KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 11

MATHEMATICS

COMMON TEST

MARCH 2024

MARKING GUIDELINES

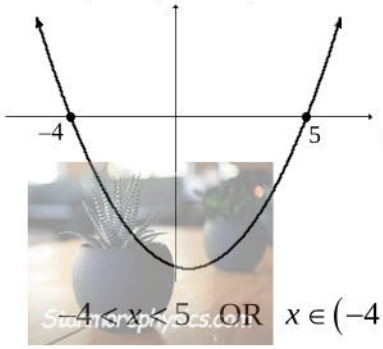
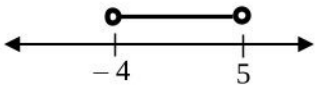
MARKS: 75

These marking guidelines consist of 8 pages.

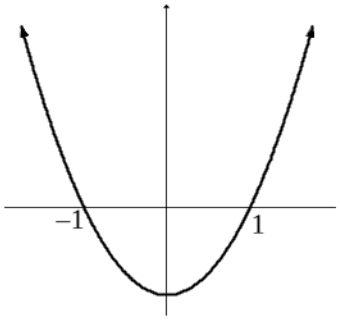
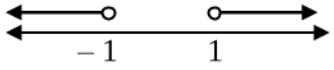
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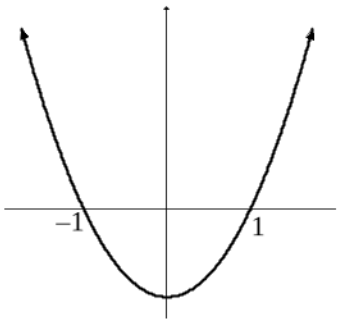
GRADE 11
Marking Guideline

QUESTION 1

1.1.1	$2x^2+5x=0$ $x(2x+5)=0$ $x=0$ or $x=-\frac{5}{2}$	✓ factors ✓ answer ✓ answer (3)
1.1.2	$-4x^2+3x+6=0$ OR $4x^2-3x-6=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-3\pm\sqrt{3^2-4(-4)(6)}}{2(-4)}$ $=\frac{3\pm\sqrt{(-3)^2-4(4)(-6)}}{2(4)}$ $=-0,91$ or $x=1,66$	✓ substitution ✓ answer ✓ answer (3)
1.1.3	$3\sqrt{x-2}=x$ $\left(3\sqrt{x-2}\right)^2=x^2$ $9(x-2)=x^2$ $x^2-9x+18=0$ $(x-6)(x-3)=0$ $x=3$ or $x=6$	✓ squaring both sides ✓ standard form ✓ factors ✓ both answers (4)
1.2.1	$x^2-x-20<0$ $(x+4)(x-5)<0$  OR  $-4<x<5$ OR $x\in(-4\,;5)$	✓ factors ✓ ✓ answer (3)
1.2.2	Sum of integers $=(-3)+(-2)+(-1)+0+1+2+3+4$ $=4$	✓ adding integers between –4 and 5 ✓ answer (2)

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1.3	$4x+y=7$ $y=7-4x$ …….… line 1 $3x^2+2xy=y^2$ ……. line 2 Substitute line 1 into line 2: $3x^2+2x(7-4x)=(7-4x)^2$ $3x^2+14x-8x^2=49-56x+16x^2$ $-21x^2+70x-49=0$ $3x^2-10x+7=0$ $(3x-7)(x-1)=0$ $x=\frac{7}{3}$ or $x=1$ $y=-\frac{7}{3}$ or $y=3$	✓ making y the subject of the formula ✓ substitution ✓ standard form ✓ factors ✓ x-values ✓ y-values (6)
1.4	For equal roots: $13-2k=0$ $2k=13$ $k=\frac{13}{2}$ or $6\frac{1}{2}$	✓ $13-2k=0$ ✓ answer (2)
1.5	$(x+5)^2=1-p^2$ $x+5=\pm\sqrt{1-p^2}$ $x=-5\pm\sqrt{1-p^2}$ For non-real roots: $1-p^2<0$ $\therefore p^2-1>0$  OR  $p<-1$ or $p>1$ OR $p\in(-\infty;-1)$ or $(1;\infty)$ **OR**	✓ square root taken on both sides ✓ x subject of formula ✓ $1-p^2<0$ ✓ ✓ answer (5) **OR**

	$(x+5)^2 = 1-p^2$ $x^2+10x+25 = 1-p^2$ $x^2+10x+24+p^2 = 0$ $b^2-4ac = 10^2-4(1)(24+p^2)$ $= 100-96-4p^2$ $= 4-4p^2$ For non-real roots: $4-4p^2 < 0$ $p^2-1 > 0$ $(p-1)(p+1) > 0$  OR  $p < -1$ or $p > 1$ OR $p \in (-\infty\,;-1)$ or $(1\,;\infty)$	✓ $b^2-4ac = 4-4p^2$ ✓ $4-4p^2 < 0$ ✓ factorisation ✓ ✓ answer (5)
		[28]

QUESTION 2

2.1.1	$64^{-\frac{2}{3}}$ $= \left(2^6\right)^{-\frac{2}{3}}$ $= 2^{-4}$ $= \frac{1}{16}$ **OR** $64^{-\frac{2}{3}}$ $= \left(4^3\right)^{-\frac{2}{3}}$ $= 4^{-2}$ $= \frac{1}{16}$ **OR**	✓ $\left(2^6\right)^{-\frac{2}{3}}$ ✓ 2^{-4} ✓ answer (3) **OR** ✓ $\left(4^3\right)^{-\frac{2}{3}}$ ✓ 4^{-2} ✓ answer (3) **OR**

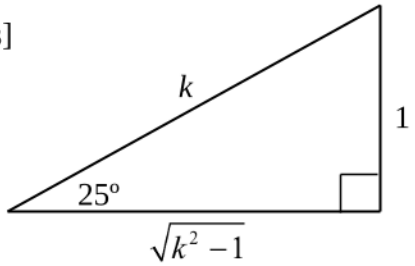
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	$64^{-\frac{2}{3}}$ $=\frac{1}{64^{\frac{2}{3}}}$ $=\frac{1}{\sqrt[3]{64^2}}$ $=\frac{1}{4^2}$ $=\frac{1}{16}$ Answer only: 0 marks	✓ $\frac{1}{64^{\frac{2}{3}}}$ ✓ $\frac{1}{\sqrt[3]{64^2}}$ ✓ answer (3)
2.1.2	$\frac{3^{2n+2}-9^{n-1}}{2.3^{2n+1}}$ $=\frac{3^{2n+2}-\left(3^2\right)^{n-1}}{2.3.3^{2n}}$ $=\frac{3^{2n+2}-3^{2n-2}}{6.3^{2n}}$ $=\frac{3^{2n}\left(3^2-3^{-2}\right)}{6.3^{2n}}$ $=\frac{3^{2n}\left(9-\frac{1}{9}\right)}{6.3^{2n}}$ $=\frac{80}{9}\times\frac{1}{6}$ $=\frac{40}{27}$	✓ $9^{n-1}=3^{2n-2}$ ✓ $2.3^{2n+1}=6.3^{2n}$ ✓ factorising numerator ✓ simplification ✓ answer (5)
2.1.3	$\frac{\left(3-\sqrt{3}\right)^2}{\sqrt{3}.\sqrt{6}}$ $=\frac{9-6\sqrt{3}+3}{\sqrt{3}.\sqrt{6}}$ $=\frac{12-6\sqrt{3}}{\sqrt{3}.\sqrt{6}}$ $=\frac{6\left(2-\sqrt{3}\right)}{\sqrt{3}.\sqrt{6}}$ $=\frac{6\left(2-\sqrt{3}\right)}{\sqrt{3}.\sqrt{6}}\times\frac{\sqrt{6}}{\sqrt{6}}$ $=\frac{\sqrt{6}\left(2-\sqrt{3}\right)}{\sqrt{3}}$ $=\sqrt{2}\left(2-\sqrt{3}\right)$ OR $=2\sqrt{2}-\sqrt{6}$ Answer only: 0 marks	✓ multiplying out numerator ✓ factorising numerator ✓ $\frac{\sqrt{6}\left(2-\sqrt{3}\right)}{\sqrt{3}}$ ✓ answer (4)

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2.2.1	$\sqrt[x]{32}=128$ $32^{\frac{1}{x}}=128$ $\left(2^5\right)^{\frac{1}{x}}=2^7$ $2^{\frac{5}{x}}=2^7$ $\therefore \frac{5}{x}=7$ $x=\frac{5}{7}$	✓ $32^{\frac{1}{x}}$ ✓ $32=2^5$ and $128=2^7$ ✓ equating exponents ✓ answer (4)
2.2.2	$x^{\frac{1}{2}}-3x^{\frac{1}{4}}-10=0$ $\left(x^{\frac{1}{4}}+2\right)\left(x^{\frac{1}{4}}-5\right)=0$ $x^{\frac{1}{4}}\neq -2 \quad \text{or} \quad x^{\frac{1}{4}}=5$ $x=5^4$ $=625$ $x=-1$ **OR** $x^{\frac{1}{2}}-3x^{\frac{1}{4}}-10=0$ Let $k=x^{\frac{1}{4}}$: $k^2-3k-10=0$ $(k+2)(k-5)=0$ $k\neq -2 \quad \text{or} \quad k=5$ $\therefore x^{\frac{1}{4}}\neq -2 \quad \text{or} \quad x^{\frac{1}{4}}=5$ $x=5^4$ $=625$	✓✓ one mark for each correct factor ✓ $x^{\frac{1}{4}}\neq -2$ ✓ answer (4) **OR** ✓✓ one mark for each correct factor ✓ $x^{\frac{1}{4}}\neq -2$ ✓ answer (4)
		[20]

QUESTION 3

3.1.1	$OP^2 = (-6)^2 + 8^2$ $= 100$ $\therefore OP = 10$	✓ substitution in $r^2 = x^2 + y^2$ ✓ answer (2)
3.1.2	$\sin\theta + \cos\theta$ $= \frac{8}{10} + \frac{(-6)}{10}$ $= \frac{2}{10} = \frac{1}{5}$	✓ $\frac{8}{10}$ ✓ $\frac{-6}{10}$ ✓ answer (3)
3.2	$x^2 = r^2 - y^2$ [Pythagoras] $= k^2 - 1$ $x = \sqrt{k^2 - 1}$ $\tan 25^\circ = \frac{1}{\sqrt{k^2 - 1}}$ 	✓ substitution in Pythagoras or sketch ✓ $\sqrt{k^2 - 1}$ ✓ answer (3)
3.3	$\frac{\sin 698^\circ . \cos 300^\circ}{\tan 135^\circ . \cos(-248^\circ)}$ $= \frac{-\sin 22^\circ . \cos 60^\circ}{-\tan 45^\circ . -\cos 68^\circ}$ $= \frac{-\sin 22^\circ . \frac{1}{2}}{-1 . -\sin 22^\circ}$ OR $= \frac{-\cos 68^\circ . \frac{1}{2}}{-1 . -\cos 68^\circ}$ $= -\frac{1}{2}$	✓ $-\sin 22^\circ$ ✓ $\cos 60^\circ$ ✓ $-\tan 45^\circ$ ✓ $-\cos 68^\circ$ ✓ special angle values ✓ $\cos 68^\circ = \sin 22^\circ$ or vice versa ✓ answer (7)
		[15]

QUESTION 4

4.1	$\frac{\sin(180^\circ + x).\sin(90^\circ + x)}{\tan(-x)} + \sin x.\cos(90^\circ - x)$ $= \frac{-\sin x.\cos x}{-\tan x} + \sin x.\sin x$ $= \frac{\sin x.\cos x}{\frac{\sin x}{\cos x}} + \sin x.\sin x$ $= \frac{\sin x.\cos x}{1} \times \frac{\cos x}{\sin x} + \sin x.\sin x$ $= \cos^2 x + \sin^2 x$ $= 1$	✓ $\sin(180^\circ + x) = -\sin x$ ✓ $\sin(90^\circ + x) = \cos x$ ✓ $\tan(-x) = -\tan x$ ✓ $\cos(90^\circ - x) = \sin x$ ✓ $\tan x = \frac{\sin x}{\cos x}$ ✓ simplification ✓ answer (7)
4.2.1	$\frac{\sin\theta}{1+\cos\theta}$ $= \frac{\sin\theta}{1+\cos\theta} \times \frac{(1-\cos\theta)}{(1-\cos\theta)}$ $= \frac{\sin\theta(1-\cos\theta)}{(1+\cos\theta)(1-\cos\theta)}$ $= \frac{\sin\theta(1-\cos\theta)}{1-\cos^2\theta}$ $= \frac{\sin\theta(1-\cos\theta)}{\sin^2\theta}$ $= \frac{1-\cos\theta}{\sin\theta}$	✓ $\times \frac{(1-\cos\theta)}{(1-\cos\theta)}$ ✓ $1-\cos^2\theta$ in denominator ✓ $1-\cos^2\theta = \sin^2\theta$ (3)
4.2.2	Undefined when $1+\cos\theta = 0$ $\cos\theta = -1$ $\therefore \theta = 180^\circ$	✓ $\cos\theta = -1$ ✓ answer (2)
		[12]

TOTAL: 75

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