Analysis

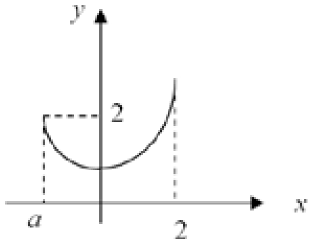
[3472/1]
[3472/2]

Additional Mathematics

NO	TOPICS	PAPER 1					PAPER 2				
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
1	Functions	1,2	1,2,3	1,2,3	1,2,3	1,2,3	2	-	-	-	-
2	Quadratic Equations	3	4	4	4	5	-	-	-	2a,2c	-
3	Quadratic Functions	4,5	5,6	5,6	5,6	4,6	-	-	2	2b	-
4	Simultaneous Equation	-	-	-	-	-	1	1	1	1	1
5	Indices and Logarithms	6,7,8	7,8	7,8	7,8	7,8	-	-	-	-	-
6	Coordinate Geometry	12	13,14	13,14	15	13,14	9	2	10	9	5
7	Statistics	24	22	22	24	22	6	5	5	-	6
8	Circular Measures	16	18	18	12	17	10	9	9	10	11
9	Differentiation	17,18,19	19,20	19,20	19,20	20,21	-	4a,4b	7a	3a,7a	8
10	Solution of Triangles	-	-	-	-	-	13	15	14	12	13
11	Index Number	-	-	-	-	-	15	13	13	13	15
12	Progressions	9,10	9,10,11	9,10,11	9,10,11	9,10,11	3	6	3	6	3
13	Linear Law	11	12	12	12	12	7	7	8	8	7
14	integration	20,21	21	21	18,20,21	19	8	4c,10	7b,7c	3b,7	4
15	Vectors	15,									
16	Trigonometric Functions	15	17	17	16,17	18	4	3	4	4	2
17	Permutations And Combinations	22	22	23	22	23	-	-	-	-	-
18	Probability	23	24	24	23	24	-	-	-	-	-
19	Probability Distributions	25	25	25	25	25	11	11	11	11	10
20	Motion Along A Straight Line	-	-	-	-	-	12	12	12	15	12
21	Linear Programming	-	-	-	-	-	14	14	15	14	14
	TOTAL	25	25	25	25	25	15	15	15	15	15

Additional Mathematic *Paper 1* [3472/1]

1 Diagram 1 shows the graph of a quadratic function $f:x \to x^2+1$ for the domain $a \le x \le 2$.



Find
(a) the value of a,
(b) the range of f(x) corresponding to the given domain. [3 marks]

2 Given $f(x)=5x+a$ and $g(x)=3bx$. Given $fg(x)=30x-3$, find the value of a and of b. [3 marks]

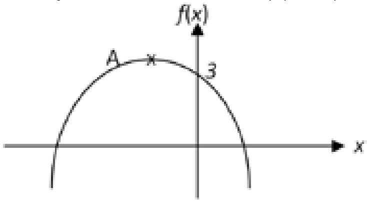
3 Given α and $\frac{1}{\alpha}$ are the roots of the quadratic equation $2x^2+5x+q=0$. Find the value of q. [2 marks]

4 Solve the quadratic equation $(2x+3)^2=4$. [3 marks]

5 Find the possible values of *m* if the straight line $y=x+m$ is the tangent to the curve $y=7x-mx^2$. [3 marks]

6 Find the range of values of x such that $4x^2 \le 9$ [2 marks]

7 Diagram 7 shows a graph of quadratic function $f(x)= a(x+2)^2+4$ such that A is a maximum point.



Find
(a) the coordinates of A,
(b) the value of a.
[3 marks]

8 Solve $4^{\log_3 x}=64$. [2 marks]

9 Solve the equation $32(2^{n-2})+2^{n+3}-2^n= 1$ [4 marks]

10 Given that $\log_3 \sqrt{q}-\log_3 p^2 q = \log_3 \left(\frac{1}{p}\right) +1$, express q in terms of p. [4 marks]

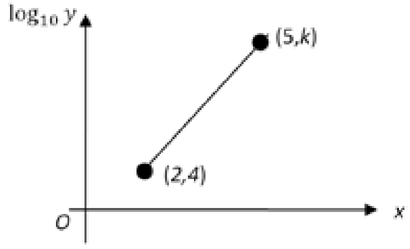
11 Given the third term and the twelfth term of an arithmetic progression are - 13 and 14 respectively.
Find the common difference of the progression. [3 marks]

12 The first term of a geometric progression is four times its third term. Find the common ratio of the progression. [2 marks]

13 Given the second term and the sum to infinity of a geometric progression are 4 and 16 respectively. Find
(a) the common ratio,
(b) the first three terms

of the progression. [4 marks]

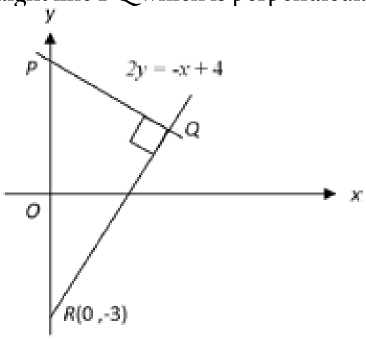
14 Diagram 15 shows a straight line obtained by plotting a graph of $\log_{10} y$ against x. The two variables x and y are related by the equation $y=10^{x+h}$, where h is a constant.



Find the value of h and k. [4 marks]

15 Given three points A (-3, -2), B (7 , 3) and P(1,k) . Point Plies on the straight line AB and divides AB in the ratio m: n. Find
(a) the ratio m :n ,
(b) the value of k . [4 marks]

16 Diagram 16 shows a straight line PQ which is perpendicular to a straight line QR at point Q.



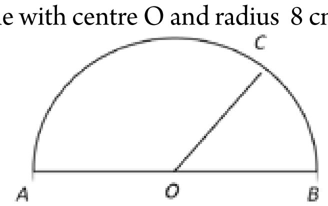
Given the equation of the straight line PQ is $2y = -x + 4$, find
(a) the equation of the straight line RQ ,
(b) the coordinates of point Q. [4 marks]

17 Given vector $\underset{\sim}{a}=2\underset{\sim}{i}-\underset{\sim}{j}$ and $\underset{\sim}{b}=-\underset{\sim}{i}+3\underset{\sim}{j}$, find the value of p if $2p\underset{\sim}{a}+3\underset{\sim}{b}$ is parallel to the y- axis. [2 marks]

18 Point M is (4,-5) and point N is (-6, -3). Find the unit vector in the direction of $\overrightarrow{MN}$. [3 marks]

19 Solve the equation $4 \sin x \cos x = 1$ for $0^0 \le x \le 360^0$. [3 marks]

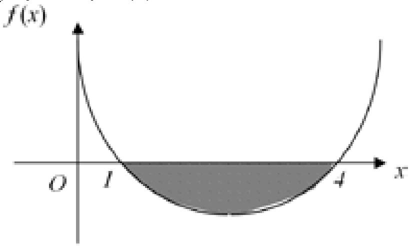
20 Diagram 20 shows the semicircle with centre O and radius 8 cm.



Given the length of arc BC is 5 cm, find the area of sector OAC.
(Use $\pi = 3.142$) [4 marks]

21 The straight line $y = 5x - 7$ is the tangent to the curve with gradient function $kx^2 - x$ at point (1, -2).
Find the value of k. [2 marks]

22 Diagram 22 shows the graph of y=f(x). Given the area of the shaded region is 12 unit2.



Find $\int_1^4 \frac{f(x)+x}{3}\,dx$ [4 marks]

23 Given a set of five positive integers with mode 3, median 4 and mean 5.
(a) Find one possible set of positive integers with the value of mode, median and mean given.
(b) If each of the integers is increased by 2, find the new mode, the new median and the new mean of the new set of positive integers. [4 marks]

24

$X = \{a, b, c, d\}$
$Y = \{2, 3, 4\}$

A code is formed by arranging three alphabets from set X followed by two digits from set Y. Find
(a) the number of possible arrangements for the code,
(b) the probability that these arrangements ends with the digit 2. [3 marks]

25 The marks of a group of students in Additional Mathematics test is normally distributed with mean 55 and standard deviation 6. If 70% of the students have marks more than t, find the value of t. [3 marks]

END OF QUESTION PAPER

Additional Mathematic ***Paper 2*** **[3472/2]**

Section A
[40 marks]
Answer all questions in this section

1. Solve the following simultaneous equations:
$2x-y-2=0$
$2x^2+y-10x+8=0$ [5 marks]

2. The quadratic function $f(x)=ax^2+bx+16$ is negative when $2<x<4$.
   (a) Sketch the graph of $f(x)$. [2 marks]
   (b) Find the values of a and b. [3 marks]
   (c) Express $f(x)$ in the form of $f(x)=a(x-m)^2+n$, where m and n are constants. [2 marks]

3. (a) Prove that $\frac{1}{\cos\theta-\sin\theta}+\frac{1}{\cos\theta+\sin\theta}=2\cos\theta\sec 2\theta$. [2marks]
   (b) (i) Sketch the graph of $y=2\sin 2x$ for $0\leq x\leq\pi$.
   (ii) Hence, using the same axes, sketch a suitable straight line to find the number of solutions for the equation $2\pi\sin 2x+2x=\pi$ for $0\leq x\leq\pi$. [6marks]

4. Table 4 shows the age distribution of the teachers in a school in 2010.

Age (years)	Frequency
23 - 27	6
28 – 32	10
33 – 37	12
38 – 42	k
43 – 47	9
48 - 52	7

   (a) Given the mean age of the workers is 37.75 years, find the value of k. [3marks]
   (b) By using the value of n in (a) and without drawing an ogive, calculate the value of the median. [3 marks]
   (c) Hence, state the mean age and the median age of the teachers in 2012. [2 marks]

5. Diagram 5 shows a triangle OAB where $\overrightarrow{BP}=n\overrightarrow{BA}$ and n is constant.

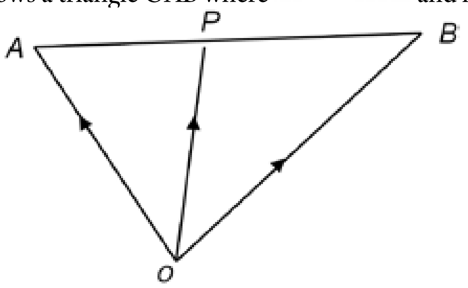
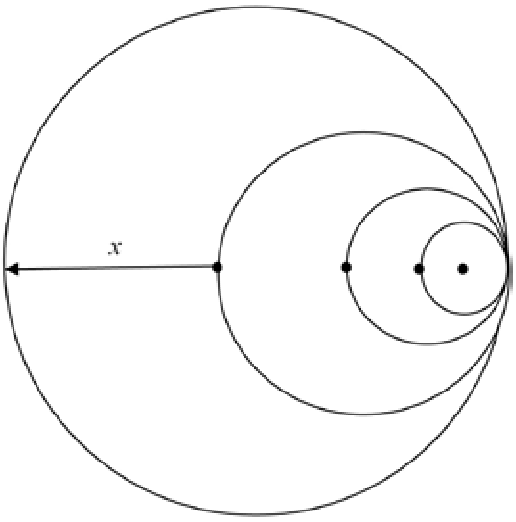


Diagram 5

It is given that $\overrightarrow{OA}=a$ and $\overrightarrow{OB}=b$.

   (a) Show that $\overrightarrow{OA}=n\underline{a}+(1-n)\underline{b}$, [3marks]
   (b) If $\overrightarrow{AP}=3\underline{a}-3\underline{b}$, find the value of n. [3marks]

6. Diagram 6 shows the arrangement of the first four of the infinite series ofcircles. The radiusof the first circle is xcm. The radius of each subsequent circle is half of the radius of the previous circle.



[Use $\pi = 3.142$]

(a) Show that the areas of the circles form a geometric progression. [2 marks]

(b) Given the area of the fourth circles is 4π cm^2, find the value of x . [2 marks]

(c) Hence, find the sum to infinity of the areas ofthe series of circles. [2 marks]

Section B
[40 marks]
Answer any fourquestions from this section.

7 Use graph paper to answer this question.
Table 7 shows the experimental values of two variables x and y known to be related by the equation $y = (p+q)x^p$.

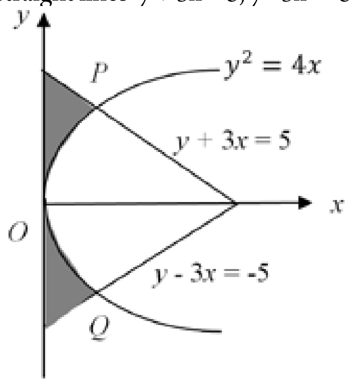
x	1.2	1.6	2.5	4.0	6.3	8.0
y	1.5	1.8	2.6	3.6	5.0	5.8

Table 7

(a) Plot $\log_{10} y$ against $\log_{10} x$, by using a scale of 2 cm to 0.1 unit on both axes.
Hence, draw the line of best fit. [5 marks]

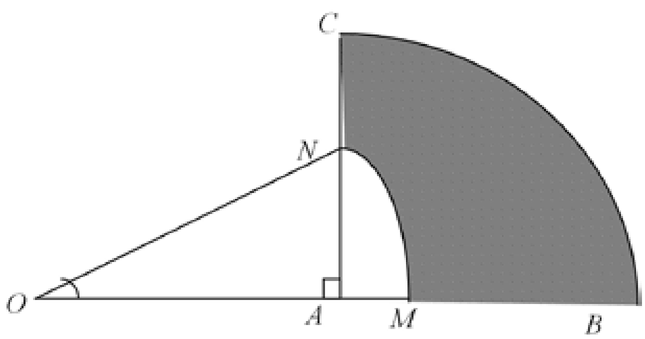
(b) Use your graph in 7(a) to find the value of
i) p,
ii) q. [5 marks]

8. Diagram 8 shows a graph of the straight lines $y + 3x = 5$, $y - 3x = -5$ and the curve $y^2=4x$.



Find
[Use $\pi = 3.142$]
(a) the coordinates of P and Q, [3 marks]
(b) the area of the shaded region, [5marks]
(c) the volume generated when the area bounded by the curve and the line x = 1 is revolved 180^{O} around the x-axis. [2marks]

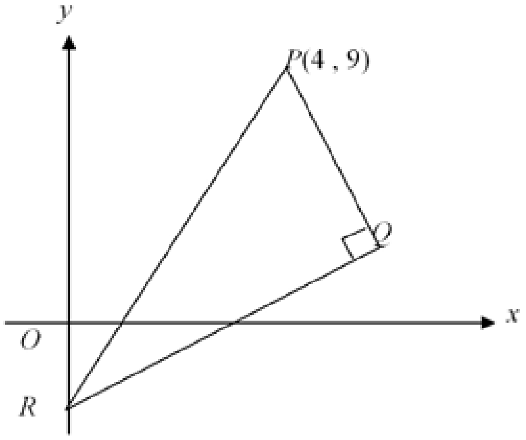
9. Diagram 9 shows the sector ABC with centre A and the sector OMN with centre O.
Point A is the midpoint of OB and point N is the midpoint of AC .



Given OB = 12 cm. Find
[Use $\pi = 3.142$]

(a) $\angle AON$ in radian, [1 marks]
(b) the perimeter of the shaded region, [5 marks]
(c) the area of the shaded region. [4 marks]

10. Solution by scale drawing is not accepted.
Diagram 10 shows a right- angled triangle PQR. The coordinates of P is (4,9) and point R lies on the y-axis.



Given the equation of the straight line QR is2y-x+6=0.

(a) Find

(i) the equation of the straight line PQ,

(ii) the coordinates of Q,

(iii) the area of triangle PQR. [7marks]

(b) The point A moves such that its distance from P is always 5 units. Find the locus of A. [3 marks]

11 (a) The probability of buying a good compact disc from a particular shop is 0.85.

(i) Find the probability that at least 4 compact disc are good if 6 compact discs are bought.

(ii) Calculate the mean and the standard deviation of getting a good compact disc if 6 compact discs are bought. [4 marks]

(b) The mass of each of the fish from a pond follows a normal distribution with a mean of 720 gram and a standard deviation of k gram.

The probability that a fish caught at random from the pond has a mass more than 745.5 gram is 0.0539.
Find the value of k.
If 200 fish has a mass between 700 gram and 740 gram, estimate the total number of fish in the pond. [6 marks]

Section C
[20 marks]
Answer any TWO questions from this section

12. A particle moves in a straight line and passes through a fixed point O. Its velocity, vms^{-1}, is given by $v = t^2 - 7t + k$, where t is the time in seconds after leaving O and k is a constant.
[Take the motion to the right as the positive direction]

(a) Given the initial velocity of the particle is 10 ms^{-1}, find
(i) the value of k,
(ii) the range of values of t during which the particle moves to the left,
(iii) the range of values of t during which the particle accelerates. [5 marks]

(b) (i) Sketch the velocity–time graph of the motion of the particle for $0 \le t \le 5$.
(ii) Hence, or otherwise , calculate the total distance travelled by the particle in the first 4 second after leaving O. [5 marks]

13. Table 13 shows the prices and weightages of four types of items A, B , C and D.

Item	Price(RM) Year 2006	Price(RM) Year 2008	Price Index	Weightage
A	7.00	8.40	w	10
B	13.50	x	130	8
C	y	13.00	115	7
D	11.00	12.10	110	z

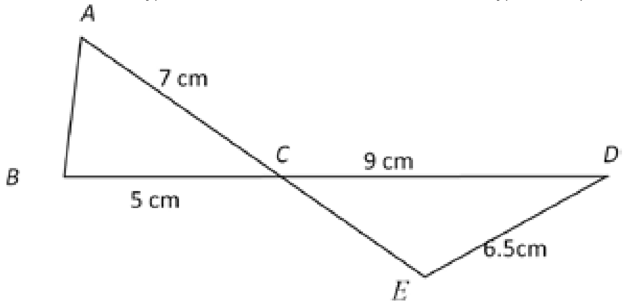
TABLE 3

(a) Calculate the value of w, x and y. [4 marks]

(b) The composite index of these items for the year 2008 based on the year 2006 is 120.
Calculate the value of z. [3 marks]

(c) The total cost of all these items is expected to increase by 10% from the year 2008 to the year 2009.
Find the expected composite index for the year 2009 based on the year 2006. [3 marks]

14. Diagram 14 shows two triangles ABCand CDE. The two triangles are joined at C such that AE and BD are straight lines.



Given that $\angle DCE = 34.050$ and $\angle CED$ is an obtuse angle.
(a) Calculate
(i) $\angle CED$
(ii) the length of AB. [5 marks]
(b) The straight line CE is extended to F such that DE = DF.
Find the area of triangle CDF. [5 marks]

15. Use graph paper to answer this question.

Perdana Youth Club wants to send a number of its members to participate in a motivation course. Given the number of male participants is x and the number of female participants is y. The participation of the members is based on the following constraints:

I : The total number of the participants is at least 100.

II : The number of female participants is at most twice that of the male participants.

III : The fee for each male participant is RM 60 while the fee for each female participant is RM 120. The maximum allocation for the course is RM 12,000.

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

b) By using a scale of 2 cm to 20 participants on the x- axis and 2cm to 10 participants on the y-axis , construct and shade the region R that satisfies all the above constraints. [3 marks]

(c) By using your graph from (b), find

(i) the range of the number of male participants if the number of female participants is 60.

(ii) the minimum allocation needed by the club for its members to participate in the course. [4 marks]

END OF QUESTION PAPER

Jawapan

Additional Mathematics

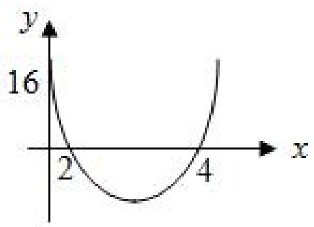
Additional Mathematics Paper 1

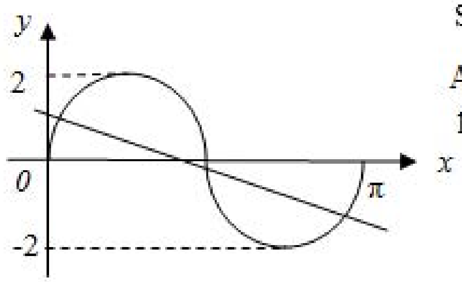
NO	SOLUTION	B mark	TOTAL MARK	NO	SOLUTION	B mark	TOTAL MARK
1	(a) $x^2 + 1 = 2$ $a = -1$ (b) 5	1 1 1	3	2	$5(3bx) + a$ $a = -3$ or $15b = 30$ $a = -3$ and $b = 2$	1 2 3	3
3.	$\alpha \left(\frac{1}{\alpha}\right) \frac{q}{2}$ $= 2$	1 2	2	4	$(2x + 3) = \pm 2$ $x = -\frac{1}{2}$ or $-\frac{5}{2}$ $x = -\frac{1}{2}$ and $-\frac{5}{2}$	1 2 3	3
5	$mx^2 - 6x + m = 0$ $[-6]^2 - 4(m)(m) = 0$ $36 - 4m^2 = 0$ $m = \pm 3$	1 2 3	3	6	$(2x+3)(2x-3) \leq 0$ or graph $-\frac{3}{2} \leq x \leq \frac{3}{2}$	1 2	2
7	(a) A(-2 , 4) (b) $a(0 + 2)^2 + 4 = 3$ $a = -1$	1 1 2	3	8	$4^{\log_3 x} = 4^3$ or $\log_3 x \log_4 4 = \log_4 64$ $\log_3 x = 3$ $x = 27$	1 2 3	3

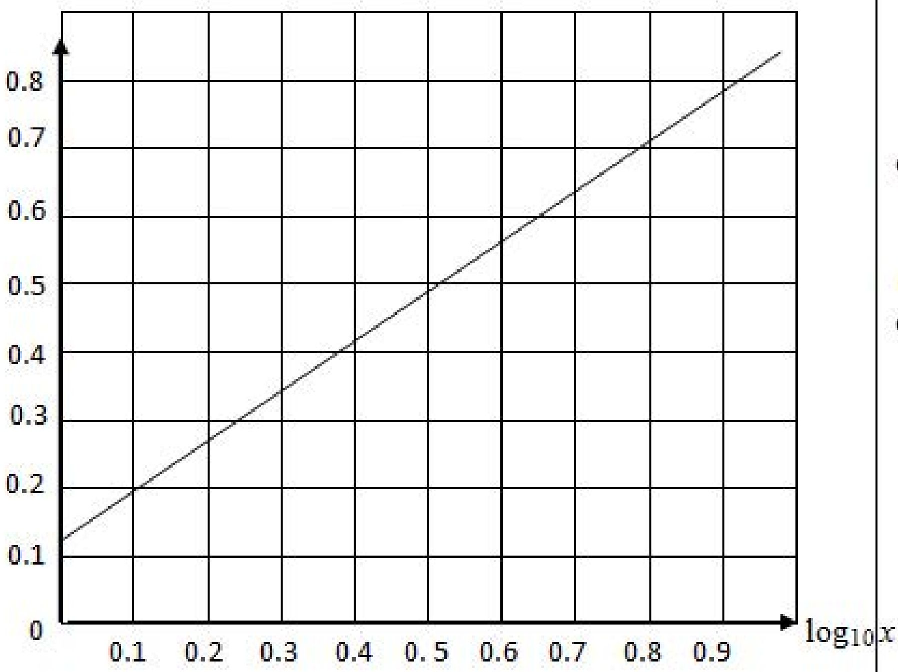
9	$32\left(\frac{2^n}{4}\right)+2^n(8)-2^n=1$	1		10	$\log_3\left[\frac{\sqrt{q}}{p^2q\left(\frac{1}{p}\right)}\right]=1$	1	
	$2^n(8+8-1)=1$	2			$\log_3\left(\frac{1}{p\sqrt{q}}\right)=1$	2	
	$2^n=\frac{1}{15}$	3			$\frac{1}{p\sqrt{q}}=3$	3	
	$n=-3.907$	4	4		$q=\frac{1}{9p^2}$	4	4
11	$a+2d=-13$ Or $a+11d=14$	1		12	$a=4(ar^2)$	1	
	$9d=27$	2			$r=\pm\frac{1}{2}$	2	
	$d=3$	3	3				2
13	(a) $ar=4$ or $\frac{a}{1-r}=16$,	1		14	$\log_{10}y=(x+h)$	1	
	$\frac{4}{r(1-r)}$ 16	2			$4=2+h$ or $k=5+h$	2	
	$r=\frac{1}{2}$	3			$h=2$	3	
					$k=7$	4	4
	(b) 8 , 4 , 2	1	4				
15	(a) 4 : 6	1		16	(a) $m_{RQ}=2$	1	
	2 : 3	2			$y=2x+3$	2	
	(b) $\frac{3(-2)+2(3)}{5}$ k	1			(b) $x=-2$ or $y=-7$	1	
	$k=0$	2	4		$(-2,-7)$	2	4

17	$2p(2\underline{i} - \underline{j}) + 3(-\underline{i} + 3\underline{j})$ $4p - 3 = 0$ $p = \frac{3}{4}$	 1 2	2	18	$\overrightarrow{MN} = \begin{pmatrix} -10 \\ 2 \end{pmatrix}$ $\sqrt{104}$ $\frac{-10\ i + 2\ j}{\sqrt{104}}$	1 2 3	3
19	$\sin 2x = \frac{1}{2}$ $30^0,\ 150^0$ $30^0,\ 150^0,\ 390^0,\ 510^0$	1 2 3	3	20	$\frac{5}{8}\ radian$ 64π or $\frac{1}{2}(64)\left(\frac{5}{8}\right)$ $64\pi - \frac{1}{2}(64)\left(\frac{5}{8}\right)$ $181.09\ \text{cm}^2$	1 2 3 4	4
21	$k - 1 = 5$ $k = 6$	1 2	2	22	$\frac{1}{3}\left[\int_1^4 f(x)dx + \int_1^4 x\ dx\right]$ $\frac{1}{3}\left[(-12) + \left(\frac{x^2}{2}\right)_1^4\right]$ $\frac{1}{3}\left[(-12) + 8 - \frac{1}{2}\right]$ $-\frac{3}{2}$	1 2 3 4	4
23	(a) 3, 3, 4, 5,15 *Accept all relevant set.* (b) mode = 5 median = 6 mean =7	1 1 1 1	4	24	(a) $4_{P_3} \times 3_{P_2}$ or $4 \times 3 \times 2 \times 3 \times 2$ 144 (b) $4_{P_3} \times 2_{P_1}$ or $4 \times 3 \times 2 \times 2 \times 1$ $\frac{48}{144}$	1 2 1 2	4
25	0.524 $\frac{t - 55}{6} = 0.524$ $t = 58$	1 2 3	3 4		TOTAL 80 MARKS		

Additional Mathematics ***Paper 2***

No	SOLUTIONS	Marks	Sub marks	Total Marks
1	$y = 2x - 2$	1 m		
	$2x - 2 + 2x^2 - 10x + 8 = 0$	1 m		
	$(x-1)(x-3) = 0$	1 m		
	$x = 1, 3$	1 m		
	$y = 4, 0$	1 m	5m	5m
2	(a)  Shape	1 m		
	Points (0,16), (2,0),(4,0)	1 m	2m	
	(b) $\frac{-b}{a} = 6$ *or* $\frac{16}{a} = 8$	1 m		
	$a = 2$	1 m		
	$b = -12$	1 m	3 m	
	(c) $f(x) = 2(x-3)^2 - 2(3)^2 + 16$	1 m		
	$f(x) = 2(x-3)^2 - 2$	1 m	2 m	7 m
3	(a) $\frac{\cos\theta + \sin\theta + \cos\theta - \sin\theta}{\cos^2\theta - \sin^2\theta}$	1 m		
	$\frac{2\cos\theta}{\cos 2\theta}$			
	$2\cos\theta \sec 2\theta$	1 m	2 m	

No	SOLUTIONS	Marks	Sub marks	Total Marks
	(b)  Shape Amplitude=2 1 cycle $y = 1 - \frac{2}{\pi}x$ Straight line graph passing through (0,1), (π,-1) 3 solutions	1 m 1 m 1 m 1 m 1 m 1 m	8 m	
4	(a) Midpoint : 25, 30,35, 40, 45, 50 $\frac{\sum fx}{\sum f} = \frac{1625 + 40n}{44 + n} = 37.75$ $n = 16$	1 m 1 m 1 m	3 m	
	(b) $N = 60$ or $L = 37.5$ or $F = 28$ $37.5 + \left(\frac{30 - 28}{16}\right)5$ 38.13	1 m 1 m 1 m	3 m	
	c) mean = 39.75 median = 40.13	1 m 1 m	2 m	8 m
5	a) $\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP} = \underline{a} + (1 - n)\overrightarrow{AB}$ $= \underline{a} + (1 - n)(-\underline{a} + \underline{b})$ $= \underline{a} + (-\underline{a}) + n\underline{a} + \underline{b} - n\underline{b}$ $\overrightarrow{OP} = n\underline{a} + (1 - n)\underline{b}$	1 m 1 m 1 m	3 m	
	b) $\overrightarrow{AP} = 3\underline{a} - 3\underline{b} = 3(\underline{a} - \underline{b})$ $= -3(-\underline{a} + \underline{b})$ $= (1 - n)(-\underline{a} + \underline{b})$ $1 - n = -3 \rightarrow n = 4.$	1 m 1 m 1 m	3 m	6 m

<table>
<tr><th>No</th><th>SOLUTIONS</th><th>Marks</th><th>Sub marks</th><th>Total Marks</th></tr>
<tr><td>6</td><td>(a) $T_1 = \pi x^2, T_2 = \frac{\pi x^2}{4}, T_2 = \frac{\pi x^2}{16}$
$r = \frac{1}{4}$</td><td>1 m
1 m</td><td>2 m</td><td rowspan="3">6 m</td></tr>
<tr><td></td><td>(b) $\pi x^2 \left(\frac{1}{4}\right)^3 = 4\pi$
$x = 16$</td><td>1 m
1 m</td><td>2 m</td></tr>
<tr><td></td><td>(c) $S_\infty = \frac{\pi(16)^2}{1-\frac{1}{4}}$
$= 1072.47 \text{ cm}^2$</td><td>1 m
1 m</td><td>2 m</td></tr>
<tr><td>7</td><td>(a)<table><tr><td>$\log_{10} x$</td><td>0.08</td><td>0.20</td><td>0.40</td><td>0.60</td><td>0.80</td><td>0.90</td></tr><tr><td>$\log_{10} y$</td><td>0.18</td><td>0.26</td><td>0.42</td><td>0.56</td><td>0.70</td><td>0.76</td></tr></table></td><td>1 m
1 m</td><td>2 m</td><td rowspan="3">10 m</td></tr>
<tr><td></td><td>(b)
</td><td>Correct axes and 1 point correctly marked

6 points correctly plotted

Line of best fit</td><td>1 m

1 m

1 m</td></tr>
<tr><td></td><td>b) $\log_{10} y = \log_{10}(p+q) + p \log_{10} x$

(i) $p = gradient = \frac{0.70 - 0.11}{0.8 - 0}$

$= 0.7375$

(ii) $\log_{10}(p+q) = 0.11$
$p + q = 1.2882$
$q = 0.5507$</td><td>1 m

1 m

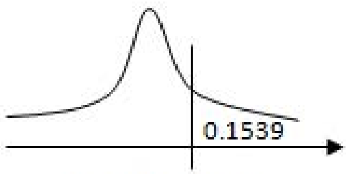
1 m

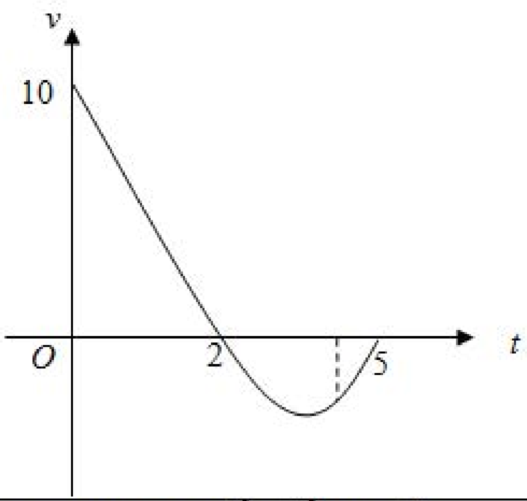
1 m

1m</td><td>5 m</td></tr>
</table>

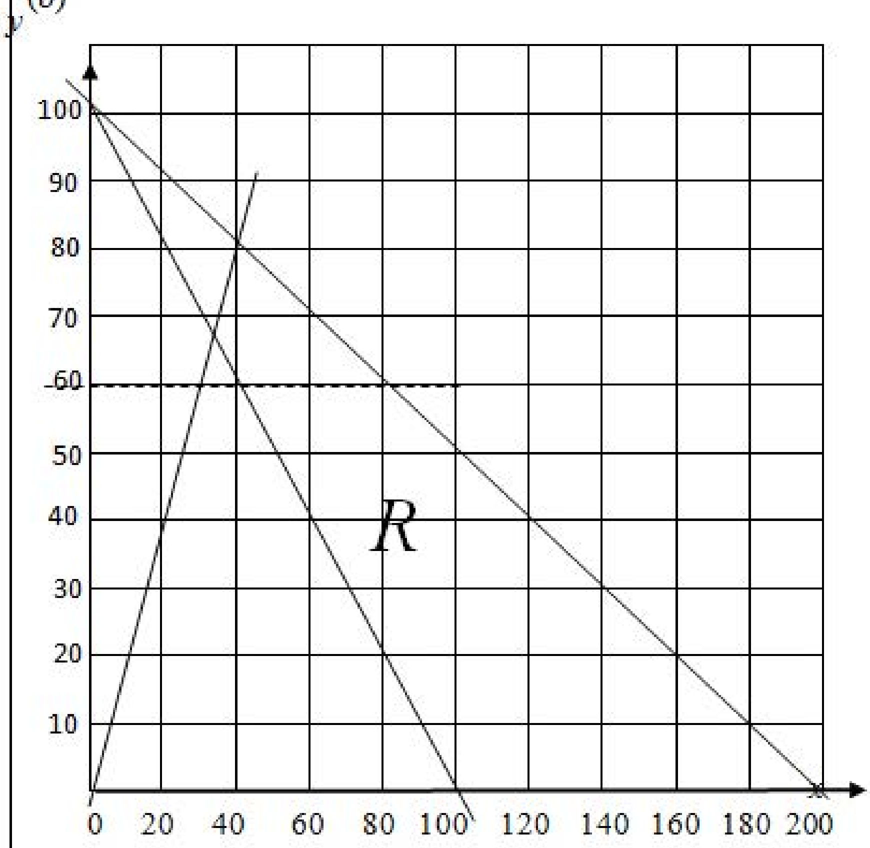
No	SOLUTIONS	Marks	Sub marks	Total Marks
8	(a) $9x^2-34x+25=0$			
	or $3y^2-4y-20=0$			
	or $3y^2+4y-20=0$	1 m		
	$P(1,2)$, $Q(1,-2)$	1 m, 1 m	3 m	
	(b) Area of triangle: $A_1=\frac{1}{2}(3)(1)$ or $\int_2^5\left(\frac{5-y}{3}\right)dy$ or equivalent	1 m		
	Area under the curve: $A_2=\int_0^2\left(\frac{y^2}{4}\right)dy=\left[\frac{y^3}{12}\right]_0^2$ or equivalent	1 m		
	$A_1=\frac{3}{2}$ or $A_2=\frac{2}{3}$	1 m		
	Area of the shaded region $=2(A_1+A_2)$	1 m		
	$=\frac{13}{3}$ unit^2	1 m	5 m	10 m
	(c) $\pi\int_0^1 4x\ dx=\pi\left[\frac{4x^2}{2}\right]_0^1$	1 m		
	$=2\pi$ unit^3	1 m	2 m	
9.	(a) 0.4637 radian	1 m	1 m	
	(b) $ON=6.708$	1 m		
	$S_{NM}=6.708\times0.4637$ OR $S_{BC}=\frac{\pi}{2}\times 6$	1 m		
	$MB=12-6.708$	1 m		
	Use $CN+S_{NM}+MB+S_{BC}$	1 m		
	Perimeter of the shaded region $=20.83$ cm	1 m	5 m	

	(c) Area of the sector ABC, $A_1 = \frac{1}{2} \times 6^2 \times \frac{\pi}{2}$	1 m		
	Area of the sector OMN, $A_2 = \frac{1}{2} \times 6.708^2 \times 0.4637$	1 m	2m	
	Area of triangle OAN, $A_3 = ½ (6) (3)$			
	Use $A_1 - (A_2 - A_3)$	1 m		
	Area of the shaded region $= 26.85$ cm²	1 m		10 m
10	(a) (i) $m_{QR} = \frac{1}{2}$, $m_{PQ} = -2$	1 m		
	Equation of PQ; $y - 9 = -2(x - 4)$	1 m		
	$y = -2x + 17$	1 m		
	(ii) Solve simultaneous equation $y = -2x + 17$ and $2y - x + 6 = 0$	1 m		
	$Q = (8 , 1)$	1 m		
	(iii) $R = (0 , -3)$	1 m		
	Area of triangle PQR $= \frac{1}{2}\begin{vmatrix} 4 & 8 & 0 & 4 \\ 9 & 1 & -3 & 9 \end{vmatrix}$	1 m		
	$= \frac{1}{2}\lvert(4 - 24) - (72 - 12)\rvert$			
	$= 40$ unit²	1 m	8 m	
	(c) $A(x ,y)$, $P(4, 9)$			
	$PA = 5$			
	$PA = \sqrt{(x-4)^2 + (y-9)^2} = 5$	1 m		
	Answer : $x^2 + y^2 - 8x - 18y + 72 = 0$	1 m	2 m	10 m

11	(a) (i) $p = 0.85$, $q = 0.15$			
	$^6C_4(0.85)^4(0.15)^2$ or			
	$^6C_5(0.85)^5(0.15)^1$ or $^6C_6(0.85)^6(0.15)^0$	1 m		
	$^6C_4(0.85)^4(0.15)^2 + ^6C_5(0.85)^5(0.15)^1 + ^6C_6(0.85)^6(0.15)^0$	1 m		
	$= 0.9526$	1 m		
	(ii) mean $= 6 \times 0.85$ $= 5.1$	1 m		
	Standard deviation $= 6 \times 0.85 \times 0.15$ $= 0.765$	1 m	5 m	
	(b) (i) $p\,(X > 745.5) = 0.0539$			
				
	$\dfrac{745.5 - 720}{k} = 2.55$	1 m		
	$k = 10$	1 m		
	(ii) $P(675 < X < 750)$			
	$= P\left(\dfrac{700 - 720}{10} < z < \dfrac{740 - 720}{10}\right)$	1 m		
	$= P(-2 < z < 2)$			
	$= 0.9546$	1 m		10 m
	Number of fish = 209	1 m	5 m	

12	(a) (i) $k = 10$	1 m		
	(ii) $(t-2)(t-5) < 0$	1 m		
	$2 < t < 5$	1 m		
	(iii) $a = 2t - 7$	1 m		
	$2t - 7 > 0$ $t > \frac{7}{2}$	1 m	5 m	
	(b) (i) 	Shape 1 m All points 1 m	2 m	
	ii) $\int_0^2 (t^2 - 7t + 10)dt = \left[\frac{t^3}{3} - \frac{7t^2}{2} + 10t\right]_0^2$ or $\int_2^4 (t^2 - 7t + 10)dt = \left[\frac{t^3}{3} - \frac{7t^2}{2} + 10t\right]_2^4$	1 m		
	$\int_0^2 (t^2 - 7t + 10)dt + \left\lvert \int_2^4 (t^2 - 7t + 10)dt \right\rvert$	1 m		10 m
	The total distance travelled= 12 m.	1 m	3 m	

13	a) Using $I = \frac{Q_{2008}}{Q_{2006}} \times 100$ $w = 120$ $x = 17.55$ $y = 11.30$	1 m 1 m 1 m 1 m	4m	
	b) $120 = \frac{100(*120) + 130(80) + 115(70) + 110(z)}{250 + z}$ $z = 45$	1 m,1 m 1 m	3 m	10 m
	c) $\bar{I} = \frac{120}{100} \times 110$ $= 132$	1 m,1 m 1 m	3 m	10 m
14	a) (i) $\frac{\text{Sin } \angle CED}{9} = \frac{\sin 34.05}{6.5}$ $\angle CED = 180^0 - 50.83^0$ $= 129.17^0$ (ii) $AB^2 = 7^2 + 5^2 - 2(7)(5)\cos 50.83^0$ $AB = 5.458$ cm	1 m 1 m 1 m 1 m 1 m	5 m	
	c) $\angle CDE = 180^0 - \angle ACB - \angle CED$ $\angle DEF = 180^0 - \angle CED$	1 m		
	$\angle EDF = 180^0 - 2(\angle DEF)$ $\angle CDF = \angle CDE + \angle EDF$ $\angle CDF = 95.12^0$ Area of $\Delta\ CDF = \frac{1}{2}(9)(6.5)\sin \angle CDF$ $= 29.13\ \text{cm}^2$	1 m 1 m 1 m 1 m	5 m	10 m

15	(a) $x + y \geq 100$	1 m		
	$y \leq 2x$	1 m		
	$60x + 120y \leq 12000$	1 m	3 m	
	(b) 	Any line correct	1 m	
		All 3 lines correct	1 m	
		Correct region	1 m	
	(c) (i) $40 \leq y \leq 80$	1 m		
	(ii) At (100,0)	1 m		
	60 (100) + 120 (0)	1 m		
	RM 6000	1 m	4 m	10 m