3472/2
Additional
Mathematics

Sept 2013

PROGRAM PENINGKATAN PRESTASI AKADEMIK SPM 2013

ADDITIONAL MATHEMATICS

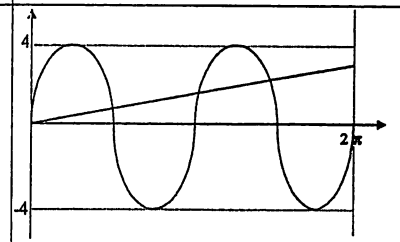
Paper 2

(SET A)

MARKING SCHEME

(46)

MARKING SCHEME
ADDITIONAL MATHEMATICS PAPER 2 2013

NO.	SOLUTION	MARKS
1	$x=2y+5$ or $2y=x-5$ $(2y+5)^2+2y=7$ $x^2+x-5=7$ $2y^2+11y+9=0$ $x^2+x-12=0$ $(2y+9)(y+1)=0$ $(x+4)(x-3)=0$ $x=-4$ and $x=3$ (both) $y=-\frac{9}{2}$ and $y=-1$ (both)	P1 K1 Eliminate y K1 Solve quadratic equation N1 N1
		5
2 (a)	$3x^2+7x-6=0$ $(3x-2)(x+3)=0$ $x=\frac{2}{3}$ or $x=-3$ $h=\frac{2}{3}$, $k=-3$	K1 N1 N1
(b)	$3x^2+7x-6>0$ $x<-3$ and $x>\frac{2}{3}$	K1 N1
		5
3 (a) (b)	 $y=\frac{x}{\pi}$ draw the straight line $y=\frac{x}{\pi}$ Number of solutions = 4	P1 sin shape correct. P1 Amplitude = 4 P1 2 full cycle in $0 \le x \le 2\pi$ P1 [Maximum = 4 and Minimum = −4] N1 For equation K1 Sketch the straight line N1
		7

15. Table 15 shows the prices and the price indices of four ingredients *T*, *U*, *V*, and *W*, used to make bread. Diagram 15 shows the relative quantity of the ingredients used.

Ingredient *Bahan*	Price (RM) *Harga (RM)*		Price index in the year 2011 based on year 2010 *Indeks harga pada tahun 2011 berasaskan tahun 2010*
	2010	2011	
T	5	6.50	130
U	6	9	*p*
V	*q*	3.50	140
W	4	5.40	135

Table 15 / *Jadual* 15

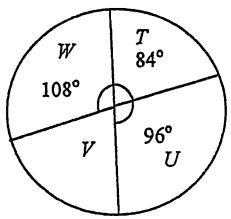


Diagram 15 / *Rajah* 15

(*a*) Find the values of *p* and *q*.

[3 *marks*]

(*b*) Calculate the composite index of the cost of making bread in the year 2011 based on year 2010.

[3 *marks*]

(*c*) The cost of making bread increased by 15% from year 2011 to year 2012. Calculate

(i) the composite index in the year 2012 using the year 2010 as the base year.

(ii) the cost of making the bread in the year 2011 if the cost in year 2010 is RM50.

[4 *marks*]

Jadual 15 *menunjukkan harga dan indeks harga bagi empat bahan T, U, V, dan W yang digunakan untuk membuat roti. Rajah* 15 *menunjukkan kuantiti relatif bagi penggunaan bahan-bahan itu.*

(*a*) *Cari nilai bagi p dan q.*

[3 *markah*]

(*b*) *Hitung nombor indeks gubahan bagi kos pembuatan roti itu pada tahun* 2011 *berasaskan tahun* 2010.

[3 *markah*]

(*c*) *Harga untuk membuat roti telah meningkat sebanyak* 15% *dari tahun* 2011 *hingga* 2012. *Hitungkan*

(i) *nombor indeks gubahan pada tahun* 2012 *dengan menggunakan tahun* 2010 *sebagai tahun asas.*

(ii) *kos untuk membuat roti pada tahun* 2011 *jika kosnya pada tahun* 2010 *ialah* RM50.

[4 *markah*]

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

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4 (a)	(i)	
	$\overline{BC} = \overline{BA} + \overline{AC}$	K1
	$\overline{BC} = -4\underset{\sim}{x} + \underset{\sim}{y}$	N1
	(ii)	
	$\overline{PC} = \overline{PA} + \overline{AC}$	N1
	$\overline{PC} = -\underset{\sim}{x} + \underset{\sim}{y}$	
	(iii)	K1
	$\overline{AQ} = \overline{AP} + \overline{PQ}$	
	$\overline{AQ} = \frac{2}{3}\underset{\sim}{x} + \frac{1}{3}\underset{\sim}{y}$	N1
(b)	$\overline{AQ} = h\overline{QR}$	K1 find h
	$h = 1$	
	A, Q, R are collinear.	N1
		N1
		8
5 (a)	median = $25{\cdot}5 + \left[\frac{\frac{1}{2}(48) - 23}{15}\right](5)$	P1 for L=24.5 or F=23 or f_m=15
		K1 use correct formula
	$=25{\cdot}8333$	N1
(b)	new mean=2(8)+5= 21	K1 N1
	new standard devition=2(4)=8	K1 N1
		7

6 (a)	$\frac{1}{4}\pi p^2, \frac{1}{16}\pi p^2, \frac{1}{64}\pi p^2, \ldots$	K1
	$\frac{\frac{1}{16}\pi p^2}{\frac{1}{4}\pi p^2} = \frac{\frac{1}{64}\pi p^2}{\frac{1}{16}\pi p^2}$,	K1
	$r = \frac{1}{4}$	N1
(b)	(i)	
	$900\pi(\frac{1}{4})^{n-1} = \frac{225}{256}\pi$	K1K1
	$n = 6$	N1
	(ii)	
	$S_\infty = \frac{900\pi}{1-\frac{1}{4}}$	K1
	1200π	N1
		8

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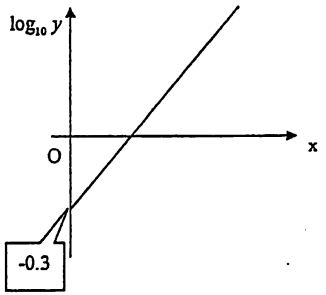
7			
(a)			N1 6 correct values of $\log y$

x	1	2	3	4	5	6
$\log_{10} y$	- 0.15	0	0.14	0.30	0.46	0.60

(b)



K1 Plot $\log_{10} y$ vs x. Correct axes & uniform scale

N1 6 points plotted correctly

N1 Line of best-fit

(c) $\log y = kx - \log_{10} h$ — P1

(i) $-\log_{10} h$ = *y-intercept — K1
$h = 2.00$ — N1

(ii) k = *gradient — K1
$= 0.15$ — N1

(iii) $y = 1.70$ — N1

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N0.	SOLUTION	MARKS
8		
(a)	2.095 rad	N1
(b)	$AB = 5.07$ cm	K1
	$S_{BC} = 12(30 \times \frac{\pi}{180})$ or $S_{AC} = 4(2.095)$	K1 Use $s = r\theta$
	$= 6.28$ $= 8.38$	N1
	Perimeter = 5.07 + 6.28 + 8.38	K1
	= 19.73	N1
(c)	Area of $OBC = \frac{1}{2}(12)^2(30 \times \frac{\pi}{180})$ or Area of $OBC = \frac{1}{2}(4)^2(2.095)$	K1 Use formula $A = \frac{1}{2}r^2\theta$
	$= 37.70$ cm^2 $= 16.76$ cm^2	N1
	Area of the shaded region = 37.70 – 16.76 – 13.86	K1
	= 7.08 cm^2	N1
		10

NO.	SOLUTION	MARKS
9		
(a)	Area of POR = $\frac{1}{2}\begin{vmatrix} 0 & 11 & -1 & 0 \\ 0 & 7 & -2 & 0 \end{vmatrix}$	K1
	$= \frac{1}{2}\lvert -15 \rvert = 7.5$	N1
(b)	Let Q (x,y)	
	$x = \frac{1(11)+2(-1)}{3}$, $y = \frac{1(7)+2(-2)}{3}$	K1 for either x or y
	Q (3 , 1)	N1
(c)	$M_{PR} = \frac{7-(-2)}{11-(-1)} = \frac{9}{12} = \frac{3}{4}$, $m \perp M_{PR} = -\frac{4}{3}$	K1 use gradient correctly
	$y - 1 = -\frac{4}{3}(x-3)$	K1 use forming quadratic equation
	$3y = -4x + 15$	N1
(d)	Let T as (x,y)	
	TP = 2 TR	P1
	$(x+1)^2 + (y+2)^2 = 4[(x-11)^2 + (y-7)^2]$	K1 (use distance formula)
	$3x^2 + 3y^2 - 90x - 60y + 675 = 0$	
	$x^2 + y^2 - 30x - 20y + 225 = 0$	N1
		10

NO.	SOLUTION	MARKS
10.		
(a)	$y = 3x + 2$, $y = x^2 + 2$	
	$3x = x^2$	K1
	$x(x-3) = 0$	
	$x = 0, 3$	K1 for solving quad.equation
	When $x = 3$, $y = 3(3) + 2 = 11$	
	P (3,11)	N1
(b)	$A = \int_0^3 ([3x+2] - (x^2+2))dx$	K1 use $\int (y_2 - y_1)dx$
	$= \left(\frac{3x^2}{2} - \frac{x^3}{3}\right)_0^3$	K1 integrate correctly K1 Subtitute the limit correctly
	$= \frac{27}{2} - \frac{27}{3} = 4\frac{1}{2}$	N1
	Note : If use area of right angle triangle and $\int x\,dy$, give marks accordingly.	
(c)	$V = \pi \int_2^{11} x^2 dy - \frac{1}{3}\pi r^2 h$	K1 correct limit or use volume of cone
	$= \pi \int_2^{11} (y-2)dy - \frac{1}{3}\pi(3)^2(9)$	K1 integrate correctly
	$= \pi\left[\frac{y^2}{2} - 2y\right]_2^{11} - 27\pi$	
	$= (40\frac{1}{2})\pi - 27\pi = 13\frac{1}{2}\pi$	N1
		10

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N0.	SOLUTION	MARKS
11		
(a)	X= Students have their breakfast	
(i)	$p = 0.6$, $q = 1 - 0.6 = 0.4$, $n = 10$	K1 Use $P(X=r) = {}^nC_r\, p^r q^{n-r}$
	$P(X=3) = {}^{10}c_3 0.6^3 0.4^7$	
	$=0.0425$	N1
(ii)		
	$P(X \geq 2) = 1 - P(X=0) - P(X=1)$	K1
	Or $= P(X=2) + P(X=3) + \ldots\ldots + P(X=10)$	K1 Use $P(X=r) = {}^nC_r\, p^r q^{n-r}$
	$= 1 - {}^{10}c_0 0.6^0 0.4^{10} - {}^{10}c_1 0.6^1 0.4^9$	
	$=0.9983$	N1
(b)		
	X= masses of a group of boys, $X \approx N(45,5)$	
(i)		
	$\mu = 45$, $\sigma = 5$	
	$P(X<40) = P\left(Z < \frac{40-45}{5}\right)$	K1 Use $Z = \frac{X-\mu}{\sigma}$
	$= P(Z<-1)$ $= P(Z>1)$	
	$= 0.1587$	N1
(ii)	$P(X>m) = 0.3$	
	$P\left(Z > \frac{m-45}{5}\right) = 0.3$	K1 use $\frac{x-\mu}{\sigma}$
	From table, $\frac{m-45}{5} = 0.524$	K1 equate with z score
	$m - 45 = 2.62$	
	$m = 47.62$ kg	N1
		10

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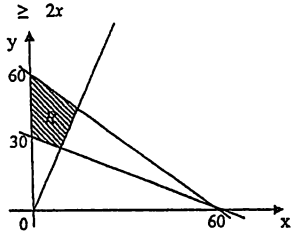
N0.	SOLUTION	MARKS
12		
(a)	$a_{initial} = 4\ ms^{-2}$	N1
(b)	$v = \int (4-2t)dt$	K1 for integrating v
	$= 4t - t^2 + c$	
	$t = 0, v = 12, c = 12$	
	$v = 4t - t^2 + 12$	
	$a = 0, t = 2$	K1
	$V_{max} = 4(2) - (2)^2 + 12$	
	$= 16\ m\ s^{-1}$	N1
(c)	$v = 0$, $(t+2)(-t+6) = 0$	K1
	$t = 6 = p$	N1
(d)	Total distance	K1 for $\int_0^6$ or $\int_6^8$
	$= \left[\int_0^6 (4t^2 - t^2 + 12)dt\right] + \left[\left[\int_6^8 (4t^2 - t^2 + 12)dt\right]\right]$	K1 (for Integration; either one)
	$= \left[2t^2 - \frac{t^3}{3} + 12t\right]_0^6 + \left[\left|2t^2 - \frac{t^3}{3} + 12t\right|_6^8\right]$	K1 (for use and summation)
	$= \left[2(6)^2 + \frac{(6)^3}{3} + 12(6)\right] - 0 + \left[\left|2(8)^2 - \frac{(8)^3}{3} + 12(8)\right| - 2(6)^2 + \frac{(6)^3}{3} + 12(6)\right]$	
	$= 90\frac{2}{3}$	N1
		10

N0.	SOLUTION	MARKS
13 (a)	$18 = \frac{1}{2}(8)(7)\sin\angle QRS$	K1
	$Sin\angle QRS = 0.75$ $\angle QRS = 48.59°$	N1
(b)	$QS^2 = 8^2 + 6^2 - 2(8)(6)\cos 48.59°$	K1
	$QS = 6.042$ cm	N1
(c)	$\frac{6.5}{\sin 49°} = \frac{6.042}{\sin\angle QPS}$	K1
	$Sin\angle QPS = 0.7015$ $\angle QPS = 44.55°$	K1
	$\angle PQS = 180 - 49° - 44.55°$ $= 86.45°$	N1
(d)	Area of $PQRS$ = Area of triangle $QRS + \frac{1}{2}(6.042)(6.5)\sin 86.45°$	K1
	$= 18 + 19.598$	K1
	$= 37.598$	N1
		10

N0.	SOLUTION	MARKS
14 (a)	$x + y \le 60$	N1
	$60x + 120y \ge 3600$ or $x + 2y \ge 60$	N1
	$y \ge 2x$	N1
(b)		
	• At least one straight line is drawn correctly from inequalities involving x and y.	K1
	• All the three straight lines are drawn correctly.	N1
	• Region is correctly shaded.	N1
(c)(i)	12	N1
(ii)	Minimum point (12, 24)	N1
	$30x + 90y = k$	
	Minimum profit = 30(12) + 90(24)	K1
	= RM 2520	N1
		10

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NO.	SOLUTION	MARKS
15 (a)	$p = \frac{9}{6} x100$ atau $140 = \frac{3.5}{q} x100$	K1
	$p = 150$	N1
	$q = RM\,2.50$	N1
(b)	72°(can be seen)	N1
	$\bar{I} = \frac{130x84 + 150x96 + 140x72 + 135x108}{84 + 96 + 72 + 108}$	K1
	$\bar{I}_{11/10} = 138.83$	N1
(c) (i)	$\bar{I}_{12/10} = 138.83x\frac{115}{100}$	K1
	$= 159.65$	N1
(ii)	Cost of making bread in the year 2011	
	$138.83 = \frac{p_{11}}{50} x100$	K1
	$p_{11} = RM69.42$	N1
		10

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END OF MARKING SCHEME