Basic Education

KwaZulu-Natal Department of Basic Education
REPUBLIC OF SOUTH AFRICA

MATHEMATICS

MEMORANDUM

COMMON TEST

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NATIONAL SENIOR CERTIFICATE

GRADE 11

N.B. This memorandum consists of 9 pages including this page.

QUESTION ONE

1.1

1.1.1 $(3)^{-6\left(\frac{-1}{2}\right)}$

$= 3^4$ ✓ 1A for simplification

$= 81$ ✓ 1CA for correct answer

OR

$\left(9^{-3}\right)^{\frac{-2}{3}}$ ✓ 9^{-3}

$= 9^2$

$= 81$ ✓ 81

OR

$\left(3^{-6}\right)^{\frac{-2}{3}}$ ✓ 3^{-6}

$= 3^4$

$= 81$ ✓ 81 (2)

1.1.2 $\dfrac{5^{2-m}.2^m.5^m}{2^{m-1}}$

$= 5^{2-m+m}.2^{m-m+1}$ ✓ Same bases

$= 5^2.2$ ✓ $5^2.2$

$= 50$ ✓ 50 (3)

1.1.3 $\dfrac{2^y\left(5.2^1-1\right)}{2^y\left(2^{-1}\right)}$ ✓ Factorising

$= \dfrac{9}{\frac{1}{2}}$ ✓ Simplifying

$= 18$ ✓ 18 (3)

1.2 $\dfrac{9-3\sqrt{6}}{6\sqrt{2}}$

$\dfrac{3(3-\sqrt{6})}{6\sqrt{2}}$ ✓ 1CA for factorisation

$= \dfrac{3-\sqrt{6}}{2\sqrt{2}} \times \dfrac{\sqrt{2}}{\sqrt{2}}$ ✓ 1CA for rationalising

$= \dfrac{3\sqrt{2}-2\sqrt{3}}{4}$ ✓ 1CA for correct simplification

L.H.S $= \dfrac{9-3\sqrt{6}}{6\sqrt{2}} \times \dfrac{\sqrt{2}}{\sqrt{2}}$ ✓ Rationalising

$= \dfrac{9\sqrt{2}-3\sqrt{12}}{12}$ ✓ Multiplying

$= \dfrac{3(3\sqrt{2}-2\sqrt{3})}{124}$ ✓ Factorising

$= \dfrac{3\sqrt{2}-2\sqrt{3}}{4}$ = RHS

(3)

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QUESTION TWO

2.1

2.1.1 $x = 0$ or $x = \frac{1}{2}$ — ✓✓ Answers (2)

2.1.2 $5x^2 - 3x - 4 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ — ✓ 1M for correct formula

$$= \frac{-(-3) \pm \sqrt{(-3)^2 - 4(5)(-4)}}{2(5)}$$ — ✓ 1A for substitution

$= 1{,}24$ or $-0{,}64$ — ✓ 2CA for each value of x (4)

2.1.3 $\sqrt{7x + 2} = 2x$

$7x + 2 = 4x^2$ — ✓ 1A for squaring both sides

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

$(4x + 1)(x - 2) = 0$ — ✓ 1CA for correct factorization

$x = \frac{-1}{4}$ or 2 — ✓ 1CA for both values of x

$SS = \{2\}$ — ✓ 1CA for correct solution (4)

2.2 $x = 6 - y$ — ✓ 1A for making x the subject

$(6 - y)^2 + 2y(6 - y) - 8y^2 = 0$ — ✓ 1CA for substitution

$36 - 12y + y^2 + 12y - 2y^2 - 8y^2 = 0$ — ✓ 1CA for simplification

$-9y^2 + 36 = 0$

$y^2 - 4 = 0$ — ✓ 1CA for correct quadratic

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

$y = 2$ or $y = -2$ — ✓ 1CA for correct values of y

$x = 4$ or $x = 8$ — ✓ 1CA for correct values of x

OR $y = 6 - x \rightarrow (3)$ — ✓ Making y the subject

$x^2 + 2x(6 - x) - 8(6 - x)^2 = 0$ — ✓ Substitution

$x^2 + 12x - 2x^2 - 8(36 - 12x + x^2) = 0$

$-x^2 + 12x - 288 + 96x - 8x^2 = 0$ — ✓ Simplifying

$-9x^2 + 108x - 288 = 0$ — ✓ Standard form

$x^2 - 12x + 32 = 0$

$(x - 4)(x - 8) = 0$

$x = 4$ or $x = 8$ — ✓ x– values

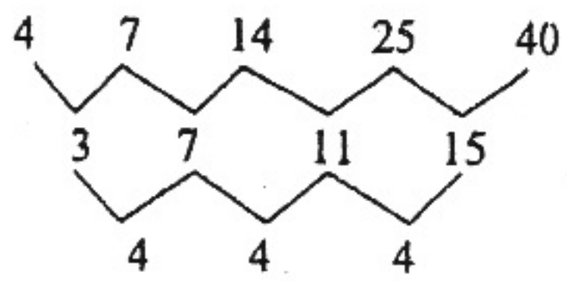
$y = 2$ or $y = -2$ — ✓ y–values (6)

2.3	$-2x(x-3) \leq 4$	
	$-2x^2 + 6x - 4 \leq 0$	✓ 1A for writing in standard form
	$x^2 - 3x + 2 \geq 0$	
	$(x-2)(x-1) \geq 0$	✓ 1CA for correct factors
	CVs $x = 2$ or $x = 1$	
	$+ \quad - \quad +$ $1 \quad 2$	
	SS $x \in R, \{x \geq 2\}$ ✓ $\cup$ $\{x \leq 1\}$	✓ 1CA for each correct value of x (4)
2.4		
	2.4.1 $m + 6 < 0$	✓ $m + 6 < 0$
	$m < -6$	✓ Answer (2)
	2.4.2 $x^2 - 5x + p = 0$	
	$b^2 - 4ac \geq 0$	✓ 1A for ≥ 0
	$(-5)^2 - 4(1)(p) \geq 0$	✓ 1A for correct substitution
	$25 - 4p \geq 0$	
	$-4p \geq -25$	
	$p \leq \frac{25}{4}$ or $6\frac{1}{4}$	✓ 1CA for correct answer (3)
		[25]

QUESTION THREE

3.1 $m = 40$ ✓✓ 2A for correct answer (2)

3.2



✓ 1A for finding the difference

$2a = 4$

$a = 2$ ✓ a–value

$3a + b = 3$

$b = -3$ ✓ b–value

$a + b + c = 4$

$c = 5$ ✓ c–value

$T_n = 2n^2 - 3n + 5$ ✓ Answer (4)

3.3 T_n of 1st difference $= 4n - 1$

$T_n - T_{n-1} = 87$

$4n - 1 = 87$ ✓ $T_n = 87$

$n = 22$ ✓ $n = 22$

$\therefore T_{23} - T_{22} = 87$

$T_{22} = 2(22)^2 - 3(22) + 5 = 907$ ✓ T_{22} value

$T_{23} = 2(23)^2 - 3(23) + 5 = 994$ ✓ T_{23} value

OR

$T_n = 4n - 1$ ✓ 1CA for finding the nth term of the first difference

$87 = 4n - 1$ ✓ 1CA for correct substitution

$22 = n$

The 22nd and the 23rd terms ✓ 1CA for each term (4)

3.4 $T_n = 4855$

$2n^2 - 3n + 5 = 4855$ ✓ $Tn = 4855$

$2n^2 - 3n - 4850 = 0$ ✓ Standard form

$(2n + 97)(n - 50) = 0$ ✓ 1CA for correct factorization

$\therefore \quad n = 50$ ✓ 1CA for correct answer (4)

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QUESTION FOUR

4.1 $C = \left(\frac{6+4}{2}; \frac{-5+5}{2}\right)$

$= \left(\frac{10}{2}; \frac{0}{2}\right)$

$= (5; 0)$

✓ 1A for 5 and ✓ 1A for 0 (2)

4.2 $m_{PQ} = \frac{1-(-5)}{-6-6}$

✓ 1A for correct substitution

$= \frac{6}{-12}$

$= \frac{-1}{2}$

✓ 1CA for correct answer (2)

4.3 $y = mx + c$

$1 = \frac{-1}{2}(-6) + c$ OR $-5 = \frac{-1}{2}(6) + c$

✓ 1A for correct substitution

$c = -2$ $c = -2$

✓ 1CA for correct value of c

$y = \frac{-1}{2}x - 2$

✓ 1CA for correct equation

OR $y - y_1 = m(x - x_1)$

$y - 1 = \frac{-1}{2}x(x + 6)$

✓ 1A for correct substitution

$y - 1 = \frac{-1}{2}x - 3$

✓ 1A for simplification

$y = \frac{-1}{2}x - 2$

✓ 1CA for correct answer

OR $y + 5 = \frac{-1}{2}(x - 6)$

✓ 1A for correct substitution

$y + 5 = \frac{-1}{2}x + 3$

✓ 1CA for simplification

$y = \frac{-1}{2}x - 2$

✓ 1CA for correct answer (3)

4.4	$PR = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$	✓ 1M for formula
	$= \sqrt{(4+6)^2 + (5-1)^2}$	✓ 1A for correct substitution
	$= \sqrt{116}$	
	$= 2\sqrt{29}$	✓ 1CA for correct answer (3)
4.5	B = (0; –2) and C = (5; 0)	✓ 1A for co-ordinates of B
	$\therefore BC = \sqrt{(5-0)^2 + (0+2)^2}$	✓ 1CA for correct substitution
	$= \sqrt{29}$	✓ 1CA for correct answer
	$\therefore PR = 2\ BC$	(3)
4.6	B = (0; –2)	
	C = (5; 0)	
	$M_{BC} = \frac{2}{5}$	✓ 1CA for gradient of BC
	$M_{PR} = \frac{4}{10} = \frac{2}{5}$	✓ 1CA for gradient PR
	∴ BC // PR (equal gradients)	✓ Equal gradients (3)
4.7	$\tan\theta = m$	
	$\tan\theta = -5\ [RA = 78{,}7°]$	✓ 1A for 78,7°
	$\theta_2 = 101{,}3°$	✓ 1CA for 101,3°
	$\tan\theta = m$	
	$\tan\theta = \frac{-1}{2}\ [RA = 26{,}6°]$	✓ 1A for 26,6°
	$\therefore \theta_1 = 153{,}4°$	
	$\therefore \alpha = 52{,}1°$	✓✓ 2CA for correct answer (5)
4.8	$M_{PQ} = \frac{-1}{2}$	
	∴ M ⊥ a line = 2	✓ 1A for gradient
	$y = mx + c \quad (-6; 1)$	
	$1 = 2(-6) + c$	✓ 1CA for correct substitution
	$c = 13$	✓ 1CA for c value
	$\therefore y = 2x + 13$	✓ 1CA for correct answer (4)
		[25]

TOTAL MARKS: 75