



GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL EXAMINATION

JUNE 2022

GRADE 11

MARKING GUIDELINES

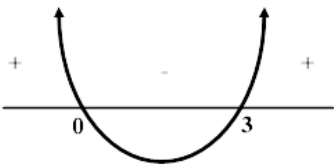
MATHEMATICS
PAPER 1

12 pages

QUESTION 1

1.1	$x \geq -3; \quad x \neq -1$	✓ answer ✓ exclusion	(2)
1.2.1	$(x+4)(x-1) = 0$ $x = -4 \quad \text{or} \quad x = 1$	✓ answers	(1)
1.2.2	$3x^2 - 2x = 14$ $3x^2 - 2x - 14 = 0$ $x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(3)(-14)}}{2(3)}$ $x = \frac{1 \pm \sqrt{43}}{3}$ $x = -1,85 \quad \text{or} \quad x = 2,52$ NOTE: Penalise 1 mark for incorrect rounding in this question ONLY. Any other valid method.	✓ standard form ✓ correct substitution ✓ answer ✓ answer	(4)
1.2.3	$x^2 - 2x = 18 - \frac{45}{x^2 - 2x}$ <i>restriction</i> $\therefore x^2 - 2x \neq 0$ <i>let</i> $k = x^2 - 2x$ $\therefore k = 18 - \frac{45}{k}$ $\therefore k^2 = 18k - 45$ $\therefore k^2 - 18k + 45 = 0$ $\therefore (k-15)(k-3) = 0$ $\therefore k = 15 \dots \text{or} \dots k = 3$ <i>substitute</i> $\dots x^2 - 2x \dots \text{back} \dots \text{into} \dots k$. $\therefore x^2 - 2x = 15 \dots \text{or} \dots x^2 - 2x = 3$ $\therefore x^2 - 2x - 15 = 0 \dots \text{or} \dots x^2 - 2x - 3 = 0$ $\therefore (x-5)(x+3) = 0 \dots \text{or} \dots (x-3)(x+1) = 0$ $\therefore x = 5 \dots \text{or} \dots x = -3 \dots \text{or} \dots x = 3 \dots \text{or} \dots x = -1$ NOTE: Any other valid method.	✓ method ✓ values of k ✓ equating ✓ all values of x	(4)

1.2.4	$\sqrt{5-x} + 1 = -x$ $\sqrt{5-x} = -x-1$ $5-x = x^2 + 2x+1$ $0 = x^2 + 3x-4$ $0 = (x+4)(x-1)$ $\therefore x = -4 \text{ or } x \neq 1$ NOTE: Any other valid method.	✓ method ✓ standard form ✓ factors ✓ critical values ✓ rejection	(5)
1.2.5	$3^{2x+1} - 4 \cdot 3^x = -1$ $3 \cdot 3^{2x} - 4 \cdot 3^x + 1 = 0$ $(3 \cdot 3^x - 1)(3^x - 1) = 0$ $3^x = \frac{1}{3} \text{ or } 3^x = 1$ $3^x = 3^{-1} \text{ or } 3^x = 3^0$ $x = -1 \quad \quad \quad x = 0$ OR $3^{2x+1} - 4 \cdot 3^x = -1$ let $3^x = k$ $\therefore 3k^2 - 4k = -1$ $3k^2 - 4k + 1 = 0$ $(3k-1)(k-1) = 0$ $k = \frac{1}{3} \text{ or } k = 1$ $3^x = 3^{-1} \text{ or } 3^x = 3^0$ $x = -1 \quad \quad \quad x = 0$	✓ standard form ✓ factors ✓ equating ✓ answers ✓ standard form ✓ factors ✓ equating ✓ answers	(4)

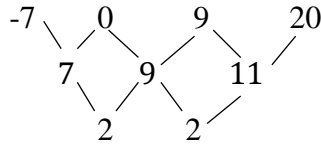
1.2.6(a)	$x^2 - 3x \leq 0$ $x(x-3) \leq 0$ CVs 0 ; 3 $0 \leq x \leq 3$		✓ factors ✓ answer	(2)
1.2.6(b)	$3 \leq x \leq 6$ NOTE: Answer can be written as separate inequalities.		✓ critical values ✓ answer	(2)
1.3	$x + y = -10$ $x = -10 - y \dots (1)$ sub (1) in (2) $(-10 - y)y = -600$ $-10y - y^2 = -600$ $y^2 + 10y - 600 = 0$ $(y - 20)(y + 30) = 600$ $y = 20$ or $y = -30$ as $y = 20$ as $y = -30$ $x = -30$ $x = 20$	$xy = -600 \dots (2)$	✓ setting up equations ✓ substitution ✓ factors ✓ values of y ✓ values of x	(5)
NOTA: Enige ander geldige metode.				[29]

QUESTION 2

2.1.1	$2\sqrt{8} - 4\sqrt{32} + 3\sqrt{50}$ $= 2\sqrt{4 \cdot 2} - 4\sqrt{16 \cdot 2} + 3\sqrt{25 \cdot 2}$ $= 2 \cdot 2\sqrt{2} - 4 \cdot 4\sqrt{2} + 3 \cdot 5\sqrt{2}$ $= 4\sqrt{2} - 16\sqrt{2} + 15\sqrt{2}$ $= 3\sqrt{2}$	<div>Mark allocated to 1st step.</div>	✓ simplify surds ✓ simplification ✓ answer	(3)
2.1.2	$3^{-\frac{1}{2}}[\sqrt{12} + \sqrt[3]{(3\sqrt{3})}]$ $3^{-\frac{1}{2}}[(2^2 \cdot 3)^{\frac{1}{2}} + (3 \cdot 3^{\frac{1}{2}})^{\frac{1}{3}}]$ $3^{-\frac{1}{2}}[2^1 \cdot 3^{\frac{1}{2}} + (3^2)^{\frac{1}{2}}]$ $3^{-\frac{1}{2}}[2 \cdot 3^{\frac{1}{2}} + 3^{\frac{1}{2}}]$ $2 \cdot 3^0 + 3^0$ $2 + 1$ 3		✓ simplify surds ✓ simplification ✓ simplification ✓ answer	(4)
2.1.3	$\frac{5^{2006} - 5^{2004} + 24}{5^{2004} + 1}$ $\frac{5^{2004}(5^2 - 1) + 24}{5^{2004} + 1}$ $\frac{5^{2004}(24) + 24}{5^{2004} + 1}$ $\frac{24(5^{2004} + 1)}{5^{2004} + 1}$ 24		✓ factorise ✓ simplify ✓ factorise ✓ answer	(4)
2.2.1	$x = \sqrt{6 + \sqrt{6 + \sqrt{6 + \dots}}}$ $\therefore x^2 = 6 + \sqrt{6 + \sqrt{6 + \dots}}$ $\therefore x^2 = 6 + x$		✓ method ✓ answer	(2)
2.2.2	$x^2 - x - 6 = 0$ $(x - 3)(x + 2) = 0$ $x = 3 \dots x \neq -2$		✓ standard form ✓ factors ✓ answer ✓ exclusion	(4)

2.3	$d^2 = (\sqrt{8} - 1)^2 + (\sqrt{8} + 1)^2$ Pythag $d^2 = 8 - 2\sqrt{8} + 1 + 8 + 2\sqrt{8} + 1$ $d^2 = 18$ $d = 3\sqrt{2}$	✓ method ✓ value of d^2 ✓ answer	(3)
[20]			

QUESTION 3

3.1.1	 $2a = 2$ $\therefore a = 1$ $3(1) + b = 7$ $\therefore b = 4$ $1 + 4 + c = -7$ $\therefore c = -12$ $\therefore T_n = n^2 + 4n - 12$	✓ second difference ✓ value of a ✓ value of b ✓ value of c	(4)
3.1.2	$T_n = n^2 + 4n - 12$ $128 = n^2 + 4n - 12$ $0 = n^2 + 4n - 140$ $0 = (n - 10)(n + 14)$ $\therefore n = 10 \dots n \neq -14$	✓ equating ✓ factors ✓ selection of $n = 10$	(3)
3.1.3	$T_n = 2n + 5$ $599 = 2n + 5$ $594 = 2n$ $n = 297$ <p>This difference will be between term number 297 and 298.</p>	✓ equating ✓ value of n ✓ conclusion	(3)
3.2.1	93	✓ answer	(1)
3.2.2	$T_n = 10n - 3$ $T_n = (10n - 2) - 1$ $T_n = 2(5n - 1) - 1$ <p>Thus:</p> $(10n - 2) = 2(5n - 1)$ <p>$10n - 2$ EVEN for any value of n.</p> <p>$\therefore T_n$ is ODD when:</p> $T_n = (10n - 2) - 1$	✓ $T_n = 10n - 3$ ✓ method ✓ equating ✓ explanation	(4)
[15]			

QUESTION 4

4.1	$1 - p; 2p - 3; p + 5$ $\therefore T_2 - T_1 = T_3 - T_2$ $\therefore (2p - 3) - (1 - p) = (p + 5) - (2p - 3)$ $\therefore 2p - 3 - 1 + p = p + 5 - 2p + 3$ $\therefore 3p - 4 = -p + 8$ $\therefore 4p = 12$ $\therefore p = 3$	✓ method ✓ simplification ✓ answer	(3)
4.2.1	$T_1 = 1 - p$ $T_1 = 1 - 3$ $T_1 = -2$ NOTE: Answer only: full marks	✓ answer	(1)
4.2.2	$\therefore T_2 = 2p - 3$ $T_2 = 2(3) - 3$ $T_2 = 3$ $d = T_2 - T_1$ $d = 3 - (-2)$ $d = 5$ NOTE: Answer only: full marks	✓ answer	(1)
4.3	$1 - p; 2p - 3; p + 5$ $= 1 - 3; 2(3) - 3; 3 + 5$ $= -2; 3; 8; 13; 18; \dots$ All the terms except T_1 end in either a 3 or an 8 while perfect squares end on 0; 1; 4; 5; 6; 9.	✓✓ explanation	(2)
[7]			

QUESTION 5

5.1	$-3 \leq x \leq 2$ NOTE: Candidates can present the answer as separate inequalities.	✓ answer	(1)
5.2	$f(x) = a(x - x_1)(x - x_2)$ $f(x) = a(x + 3)(x - 2)$ $-8 = a(1 + 3)(1 - 2) \dots (1; -8)$ $-8 = a(4)(-1)$ $\therefore a = 2$ $f(x) = 2(x + 3)(x - 2)$ $f(x) = 2(x^2 + x - 6)$ $f(x) = 2x^2 + 2x - 12$ $\therefore a = 2 \dots b = 2 \dots c = -12$	✓ sub. point D and x-intercepts ✓ value of a ✓ simplification of binomial ✓ values of a, b, c	(4)
5.3	$x = -\frac{b}{2a}$ $x = -\frac{2}{2(2)}$ $x = -\frac{2}{4}$ $x = -\frac{1}{2}$ $\therefore f(-\frac{1}{2}) = 2(\frac{1}{2})^2 + 2(\frac{1}{2}) - 12$ $f(-\frac{1}{2}) = \frac{1}{2} - 1 - 12$ $f(-\frac{1}{2}) = -12\frac{1}{2}$ $\therefore \text{turning... point}(-\frac{1}{2}; -12\frac{1}{2})$ NOTE: Answer does not have to be in coordinate form.	✓ value of x ✓ sub for x into $f(x)$ ✓ value of y	(3)

5.4	$x = -\frac{1}{2} + 7$ $x = 6\frac{1}{2}$ <p>NOTE: Answer only: full marks.</p>	✓ answer	(1)
5.5	$In \dots g \dots m = 6$ $\therefore \dots In \dots q \dots m = -\frac{1}{6}$ $\therefore y = mx + c$ $0 = -\frac{1}{6}(-3) + c$ $0 = \frac{1}{2} + c$ $c = -\frac{1}{2}$ $\therefore y = -\frac{1}{6}x - \frac{1}{2}$	✓ gradient of q ✓ value of c ✓ answer	(3)
NOTE: Answer only: FULL marks			
[12]			

QUESTION 6

6.1		<ul style="list-style-type: none"> ✓ shape of p with y-intercept = 1 ✓ shape of h ✓ x- and y-intercepts of h ✓ turning point of h 	(4)
6.2	See sketch in Q6.1.	<ul style="list-style-type: none"> ✓ shape of $f(x)$ with y-intercept = 1 	(1)
6.3	$y = 2(x-1+2)^2 - 8$ $y = 2(x+1)^2 - 8$	<ul style="list-style-type: none"> ✓ answer 	(1)
6.4	$p(x) = 4^x$ $\therefore p(x + \frac{1}{2}) = 4^{(x+\frac{1}{2})}$ $p(x + \frac{1}{2}) = 4^x \cdot 4^{\frac{1}{2}}$ $p(x + \frac{1}{2}) = 4^x \cdot (2^2)^{\frac{1}{2}}$ $p(x + \frac{1}{2}) = 4^x \cdot 2$ $\therefore p(x + \frac{1}{2}) = 2p(x)$	<ul style="list-style-type: none"> ✓ expansion ✓ simplification ✓ simplification 	(3)
[9]			

QUESTION 7

7.1	$p = 4$ $q = 2$ $\therefore f(x) = \frac{a}{x-4} + 2$ $3 = \frac{a}{5-4} + 2 \quad T(5;3)$ $3 = a + 2$ $a = 3 - 2$ $a = 1$	✓ value of p ✓ value of q ✓ sub. point (5 ; 3) ✓ answer	(4)
7.2	$h(x) = -\frac{1}{x-4} + 2$	✓ answer	(1)
7.3	$y \in \mathbb{R}; y \neq 2$ NOTE: Both conditions must be stated.	✓ answer	(1)
7.4	Axis of Symmetry of f is: $y = x - p + q$ and $y = -x - p + q$ $y = x - 4 + 2$ $y = -x + 4 + 2$ $y = x - 2$ $y = -x + 6$ Selection of: $y = -x + 6$ $c = 6$	✓ method ✓ selection	(2)
[8]			
TOTAL: 100			