KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 11

MATHEMATICS

COMMON TEST

MARCH 2023

MARKING GUIDELINE

MARKS: 75

This marking guideline consists of 7 pages.

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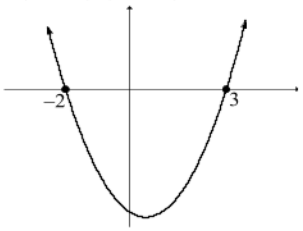
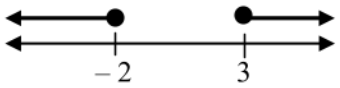
Marking Guideline

QUESTION 1

1.1.1	$x^2-2x=8$ $x^2-2x-8=0$ $(x+2)(x-4)=0$ $x=-2$ or $x=4$	✓ standard form ✓ factors ✓ both answers (3)
1.1.2	$4x^2-x-2=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-(-1)\pm\sqrt{(-1)^2-4(4)(-2)}}{2(4)}$ $=0,84$ or $x=-0,59$	✓ substitution ✓ answer; ✓ answer (3)
1.1.3	$x(x-1)\geq 6$ $x^2-x-6\geq 0$ $(x-3)(x+2)\geq 0$  OR  $x\leq -2$ or $x\geq 3$	✓ standard form ✓ critical values ✓ ✓ answer (4)
1.1.4	$2x+\sqrt{x+1}=1$ $\sqrt{x+1}=1-2x$ $\left(\sqrt{x+1}\right)^2=(1-2x)^2$ $x+1=1-4x+4x^2$ $4x^2-5x=0$ $x(4x-5)=0$ $x=0$ or $x\neq\frac{5}{4}$	✓ isolating surd ✓ squaring both sides ✓ standard form ✓ both answers ✓ rejecting $x=\frac{5}{4}$ (5)

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1.2	$x-y-3=0$ $x=y+3$ ..... line 1 $x^2-3y^2=13$ ..... line 2 Substitute line 1 into line 2: $(y+3)^2-3y^2=13$ $y^2+6y+9-3y^2=13$ $-2y^2+6y-4=0$ $y^2-3y+2=0$ $(y-2)(y-1)=0$ $y=1$ or $y=2$ $x=4$ or $x=5$	✓ making x the subject of the formula ✓ substitution ✓ standard form ✓ factors ✓ y-values ✓ x-values (6)
1.3.1	$\Delta=b^2-4ac$ $=7^2-4(3)\left(\frac{11h}{12}\right)$ $=49-11h$ For real roots: $49-11h\geq 0$ $-11h\geq -49$ $h\leq\frac{49}{11}$ OR $h\leq 4,45$	✓ $\Delta=49-11h$ ✓ $49-11h\geq 0$ ✓ answer (3)
1.3.2	Consider $49-11h$: If $h=4$, $49-11(4)=5$. Roots are irrational. If $h=3$, $49-11(3)=16$. Roots are rational. Largest integral value of h for rational roots = 3. Answer only: full marks	✓ $49-11h=49-11(3)=16$ ✓ answer (2)
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QUESTION 2

2.1.1	$\left(\frac{1}{16}\right)^{-\frac{3}{4}} = 16^{\frac{3}{4}}$ $= (2^4)^{\frac{3}{4}}$ $= 2^3$ $= 8$ **OR** $\left(\frac{1}{16}\right)^{-\frac{3}{4}} = \left[\left(\frac{1}{2}\right)^4\right]^{-\frac{3}{4}}$ $= \left(\frac{1}{2}\right)^{-3}$ $= 2^3$ $= 8$	✓ $16^{\frac{3}{4}}$ ✓ $(2^4)^{\frac{3}{4}}$ ✓ answer (3) **OR** ✓ $\left[\left(\frac{1}{2}\right)^4\right]^{-\frac{3}{4}}$ ✓ $\left(\frac{1}{2}\right)^{-3}$ ✓ answer (3)
2.1.2	$\frac{54^n.6^{-2n+1}}{12^{n-1}.8^{-n}}$ $= \frac{\left(2.3^3\right)^n.(2.3)^{-2n+1}}{\left(3.2^2\right)^{n-1}.\left(2^3\right)^{-n}}$ $= \frac{2^n.3^{3n}.2^{-2n+1}.3^{-2n+1}}{3^{n-1}.2^{2n-2}.2^{-3n}}$ $= 2^{n-2n+1-2n+2+3n}.3^{3n-2n+1-n+1}$ $= 2^3.3^2$ $= 72$	✓ writing bases i.t.o. prime factors ✓ law: raising a power to a power ✓ adding and subtracting indices ✓ $2^3.3^2$ ✓ answer (5)
2.1.3	$\sqrt{b\sqrt{a}-b}.\sqrt{b\sqrt{a}+b}$ $= \sqrt{\left(b\sqrt{a}-b\right).\left(b\sqrt{a}+b\right)}$ $= \sqrt{b^2a-b^2}$ $= \sqrt{b^2(a-1)}$ $= b\sqrt{(a-1)}$	✓ writing as a single surd ✓ difference of two squares ✓ take out common factor ✓ answer (4)
2.2.1	$7^x = \frac{1}{343}$ $7^x = \frac{1}{7^3}$ $7^x = 7^{-3}$ $x = -3$	✓ $343 = 7^3$ ✓ answer (2)

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2.2.2	$3^{2x+1}+26.3^{x}-9=0$ $3.3^{2x}+26.3^{x}-9=0$ $(3.3^{x}-1)(3^{x}+9)=0$ $3^{x}=\frac{1}{3}$ or $3^{x}\neq -9$ $x=-1$ **OR** $3^{2x+1}+26.3^{x}-9=0$ Let $k=3^{x}$: $3k^{2}+26k-9=0$ $(3k-1)(k+9)=0$ $k=\frac{1}{3}$ or $k\neq -9$ $3^{x}=\frac{1}{3}$ or $3^{x}\neq -9$ $x=-1$	✓✓ one mark for each correct factor ✓ $3^{x}\neq -9$ ✓ $x=-1$ (4) **OR** ✓✓ one mark for each correct factor ✓ $3^{x}\neq -9$ ✓ $x=-1$ (4)
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QUESTION 3

3.1.1	$x^2+y^2=r^2$ [Pythagoras] $x^2+(-9)^2=15^2$ $x^2=144$ $x=-12$	✓ substitution in Pythagoras ✓ answer (2)
3.1.2	$\tan\theta=\frac{-9}{-12}=\frac{9}{12}=\frac{3}{4}=0,75$	✓ answer $(\frac{9}{12}$ or $\frac{3}{4}$ or $0,75)$ (1)
3.1.3	Using point S: $\tan\theta=\frac{c}{-2}$ Therefore: $\frac{c}{-2}=\frac{3}{4}$ **OR** $\frac{c}{-2}=\frac{9}{12}$ $4c=-6$ **OR** $12c=-18$ $c=-\frac{3}{2}=-1,5$	✓ $\tan\theta=\frac{c}{-2}$ ✓ $\frac{c}{-2}=\frac{3}{4}$ **OR** $\frac{c}{-2}=\frac{9}{12}$ ✓ answer (3)
3.2.1	$\frac{\sin(180^\circ-x)}{\cos(90^\circ+x)+\sin(360^\circ-x)}$ $=\frac{\sin x}{-\sin x-\sin x}$ $=\frac{\sin x}{-2\sin x}$ $=-\frac{1}{2}$	✓ $\sin(180^\circ-x)=\sin x$ ✓ $\cos(90^\circ+x)=-\sin x$ ✓ $\sin(360^\circ-x)=-\sin x$ ✓ answer (4)
3.2.2	$\frac{\cos 295^\circ.\cos 752^\circ}{\sin 238^\circ.\cos 65^\circ}$ $=\frac{\cos 65^\circ.\cos 32^\circ}{-\sin 58^\circ.\cos 65^\circ}$ $=\frac{\cos 32^\circ}{\sin 238^\circ}$ $=\frac{\cos 32^\circ}{-\sin 58^\circ}$ $=\frac{\cos 32^\circ}{-\cos 32^\circ}$ **OR** $\frac{\sin 58^\circ}{-\sin 58^\circ}$ $=-1$	✓ $\cos 295^\circ=\cos 65^\circ$ ✓ $\cos 752^\circ=\cos 32^\circ$ ✓ $\sin 238^\circ=-\sin 58^\circ$ ✓ $-\sin 58^\circ=-\cos 32^\circ$ **OR** $\cos 32^\circ=\sin 58^\circ$ ✓ answer (5)
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QUESTION 4

4.1	$\frac{\sin^2(180^\circ+\theta)+\cos(-\theta).\sin(90^\circ-\theta)}{\sin\theta}+\frac{1}{\tan\theta}$ $=\frac{(-\sin\theta)^2+\cos\theta.\cos\theta}{\sin\theta}+\frac{1}{\tan\theta}$ $=\frac{(-\sin\theta)^2+\cos\theta.\cos\theta}{\sin\theta}+\left(1\div\frac{\sin\theta}{\cos\theta}\right)$ $=\frac{\sin^2\theta+\cos^2\theta}{\sin\theta}+\frac{\cos\theta}{\sin\theta}$ $=\frac{1}{\sin\theta}+\frac{\cos\theta}{\sin\theta}$ $=\frac{1+\cos\theta}{\sin\theta}$	✓ $\cos(-\theta)=\cos\theta$ ✓ $\sin(90^\circ-\theta)=\cos\theta$ ✓ $\sin^2(180^\circ+\theta)=(-\sin\theta)^2$ ✓ $\frac{\cos\theta}{\sin\theta}$ ✓ $\sin^2\theta+\cos^2\theta=1$ (5)
4.2	$\sin x=-0,4$ Ref $\angle$: $23,58^\circ$ $x=180^\circ+23,58^\circ$ or $x=360^\circ-23,58^\circ$ $x=203,58^\circ$ $x=336,42^\circ$	✓ Ref $\angle$: $23,58^\circ$ ✓ $x=203,58^\circ$ ✓ $x=336,42^\circ$ (3)
4.3.1	$\sqrt{3}\cos^2\alpha-\sin\alpha\cos\alpha=0$ $\cos\alpha(\sqrt{3}\cos\alpha-\sin\alpha)=0$ $\cos\alpha=0$ or $\sqrt{3}\cos\alpha-\sin\alpha=0$ $\alpha=90^\circ+k.180^\circ,\ k\in Z$ $\sin\alpha=\sqrt{3}\cos\alpha$ $\frac{\sin\alpha}{\cos\alpha}=\sqrt{3};\ \cos\alpha\neq 0$ $\tan\alpha=\sqrt{3}$ $\alpha=60^\circ+k.180^\circ, k\in Z$	✓ factorisation ✓ both equations ✓ $\alpha=90^\circ+k.180^\circ$ ✓ $\tan\alpha=\sqrt{3}$ ✓ $\alpha=60^\circ+k.180^\circ$ ✓ $k\in Z$ (6)
4.3.2	$\alpha=-90^\circ$ or 90° $\alpha=-120^\circ$ or 60°	✓ $\alpha=-90^\circ$ or 90° ✓ $\alpha=-120^\circ$ or 60° (2)
		[16]

TOTAL: 75