GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL EXAMINATION

NOVEMBER 2021

GRADE 11

MARKING GUIDELINES

MATHEMATICS
(PAPER 1)

EXEMPLAR

17 pages

INSTRUCTIONS AND INFORMATION

A – ACCURACY
C.A. – CONSISTENT ACCURACY

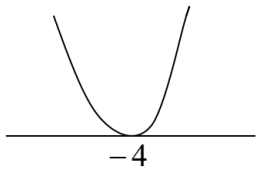
NOTE:

- 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 guidelines.
- Assuming values/answers in order to solve a question is UNACCEPTABLE.

EXEMPLAR

QUESTION 1				
1.1	1.1.1	$(x+2)(2x-1)=0$ $x=-2$ **or** $x=\frac{1}{2}$	✓ simplification ✓ both values for x	(2)
	1.1.2	$3-x=0$ $\therefore \quad x=3$	✓ answer	(1)
1.2	1.2.1	$2x^2-3x-4=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $x=\frac{-(-3)\pm\sqrt{(-3)^2-4(2)(-4)}}{2(2)}$ $x=2,35 \quad \text{or} \quad x=-0,85$	✓ correct substitution ✓✓ answers	(3)
	1.2.2	$(2x+3)(3-x)>4$ $-2x^2+3x+9>4$ $-2x^2+3x+5>0$ $2x^2-3x-5<0$ $(2x-5)(x+1)<0$ $\therefore -1<x<\frac{5}{2}$ **NOTE:** Candidates can write the answer as separate inequalities but must state AND between the inequalities, not OR.	✓ simplify ✓ standard form ✓ factors ✓ critical values ✓ answer	(5)
	1.2.3	$\sqrt{x+2}+x=4$ $\sqrt{x+2}=4-x$ $x+2=16-8x+x^2$ $\quad a^2+b^2=c^2$ $0=x^2-9x+14$ $0=(x-7)(x-2)$ $x\neq 7 \quad \text{or} \quad x=2$	✓ squaring both sides ✓ standard form ✓ factors ✓ critical values ✓ exclusion of $x=7$	(5)

EXEMPLAR

	1.2.4	$2^{2x+1}-3(2^{2x-1})+4^x=12$ $2^{2x}\left(2-\frac{3}{2}+1\right)=12$ $2^{2x}\left(\frac{3}{2}\right)=12$ $2^{2x}=8$ $2^{2x}=2^3$ $x=\frac{3}{2}$	✓ correct factorisation ✓ simplification $2^{2x}=8$ ✓ equating to like bases ✓ answer	(4)
1.3	1.3.1	$f(x)=x^2+8x+16$ $f(2)=2^2+8(2)+16$ $f(2)=36$	✓ answer	(1)
	1.3.2	$f(x)>0$ $x^2+8x+16>0$ $(x+4)(x+4)>0$ $(x+4)^2>0$ $CV:\quad -4$ + 0 + / -4 OR  / -4 $x\in\mathbb{R}$; $x\neq -4$ **NOTE:** Both criteria must be presented for the answer mark.	✓ factors ✓ critical value ✓ answer	(3)

EXEMPLAR

1.4	$y-2x+1=0$ and $xy=2y+x^2+3x-10$ ... (2) $y=2x-1$ ... (1) sub (2) into (1) $x(2x-1)=2(2x-1)+x^2+3x-10$ $2x^2-x=4x-2+x^2+3x-10$ $x^2-8x+12=0$ $(x-6)(x-2)=0$ $x=6$ **or** $x=2$ if $x=6$ if $x=2$ $y=2(6)-1$ $y=2(2)-1$ $y=11$ $y=3$ **NOTE:** Any other valid method.	✓ y as subject in (1) ✓ substitution ✓ standard form ✓ factors ✓ values for x ✓ values for y	(6)
1.5	$(xp)^2+3=2x(p-x)$ $x^2p^2+3=2px-2x^2$ $x^2p^2+3-2px+2x^2=0$ $(p^2+2)x^2-2xp+3=0$ $\Delta=b^2-4ac$ $=(-2p)^2-4(p^2+2)(3)$ $=4p^2-12p^2-24$ $=-8p^2-24$ $p^2>0$ for $p\in\mathbb{R}$ $\therefore -8p^2<0$ for $p\in\mathbb{R}$ $\therefore -8p^2-24<0$ for $p\in\mathbb{R}$ $\therefore$ roots are non-real.	✓ standard form ✓ substitution ✓ value for Δ ✓ complete explanation	(4)
			[34]

EXEMPLAR

QUESTION 2				
2.1	2.1.1	$\left\{\frac{16x^2}{81x^{-2}}\right\}^{-\frac{1}{2}}$ $=\left\{\frac{81x^{-2}}{16x^2}\right\}^{\frac{1}{2}}$ $=\frac{9}{4x^2}$ **NOTE:** Any correct alternative method.	✓ interchange base AND additive inverse of index ✓ answer	(2)
	2.1.2	$\frac{9^x+3^{2x+1}}{18^x.2^{-x}}$ $=\frac{3^{2x}+3^{2x+1}}{3^{2x}.2^x.2^{-x}}$ $=\frac{3^{2x}(1+3)}{3^{2x}.2^0}$ $=4$ **NOTE:** Any correct alternative method.	✓ simplification of 9^x and 18^x ✓ factorise ✓ answer	(3)
	2.1.3	$\sqrt{10-3^{2x}}=3^x-2$ $10-3^{2x}=(3^x-2)^2$ $10-3^{2x}=3^{2x}-4.3^x+4$ $2.3^{2x}-4.3^x-6=0$ $3^{2x}-2.3^x-3=0$ $(3^x-3)(3^x+1)=0$ $3^x=3$ or $3^x=-1$ $x=1$ no solution ($3^x>0$)	✓ squaring both sides ✓ simplification ✓ standard form ✓ factors ✓ value of x and rejection	(5)
2.2		$3\sqrt{2a}-2\sqrt{3a}$ $=\sqrt{(3\sqrt{2a}-2\sqrt{3a})^2}$ $=\sqrt{9.\sqrt{4a^2}-12\sqrt{6a^2}+4.\sqrt{9a^2}}$ $=\sqrt{9.2a-12\sqrt{6a^2}+4.3a}$ $\sqrt{18a-12a\sqrt{6}+12a}$ $=\sqrt{30a-12a\sqrt{6}}$	✓ surd and squaring ✓ multiplication ✓ simplification ✓ simplification	(4)
				[14]

EXEMPLAR

QUESTION 3				
3.1	3.1.1	A = 9 B = 11	✓ answer ✓ answer	(2)
	3.1.2	$T_n = 2n+1$	✓✓ answer	(2)
	3.1.3	$T_n = 2n+1$ $T_n = 2(100)+1$ $T_n = 201$ **NOTE :** Answer only, award FULL marks.	✓ substitution ✓ answer	(2)
	3.1.4	$T_n = 2n+1$ $305 = 2n+1$ $304 = 2n$ $n = 152$	✓ substitution ✓ answer	(2)
3.2		$T_3 - T_2 = T_2 - T_1$ $3x^2 + 4x - 3 - (2x^2 + 5x + 2)$ $= 2x^2 + 5x + 2 - (2x^2 + 5x + 5)$ $3x^2 + 4x - 3 - 2x^2 - 5x - 2$ $= 2x^2 + 5x + 2 - 2x^2 - 5x - 5$ $x^2 - x - 5 = -3$ $x^2 - x - 2 = 0$ $(x-2)(x+1)$ $\therefore x = 2$ **or** $x = -1$	✓ substitution ✓ simplification ✓ standard form ✓ answers	(4)
				[12]

EXEMPLAR

QUESTION 4			
4.1	-1 ; x ; 3 ; x+8 x-(-1) 3-x x+8-3 3-x-(x+1) x+5-(3-x) $3-x-(x+1)=x+5-(3-x)$ $3-x-x-1=x+5-3+x$ $2-2x=2x+2$ $4x=0$ $\therefore x=0$	✓ first differences ✓ second differences ✓ equating ✓ answer	(4)
4.2	-1 ; 0 ; 3 ; 8 1 3 5 2 2 $2a=2$ $a=1$ $3a+b=1$ $3(1)+b=1$ $b=-2$ $a+b+c=-1$ $1-2+c=-1$ $c=0$ $Tn=n^2-2n$ $Tn=n^2-2n+1-1$ $Tn=(n-1)^2-1$ **NOTE:** If a candidate uses $Tn=(n-1)^2-1$ to validate the quadratic pattern, award ZERO marks.	✓ 2nd difference ✓ value for a ✓ value for b ✓ value for c ✓ equation of T_n ✓ complete the square of T_n	(6)

EXEMPLAR

4.3	$Tn=(n-1)^2-1$ $T_{65}=(65-1)^2-1$ $T_{65}=4095$	✓ substitution ✓ answer	(2)
4.4	$(n-1)^2-1>9800$ $n^2-2n-9800>0$ $(n+98)(n-100)$ *CVs* -98 or 100 $n>100$ $\therefore n=101$	✓ setting up inequality ✓ factors ✓ choice of $n=100$ ✓ answer	(4)
			[16]

QUESTION 5				
5.1	5.1.1	$A=P(1-i)^n$ $A=250000(1-0.1)^5$ $A=R147622,50$	✓ correct substitution into correct formula ✓ answer	(2)
	5.1.2	$A=P(1+i)^n$ $A=250\,000(1+0.08)^5$ $A=R367\,332,02$	✓ correct substitution into correct formula ✓ answer	(2)
	5.1.3	$\frac{95}{100}\times 147\,622.50$ $=R140\,241,375$ New Machine - Sale of Old Machine $R367\,332,02-R140\,241,375$ $R227\,090,65$	✓ R140 241, 375 ✓ answer	(2)
5.2	5.2.1	$1+i_{eff}=\left(1+\frac{i_{nom}}{m}\right)^m$ $1+i_{eff}=\left(1+\frac{0.115}{12}\right)^{12}$ $i_{eff}=12,13\%$ Bank B offers a better interest rate. **NOTE:** Award no marks if candidate concludes only.	✓ correct substitution into correct formula ✓ 12,13% ✓ conclusion	(3)

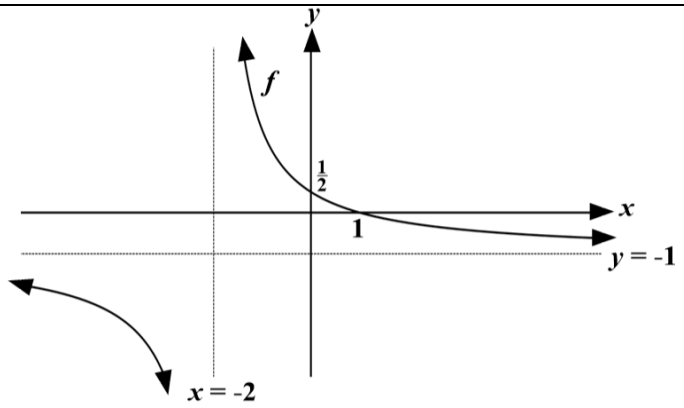
EXEMPLAR

	5.2.2	$A = P(1+i)^n$ $R280\,000 = \left[P\left(1+\frac{0.115}{12}\right)^{24} - 50\,000\right]\left(1+\frac{0.115}{12}\right)^{36}$ $P = R197\,759{,}51.$ **OR** $A = P(1+i)^n$ $R280000 = P\left(1+\frac{0.115}{12}\right)^{60} - 50\,000\left(1+\frac{0.115}{12}\right)^{36}$ $P = R197\,759{,}51$ **OR** $A = P(1+i)^n$ $R280\,000 = [P(1+0{,}1213)^2 - 50\,000](1+0{,}1213)^3$ $P = R197\,729{,}98$ **OR** $A = P(1+i)^n$ $R280\,000 = P(1+0{,}1213)^5 - 50\,000(1+0{,}1213)^3$ $P = R197\,727.98$	✓ value of i ✓ $n = 24$ ✓ $n = 36$ ✓ setting up equation ✓ answer **OR** ✓ value of i ✓ n = 60 ✓ n = 36 ✓ setting up equation ✓ answer **OR** ✓ value of i ✓ n = 2 ✓ n = 3 ✓ setting up equation ✓ answer **OR** ✓ value of i ✓ n = 5 ✓ n = 3 ✓ setting up equation ✓ answer	(5)
				[14]

EXEMPLAR

QUESTION 6			
6.1	$f(x)=\frac{3}{x+2}-1$ $2=\frac{3}{k+2}-1$ $3=\frac{3}{k+2}$ $3k+6=3$ $k=-1$	✓ substitution ✓ answer	(2)
6.2	$x=-2$ $y=-1$	✓ answer ✓ answer	(2)
6.3	$f(x)=\frac{3}{x+2}-1$ $f(0)=\frac{3}{0+2}-1$ $=\frac{1}{2}$ $\therefore\left(0;\frac{1}{2}\right)$ **NOTE:** Answer MUST be presented in coordinate form.	✓ answer	(1)
6.4	$f(x)=\frac{3}{x+2}-1$ $0=\frac{3}{x+2}-1$ $1=\frac{3}{x+2}$ $x+2=3$ $x=1$ $(1;0)$ **NOTE:** Answer does NOT need to be in coordinate form.	✓ simplification ✓ answer	(2)

EXEMPLAR

6.5		✓ shape ✓ asymptotes ✓ *x*- and *y*- intercepts	(3)
6.6	$m=-1$ and (-2;-1) is on the axis of symmetry $\therefore y=mx+c$ $-1=-1(-2)+c$ $\therefore c=-3$ $\therefore y=-x-3$ **NOTE:** Any other valid method.	✓ substitution for *m* AND the point ✓ answer	(2)
6.7	$x>-2$	✓ answer	(1)
6.8	$f(x)=\frac{3}{x+2}-1$ $-y=\frac{3}{x+2}-1$ $y=-\left(\frac{3}{x+2}-1\right)$ $y=\frac{-3}{x+2-4}+1$ $y=\frac{-3}{x-2}+1$	✓ make *y* negative ✓ subtract 4 ✓ answer	(3)
			[16]

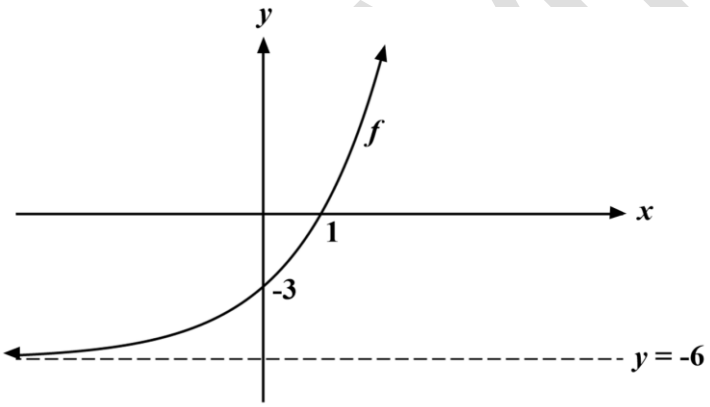
EXEMPLAR

QUESTION 7			
7.1	$q = 5$	✓ answer	(1)
7.2	$f(x) = -x^2 - 4x + 5$ $x^2 + 4x - 5 = 0$ $(x+5)(x-1) = 0$ $x = -5$ **or** $x = 1$ $\therefore$ EP = 6 units	✓ factors ✓ critical values ✓ answer	(3)
7.3	$x = \frac{-b}{2a}$ $x = \frac{-(-4)}{2(-1)}$ $x = -2$ $f(-2) = 9$ $\therefore N(-2;9)$ **OR** $f(x) = -(x^2 + 4x) + 5$ $f(x) = -(x^2 + 4x + 2^2) + 5 + 4$ $f(x) = -(x+2)^2 + 9$ $\therefore N(-2;9)$ **NOTE:** Answer does NOT have to be in coordinate form.	✓ x-value ✓ y-value **OR** ✓ x-value ✓ y-value	(2)
7.4	m of $g = 1$ $\therefore m$ of $h = -1$ $y = mx + c$ $9 = -1(-2) + c$ $c = 7$ $h(x) = -x + 7$ **NOTE:** Any other valid method.	✓ gradient of $h = -1$ ✓ $c = 7$ ✓ answer	(3)
7.5	M(0;5) and N(-2;9) $m_{MN} = \frac{y_2 - y_1}{x_2 - x_1}$ $m_{MN} = \frac{9-5}{-2-0}$ $m_{MN} = -2$ **NOTE:** NO marks for applying incorrect gradient formula.	✓ correct substitution ✓ answer	(2)

EXEMPLAR

7.6	At point N: $f(-2)=9$ At point T: $g(-2)=3$ $\therefore$ distance of NT $= 9-3$ $= 6$ units **OR** $NT = f(x)-g(x)$ $= -x^2-4x+5-(x+5)$ $= -x^2-5x$ $x=-2$ $\therefore NT = -(-2)^2-5(-2)$ $NT = 6$ units **NOTE:** Any other valid method.		✓ $g(-2) = 3$ ✓ method ✓ answer **OR** ✓ method ✓ substitution ✓ answer	(3)
7.7	By symmetry: $S(-4;5)$ **OR** At point S: $y = 5$ $\therefore 5 = -x^2-4x+5$ $x^2+4x=0$ $x(x+4)=0$ $x=0$ or $x=-4$ $\therefore S(-4;5)$		✓✓✓ answer **OR** ✓ $y = 5$ ✓ equating ✓ selection of –4	(3)
7.8	7.8.1	$x = -5$ **OR** $x = 0$	✓ answer ✓ answer	(2)
	7.8.2	$x > 1$	✓ answer	(1)
				[20]

EXEMPLAR

QUESTION 8			
8.1	let $x = 0$ $f(x) = 3.2^x - 6$ $f(0) = 3.2^0 - 6$ $y = -3$ $\therefore (0;-3)$ **NOTE:** Answer MUST be in coordinate form.	✓ answer	(1)
8.2	let $y = 0$ $0 = 3.2^x - 6$ $6 = 3.2^x$ $2 = 2^x$ $x = 1$ $\therefore (1;0)$ **NOTE:** Answer does NOT have to be in coordinate form.	✓ simplify both sides to base 2 ✓ answer	(2)
8.3		✓ shape ✓ asymptote ✓ *x*- and *y*- intercepts	(3)
8.4	$y > -6$ **OR** $y \in [-6;\infty]$	✓ answer	(1)
			[7]

EXEMPLAR

QUESTION 9

NOTE: Candidates may present answers as a fraction, decimal fraction or percentage.

9.1	9.1.1	P(male)= $\frac{120}{236}$ P(male)= $0,51$	✓ $\frac{120}{236}$ ✓ answer	(2)
	9.1.2	P(Female and plays sport) $= \frac{67}{236}$ P(Female and plays sport) $= 0,28$	✓ $\frac{67}{236}$ ✓ answer	(2)
9.2		P(Male and does not play sport) $= \frac{51}{236}$ P(Male and does not play sport) $= 0,22$ $\neq 0$ NOT mutually exclusive **OR** There are 51 male learners who do not play sport. Therefore the two are NOT mutually exclusive. **NOTE:** Accept alternative answers expressed as a percentage or in fraction form.	✓ 0,22 ✓ conclusion **OR** ✓ statement ✓ conclusion	(2)
9.3		P(male and does not play sport) $= 0,22$ P(male)×P(does not play sport) $= \frac{120}{236} \times \frac{100}{236}$ $= 0,22$ $\therefore P$(male and does not play sport) $= P$(male)×P(does not play sport) $\therefore$ the events ARE independent (correct to two decimal places)	✓✓ P(male) x P(does not play sport) = 0,22 ✓ equating ✓ conclusion	(4)
				[10]

EXEMPLAR

QUESTION 10			
10.1	$c = 84 - 75$ $c = 9$	✓ answer	(1)
10.2	$f + 18 + x = 41$ $f = 41 - x - 18$ $f = 23 - x$	✓ equating correctly ✓ answer	(2)
10.3	$f = 23 - x \quad \therefore \; x = 23 - f$ $e = 17 - x \quad \therefore x = 17 - e$ $\therefore 23 - f = 17 - e$ but $40 + e + f + x = 75$ $\therefore \quad e + f + x = 35$ $\therefore \; 17 - x + 23 - x + x = 35$ $40 - x = 35$ $x = 5$	✓ equating expressions of x ✓ equating to 75 ✓ simplification ✓ answer	(4)
			[7]

TOTAL: 150

EXEMPLAR