

**MATHEMATICS**

**(PAPER 1)**

**JUNE 2008**

**MEMORANDUM**

TIME: 3 HOURS  
MARKS: 150



**education**

Western Cape Education Department

**NATIONAL STRATEGY FOR LEARNER ATTAINMENT**

**NATIONAL SENIOR CERTIFICATE**

**MEMO**

This memo consists of **10** pages

**Note:**

1. omitting 0 in standard form - penalize once in paper at 1.1.1
2. Penalize for rounding only once in paper at 1.1.2

**QUESTION 1**

1.1

1.1.1  $2x^2 + 6x - x - 3 = 12x + 1$

$$2x^2 - 7x - 4 = 0$$

$$(2x + 1)(x - 4) = 0$$

$$x = -\frac{1}{2}; 4$$

- ✓ expansion
- ✓ standard form
- ✓ factors
- ✓ ✓ each value (5)

1.1.2  $3x^2 + 2x - 4 = 0$

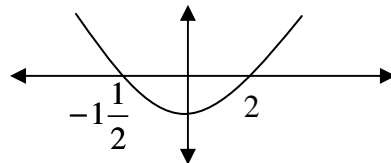
$$x = \frac{-2 \pm \sqrt{4 + 48}}{6}$$

$$= 0,87; -1,54$$

- ✓ standard form
- ✓ ✓ formula and substitution
- ✓ ✓ each value (5)

1.1.3  $(2x + 3)(x - 2) \leq 0$

$$-1\frac{1}{2} \leq x \leq 2$$



- ✓ factors
- ✓ ✓ ✓ each end values, signs (4)

1.2  $x = -3y - 3$

$$(-3y - 3)y + 6 = 0$$

$$-3y^2 - 3y + 6 = 0$$

$$y^2 + y - 2 = 0$$

$$(y - 1)(y + 2) = 0$$

$$y = 1; -2$$

$$\therefore x = -6; 3$$

- ✓  $x$  subject of formula
- ✓ substituting
- } ✓ standard form
- ✓ factors
- ✓ both values
- ✓ ✓ each value (7)

**[21]**

**QUESTION 2**

2.1  $\frac{3-x}{x+7} \geq 0$  ✓ condition for real number

$$\begin{array}{r} x: \quad -7 \qquad \qquad 3 \\ 3-x: \quad + \dots + + + + 0 - - - - \\ x+7: \quad - - 0 + + + + \\ \text{fraction:} \quad - \text{undefined} + 0 - \end{array}$$

$\therefore -7 < x \leq 3$  ✓ ✓ ✓ critical values, signs (4)

2.2  $3^{-2} \cdot 3^{-1} \cdot x^{-2} \cdot x^3$  ✓ ✓ base 3, base x  
 $= 3^{-3} \cdot x$  ✓ solution (3)  
 $= \frac{x}{27}$  [7]

**QUESTION 3**

3.1  $(1 + \frac{0,1028}{365})^{365} = 1,10825\dots$  ✓ ✓ ✓ *i*, interval, answer

$(1 + \frac{0,103}{12})^{12} = 1,10800\dots$  ✓ ✓ interval, answer (6)

$\therefore 10,28$  p.a. compounded daily is better ✓ solution

3.2.1  $F_v = 576\,000(1 + \frac{0,0875}{12})^{14}(1 + \frac{0,0925}{12})^{22}$  ✓ ✓ ✓ ✓ P, both *i*, each interval (5)  
 $= R755\,027,13$  ✓ solution

3.2.2  $576\,000(1 + i)^3 = 755\,027,13$  ✓ equation (concept)  
 $i = \sqrt[3]{\frac{7555027,13}{576000}} - 1$  }  
 $i = 0,094409\dots$  ✓ calculation  
 • • effective rate  $i \times 100 = 9,44\%$  ✓ solution (3)

3.2.3  $576\,000\left(1 + \frac{i}{12}\right)^{36} = 755\,027,13$

$$i = \left[ \sqrt[3]{\frac{755027,13}{576000}} - 1 \right] \times 12$$

$$= 0,090555\dots$$

✓ equation (concept)

✓ calculation

∴ nominal rate:  $i \times 100 = 9,06\%$

✓ solution

(3)

[17]

**QUESTION 4**

4.1  $a = 6$   
 $r = 3$

✓  $a$

✓  $r$

(2)

4.2  $6 \cdot 3^{n-1} = 1458$   
 $3^{n-1} = 243$   
 $= 3^5$   
 $n - 1 = 5$   
 $n = 6$

✓ ✓ substitution and equation

✓ base 3

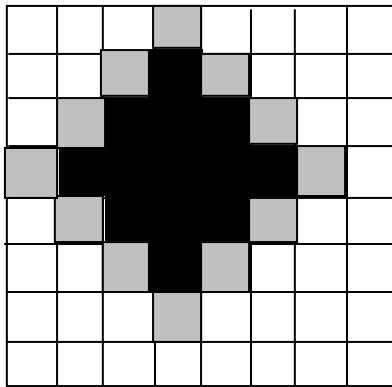
✓ solution

(4)

[6]

**QUESTION 5**

5.1



✓ black

✓ grey

(2)

5.2  $S_1 = 0; 4; 8; 12; 16; 20$   
 $S_2 = 1; 5; 13; 25; 41; 61$

✓ ✓ ✓ 1 mark per two terms

✓ ✓ ✓ 1 mark per two terms

(6)

[8]

**QUESTION 6**

6.1 46; 60 ✓ ✓ per term (2)

6.2 first differences: 4; 6; 8; 10; 12 ...  
second differences: 2; 2; 2 ✓ second difference

∴  $2a = 2$  [Quadratic]  
 $a = 1$  ✓ value of  $a$

∴  $T_n = an^2 + bn + c$   
but  $a = 1$   
∴  $T_1 = 1(1) + b(1) + c = 6$  ... [1] ✓ any substitution  
 $T_2 = 4 + 2b + c = 10$  ...[2]

∴ From [1]:  $b + c = 5$  ...[3]  
From [2]:  $2b + c = 6$  ...[4]  
[4] - [3]:  $b = 1$  ✓ value of  $b/ c$   
substitute in [3]:  $c = 4$

∴  $T_n = n^2 + n + 4$  ✓  $T_n$  (5)

6.3  $n^2 + n + 4 = 1264$  ✓ equation/ concept  
 $n^2 + n - 1260 = 0$

$n = \frac{-1 \pm \sqrt{5041}}{2}$  ✓ formula/ factors  
 $= 35$  or  $-36$  ✓ answers

∴  $n = 35$  ✓ solution (4)

[11]

**QUESTION 7**

7.1  $(-1; 2)$

✓ ✓ 1 per coordinate (2)

7.2  $-\frac{1}{2}(x+1)^2 + 2 = 0$

✓ equation/ concept

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

$(x+1)^2 = 4$

$x+1 = \pm 2$

$x = 1; -3$

}

✓ simplification

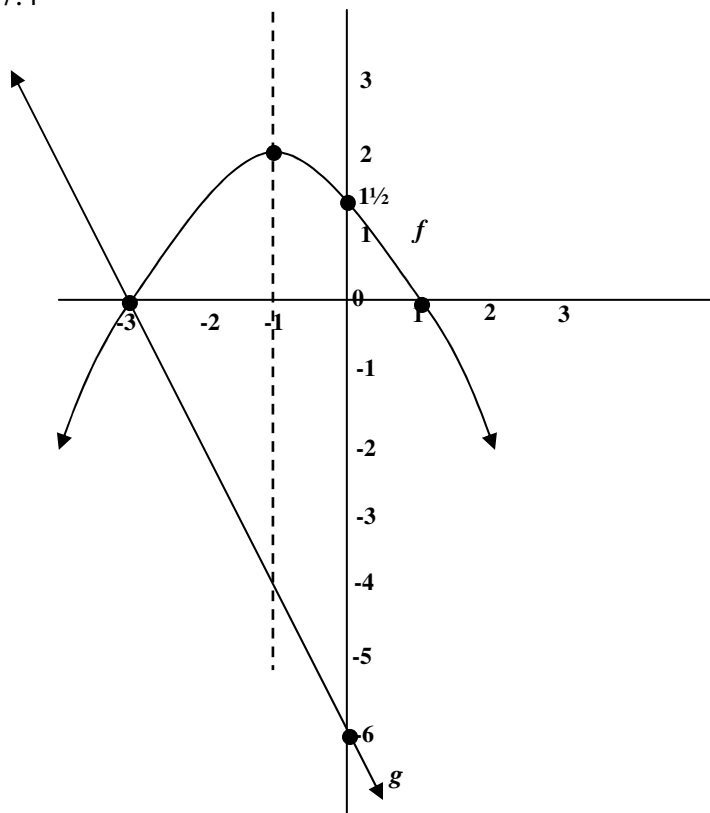
✓

✓ both solutions (4)

7.3  $x = -1$

✓ solution (1)

7.4



✓ turning point

✓ shape of  $f$

✓ all intercepts of  $f$

✓ all intercepts of  $g$  (4)

[11]

**QUESTION 8**

8.1.1  $x = 2$  and  $y = -4$  ✓ ✓ each equation (2)

8.1.2 for y - intercept  $= \frac{5}{0-2} - 4 = -6\frac{1}{2}$  ✓ y-intercept

for x - intercept  $0 = \frac{5}{x-2} - 4$  ✓ equation/ concept

$$4 = \frac{5}{x-2}$$

$$\therefore 4x - 8 = 5$$

$$4x = 13$$

$$x = 3\frac{1}{4}$$

✓ x - intercept (3)

8.2.1  $120^\circ$  ✓ answer (1)

8.2.2  $f(x) = \cos(x - 90^\circ)$  ✓ ✓ cos and  $-90^\circ$  (2)

8.2.3  $-30^\circ; 60^\circ$  ✓ ✓ each value (2)

**[10]**

**QUESTION 9**

9.1  $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$  ✓ formula

$$f(x+h) = \frac{1}{x+h}$$

$f(x+h) - f(x) = \frac{1}{x+h} - \frac{1}{x}$  ✓ substitution

$$= \frac{x - x - h}{x(x+h)}$$

✓ simplification

$$\frac{f(x+h) - f(x)}{h} = \frac{-h}{x(x+h)} \times \frac{1}{h}$$

$$= \frac{-1}{x^2 + xh}$$

✓ simplification

$$\therefore \lim_{h \rightarrow 0} = -\frac{1}{x^2}$$

✓ solution (5)

9.2  $f'(x) = 21x^2 - 4$  ✓ ✓ ✓ each term (3)

**[8]**

**QUESTION 10**

- 10.1 At A and B  $f'(x) = 3x^2 - 8x - 11 = 0$   
 $(3x - 11)(x + 1) = 0$   
 $x = \frac{11}{3}; -1$   
 $y = -14\frac{22}{27}; 36$  ✓ concept  
 ✓ factors  
 ✓ both values  
 ✓ ✓ each value (5)
- 10.2  $(1; 36)$  and  $(\frac{17}{3}; -14\frac{22}{27})$  ✓ ✓ each turning point (2)
- 10.3 Average rate of change =  $\frac{36 + 14\frac{22}{27}}{-1 - \frac{11}{3}}$   
 $= -10\frac{8}{9}$  ✓ difference y  
 ✓ difference x  
 ✓ answer (3)
- 10.4  $m_1 = 3(1)^2 - 8(1) - 11 = -16$   
 $f(1) = 1 - 4 - 11 + 30 = 16$   
 $y = -16x + c$  through  $(1; 16)$   
 $16 = -16 + c$   
 $c = 32$   
 $\therefore y = -16x + 32$  ✓ gradient  
 ✓ y-value  
 ✓ y- intercept  
 ✓ equation (4)
- 10.5  $k > 36$  or  $k < -14\frac{22}{27}$  ✓ ✓ each solution (2)
- 10.6 for inflection points  
 $f''(x) = 6x - 8 = 0$   
 $x = \frac{4}{3}$   
 $\therefore y = 10\frac{16}{27}$  ✓ ✓ ✓ notation,  
 equation and concept  
 ✓ x-value  
 ✓ ✓ y-value (6)  
 [22]



**QUESTION 11**

11.1  $2l + 2b = 72$

$\therefore 2x + 2b = 72$

$b = 36 - x$

✓ solution (1)

11.2 mirror length =  $x - 4$

mirror breadth =  $32 - x$

✓ solution (2)  
✓ solution

11.3  $A = (x - 4)(-x + 32)$   
 $= -x^2 + 36x - 128 \text{ cm}^2$

✓ ✓ formula & substitution (2)

11.4 for largest mirror  $\frac{dA}{dx} = 0$

$\therefore -2x + 36 = 0$

$-2x = -36$

$x = 18$

$\therefore$  length =  $18 - 4 = 14\text{cm}$

breadth =  $32 - 18 = 14\text{cm}$

✓ concept  
✓ derivative  
✓ x-value (4)  
✓ both values [9]

**QUESTION 12**

12.1

	Raisons	Peanuts	Profit
x (Half-n-Half)	$\frac{1}{2}$	$\frac{1}{2}$	5
y(Nuts about Nuts)	$\frac{1}{3}$	$\frac{2}{3}$	4
Total	100	125	

$\therefore \frac{1}{2}x + \frac{1}{3}y \leq 100 \dots [1]$

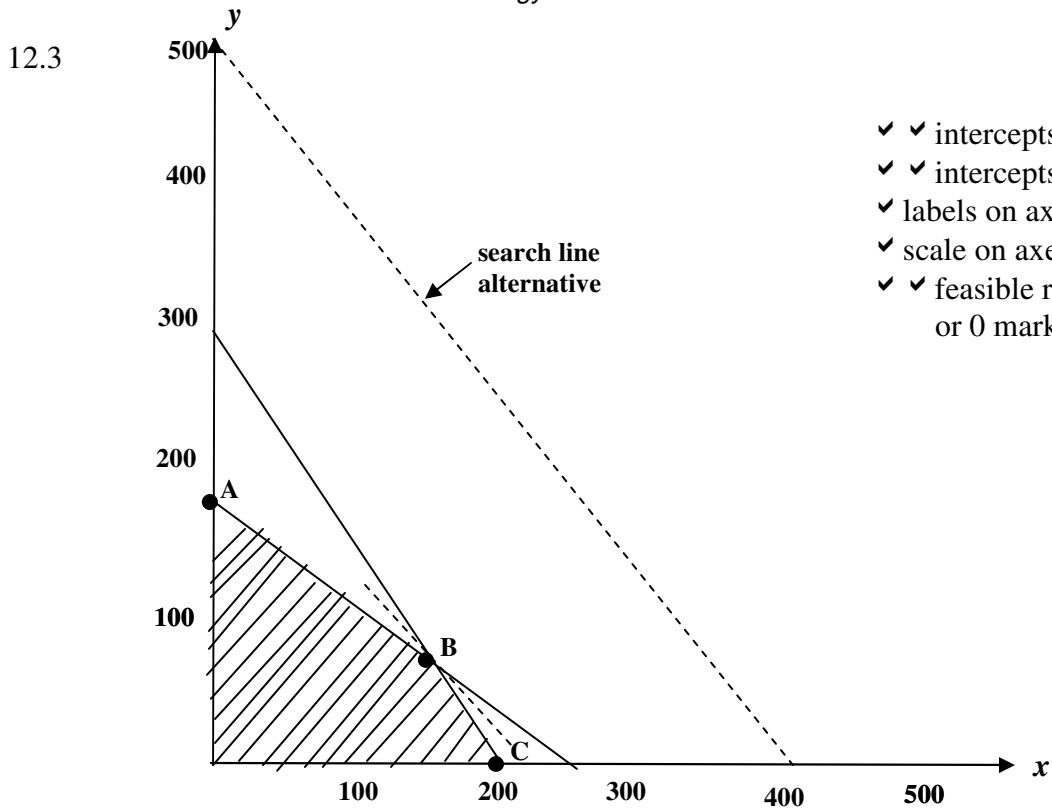
✓ ✓ LHS; sign & RHS

$\frac{1}{2}x + \frac{2}{3}y \leq 125 \dots [2]$

✓ ✓ LHS; sign & RHS (4)

12.2  $P = R(5x + 4y)$

✓ ✓  $5x$  and  $4y$  (2)



- ✓ ✓ intercepts line[1]
- ✓ ✓ intercepts line[2]
- ✓ labels on axes
- ✓ scale on axes
- ✓ ✓ feasible region/  
or 0 marks

(8)

12.4.1 A+ A(0; 187,5)  
or B(150; 75)  
or C(200; 0)  
B (150; 75) will ensure maximum profit

- ✓ ✓ ✓ each point
- ✓ selecting B
- answer only full marks
- search line full marks

(4)

12.4.2  $P = 5(150) + 4(75)$   
 $= R1\ 050$

- ✓ substitution
- ✓ solution

(2)

[20]

**TOTAL: 150**