

GAUTENG DEPARTMENT OF EDUCATION PROVINCIAL EXAMINATION JUNE 2016

GRADE 11

MATHEMATICS P1

MEMORANDUM

11 pages

GAUTENG DEPARTMENT OF EDUCATION-

PROVINCIAL EXAMINATION

MATHEMATICS (Paper 1)

(Paper 1)

MEMORANDUM

1.1		(x-2)(3x+4) = 0	$\checkmark x = 2$	
1.1			$\sqrt{x} = -\frac{4}{4}$	
		$x = 2$ OR $x = -\frac{4}{3}$	$x = -\frac{1}{3}$	(2)
1.2	1.2.1	$\sqrt{2-x} = x+4$ $(\sqrt{2-x})^2 = (x+4)^2$ $2-x = x^2 + 8x + 16$ $x^2 + 8x + 16 + x - 2 = 0$ $x^2 + 9x + 14 = 0$ $(x+2)(x+7) = 0$ $x = -2 \text{ OR } x = -7$	 ✓ Squaring both sides ✓ Standard form ✓ Factors ✓ Answers ✓ x= -2 only 	
		NA		(5)
	1.2.2	2x(x-3) = 1 $2x^{2} - 6x - 1 = 0$ a = 2; b = -6; c = -1 $x = \frac{-b \pm \sqrt{b^{2} - 4ac}}{2a}$ $x = \frac{-(-6) \pm \sqrt{(-6)^{2} - 4(2)(-1)}}{2(2)}$ $x = \frac{6 \pm \sqrt{36 + 8}}{4}$ $x = \frac{6 \pm \sqrt{44}}{4}$	 ✓ Standard form ✓ Substitution ✓ Answer ✓ answer 	
		x = 3,2 OR $x = -0,2$		(4)

MATHEMATICS Grade 11 MEMORANDUM (Paper 1)

$1.2.3 \qquad \frac{x^2 + 4x + 3}{x - 1} > 0$ $\frac{x^2 + 4x + 3}{x - 1} > 0$ $\frac{x^2 + 4x + 3}{x - 1} > 0$ $\frac{(x + 1)(x + 3)}{x - 1} > 0$ $-3 < x < -1 \text{ or } 3$ OR $(-3; -1) \cup (1; x)$	x > 1 inequality \checkmark correct notation Only focus on numerator	(4)
1.3 $2x^{2} - 3x = 8$ $x^{2} - \frac{3}{2}x = 4$ $x^{2} - \frac{3}{2}x + \left(\frac{1}{2} \times \frac{-3}{2}\right)^{2} =$ $\left(x - \frac{3}{2}\right)^{2} = 4 + \frac{9}{16}$ $\left(x - \frac{3}{4}\right)^{2} = \frac{73}{16}$ $x - \frac{3}{4} = \pm \sqrt{\frac{73}{16}}$ $x - \frac{3}{4} = \pm \sqrt{\frac{73}{16}}$ $x = \frac{3}{4} \pm \sqrt{\frac{73}{16}}$ $x = \frac{3 \pm \sqrt{73}}{4} \text{ OR } x = \frac{3 \pm \sqrt{73}}{4}$ $x = 2,89 \text{ OR } x = -1,39$	(\pm) (\pm) (\pm) (\pm) $(\pm$	(5)
	1	[20]

2.1	$\frac{3.3^{x} - 4.3}{3^{x} - 3^{x}}$ $= \frac{3.3^{x} - 3}{3^{x} - 3^{x}}$ $= \frac{3.3^{x} - 3}{-2}$ $= 16\frac{1}{2}$	$\frac{x_{1}^{2}}{x_{3}^{2}}$ $\frac{x_{3}^{2}}{x_{3}^{2}}$ $\frac{x_{3}^{2}}{x_{3}^{2}}$ $\frac{x_{3}^{2}}{x_{3}^{2}}$	 ✓ Expansion ✓ 3³(3-4.9) ✓ 3^x(1-3) ✓ Answer If <i>k</i>-method is used exactly the same mark allocation 	(4)
2.2	2.2.1	$\frac{\sqrt{5}}{\sqrt{5+2}} + \frac{10}{\sqrt{5}}$ $= \frac{5+10(\sqrt{5}+2)}{5+2\sqrt{5}}$ $= \frac{5+10\sqrt{5}+20}{5+2\sqrt{5}}$ $= \frac{25+10\sqrt{5}}{5+2\sqrt{5}}$ $= \frac{2(5+10\sqrt{5})}{5+2\sqrt{5}}$ $= \frac{5(5+2\sqrt{5})}{5+2\sqrt{5}5}$ $= 5$	✓ $\frac{5+10(\sqrt{5}+2)}{5+2\sqrt{5}}$ ✓ simplification ✓ $\frac{5(5+2\sqrt{5})}{5+2\sqrt{55}}$ ✓ answer	
		OR $\frac{\sqrt{5}}{\sqrt{5}+2} + \frac{10}{\sqrt{5}}$ $\frac{\sqrt{5}}{\sqrt{5}+2} \times \frac{\sqrt{5}-2}{\sqrt{5}-2} + \frac{10}{\sqrt{5}}$ $= \frac{5-2\sqrt{5}}{5-4} + \frac{10}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$ $= 5 - 2\sqrt{5} + \frac{10\sqrt{5}}{5}$ $= 5 - 2\sqrt{5} + 2\sqrt{5}$ $= 5$	Rationalizing the denominator ✓ Rationalizing the denominator ✓ Simplification ✓ Answer	(4)

MATHEMATICS Grade 11 MEMORANDUM (Paper 1)

	2.2.2	$(\frac{\sqrt{7^{2011}} - \sqrt{7^{2009}}}{\sqrt{7^{2008}}} + \sqrt{7})^{2}$ $= (\frac{\sqrt{7^{2008}} (\sqrt{7^{3}} - \sqrt{7^{1}})}{\sqrt{7^{2008}}} + \sqrt{7})^{2}$ $= (\sqrt{7^{3}} - \sqrt{7^{1}} + \sqrt{7})^{2}$ $= (7\sqrt{7} - \sqrt{7} + \sqrt{7})^{2}$ $= (7\sqrt{7})^{2}$ $= 343$ OR	$\checkmark \sqrt{7^{2008}}$ $\checkmark \sqrt{7^3} - \sqrt{7^1}$ $\checkmark (7\sqrt{7})^2$ $\checkmark \text{Answer}$	
	2.2.2 cont.	$\left(\frac{\sqrt{7^{2011}} - \sqrt{7^{2009}}}{\sqrt{7^{2008}}} + \sqrt{7}\right)^{2}$ $= \left(\frac{7^{\frac{2011}{2}} - 7^{\frac{2009}{2}}}{7^{\frac{2009}{2}}} + \sqrt{7}\right)^{2}$ $= \left(\frac{7^{\frac{2009}{2}}(7-1)}{7^{1004}} + \sqrt{7}\right)^{2}$ $= (7\sqrt{7})^{2}$ $= (49)(7)$ $= 343$	✓ $7^{\frac{2009}{2}}$ ✓ $(7-1)$ ✓ $(7\sqrt{7})^2$ ✓ Answer	(4)
2.3	subst $y = y = 1$		✓ 2^{2y} ✓ $x + 2y = 0$ OR x = -2y ✓ substitution ✓ same bases on either side ✓ $y = \pm 1$ ✓ $x = \pm 2$	
				(6)

		MATHEMATICS	Grade 11
	MEMORANDUM	(Paper 1)	
$2^{x}.4^{y} = 1$		2 ^{2 y}	
$2^{x} \cdot 4^{y} = 1^{0}$ $2^{x} \cdot 2^{2y} = 2^{0}$		x + 2y = 0	
x + 2y = 01		\mathbf{OR}	
$(4^{y})^{x} = \frac{1}{16}$		x = -2y	
16 $2^{2xy} = 2^{-4}$	\checkmark	$2^{2xy} = 2^{-4}$	
2 - 2 $2xy = -4$		2xy = -4	
$y = -\frac{2}{2}$ 2		$y = \pm 1$	
X	✓	$x = \pm 2$	
$x + 2\left(-\frac{2}{x}\right) = 0$			
$x^2 - 4 = 0$			
(x-2)(x+2)=0			
x = -2 or $x = 2$			
2			
$y = -\frac{2}{x}$			
$=-\frac{2}{2}$ or $-\frac{2}{-2}$			
$2 \qquad -2$ $y = -1 \qquad y = 1$			
			[18]

	MATHEMATICS	Grade 11
MEMORANDUM	(Paper 1)	

QUESTION 3

3.1	3.1.1	Roots are non-real (imaginary)	✓✓Non-real roots	
		therefore $\Delta < 0$.	OR	
			$\checkmark \checkmark \Delta < 0$	(2)
	3.1.2	Roots are real and equal,	✓ Roots are real	
		$\Delta = 0$	✓ Roots equal	
				(2)
3.2		$\Delta = (2k-1)^2 - 4(k)(k-1)$ = 4k ² - 4k + 1 - 4k ² + 4k	✓ Substitution	
		$=4k^2-4k+1-4k^2+4k$	✓ Simplification	
		= 1	\checkmark Value of 1	
		1 is a perfect square, the coefficients	✓ Perfect square	
		are rational, so the roots are rational.		(4)
				[8]

4 1	4 1 1	1 0 00	/ 1	
4.1	4.1.1	-1; 8; 23;	$\checkmark -1$	
			√8	
			✓23	(3)
	4.1.2	$3k^2 - 4 = 71$	$\checkmark 3k^2 - 4 = 71$	
		$k^2 = 25$	✓ $k^2 = 25$ or	
		$k = \pm 5$	(k-5)(k+5)	
		$\therefore k = 5$	\checkmark $k = 5$	
			No marks for $k = \pm 5$	(3)
4.2	4.2.1	Quadratic number pattern	✓ Quadratic	
			\checkmark second difference is	
		0; 5; 12; 21;	constant or	
			illustration	
		5 7 9		
		2 2	If the learner only	
		Quadratic number pattern	show the pattern	
			without justification	
		OR/OF	only 1 mark	
		Quadratic number pattern	5	
		The first difference is not constant		
		but the second difference is		
		constant.		
				(2)

MATHEMATICS Grade 11 MEMORANDUM (Paper 1)

-		1		
	4.2.2	2a = 2		
		$\therefore a = 1$	$\checkmark a = 1$	
		3a+b = 5		
		3(1) + b = 5		
		$\therefore b = 2$	$\checkmark b = 2$	
		$\mathbf{T} = a + b + c$		
		$T_1 = a + b + c$ 0 = 1 + 2 + c		
		$\therefore c = -3$	$\checkmark c = -3$	
		\therefore Tn = an ² + bn + c		
		$Tn = n^2 + 2n - 3$	$\checkmark \mathrm{T}n = n^2 + 2n - 3$	
				(4)
4.3	4.3.1	<u>Row 4</u>	\checkmark Row 4 = 22	
		$7^2 - 6^2 + 5^2 - 4^2 = 22$		
		<u>Row 20</u>	\checkmark Row 20 = 86	
		$23^2 - 22^2 + 21^2 - 20^2 = 86$		(2)
	4.3.2	$(n+3)^{2} - (n+2)^{2} + (n+1)^{2} - n^{2} = 4n+6$	√ a=n+3	
			$\int b = n+2; c = n+1; d = n$	
			•	
			\checkmark $T_n = 4n + 6$	
			If only the general term	
			was given 1/3	(3)
				[17]

5.1	x = -2 and $y = 1$	✓ $x = -2$ ✓ $y = 1$ Both has to be in equation form. If not 0/2 If $p = -2$ and $q = 10/2$	(2)
5.2	Sub B = (0; -2) in y = $\frac{k}{x+2} + 1$ -2 = $\frac{k}{0+2} + 1$ -2 = $\frac{k}{2} + 1$	✓ Substitution of (0; -2) and $q = 1$	
	$-3 = \frac{k}{2}$ then $k = -6$ $\therefore y = \frac{-6}{x+2} + 1$	 ✓ k value ✓ Answer 	(3)

MATHEMATICS Grade 11 MEMORANDUM (Paper 1) $0 = \frac{-6}{x+2} + 1$ -1 = $\frac{-6}{x+2}$ (x + 2) = 6 $\checkmark y = \overline{0}$ 5.3 $\checkmark x+2=6$ $\checkmark x = 4$ ✓ Writing Point D in x = 4coordinate form. $\therefore D(4; 0)$ (4) C(-2; 0) and B(4; 0)CA from 5.3 5.4 $\checkmark x+2$ y = a(x+2)(x-4) \checkmark (x-4) -2 = a(0+2)(0-4)✓ Sub. B (0; −2) -2 = a(-8) $\frac{1}{4} = a$ $\checkmark a = \frac{1}{4}$ $y = \frac{1}{4}(x+2)(x-4)$ $y = \frac{1}{4}(x^2 - 2x - 8)$ $= \frac{1}{4}x^2 - \frac{1}{2}x - 2$ \checkmark answer in any form (5) ✓ Shape 5.5 $g(x) = 2^{x+2}$ ✓ Coordinates of (0; 4)✓ Graph not crossing the *x*-axis (0; 4) *x* (3) $v = 2^{x-1}$ $\checkmark \checkmark y = 2^{x-1}$ 5.6 (2)

9

 \checkmark y is real, $y \neq 1$

both condition

(1) [20]

y is real, $y \neq 1$

 $(y \in \mathbb{R})$

5.7

	MATHEMATICS	Grade 11
MEMORANDUM	(Paper 1)	

6.1	$x \in [0; 4]$	√ 0	
0.1	OR	\checkmark 4	
			(2)
6.2	$0 \le x \le 4$ $h(x) = -(x^2 - 4x + 4 - 4)$	$\checkmark a = -1.$	
0.2		$\checkmark p = -2.$	
	$=-(x-2)^2-4$	$\checkmark q = -4.$	(3)
6.3		CA from 6.1	
	(2:4) h(x) 0 2 4 x	 ✓ Shape (neg graph) ✓ Turning point ✓ y-intercept. ✓ positive y-values only. 	
6.4	$h(x) = -x^2 + 4x$	$\int (\nabla u h + u m h h - \tau)$	(4)
0.4		✓ Sub x with $(x-5)$	
		✓ Simplification✓ Answer	
	$= -(x^2 - 10x + 25) + 4x - 20$		
	$= -x^{2} + 10x - 25 + 4x - 20$		
	$\therefore h(x-5) = -x^2 + 14x - 45$		
	OR	OR	
	$y = -(x-2)^2 + 4$	$\checkmark (x-2-5)^2$	
	$= -(x-2-5)^2 + 4$		
	$=-(x-7)^2+4$		
	$=-(x^2-14x+49)+4$	✓ Simplification	
	$=-x^{2}+14x-49+4$		
	$=-x^{2}+14x-45$	✓ Answer	(3)

	MATHEMATICS	Grade 11
MEMORANDUM	(Paper 1)	

6.5	$k(x) = x^2 - 4x$	$\checkmark x^2$	
		\checkmark -4x	(2)
6.6	$p(-3) = \frac{9}{2}$	✓ $p(-3) = \frac{9}{2}$ ✓ $p(-1) = \frac{1}{2}$	
	$p(-1) = \frac{1}{2}$		
	Average gradient	✓ Answer	
	$=\frac{y_2 - y_1}{x_1 - x_2}$		
	$= x_2 - x_1$		
	$\frac{9}{2} - \frac{1}{2}$		
	$=\frac{\frac{2}{2}-\frac{2}{2}}{-3-(-1)}$		
	\therefore Average gradient of $p = -2$		(3)
			[17]