DEPARTMENT OF EDUCATION

HIGHER SCHOOL CERTIFICATE EXAMINATIONS

MATHEMATICS A

PAPER 2

Monday

19 October 2009

Time allowed: 2 hours

(8:00 am – 10:00 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

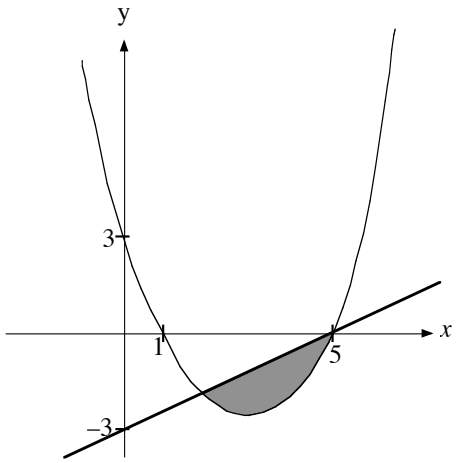
1. There are **4** printed pages in the question booklet and **8 printed** pages in the answer booklet. The formula sheet is in pages 6 of the question booklet.
2. The answer booklet is enclosed in the centre of this booklet. Take out the answer booklet now.
3. Check that you have the correct number of pages.
4. Write your province, school and candidate number, your name and your school name in the space provided in the answer booklet.
5. This paper contains 7 questions worth a total of 50 marks

   Answer **ALL** questions.
6. Calculators, rulers and protractors are allowed.
7. Answer all questions on the answer sheet. Answers on any other paper including rough work paper and the question paper **will not be marked**
8. ALL working must be shown step by step to get full marks. Students may lose marks for writing down final answers only.
9. Enough spaces have been allocated for answers to every question. Questions must be answered in spaces as allocated. Answers all over the answer booklet may not be marked.
10. Rubbers and Correctional Fluid are not allowed on the answer sheet. Where you have made an error, cross out all the working and start 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 **(8 MARKS)**



(i) What is the equation of the straight line? *(1 mark)*

(ii) What is the equation of the parabola? *(2 marks)*

(iii) What are the coordinates of the point of intersection of the line and the parabola. (Solve algebraically) *(4 marks)*

(iv) State the inequalities that satisfy the shaded region. *(1 mark)*

QUESTION 2 **(7 MARKS)**

The height H metres of a ball projected upwards t seconds after being projected in given by $H = 64t - 16t^2$.

Find

(i) its initial velocity. *(1 mark)*

(ii) the time taken to reach its maximum height. *(1 mark)*

(iii) the maximum height the ball reaches. *(2 mark)*

(iv) time taken for the ball to hit the ground. *(1 mark)*

(v) the velocity with which the ball hits the ground. *(2 marks)*

QUESTION 3 **(7 MARKS)**

(i) Find the 20^{th} term of the sequence $35, 42, 49, \ldots$ *(2 marks)*

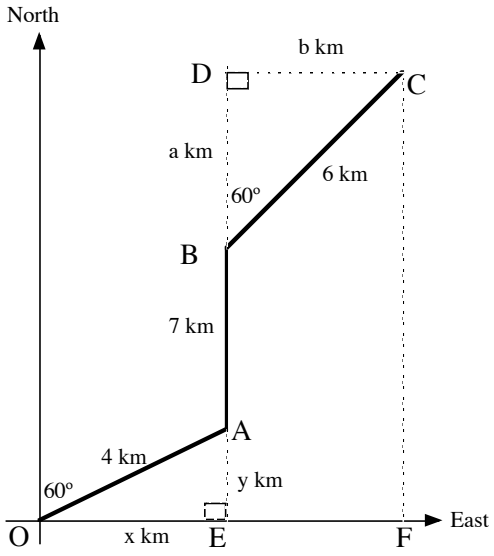
(ii) The sum of the 3^{rd} and the 6^{th} terms of an arithmetic sequence is 115 and the 11^{th} term is 77.

Find the first term of the sequence. *(2 marks)*

(iii) An accountant is employed at a salary of K28,000 per annum. Each year the salary increases by K900. What will be the salary in the 11^{th} year? *(3 marks)*

QUESTION 4 **(7 MARKS)**

A ship leaves port O and sails 4 km N60ºE to A, then 7km north to B then 6 km N60ºE to C as shown in the diagram.



Find the values of

(i) x (ii) y

(iii) a (iv) b

(v) distance OF

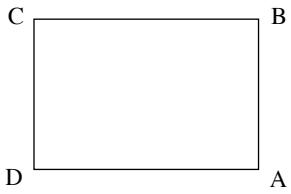
(vi) distance FC

(vii) Use Pythagoras theorem to prove that OC is 14.8 km.

Note: *Each part is worth 1 mark.*

QUESTION 5 **(7 MARKS)**

A (4, 2), B (4, 5) C (1, 5) and D (1, 2) a re vertices of a quadrilateral.



(i) Show that AC and BD have the same mid point. (*2 marks*)

(ii) Show that the diagonals AC and BD are perpendicular to each other. (*3 marks*)

(iii) Show that the diagonals have equal lengths. (*2 marks*)

QUESTION 6 **(7 MARKS)**

A local football club is organising an end of year fund raising 'Grand Final' luncheon.

They know they can sell y tickets if they set the price at K(60 – 0.1*y*) per ticket.

If y tickets are sold, their total cost will be KC(*y*) = 500 + 4*y*.

(i) Find an expression for the revenue function R(*y*) if *y* tickets are sold. *(1 mark)*

(ii) Find the expression for the profit function P(*y*) if *y* tickets are sold. *(2 marks)*

(iii) Calculate the profit if 200 tickets are sold. *(1 mark)*

(iv) How many tickets should they sell to achieve maximum profit and what would this profit be? *(2 marks)*

QUESTION 7 **(7 MARKS)**

The displacement of a particle moving in a straight line is given by $x = t^3 - \frac{7}{2}t^2 + 2t - 1$ where t = time in seconds and

x = distance in metres.

Find

(i) the particle's initial displacement. *(1 mark)*

(ii) the acceleration of the particle after 2 seconds (*2 marks*)

(iii) when the particle is at rest (*2 marks*)

(iv) the total distance travelled by the particle between $t = 1$ and $t = 3$. (*2 marks*)

END OF EXAMINATION

HIGHER SCHOOL CERTIFICATE EXAMINATIONS, 2009

FORMULAE SHEET FOR MATHEMATICS A

MENSURATION

Arc Length	$L = \frac{\theta}{360}\ 2\pi r$
Area of Sector	$A = \frac{\theta}{360}\ \pi r^2$
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	$S_n = (n - 2) \times 180^\circ$

INTEREST

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

TRIGONOMETRY

Sine 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	$\pi^c = 180^\circ$
Arc Length	$L = r\theta^c$
Area of Sector	$A = \frac{1}{2}\ r^2\theta^c$
Area of Minor Segment	$A = \frac{1}{2}\ r^2(\theta^c - \sin\theta^c)$

SERIES

Arithmetic Progression	$T_n = a + (n - 1)d$
	$S_n = \frac{n}{2}(a + T_n)$
	$S_n = \frac{n}{2}(2a + [n - 1]d)$
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	$\frac{y_2 - y_1}{x_2 - x_1} = m = \tan\theta$