GRADE 11 STANDARDISATION PROJECT
NOVEMBER 2013

MATHEMATICS: PAPER I

MARKING GUIDELINES

Time: 3 hours 150 marks

These marking guidelines are prepared for use by examiners and sub-examiners, all of whom are required to attend a standardisation meeting to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.

The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.

SECTION A

QUESTION 1

(a) $2x^2 + 10x = x^2 - 16$ ✓m
$x^2 + 10x + 16 = 0$ ✓a
$(x + 8)(x + 2) = 0$ ✓a
$x = -8$ or $x = -2$ ✓ca (4)

(b) $3px = 6x + 4m$ ✓m
$3px - 6x = 4m$ ✓m
$x(3p - 6) = 4m$ ✓a
$x = \dfrac{4m}{(3p - 6)}$ ✓ca (4)

(c) $4^{2x+1} = \left(8^{2x-10}\right)^{\frac{1}{2}}$ ✓m
$2^{4x+2} = 8^{x-5}$
$2^{4x+2} = 2^{3x-15}$ ✓a
$4x + 2 = 3x - 15$ ✓m
$x = -17$ ✓ca (4)

(d) + – + ✓m✓a (Any method; accuracy for critical values)
$-\frac{1}{3}$ 5
$-\frac{1}{3} \leq x \leq 5$ ✓ca (3)

(e) $x^2 + 2x\sqrt{m} + m = 2x\sqrt{m} + 9 + m$ ✓m
$x^2 = 9$ ✓a
$x = \pm 3$ ✓a (3)
[18]

QUESTION 2

(a) $f(5) = 2(5 - 3)^2 + 5$ ✓m
$f(5) = 13$ ✓a (2)

(b) $2x^2 - 12x + 23 = 103$ ✓m
$2x^2 - 12x - 80 = 0$
$x^2 - 6x - 40 = 0$
$(x - 10)(x + 4) = 0$ ✓a
$x = 10$ or $x = -4$ ✓ca✓
ALTERNATIVELY
$2(x - 3)^2 + 5 = 103$ ✓m
$2(x - 3)^2 = 98$
$(x - 3)^2 = 49$
$x - 3 = \pm 7$ ✓a $x = 10$ ✓ca OR $x = -4$ ✓ca (4)
[6]

QUESTION 3

(a) 2 $\overset{4}{\underset{2}{\triangledown}}$ 6 $\overset{6}{\underset{2}{\triangledown}}$ 12 $\overset{8}{\underset{2}{\triangledown}}$ 20 ✓m

$2a = 2$ $3(1) + b = 4$ $(1) + (1) + c = 2$ ✓m
$a = 1$ $b = 1$ $c = 0$ ✓a

$T_n = n^2 + n$ ✓ca

ALTERNATIVELY

$Tn = 2 + (n - 1)\,4 + \dfrac{(n-1)(n-2)}{2} \times 2$ ✓m
$= 2 + 4n - 4 + n^2 - 3n + 2$ ✓a
$= n^2 + n$ ✓ca

(4)

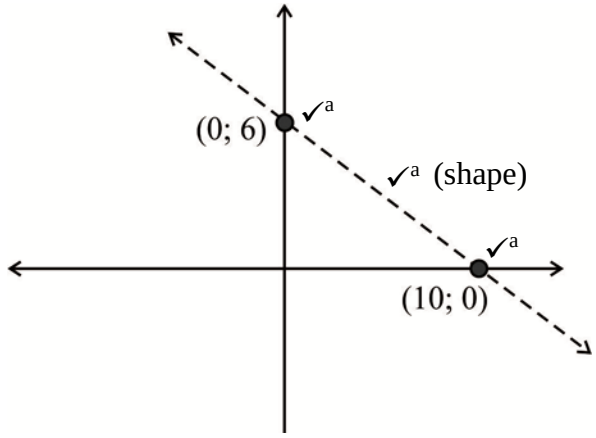
(b) $7\,260 \times 6 = 43\,560$ ✓m
$T_{43561} = 2$ ✓a

(2)

[6]

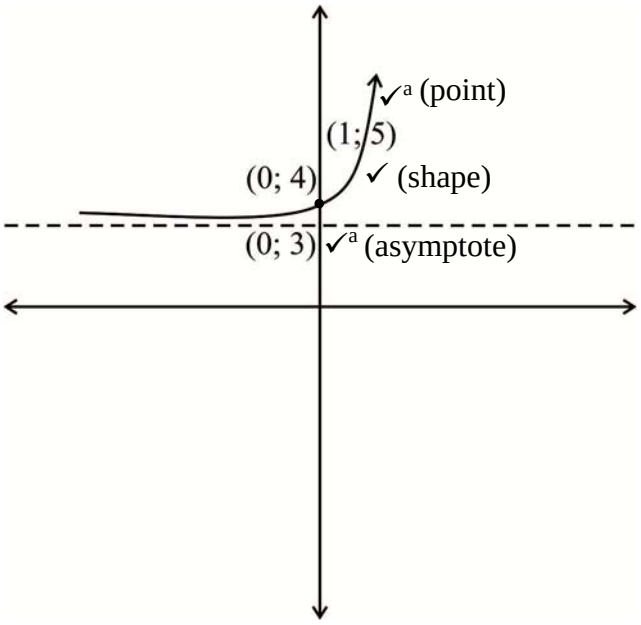
QUESTION 4

(a)



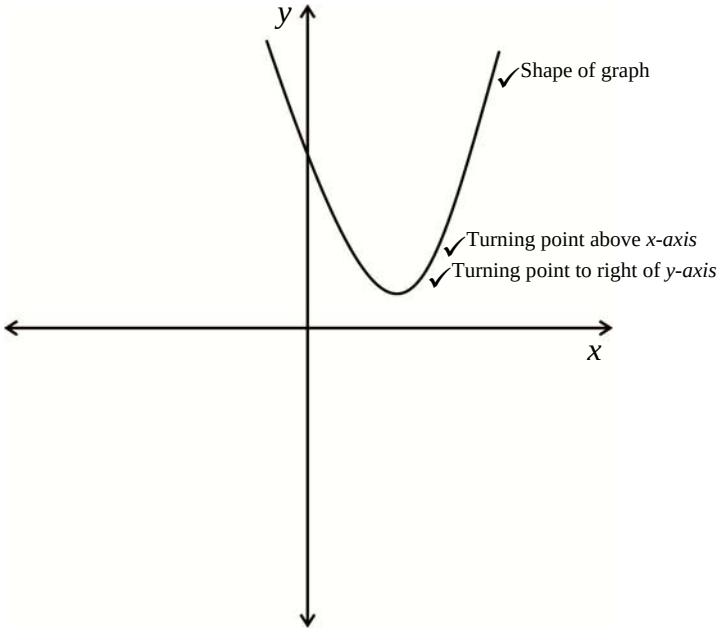
(3)

(b)



(3)

(c)



(3)
[9]

QUESTION 5

(a) $w = 4$ ✓a and $d = 2$ ✓a (2)

(b) $y = -x + c$ ✓m
$2 = -4 + c$ ✓m
$c = 6$
$g(x) = -x + 6$ ✓a (3)

(c) $p = y_c = -(1) + (6)$ ✓m
$= 5$ ✓a

$m = y_B = \dfrac{2}{1-4} + 2$

$y_B = \dfrac{4}{3}$ ✓a

$CB = 5 - \dfrac{4}{3}$

$= \dfrac{11}{3}$ *units* ✓ca (4)

(d) $0 = \dfrac{2}{x-4} + 2$ ✓m (subbing in point)
$0 = 2 + 2(x - 4)$ ✓m (solving equation)
$0 = 2 + 2x - 8$
$-2x = -6$
$x = 3$ ✓a
you would need to shift it 3 units to the left ✓ca (3 units left) (4)
[13]

QUESTION 6

(a) (1) ✓m $\frac{2^x\left(2^3+1\right)}{2^x}$ ✓a
= 9 ✓a (3)

(2) $\frac{(2x+1)}{(x+7)(x-7)}$ ✓a × ✓a $\frac{2^{6x}(x-7)}{2^{6x}}$ ✓a ✓m (factorising)
= 2x + 1 ✓ca (6)

(b) $12^8.12^4.6$ ✓m✓a
$6m^{12}$ or $\frac{m^{13}}{2}$ ✓a✓a (4)

[13]

QUESTION 7

(a) (1) $a = c - 5$ ✓a
$5(c - 5) + 5 = 3c - 3$ ✓m
$5c - 25 + 5 = 3c - 2$
$2c = 18$
$c = 9$ ✓a
$a = 4$ ✓a
$b^2 = 4(4)(9)$ ✓m
$b = 12$ ✓ca

ALTERNATIVELY
$5a + 5 = 3(a + 5) - 2$ ✓m
$= 3a + 15 - 2$
$2a = 8$ ✓a
$a = 4$ ✓a } OR $(2x + 3)^2$ and work out b
$c = 9$ ✓a } using (2)(3)(2) = 12
$b^2 = 4(4)(9)$ ✓a
$b = 12$ ✓ca

(5)

(2) *One solution* ✓a OR two equal solutions (1)

(b) $3(x^2 - 2bx + b^2) + 4$ ✓m
$= 3(x - b)^2 + 4$ ✓a
$= 3(15) + 4$ ✓m
$= 49$ ✓a (4)

[10]

75 marks

SECTION B

QUESTION 8

(a) $i_e = \left(1 + \frac{0,15}{12}\right)^{12} - 1$ ✓m

$i_e = 16,0754\%$

$i_e \approx 16,1\%$ ✓a (2)

(b) $20\,000 = x\left(1 + \frac{0,15}{12}\right)^{48}$ ✓m

$x = \text{R}11\,017,13$ ✓a (2)

(c) $3\,500\left(1 + \frac{0,15}{12}\right)^{40}$ ✓a $+ 8\,100\left(1 + \frac{0,15}{12}\right)^{23}$ ✓a $- 4\,200\left(1 + \frac{0,15}{12}\right)^{12}$ ✓a $+ 8\,500\left(1 + \frac{0,15}{12}\right)^{6}$ ✓a ✓m

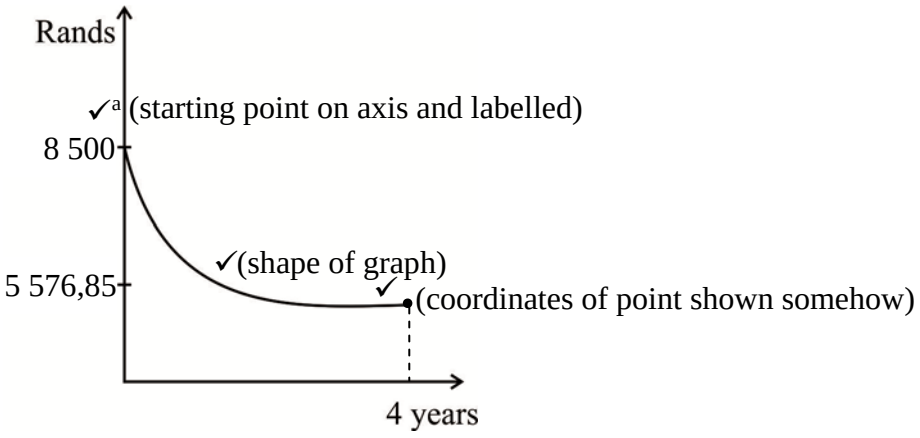
$= \text{R}20\,814,06$ ✓a

Yes; Flippie will have money if he follows the above savings plan. ✓ca (7)

(d) $8\,500(1 - 0,10)^4$ ✓m

$= \text{R}5\,576,85$ ✓a (2)

(e)



(3)

[16]

QUESTION 9

(a) $2 \underset{x-2}{\bigtriangledown} x \underset{x+1}{\bigtriangledown} 2x+1 \underset{2x-1}{\bigtriangledown} 4x$ ✓m

$\underset{3}{\bigtriangledown}$ $\underset{x-2}{\bigtriangledown}$ ✓a

$3 = x - 2$ ✓m

$x = 5$ ✓

hence the fourth term has a value of 20 ✓ca (5)

(b) $2 \underset{3}{\bigtriangledown} 5 \underset{3}{\bigtriangledown} 11 \underset{3}{\bigtriangledown} 20$ ✓a

$2a \overset{\checkmark m}{=} 3 \quad 3\left(\frac{3}{2}\right) + b = 3 \quad \frac{3}{2} - \frac{3}{2} + c = 2$ ✓m

$a = \frac{3}{2} \quad b = -\frac{3}{2} \quad c = 2$

$T_n = \frac{3}{2}n^2 - \frac{3}{2}n + 2$ ✓a ✓ ✓a

ALTERNATIVELY

$T_n = 2 + (n-1)3 +$ ✓m

$\frac{(n-1)(n-2)}{2} \times 3$ ✓m

$= 2 + 3n - 3 + \frac{3}{2}(n^2 - 3n + 2)$

$= 3n - 1 + \frac{3}{2}n^2 - \frac{9n}{2} + 3$

$= \frac{3}{2}n^2 - \frac{3}{2}n + 2$

✓a ✓a ✓a

(6)

(c) $572 = \frac{3}{2}n^2 - \frac{3}{2}n + 2$ ✓m

$1\,144 = 3n^2 - 3n + 4$

$0 = 3n^2 - 3n - 1\,140$

$0 = n^2 - n - 380$ ✓a

$0 = (n - 20)(n + 19)$ ✓m

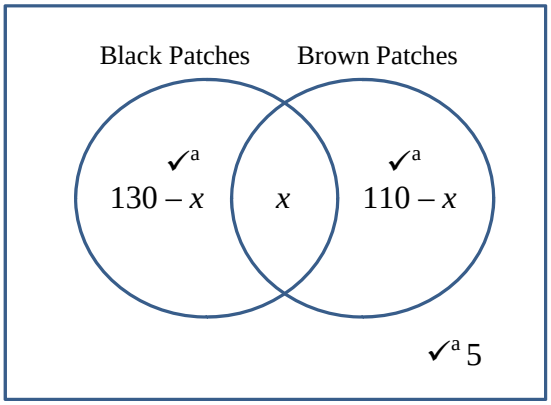
$n = 20$ or $n = -19$ ✓a

at the end of the 20th year ✓ca (5)

[16]

QUESTION 10

(a)



(4)

(b) $130 - x + x + 110 - x + 5 = 200$ ✓m✓a
$-x = 200 - 5 - 130 - 110$
$x = 45$ ✓ca (3)

(c) $\frac{65}{200}$ ✓m
$= \frac{13}{40}$ ✓a (2)

[9]

QUESTION 11

(a) R9 ✓a (1)

(b) (5 + 2 + 2) *one option* ✓m✓a
(5 + 2 + 1 + 1) *six options* ✓m✓a (4)

(c) (i) 1 or 100% ✓a (1)

(ii) $\frac{1}{7}$ ✓ca (1)

(iii) $\frac{6}{7}$ ✓ca (1)

[8]

QUESTION 12

(a) $T\left(\frac{3}{2}; 2\right)$ ✓a (1)

(b) $y = a\left(x - \frac{3}{2}\right)^2 + 2$ ✓m (subbing in co-ordinates of T)

Sub in (0; 0)

$0 = a\left(-\frac{3}{2}\right)^2 + 2$ ✓m

$-2 = \frac{9}{4}a$ ✓a } Must show working

$a = -\frac{8}{9}$ (3)

(c) $\frac{16}{9} = -\frac{8}{9}\left(x - \frac{3}{2}\right)^2 + 2$ ✓m

$\frac{1}{4} = x^2 - 3x + \frac{9}{4}$

$1 = 4x^2 - 12x + 9$

$0 = 4x^2 - 12x + 8$

$0 = x^2 - 3x + 2$ ✓a

$0 = (x - 2)(x - 1)$

$x = 2$ or $x = 1$ ✓ca

$S\left(2; \frac{16}{9}\right)$ ✓a (4)

(d) $y = \frac{10}{9}x + c$

$\frac{16}{9} = -\frac{10}{9}(2) + c$ ✓m

$c = 4$

$y = -\frac{10}{9}x + 4$

$0 = -\frac{10}{9}x + 4$ ✓a

$10x = 36$

$x = \frac{18}{5}$ ✓a

$RU = \frac{18}{5} - 3$

$RU = \frac{3}{5}$ *metres* or *60 cm* ✓ca (4)

ALTERNATIVELY:

$m_{su} = \frac{16}{9} \div (2 - x_u) = \frac{-10}{9}$ ✓m

$16 = -10(2 - x_u)$

$\frac{-8}{5} = 2 - x_u$ ✓a

$x_u = 2 + \frac{8}{5}$

$= \frac{18}{5}$ ✓a

[12]

QUESTION 13

(a) $mx + m + 6 = bx + m + 8$ ✓m✓a
$mx - bx = 2$ ✓m (getting terms with 'x' to one side)
$x(m - b) = 2$ ✓a (common factor is taken out)
$x = \frac{2}{m - b}$ ✓a (5)

(b) Let $p^2 + p = k$ ✓m
$(k + 1)^2 = (k - 7)^2 + k^2$ ✓a
$0 = k^2 - 16k + 48$
$0 = (k - 12)(k - 4)$
$k = 12$ or $k = 4$ ✓a

$p^2 + p = 12$ ✓ca	$p^2 + p = 4$ ✓ca
$p^2 + p - 12 = 0$	$p^2 + p - 4 = 0$
$(p + 4)(p - 3) = 0$	*Solutions are not natural numbers*
$p = -4$ or $p = 3$ ✓a	AC $= 3^2 + 3 + 1$
N.V.	$= 13$ ✓a
$n \in N$	

(7)

(c) $E\left(\frac{2}{m - b}; 0\right)$
$x = \frac{2}{\frac{1}{2} - \left(-\frac{12}{5}\right)}$ ✓m (subbing in values)
$x = \frac{20}{29}$ ✓a
$E\left(\frac{20}{29}; 0\right)$ (2)

[14]

75 marks

Total: 150 marks