education

Department:
Education
PROVINCE OF KWAZULU-NATAL

MATHEMATICS P1

COMMON TEST

JUNE 2019

MARKING GUIDELINE

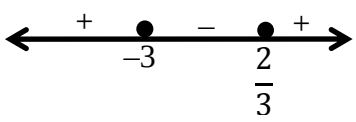
NATIONAL
SENIOR CERTIFICATE

GRADE 11

MARKS: **100**

This marking guideline consists of 9 pages.

QUESTION 1

1.1.1	$x(2x-5)=0$ $x=0$ or $x=\frac{5}{2}$	✓ $x=0$ ✓ $x=\frac{5}{2}$ (2)
1.1.2	$2x^2-x-7=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $x=\frac{-(-1)\pm\sqrt{(-1)^2-4(2)(-7)}}{2(2)}$ $x=2{,}14$ or $x=-1{,}64$	✓ substitution into quadratic formula ✓ answer ✓answer (3)
1.1.3	$x-\sqrt{2x-1}=2$ $x-2=\sqrt{2x-1}$ $x^2-4x+4=2x-1$ $x^2-6x+5=0$ $(x-5)(x-1)=0$ $x=5$ or $x\neq 1$	✓ isolate surd ✓ square both sides ✓ standard form ✓ answer ✓ $x\neq -1$ (5)
1.1.4	$3x^2+7x-6\geq 0$ $(3x-2)(x+3)\geq 0$  $x\leq -3$ or $x\geq\frac{2}{3}$	✓ factors ✓✓ answers (3)
1.1.5	$3^x\left(x+\frac{1}{3}\right)<0$ $3^x>0$ for all real values of x $\therefore x+\frac{1}{3}<0$ $\therefore x<-\frac{1}{3}$	✓ $3^x>0$ ✓ $x+\frac{1}{3}<0$ ✓ answer (3)
1.2	$x-4y=5$ and $x^2-2xy-3y^2=0$ $x=5+4y$ $(5+4y)^2-2y(5+4y)-3y^2=0$ $25+40y+16y^2-10y-8y^2-3y^2=0$ $5y^2+30y+25=0$ $y^2+6y+5=0$ $(y+5)(y+1)=0$ $y=-5$ *or* $y=-1$ $x=-15$ *or* $x=1$	✓making x the subject of the formula ✓substitution ✓ simplification ✓ standard form ✓y values ✓x values (6)

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	OR $4y = x - 5$ $y = \frac{x-5}{4}$ $x^2 - 2x\left(\frac{x-5}{4}\right) - 3\left(\frac{x-5}{4}\right)^2 = 0$ $16x^2 - 8x^2 + 40x - 3x^2 + 30x - 75 = 0$ $5x^2 + 70x - 75 = 0$ $x^2 + 14x - 15 = 0$ $(x + 15)(x - 1) = 0$ $x = -15 \quad or \quad x = 1$ $y = -5 \quad or \quad y = -1$	✓making y the subject of the formula ✓substitution ✓ simplification ✓ standard form ✓x values ✓y values (6)
		[22]

QUESTION 2

2.1.1	$\left(\frac{2}{\sqrt{3}} - \frac{\sqrt{3}}{2}\right)^2$ $= \frac{4}{3} - 2 + \frac{3}{4}$ $= \frac{1}{12}$	✓ for correct expansion ✓answer (2)
2.1.2	$\frac{\sqrt{72}}{\sqrt{8} + \sqrt{98}}$ $= \frac{\sqrt{36 \times 2}}{\sqrt{4 \times 2} + \sqrt{49 \times 2}}$ $= \frac{6\sqrt{2}}{2\sqrt{2} + 7\sqrt{2}}$ $= \frac{6\sqrt{2}}{9\sqrt{2}}$ $= \frac{2}{3}$	✓ simplifying surds ✓ adding like surds ✓ answer (3)

2.1.3	$\frac{6(3^{n+1})}{3^{n(n-1)}} \div \frac{2.9^{n+1}}{3^{n^2-1}}$ $= \frac{6.3^n.3^1}{3^{n^2}.3^{-n}} \times \frac{3^{n^2}.3^{-1}}{2.3^{2n}.3^2}$ $= \frac{1}{3}$ **OR** $\frac{6(3^{n+1})}{3^{n(n-1)}} \div \frac{2.9^{n+1}}{3^{n^2-1}}$ $= 6.3^{n+1-n^2+n} \div 2.3^{2n+2-n^2+1}$ $= \frac{6.3^{-n^2+2n+1}}{2.3^{-n^2+2n+3}}$ $= \frac{3^{-n^2+2n+2}}{3^{-n^2+2n+3}}$ $= \frac{1}{3}$	✓ writing as prime bases ✓ simplification using exp. laws ✓ ÷ to × and invert 2nd fraction ✓ answer (4) ✓ writing as prime bases ✓ simplification using laws ✓ simplification using laws ✓ answer (4)
2.2	$3^x.5+3^{x+1}=216$ $3^x.5+3^x.3^1=216$ $8.3^x=216$ $3^x=27$ $3^x=3^3$ $x=3$	✓ simplification to 8.3^x ✓ $3^x=27$ ✓ answer (3)
2.3	$\frac{18^x}{2^{-x}}$ $= \frac{(3.6)^x}{2^{-x}}$ $= 3^x.6^x.2^x$ $= (36)^x$ or $(6^x)^2$ $= 5^2$ $= 25$ **OR** $\frac{18^x}{2^{-x}}$ $= \frac{2^x.3^{2x}}{2^{-x}}$ $= 2^{2x}.3^{2x}$ $= (6^x)^2$ $= 5^2$ $= 25$	✓simplification suing exp. laws ✓for writing as $(36)^x$ or $(6^x)^2$ ✓ answer (3) ✓simplification suing exp. laws ✓for writing as $(36)^x$ or $(6^x)^2$ ✓ answer (3)
		[15]

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QUESTION 3

3.1	26 ; 37	✓✓ answers (2)
3.2	$x-3$ $\quad -2x+2$ $\quad 3x+11$ $\quad 4x+12$ $-3x+5$ $\quad 5x+9$ $\quad x+1$ $8x+4$ $\quad -4x-8$ $5x+9+3x-5 = x+1-5x-9$ $8x+4 = -4x-8$ $x = -1$	✓ 1st difference ✓ 2nd difference ✓ equating 2nd differences ✓ answer (4)
3.3.1	3 7 13 21 4 6 8 2 2 $2a = 2$ $\quad 3a+b = 4$ $\quad a+b+c = 3$ $a = 1$ $\quad b = 1$ $\quad c = 1$ $T_n = n^2+n+1$	✓ $a = 1$ ✓ b value ✓ c value ✓ answer (4)
3.3.2	$n^2+n+1 > 463$ $n^2+n-462 > 0$ $(n-21)(n+22) > 0$ + o – o + −22 21 ∴ The 22nd term will be the first to exceed 463	✓ $T_n > 463$ ✓ standard form ✓ factors or quadratic formula ✓answer (4)
3.3.3	n^{th} term of 1st difference: $T_n = 2n+2$ $2n+2 = 102$ $n = 50$ ∴ between T_{50} and T_{51}	✓ $T_n = 2n+2$ ✓ equating T_n to 102 ✓ value of n ✓ answer (4)
3.3.4	The nos. at the end of the rows are: 3 ; 7 ; 13 ; 21 ; … $\therefore T_n = n^2+n+1$ $\therefore T_{60} = (60)^2+60+1$ $= 3661$	✓ T_n from 3.3.1 ✓ substitution of 60 for n into Tn ✓ answer (3)

3.4	6 ; p ; q ; r ; 42 ; … 6 + 4(common difference) = 42 4(common difference) = 36 common difference = 9 $\therefore p = 15$ $\therefore q = 24$ $\therefore r = 33$ **OR** 6 ; p ; q ; r ; 42 ; … $T_n = bn + c$ $6 = b + c \ldots T_1 = 6$ $42 = 5b + c \ldots T_5 = 42$ $4b = 36$ $b = 9$ $\therefore p = 15$ $\therefore q = 24$ $\therefore r = 33$	✓ 6 + 4(common difference) = 42 ✓ common difference ✓ value of p ✓ values of q and r (4) ✓ setting up equations ✓ common difference ✓ value of p ✓ values of q and r (4)
		[25]

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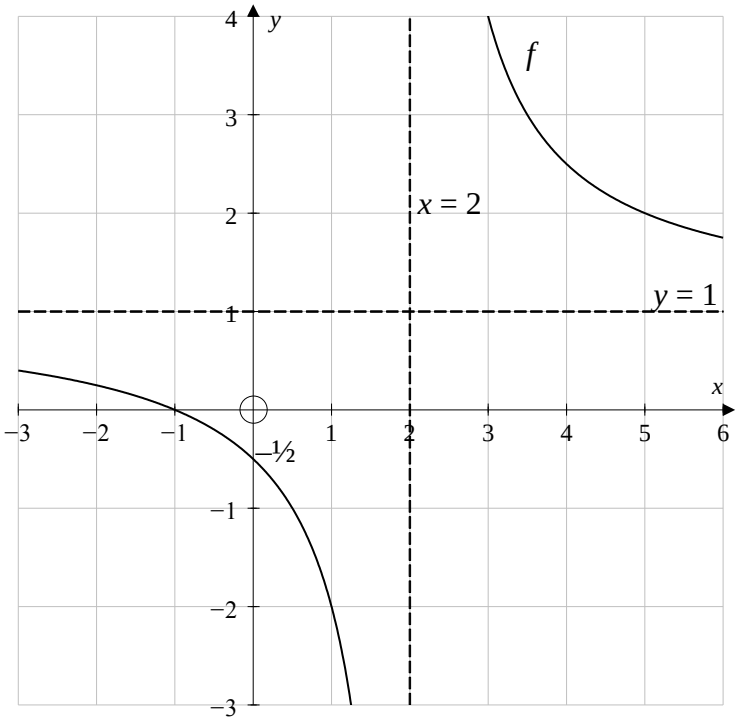
QUESTION 4

4.1	$f(x)=\frac{3}{x-2}+1$ $x = 2$ $y = 1$	✓ $x = 2$ ✓ $y = 1$ (2)
4.2	y-intercept $y=-\frac{1}{2}$	✓ answer (1)
4.3	x intercept $\frac{3}{x-2}+1=0$ $x-2=-3$ $x=-1$	✓ set $y = 0$ ✓answer (2)
4.4		✓ both asymptotes ✓x and y intercepts ✓ shape (3)
4.5	$h(x)=\frac{3}{x-4}+1$ Domain: $\{x/\ x\ \varepsilon\ R\ ;\ x \neq 4\}$	✓✓ answer (2)
		[10]

QUESTION 5

5.1.1	C	✓ answer (1)
5.1.2	A	✓ answer (1)
5.1.3	B	✓ answer (1)
5.2.1	$y = a(x)(x-4)$ $-3 = a\,(1)(1-4)$ $1 = a$ $y = x(x-4)$ $= x^2 - 4x$ $b = -4$	✓ substituting *x*-intercepts ✓ substituting $(1\,;-3)$ ✓ writing eqn. in standard form (3)
5.2.2	$x = 2$ $y = 2^2 - 4(2)$ $= -4$ $P(2\,;-4)$	✓ $x = 2$ ✓ $y = -4$ (2)
5.2.3	$y \in [-4;\infty)$ **OR** $y \geq -4$	✓ answer (1) ✓ answer (1)
5.2.4	$t = -4$	✓ answer (1)
5.2.5	$y = k^x + t$ $0 = k^2 - 4$ $4 = k^2$ $\therefore\ k = 2$	✓ substituting –4 , 0 and 2 ✓ answer (2)
5.2.6	$r > 4$ **OR** $r \in (4\,;\infty)$	✓✓ answer (2) ✓✓ answer (2)
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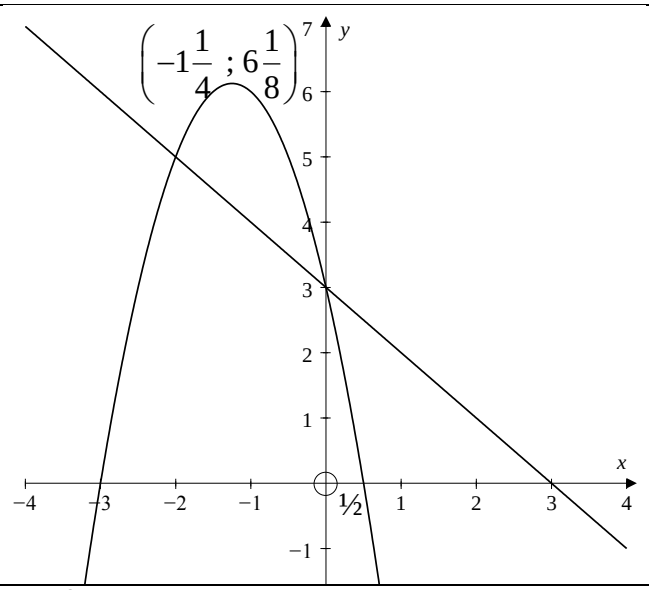
QUESTION 6

6.1	x-intercepts: $-2x^2 - 5x + 3 = 0$ $2x^2 + 5x - 3 = 0$ $(2x - 1)(x + 3) = 0$ $x = \frac{1}{2}$ or $x = -3$ y-intercept: (0 ; 3)	✓ factors ✓ x-intercepts ✓ y-intercept (3)
6.2	Axis of symmetry: $x = \frac{x_1 + x_2}{2}$ or $x = \frac{-b}{2a}$ $x = \frac{-3 + \frac{1}{2}}{2}$ or $x = \frac{-(-5)}{2(-2)}$ $x = -\frac{5}{4}$ Maximum value: $y = -2(\frac{-5}{4})^2 - 5\left(\frac{-5}{4}\right) + 3$ $y = \frac{49}{8}$ ∴ Turning point: $\left(-1\frac{1}{4} ; 6\frac{1}{8}\right)$	✓ x–coordinate ✓ y–coordinate (2)
6.3	$m = tan\,135°$ $m = -1$	✓ answer (1)
6.4		✓ y intercept of p ✓ x intercepts of p ✓ turning point of p ✓ y intercept of q ✓ x intercept of q (5)
6.5	$-2x^2 - 5x + 3 = -x + k$ $-2x^2 - 4x + 3 - k = 0$ $(-4)^2 - 4(-2)(3 - k) = 0$ $16 + 24 - 8k = 0$ $k = 5$	✓ equating ✓ substituting into $b^2 - 4ac = 0$ ✓ answer (3)
		[14]

TOTAL: 100