DEPARTMENT OF EDUCATION

UPPER SECONDARY SCHOOL CERTIFICATE EXAMINATIONS

ADVANCE MATHEMATICS

PAPER 2

Friday

26th October 2012

Time allowed:

2 hours 30 minutes

(8:00am – 10:30 am)

NO EXTRA TIME

(NO OTHER TIME)

Candidates are advised to fully utilise the allocated time

MA_2

INSTRUCTIONS TO CANDIDATES

To be read by the external invigilator to all candidates

1. The code for Advance Mathematics is **3.**
2. There are **3** printed pages in the question booklet and **6 printed** pages in the answer booklet. The **1 page formula sheet** is inserted in the question booklet.
3. The answer booklet is enclosed in the centre of this booklet. Take out the answer booklet now.
4. Check that you have the correct number of pages.
5. Write your 10 - digit candidate number, your name and your school name in the spaces provided in the answer booklet.
6. This paper contains 10 Short Answer Questions worth 5 marks each.

   Total: 50 marks

   Answer **ALL** questions.
7. Calculators, rulers and protractors are allowed.
8. Answer all questions on the answer sheet. Answers on any other paper including rough work paper and the question paper **will not be marked**
9. ALL working must be shown step by step to get full marks. Students may lose marks for writing down final answers only.
10. Correction Fluid is not allowed on the answer sheet. Where you have made an error, cross out all the working and start again on a new line.
11. Graphical Calculators are not permitted.

PENALTY FOR CHEATING OR ASSISTING TO CHEAT IN NATIONAL EXAMINATIONS IS NON-CERTIFICATION.

DO NOT TURN OVER THE PAGE AND DO NOT WRITE UNTIL YOU ARE TOLD TO START.

QUESTION 1

At the college, a survey of 100 students revealed the following information about enrolment; 26 take Mathematics, 65 take Political Science, 65 take Sociology, 14 take Mathematics and Political Science, 13 take Mathematics and Sociology, 40 take Political Science and Sociology and 8 take Political Science, Mathematics and Sociology.

a) Show this information on a Venn diagram. (4 marks)

b) How many students take Mathematics only? (1 mark)

QUESTION 2

When the function $f(x) = 2x^n + ax^2 - 6$ is divided by $(x-1)$, the remainder is -7 and when divided by $(x+3)$, the remainder is 129.

Calculate the value of "*a*" and "*n*" and hence write the polynomial function completely. (5 marks)

QUESTION 3

Consider the function $f(x) = |x+1|$

a) Express $f(x)$ in piecewise form. (2 marks)

b) Sketch the graph of $f(x) = |x+1|$. (3 marks)

QUESTION 4

Consider the experiment where marbles are selected from a bag, which contains 4 green, 2 red and a yellow marble, without replacement.

a) What is the probability that the first marble selected is red? (1 mark)

b) What is the probability that the second marble selected is green, conditional on the first being red? (2 marks)

c) What is the probability that the third marble selected is red, conditional to the first being red, second being green? (2 marks)

QUESTION 5

Jimmy walks due north at a speed of 8 km/hr. Jeffery rides a bicycle due east at 20 km/hr. If they start together, how far apart will they be after 1 minute? Express your answer in kilometres correct to 3 decimal places. (5 marks)

QUESTION 6

Ben, Richardo and Imelda share a sum of money in the ratio of 3: 5: 7.

If Imelda receives K10.00 more than Richardo, find the amount of money that was shared? (5 marks)

QUESTION 7

Solve the equation for ***x*.**

$$\begin{vmatrix} 2x & 7 \\ 3 & x \end{vmatrix} - x + 2 \begin{vmatrix} -1 & -1 \\ 2 & 2 \end{vmatrix} = 0$$

(5 marks)

QUESTION 8

A piece of wire of length 1 metre is cut into two parts and each part is bent to form a square. The total area of the two squares formed is 325 cm^2. (5 marks)

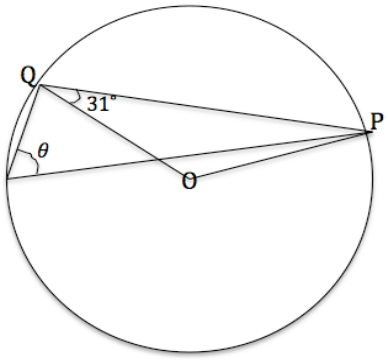
a) Given that one of the pieces is $\boldsymbol{x}$ cm long, find the area of the square formed from this piece in terms of $\boldsymbol{x}$.

b) Find the area of the square formed by the remaining piece in terms of $\boldsymbol{x}$.

c) Determine the possible values of $\boldsymbol{x}$.

QUESTION 9

Find the size of the angle indicated by θ in the diagram below. O is the centre of the circle and P and Q are points on the circle. (5 marks)



QUESTION 10

The normal to the curve $y = x^3 + cx$ at the point $(2, d)$ has gradient $\frac{1}{2}$. Find the values of c and d and hence the equation of the normal. (5 marks)

END OF EXAMINATION

Advance Mathematics '12 Paper 2 - Answer Booklet

Write your province, school and candidate number, your name and your school name in the space provided below.

Year		Province		School			Candidate No		
1	2								

Candidate Name: _____

School Name: _____

All answers must be written in this booklet and in the appropriate spaces provided.

	SCORE	Marker 1	Marker 2
Question 1			
Question 2			
Question 3			
Question 4			
Question 5			
Question 6			
Question 7			
Question 8			
Question 9			
Question 10			
TOTAL			

QUESTION 1		**QUESTION 2**
total for this question ☐ Marker 1 Marker 2		total for this question ☐ Marker 1 Marker 2

QUESTION 3

total for this question ____ Marker 1 Marker 2

QUESTION 4

total for this question ____ Marker 1 Marker 2

QUESTION 5		**QUESTION 6**
total for this question ☐ Marker 1 Marker 2		total for this question ☐ Marker 1 Marker 2

QUESTION 7

total for this question [ ] Marker 1 Marker 2

QUESTION 8

total for this question [ ] Marker 1 Marker 2

QUESTION 9		**QUESTION 10**
total for this question ____ Marker 1 Marker 2		total for this question ____ Marker 1 Marker 2

HIGHER SCHOOL CERTIFICATE EXAMINATIONS 2012
FORMULAE SHEET FOR ADVANCE MATHEMATICS

MENSURATION

Arc Length	$L = \frac{\theta}{360} = 2\pi r$
Area of Sector	$A = \frac{\theta}{360} 2\pi r^2$
Surface Area of Cylinder	$A = 2\pi r^2 + 2\pi rh$
Surface Area of Sphere	$A = 4\pi r^2$
Curved Surface Area of Cone	$A = \pi rL$
Volume of Sphere	$V = \frac{4}{3}\pi r^3$
Interior Angles of Polygon	$s_n = (n-2)\text{x } 180^o$

INTEREST

Compound Interest	$A = P\left(1 + \frac{r}{100}\right)^n$

TRIGONOMETRY

Sin Rule	$\frac{a}{sin\ A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
Cosine Rule	$c^2 = a^2 + b^2 - 2ab\cos C$
Area of Triangle	$A = \frac{1}{2}ab\sin C$
Conversion	$\pi^c = 180^o$
Arc Length	$L = r\theta^c$
Area of Sector	$A = \frac{1}{2}r^2\theta$
Area of Minor Segment	$A = \frac{1}{2}r^2(\theta^c - sin\ \theta^c)$

PERMUTATION $\quad {}^nP_r = \frac{n!}{(n-r)!}$

SERIES

Arithmetic Progression	$T_n = a + (n-1)d$
	$S_n = \frac{n}{2}(a + T_a)$
	$S_n = \frac{n}{2}(2a + [n-1]d)$
Geometric progression	$T_n = ar^{n-1}$
	$S_n = \frac{a(r^n-1)}{r-1} - \frac{a(1-r^n)}{1-r}$, for $r \neq 1$
	$S_\infty = \frac{a}{1-r}$, for $-1 < r < 1$

ALGEBRA

Quadratic Formula	$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$
First Derivative	$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h} = \lim_{\Delta x\to 0} \frac{f(x+\Delta x)-f(x)}{\Delta x}$

ANALYTIC GEOMETRY

Distance between two points	$d = \sqrt{(x_2 - x_1)^2 + (y_2 + y_1)^2}$
Mid-point of Interval	$\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$
Gradient of a Line	$\frac{y_2-y_1}{x_2-x_1} = m = tan\ \theta \frac{y_2-y_1}{x_2-x_1} = m = tan\ \theta$
ABSOLUTE VALUE	$\lvert x\rvert = \begin{cases} -x, \text{ if } x < 0 \\ x, \text{ if } x \geq 0 \end{cases}$

BINOMIAL EXPANSION

$$(x+y)^n = x^n + \binom{n}{1}x^{n-1}y + \binom{n}{2}x^{n-2}y^2 + \cdots + y^n \text{ where } \binom{n}{r} = \frac{n!}{r!(n-r)!}$$