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

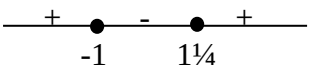
INFORMATION

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	$x^2 - 2x = 15$ $x^2 - 2x - 15 = 0$ $(x - 5)(x + 3) = 0$ $x = 5$ 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	$\sqrt{2x-1} + 2 = x$ $(\sqrt{2x-1})^2 = (x-2)^2$ $2x - 1 = x^2 - 4x + 4$ $0 = x^2 - 6x + 5$ $0 = (x-5)(x-1)$ $x = 5$ or $x = 1$ Test: $x = 5$ only	✓ squaring both sides ✓ std. form ✓ factors ✓ both solutions ✓ accepting $x = 5$ **(5)**
1.1.4	$2x^{\frac{2}{3}} - 8 = 0$ $2x^{\frac{2}{3}} = 8$ $x^{\frac{2}{3}} = 4$ $(\boldsymbol{x^{\frac{2}{3}}})^{\frac{3}{2}} = \pm\,(\boldsymbol{4})^{\frac{3}{2}}$ $x = \pm 2^3$ **OR** $x = \pm 8$ **OR** $x^{\frac{2}{3}} = 4$ $\left(\sqrt[3]{x^2}\right)^3 = (4)^3$ $x^2 = 64$ $x = \pm 8$	✓ $x^{\frac{2}{3}} = 4$ ✓ 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	$a+b+c=0$ $b=-a-c$ $ax^2+bx+c=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-(-a-c)\pm\sqrt{(-a-c)^2-4ac}}{2a}$ $=\frac{a+c\pm\sqrt{a^2+2ac+c^2-4ac}}{2a}$ $=\frac{a+c\pm\sqrt{a^2-2ac+c^2}}{2a}$ $=\frac{a+c\pm\sqrt{(a-c)^2}}{2a}$ $=\frac{a+c\pm(a-c)}{2a}$ $\therefore x=1$ or $x=\frac{c}{a}$	✓ $b=-a-c$ ✓ sub. in corr. formula ✓ simplification to $\sqrt{a^2-2ac+c^2}$ ✓ $(a-c)^2$ ✓ $x=1$ **(5)**

	QUESTION 2	**MARKS: 15**
2.1	$3y+x=2$ ……. (1) $y^2+x=xy+y$.....(2) from (1) $x=2-3y$ subst. $x=2-3y$ in (2) $y^2+(2-3y)=y(2-3y)+y$ $y^2+2-3y=2y-3y^2+y$ $4y^2-6y+2=0$ [÷ 2] $2y^2-3y+1=0$ $(2y-1)(y-1)=0$ $y=\frac{1}{2}$ or $y=1$ $\therefore x=\frac{1}{2}$ or $x=-1$	✓ $x=2-3y$ ✓ sub. $x=2-3y$ in..... (2) ✓ std. form ✓ factorisation ✓ both *y* values ✓ both *x* values **(6)**

2.2	L.H.S: $\sqrt{b\sqrt{a}-b}\ .\sqrt{b\sqrt{a}+b}$ $=\sqrt{(b\sqrt{a}-b)(b\sqrt{a}-b)}$ $=\sqrt{b^2a-b^2}$ $=\sqrt{b^2(a-1)}$ $=b\sqrt{a-1}$ = R.H.S	✓ $(b\sqrt{a}-b)(b\sqrt{a}-b)$ ✓ simplification $\sqrt{b^2a-b^2}$ ✓ factorisation ✓ b **(4)**

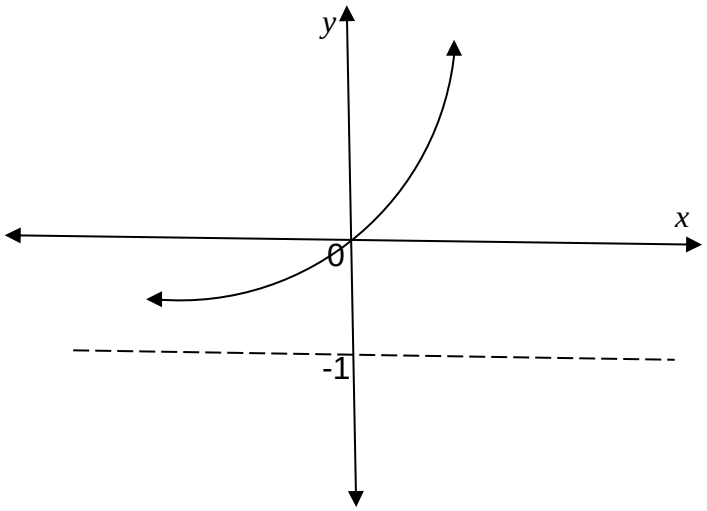
2.3	$3^a = 21^b$ $(3^a)^c = (21^b)^c$ $3^{ac} = (3^b \times 7^b)^c$ $3^{ac} = 3^{bc} \times 3^{ab}$ $3^{ac} = 3^{bc+ab}$ $ac = bc + ab$ $ac = b(c+a)$ $\therefore b = \frac{ac}{a+c}$	✓ intro. power c on both sides ✓ $(3^b \times 7^b)^c$ ✓ deducing that $7^c = 3^a$ ✓ equating the indices ✓ factorisation **(5)**

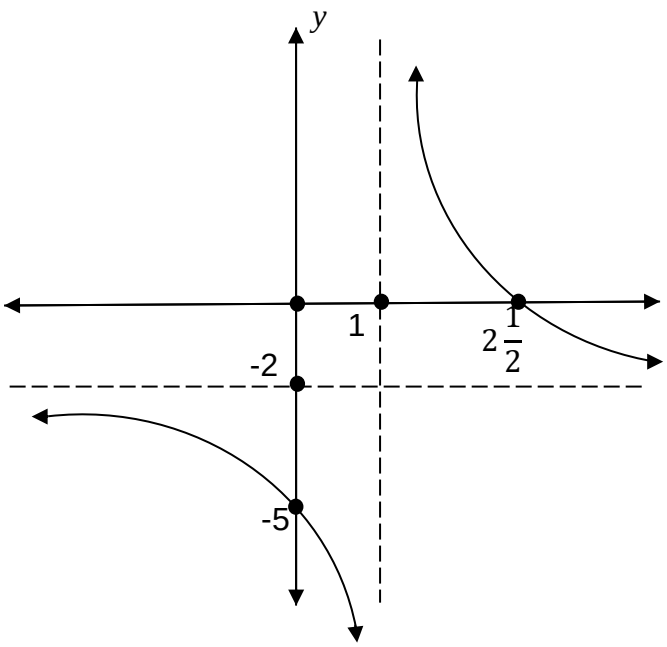
	QUESTION 3	**MARKS: 18**
3.1.1	13	✓ answer **(1)**
3.1.2	$T_n = an + b$ $-3 = 4(1) + b$ $-7 = b$ $T_n = 4n - 7$ **ANY** other valid method	✓ $b = -7$ ✓ answer **(2)**
3.1.3	$394 = 4n - 7$ $401 = 4n$ $100{,}25 = n$ since $n \notin \mathbb{N}$, 394 is NOT a term	✓ equation ✓ $100{,}25 = n$ ✓ any valid explanation **(3)**

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

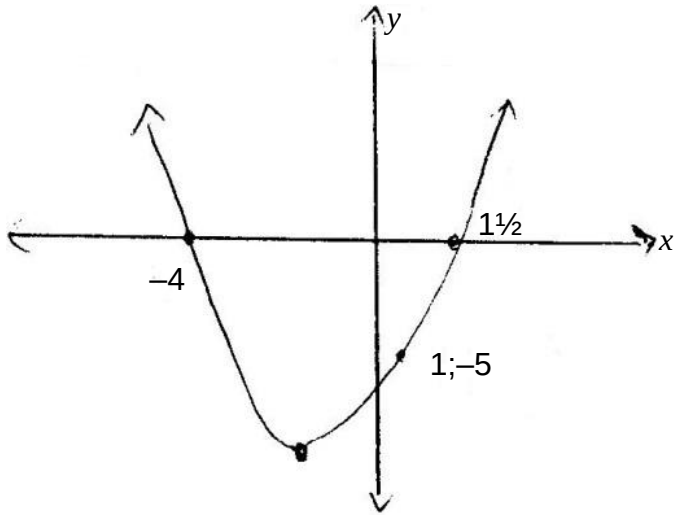
	QUESTION 4	MARKS: 6
4.1	$x - 2 \geq 0$ $x \geq 2$	✓ $x - 2 \geq 0$ ✓ answer **(2)**
4.2	2	✓ answer **(1)**
4.3	$k = 2 + \frac{\sqrt{3-2}}{4}$ $= 2\frac{1}{4}$ $g(k) = \left(2\frac{1}{4}\right)^2 - 1$ $= 4\frac{1}{16}$ **OR** $\frac{65}{16}$ **OR** 4,06	✓ $k = 2\frac{1}{4}$ ✓ substitution ✓ answer **(3)**

	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.		✓ shape ✓ passing thr. origin ✓ asymptote at $y = -1$ **(3)**
5.3	$(-1\,;\infty)$ **OR** $y > -1$	✓ answer **(1)**
5.4.1	$x = -2$	✓ answer **(1)**
5.4.2	$x > -1$	✓ answer **(1)**
5.5	$3h(x) = 726$ $h(x) = 242$ $3^x - 1 = 242$ $3^x = 243$ $3^x = 3^5$ $x = 5$	✓ 242 ✓ 3^5 ✓ answer **(3)**

	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 $x = 0$ $y = \frac{3}{0-1} - 2$ $y = -5$	✓ $y = 0$ ✓ $x = 2½$ ✓ $y = -5$ **(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	$x = \frac{-b}{2a}$ $= \frac{-(8)}{2(2)}$ $= -2$ D(- 2 ; - 5)	✓ corr. sub. in corr. formula ✓ *x* -co-ord. - 2 ✓ *y* -co-ord. - 5 (if not ordered pair) $\frac{2}{3}$ **(3)**
7.1.2	$x \geq 0$ or $x \leq -4$	✓ $x \geq 0$ ✓ $x \leq -4$ (incorrect notation) $\frac{1}{2}$ **(2)**
7.1.3	LM $= k(x) - p(x)$ $= 2x^2 + 8x + 3 - (2x - 4)$ $= 2x^2 + 6x + 7$ $\text{Min}_{\text{LM}} = \frac{4ac - b^2}{4a}$ $= \frac{4(2)(7) - 6^2}{4(2)}$ $= 2\frac{1}{2}$ **OR** LM $= k(x) - p(x)$ $= 2x^2 + 8x + 3 - (2x - 4)$ $= 2x^2 + 6x + 7$ $x = \frac{-b}{2a}$ $= \frac{-(6)}{2(2)}$ $= -\frac{3}{2}$ $\text{Min}_{\text{LM}} = 2(-\frac{3}{2})^2 + 6\left(-\frac{3}{2}\right) + 7$ $= 2\frac{1}{2}$	✓ simplification ✓ formula ✓ corr. sub. in corr. formula ✓ answer **OR** ✓ simplification ✓ corr. sub. in corr. formula ✓ sub. *x* in eqn. ✓ answer **(4)**

7.1.4	$\text{Ave. grad} = \frac{k(-2) - k(3)}{-2-3}$ $= \frac{-5-45}{-2-3}$ $= 10$	✓ -5 ✓ -45 ✓ answer **(3)**
7.1.5	$2x^2 + 8x + 3 = 2x + t$ $2x^2 + 6x + 3 - t = 0$ $\Delta = b^2 - 4ac$ $= (6)^2 - 4(2)(3-t)$ $= 39 - 24 + 8t$ $= 12 + 8t$ for = roots, $\Delta = 0$ $12 + 8t = 0$ $8t = -12$ $t = -1\frac{1}{2}$ or $-\frac{3}{2}$ or -1,5	✓ std. form ✓ corr. sub. in formula ✓ value of Δ ✓ $\Delta = 0$ ✓ answer **(5)**
7.2		✓ shape ✓ *x*-intercepts ✓ turning point in 3rd quadrant **(3)**