KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 11

MATHEMATICS

MARKING GUIDELINES

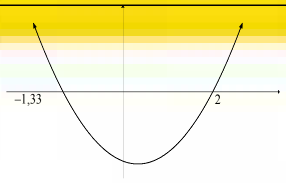
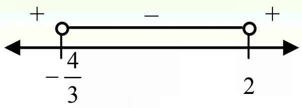
COMMON TEST

MARCH 2022

MARKS: 75

This memorandum consists of 6 pages.

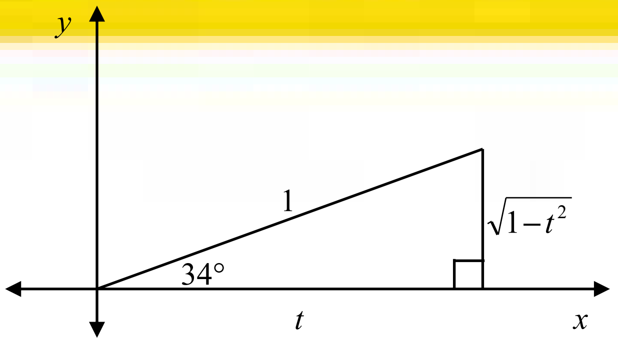
QUESTION 1

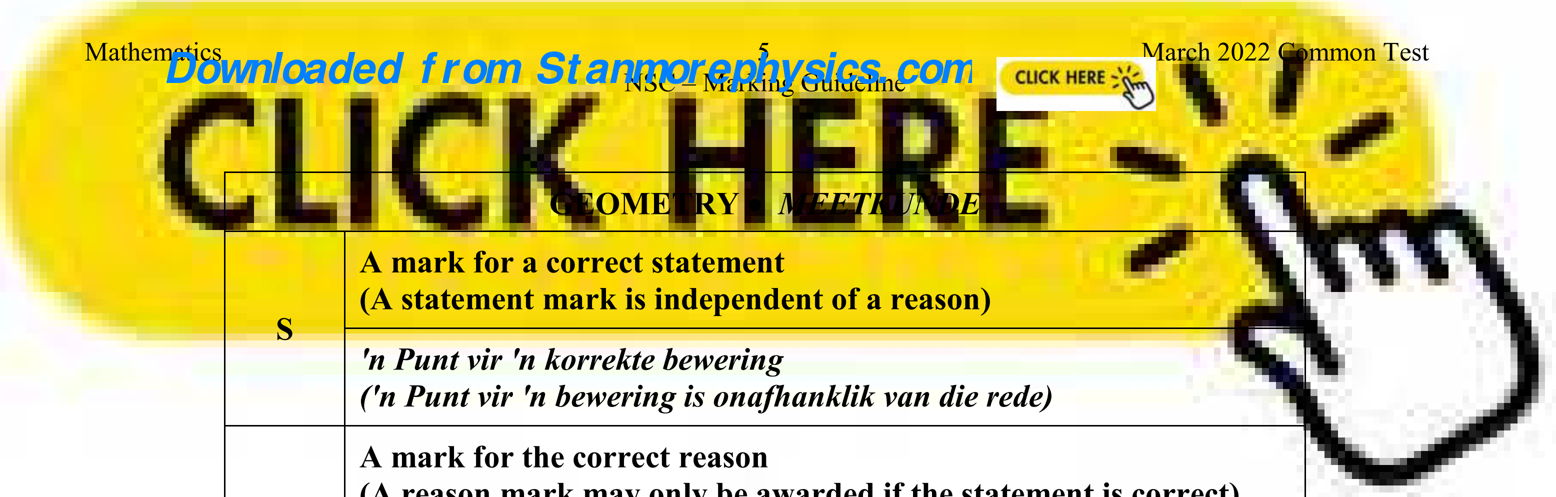
1.1.1	$x = 2$ or $x = -\frac{4}{3}$	✓✓ answer (2)
1.1.2	 **OR**  $-\frac{4}{3} < x < 2$	✓ ✓ answer (2)
1.1.3	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-11) \pm \sqrt{(-11)^2 - 4(5)(4)}}{2(5)}$ $= 1{,}74$ or $0{,}46$	✓ substitution ✓ ✓ answer (3)
1.1.4	$\frac{4}{x+3} + \frac{x}{x-1} = \frac{12x+20}{x^2+2x-3}$ $\frac{4}{x+3} + \frac{x}{x-1} = \frac{12x+20}{(x+3)(x-1)}$ $4(x-1) + x(x+3) = 12x + 20$ $4x - 4 + x^2 + 3x = 12x + 20$ $x^2 - 5x - 24 = 0$ $(x-8)(x+3) = 0$ $x = 8$ or $x \neq -3$	✓ factorisation ✓ multiply through by LCD ✓ standard form ✓ factors ✓ answers with selection (5)
1.2	$x = 2 - 3y$ Substitute in $y^2 + x = xy + y$: $y^2 + 2 - 3y = y(2-3y) + y$ $y^2 + 2 - 3y = 2y - 3y^2 + y$ $4y^2 - 6y + 2 = 0$ $2y^2 - 3y + 1 = 0$ $(2y-1)(y-1) = 0$ $y = \frac{1}{2}$ or $y = 1$ $x = \frac{1}{2}$ or $x = -1$	✓ making x the subject of the formula ✓ substitution ✓ standard form ✓ factors ✓ values of y ✓values of x (6)
1.3	For non-real roots, $\mathrm{D} = b^2 - 4ac < 0$ $6^2 - 4(1)(-2k) < 0$ $8k < -36$ $k < -\frac{9}{2}$	✓ condition for non-real roots ✓ substitution ✓ answer (3)
		[21]

QUESTION 2

2.1.1	$16^x = 1$ $16^x = 16^0$ $x = 0$	✓ answer (1)
2.1.2	$\sqrt{2x+7} = 4 - x$ $2x + 7 = (4-x)^2$ $2x + 7 = 16 - 8x + x^2$ $x^2 - 10x + 9 = 0$ $(x-1)(x-9) = 0$ $x = 1 \text{ or } x \neq 9$	✓ squaring both sides ✓ standard form ✓ factorisation ✓ answer with selection (4)
2.1.2	$\left(\dfrac{1}{\sqrt[3]{p^2}}\right)^{-3}$ $= \left(\dfrac{1}{p^{\frac{2}{3}}}\right)^{-3}$ $= \left(p^{-\frac{2}{3}}\right)^{-3}$ $= p^2$ **OR** $\left(\dfrac{1}{\sqrt[3]{p^2}}\right)^{-3}$ $= \left(\sqrt[3]{p^2}\right)^3$ $= \left(p^{\frac{2}{3}}\right)^3$ $= p^2$	✓ $\sqrt[3]{p^2} = p^{\frac{2}{3}}$ ✓ $\dfrac{1}{p^{\frac{2}{3}}} = p^{-\frac{2}{3}}$ ✓ answer (3) **OR** ✓ $\left(\dfrac{1}{\sqrt[3]{p^2}}\right)^{-3} = \left(\sqrt[3]{p^2}\right)^3$ ✓ $\sqrt[3]{p^2} = p^{\frac{2}{3}}$ ✓ answer (3)
2.2.2	$\left(\dfrac{\sqrt{5^{2023}} - \sqrt{5^{2021}}}{\sqrt{5^{2020}}} - \sqrt{45}\right)^2$ $= \left(\dfrac{\sqrt{5}.5^{1011} - \sqrt{5}.5^{1010}}{5^{1010}} - 3\sqrt{5}\right)^2$ $= \left(\dfrac{\sqrt{5}.5^{1010}(5^1 - 1)}{5^{1010}} - 3\sqrt{5}\right)^2$ $= \left(\sqrt{5}(4) - 3\sqrt{5}\right)^2$ $= 5$	✓ $\dfrac{\sqrt{5}.5^{1011} - \sqrt{5}.5^{1010}}{5^{1010}}$ ✓ $3\sqrt{5}$ ✓ factorisation ✓ answer (4)
		[12]

QUESTION 3

3.1.1	 $\sin 34^\circ$ $=\sqrt{1-t^2}$ **OR** $\sin^2 34^\circ+\cos^2 34^\circ=1$ $\sin^2 34^\circ+t^2=1$ $\sin^2 34^\circ=1-t^2$ $\sin 34^\circ=\sqrt{1-t^2}$	✓ correct sketch with labels for t and 1 correctly indicated ✓ label of $\sqrt{1-t^2}$ correctly indicated ✓ answer (3) **OR** ✓ square identity ✓ substitution ✓ answer (3)
3.1.2	$\tan 146^\circ$ $=-\tan 34^\circ$ $=-\dfrac{\sqrt{1-t^2}}{t}$	✓ $-\tan 34^\circ$ ✓ answer (2)
3.2.1	$\dfrac{\sin 550^\circ}{\cos(-170^\circ)}$ $=\dfrac{\sin 190^\circ}{\cos 170^\circ}$ or $\dfrac{\sin 190^\circ}{\cos 190^\circ}$ $=\dfrac{-\sin 10^\circ}{-\cos 10^\circ}$ $=\tan 10^\circ$	✓ $-\sin 10^\circ$ ✓ $-\cos 10^\circ$ ✓ answer (3)
3.2.2	$\sqrt{1+\cos(90^\circ+\theta).\sin(180^\circ-\theta)}$ $=\sqrt{1-\sin\theta.\sin\theta}$ $=\sqrt{1-\sin^2\theta}$ $=\sqrt{\cos^2\theta}$ $=\cos\theta$	✓ $-\sin\theta$ ✓ $\sin\theta$ ✓ $\sqrt{\cos^2\theta}$ ✓ answer (4)
		[12]

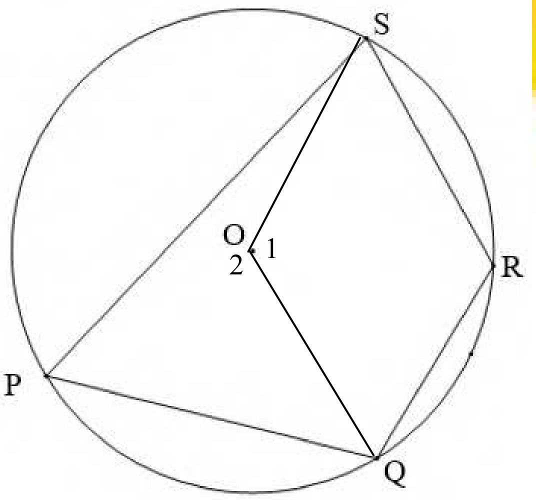


GEOMETRY • *MEETKUNDE*	
S	**A mark for a correct statement** **(A statement mark is independent of a reason)**
	'n Punt vir 'n korrekte bewering ***('n Punt vir 'n bewering is onafhanklik van die rede)***
R	**A mark for the correct reason** **(A reason mark may only be awarded if the statement is correct)**
	'n Punt vir 'n korrekte rede ***('n Punt word slegs vir die rede toegeken as die bewering korrek is)***
S/R	**Award a mark if statement AND reason are both correct**
	Ken 'n punt toe as die bewering EN rede beide korrek is

QUESTION 4

4.1.1 (a)	$F\hat{E}H = 90^\circ$ [$\angle$ in a semi-circle]	✓ S/R (1)
4.1.1 (b)	$D\hat{F}H = 90^\circ$ [tangent $\perp$ diameter]	✓ S/R (1)
4.1.2	$\hat{F}_2 = 90^\circ - 58^\circ = 32^\circ$ $\hat{G} = 32^\circ$ [$\angle$s in the same segment]	✓ $\hat{F}_2 = 32^\circ$ ✓ S ✓ R (3)
4.2	$\hat{D}_1 = 90^\circ$ [line from centre to midpoint of chord] In Δ ADO: $AO^2 = AD^2 + OD^2$ [Pythagoras] $= 48^2 + 14^2$ $AO = 50\text{ cm} = \text{radius} = OE$ $\therefore DE = 50 - 14 = 36\text{ cm}$	✓ S ✓ R ✓ S/R ✓ length of radius ✓ answer (5)
4.3	$\hat{C} = 180^\circ - 66^\circ$ [co-interior $\angle$s; AC ‖ OB] $= 114^\circ$ $\hat{O}_2 = 2 \times \hat{C}$ [$\angle$ at centre = 2 × $\angle$ at circumference] $= 228^\circ$ $\hat{O}_1 = 360^\circ - 228^\circ$ [$\angle$s around a point] $= 132^\circ$ $\hat{A} = 180^\circ - 132^\circ$ [co-interior $\angle$s; AC ‖ OB] $= 48^\circ$	✓ S/R ✓ S ✓ R ✓ S/R ✓ S (5)
		[15]

QUESTION 5

5.1	 Construction: Join QO and SO. Let obtuse $S\hat{O}Q = \hat{O}_1$, and reflex $S\hat{O}Q = \hat{O}_2$. Proof: $\hat{O}_1 = 2\hat{P}$ [$\angle$ at centre $= 2 \times \angle$ at circumference] $\hat{O}_2 = 2\hat{R}$ [$\angle$ at centre $= 2 \times \angle$ at circumference] $\hat{O}_1 + \hat{O}_2 = 360^\circ$ [$\angle$s around a point] $\therefore 2\hat{P} + 2\hat{R} = 360^\circ$ $\therefore 2(\hat{P} + \hat{R}) = 360^\circ$ $\therefore \hat{P} + \hat{R} = 180^\circ$	✓ construction ✓ S/R ✓ S ✓ S/R ✓ S	(5)
5.2.1	$\hat{M}_4 = x$ [$\angle$s opposite = sides] $V\hat{M}J = \hat{T} = x$ [tan-chord theorem] $\hat{K}_2 = \hat{T} = x$ [ext. $\angle$ of cyclic quad.]	✓ S/R ✓ S ✓ R ✓ S ✓ R	(5)
5.2.2	$\hat{M}_3 = \hat{K}_2 - \hat{J}_2$ [ext. $\angle$ of ΔKMJ] $= x - y$ **OR** $\hat{M}_2 = \hat{J}_2 = y$ [tan-chord theorem] $\therefore \hat{M}_3 = x - y$ **OR** $\hat{K}_1 = 180^\circ - x$ [opposite $\angle$s of cyclic quad] $\hat{M}_3 = 180^\circ - (\hat{K}_1 + \hat{J}_2)$ [sum of $\angle$s of ΔKMJ] $= 180^\circ - (180^\circ - x + y)$ $= x - y$	✓ S/R ✓ answer **OR** ✓ S/R ✓ answer (2) **OR** ✓ S/R ✓ answer	(2)
5.2.3	$\hat{L} = \hat{M}_4 - \hat{J}_2$ [ext. $\angle$ of ΔMLJ] $= x - y$ $\therefore \hat{M}_3 = \hat{L}$ [both $= x - y$] $\therefore$ JM is a tangent to the circle through K, L & M [converse: tan-chord theorem]	✓ S/R ✓ $\hat{M}_3 = \hat{L}$ ✓ R	(3)
			[15]

TOTAL: 75