KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS

MARKING GUIDELINE

COMMON TEST

MARCH 2023

MARKS: 100

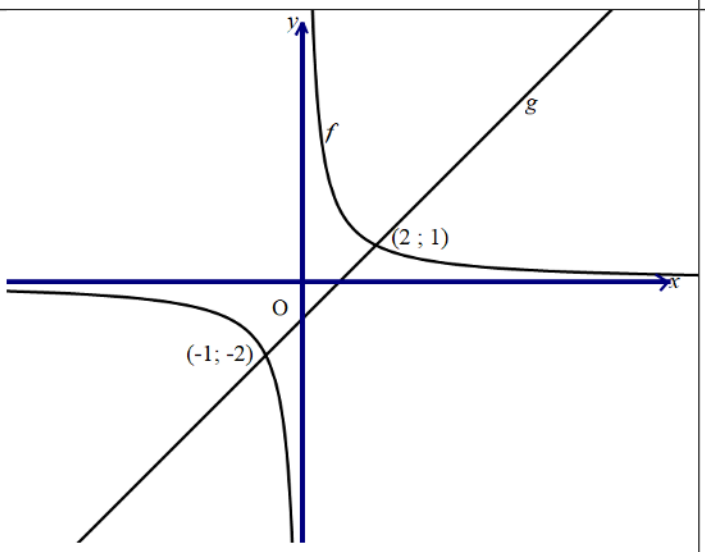
This memorandum consists of 12 pages.

QUESTION 1			
1.1	2 ; 7 ; 14 ; 23 ; 34 ; ..... 5 ; 7 ; 9 ; 11 ; ..... 2 ; 2 ; 2 Fifth term is 34	A✓ 34	(1)
1.2	$T_n = an^2 + bn + c$ $2a = 2$ $a = 1$ $5 = 3a + b$ $5 = 3(1) + b$ $2 = b$ $2 = 1 + 2 + c$ $c = -1$ $T_n = n^2 + 2n - 1$	A✓ $a = 1$ CA✓ $b = 2$ CA✓ $c = -1$ CA✓answer	(4)
1.3	First difference 5;7;9;11;.... $T_n = 2n + 3$ $57 = 2n + 3$ $54 = 2n$ $27 = n$ Between T_{27} and T_{28}	A✓ $2n + 3$ CA✓equating to 57 CA✓ T_{27} and T_{28}	(3)
			[8]

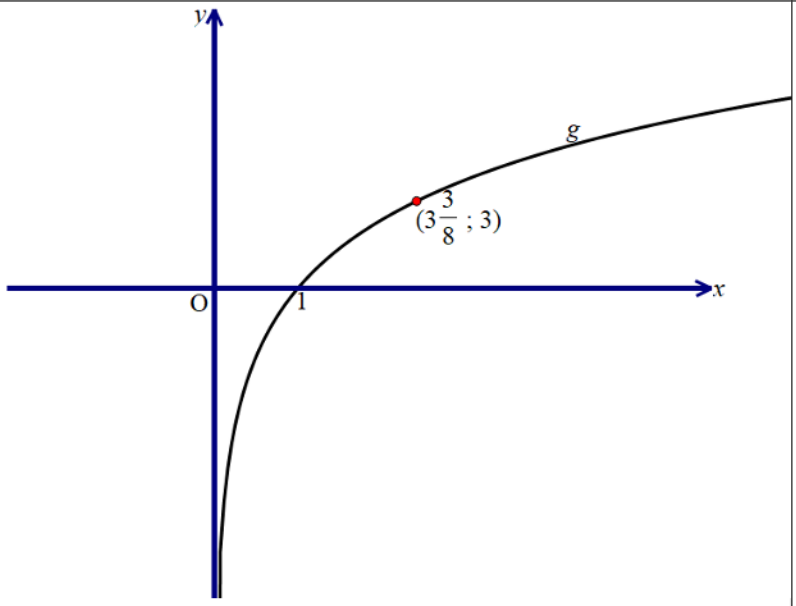
QUESTION 2			
2.1.1	$10; a; 24; b; 38; .....$ $a - 10 = 24 - a$ $2a = 34$ $a = 17$ $38 - b = b - 24$ $62 = 2b$ $31 = b$ **OR** $a = \frac{24+10}{2} = 17$ $b = \frac{24+38}{2} = 31$	A✓equating A✓equating OR A✓ answer A✓ answer	(2) (2)
2.1.2	$a = 10$ $d = 7$ $S_n = \frac{n}{2}\left[2a + (n-1)d\right]$ $S_{67} = \frac{67}{2}\left[2(10) + (67-1)7\right]$ $S_{67} = 16147$ **OR** $S_n = \frac{n}{2}(a + l)$ $S_{67} = \frac{67}{2}(10 + 472)$ $S_{67} = 16147$	A✓substituting CA✓answer A✓substituting CA✓answer	(2) (2)

2.1.3	$10;24;38;52;66;.....$ $a=10$ $d=14$ $n=34$ $S_n=\frac{n}{2}\left[2a+(n-1)d\right]$ $S_{34}=\frac{34}{2}\left[2(10)+(34-1)14\right]$ $S_{34}=8194$ OR $S_n=\frac{n}{2}(a+l)$ $S_{34}=\frac{34}{2}(10+472)$ $S_{34}=8194$	A✓sequence CA✓sub into formu CA✓answer OR CA✓sub into formu A✓ 472 CA✓answer	(3)
2.2	For : $\sum_{r=2}^{\infty}3.2^{1-r}$ $a=\frac{3}{2}$ $r=\frac{1}{2}$ $S_\infty=\frac{a}{1-r}=\frac{1,5}{1-0,5}=3$ For $\sum_{r=2}^{12}3.2^{1-r}$ $a=\frac{3}{2}$ $r=\frac{1}{2}$ $n=11$ $S_{11}=\frac{1,5\left(1-(0,5)^{11}\right)}{1-0,5}=2,999$ $\therefore 3+2,999=5,999$	A✓ $S_\infty=3$ A✓ $S_{11}=2,999$ CA✓answer	(3)
			[10]

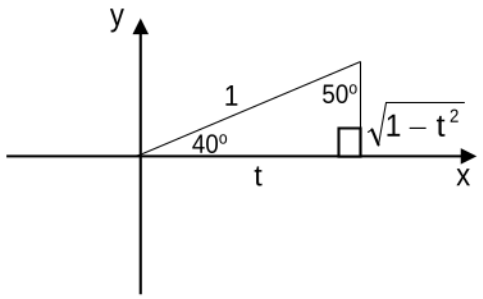
QUESTION 3			
3.1 3.1.1	$r = x - 2$	A✓	(1)
3.1.2	$-1 < x - 2 < 1$ $1 < x < 3$	A✓ CA✓ answer	(2)
3.2	$a + ar + ar^2 + ar^3 = 8400$ $ar^3 = 27a$ $r = 3$ $a + 3a + 9a + 27a = 8400$ $40a = 8400$ $a = 210$ R210; R630; R1890; R5670	A✓ forming equation A✓ $ar^3 = 27a$ CA✓ value of r CA✓ answer	(4)
			[7]

QUESTION 4			
4.1	$\frac{2}{x} = x-1$ $2 = x^2 - x$ $0 = x^2 - x - 2$ $0 = (x-2)(x+1)$ $x = 2 \text{ or } -1$ $y = 2-1 = 1$ $y = -1-1 = -2$ $(2;1);(-1;-2)$	A✓ equating CA✓ factors CA✓ x values CA✓ y values	(4)
4.2		A✓ shape of f A✓ slope of g CA✓ label points of intersection	(3)
4.3	$x < -1$ or $0 < x < 2$	CA✓ $x < -1$ CA✓ $0 < x$ CA✓ $x < 2$	(3)
4.4	Translation 3 units to the left and 4 units down.	A✓ 3 units left A✓ 4 units down	(2)
			[12]

QUESTION 5			
5.1	$k=\frac{1}{2}$	A✓	(1)
5.2	$m=\frac{-3}{2}$	A✓	(1)
5.3	$y=a(x-x_1)(x-x_2)$ $y=a\left(x+\frac{3}{2}\right)(x-2)$ $6=a\left(0+\frac{3}{2}\right)(0-2)$ $6=-3a$ $-2=a$ $y=-2\left(x+\frac{3}{2}\right)(x-2)$ $y=-2\left(x^2-\frac{1}{2}x-3\right)$ $y=-2x^2+x+6$ $y=-2\left(\frac{1}{4}\right)^2+\frac{1}{4}+6=\frac{49}{8}$ $n=\frac{49}{8}$	A✓sub x - intercepts A✓sub (0;6) CA✓ $a=-2$ A✓sub $x=\frac{1}{4}$ CA✓value for n	(5)
			[7]

QUESTION 6			
6.1	$\frac{27}{8} = a^3$ $\sqrt[3]{\frac{27}{8}} = a$ $\frac{3}{2} = a$	A✓sub $(3;3\frac{3}{8})$ CA✓cube root	(2)
6.2	$x \in R$	A✓	(1)
6.3		A✓shape A✓point A✓x-intercept	(3)
6.4	$x = \left(\frac{3}{2}\right)^y$ $g(x) = \log_{\frac{3}{2}} x$	A✓swapping x and y coordinates. A✓ answer	(2)
6.5	$x \in \left(0;3\frac{3}{8}\right)$	CA✓ answer	(1)
			[9]

QUESTION 7

7.1 7.1.1	$\tan 40^\circ = \frac{\sqrt{1-t^2}}{t}$  	A✓ diagram A✓ $\frac{\sqrt{1-t^2}}{t}$	(2)
7.1.2	$\cos^2 130^\circ$ $= (-\cos 50^\circ)^2$ $= \left(\frac{\sqrt{1-t^2}}{1}\right)^2$ $= 1 - t^2$	A✓ $-\cos 50^\circ$ CA✓ $\left(\frac{\sqrt{1-t^2}}{1}\right)^2$ CA✓ $1 - t^2$	(3)
7.1.3	$\cos 220^\circ$ $= \cos(180^\circ + 40^\circ)$ $= -\cos 40^\circ$ $= -t$	A✓ $\cos(180^\circ + 40^\circ)$ A✓ $-\cos 40^\circ$ CA✓ $-t$	(3)
7.2	$\sin 237^\circ . \cos 147^\circ - \frac{\cos 213^\circ . \cos 303^\circ}{\tan 237^\circ}$ $= (-\sin 57^\circ) . (-\cos 33^\circ) - \frac{(-\cos 33^\circ)(\cos 57^\circ)}{\tan 57^\circ}$ $= \sin 57^\circ . \sin 57^\circ + \frac{\sin 57^\circ . \cos 57^\circ}{\tan 57^\circ}$ $= \sin 57^\circ . \sin 57^\circ + \sin 57^\circ . \cos 57^\circ . \frac{\cos 57^\circ}{\sin 57^\circ}$ $= \sin^2 57^\circ + \cos^2 57^\circ$ $= 1$	A✓ $-\sin 57^\circ$ A✓ $-\cos 33^\circ$ A✓ $-\cos 33^\circ$ A✓ $\cos 57^\circ$ A✓ $\tan 57^\circ$ A✓ $\sin^2 57^\circ + \cos^2 57^\circ$ A✓ answer	(7)
			[15]

QUESTION 8

8.1	$\tan x = \dfrac{1 - \cos 2x - \sin x}{\sin 2x - \cos x}$ RHS = $\dfrac{1 - \cos 2x - \sin x}{\sin 2x - \cos x}$ = $\dfrac{1 - (1 - 2\sin^2 x) - \sin x}{2\sin x \cos x - \cos x}$ = $\dfrac{2\sin^2 x - \sin x}{\cos x\,(2\sin x - 1)}$ = $\dfrac{\sin x\,(2\sin x - 1)}{\cos x\,(2\sin x - 1)}$ = tan x = LHS	A✓ $1 - 2\sin^2 x$ A✓ $2\sin x \cos x$ A✓ simplification A✓ $(2\sin x - 1)\cos x$ A✓ denominator and numerator	(5)
8.2	Undefined if: $\sin 2x - \cos x = 0$ $2\sin x \cos x - \cos x = 0$ $\cos x\,(2\sin x - 1) = 0$ $\therefore \cos x = 0$ or $\sin x = \frac{1}{2}$ $\therefore x = 90^o + k \cdot 360^o$ or $x = 30^o + k \cdot 360^o; k \in Z$ **OR** $x = 270^o + k.360^o$ or $x = 30^o + k.360^o; k \in Z$ **OR** $x = 270^o + k.360^o$ or $x = 150^o + k.360^o; k \in Z$ $\therefore$ not defined if $x = 0^o; 30^o; 90^o; 150^o; 180^o; 270^o$	A✓ = 0 A✓ $2\sin x \cos x$ A✓ $\cos x = 0$ A✓ $\sin x = \frac{1}{2}$ A✓A✓A✓ (1 mark for any 2 correct values)	(7)
			[12]

QUESTION 9

9.1	a = 2 b = –45°	A✓ a = 2 A✓ b = –45°	(2)
9.2	Period : 360°	A✓ 360°	(1)
9.3	C (–135° ; –1)	A✓ –135° ✓ –1	(2)
9.4	D (0° ; 0,707) E (180° ; –0,707)	A✓ 0,707 A✓ –0,707	(2)
9.5	$0^\circ \leq x < 165^\circ \; ; \; x \neq 45^\circ$	A✓ correct notation A✓ correct end values ✓ $x \neq 45^\circ$	(3)
			[10]

QUESTION 10

10.1	In ΔRQS: Area $\Delta RQS = \frac{1}{2}$ SQ . RQ sin y $= \frac{1}{2}$ a RQ sin y $\therefore$ RQ $= \frac{2A}{a \sin y}$ In ΔPQR: $\tan x = \frac{PQ}{QR}$ $\therefore$ PQ = QR tan x $= \frac{2A \,.\, \tan x}{a \sin y}$	A✓ area rule A✓ substitution A✓ RQ A✓ $\frac{PQ}{QR}$ A✓ QR tan x	(5)
10.2	$PQ = \frac{2A \,.\, \tan x}{a \sin y}$ $2A = \frac{PQ \; a \sin y}{\tan x}$ $A = \frac{PQ \; a \,.\, \sin y}{2 \tan x}$ $= \frac{77m \,.\, 89m \sin 115^\circ}{2 \tan 46{,}5^\circ}$ $= \frac{77m \,.\, 89m \;\; (0{,}906)}{2 \; (1{,}054)}$ $= 2945{,}36 \; m^2$	A✓ making A subject of formula A✓ substitute values A✓ 0,906 A✓ 1,054 CA✓ answer	(5)
			[10]