GRADE 11 EXAMINATION
NOVEMBER 2007

MATHEMATICS: PAPER I
(LO1 & LO2)

MARKING GUIDELINES

Time: 3 hours 150 marks

The marking guide is a working document prepared for use by teachers as they assess the Grade 11 externally set examinations.

There may be different interpretations of the marking guidelines but the teacher should keep as closely as possible to the suggested way of assessing. When in doubt, a teacher should check with another member of the cluster or with the relevant Assessment Specialist.

QUESTION 1

(a) $x^2 - x = 12$
$x^2 - x - 12 = 0$ ✓M
$(x+3)(x-4) = 0$ ✓A
$x = -3$ or $x = 4$ ✓A (3) K

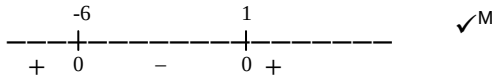
(b) $2 \cdot 5^x = 50$
$5^x = 25$ ✓M
$= 5^2$
$\therefore x = 2$ ✓A (2) RP

(c) $x^2 - 6x + 6 = 0$
$x = \frac{6 \pm \sqrt{36-24}}{2}$ ✓M
$x = \frac{6 \pm \sqrt{12}}{2}$ ✓A
$x = 4{,}7$ or $x = 1{,}3$ ✓C/A (3) K

(d) $x^2 + 8x = 4$
$x^2 + 8x + 16 = 4 + 16$ ✓M
$(x+4)^2 = 20$ ✓A
$x + 4 = \pm\sqrt{20}$ ✓A ✓M
$x = -4 \pm 2\sqrt{5}$ ✓A (5) RP

(e) $x^2 + 4 = 0$
$x^2 = -4$
Non-real ✓A (1) K

(f) $x^2 + 5x - 6 > 0$ ✓A
$(x+6)(x-1) > 0$



✓M
$x < -6$ or $x > 1$ ✓A (3) RP

(g) $\frac{x+2}{x+1} - \frac{3}{x-2} = \frac{1}{x+1}$

$\frac{(x+2)(x-2) - 3(x+1)}{(x+1)(x-2)} = \frac{x-2}{(x+1)(x-2)}$ ✓M ✓A $x \neq -1, x \neq 2$

$x^2 - 4 - 3x - 3 = x - 2$ ✓M

$x^2 - 4x - 5 = 0$ ✓A

$(x-5)(x+1) = 0$ ✓M

$x = 5$ ✓A or $x = -1$ ✗ N.V. ✓M (7) RP

24 marks

QUESTION 2

(a) $y = x - 1$ .....❶

$y + 7 = x^2 + 2x$ .....❷

❷: $x - 1 + 7 = x^2 + 2x$ ✓M

$x^2 + x - 6 = 0$ ✓A

$(x+3)(x-2) = 0$ ✓A

$x = -3$ or $x = 2$ ✓A

$y = -4$ or $y = 1$ ✓C/A (5) RP

(b) (1) $\frac{x^2 - y^2}{x^2} \times \frac{x}{x-y}$

$= \frac{(x-y)(x+y)}{x^2} \times \frac{x}{x-y}$ ✓M

$= \frac{x + y}{x}$ ✓A (2) RP

(2) $\frac{12^{n+1}.27^{n-2}}{18^{2n-1}}$

$= \frac{(2^2.3)^{n+1}.(3^3)^{n-2}}{(2.3^2)^{2n-1}}$ ✓M

$= \frac{2^{2n+2}.3^{+1}.3^{3n-6}}{2^{2n-1}.3^{4n-2}}$ ✓A ✓A

$= 2^3.3^{-3}$ ✓M

$= \frac{8}{27}$ ✓A (5) RP

(b) (3) $2\sqrt{8}-4\sqrt{32}+3\sqrt{50}$

$= 2\times 2\sqrt{2}-4\times 4\sqrt{2}+3\times 5\sqrt{2}$ ✓M

$= 4\sqrt{2}-16\sqrt{2}+15\sqrt{2}$ ✓A

$= 3\sqrt{2}$ ✓A (3) RP

(c) $5 < x < 6$

$\therefore \sqrt{25} < x < \sqrt{36}$ ✓M

$\therefore x = \sqrt{30}$ ✓A Any value in interval $(\sqrt{25},\sqrt{36})$ (2) K

(d) $M = \sqrt{\dfrac{k-2}{2k}}$

(1) $k = 1 : M = \sqrt{-\dfrac{1}{2}}$ ✓A ✓A (2) CP

(2) $k = -2 : M = 1$ ✓✓MA ✓A (3) PS

22 marks

QUESTION 3

(a) $\dfrac{10\sqrt{2x^{16}} - 2\sqrt{8x^{16}}}{\sqrt{18x^{16}}}$

$= \dfrac{10\sqrt{2}x^8 - 4\sqrt{2}x^8}{3\sqrt{2}x^8}$ ✓M ✓A

$= \dfrac{6\sqrt{2}x^8}{3\sqrt{2}x^8}$ ✓A

$= 2$ ✓A (4) CP

(b) (1) $A = \dfrac{3^{\pi}-4}{6^n-2^{n+2}}$

$= \dfrac{3^n-4}{2^n.3^n-2^n.2^2}$ ✓M

$= \dfrac{3^n-4}{2^n(3^n-4)}$ ✓M ✓A

$= \dfrac{1}{2^n}$ ✓A (4) CP

(b) (2) $\sqrt[n]{A} = \sqrt[n]{\frac{1}{2^n}}$

$= \frac{1}{2}$ ✓A (1) K

(c) Diagonal ^{2} $= \left(\sqrt{5}+1\right)^2 + \left(\sqrt{5}-1\right)^2$ ✓M✓A

$= 5+2\sqrt{5}+1+5-2\sqrt{5}+1$ ✓M

$= 12$

$\therefore$ Diagonal $= \sqrt{12}$

$= 2\sqrt{3}$ ✓C/A (4) CP

(d) (1) Time $= 909526 \div (60\times 60\times 24)$ ✓M

$= 10{,}5269 \ldots\ldots$ days ✓A

$>$ so more than a week ✓CA (3) RP

(2) Distance $= 909526 \div 10 \times 5 \div (100\times 1000)$ ✓M

$= 4{,}5$ km ✓A (2) RP

18 marks

QUESTION 4

(a) (1) $a = 7$ ✓A $b = 15$ ✓A

$y = 2x-1$ ✓A (3) RP

(If answer is wrong, 1 method mark for linear expression)

(2) $a = 64$ ✓A $b = 72$ ✓A

$y = x^2 + x$ ✓A (3) RP

(If answer is wrong, 1 method mark for quadratic expression)

(b) (1) A.P. $a = 201, d = -4$

n	1	2	3	4
$-4n$	-4	-8	-12	-16
T_n	201	197	193	189

✓M ✓A

$\therefore$ $T_n = 205-4n$ ✓A

ALTERNATIVELY:

$T_n = a+(n-1)d$

$= 201+(n-1)(-4)$ ✓M ✓A

$= 201-4n+4$

$= 205-4n$ ✓A (3) RP

(2) $T_n = 205 - 4n$

$T_{50} = -4 \times 50 + 205$ ✓M

$= 5$ ✓A

ALTERNATIVELY:

$T_{50} = a + 49d$

$= 201 + 49(-4)$ ✓M

$= 5$ ✓A (2) RP

(c) $T_n = an^2 + bn$

$T_1 = a + b = 3 \ldots\ldots\ldots ❶$

$T_2 = 4a + 2b = 10 \ldots\ldots ❷$ ✓M ✓A

❷: $2a + b = 5 \ldots\ldots ❸$ ✓M

❸–❶ $a = 2$ ✓A

$b = 3 - 2$

$= 1$ ✓A (5) RP

(d) $F_v = P_v(1-i)^n$

✓A ✓A ✓M

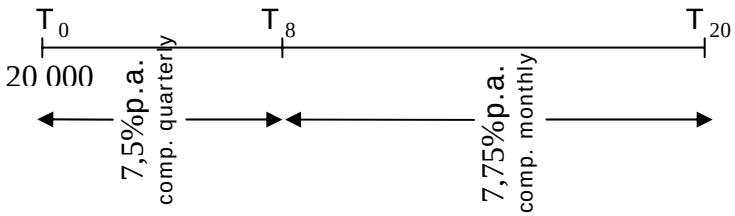
$\therefore 183680 = P(0,92)^1$

$P = R199652,17$ ✓A (4) RP

(e) (1) $A = 20000\left(1 + \frac{0,075}{4}\right)^{4\times 20}$ ✓M ✓A

$= \text{R } 88\,397,45$ ✓CA (3) RP

(2)



$A = 20\,000\left(1 + \frac{0,075}{4}\right)^{4\times 8}$ ✓A $\left(1 + \frac{0,0775}{12}\right)^{12\times 12}$ ✓A ✓M

$= 91577,57$ ✓A

$\therefore$ Extra R 3 180,12 ✓CA (5) CP

(f) $30{,}15 \leq \text{Length} < 30{,}25$ ✓A
$15{,}45 \leq \text{Width} < 15{,}55$ ✓A
$\therefore 465{,}8175 \leq \text{Area} < 470{,}3875$ ✓A ✓A (4) RP

32 marks

QUESTION 5

(a) (1) At A : $x = 5$
$5 + y = 25$ ✓M
$y = 20$
$\therefore$ A$(5 ; 20)$ ✓A

At B : $x = 5$
$5 + 2y = 34$ ✓M
$2y = 29$
$y = 14{,}5$
$\therefore$ B$(5 ; 14{,}5)$ ✓A

At C : $x = 25 - y$ and $x + 2y = 34$
$25 - y + 2y = 34$ ✓M
$y = 9$ ✓A
$x = 16$
$\therefore$ C$(16 ; 9)$ ✓A (7) RP

(2) At A : $P = 3 \times 5 + 2 \times 20$
$= 55$ ✓CA
At B : $P = 3 \times 5 + 2 \times 14{,}5$
$= 44$ ✓CA
At C : $P = 3 \times 16 + 2 \times 9$
$= 66$ ✓CA

$\therefore$ P maximised for $x = 16, y = 9$ ✓CA (4) RP

(b) (1) $375x + 125y \leq 300\,000$ ✓M ✓A
$125x + 375y \leq 320\,000$ ✓M ✓A
$x + y \leq 300$ ✓A (5) CP

(2) Profit $= 2x + 2{,}5y$ ✓ (1) K

17 marks

QUESTION 6

(a) Domain : $x \varepsilon R$ ✓A
Range : $y \geq -8$ ✓A (2) K

(b) Ave.Grad. $= \frac{-6-0}{0-3}$ ✓M
$= 2$ ✓A (2) K

(c) $j(x) = 2(-x-1)^2 - 8$ ✓M ✓A
$= 2(x+1)^2 - 8$ (2) RP

(d) $g(x) = 2x^2 - 8$ ✓A ✓A for TP on y-axis (2) CP

(e) $k > 8$ (2) PS
✓A ✓A (for 8)

10 marks

QUESTION 7

(a) P(0; 1) ✓A (1) K

(b) (1) D ✓A ✓A (2) RP

(2) B ✓A ✓A (2) RP

(3) E ✓A ✓A (2) RP

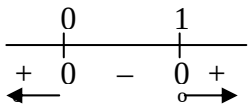
7 marks

QUESTION 9(A)

(a) (1) (i) $x^2 > x$

$x^2 - x > 0$

$x(x-1) > 0$ ✓M

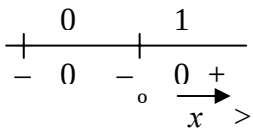


$x < 0$ or $x > 1$ ✓A

(ii) $x^3 > x^2$

$x^3 - x^2 > 0$

$x^2(x-1) > 0$ ✓M



$x > 1$ ✓A (4) RP/CP

(2) The square of a number is only greater than the original number if $x < 0$ or $x > 1$ ✓C_A

For $x = 0$ or $x = 1$ the square equals the number while for $0 < x < 1$ the square is smaller. ✓C_A

The cube of a number is only greater than the square if $x > 1$ ✓C_A

For $x = 0$ or $x = 1$ the square and the cube are equal while for $x < 1, x \neq 0$ the cube is smaller than the square. ✓C_A (4) PS

8 marks

Total: 150 marks