



GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

**GAUTENG DEPARTMENT OF EDUCATION
PROVINCIAL EXAMINATION
JUNE 2017
GRADE 11**

**MATHEMATICS
PAPER 1**

MEMORANDUM

11 pages

**GAUTENG DEPARTMENT OF EDUCATION
PROVINCIAL EXAMINATION**

**MATHEMATICS
(Paper 1)**

MEMORANDUM

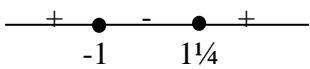
INFORMATION

A – Accuracy

CA – Continued Accuracy

NOTE:

- If a candidate answered a question **TWICE**, mark only the first attempt.
- If a candidate **CROSSED** out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to **ALL** aspects of the marking memorandum.
- Assuming values/answers in order to solve a problem is **UNACCEPTABLE**.

	QUESTION 1	MARKS: 19
1.1.1	$x^2 - 2x = 15$ $x^2 - 2x - 15 = 0$ $(x - 5)(x + 3) = 0$ $x = 5 \text{ or } x = -3$	✓ std. form ✓ correct factors ✓ both solutions (3)
1.1.2	$4x^2 - x - 5 < 0$ $(4x - 5)(x + 1) < 0$  $-1 < x < 1\frac{1}{4}$	✓ factors ✓ critical values ✓ correct inequality (3)
1.1.3	$\sqrt{2x - 1} + 2 = x$ $(\sqrt{2x - 1})^2 = (x - 2)^2$ $2x - 1 = x^2 - 4x + 4$ $0 = x^2 - 6x + 5$ $0 = (x - 5)(x - 1)$ $x = 5 \text{ or } x = 1$ $\text{Test: } x = 5 \text{ only}$	✓ squaring both sides ✓ std. form ✓ factors ✓ both solutions ✓ accepting $x = 5$ (5)
1.1.4	$2x^{\frac{2}{3}} - 8 = 0$ $2x^{\frac{2}{3}} = 8$ $x^{\frac{2}{3}} = 4$ $(x^{\frac{2}{3}})^{\frac{3}{2}} = \pm (4)^{\frac{3}{2}}$ $x = \pm 2^3 \text{ OR}$ $x = \pm 8$ <p>OR</p> $x^{\frac{2}{3}} = 4$ $(\sqrt[3]{x^2})^3 = (4)^3$ $x^2 = 64$ $x = \pm 8$	✓ $x^{\frac{2}{3}} = 4$ ✓ raising both sides to the power $\frac{3}{2}$ ✓ $x = \pm 2^3$ OR $x = \pm 8$ OR ✓ $x^{\frac{2}{3}} = 4$ ✓ raising both sides to the power of 3 ✓ $x = \pm 2^3$ OR $x = \pm 8$ (3)

1.2	$a + b + c = 0$ $b = -a - c$ $ax^2 + bx + c = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-a - c) \pm \sqrt{(-a - c)^2 - 4ac}}{2a}$ $= \frac{a + c \pm \sqrt{a^2 + 2ac + c^2 - 4ac}}{2a}$ $= \frac{a + c \pm \sqrt{a^2 - 2ac + c^2}}{2a}$ $= \frac{a + c \pm \sqrt{(a - c)^2}}{2a}$ $= \frac{a + c \pm (a - c)}{2a}$ $\therefore x = 1 \text{ or } x = \frac{c}{a}$	<p>✓ $b = -a - c$</p> <p>✓ sub. in corr. formula</p> <p>✓ simplification to $\sqrt{a^2 - 2ac + c^2}$</p> <p>✓ $(a - c)^2$</p> <p>✓ $x = 1$</p>
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(5)

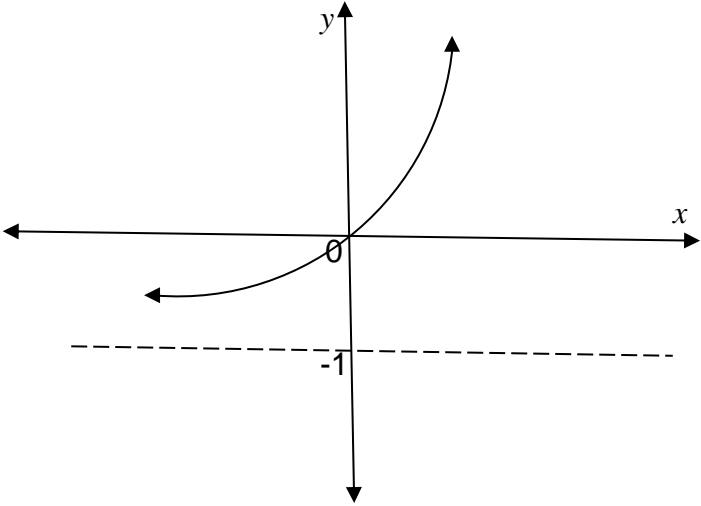
	QUESTION 2	MARKS: 15
2.1	$3y + x = 2 \dots\dots\dots(1)$ $y^2 + x = xy + y\dots\dots\dots(2)$ <p>from (1)</p> $x = 2 - 3y$ <p>subst. $x = 2 - 3y$ in (2)</p> $y^2 + (2 - 3y) = y(2 - 3y) + y$ $y^2 + 2 - 3y = 2y - 3y^2 + y$ $4y^2 - 6y + 2 = 0$ $2y^2 - 3y + 1 = 0$ $(2y - 1)(y - 1) = 0$ $y = \frac{1}{2} \text{ or } y = 1$ $\therefore x = \frac{1}{2} \text{ or } x = -1$	<p>✓ $x = 2 - 3y$</p> <p>✓ sub. $x = 2 - 3y$ in..... (2)</p> <p>✓ std. form</p> <p>✓ factorisation</p> <p>✓ both y values</p> <p>✓ both x values</p>

(6)

2.2	$\begin{aligned} \text{L.H.S: } & \sqrt{b\sqrt{a}-b} \cdot \sqrt{b\sqrt{a}+b} \\ & = \sqrt{(b\sqrt{a}-b)(b\sqrt{a}+b)} \\ & = \sqrt{b^2a-b^2} \\ & = \sqrt{b^2(a-1)} \\ & = b\sqrt{a-1} = \text{R.H.S} \end{aligned}$	$\checkmark (b\sqrt{a}-b)(b\sqrt{a}+b)$ \checkmark simplification $\sqrt{b^2a-b^2}$ \checkmark factorisation $\checkmark b$	(4)
2.3	$\begin{aligned} 3^a &= 21^b \\ (3^a)^c &= (21^b)^c \\ 3^{ac} &= (3^b \times 7^b)^c \\ 3^{ac} &= 3^{bc} \times 7^{bc} \\ 3^{ac} &= 3^{bc+ab} \\ ac &= bc+ab \\ ac &= b(c+a) \\ \therefore b &= \frac{ac}{a+c} \end{aligned}$	\checkmark intro. power c on both sides $\checkmark (3^b \times 7^b)^c$ \checkmark deducing that $7^c = 3^a$ \checkmark equating the indices \checkmark factorisation	(5)
QUESTION 3		MARKS: 18	
3.1.1	13	\checkmark answer	(1)
3.1.2	$\begin{aligned} T_n &= an + b \\ -3 &= 4(1) + b \\ -7 &= b \\ T_n &= 4n - 7 \\ \text{ANY other valid method} \end{aligned}$	$\checkmark b = -7$ \checkmark answer	(2)
3.1.3	$\begin{aligned} 394 &= 4n - 7 \\ 401 &= 4n \\ 100,25 &= n \\ \text{since } n \notin \mathbb{N}, 394 &\text{ is NOT a term} \end{aligned}$	\checkmark equation $\checkmark 100,25 = n$ \checkmark any valid explanation	(3)

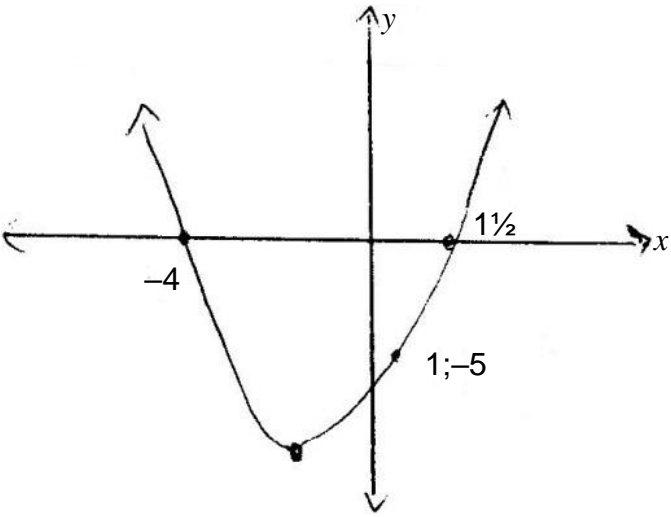
3.2.1	<p style="text-align: center;">OR</p> $T_n = n^2 + 2n + c$ $0 = (1)^2 + 2(1) + c$ $0 = 3 + c$ $-3 = c$ $T_1 = a + b + c$ $0 = 1 + 2 + c$ $0 = 3 + c$ $-3 = c$	<p>✓ corr. sub. ✓ simplification</p> <p>OR</p> <p>✓ corr. sub. ✓ simplification</p> <p style="text-align: right;">(2)</p>
3.2.2	$T_n = n^2 + 2n + c$ $T_{10} = (10)^2 + 2(10) - 3$ $= 117$	<p>✓ corr. sub. ✓ answer</p> <p style="text-align: right;">(2)</p>
3.2.3	$n^2 + 2n - 3 > 360$ $n^2 + 2n - 363 > 0$ <p>C.V: $n = \frac{(-2) \pm \sqrt{2^2 - 4(1)(-363)}}{2(1)}$</p> $n = -20,08 \text{ or } n = 18,08$ <p>$\therefore n = 19$ $T_{19} > 360$</p>	<p>✓ $n^2 + 2n - 363 > 0$</p> <p>✓ corr. sub. in corr. formula</p> <p>✓ both critical values</p> <p>✓ $n = 19$</p> <p style="text-align: right;">(4)</p>
3.3.1	$a = 10$	<p>✓ answer</p> <p style="text-align: right;">(1)</p>
3.3.2	$b = 99 + 98 + 97 + 96 \dots\dots + 50 + \dots\dots + 3 + 2 + 1$ $(99 + 1) = 100$ $(98 + 2) = 100$ \vdots $\therefore b = (100) \times 49 + 50$ $b = 4950$	<p>✓ sequence</p> <p>✓ $(100) \times 49$ ✓ answer</p> <p style="text-align: right;">(3)</p>

	QUESTION 4	MARKS: 6
4.1	$x - 2 \geq 0$ $x \geq 2$	✓ $x - 2 \geq 0$ ✓ answer (2)
4.2	2	✓ answer (1)
4.3	$k = 2 + \frac{\sqrt{3-2}}{4}$ $= 2\frac{1}{4}$ $g(k) = \left(2\frac{1}{4}\right)^2 - 1$ $= 4\frac{1}{16} \text{ OR } \frac{65}{16} \text{ OR } 4,06$	✓ $k = 2\frac{1}{4}$ ✓ substitution ✓ answer (3)
	QUESTION 5	MARKS: 12
5.1	for x - intercept, make $y = 0$ $3^x - 1 = 0$ $3^x = 1$ $3^x = 3^0$ $x = 0$ for y - intercept, make $x = 0$ $y = 3^0 - 1$ $y = 0$	✓ $1 = 3^0$ ✓ $x = 0$ ✓ $y = 0$ (3)

5.2.		<ul style="list-style-type: none"> ✓ shape ✓ passing thr. origin ✓ asymptote at $y = -1$ <p style="text-align: right;">(3)</p>
5.3	$(-1; \infty)$ OR $y > -1$	<ul style="list-style-type: none"> ✓ answer <p style="text-align: right;">(1)</p>
5.4.1	$x = -2$	<ul style="list-style-type: none"> ✓ answer <p style="text-align: right;">(1)</p>
5.4.2	$x > -1$	<ul style="list-style-type: none"> ✓ answer <p style="text-align: right;">(1)</p>
5.5	$3h(x) = 726$ $h(x) = 242$ $3^x - 1 = 242$ $3^x = 243$ $3^x = 3^5$ $x = 5$	<ul style="list-style-type: none"> ✓ 242 ✓ 3^5 ✓ answer <p style="text-align: right;">(3)</p>

	QUESTION 6	MARKS: 10
6.1	$x = 1$ $y = -2$	✓ $x = 1$ ✓ $y = -2$ (2)
6.2	for x-intercept, make $y = 0$ $0 = \frac{3}{x-1} - 2$ $2 = \frac{3}{x-1}$ $x = 2\frac{1}{2}$ for y-intercept, make $x = 0$ $y = \frac{3}{0-1} - 2$ $y = -5$	✓ $y = 0$ ✓ $x = 2\frac{1}{2}$ ✓ $y = -5$ (3)
6.3		✓ shape ✓ x and y-intercepts ✓ asymptotes (3)
6.4	Reflection about the y-axis.	✓ reflection ✓ y-axis (2)

	QUESTION 7	MARKS: 20
7.1.1	$x = \frac{-b}{2a}$ $= \frac{-(8)}{2(2)}$ $= -2$ <p>D(-2 ; -5)</p>	<p>✓ corr. sub. in corr. formula</p> <p>✓ x -co-ord. - 2</p> <p>✓ y -co-ord. - 5</p> <p>(if not ordered pair) $\frac{2}{3}$</p> <p>(3)</p>
7.1.2	$x \geq 0 \text{ or } x \leq -4$	<p>✓ $x \geq 0$</p> <p>✓ $x \leq -4$</p> <p>(incorrect notation) $\frac{1}{2}$</p> <p>(2)</p>
7.1.3	$\text{LM} = k(x) - p(x)$ $= 2x^2 + 8x + 3 - (2x - 4)$ $= 2x^2 + 6x + 7$ $\text{Min}_{\text{LM}} = \frac{4ac - b^2}{4a}$ $= \frac{4(2)(7) - 6^2}{4(2)}$ $= 2\frac{1}{2}$ <p>OR</p> $\text{LM} = k(x) - p(x)$ $= 2x^2 + 8x + 3 - (2x - 4)$ $= 2x^2 + 6x + 7$ $x = \frac{-b}{2a}$ $= \frac{-(6)}{2(2)}$ $= -\frac{3}{2}$ $\text{Min}_{\text{LM}} = 2\left(-\frac{3}{2}\right)^2 + 6\left(-\frac{3}{2}\right) + 7$ $= 2\frac{1}{2}$	<p>✓ simplification</p> <p>✓ formula</p> <p>✓ corr. sub. in corr. formula</p> <p>✓ answer</p> <p>OR</p> <p>✓ simplification</p> <p>✓ corr. sub. in corr. formula</p> <p>✓ sub. x in eqn.</p> <p>✓ answer</p> <p>(4)</p>

7.1.4	$\text{Ave. grad} = \frac{k(-2) - k(3)}{-2 - 3}$ $= \frac{-5 - 45}{-2 - 3}$ $= 10$	<ul style="list-style-type: none"> ✓ -5 ✓ -45 ✓ answer <p style="text-align: right;">(3)</p>
7.1.5	$2x^2 + 8x + 3 = 2x + t$ $2x^2 + 6x + 3 - t = 0$ $\Delta = b^2 - 4ac$ $= (6)^2 - 4(2)(3 - t)$ $= 39 - 24 + 8t$ $= 12 + 8t$ <p>for = roots, $\Delta = 0$</p> $12 + 8t = 0$ $8t = -12$ $t = -1\frac{1}{2} \text{ or } -\frac{3}{2} \text{ or } -1,5$	<ul style="list-style-type: none"> ✓ std. form ✓ corr. sub. in formula ✓ value of Δ ✓ $\Delta = 0$ ✓ answer <p style="text-align: right;">(5)</p>
7.2		<ul style="list-style-type: none"> ✓ shape ✓ x-intercepts ✓ turning point in 3rd quadrant <p style="text-align: right;">(3)</p>