCD. [4 *markah*]

(b) Given that T is a point situated between B and C. Find the shortest distance between point D and point T. [2 *marks*]

Diberi bahawa T ialah satu titik yang terletak antara B dan C. Cari jarak terpendek antara titik D dan titik T. [*2 markah*]

13. Table 13 shows the prices and the price indices of four items *P*, *Q*, *R* and *S* which are the main items sold by Mr. John. Diagram 13 is a bar chart which represents the quantities of *P*, *Q*, *R* and *S* that are sold.

Jadual 13 menunjukkan harga dan indeks harga bagi empat barangan P. Q, R dan S yang dijual oleh Mr. John. Rajah 13 ialah carta bar yang mewakili kuantiti P, Q, R dan S yang dijual.

Item *Barangan*	Price (RM) *Harga (RM)*		Price index for the year 2006 based on the year 2005 *Indeks harga pada tahun 2006 berasaskan tahun 2005*
	Year 2005 *Tahun 2005*	Year 2006 *Tahun 2006*	
P	*x*	1.75	125
Q	4.00	*y*	150
R	2.00	2.60	*z*
S	3.00	3.60	120

Table 13
Jadual 13

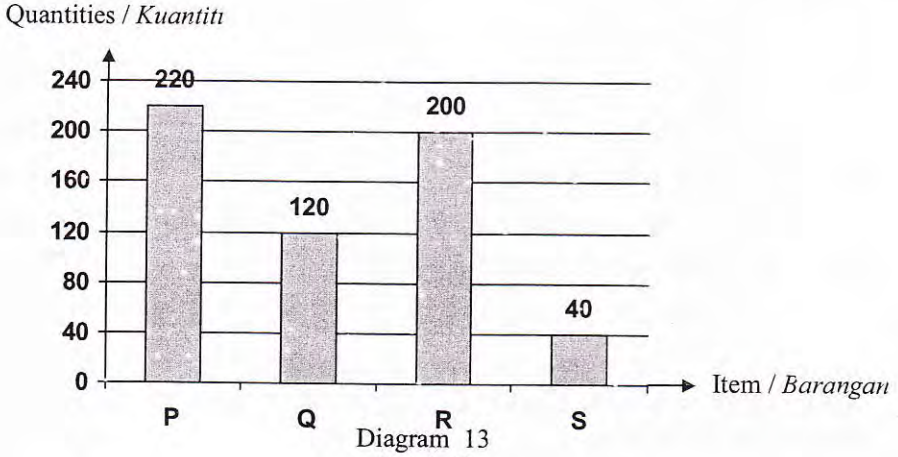


Diagram 13
Rajah 13

(a) Find the value of x, y and z. [3 *marks*]

Cari nilai x, y dan z. [3 *markah*]

(b) (i) Calculate the composite index for the sale item in the year 2006 based on the year 2005. [3 *marks*]

Hitung indeks gubahan bagi jualan barangan pada tahun 2006 berasaskan tahun 2005. [3 *markah*]

(ii) Hence, calculate the profit in the year 2005 if the profit in the year 2006 was RM 5248. [2 *marks*]

Seterusnya, hitung keuntungan pada tahun 2005 jika keuntungan pada tahun 2006 ialah RM 5248. [2 *markah*]

(c) The price index for S in the year 2007 based on the year 2005 is 125. Calculate the price index for S in year 2007 based on the year 2006. [2 *marks*]

Indeks harga bagi barangan S pada tahun 2007 berasaskan tahun 2005 ialah 125. Hitung indeks harga bagi S pada tahun 2007 berasaskan tahun 2006.

[2 *markah*]

14. Use graph paper to answer this question.

Gunakan kertas graf untuk menjawab soalan ini.

Item *Item*	Processing Time *Masa Memproses* (minutes/ *minit*)	Preparation Time *Masa Persediaan* (minutes/ *minit*)
M	45	50
N	30	70

Table 14
Jadual 14

Table 14 shows processing time and preparation time of a unit of item *M* and a unit of item *N* in a factory. In a week, the total processing time is at most 10 hours while the total preparation time taken is at least 5 hours 50 minutes. The number of item *M* produced is not more than $\frac{4}{5}$ the number of item N. The factory produces *x* unit *M* and *y* unit *N* in a week.

Jadual 14 menunjukkan masa memproses dan masa persediaan untuk menghasilkan seunit item M dan seunit item N di sebuah kilang. Dalam seminggu, jumlah masa memproses ialah sebanyak-banyaknya 10 jam sementara jumlah masa persediaan ialah sekurang-kurangnya 5 jam 50 minit. Bilangan item M yang dihasilkan tidak melebihi $\frac{4}{5}$ *bilangan item N yang dihasilkan. Kilang tersebut menghasilkan x unit M dan y unit N dalam seminggu .*

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

Tulis tiga ketaksamaan, selain $x \geq 0$ *dan* $y \geq 0$ *,, yang memenuhi semua kekangan di atas.*
[3 *markah*]

b) Using a scale of 2 cm to 1 unit on the x- axis and a scale of 2 cm to 2 unit on y-axis, draw and shade the region R that satisfies the above constraints. [3 *marks*]

Menggunakan skala 2 cm kepada 1 unit pada paksi-x dan 2 cm kepada 2 unit pada paksi-y, bina dan lorek rantau R yang memenuhi semua kekangan di atas.

[3 *markah*]

c) From your graph, find
Dari graf anda, cari

i) the minimum number of N produced if 3 unit of M have been produced.
bilangan minimumi N yang dihasilkan jika sebanyak 3 unit M dihasilkan.

ii) the maximum profit gained in that week if M and N gained a profit of RM 14 and RM 8 per unit respectively.
Keuntungan maksimum yang diperoleh dalam minggu itu jika keuntungan bagi M dan N ialah RM 14 dan RM 8 seunit masing-masing.

[4 *marks*]

[4 *markah*]

15. A particle P moves along a straight path such that t seconds after passing the reference point O, its velocity, v cms^{-1}, is given as $v = 3t^2 - 15t + 18$.

Satu partikel P bergerak pada satu lintasan lurus supaya t saat selepas melalui titik rujukan O, halajnya, v cms^{-1}, diberi sebagai $v = 3t^2 - 15t + 18$.

Find

Cari

a) its initial velocity, [1 *mark*]
halaju awalnya. [1 *markah*]

b) the values of t for which P is instantaneously at rest, [2 *marks*]
nilai-nilai t bila P berhenti seketika. [2 *markah*]

c) an expression, in terms of t, for the distance of P from O at time t, [2 *marks*]
satu ungkapan dalam sebutan t, untuk jarak P dari O pada masa t, [2 *markah*]

d) the total distance travelled by P in the first 4 seconds after passing through O, [3 *Marks*]
jumlah jarakyang dilalui oleh P dalam 4 saat yang pertama selepas melalui titik O, [3 *markah*]

e) the time when the acceleration of P is zero. [2 *marks*]
masa apabila pecutan P ialah sifar. [2 *markah*]

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

PERSIDANGAN KEBANGSAAN PENGETUA-PENGETUA
SEKOLAH MENENGAH (CAWANGAN PULAU PINANG)

PEPERIKSAAN PERCUBAAN BERSAMA S.P.M 2010

SKEMA JAWAPAN

ADD MATHEMATICS KERTAS 1 DAN 2
3472/1
3472/2

SULIT

SEKOLAH-SEKOLAH MENENGAH KEBANGSAAN

NEGERI PULAU PINANG

PEPERIKSAAN PERCUBAAN SPM 2010

ADDITIONAL MATHEMATICS
Kertas 1
3472/1

MARKING SCHEME

PERATURAN PEMARKAHAN

ADDITIONAL MATHEMATICS PAPER 1

Question	Marking Scheme	Sub Mark	Total Mark
1	a) 1 b) 6 c) 6	1 1 1	3
2 (a)	-10	1	3
(b)	$\frac{5}{3x-4}, x \neq \frac{4}{3}$ B1 $\frac{5}{3x-4}$	2	
3	$h=-3$ and $k=4$ B2 : $h=-3$ *or* $k=4$ B1 : $\frac{1}{4}x-\frac{h}{4}$	3	3
4	$k=-6, 3$ B2 : $k=-6$ *or* $k=3$ B1 : $(-12)^2-4(k+3)2k=0$	3	3
5 (a)	4	1	3
(b)	$(x-4)^2-8$ B1 : $(x-4)^2$ *or* -8	2	
6	$p=-\frac{1}{4}$ B2 : $3+(2x-1)=0$ B1 : $3^3(3^2)^{2p-1}=3^0$	3	3
7	$2p-4q+1$ B3 : $2\log_m 5+1-4\log_m 3$ B2 : $\log_m 25+\log_m m-\log_m 81$ B1 : $\log_m 25-\log_m 81$	4	4

Question	Marking Scheme	Sub Mark	Total Mark
8	$\left(\frac{11}{5}, 1\right)$ B2 : $\left(\frac{(-2)(2)+(5)(3)}{3+2}, \frac{(7)(2)+(-3)(3)}{3+2}\right)$ B1 : $\frac{(-2)(2)+(5)(3)}{3+2}$ *or* $\frac{(7)(2)+(-3)(3)}{3+2}$	3	3
9 (a)	15	1	2
(b)	12	1	
10	$\frac{8}{11}$ B1 : $\frac{0.72}{1-0.01}$	2	2
11	$-13\underset{\sim}{i}+5\underset{\sim}{j}$ B2 : $-(7\underset{\sim}{i}+4\underset{\sim}{j})+(-6\underset{\sim}{i}+9\underset{\sim}{j})$ B1 : $\overrightarrow{PO}+\overrightarrow{OR}$ or $\overrightarrow{OR}-\overrightarrow{OP}$	3	3
12 a)	$\begin{pmatrix}15\\8\end{pmatrix}$	1	3
b)	$\frac{15\underset{\sim}{i}+8\underset{\sim}{j}}{17}$ *or* $\frac{15}{17}\underset{\sim}{i}+\frac{8}{17}\underset{\sim}{j}$ *or* $\frac{1}{17}\begin{pmatrix}15\\8\end{pmatrix}$ *or* $\begin{pmatrix}\frac{15}{17}\\\frac{8}{17}\end{pmatrix}$ B1 : $\sqrt{15^2+8^2}$ *or* 17	2	

Question	Marking Scheme	Sub Mark	Total Mark
13 (a)	35.1 cm	1	4
(b)	278.3 cm^2 B2 : $\frac{1}{2}(18)^2(1.95) - \frac{1}{2}(9)^2 \sin 111.73^0$ B1 : $\frac{1}{2}(18)^2(1.95)$ *or* $\frac{1}{2}(9)^2 \sin 111.73^0$	3	
14	45^o, 165.96^o, 225^o, 345.96^o B2 : 45^o and (165.96^o *or* $165^o\,58'$) B1 : $4\tan x = 3 + \frac{1}{\tan x}$	3	3
15 (a)	$\frac{1}{t}$	1	3
(b)	$\frac{1}{\sqrt{1+t^2}}$ B1 : $\sqrt{1+t^2}$ *or* $\cos\theta$	2	
16 (a)	-7	1	4
(b)	53 B2 : $\left[10x\right]_2^8 - 7$ B1 : $10x$	3	
17 (a)	19 B1 : $6x + 1$	2	4
(b)	0.38 B1 : $\delta x = 0.02$	2	

Question	Marking Scheme	Sub Mark	Total Mark
18	(-2, 16) - Maximum point B2 : (-2, 16) B1 : $-2x - 4$	3	3
19 (a)	$\frac{1}{5}$	1	4
(b)	$\frac{8}{15}$ B2 : $\left(\frac{3}{5}\times\frac{2}{3}\right)+\left(\frac{2}{5}\times\frac{1}{3}\right)$ B1 : $\frac{3}{5}\times\frac{2}{3}$ *or* $\frac{2}{5}\times\frac{1}{3}$	3	
20 (a)	252	1	3
(b)	21 B1 : ${}^3C_2$ *or* ${}^7C_2$ *or* 1	2	
21 (a)	60 B1 : 1 x 5 x 4 x 3 *or* ${}^1P_1 \times {}^5P_3$	2	4
(b)	120 B1 : 5 x 4 x 3 x 2 *or* ${}^5P_4$	2	
22 (a)	0.1209 B1 : $P(X = 8) = {}^{10}C_8 (0.6)^8 (0.4)^2$	2	4
(b)	510 B1 : 850 x 0.6	2	

Question	Marking Scheme	Sub Mark	Total Mark
23	0.1086 B1 : $1-0.7828$ *or* 0.2712	2	2
24 (a)	$p=6$, $q=10$ B1 : $\frac{65+p+q}{9}=9$ B2 : $p+q=16$	3	4
(b)	8	1	
25	$h=2$ $k=-7$ B2 : $h=2$ *or* $k=-7$ B1 : $\frac{y}{x}=hx^2+k$	3	3

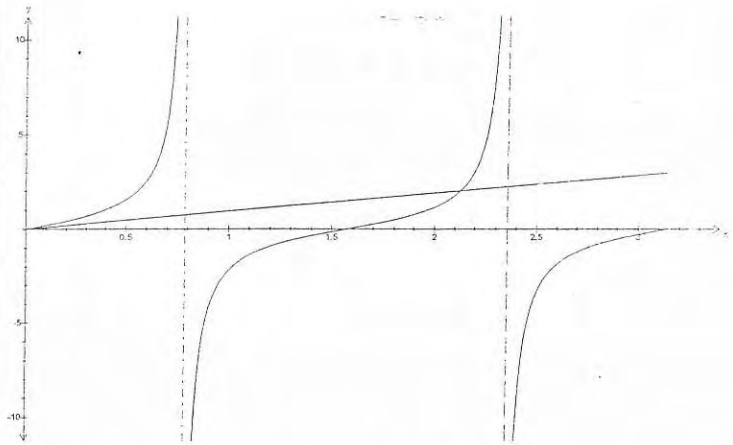
MARKING SCHEME
FOR
ADDITIONAL MATHEMATICS
PAPER 2
2010

Question	Mark Scheme	Sub Marks	Total Mark
1	$q = 1 - 3p$ or $p = \frac{1-q}{3}$ or $p = \frac{-6}{q+2}$ **P1** Eliminate p or q $p*(1-3p) + 2p + 6 = 0$ **K1** or $*\frac{(1-q)}{3}q + 2*\frac{(1-q)}{3} + 6 = 0$ Or $*\frac{-6}{q+2}q + 2*\frac{-6}{q+2} + 6 = 0$. **K1** Solve the quadratic equation Using formula $p = \frac{1 \pm \sqrt{(-1)^2 - 4(1)(-2)}}{2(1)}$ $q = \frac{-1 \pm \sqrt{(1)^2 - 4(1)(-20)}}{2(1)}$ OR Factorisation $(p + 1)(p - 2) = 0$ $(q - 4)(q + 5) = 0$ **N1** $p = -1, 2$ OR $q = 4, -5$ **N1** $q = 4, -5$ or $p = -1, 2$	5	5

Note
(1) OW – 1 if the method of solving quadratic equation is not shown.

Question	Mark Scheme	Sub Mark	Total Mark
2(a)(i)	**P1** $-2(x^2 + \frac{x}{2} - \frac{5}{2})$ **K1** Completing the square compare with $a(x-h)^2 + k$ $-2\left(x + \frac{1}{4}\right)^2 + \frac{41}{8}$ **K1** Compare $-2\left(x + \frac{1}{4}\right)^2 + \frac{41}{8}$ with $a(x-h)^2 + k$ **N1** Maximum value $= \frac{41}{8}$ **N1** $x = -\frac{1}{4}$	3 2	5
(b)	**K1** Use $b^2 - 4ac < 0$. $(-1)^2 - 4(3)(p) < 0$ **N1** $p > \frac{1}{12}$	2	2
			7

estion	Mark Scheme	Sub Marks	Total Marks
3(a)	P1 $Z = 2(6-k)^2+3k^2$ or $Z = 2h^2 + 3(6-h)^2$		
	K1 Differentiate $\frac{dZ}{dk}$ or $\frac{dZ}{dh}$		
	K1 Use $\frac{dZ}{dk}=0$ to find k. $k = \frac{12}{5}$,		
	K1 Substitute $k = *\frac{12}{5}$ into $h + k = 6$ to find the value of h. $h = \frac{18}{5}$		
	K1 Differentiate $\frac{dZ}{dk}$ and find the value of $\frac{d^2Z}{dk^2}$		
	N1 minimum point	6	6
b)	K1 Differentiate y using formula and substitute x= 3 into $\frac{dy}{dx}$		
	N1 $\frac{54}{49}$	2	2
			8

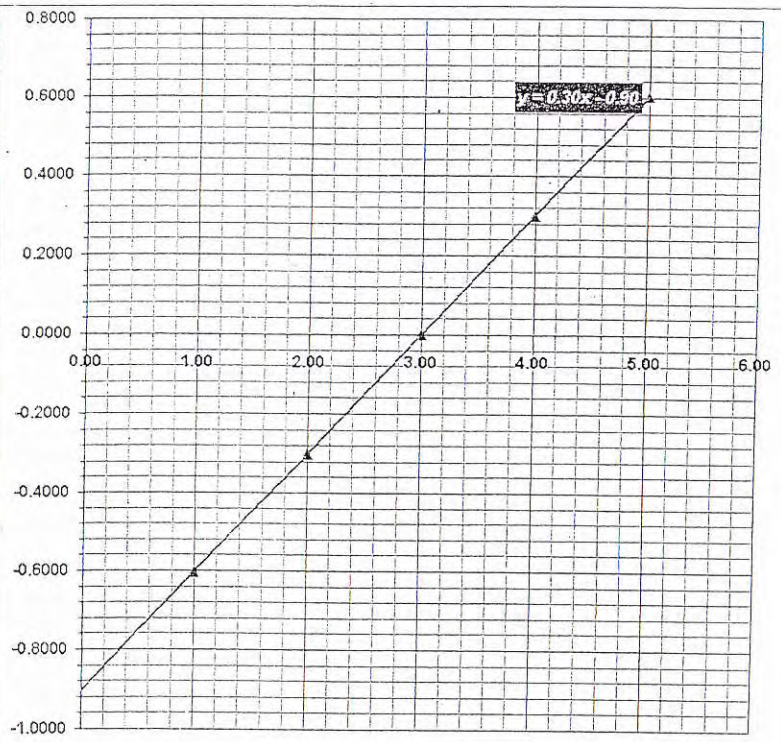
Question	Mark Scheme	Sub Marks	Total Marks
4(a)	Tangent curve P1		
	2 cycles for $0 \le x \le \pi$ P1	2	2
(b)			
	$y = \frac{3x}{\pi}$ or equivalent N1	3	3
	Sketch straight line with *gradient or *y-intercept and straight line involves x and y. K1		5
	2 N1		

5(a)	Use triangle law for AP or OM AP = AO + OP OM = OA + AM K1 N1 N1 $AP = -a + \frac{1}{3}b$ $OM = \frac{1}{2}(a+b)$	3	3
(b)	P1 $OQ = \frac{1}{2}\lambda(a+b)$	1	1
(c)	Use triangle law to find AQ $AO + OP = \mu\ *AP$ K1 N1 $OQ = (1-\mu)a + \frac{1}{3}\mu b$ K1 Compare $*OQ = \frac{1}{2}\lambda(a+b)$ with $*OQ = (1-\mu)a + \frac{1}{3}\mu b$ and solve Simultaneous equation N1 $\mu = \frac{3}{4}$ or $\lambda = \frac{1}{2}$ N1 $\lambda = \frac{1}{2}$ or $\mu = \frac{3}{4}$	5	5
			9

Question	Mark Scheme	Sub Marks	Total Marks
6(a)	P1 $a = 51$ or 25 / $d = -1$ K1 Use $S_1 = \frac{n}{2}(2(51)+(n-1)(-2))$ or $S_2 = \frac{n}{2}(2(25)+(n-1)(-1))$ and $S_1 + S_2 = 1000$ K1 Solve quadratic equations $3n^2 - 155n + 2000 = 0$. N1 $n = 25$ s	4	4
(b)	K1 Use $r = \frac{x}{3} = \frac{4}{x}$ N1 $x = 3.4641$ / 3.464	2	2
			6

estion	Mark Scheme	Sub Marks	Total Marks
'(a)	K1 Subtitute (k, 0) into x $(y-2)^2$ N1 k = 4	2	2
b)	Integrate $L = \int (y-2)^2 dy$ K1 K1 Use the limit $\int_0^k$ into L N1 $\frac{8}{3}$ unit^2	3	3
c)	Find the volume of straight line x = 1 revolved 360°, $V_1 = \pi \int x^2 dy$ K1 K1 Find the volume of the curve $V_2 = \pi \int (y-2)^4 dy$ Use the limit $\int_0^6$ into V_2 K1 K1 Use $V_1 - V_2$ N1 $\frac{8}{5}\pi / 1\frac{3}{5}\pi$ unit^2	5	5
			10

Question	Mark Scheme	Sub Marks	Total Marks
8(a)	$\log_{10} y$ | -0.6021 | - 0.3010 | 0 | 0.3010 | 0.6021 | 0.9031 N1	1	1
(b)	Plot $\log_{10} y$ against x (correct axes and uniform scales) K1 6* point are correctly plotted N1 Line of best fit N1	3	3
(c)	$\log_{10} y = x \log_{10} h + 3 \log_{10} k$ P1 K1 Use *c =3 $\log_{10} k$		
(i)	Use *m = $\log_{10} h$ K1 N1 k = 0.5 N1 h = 2		
(iii)	When y = 0.355 ,x = 1.5 N1	6	6
	Note: SS – 1 If part of scale is not uniform on either axis Or the given scale is not used Or the graph paper is not used		10

Question	Mark Scheme	Sub Marks	Total Marks
8		4	4

Question	Mark Scheme	Sub Marks	Total Marks
9(a)(i)	K1 Solve simultaneous equation $y = 2x - 4$ and $y = x^2 - x - 2$ $2x - 4 = x^2 - x - 2$ N1 A (1, -2) or (2,0) N1 B(2, 0) / (1, -2)	3	
(ii)	Use $A = \frac{1}{2}\begin{vmatrix} 0 & *2 & *1 & 0 \\ 0 & *0 & *-2 & 0 \end{vmatrix}$ K1 N1 2 unit^2	2	5
(b)(i)	K1 Use $m = \frac{*0 - *(-2)}{*2 - *1}$ and $y - *0 = *m\,(x - *2)$ K1 Substitue $\left(\frac{6}{5}, p\right)$ into $y = *2x - 4$ N1 $p = -\frac{8}{5}$	3	
(ii)	Use $\left(\frac{6}{5}\right) = \left(\frac{*1(n) + *2(m)}{m+n}\right)$ or $\left(-\frac{8}{5}\right) = \left(\frac{-2(n) + 0(m)}{m+n}\right)$ K1 or $\left(\frac{6}{5}\right) = \left(\frac{*2(n) + *1(m)}{m+n}\right)$ or $\left(-\frac{8}{5}\right) = \left(\frac{0(n) + -2(m)}{m+n}\right)$ N1 1 : 4 / 4 : 1	2	5 10

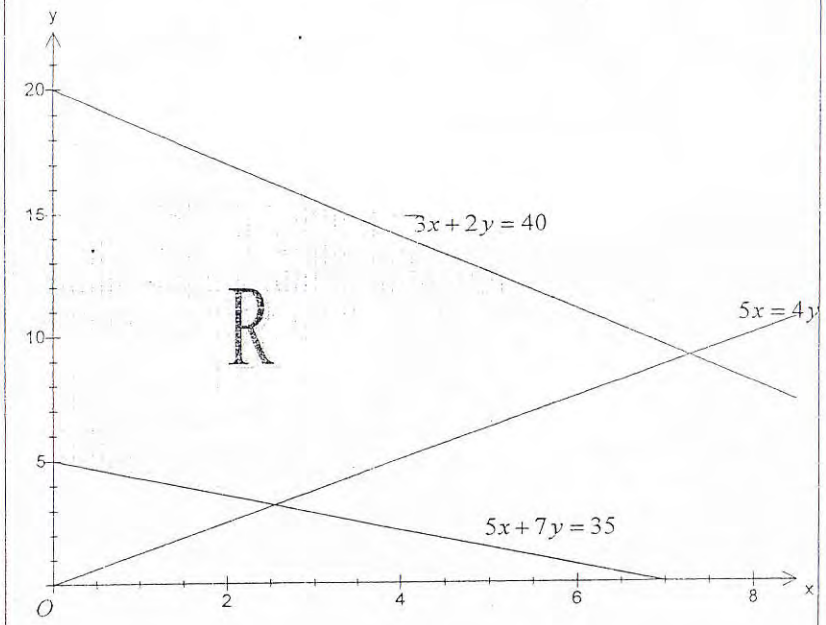
stion	Mark Scheme	Sub Marks	Total Marks
10	Use teorem phythagoras to find AB K1; Use cosine rule to find $\angle AOB$. K1; $*48^2 = 40^2 + 40^2 - 2(40)(40)\cos AOB$; N1 1.29	3	3
a) i)	Use Use $S_1 = 40*\theta$ to to find the length of AXB $S = 40*(1.29)$ K1; K1 51.6 / 51.48	2	2
ii)	Use $A_1 = \frac{1}{2}r^2\theta$ for the area of circle or $A_2 = \frac{1}{2}\times r^2\sin\theta$ K1; K1 Use area of $A_1 - A_2$; N1 4762.22 / 4764.95 cm^2	3	3
ii)	Use $\frac{*4762.22}{\frac{1}{2}(40^2)(2\pi)}\times 100\%$ K1; N1 94.74 % / 94.80%	2	2
			10

Question	Mark Scheme	Sub Marks	Total Marks
11(a)	p = 0.6 or q = 0.4 P1		
	Write P(x =2) + P(x=3)+…+ P(x=5). or $1 - P(x = 0) - P(x = 1)$ K1; N1 0.9130/ 0.913	3	
(ii)	Use $\sqrt{1020*(0.6)*(0.4)}$ K1; N1 15.646	2	5
(b)(i)	Use $Z = \frac{19-15}{3}$ K1; N1 0.9087	2	
(ii)	Use $P\left(Z > \frac{m-15}{3}\right) = \frac{30}{150}$ K1; Use $0.8416 = \frac{m-15}{3}$ K1; N1 17.526 / 17.525	3	5
			10

Question	Mark Scheme	Sub Marks	Total Marks
12(a)(i)	Use ratio of trigonometry $\text{Tan}^{-1}\left(\frac{5.2}{9.5}\right)$ K1 N1 28.69° // 28° 42'	2	
(ii)	K1 Use cosine rule for $\angle BCD$ to find BC $BC = \sqrt{13.2^2 + 9.5^2 - 2(13.2)(9.5)\cos 120^\circ}$ N1 17.79	2	
(iii)	Use $A_1 = \frac{1}{2}$ ab sin c or other valid method for ΔBCD K1 $\frac{1}{2}(13.2)(9.5)\sin 102$ Use $A_2 = \frac{1}{2} \times base \times height$ K1 for ΔABD $\frac{1}{2} \times 5.2 \times 9.5$ Use $A_1 + A_2$ K1 N1 86.03	4	8
(b)	Use $\frac{1}{2} \times *BC \times DT = *areaBCD$ K1 K1 6.895	2	2
			10

Question	Mark Scheme	Sub Marks	Total Marks
13(a)	Use $I = \frac{P_{2006}}{P_{2005}} \times 100$ K1 N2, 1, 0 x = 1.40, y = 6, z = 130	3	3
(b)(i)	values of w: 11, 6, 10, 2 or equivalent N1 Use $I = \frac{125 \times 11 + 150 \times 6 + *130 \times 10 + 120 \times 2}{11 + 6 + 10 + 2}$ K1 N1 131.6	3	
(ii)	Use $*I = \frac{5248}{P_{05}} \times 100$ K1 N1 3987.8	2	5
(c)	Use $I_{07/06} = I_{07/05} / I_{06/05}$ K1 N1 104.2	2	2
			10

stion	Mark Scheme	Sub Marks	Total Marks
(a)	$3x + 2y \leq 40$ N1 $5x + 7y \geq 35$ N1 $5x \leq 4y$ N1	3	3
b)	Draw correctly at least one straight line from the *inequalities which involves x and y. K1 Draw correctly all the three * straight lines N1 Note: Accept dotted lines The correct region shaded N1	3	3
i)	(y minimum) = 4 N1	1	
ii)	Maximum point (7,9) N1 Use $14x + 8y$ for point in the * region R K1 N1 RM170	3	4
			10

Question	Mark Scheme	Sub Marks	Total Marks
14. (b),(c)			

Question	Mark Scheme	Sub Marks	Total Marks
15(a)	P1 18 m/s	1	1
(b)	Use $v = 0$ to find t K1 $3t^2 - 15t + 18 = 0$ N1 2 s, 3 s	2	2
(c)	Integrate $3t^2 - 15t + 18$ K1 N1 $S = t^3 - \frac{15}{2}t^2 + 18t$	2	2
(d)	Subtitute t = 2 or t = 3 or t = 4 into *s K1 K1 $S_2 + S_3 + S_4$ N1 17m	3	2
(e)	Differentiate v and use $\frac{dv}{dt} = 0$ K1 N1 2.5 s	2	2
			10

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