GRADE 10 EXEMPLAR EXAMINATION
NOVEMBER 2006

MATHEMATICS PAPER I

LO 1 & 2

Time: 2 Hours 100 marks

The latest proposal of the IEB Subject Assessment Guidelines is in line with the state system. Paper 1 will contain 25 – 35% from LO1 and 65 – 75% LO2.

Levels of difficulty of questions within the 100 marks are categorised as :

K	Knowledge :	15 – 25 %
RP	Routine Procedure :	25 – 35 %
CP	Complex Procedure :	25 – 35 %
PS	Problem Solving :	15 – 20 %

The following questions give examples at the different levels from which teachers can get ideas so that a paper can be compiled according to the above guidelines. Depending on the nature of questions, teachers might wish to provide a Formula Sheet.

QUESTION 1

(a) Factorise fully :

(i) $x^2 - 5x - 6$ (2) K

(ii) $x - y + xy - 1$ (3) RP

(iii) $5x^2 - 12x + 4$ (3) RP

(b) Solve for x :

(i) $5x - 2 = 3$ (1) K

(ii) $x + \frac{9}{2} + \frac{2}{x} = 0$ (4) RP

(iii) $2x^2 + 13 = 63$ (3) RP

(iv) $5^x = 125$ (1) K

(v) $9^x = 27$ (2) RP

(vi) $7(3x + 2) - 5(2x - 3) > 7$
Illustrate this answer on a number line. (4) RP

(vii) $\frac{1}{ax} + \frac{1}{bx} = 1$ (4) CP

(c) Simplify :

(i) $\frac{5(x-1)}{6} - \frac{x-1}{2} + \frac{x-3}{3}$ (5) RP

(ii) $\frac{3^{2n-1}.9^{n+1}}{9^{2n}}$ (3) RP

(iii) $\left(a^{-1} + b^{-1}\right)^{-1}$ (3) CP

(d) Solve for x and y for the following system of equations:

$x + 3y = 5$ and $4x + 3y = 11$ (4) RP

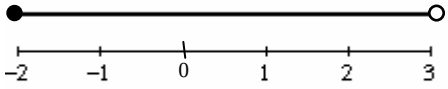
42 MARKS

QUESTION 2

(a) Showing all working, express $0,7\dot{8}$ as a fraction $\frac{a}{b}$ where $a, b \varepsilon \mathbb{Z}$. (4) RP

(b) Without using a calculator, determine between which two integers $\sqrt{11}$ lies. (2) K

(c) Given :



(i) Write down the single inequality represented by this number line. (2) K

(ii) Give the largest integer that satisfies the inequality. (1) K

9 MARKS

QUESTION 3

Given : $A = \sqrt{4x-3}$

Determine for each of the following, ONE value of x that satisfies the condition and give the corresponding A value.

(a) $A = 0$ (1) K

(b) A is an integer (2) CP

(c) A is irrational (2) CP

(d) A is non-real (2) CP

7 MARKS

QUESTION 4

(a) Many of Naledi's relatives gathered for a family reunion.
One uncle from America gave her $50 and another from Europe gave her €50.
She read the following table in the newspaper :

	One Rand equals X currency		One currency equals X Rand
€	0.108552 Euro (EUR)		9.212125 ZA Rand
$	0.136276 Dollar (USD)		7.338 ZA Rand
¥	15.859907 Yen (JPY)		0.063052 ZA Rand
£	0.074918 Pound Sterling (GBP)		13.347822 ZA Rand

(i) Calculate how many South African Rands she can expect to be paid. (3) RP

(ii) Naledi hopes to convert this money to Pounds to give to a cousin returning to Britain to purchase CDs for her.
Calculate the amount in Pounds Sterling that Naledi will get from her uncles' gifts. (2) RP

(b) Sam is keen to buy an i-Pod advertised for R2 500.
There is an option of paying a 10% deposit then making 24 monthly payments using a hire purchase agreement where interest is calculated at 7,5% p.a. simple interest.

(i) Calculate what Sam's monthly payments will be. (5) CP

(ii) Calculate the total amount that Sam will pay for the i-Pod. (2) RP

12 MARKS

QUESTION 5

(a) Jack is enchanted and writes down the name SALLY over and over again as shown :

SALLYSALLYSALLYSALLYSALLY…

(i) What is the 23^{rd} letter in his list? (1) RP

(ii) Determine the 506^{th} letter. (2) PS

(b) Les takes a triangle and divides it as shown.

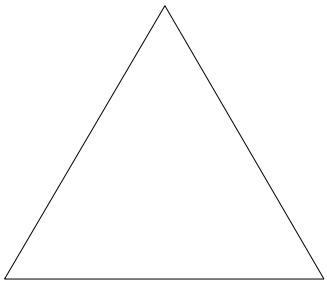


Fig. 1

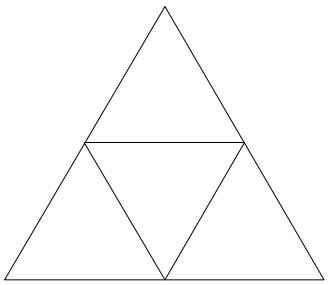


Fig. 2

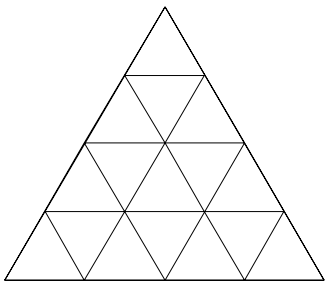


Fig. 3

(i) Convert the copy of Figure 3 provided in the Answer Booklet into how you think Figure 4 will look. (2) RP

(ii) Give a formula to represent the number of triangles of the same size expected in Figure *n*. (3) CP

(iii) Les wants to continue until there are exactly 100 small triangles of the same size.
Explain why this is not possible. (2) PS

10 MARKS

QUESTION 6

(a) Ayanda was given the following calculation :

$9785627^2 - 9785630 \times 9785624$

Her calculator gives zero as the answer, which is not correct.
Use your knowledge of Mathematics to determine the correct answer.
It is NOT necessary to do long multiplication. (3) PS

(b) Tom declared that for any natural number n, $n^2 + n$ is even.
Write a mathematical argument to either prove or disprove Tom's conjecture. (4) PS

(c) Simon was asked to solve for x in the equation : $x^2 + b^2 = 25$
His working is shown :

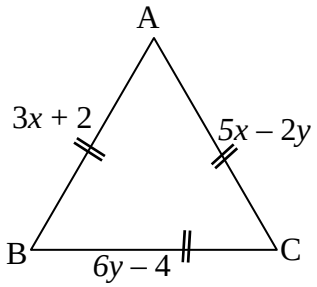
$$\begin{aligned} x^2 + b^2 &= 25 \\ x^2 &= 25 - b^2 && \textbf{Step 1} \\ x &= \sqrt{25 - b^2} && \textbf{Step 2} \\ &= 5 - b && \textbf{Step 3} \end{aligned}$$

Comment on two mistakes in Simon's working. (4) CP

11 MARKS

QUESTION 7

ΔABC is equilateral.



Find the values of :

(a) x and y (6) PS

(b) the perimeter of ΔABC (3) RP

9 MARKS

QUESTION 8

A playground is in the form of a rectangle with the length 2 m longer than the breadth. A new rectangular playground is planned that will be 2 m longer than the original length and with breadth 1 m shorter than that of the original breadth.

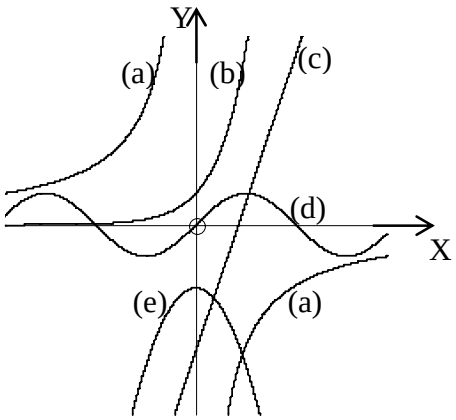
(a) Determine the difference in perimeter of the two playgrounds. (5) CP

(b) If both playgrounds are to have the same area, determine the dimensions of the original playground. (5) CP

10 MARKS

QUESTION 9

Refer to the figure where five graphs are shown.



The graphs have standard forms :

- $y = mx + c$
- $y = a^x$
- $y = ax^2 + q$
- $y = \frac{k}{x}$
- $y = a\sin x$

Write down for each graph (a), (b), etc. Which standard form matches it?

(5) K

5 MARKS

QUESTION 10

Refer to the figure.

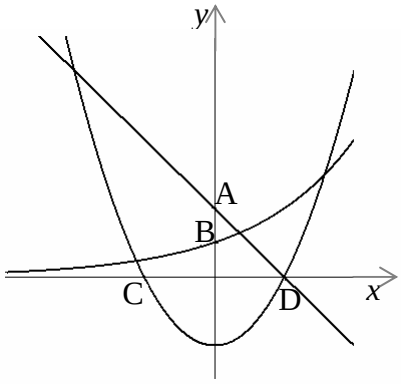
Sketched (not drawn to scale) are graphs of :

$f(x) = 2 - 2x$,

$g(x) = 2^x$

and

$h(x) = 2x^2 - 2$



(a) Find the length of AB. (2) RP

(b) Find the length of CD. (3) RP

(c) Determine the equation of a new graph : $j(x)$,
the reflection of $h(x)$ about the x-axis. (2) RP

(d) Determine the equation of a new graph : $k(x)$,
the reflection of $f(x)$ about the line $y = x$. (2) RP

(e) Without changing the shape or symmetry about the y-axis of any of the graphs, they need to be moved so that they all have a y-intercept at the origin.
Give the new equation for each of the original graphs. (3) CP

12 MARKS

QUESTION 11

Al and Billy are training for a triathlon. They both start at 9:00 (at the same point) by swimming 1 km along a river, cycling 9 km in the same direction along the straight river road, and then running 10 km back to their starting position on the same road. The table below shows the times each took for the training session.

Activity	**Al's time (minutes)**	**Billy's time (minutes)**
Swimming	25	15
Rest	5	10
Cycling	15	20
Rest	10	5
Running	35	45

(a) On the grid provided in the Answer Booklet, draw graphs illustrating each person's distance from the starting point with respect to time. (6) RP

(b) Use your graph to determine :

(i) at what time each person finished their training. (2) RP

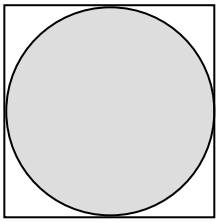
(ii) at what time they were tied (i.e. at the same stage). (1) RP

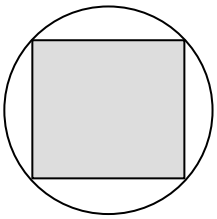
(iii) the winner's speeds for swimming, cycling and running.
Give these answers in km/h correct to one decimal digit. (4) CP

13 MARKS

QUESTION 12

Which is a better fit, a round peg that just fits in a square hole or a square peg that just fits in a round hole?





(8) PS

8 MARKS