DEPARTMENT OF EDUCATION

UPPER SECONDARY SCHOOL CERTIFICATE EXAMINATIONS

ADVANCE MATHEMATICS

PAPER 2

Friday

24th October 2014

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. A **1 page formula sheet** is also 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. Enough space has been allocated for the answer to every question. Questions must be answered in spaces allocated on the Answer booklet. Answers all over the answer booklet may not be marked.
11. Rubbers and Correctional Fluid are not allowed on the answer sheet. Where you have made an error, cross out all the working and start again on a new line.
12. 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

Without using a calculator, find x given that
$\log_b x = \frac{2}{3}\log_b 27 + 2\log_b 2 - \log_b 3$.

QUESTION 2

Solve the pair of equations simultaneously.
$y = 3x + 2 \quad and \quad y = 3x^2 + 2x - 2$.

QUESTION 3

Solve the inequality $|3x - 5| < x + 2$.

QUESTION 4

A bag contains two green marbles and two blue marbles. A marble is selected at random and without replacing it another marble is picked.

a) What is the probability of selecting two marbles of the same colour?

(2 marks)

b) What is the probability of selecting at least a blue marble?

(3 marks)

QUESTION 5

Find the centre and radius of the circle
$x^2 + y^2 - 4x + 2y - 2 = 0$.

QUESTION 6

A survey of 100 college students revealed the following information.

26 take Mathematics, 65 take Physics, 65 take Chemistry, 14 take Mathematics and Physics, 13 take Mathematics and Chemistry, 40 take Physics and Chemistry and 8 take Mathematics, Physics and Chemistry.

a) Construct a Venn diagram to represent the above information.

(3 marks)

b) How many students take neither Mathematics nor Physics?

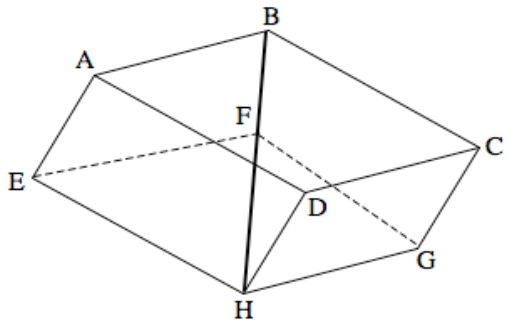
(2 marks)

QUESTION 7

The 1st, 2nd and 3rd terms of an arithmetic progression are $8 - x, 3x \; and \; 4x + 1$ respectively. Calculate the value of x, and find the sum of the first eight terms of the progression.

QUESTION 8

Given a rectangular cuboid ABCDEFGH, with sides $EF = 5 \; cm, FG = 8 \; cm \; and \; BF = 6 \; cm$.



a) Find the distance BH.

(3 marks)

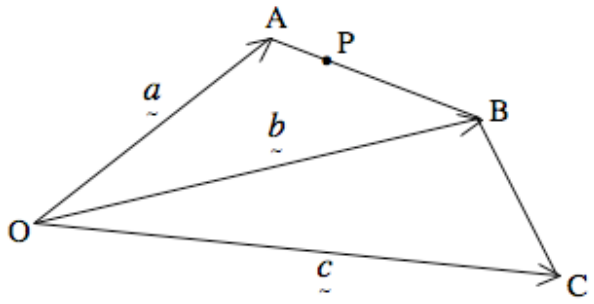
b) Find the angle $\angle BHF$.

(2 marks)

QUESTION 9

The points A, B and C have position vectors $\underset{\sim}{a}, \underset{\sim}{b}$ *and* $\underset{\sim}{c}$.

Point P is a third of the distance AB from A.



a) Find the position vector of P.

(3 marks)

b) Find the vector $\overrightarrow{PC}$.

(2 marks)

QUESTION 10

Using the First Principle, find $f'(x)$ given $f(x) = 2x^3 - 4$.

END OF EXAMINATION

Advance Mathematics '14
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	4								

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

a)

(2 marks)

b)

(3 marks)

total for this question Marker 1 Marker 2

QUESTION 5

total for this question [ ] Marker 1 Marker 2

QUESTION 6

a)

(3 marks)

b)

(2 marks)

total for this question [ ] Marker 1 Marker 2

QUESTION 7

Marker 1 Marker 2

QUESTION 8

a)

(3 marks)

b)

(2 marks)

Marker 1 Marker 2

QUESTION 9

a)

(3 marks)

b)

(2 marks)

Marker 1 Marker 2

QUESTION 10

Marker 1 Marker 2

HIGHER SCHOOL CERTIFICATE EXAMINATIONS 2014

FORMULAE SHEET FOR ADVANCE MATHEMATICS

MENSURATION

Arc Length	$L = \frac{\theta}{360} r = 2\pi r$
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	$A = \frac{1}{2}r^2\theta^c$
Area of Minor Segment	$A = \frac{1}{2}r^2(\theta^c - \sin\theta^\circ)$

PERMUTATION AND COMBINATION

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

SERIES

Arithmetic Progression	$T_n = a + (n-1)d$
	$S_n = \frac{n}{2}(a + l)$
	$S_n = \frac{n}{2}(2a + [n-1]d)$
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	$\frac{y_2-y_1}{x_2-x_1} = m = tan\,\theta$
ABSOLUTE VALUE	$\lvert x\rvert = \begin{cases} -x, & \text{if } x < 0 \\ x, & \text{if } x \geq 0 \end{cases}$

BINOMIAL EXPANSION

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