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MOPANI EAST DISTRICT

GRADE 11

MATHEMATICS
CONTROLLED TEST 1
MEMORANDUM
15 MARCH 2023

MARKS: **100**

TIME: **2 HOUR**

This question paper consists of 5 pages (including this cover page).

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QUESTION 1

S/n	Solution	Mark allocation	Total
1.1.1	$x^2-5x-6=0$	✓$(x-6)(x+1)=0$ ✓$(x=6\ or\ x=-1)$	2
1.1.2	$(3x-1)(x-4)=16$ $3x^2-5x+4-16=0$ $3x^2-5x-12=0$ *Use of Quadratic Formula* $x=3\ or\ x=-\frac{4}{3}\ or\ 1.33$	✓standard form ✓correct substitution in a quadratic formula ✓x = 3 and ✓$x=-\frac{4}{3}\ or\ 1.33$	4 ✓
1.1.3	$\sqrt{x-1}+3=x-4$ $\sqrt{x-1}=x-4-3$ $x-1=(x-7)^2$ $x-1=x^2-14x+49$ $x^2-15x+50=0$ $(x-5)(x-10)=0$ $x\neq 5$ or $x=10$	✓isolate/*isoleer* √ sign/*teken* ✓squaring/*kwadr* both sides ✓ std vorm/*stand vorm* ✓factors/*fakt* ✓$x\neq 5$ ✓$x=10$ (6)	6
1.1.4	$2x^2-2\geq 3x$ $2x^2-3x-2\geq 0$ $(2x+1)(x-2)\geq 0$  $x\leq -\frac{1}{2}$ or/*of* $x\geq 2$	✓std form/*stand. vorm* ✓factors or using formula/ *faktore of gebruik formule* ✓✓$x\leq -\frac{1}{2}$ or/*of* $x\geq 2$ (4)	4

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1.2.1	$5x^2 + 6x = 7$ $x^2 + \frac{6}{5x} = \frac{7}{5}$ $x^2 + \frac{6}{5x} + \left(\frac{1}{2} * \frac{6}{5}\right)^2 = \frac{7}{5} + \frac{9}{25}$ $\left(x + \frac{3}{5}\right)^2 = \frac{\sqrt{44}}{5}$ $x = -\frac{3}{5} \pm \frac{\sqrt{44}}{5}$ $x = 0{,}73 \text{ or } x = -1.93$	✓ *simplyfy to* $\left(x + \frac{3}{5}\right)^2$ ✓ Simplify to $\frac{\sqrt{44}}{5}$ ✓ $x = -\frac{3}{5} \pm \frac{\sqrt{44}}{5}$ ✓ $x = 0{,}73$ ✓ $x = -1.93$	5
1.2.2	$\Delta = b^2 - 4ac$ $= (6)^2 - 4(5)(-d)$ $36 + 20d = 0$ $d = -\frac{9}{5}$	✓ substitution ✓ $36 + 20d = 0$ ✓ answer/*antwoord* (3)	3

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2.1.1	$\frac{2^{n+2}.4^{n+1}}{8^{n-1}}$ $=\frac{2^{n+2}.2^{2n+2}}{2^{3n-3}}$ $=2^{n+2+2n+2-(3n-3)}$ $=2^{7}$ $=128$ **OR/*OF*** $\frac{2^{n}.2^{2}.4^{n}.4}{8^{n}.8^{-1}}$ $=\frac{8^{n}.2^{2}.2^{2}}{8^{n}.2^{-3}}$ $=2^{7}$ $=128$	✓writing as prime bases/ *skryf as priembasisse* ✓applying exponential laws/ *pas ekspon.wette toe* ✓answer/*antwoord* (3)	3
2.1.2	$\frac{\sqrt{p^2-q^2}\times(p+q)^{\frac{5}{2}}}{(p-q)^{\frac{1}{2}}}$ $=\frac{\sqrt{(p-q)(p+q)}\times(p+q)^{\frac{5}{2}}}{(p-q)^{\frac{1}{2}}}$ $=\frac{(p-q)^{\frac{1}{2}}(p+q)^{\frac{1}{2}}\times(p+q)^{\frac{5}{2}}}{(p-q)^{\frac{1}{2}}}$ $=(p+q)^{\frac{1}{2}+\frac{5}{2}}$ $=(p+q)^{3}$	✓difference of 2 squares *verskil van 2 kwadrate* ✓exponent law/*eksponentwet* ✓answer/*antw.* (3)	3

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2.1.3	$\sqrt{x+\sqrt{2x-1}}.\sqrt{x-\sqrt{2x-1}}$ $=\sqrt{\left(x+\sqrt{2x-1}\right)\left(x-\sqrt{2x-1}\right)}$ $=\sqrt{x^2-2x+1}$ $=\sqrt{(x-1)^2}$ $=x-1$	✓writing as one surd/ *skryf as een wortel* ✓ $\sqrt{x^2-2x+1}$ ✓ $\sqrt{(x-1)^2}$ ✓answer/*antwoord* (4)	4
2.1.4	$\frac{5^a.5^{-2}.2^a\,2^2}{10^a-10^a.10^{-1}.2}$ $=\frac{(5.2)^a.5^{-2}.2^2}{10^a\left[1-\frac{2}{10}\right]}$ $=\frac{10^a.\frac{4}{25}}{10^a.\frac{8}{10}}$ $=\frac{4}{25}\times\frac{10}{8}$ $=\frac{1}{5}$	✓writing as separate bases/ *skryf as priembasisse* ✓multiplication of bases with same exponents/*vermenigv. van basisse met dies. eksp.* ✓common/*gemene* factor ✓simplification/*vereenv.* ✓answer/*antw.*	5
s/N	Question 3		

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3.1.1	$x^{\frac{-3}{4}} = 8$ $x = (2^3)^{\frac{4}{-3}}$ $x = 2^{-4}$ $x = \frac{1}{16}$ **OR/*OF*** $x^{\frac{3}{4}} = 8$ $\sqrt[4]{x^{-3}} = 2^3$ $x^{-3} = 2^{12}$ (4096) $x^{-1} = 2^4$ (16) $x = 2^{-4}$ $x = \frac{1}{16}$	✓change to prime base/ *verander na priembasis* ✓rational exponent/ *rasionele eksp* ✓ answer in any form/ *antw. in enige vorm* (3) ✓use of surds/*gebr van wortls* ✓ $x^{-1} = 2^4$ ✓answer in any form/*antw. in enige vorm*	3
3.1.2	$3 - 12k^2 = 0$ $1 - 4k^2 = 0$ $k^2 = \frac{1}{4}$ $k = \pm\frac{1}{2}$	✓ $3 - 12k^2 = 0$ ✓ $k^2 = \frac{1}{4}$ ✓ $k = \pm\frac{1}{2}$ (3)	3

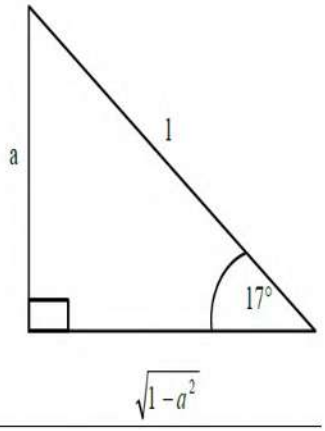
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3.1.3	$2^{3x+1}+2^{3x}=12$ $2^{3x}\left[2^1+1\right]=12$ $2^{3x}.3=12$ $2^{3x}=4$ $2^{3x}=2^2$ $3x=2$ $\therefore x=\frac{2}{3}$	✓common/*gemene* factor ✓ simplificaton/*vereenv.* ✓ equating/*gelykst* exponents ✓answer/*antw.* (4)	4
3.1.4	$3x+2=y \text{ and } y=-x^2+2x+8$ $3x+2=-x^2+2x+8$ $x^2+x-6=0$ $(x-2)(x+3)=0$ $X=2 \text{ or } X=-3$ $Y=3(-3)+2 \text{ or } Y=3(2)+2$ $Y=-7 \text{ or } Y=8$	✓ $y=3x+2$ ✓substitution/*verv* ✓std form/*stand vorm* ✓factors/*fakt* ✓x-values/*wrdes* ✓ y-values/*wrdes*	6
S/N	Question 4		
4.1.1	$\sin(90^\circ-x).\cos(180^\circ+x)+\tan x.\cos x.\sin(x-180^\circ)$ $=\cos x.(-\cos x)+\frac{\sin x}{\cos x}.\cos x.(-\sin x)$ $=-\cos^2 x-\sin^2 x$ $=-(\cos^2 x+\sin^2 x)$ $=-1$	✓ $\cos x$ ✓ $-\sin x$ ✓ $-\cos x$ ✓ $\frac{\sin x}{\cos x}$ ✓common factor/*gemene fakt.* ✓ identity/*identiteit*	6

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4.1.2	$LHS = \frac{\sin 120°.\cos 210°.\tan 315°.\cos 27°}{\cos 540°.\sin 63°}$ $= \frac{\sin 60°.(-\cos 30°)(-\tan 45)°.\sin 63°}{\cos 180°.\sin 63°}$ $= \frac{\frac{\sqrt{3}}{2}.\frac{-\sqrt{3}}{2}(-1)}{-1}$ $= -\frac{3}{4}$	✓ $\sin 60° / \cos 30°$ ✓ $-\cos 30°$ ✓ $-\tan 45°$ ✓ $\sin 63° / \cos 27°$ ✓ $\cos 180°$ ✓ special angle ratios/ *spesiale hoeke verhoudings* ✓ answer/ *antwoord*	7
4.2.1	$\frac{(\sin x - \cos x)^2 - 1}{sin^2 x - 1}$ $= \frac{sin^2 x - 2sinxcosx + cos^2 x - 1}{sin^2 x - 1}$ ✓ $= \frac{-2sinxcosx + sin2x + cos2x - 1}{sin^2 x - 1}$ ✓ $= \frac{-2sinxcosx + 1 - 1}{-(1 - sin^2 x)}$ ✓✓ $= \frac{-2sinxcosx}{-cos^2 x}$ ✓ $= \frac{-2sinx}{-cosx}$ ✓ $= 2\ tanx$		6
4.2.2	$When\ sin^2 x - 1 = 0$ $sin^2 x = 1$ $\sin x = 1\ or \sin x = -1$ $x = 270\ or\ x = 90$		4
S/N	Question 5		
5.1.1	$x^2 + y^2 = r^2$ $(-8)^2 + (t)^2 = 17^2$ $t^2 = 225$ $t = -15$	✓ subst in pyth ✓ answer/*antw*	2

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5.1.2 (a)	$\cos(-\theta)$ $=\cos\theta$ $=\frac{-8}{17}$	✓ $\cos\theta$ ✓ answer/*antw* (2)	2
5.1.2 (b)	$1-\sin\theta=1-\frac{-15}{17}$ $=\frac{17}{17}+\frac{15}{17}$ $=\frac{32}{17}$	✓ subst ✓ answer/*antw*	2
	Question 6		
6.1.1	$\tan 17^\circ=\frac{a}{\sqrt{1-a^2}}$ 	✓ sketch ✓ $\sqrt{1-a^2}$ ✓ answer/*antw* (3)	3

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6.1.2	$\sin 107°$ $= \sin(90° + 17°)$ $= \cos 17°$ $= \sqrt{1-a^2}$ **OR/*OF*** $\sin 107°$ $= \sin(180° - 73°)$ $= \sin 73°$ $= \sqrt{1-a^2}$	✓ $\cos 17°$ ✓ $\sqrt{1-a^2}$ ✓ $\sin 73°$ ✓ $\sqrt{1-a^2}$	2
6.1.3	$\cos^2 253° + \sin^2 557°$ $= (-\cos 73)^2 + (-\sin 17°)^2$ $= (-a\ )^2 + (-a\ )^2$ $= 2a^2$	✓ $\cos^2 73°$ ✓ $\sin^2 17°$ ✓ subst of ratios ✓ answer/*antw* (4)	4

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6.2.1	$\sin(x-30^\circ)=\cos 2x$ $\sin(x-30^\circ)=\sin(90^\circ-2x)$ $x-30^\circ=90^\circ-2x+360^\circ k$ $3x=120^\circ+360^\circ k$ $x=40^\circ+120^\circ k$ *or* $x-30^\circ=180^\circ-(90^\circ-2x)+360k$ $-x=120^\circ+360^\circ k$ $x=-120^\circ+360^\circ k, k\in Z$ **OR/*OF*** $\cos(90^\circ-(x-30^\circ))=\cos 2x$ $\cos(120^\circ-x)=\cos 2x$ $120^\circ-x=2x+360^\circ k$ *or* $-3x=-120^\circ+360^\circ k$ $x=40^\circ+120^\circ k,\ k\in Z$	✓ $\sin(90^\circ-2x)$ ✓ $x-30^\circ=90^\circ-2x+360^\circ k$ ✓ $x=40^\circ+120^\circ k$ ✓ $x-30^\circ=180^\circ-(90^\circ-2x)+360k$ ✓ $x=-120^\circ+360^\circ k$ (5) ✓ $\cos(90^\circ-(x-30^\circ))$ ✓ $120^\circ-x=2x+360^\circ k$ ✓ $x=40^\circ+120^\circ k$ ✓ $120^\circ-x=-2x+360^\circ k$ ✓ $x=240^\circ+360^\circ k$ (5)	5
		TOTAL	100

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