GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL EXAMINATION

JUNE 2022

GRADE 11

MARKING GUIDELINES

MATHEMATICS
PAPER 1

EXEMPLAR

12 pages

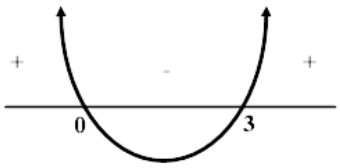
QUESTION 1

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	$3x^2-2x=14$ $3x^2-2x-14=0$ $x=\dfrac{-(-2)\pm\sqrt{(-2)^2-4(3)(-14)}}{2(3)}$ $x=\dfrac{1\pm\sqrt{43}}{3}$ $x=-1,85 \quad \text{or} \quad x=2,52$ **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	$x^2-2x=18-\dfrac{45}{x^2-2x}$ $restriction \therefore x^2-2x\neq 0$ $let: k=x^2-2x$ $\therefore k=18-\dfrac{45}{k}$ $\therefore k^2=18k-45$ $\therefore k^2-18k+45=0$ $\therefore (k-15)(k-3)=0$ $\therefore k=15\ldots or\ldots k=3$ $substitute\ldots x^2-2x\ldots back\ldots \text{int}\, o\ldots k.$ $\therefore x^2-2x=15\ldots or\ldots x^2-2x=3$ $\therefore x^2-2x-15=0\ldots or\ldots x^2-2x-3=0$ $\therefore (x-5)(x+3)=0\ldots or\ldots (x-3)(x+1)=0$ $\therefore x=5\cdots or\cdots x=-3\ldots or\ldots x=3\cdots or\cdots x=-1$ **NOTE**: Any other valid method.	✓ method ✓ values of k ✓ equating ✓ all values of x	(4)

EXEMPLAR

1.2.4	$\sqrt{5-x}+1=-x$ $\sqrt{5-x}=-x-1$ $5-x=x^2+2x+1$ $0=x^2+3x-4$ $0=(x+4)(x-1)$ $\therefore x=-4 \quad \text{or} \quad x\neq 1$ **NOTE**: Any other valid method.	✓ method ✓ standard form ✓ factors ✓ critical values ✓ rejection	(5)
1.2.5	$3^{2x+1}-4.3^x=-1$ $3.3^{2x}-4.3^x+1=0$ $(3.3^x-1)(3^x-1)=0$ $3^x=\frac{1}{3} \quad \text{or} \quad 3^x=1$ $3^x=3^{-1} \quad \text{or} \quad 3^x=3^0$ $x=-1 \qquad x=0$ **OR** $3^{2x+1}-4.3^x=-1$ let $3^x=k$ $\therefore 3k^2-4k=-1$ $3k^2-4k+1=0$ $(3k-1)(k-1)=0$ $k=\frac{1}{3} \quad \text{or} \quad k=1$ $3^x=3^{-1} \quad \text{or} \quad 3^x=3^0$ $x=-1 \qquad x=0$	✓ standard form ✓ factors ✓ equating ✓ answers ✓ standard form ✓ factors ✓ equating ✓ answers	(4)

EXEMPLAR

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

EXEMPLAR

QUESTION 2

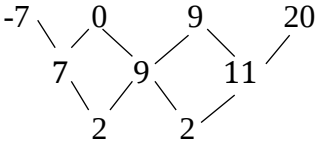
2.1.1	$2\sqrt{8}-4\sqrt{32}+3\sqrt{50}$ $=2\sqrt{4.2}-4\sqrt{16.2}+3\sqrt{25.2}$ $=2.2\sqrt{2}-4.4\sqrt{2}+3.5\sqrt{2}$ $=4\sqrt{2}-16\sqrt{2}+15\sqrt{2}$ $=3\sqrt{2}$ Mark allocated to 1st step.	✓ simplify surds ✓ simplification ✓ answer	(3)
2.1.2	$3^{-\frac{1}{2}}[\sqrt{12}+\sqrt[3]{(3\sqrt{3})}]$ $3^{-\frac{1}{2}}[(2^2.3)^{\frac{1}{2}}+(3.3^{\frac{1}{2}})^{\frac{1}{3}}]$ $3^{-\frac{1}{2}}[2^1.3^{\frac{1}{2}}+(3^{\frac{3}{2}})^{\frac{1}{2}}]$ $3^{-\frac{1}{2}}[2.3^{\frac{1}{2}}+3^{\frac{1}{2}}]$ 2.3^0+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	$x=\sqrt{6+\sqrt{6+\sqrt{6+.....}}}$ $\therefore x^2=6+\sqrt{6+\sqrt{6+...}}$ $\therefore x^2=6+x$	✓ method ✓ answer	(2)
2.2.2	$x^2-x-6=0$ $(x-3)(x+2)=0$ $x=3 \ldots x\neq -2$	✓ standard form ✓ factors ✓ answer ✓ exclusion	(4)

EXEMPLAR

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]

EXEMPLAR

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

EXEMPLAR

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; … 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]

EXEMPLAR

QUESTION 5

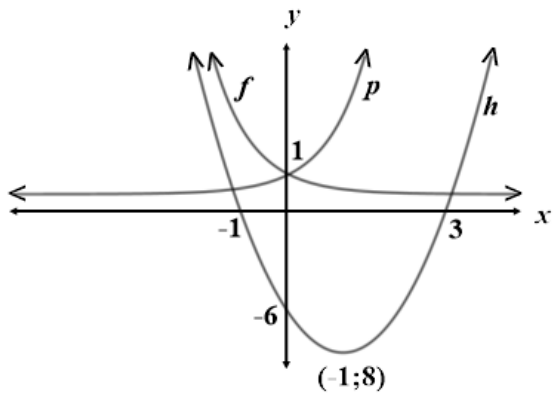
5.1	$-3 \le x \le 2$ **NOTE:** Candidates can present the answer as separate inequalities.	✓ answer	(1)
5.2	$f(x) = a(x - x_1)(x - x_2)$ $f(x) = a(x+3)(x-2)$ $-8 = a(1+3)(1-2) \ldots\ldots (1;-8)$ $-8 = a(4)(-1)$ $\therefore a = 2$ $f(x) = 2(x+3)(x-2)$ $f(x) = 2(x^2 + x - 6)$ $f(x) = 2x^2 + 2x - 12$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

EXEMPLAR

5.4	$x = -\frac{1}{2} + 7$ $x = 6\frac{1}{2}$ **NOTE:** Answer only: full marks.	✓ 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]

EXEMPLAR

QUESTION 6

6.1		✓ 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.	✓ shape of $f(x)$ with y-intercept = 1	(1)
6.3	$y = 2(x-1+2)^2 - 8$ $y = 2(x+1)^2 - 8$	✓ answer	(1)
6.4	$p(x) = 4^x$ $\therefore p(x+\frac{1}{2}) = 4^{(x+\frac{1}{2})}$ $p(x+\frac{1}{2}) = 4^x.4^{\frac{1}{2}}$ $p(x+\frac{1}{2}) = 4^x.(2^2)^{\frac{1}{2}}$ $p(x+\frac{1}{2}) = 4^x.2$ $\therefore p(x+\frac{1}{2}) = 2p(x)$	✓ expansion ✓ simplification ✓ simplification	(3)
			[9]

EXEMPLAR

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

EXEMPLAR