Additional Mathematics
Kertas 1
Ogos 2015
2 Jam

Name : ……………..………………….….... Form :……………

BAHAGIAN PENGURUSAN SEKOLAH BERASRAMA PENUH
DAN SEKOLAH KECEMERLANGAN

PENTAKSIRAN DIAGNOSTIK AKADEMIK SBP 2015
PERCUBAAN SIJIL PELAJARAN MALAYSIA

ADDITIONAL MATHEMATICS
Kertas 1
2 Jam

JANGAN BUKA KERTAS SOALAN
INI SEHINGGA DIBERITAHU

Arahan:

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.*

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

Kertas soalan ini mengandungi **28** 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   $(a^m)^n = a^{nm}$

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

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

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

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

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

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

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

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

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

CALCULUS

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

   $= \displaystyle\int_a^b y \; dx$ or

   $= \displaystyle\int_a^b x \; dy$

5   Volume generated

   $= \displaystyle\int_a^b \pi y^2 \; dx$ or

   $= \displaystyle\int_a^b \pi x^2 \; dy$

GEOMETRY

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

2   Midpoint

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

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

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

5   A point dividing a segment of a line

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

6.   Area of triangle =

   $\dfrac{1}{2} \left| (x_1 y_2 + x_2 y_3 + x_3 y_{1_1}) - (x_2 y_1 + x_3 y_2 + x_1 y_3) \right|$

STATISTIC

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 $I = \dfrac{P_1}{P_0} \times 100$

7 $\bar{I} = \dfrac{\sum w_1 I_1}{\sum w_1}$

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 , $\mu = np$

13 $\sigma = \sqrt{npq}$

14 $z = \dfrac{x - \mu}{\sigma}$

TRIGONOMETRY

1 Arc length, $s = r\theta$

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

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

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

5 $\csc^2 A = 1 + \cot^2 A$

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

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

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

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

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

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

14 Area of triangle $= \dfrac{1}{2}ab\sin C$

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

1 It is given that the relation between set *P* and set *Q* is defined by the set of ordered pairs $\{(1,1),(2,0.5),(4,0.25),(5,0.2),(p,0.1)\}$.

Diberi bahawa hubungan antara set P dan set Q ditakrifkan oleh set pasangan tertib $\{(1,1),(2,0.5),(4,0.25),(5,0.2),(p,0.1)\}$.

(a) Find the value of *p*.
   Cari nilai bagi p.

(b) Using the function notation, express the relation of the function. State whether the relation is a function or not, give your reason.
   Menggunakan tata tanda fungsi, ungkapkan hubungan bagi fungsi tersebut. Tentukan samada hubungan ini fungsi atau tidak, berikan alasan anda.
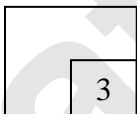
[3 *marks*]
[3 *markah*]

Answer / *Jawapan :*

(a)

(b)

1

3

2 Diagram 2 shows a function $h : x \rightarrow \dfrac{4}{x-q}, x \neq q$.

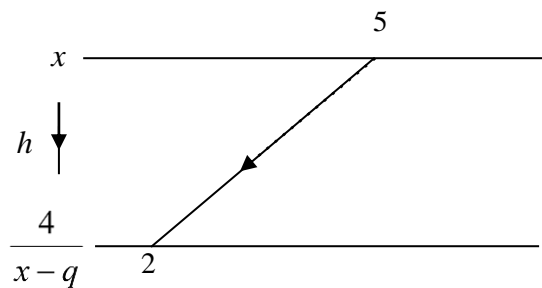*Rajah 2 menunjukkan suatu fungsi* $h : x \rightarrow \dfrac{4}{x-q}, x \neq q$

5

x ——————————

$h \downarrow$

$\dfrac{4}{x-q}$ 2 ——————————

Diagram 2
Rajah 2

Find / *Cari*
  (a) the value of q,
      nilai bagi q,

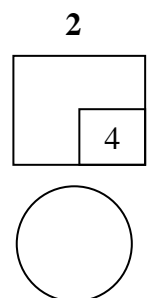 (b) inverse function of h.
      fungsi songsang bagi h

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

Answer / *Jawapan* :

(a)

(b)

2

4

3 Solve the quadratic equation $(1-x)^2 + 2x^2 = 8 - x(1-x)$. Give your answer correct to four significant figures.
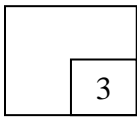
Selesaikan persamaan kuadratik $(1-x)^2 + 2x^2 = 8 - x(1-x)$. Berikan jawapan anda betul kepada empat angka bererti.

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

Answer / *Jawapan* :

3

3

4 Given $\dfrac{5}{3}$ is one of the roots of the quadratic equation $3x^2 - px + 5 = 0$.

Find the value of p.

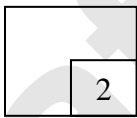*Diberi $\dfrac{5}{3}$ ialah satu punca bagi persamaan kuadratik $3x^2 - px + 5 = 0$.*

Cari nilai p.

[2 *marks*]
[2 *markah*]
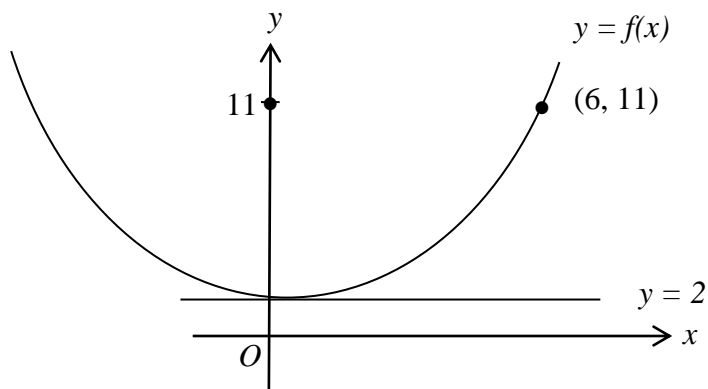
Answer / *Jawapan* :

4

2

5

Diagram 5

Rajah 5

Diagram 5 shows the graph of a quadratic function $f(x) = (x - p)^2 + q$, where p and q are constants. The straight line $y = 2$ is a tangent to the curve $y = f(x)$.

Rajah 5 menunjukkan suatu graf fungsi kuadratik $f(x) = (x - p)^2 + q$, dengan keadaan p dan q ialah pemalar. Garis lurus $y = 2$ ialah tangen kepada lengkung $y = f(x)$.

State

Nyatakan

(a) the value of p,

   nilai p,

(b) the value of q,

   nilai q,

(c) the equation of the axis of symmetry.

   persamaan paksi simetri.

[3 *marks*]

[3 *markah*]

Answer / *Jawapan* :

(a)

(b)

(c)

5

3
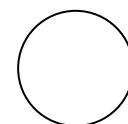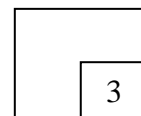
6   Find the range of values of x for $x(x+4)-5 < 5x-3$.

Cari julat nilai x bagi $x(x+4)-5 < 5x-3$.

[3 *marks*]

[3 *markah*]

Answer / *Jawapan* :

6

3

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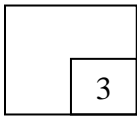
7   If $2^m = n$, express $8^m - 4^{-m}$ in terms of n.

Jika $2^m = n$, ungkapkan $8^m - 4^{-m}$ dalam sebutan n.

[3 *marks*]

[3 *markah*]

Answer / *Jawapan* :

7

3
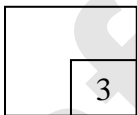
8 Given $\log_2(y+1)-3=\log_2 x$, express y in terms of x.

Diberi $\log_2(y+1)-3=\log_2 x$, *ungkapkan* y *dalam sebutan x.*

[3 *marks*]

[3 *markah*]

Answer / *Jawapan* :

8

3
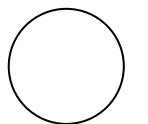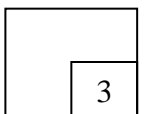
9

Diagram 9
Rajah 9

Mr Anuar has bought a double storey house from a housing developer SA Setia Sdn Bhd. The price of the house is RM 300 000. Each year the price of the house was increased by 5% from the actual price. The price of the house after *n* years is given by $300\,000(1.05)^n$. Mr. Anuar decided to sell the house, when the price exceed RM 390 000 for the first time. After how many years can he sell the house?

En Anuar telah membeli sebuah rumah 2 tingkat dari pemaju perumahan SA Setia Sdn Bhd. Harga rumah tersebut adalah RM 300 000. Setiap tahun harga rumah itu bertambah sebanyak 5% daripada harga sebenar. Harga rumah itu selepas n tahun adalah $300\,000(1.05)^n$. En Anuar bercadang untuk menjual rumah tersebut, apabila harga rumah itu melebihi RM 390 000 buat pertama kali. Selepas berapa tahunkah beliau boleh menjual rumah tersebut?

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

Answer / *Jawapan* :

9

| 3 |
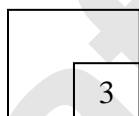
10   Diagram 10 shows three triangles formed by match sticks. The length of each match stick is 4.2 cm.

Rajah 10 *menunjukkan tiga segitiga yang dibentukkan oleh batang mancis. Panjang setiap batang mancis ialah 4.2 cm.*
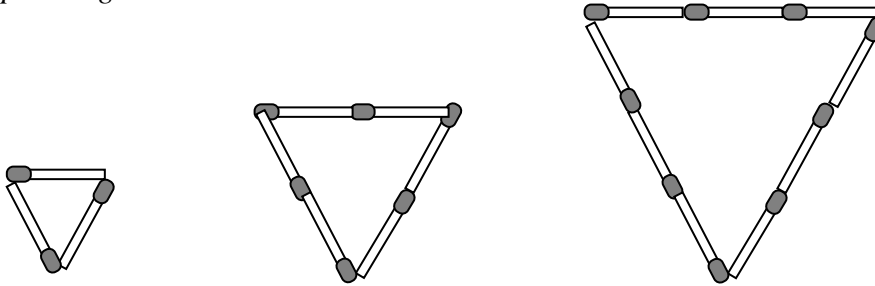
Diagram 10
Rajah 10

The perimeters of the triangle form an arithmetic progression. The terms of the progression are in ascending order.

Perimeter bagi setiap segitiga membentuk janjang aritmetik. Sebutan untuk janjang mengikut tertib menaik.

(a)   Write down the first four terms of the progression
      Tulis empat sebutan pertama dalam janjang ini

(b)   Find the common difference of the progression.
      Cari beza sepunya janjang itu

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

Answer / *Jawapan* :

(a)

(b)

10

2
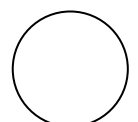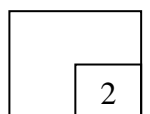
11 Given the geometric progression x, 18, 36, …
Diberi suatu janjang geometri x, 18, 36, …

(a) state the value of x,
nyatakan nilai x,

(b) find the sum of the first 10 terms of the progression.
cari hasil tambah 10 sebutan pertama janjang itu.

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

Answer / *Jawapan* :

(a)

(b)

11

3
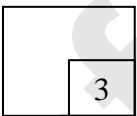
12 The variables x and y are related by the equation $y^2 = 2x(5-x)$. A straight line graph is obtained by plotting $\dfrac{y^2}{x}$ against x as shown in the Diagram 12.

Pembolehubah x dan y dihubungkan oleh persamaan $y^2 = 2x(5-x)$. Garis lurus diperoleh dengan memplotkan $\dfrac{y^2}{x}$ melawan x seperti yang ditunjukkan dalam Rajah 12.
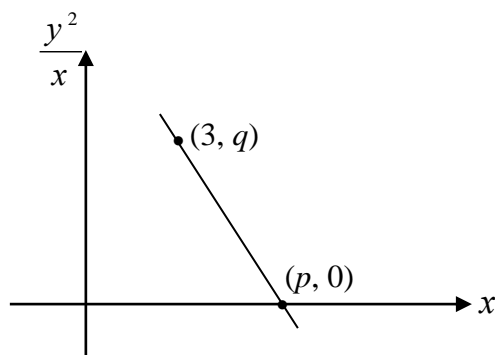
Diagram 12
Rajah 12

(a) Express $y^2 = 2x(5-x)$ in its linear form, which is used to obtain the straight line graph shown in Diagram 12.

Ungkapkan persamaan $y^2 = 2x(5-x)$ dalam bentuk linear, yang digunakan untuk memperoleh graf garis lurus seperti yang ditunjukkan dalam Rajah 12.

(b) Find the value of p and of q.
Cari nilai p dan q.

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

Answer / *Jawapan* :

(a)

(b)

12

4
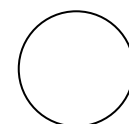
13 Diagram 13 shows part of the plan of a school compound drawn on a Cartesian plane.

Rajah 13 *menunjukkan sebahagian daripada pelan kawasan sebuah sekolah yang dilukis pada satah Cartes.*

● (100,225)
Block *B*
Blok B

Canteen
Kantin
● (−200,75)

O

Flagpole
Tiang Bendera
● (100, −150)
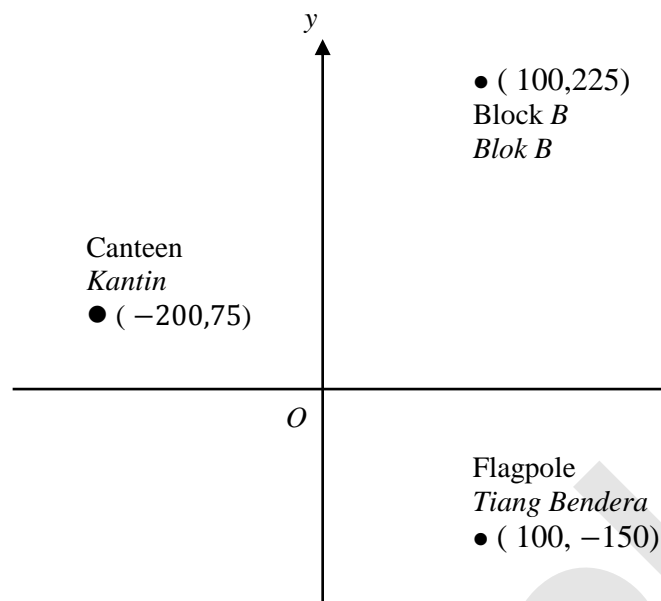
Diagram 13
Rajah 13

A walk way will be built equidistant from the canteen and block *B*. Find the equation of the walkway. Hence, determine whether the flag pole should be moved to other place.

Satu lorong pejalan kaki akan dibina berjarak sama dari blok B dan kantin.
Cari persamaan lorong pejalan kaki. Seterusnya, tentukan sama ada tiang bendera perlu dipindahkan ke tempat lain.

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

Answer / *Jawapan* :

13

4
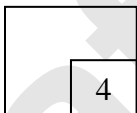
14 The straight line $\dfrac{x}{p} + \dfrac{y}{5} = 1$ has *x*-intercept of 3 and is parallel to the straight line $2y + qx = 0$.

Garis lurus $\dfrac{x}{p} + \dfrac{y}{5} = 1$ mempunyai 3 sebagai pintasan-x dan selari dengan garis lurus $2y + qx = 0$.

Determine
Tentukan

(a) the value of *p*,
nilai p,

(b) the value of *q*.
nilai q.

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

Answer / *Jawapan* :

(a)

(b)

14

3
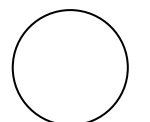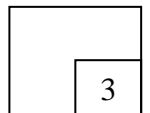
15 Given that $\tan\theta = p$, where p is a constant and θ is a reflex angle.

Diberi $\tan\theta = p$, *dengan keadaan p ialah pemalar dan θ ialah* sudut refleks.

Find in terms of p:

Cari dalam sebutan p:

(a) $\sin\theta$

(b) $\tan(45° - \theta)$

[3 *marks*]

[3 *markah*]

Answer / *Jawapan* :

(a)

(b)

15

3
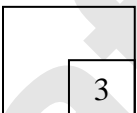
16 Diagram 16 shows a pattern on a piece of tile, measuring 12 cm x 12 cm. The pattern consists of a circle , centre *O*, inscribed in a square *ABCD* and four sectors with centres *A*, *B*, *C* and *D*.

Rajah 16 *menunjukkan corak yang terdapat di atas sekeping jubin yang berukuran* 12 *cm* x 12 *cm. Corak tersebut terdiri daripada sebuah bulatan, berpusat di O, yang terterap dalam sebuah segiempat sama ABCD dan empat sektor berpusat di A, B, C dan D.*
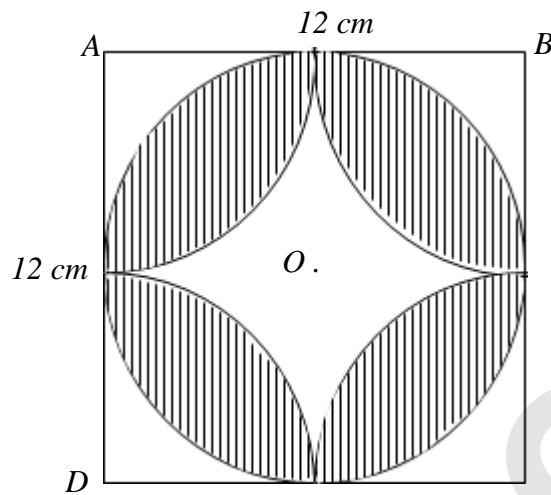
Diagram 16
Rajah 16

Calculate the area, in cm^2, of the shaded region .

Hitungkan luas, dalam cm^2, *kawasan berlorek.*
(Use/ *guna* $\pi = 3.142$)

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

Answer / *Jawapan* :

16

3
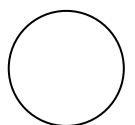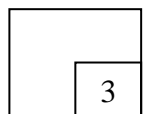
17
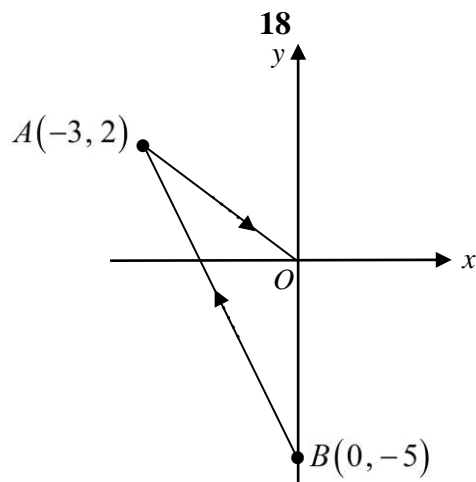
Diagram 17
Rajah 17

Diagram 17 shows two vectors, $\overrightarrow{OA}$ and $\overrightarrow{AB}$.
Rajah 17 *menunjukkan dua vektor,* $\overrightarrow{OA}$ *dan* $\overrightarrow{AB}$.

Express
Ungkapkan

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

       $\overrightarrow{OA}$ *dalam bentuk* $\begin{pmatrix} x \\ y \end{pmatrix}$

(b) $\overrightarrow{AB}$ in the form $x\mathbf{i} + y\mathbf{j}$

       $\overrightarrow{AB}$ *dalam bentuk* $x\mathbf{i} + y\mathbf{j}$

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

Answer / *Jawapan* :

(a)

(b)

17

2
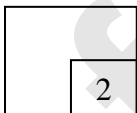
18 Diagram 18 shows $\overrightarrow{OR} = \underline{r}$ and $\overrightarrow{OS} = \underline{s}$, $\overrightarrow{OP}$ and $\overrightarrow{PQ}$ are drawn on a grid of equal squares with sides of 1 unit.

Rajah 18 menunjukkan $\overrightarrow{OR} = \underline{r}$ dan $\overrightarrow{OS} = \underline{s}$, $\overrightarrow{OP}$ dan $\overrightarrow{PQ}$ dilukis pada grid segi empat sama bersisi 1 unit.
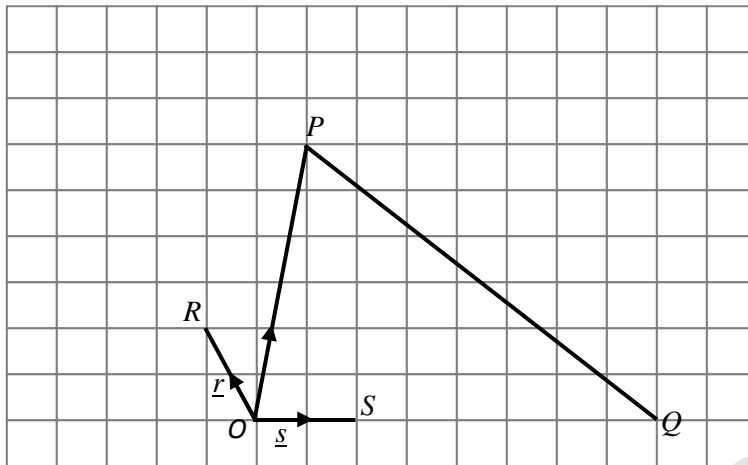
Diagram 18
Rajah 18

Determine/ *Tentukan*

(a) unit vector in the direction of $\overrightarrow{PQ}$ in terms of $\underline{r}$ and $\underline{s}$

   vektor unit dalam arah vektor $\overrightarrow{PQ}$ dalam sebutan $\underline{r}$ dan $\underline{s}$

(b) the value of a and b if $(a-5)\underline{r} = (8+b)\underline{s}$.

   nilai bagi a dan b jika $(a-5)\underline{r} = (8+b)\underline{s}$.

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

Answer / *Jawapan* :

(*a*)

(*b*)

18

4
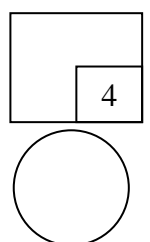
19 Given $f(x) = \dfrac{4}{(3x-5)^3}$, find the value of $f''(0)$.

Diberi $f(x) = \dfrac{4}{(3x-5)^3}$, cari nilai bagi $f''(0)$.

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

Answer / *Jawapan* :

20
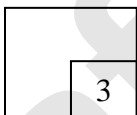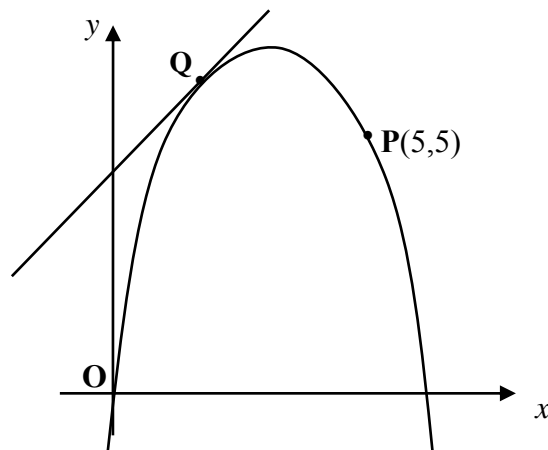
Diagram 20
Rajah 20

Diagram 20 shows the curve $y = -x^2 + 6x$. Given that the tangent to the curve at point Q is parallel to straight line OP, find the coordinates of point Q.

Rajah 20 *menunjukkan lengkung bagi fungsi* $y = -x^2 + 6x$. *Diberi tangen kepada lengkung pada titik Q adalah selari dengan garis lurus OP, cari koordinat bagi titik Q.*

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

Answer / *Jawapan* :

20

4
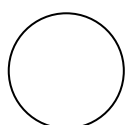
21. The rate of change of volume of a piece of pizza when heated is given by $6t^2 - 2t + 1$. Find the volume, V cm^3, of the pizza in terms of t, if its volume is 11 cm^3 when $t = 2$.

Kadar perubahan isipadu sekeping pizza apabila dipanaskan diberi oleh $6t^2 - 2t + 1$. Cari isipadu, V cm^3, pizza tersebut dalam sebutan t jika isipadunya ialah 11 cm^3 apabila $t = 2$.

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

Answer / *Jawapan* :

21

21	
	3
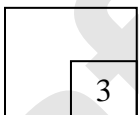
22 Table 22 shows the frequency distribution of the scores of a group of pupils in a game.

Jadual 22 *menunjukkan taburan kekerapan bagi skor kumpulan pelajar dalam satu permainan.*

Skor *Score*	Bilangan murid *Number of pupils*
10 – 19	1
20 – 29	2
30 – 39	8
40 – 49	12
50 – 59	k
60 – 69	1

Table 22
Jadual 22

It is given that the median score of the distribution is 42. Calculate the value of k.

Diberi skor median bagi taburan tersebut ialah 42. *Hitung nilai k.*

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

Answer / *Jawapan* :

22

3
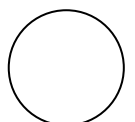
23 A school wants to choose 5 students consisting of 2 boys and 3 girls to participate in a Mathematics quiz. These 5 students are chosen from a group of 6 boys and 6 girls.
Sebuah sekolah ingin memilih 5 orang pelajar yang terdiri daripada 2 orang lelaki dan 3 orang perempuan untuk mewakili sekolah dalam kuiz Matematik. 5 orang pelajar ini dipilih daripada sekumpulan 6 orang lelaki dan 6 orang perempuan.

Find
Cari

(a) the number of ways the team can be formed,
bilangan cara pasukan itu dibentuk,

(b) the number of ways the team members can be arranged in a row for a group photograph, if the two boys sit next to each other.
bilangan cara menyusun ahli pasukan itu dalam satu baris untuk satu sesi bergambar, jika kedua-dua pelajar lelaki duduk bersebelahan antara satu sama lain.

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

Answer / *Jawapan* :

(a)

(b)

23

4
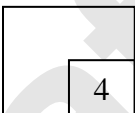
24 Table 24 shows the result of Additional Mathematics Test of all students in a certain class.

Jadual 24 *menunjukkan keputusan Ujian Matematik Tambahan bagi semua pelajar dalam kelas tertentu.*

The number of students Bilangan pelajar	The test results Keputusan ujian	
	Pass Lulus	Failed Gagal
Boy Lelaki	9	x
Girl Perempuan	11	4

Table 24
Jadual 24

(a) Given that the probability of a boy in that class failed in the test is $\dfrac{1}{4}$, calculate the value of x.

Diberi bahawa kebarangkalian seorang pelajar lelaki dalam kelas tersebut gagal dalam ujian ialah $\dfrac{1}{4}$, *hitung nilai* x.

(b) If two students are selected randomly from that class, find the probability that two of the students passed the test.

Jika dua pelajar dipilih secara rawak daripada kelas tersebut, cari kebarangkalian bahawa kedua-dua pelajar itu lulus ujian tersebut.

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

Answer / *Jawapan* :

(a)

24

4

(b)
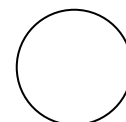
25   A discrete random variable X with $X \sim B(n, p)$, has mean 3 and variance 0.75.

Pembolehubah rawak diskrit X dengan keadaan X $\sim$ B(n, p) mempunyai min 3 dan varians 0.75.

Find */ Cari*

(a)   the value of n and of p.
            nilai n dan nilai p.

(b) $P(X = 3)$.

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

Answer / *Jawapan* :

(a)

(b)

25

4

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	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
														Minus / *Tolak*					
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

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

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

$$Q(z) = \int_k^\infty f(z)\, dz$$

Example / *Contoh*::
If $X \sim N(0, 1)$, then
Jika $X \sim N(0, 1)$, maka
$P(X > k) = Q(k)$
$P(X > 2.1) = Q(2.1) = 0.0179$

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 setip soalan ditunjukkan dalam kurungan.

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

9. The Upper Tail Probability $Q(z)$ For The Normal Distribution N(0, 1) Table is provided in page **27**.
   Jadual Kebarangkalian Hujung Atas $Q(z)$ Bagi Taburan Normal N(0,1) disediakan di halaman **27**.

10. You may use a scientific calculator.
    Anda dibenarkan menggunakan kalkulator saintifik.

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.

BAHAGIAN PENGURUSAN SEKOLAH BERASRAMA PENUH
DAN SEKOLAH KECEMERLANGAN

PENTAKSIRAN DIAGNOSTIK AKADEMIK SBP 2015
PERCUBAAN SIJIL PELAJARAN MALAYSIA

ADDITIONAL MATHEMATICS

Kertas 2

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 ceraikan halaman **21** dan ikat sebagai muka hadapan bersama-sama dengan buku jawapan.*

Kertas soalan ini mengandungi **22** halaman bercetak.

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

ALGEBRA

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

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

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

4 $(a^m)^n = a^{nm}$

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

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

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

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

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

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

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

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

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

CALCULUS

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

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

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

5 Volume generated

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

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

GEOM ETRY

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

2 Midpoint

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

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

4 $\hat{r} = \dfrac{xi + yj}{\sqrt{x^2 + y^2}}$

5 A point dividing a segment of a line

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

6. Area of triangle =

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

STATISTIC

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    $I = \dfrac{P_1}{P_0} \times 100$

7    $\bar{I} = \dfrac{\sum w_1 I_1}{\sum w_1}$

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, $\mu = np$

13    $\sigma = \sqrt{npq}$

14    $z = \dfrac{x-\mu}{\sigma}$

TRIGONOMETRY

1   Arc length, $s = r\theta$

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

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

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

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

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

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

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

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

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

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

14   Area of triangle $= \dfrac{1}{2}ab\sin C$

Section A
***Bahagian* A**

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

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

1.
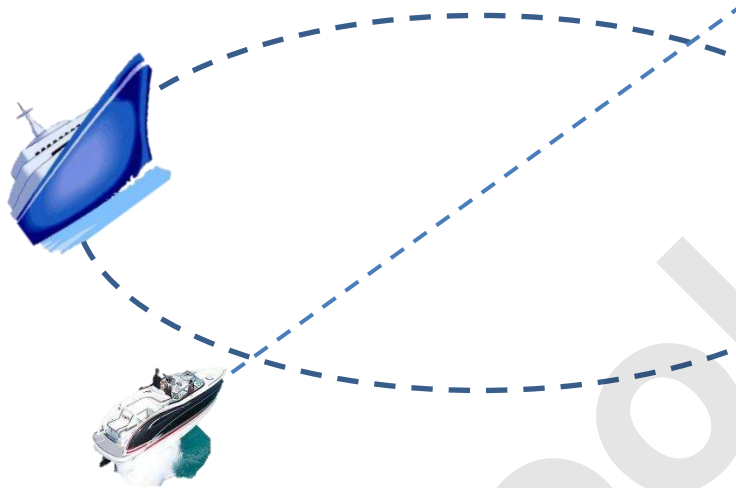
A yacht moves such that its equation of locus is given as $2x^2 + 11y^2 + 2x + 2y = 0$. While, a speed boat moves in a straight line with the equation $x - 3y + 1 = 0$ and intersect the locus. Find the intersection points.

Sebuah kapal layar bergerak dengan keadaan persamaan lokusnya diberi sebagai $2x^2 + 11y^2 + 2x + 2y = 0$. Sementara sebuah bot laju pula bergerak secara garis lurus dengan persamaan $x - 3y + 1 = 0$ dan bersilang dengan lokus tersebut. Cari titik-titik persilangan itu.

[5 *marks*]
[5 *markah*]

2.   (*a*)   Show that $\sin 2x = 2\sin x \cos x$.   [2 *marks*]
          Tunjukkan $\sin 2x = 2\sin x \text{ kos } x$.   [2 *markah*]

   (*b*)   (i)   Sketch the graph of $y = 3\sin 2x$ for $0 \leq x \leq \dfrac{3\pi}{2}$.

            Lakarkan graf bagi $y = 3\sin 2x$ *untuk* $0 \leq x \leq \dfrac{3\pi}{2}$.

(ii) Hence, using the same axes, sketch a suitable straight line to find the number of solutions to the equation $4\sin x \cos x = \dfrac{x}{\pi}$ for $0 \le x \le \dfrac{3\pi}{2}$.

State the number of solutions.

Seterusnya, dengan menggunakan paksi yang sama, lakar satu garis lurus yang sesuai untuk mencari bilangan penyelesaian bagi persamaan $4\sin x$ $\cos x = \dfrac{x}{\pi}$ *untuk* $0 \le x \le \dfrac{3\pi}{2}$.

Nyatakan bilangan penyelesaian tersebut.

[6 *marks*]

[6 *markah*]

3. Diagram 3 shows the curve of a quadratic function $f(x) = -x^2 + mx + 3$. The curve has a maximum point $B(1, n)$ and intersects the $f(x)$-axis at point A.

Rajah 3 menunjukkan lengkung bagi fungsi kuadratik $f(x) = -x^2 + mx + 3$. *Lengkung itu mempunyai titik maksimum* $B(1, n)$ *dan memotong paksi-* $f(x)$ *pada titik A.*
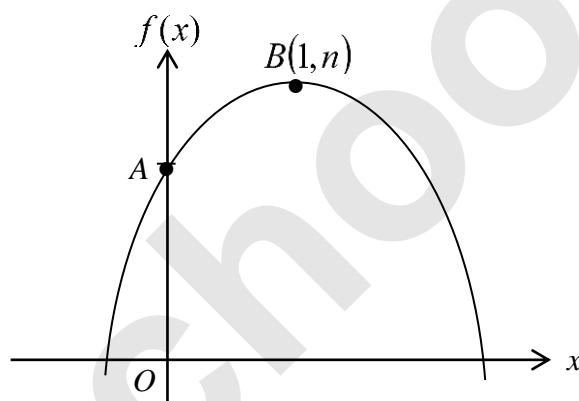
Diagram 3

Rajah 3

(*a*) State the coordinates of *A*. [1 *mark*]

Nyatakan koordinat A. [1 *markah*]

(*b*) Find the value of *m* and of *n*. [4 *marks*]

Cari nilai m dan nilai n. [4 *markah*]

(*c*) Find the equation of the curve when the graph is reflected at the *x*-axis.

[2 *marks*]

Cari persamaan lengkung apabila graf tersebut dipantulkan pada paksi-x.

[2 *markah*]

4.
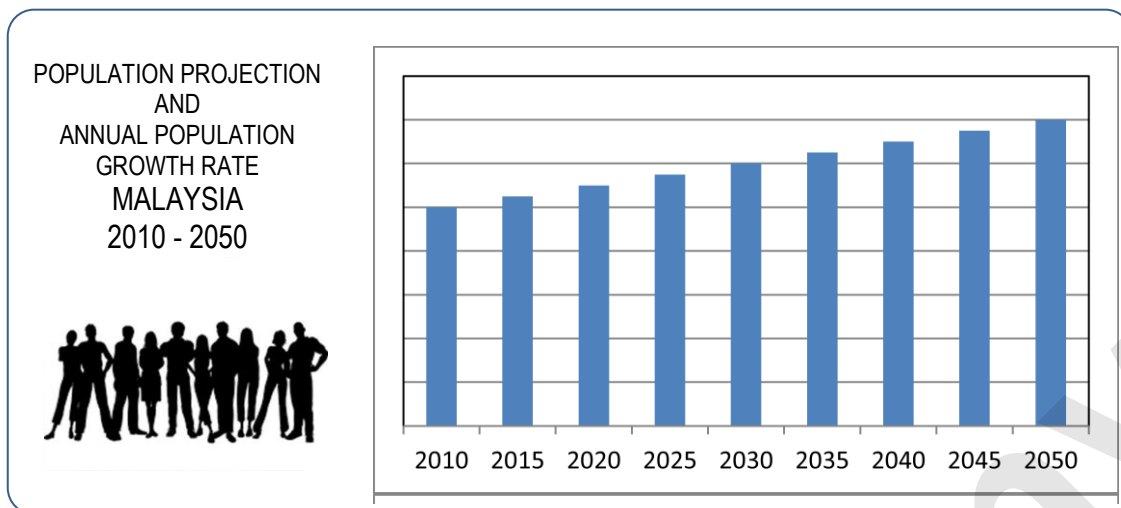
The population of a town A on the 1st of January 2010 is 40 000. By 31st of December 2010, the population increased by 3% and then continue to increase by this percentage for each subsequent year.

Bilangan penduduk di bandar A pada 1 Januari 2010 ialah 40 000. Pada 31 Disember 2010, bilangan penduduk bandar ini telah meningkat sebanyak 3% dan terus meningkat pada peratusan ini bagi tiap-tiap tahun kemudian.

Calculate
Hitung

(a) the population of the town A on the 1st of January 2015, [3 *marks*]
  bilangan penduduk bandar A itu pada 1 Januari 2015, [3 *markah*]

(b) on the 1st January of which year would the population of the town be more than tripled the population of the town on 1st January 2010. [4 *marks*]
  pada 1 Januari dalam tahun manakah bilangan penduduk bandar itu adalah melebihi tiga kali ganda bilangan penduduk pada 1 Januari 2010. [4 *markah*]

5. Diagram 5 shows a rectangle *OPQR*. *S* is a point lies on *PQ* such that *PS* : *PQ* = 1 : 3. The straight line *OS* intersects the line *PR* at point *T*.

   Rajah 5 menunjukkan sebuah segiempat tepat OPQR. S ialah satu titik yang terletak pada PQ dengan keadaan PS : PQ = 1 : 3. Garis lurus OS bersilang dengan PR pada titik T.
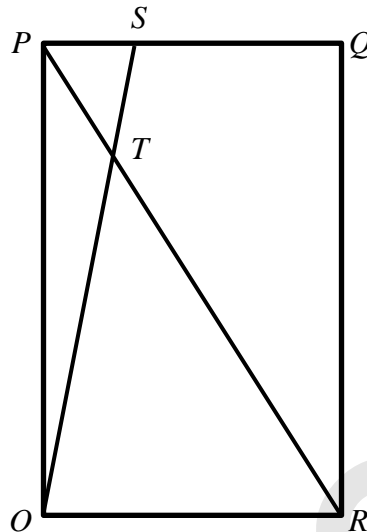
Diagram 5
Rajah 5

(*a*) Given $\overrightarrow{OP} = \underline{p}$ and $\overrightarrow{OR} = \underline{r}$, express $\overrightarrow{RP}$ *and* $\overrightarrow{OS}$ in terms of $\underline{p}$ *and/or* $\underline{r}$.

Diberi $\overrightarrow{OP} = \underline{p}$ *dan* $\overrightarrow{OR} = \underline{r}$, *ungkapkan* $\overrightarrow{RP}$ dan $\overrightarrow{OS}$ *dalam sebutan* $\underline{p}$ *dan/atau* $\underline{r}$.

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

(*b*) If $\overrightarrow{OT} = \mu\overrightarrow{OS}$ *and* $\overrightarrow{RT} = \lambda\overrightarrow{RP}$, express two different possible vectors of $\overrightarrow{RT}$. Hence, find the value of μ and of λ. [3 *marks*]

Jika $\overrightarrow{OT} = \mu\overrightarrow{OS}$ *dan* $\overrightarrow{RT} = \lambda\overrightarrow{RP}$, *ungkapkan* $\overrightarrow{RT}$ *dalam dua cara yang berlainan. Seterusnya, cari nilai* μ *dan* λ. [3 *markah*]

(*c*) Given that $|\underline{p}| = 10$ *unit and* $|\underline{r}| = 4$ *unit*, find the area of triangle *OPS*.

[2 *marks*]

Diberi bahawa $|\underline{p}| = 10$ *unit dan* $|\underline{r}| = 4$ *unit, cari luas segitiga OPS.*

[2 *markah*]

6.

CRAY ERIC Shau - 10.25s
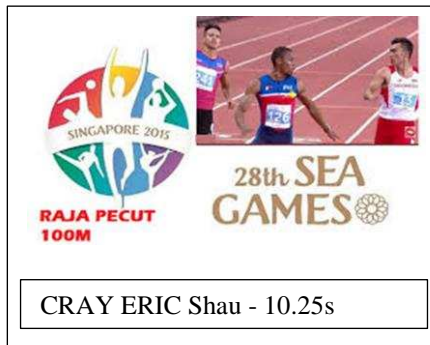
The 28th SEA Games was held in Singapore on 6-12 June 2015. In the men's 100 m event, the Malaysia athlete, Mohd Izzuddin Yahya was eliminated at the screening after just able to do timing 10.61s to be in sixth place. (http://www.bharian.com.my/node/60307)

Sukan SEA yang ke 28 telah berlangsung di Singapura pada 6 - 12 Jun 2015. Dalam acara 100m lelaki, atlit Malaysia, Mohd. Izzuddin Yahya tersingkir pada peringkat saringan selepas hanya mampu melakukan catatan masa 10.61s untuk berada di tempat keenam. (http://www.bharian.com.my/node/60307)

(*a*) As the coach of 100 m event of the 29th SEA Games, Mr *A* will held a series of intensive training and obtain data for two of the best athletes who are expected to represent the country. Table 6A shows the time recorded by two athletes, *P* and *Q*, in the 100 m event during the qualifying session. New rules of 29th SEA Games, specify only one athlete will represent the country.

Sebagai jurulatih acara 100 m ,En A telah mengadakan siri latihan intensif dan memperoleh data untuk dua orang atlit terbaik yang dijangka akan mewakili negara. Jadual 6A menunjukkan masa yang dicatatkan oleh dua atlit , P dan Q, dalam acara 100 m semasa sesi kelayakan. Syarat baharu sukan SEA menetapkan hanya seorang atlit akan dipilih bagi sebuah negara.

Athlete *Atlit*	Time (second) *Masa (saat)*				
P	10.38	10.40	10.60	10.70	10.82
Q	10.48	10.50	10.60	10.62	10.70

Table 6A
Jadual 6A

By using data in Table 6A ,which athlete qualify to compete in the 29th SEA Games?

[4 *marks*]

Dengan menggunakan data-data di dalam Jadual 6A, atlit yang manakah layak bertanding di Sukan SEA ke 29? [4 *markah*]

(*b*)   Table 6*B* shows the result of men final 100 m in the 28th SEA Games.
Jadual 6B menunjukkan keputusan 100 m *lelaki akhir Sukan SEA ke* 28.

Placing *Kedudukan*	Medal *Pingat*	Athlete's Name *Nama Atlit*	Country *Negara*	Time (s) *Masa* (*s*)
1	Gold *Emas*	CRAY ERIC Shau	Filipina	10.25
2	Silver *Perak*	BOBY Yaspi	Indonesia	10.45
3	Silver *Perak*	ISWANDI Ismadi	Indonesia	10.45
4	Bronze *Gangsa*	KANG Li Loong	Singapore *Singapura*	10.47

Table 6B
Jadual 6B

Athlete who was selected by Mr *A* has trained intensively and can reduce the timing of 0.35 s constantly for all entries which appear in table 6A . Does the new time entry allowed him to win the gold medal if other participants maintain the time record in 29th SEA Games as 28th SEA Games, as shown in Table 6B?

[2 *marks*]

 Atlit yang dipilih oleh En A telah berlatih secara intensif   dan dapat mengurangkan catatan masa sebanyak 0.35s *secara tetap bagi kesemua catatan yang terdapat dalam Jadual* 6A . *Adakah catatan masa yang baharu itu membolehkannya memenangi pingat emas jika peserta-peserta lain mengekalkan catatan masa didalam sukan SEA ke* 29 *sebagaimana sukan SEA ke* 28*, seperti yang ditunjukkan dalam Jadual* 6B*?*

[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.   (*a*)   The probability that a baby born is a girl is 0.6. If Puan Asmah has 4 childrens, find the probability that
Kebarangkalian seorang bayi yang dilahirkan ialah perempuan ialah 0.6.*Jika puan Asmah mempunyai* 4 *orang anak , cari kebarangkalian bahawa*

      (i)   she has 2 daughters,
dia mempunyai 2 *anak perempuan,*

      (ii)   she has no son.
dia tidak mempunyai anak lelaki.

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

  (*b*)   The height of adult males is normally distributed with a mean of 172 cm and a standard deviation of 8 cm.
Tinggi seorang lelaki dewasa adalah mengikut taburan normal dengan min 172 cm *dan sisihan piawai* 8 cm.

      (i)   Find the probability that the height of a randomly selected person is between 160 cm and 172 cm.
Cari kebarangkalian bahawa tinggi seorang yang dipilih secara rawak adalah di antara 160 cm *hingga* 172 cm.

      (ii)   Given that the height 80% of adult males exceed k cm, find the value of k.
Diberi bahawa tinggi 80% *lelaki dewasa melebihi k* cm*. cari nilai k.*

[6 *marks*]
[6 *markah*]

8. Diagram 8 below shows part of the curve $y = f(x)$ which passes through point M (4,0) and the straight line $x + y = 20$.
Rajah 8 menunjukkan sebahagian daripada lengkung $y = f(x)$ yang melalui titik M (4,0) dan garis lurus $x + y = 20$.

y

$y = f(x)$

$x + y = 20$

x

0 M (4,0)
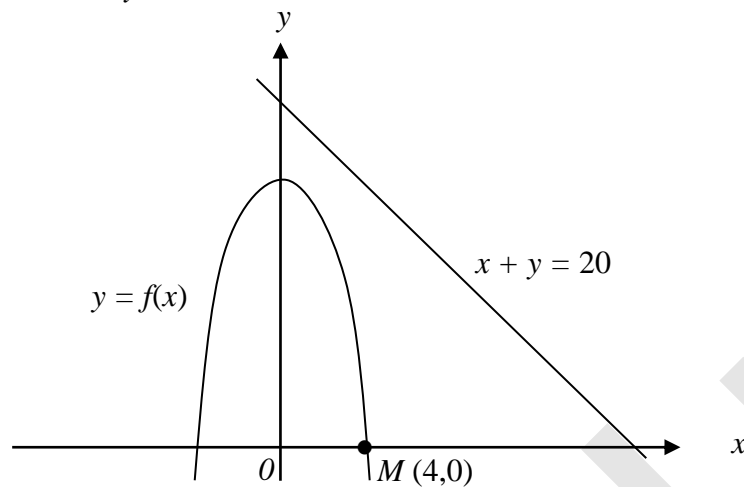
Diagram 8
Rajah 8

The curve has a gradient function $-2x$.
Lengkung itu mempunyai fungsi kecerunan $-2x$.

Find
Cari

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

(*b*)   the area of shaded region,   [4 *marks*]
   luas rantau berlorek,   [4 *markah*]

(*c*)   the volume of revolution, in terms of π, when the region bounded by the curve and the *x*-axis is revolved through 180° about the *y*-axis.   [3 *marks*]
   isi padu kisaran, dalam sebutan π, apabila rantau yang dibatasi oleh lengkung dan paksi-x dikisar 180° pada paksi-y.   [3 *markah*]

9.   Use graph paper to answer this question.
      Gunakan kertas graf untuk menjawab soalan ini.

    Table 9 shows the values of two variables, x and y, obtained from an experiment. It is
known that x and y are related by the equation $y = \dfrac{9}{b^2}(x+a)^2$, where a and b are

constants.
*Jadual 9 menunjukkan nilai-nilai bagi dua pemboleh ubah, x dan y, yang diperoleh
daripada satu eksperimen. Diketahui bahawa x dan y dihubungkan oleh persamaan*

$y = \dfrac{9}{b^2}(x+a)^2$ *dengan keadaan a dan b ialah pemalar.*

x	1	2	3	4	4.5	5
y	5.88	17.28	34.68	58.08	72.25	87.48

Table 9
Jadual 9

(*a*)   Based on Table 9, construct a table for the values of $\sqrt{y}$.   [1 *mark*]
      Berdasarkan Jadual 9*, bina satu jadual bagi nilai – nilai* $\sqrt{y}$.   [1 *markah*]

(*b*)   Plot $\sqrt{y}$ against x, using a scale of 2 cm to 1 unit on both axes. Hence draw the
      line of best fit.   [3 *marks*]

      Plot $\sqrt{y}$ *melawan x, menggunakan skala* 2 cm *kepada* 1 *unit untuk kedua-dua
paksi. Seterusnya lukis garis lurus penyuaian terbaik.*   [3 *markah*]

(*c*)   Use the graph in (*a*) to find the value of
      Gunakan graf di (*a*) *untuk mencari nilai*

      (i)   *b*,
      (ii)   *a*,
      (iii)   *x* when *y* = 100
             x bila y = 100

                                                 [6 *marks*]
                                              [6 *markah*]

10.   Solution by scale drawing is not accepted.
Penyelesaian secara lukisan berskala tidak diterima.

Diagram 10 shows a straight line *CD* which intersect *x* - axis at point *D* and intersect *y* - axis at point *C*. Straight line *DR* is pependicular to straight line *CD*.
Rajah 10 *menunjukan garis lurus CD yang menyilang paksi –x pada titik D dan menyilang paksi – y pada titik C. Garis lurus DR berserenjang dengan garis lurus CD .*
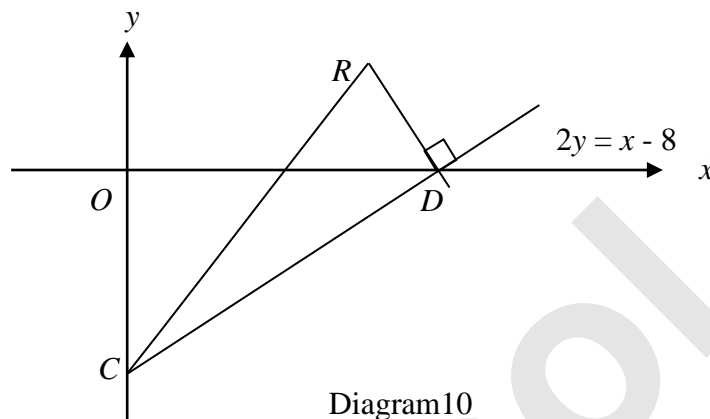
Diagram10
Rajah 10

Given that the equation of the straight line *CD* is $2y = x - 8$ and the gradient of *CR* is 1.
Diberi bahawa persamaan garis lurus CD ialah $2y = x - 8$ dan kecerunan garis lurus CR ialah 1.

Find
Carikan

(*a*)   the coordinates of *C* and *D*.   [2 *marks*]
      koordinat C dan D.   [2 *markah*]

(*b*)   the equations of the straight lines *DR* and *CR*.   [4 *marks*]
      persamaan garis lurus DR dan CR.   [4 *markah*]

(*c*)   the coordinates of point *R*.   [2 *marks*]
      koordinat R.   [2 *markah*]

(*d*)   the area of triangle *CDR*.   [2 *marks*]
      luas segi tiga CDR.   [2 *markah*]

11. Diagram 11 shows a circle with radius of 4 cm and a sector *OBC* with centre *O* .
Rajah 11 *menunjukkan sebuah bulatan berjejari* 4 cm *dan sector OBC berpusat O.*
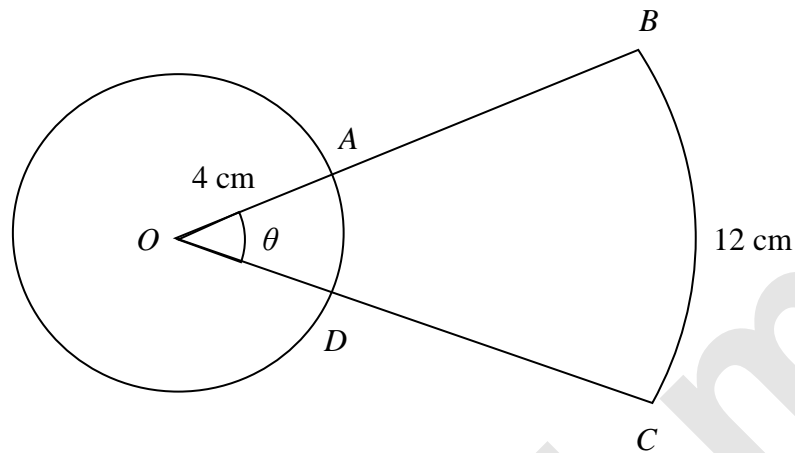
Diagram 11
Rajah 11

Given that the length of arc *BC* is 12 cm and *OA* : *OB* = 2 : 3.
Diberi bahawa panjang lengkok BC ialah 12 cm *dan OA : OB* = 2 : 3

Use / *Guna* $\pi = 3.142$

Find
Cari

(*a*) the value of *θ*, in radian,   [2 *marks*]
       nilai θ, dalam radian,   [2 *markah*]

(*b*) the perimeter of the whole diagram,   [4 *marks*]
       perimeter keseluruhan rajah tersebut,   [4 *markah*]

(*c*) the area of the whole diagram.   [4 *marks*]
       luas keseluruhan rajah tersebut.   [4 *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. A particle moves along a straight line and passes through a fixed point *O*. The velocity, *v* ms^{-1}, of the particle is given by $v = 6t - t^2 - 5$, where *t* is the time, in seconds, after passing through the point *O*.
    Suatu zarah bergerak di sepanjang suatu garis lurus dan melalui satu titik tetap O. Halaju v ms^{-1}, diberi oleh $v = 6t - t^2 - 5$, di mana t ialah masa, dalam saat, selepas melalui O.

    (*a*) Find
    Cari

        (i) the velocity, in ms^{-1}, of the particle when $t = 2$,
        halaju zarah, dalam, ms^{-1}, apabila $t = 2$,

        (ii) the time when the particle changes its direction,
        masa bila zarah bertukar arah gerakan,

        (iii) the maximum velocity, in ms^{-1}, of the particle.
        halaju maksimum zarah itu, dalam ms^{-1}.

        [6 *marks*]
        [6 *markah*]

    (*b*) Find the total distance travelled in the first 4 seconds. [4 *marks*]
    Cari jumlah jarak yang dilalui oleh zarah dalam 4 saat yang pertama.

        [4 markah]

13. Diagram 13 shows a quadrilateral *PQST and QRS* is a straight line
   Rajah 13 *menunjukkan sebuah sisiempat PQST dan QRS ialah garis lurus*
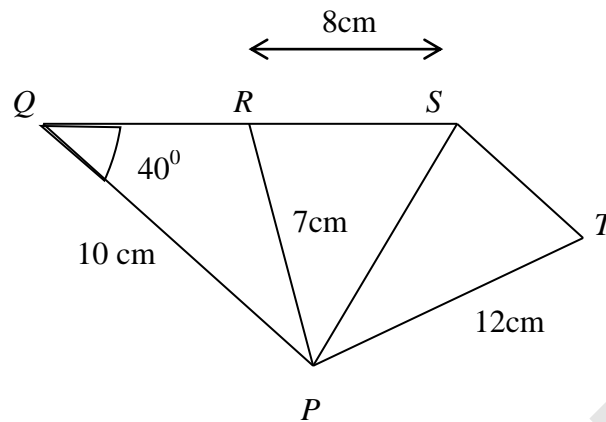
Diagram 13
Rajah 13

Given that , $\angle PRS$ is acute and the area of a triangle *PST* is 30cm².
Diberi bahawa , $\angle PRS$ ialah tirus dan luas segitiga PST ialah 30cm².

Find
Cari

(*a*) $\angle PRQ$.   [3 *marks*]
                                                                [3 *markah*]

(*b*)   the length, in cm, of *PS*.   [2 *marks*]
      panjang, dalam cm, bagi PS.   [2 *markah*]

(*c*) $\angle SPT$.   [2 *marks*]
                                                                [2 *markah*]

(*d*)   the area, in cm², of quadrilateral *PRST*.   [3 *marks*]
      luas,dalam cm², bagi sisi empat PRST .   [3 *markah*]

14. Ahmad is a farmer. He plans to plant *x* acres of tapioca and *y* acres of sweet potato. Given that the cost of planting is RM200 for each acre of tapioca and RM100 for each acre of sweet potato. Whereas, the profit for each acre of tapioca and sweet potato is RM500 and RM300 respectively. The planting is based on the following constraints :
Ahmad ialah seorang petani. Beliau merancang untuk menanam x ekar pokok ubi kayu dan y ekar ubi keledek. Diberi bahawa kos bagi penanaman ialah RM200 untuk setiap ekar ubi kayu dan RM100 untuk setiap ekar ubi keledek. Manakala, keuntungan untuk setiap ekar ubi kayu dan ubi keledek masing-masing ialah RM500 dan RM300. Penanamannya adalah berdasarkan kekangan berikut :

I : Ahmad has 10 acres of land.
Ahmad mempunyai 10 ekar tanah.

II : Ahmad has to plant at least 7 acres.
Ahmad perlu menanam sekurang-kurangnya 7 ekar.

III: The total cost of planting must not exceed RM1200.
Jumlah kos untuk penanaman itu tidak melebihi RM1200.

(*a*) Write three inequalities, other than $x \geq 0$ and $y \geq 0$ which satisfy all the above constraints. [3 *marks*]
Tulis tiga ketaksamaan, selain daripada $x \geq 0$ dan $y \geq 0$ yang memenuhi semua kekangan di atas. [3 *markah*]

(*b*) Using a scale of 2 cm to 1 acre on both axes, construct and shade the region *R* which satisfies all the above constraints. [3 *marks*]
Menggunakan skala 2 cm kepada 1 ekar pada kedua-dua paksi, bina dan lorek rantau R yang memenuhi semua kekangan di atas. [3 *markah*]

(*c*) Using the graph constructed in 15(b), find
Menggunakan graf yang dibina di 15(b), cari

(i) the range of acres of sweet potato, if 3 acres of tapioca planted.
julat bilangan ekar untuk ubi keledek, jika 3 ekar ubi kayu ditanam.

(ii) the maximum profit of sales of both tapioca and sweet potato.
untung maksimum dari jualan ubi kayu dan ubi keledek.

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

15. The bar chart in Diagram 15 shows the monthly cost of four items *P, Q, R* and *S* in the year 2000. Table 15 shows the prices and the price indices of these items.
Carta palang dalam Rajah 15 *menunjukkan kos bulanan bagi empat barangan P, Q, R dan S pada tahun* 2000. *Jadual* 15 *menunjukkan harga dan indeks harga barangan tersebut.*
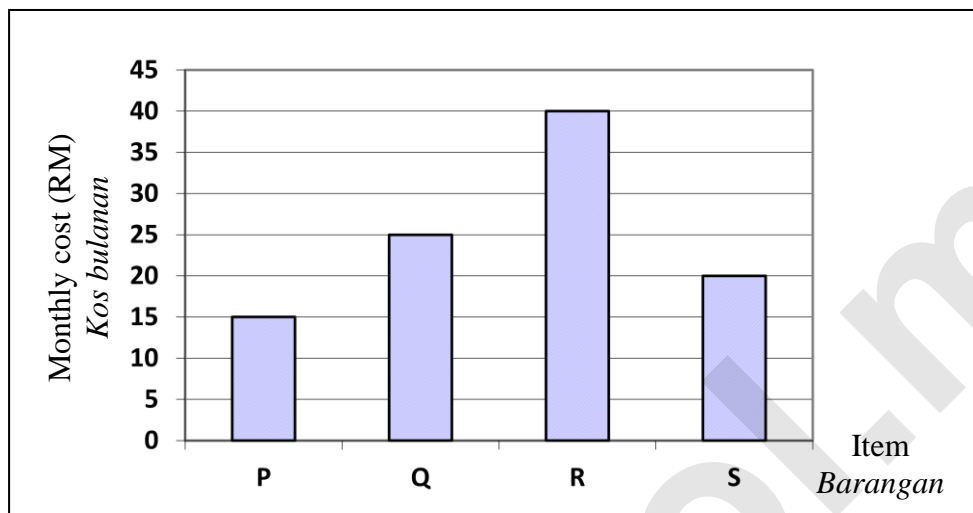
Diagram 15
Rajah 15

Item *Barangan*	Price (RM) in the year *Harga* (RM) *pada tahun*		Price index in the year 2006 *Indeks harga pada tahun 2006* (2000 = 100)
	2000	**2006**	
P	*x*	1.35	150
Q	2.50	3.00	*y*
R	3.20	4.00	125
S	1.25	*z*	140

Table 15
Jadual 15

(*a*) Find the values of *x*, *y* and *z*. [3 *marks*]
Cari nilai x, y dan z. [3 *markah*]

(*b*) Calculate the composite index in the year 2006 based on the year 2000. [3 *marks*]
Hitung indeks gubahan pada tahun 2006 *berasaskan tahun* 2000. [3 *markah*]

(*c*)   The total cost of these items in the year 2000 is RM1400. Find the corresponding
cost of the items in the year 2006. [2 *marks*]
Jumlah kos bagi barangan ini pada tahun 2000 *ialah* RM1400. *Cari jumlah kos
yang sepadan pada tahun* 2006. [2 *markah*]

(*d*)   The cost of the items decreases by 10% from the year 2006 to the year 2008. Find
the composite index for the year 2008 based on the year 2000. [2 *marks*]
Kos barangan itu menurun 10% *dari tahun* 2006 *ke tahun* 2008. *Cari indeks
gubahan pada tahun* 2008 *berasaskan tahun* 2000. [2 *markah*]

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

THE UPPER TAIL PROBABILITY Q(z) FOR THE NORMAL DISTRIBUTION N(0, 1)
KEBARANGKALIAN HUJUNG ATAS Q(z) BAGI TABURAN NORMAL N(0, 1)

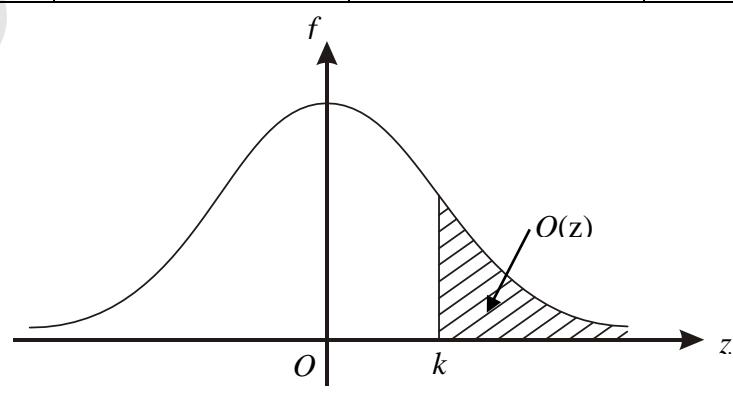| z	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
														Minus / *Tolak*					
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641	4	8	12	16	20	24	28	32	36
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247	4	8	12	16	20	24	28	32	36
0.2	0.4207	0.4168	0.4129	0.4090	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

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

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

$$Q(z) = \int_k^\infty f(z)\, dz$$

Example / *Contoh*::
If $X \sim N(0, 1)$, then
Jika $X \sim N(0, 1)$, *maka*
$P(X > k) = Q(k)$
$P(X > 2.1) = Q(2.1) = 0.0179$

NO. KAD PENGENALAN   KELAS

ANGKA GILIRAN NAMA

Arahan Kepada Calon

1. Tulis nombor kad pengenalan, angka giliran, kelas dan nama anda pada petak yang disediakan.
2. Tandakan (/) pada soalan yang dijawab.
3. Ceraikan helaian ini dan ikat sebagai muka hadapan bersama-sama dengan kertas jawapan.

Kod Pemeriksa				
Bahagian	Soalan	Soalan Dijawab	Markah Penuh	Markah Diperoleh (Untuk Kegunaan Pemeriksa)
A	1		5	
	2		8	
	3		7	
	4		7	
	5		7	
	6		6	
B	7		10	
	8		10	
	9		10	
	10		10	
	11		10	
C	12		10	
	13		10	
	14		10	
	15		10	
JUMLAH				

INFORMATION FOR CANDIDATES
MAKLUMAT UNTUK CALON

1. This question paper consists of three sections : **Section A**, **Section B** and **Section C**.

   *Kertas soalan ini mengandungi tiga bahagian : **Bahagian** **A**, **Bahagian** **B** dan **Bahagian** **C**.*

2. Answer **all** questions in **Section A**, any **four** questions from **Section B** and any **two** questions from **Section C**.

   *Jawab **semua** soalan dalam **Bahagian** **A**, mana-mana **empat** soalan daripada **Bahagian** **B** dan mana-mana **dua** soalan daripada **Bahagian** **C**.*

3. Write your answers on the 'kertas jawapan' provided. If the 'kertas jawapan' is insufficient, you may ask for 'helaian tambahan' from the invigilator.

   Jawapan anda hendaklah ditulis di dalam kertas jawapan yang disediakan. Sekiranya buku jawapan tidak mencukupi, sila dapatkan helaian tambahan daripada pengawas peperiksaan.

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. The diagrams in the questions provided are not drawn to scale unless stated.

   Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.

6. The marks allocated for each question and sub-part of a question are shown in brackets.

   Markah yang diperuntukkan bagi setiap soalan dan ceraian soalan ditunjukkan dalam kurungan.

7. The Upper Tail Probability Q (z) For The Normal Distribution N(0, 1) Table is provided on page **20** .

   *Jadual Kebarangkalian Hujung Atas Q (z) Bagi Taburan Normal N(0, 1) disediakan di halaman **20**.*

8. A list of formulae is provided on pages **2** to **3**.

   *Satu senarai rumus disediakan di halaman **2** hingga **3**.*

9. You may use a scientific calculator.

   Anda dibenarkan menggunakan kalkulator saintifik.

BAHAGIAN PENGURUSAN
SEKOLAH BERASRAMA PENUH
DAN SEKOLAH KECEMERLANGAN
KEMENTERIAN PELAJARAN MALAYSIA

PEPERIKSAAN PERCUBAAN SPM
TINGKATAN 5

2015

ADDITIONAL MATHEMATICS

Paper 1
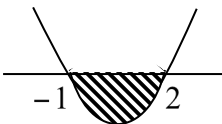
MARKING SCHEME

This marking scheme consists of 6 printed pages

MARKING SCHEME

Question	Answers	Sub Mark	Mark
1	(a) $p = 10$	1	**3**
	(b) $h : x \to \dfrac{1}{x}, x \neq 0$ or equivalent	1	
	Fungsi kerana hubungan satu dengan satu	1	
2	(a) $q = 3$	2	**4**
	B1: $2 = \dfrac{4}{5-q}$		
	(b) $h(x) = \dfrac{3x+4}{x}, x \neq 0$	2	
	B1: $y = \dfrac{4}{x-3}$ or $y(x-3) = 4$		
3	-1.637 or 2.137	3	**3**
	B2: $\dfrac{-(-1) \pm \sqrt{(-1)^2 - 4(2)(-7)}}{2(2)}$		
	B1: $2x^2 - x - 7 = 0$		
4	$p = 8$	2	**2**
	B1: $3\left(\dfrac{5}{3}\right)^2 - \dfrac{5}{3}p + 5 = 0$		
5	(a) $p = 3$	1	**3**
	(b) $q = 2$	1	
	(c) $x = 3$	1	
6	$-1 < x < 2$	3	**3**
	B2: $(x-2)(x+1) < 0$ or		
	B1: $x^2 - x - 2 < 0$		

7	$n^3 - n^{-2}$ or $n^3 - \dfrac{1}{n^2}$ B2: $(2^3)^m - (2^2)^{-m}$ B1: 2^3 or 2^2	3	**3**
8	$y = 8x - 1$ B2: $\dfrac{y+1}{x} = 2^3$ or $\dfrac{y+1}{8} = x$ B1: $3\log_2 2$ or $\dfrac{y+1}{3}$ or $\dfrac{y+1}{8}$	3	**3**
9	$n = 6$ B2: $\log(1.05)^n > \log 1.3$ B1: $300000(1.05)^n > 390000$	3	**3**
10	(a) 12.6, 25.2, 37.8, 50.4 (b) 12.6	1 1	**2**
11	(a) 9 (b) 9207 B1: $\dfrac{9(2^{10}-1)}{2-1}$	1 2	
12	(a) $\dfrac{y^2}{x} = -2x + 10$ (b) $p = 5$ and $q = 4$ B2: $p = 5$ or $q = 4$ B1: $0 = -2p + 10$ or $q = -2(3) + 10$	1 3	**4**

13	$-150 = -2(100) + 50$ Tiang bendera perlu dipindahkan sebab terletak diatas lorong (mesti tunjukkan coordinat diuji) B3: $y = -2x + 50$ Equation of perpendicular bisector Canteen and Block B B2: $y - 150 = -2*\left(x - (-50)\right)$ B1: Gradient of canteen and blok B, $m_{CB} = \dfrac{225 - 75}{100 - (-200)} = \dfrac{1}{2}$	4	**4**
14	(a) 3 (b) $\dfrac{10}{3}$ B1: $-\dfrac{q}{2} = -\dfrac{5}{3}$ or $m = -\dfrac{5}{3}$	1 2	**3**
15	(a) $\dfrac{-p}{\sqrt{p^2 + 1}}$ (b) $\dfrac{1 - p}{1 + p}$ B1: $\dfrac{\tan 45° - \tan\theta}{1 + \tan 45° \tan\theta}$	1 2	**3**
16	82.22 B2: $\dfrac{1}{2}(6)^2\left(\dfrac{\pi}{2}\right) - \dfrac{1}{2} \times 6 \times 6$ B1: $\dfrac{1}{2}(6)^2\left(\dfrac{\pi}{2}\right)$ or $\dfrac{1}{2} \times 6 \times 6$	3	**3**
17	(a) $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$ (b) 3**i** - 7**j**	1 1	**2**

18	(a) $unit\ vector\ \overrightarrow{PQ} = \dfrac{1}{\sqrt{13}}\left(2\underline{s} - 3\underline{r}\right)$ B1: $\overrightarrow{PQ} = 2\underline{s} - 3\underline{r}$ or $\sqrt{2^2 + \left(-3\right)^2}$ (b) $a = 5$ $b = -8$	2 1 1	**4**
19	$-\dfrac{432}{3125}$ or -0.1382 B2: $f\ ''(x) = \dfrac{432}{(3x-5)^5}$ or equivalent B1: $\dfrac{-36}{(3x-5)^4}$ or equivalent	3	**3**
20	$(2.5,\ 8.75)$ B3: $x = 2.5$ B2: $-2x + 6 = 1$ B1: $\dfrac{dy}{dx} = -2x + 6$ or gradient, $m = 1$	4	**4**
21	$V = 2t^3 - \dfrac{3t^2}{2} + t - 1$ B2: $11 = 2(2)^3 - \dfrac{3(2)^2}{2} + 2 + c$ or $c = -1$ B1: $\dfrac{dA}{dt} = 6t^2 - 3t + 1$ or $A = \int 6t^2 - 3t + 1\,dt$	3	**3**
22	$k = 4$ B2: $42 = 39.5 + \left(\dfrac{\frac{24+k}{2} - 11}{12}\right) \times 10$ B1: 39.5 or 11 or 12		

23	a) 300	2	**4**
	B1 : $^6C_2 \times {^6C_3}$		
	b) 48	2	
	B1 : $2! \times 4!$		
24	(a) $x = 8$	2	**4**
	B1: $\dfrac{x}{x+24} = \dfrac{1}{4}$		
	(b) $\dfrac{95}{248}$	2	
	B1: $\dfrac{20}{32} \times \dfrac{19}{31}$		
25	(a) $n = 4$ and $p = 0.75$	2	**4**
	B1: $np = 3$ or $npq = 0.75$		
	(b) 0.4219	2	
	B1: $^4C_3 (0.75)^3 (0.25)$		

END OF MARKING SCHEME

SULIT
3472/2
Additional Mathematics
Kertas 2
Ogos
2015

BAHAGIAN PENGURUSAN SEKOLAH BERASRAMA PENUH
DAN SEKOLAH KECEMERLANGAN

PENTAKSIRAN DIAGNOSTIK AKADEMIK SBP 2015
PERCUBAAN SIJIL PELAJARAN MALAYSIA

ADDITIONAL MATHEMATICS

Kertas 2

PERATURAN PEMARKAHAN
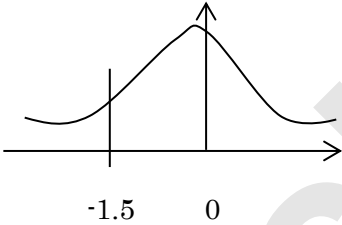
Peraturan pemarkahan ini mengandungi 14 halaman bercetak

Number	Solution and Marking Scheme	Sub Marks	Full Marks
1	$x = 3y - 1$	P1	
	$2(3y-1)^2 + 11y^2 + 2(3y-1) + 2y = 0$	K1	
	$29y^2 - 4y = 0$		
	$y(29y - 4) = 0$ **or** $y = \dfrac{-(-4) \pm \sqrt{(-4)^2 - 4(29)(0)}}{2(29)}$	K1	
	$y = 0$, $\dfrac{4}{29}$ @ 0.1379	N1	
	$x = -1$, $-\dfrac{17}{29}$ @ -0.5862	N1	**5**
2 (a)	LHS $= \sin(x + x)$	K1	
	$= \sin x \cos x + \cos x \sin x$	N1	
	$= 2 \sin x \cos x$		
	$=$ RHS		
(b) (i)			
	Shape of sin graph	P1	
	Amplitude $= 3$	P1	
	2 cycles for $0 \le x \le 2\pi$ **or** 1.5 cycle for $0 \le x \le \dfrac{3\pi}{2}$	P1	
(ii)	$y = \dfrac{3x}{2\pi}$	N1	
	Correct gradient **or** correct y-intercept	K1	
	Number of solutions $= 4$	N1	**8**

Number	Solution and Marking Scheme	Sub Marks	Full Marks
3 (a)	$A(0,3)$	N1	
(b)	$-\left(x - \dfrac{m}{2}\right)^2 + \boxed{\dfrac{m^2}{4} + 3}$	K1	
	Compare	K1	
	$m = 2$	N1	
	$n = 4$	N1	
	OR		
	$\dfrac{dy}{dx} = -2x + m = 0$	K1	
	$-2(1) + m = 0$		
	$m = 2$	N1	
	$f(x) = -(1)^2 + 2(1) + 3 = n$	K1	
	$n = 4$	N1	
	OR		
	$1 = -\dfrac{m}{2(-1)}$ $\left(\text{**Use** } x = -\dfrac{b}{2a}\right)$	K1	
	$m = 2$	N1	
	$f(x) = -(1)^2 + 2(1) + 3 = n$	K1	
	$n = 4$	N1	
(c)	$a(x + p)^2 + q$		
	$a = 1$ **or** $p = -1$ **or** $q = -4$	N1	
	$f(x) = (x - 1)^2 - 4$	N1	
	OR		
	$ax^2 + bx + c$		
	$a = 1$ **or** $b = -2$ **or** $c = -3$	N1	
	$f(x) = x^2 - 2x - 3$	N1	7

Number	Solution and Marking Scheme	Sub Marks	Full Marks
4 (a)	*See* 1.03 $T_6 = 40000(1.03)^5$ $= 46370.96$ **Accept** 46370 **or** 46371	P1 K1 N1	
(b)	$T_n > 3(40000)$ $40000(1.03)^{n-1} > 120000$ $\log(1.03)^{n-1} > \log 3$ $(n-1) > \dfrac{\log 3}{\log 1.03}$ $n > 38.17$ $n = 39$ Year 2048	K1 K1 K1 N1	7
5 (a)	$\overrightarrow{RP} = -\underline{r} + \underline{p}$ $\overrightarrow{OS} = \underline{p} + \dfrac{1}{3}\underline{r}$	N1 N1	
(b)	$\overrightarrow{RT} = \lambda(-\underline{r} + \underline{p})$ **or** $\overrightarrow{RT} = -\lambda\underline{r} + \lambda\underline{p}$ $\overrightarrow{RT} = -\underline{r} + \mu\left(\underline{p} + \dfrac{1}{3}\underline{r}\right)$ **or** $\overrightarrow{RT} = \left(\dfrac{1}{3}\mu - 1\right)\underline{r} + \mu\underline{p}$ $\mu = \dfrac{3}{4}$, $\lambda = \dfrac{3}{4}$	K1 K1 N1 (both)	
(c)	Area $= \dfrac{1}{2} \times \dfrac{4}{3} \times 10 = \dfrac{20}{3}$ $unit^2$	K1 N1	7

Number	Solution and Marking Scheme	Sub Marks	Full Marks
6 (a)	Mean $P = \dfrac{10.38+10.4+10.6+10.7+10.82}{5}$ **or** Mean $Q = \dfrac{10.48+10.5+10.60+10.62+10.7}{5}$	K1 (Mean)	
	Standard Deviation $P = \sqrt{\left(\dfrac{(10.38)^2+(10.4)^2+(10.60)^2+(10.7)^2+(10.82)^2}{5}\right.} - (10.58)^2$ **or** Standard Deviation $Q = \sqrt{\left(\dfrac{(10.48)^2+(10.50)^2+(10.60)^2+(10.62)^2+(10.70)^2}{5}\right.} - (10.58)^2$	K1 (s.d)	
	Mean $P = 10.58$ @ Mean $Q = 10.58$ (both) Standard Deviation $P = 0.17$ Standard Deviation $Q = 0.08$	N1 (Nilai)	
	Athlete Q represent the country because he has **smaller standard deviation**	N1	
(b)	Original mean of Athlete $Q = 10.58$ New mean $= 10.58 - 0.35$ $= 10.23$ s Gold Medal	K1 N1	**6**

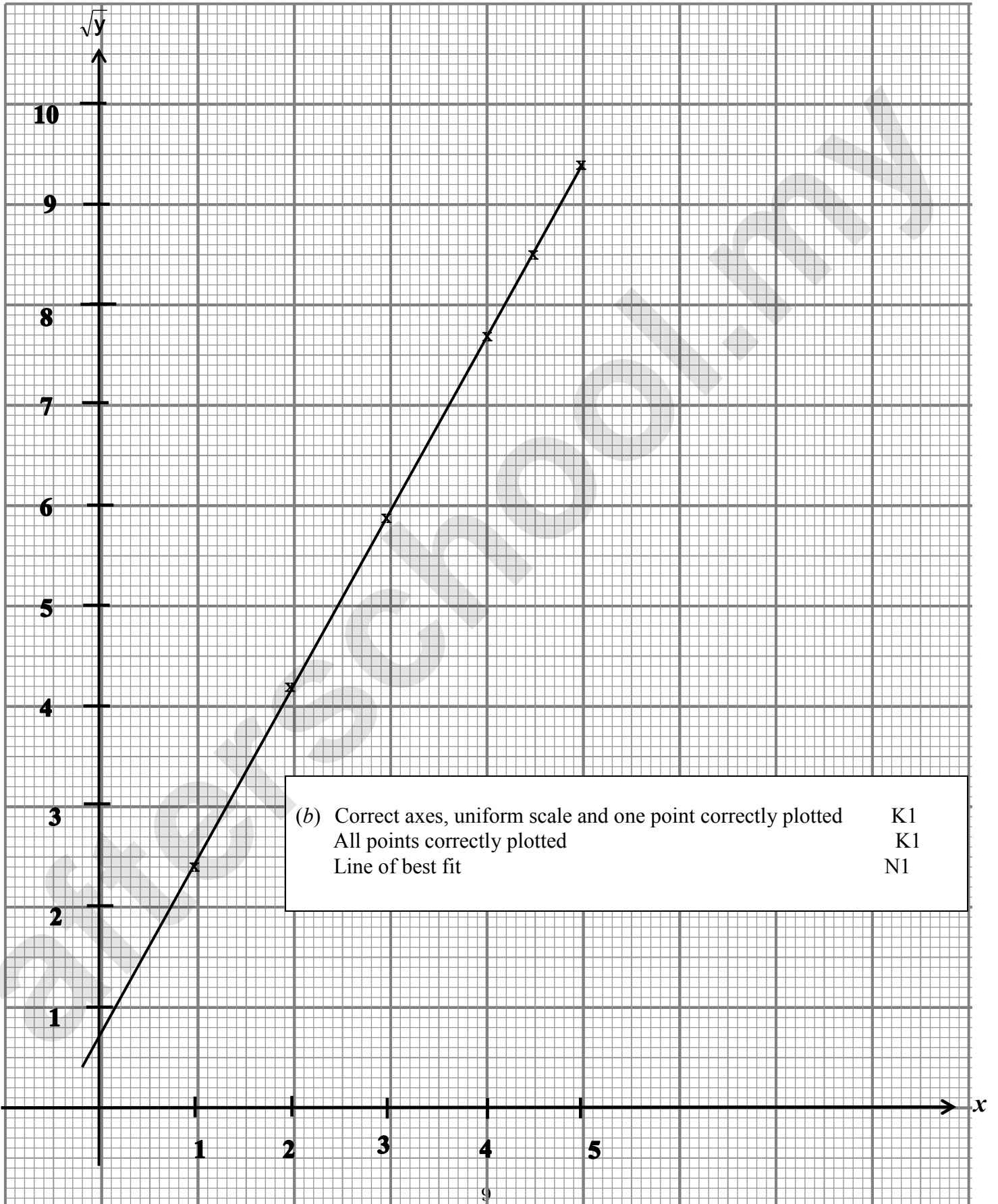| Number	Solution and Marking Scheme	Sub Marks	Full Marks
7 (a) (i)	$p = 0.6$, $q = 0.4$, $n = 4$ $P(x = 2)$ ${}^4C_2 (0.6)^2 (0.4)^2$ 0.3456	K1 N1	
(ii)	$P(X = 0) = {}^4C_4 (0.6)^4$ 0.1296 @ $\dfrac{81}{625}$	K1 N1	
(b) (i)	$\dfrac{160 - 172}{8}$ or $\dfrac{172 - 172}{8}$ $P(-1.5 < Z < 0)$ -1.5 0 0.4332 Find the probability of correct area $0.5 - P(Z>1.5)$ **or** $Q(-1.5)$	K1 K1 N1	
(ii)	$P(X > k) = 0.8$ $P\left(Z > \dfrac{k - 172}{8}\right) = 0.8$ See 0.842 $\dfrac{k - 172}{8} = -0.842$ $k = 165.264$ @ 165.26	P1 K1 N1	**10**

Number	Solution and Marking Scheme	Sub Marks	Full Marks
8 (a)	$\dfrac{dy}{dx} = -2x$ $y = \int -2x \ dx$ $y = -x^2 + c$ $M\,(4,0)$ $0 = -4^2 + c$ $c = 16$ $y = -x^2 + 16$	P1 K1 N1	
(b)	<u>Find area of A_1</u> $\dfrac{1}{2} \times 20 \times 20 = 200$ **OR** $\displaystyle\int_0^{20} (12 - x) \ dx = \left[12x - \dfrac{x^2}{2} \right]_0^{20} = 200$ <u>Use $\displaystyle\int_0^4 y \ dx$ to find area of A_2</u> $\displaystyle\int_0^4 (-x^2 + 16) \ dx = \left[-\dfrac{x^3}{3} + 16x \right]_0^4$ $\qquad\qquad = \dfrac{128}{3}$ <u>*A_1 $-$ *A_2</u> $200 - \dfrac{128}{3} = \dfrac{472}{3} = 157\dfrac{1}{3}$	K1 K1 K1 N1	
(c)	$\pi \displaystyle\int_0^{16} (-y + 16) \ dy$ $\pi \left[-\dfrac{y^2}{2} + 16y \right]_0^{16}$ 128π	K1 K1 N1	**10**

Number	Solution and Marking Scheme	Sub Marks	Full Marks
9		N1	

x	1	2	3	4	4.5	5
$\sqrt{y}$	2.42	4.16	5.89	7.62	8.5	9.35

(a) Refer to graph

(b) (i) $\sqrt{y} = \dfrac{3}{b}x + \dfrac{3a}{b}$ **or**   equivalent   P1

$\dfrac{3}{b} = {}^*m$ K1

$b = 1.7325$ N1

(ii) $\dfrac{3a}{b} = {}^*c$ KI

$a = 0.4043$ NI

(iii) $x = 5.4$ NI

Full Marks: 10

Question 9

x	1	2	3	4	4.5	5
$\sqrt{y}$	2.42	4.16	5.89	7.62	8.5	9.35

(b) Correct axes, uniform scale and one point correctly plotted   K1
All points correctly plotted   K1
Line of best fit   N1

| Number	Solution and Marking Scheme	Sub Marks	Full Marks
10 (a)	D (8,0) C (0,-4)	N1 N1	
(b)	Gradient of CD = ½ **or** Gradient of DR = -2 Equation of CR **or** DR $y = -2(x-8)$ **or** y -(-4)=1(x-0) **or** using other valid method DR ; $y = -2x + 16$ CR ; $y = x - 4$	K1 K1 N1 N1	
(c)	* $x - 4 = $ * $- 2x + 16$ (solve simulteniously) $x = 20/3$ and $y = 8/3$, $R\left(\dfrac{20}{3}, \dfrac{8}{3}\right)$	K1 N1	
(d)	Luas segitiga CDR $= \dfrac{1}{2}\left|\left[(8)^*\left(\dfrac{8}{3}\right) + {}^*\left(\dfrac{20}{3}\right)(-4) + (0)(0)\right] - \left[(0)^*\left(\dfrac{20}{3}\right) + {}^*\left(\dfrac{8}{3}\right)(0) + (-4)(8)\right]\right|$ $= 13\dfrac{1}{3}$ unit^2 .	K1 N1	**10**
11 (a)	$10\,\theta = 12$ $\theta = 1.2$	K1 N1	
(b)	2π - *1.2 $4(2\pi - 1.2)$ $6 + 12 + 6 + 4(2\pi - *1.2)$ 44.33 // 44.34	P1 K1 K1 N1	

Number	Solution and Marking Scheme	Sub Marks	Full Marks
(c)	$\frac{1}{2}(10)^2(1.2)$	K1	
	$\frac{1}{2}(4)^2(2\pi - *1.2)$	K1	
	$\frac{1}{2}(10)^2(1.2) + \frac{1}{2}(4)^2(2\pi - *1.2)$	K1	
	100.67	N1	**10**
12 (a) (i)	3 m/s	N1	
(ii)	$6t - t^2 - 5 = 0$ $t = 1 , 5$	K1 N1	
(iii)	maximum velocity , $\dfrac{dv}{dt} = 0$ $6 - 2t = 0$ $t = 3$ $v = 6(3^*) - (3^*)^2 - 5$ $= 4$	K1 K1 N1	
(b)	$\int v\, dt$ $S = 3t^2 - \dfrac{t^3}{3} - 5t$	K1	
	Find S when $t = *1$ **or** $t = 4$	K1	
	Use $\left\| *S_{t=1} \right\| + \left\| *S_{t=1} \right\| + *S_{t=4}$	K1	
	or $\left\| *S_{t=1} \right\| + *S_{t=4} - S_{t=1}$		
	$11\frac{1}{3}$	N1	**10**

11

Number	Solution and Marking Scheme	Sub Marks	Full Marks
13 (a)	$\dfrac{\sin R}{10} = \dfrac{\sin 40}{7}$ $\angle R = 66.68°$ $\therefore \angle PRQ = 113.32°$	K1 K1 N1	
(b)	$PS^2 = 8^2 + 7^2 - 2(8)(7)\cos 66.68^0$ $PS^2 = 68.66$ $PS = 8.286$	K1 N1	
(c)	$\dfrac{1}{2} * (8.286)(12)\sin P = 30$ $\therefore \angle SPT = 37.11°$ // $37.12°$	K1 N1	
(d)	Area PRS $= \dfrac{1}{2}(7)(8)sin * 66.68^0$ $= 25.71$ $\therefore area\ of\ quadrilateral = * 25.71 + 30$ $= 55.71$	K1 K1 N1	10

Number	Solution and Marking Scheme	Sub Marks	Full Marks
15 (a)	Use $\dfrac{Q_1}{Q_0} \times 100$ for x, y or z. $x = 0.90$ $y = 120$ $z = 1.75$	K1 N2,1,0	
(b)	15, 25, 40, 20 $\dfrac{(150 \times {}^*15) + ({}^*120 \times 25) + (125 \times 40) + (140 \times 20)}{15 + 25 + 40 + 20}$ 130.50	P1 K1 N1	
(c)	$\dfrac{P_{2006}}{1400} \times 100 = 130.50$ RM1827	K1 N1	
(d)	$\dfrac{90 \times 130.50}{100}$ 117.45	K1 N1	10

END OF MARKING SCHEME

Answer for question 14
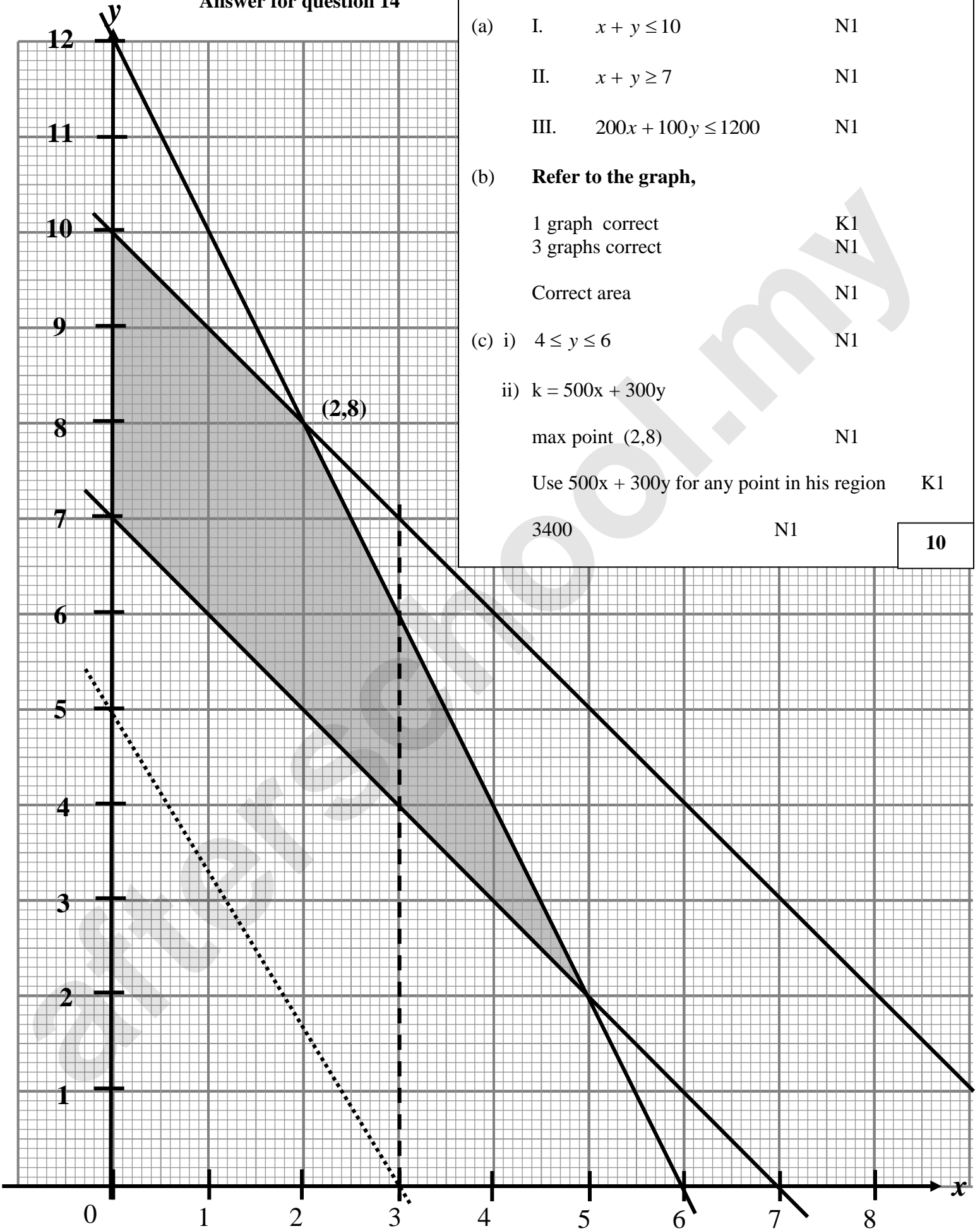
(a) I. $x + y \leq 10$ N1

     II. $x + y \geq 7$ N1

     III. $200x + 100y \leq 1200$ N1

(b) **Refer to the graph,**

     1 graph correct   K1
     3 graphs correct   N1

     Correct area   N1

(c) i) $4 \leq y \leq 6$ N1

    ii) $k = 500x + 300y$

        max point (2,8)   N1

        Use $500x + 300y$ for any point in his region   K1

        3400   N1

        10