MATHS GR 11 & 10'

KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 11

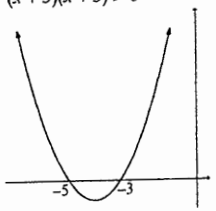
MATHEMATICS
COMMON TEST
APRIL 2021
MARKING GUIDELINE

MARKS: 75

This marking guideline consists of 9 pages.

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 1

1.1.1	$x=-\frac{3}{2}$ or $x=6$	✓ answer ✓ answer (2)
1.1.2	$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-1\pm\sqrt{1^2-4(5)(-7)}}{2(5)}$ $=\frac{-1\pm\sqrt{141}}{10}$ $=1{,}09$ or $-1{,}29$	✓ substitution ✓ answer ✓ answer (3)
1.1.3	$x^2+8x+15>0$ $(x+5)(x+3)>0$  $x<-5$ or $x>-3$	✓ critical values ✓ ✓ answer (3)

1.2	$y = 4x - 3$ Substitute in $y^2 - 2xy + 1 = 0$: $(4x-3)^2 - 2x(4x-3) + 1 = 0$ $16x^2 - 24x + 9 - 8x^2 + 6x + 1 = 0$ $8x^2 - 18x + 10 = 0$ $4x^2 - 9x + 5 = 0$ $(4x-5)(x-1) = 0$ $x = \frac{5}{4}$ or $x = 1$ $y = 2$ or $y = 1$	✓ making y the subject of the formula ✓ substitution ✓ standard form ✓ factorisation ✓ values of x ✓values of y (6)
1.3.1	$b^2 - 4ac \geq 0$ $(-5)^2 - 4k(-1) \geq 0$ $25 + 4k \geq 0$ $k \geq -\frac{25}{4}$ $k \geq -6\frac{1}{4}$	✓ condition for real roots ✓ substitution ✓ answer: $k \geq -\frac{25}{4}$ or $k \geq -6\frac{1}{4}$ (3)
1.3.2	E.g.: $k = -4 : -6 : 6 : 14 \ldots$ Any two values of k that will result in $b^2 - 4ac$ being a perfect square.	✓ any correct value of k ✓ another correct value of k (2)
		[19]

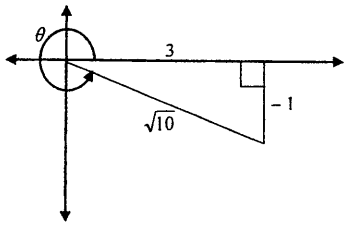
QUESTION 2

2.1	$\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ $= \frac{(\sqrt{3}-\sqrt{2})}{(\sqrt{3}+\sqrt{2})} \times \frac{(\sqrt{3}-\sqrt{2})}{(\sqrt{3}-\sqrt{2})}$ $= \frac{3 - 2\sqrt{2}\sqrt{3} + 2}{3-2}$ $= 5 - 2\sqrt{6}$	✓ $\times \frac{(\sqrt{3}-\sqrt{2})}{(\sqrt{3}-\sqrt{2})}$ ✓ multiplying out denominator correctly ✓ answer (3)
2.2	$x - 2\sqrt{x} - 8 = 0$ $x - 2x^{\frac{1}{2}} - 8 = 0$ $\left(x^{\frac{1}{2}} - 4\right)\left(x^{\frac{1}{2}} + 2\right) = 0$ $x^{\frac{1}{2}} = 4$ or $x^{\frac{1}{2}} = -2$ $x = 16$ no solution **OR** $x - 2\sqrt{x} - 8 = 0$ $2\sqrt{x} = x - 8$ $4x = x^2 - 16x + 64$ $x^2 - 20x + 64 = 0$ $(x-16)(x-4) = 0$ $x = 16$ or $x = 4$ N/A	✓ exponential form ✓ factorisation ✓ $x^{\frac{1}{2}} = 4$ or $x^{\frac{1}{2}} = -2$ ✓ $x = 16$ ✓ no solution (5) **OR** ✓ isolate surd ✓ squaring both sides ✓ standard form ✓ $x = 16$ or $x = 4$ ✓ rejecting $x = 4$ (5)

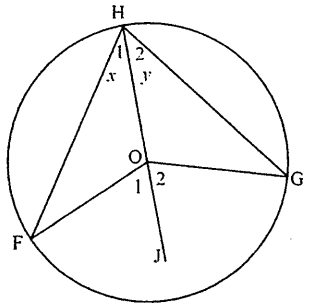
2.3	$\left(\frac{3^{x+1}+12.3^{x-1}}{7.9^x}\right)^{\frac{1}{x}}$ $=\left[\frac{3^x\left(3+12.3^{-1}\right)}{7.3^{2x}}\right]^{\frac{1}{x}}$ $=\left[\frac{7.3^x}{7.3^{2x}}\right]^{\frac{1}{x}}$ $=\left[3^{-x}\right]^{\frac{1}{x}}$ $=3^{-1}$ $=\frac{1}{3}$ **OR** $\left(\frac{3^{x+1}+12.3^{x-1}}{7.9^x}\right)^{\frac{1}{x}}$ $=\left[\frac{3.3^x\left(1+\frac{4}{3}\right)}{7.3^x.3^3}\right]^{\frac{1}{x}}$ $=\left[\frac{3.\frac{7}{3}}{7.3^x}\right]^{\frac{1}{x}}$ $=\left(3^{-x}\right)^{\frac{1}{x}}$ $=3^{-1}$ $=\frac{1}{3}$	✓ factorising numerator ✓ 3^{2x} ✓ simplification ✓ answer (4) **OR** ✓ factorising numerator ✓ $3^x.3^x$ ✓ simplification ✓ answer (4)
		[12]

QUESTION 3

3.1	$\frac{\sin(-20^\circ)}{\cos 430^\circ}$ $=\frac{-\sin 20^\circ}{\cos 70^\circ}$ $=\frac{-\sin 20^\circ}{\sin 20^\circ}$ $=-1$ OR $\frac{\sin(-20^\circ)}{\cos 430^\circ}$ $=\frac{-\sin 20^\circ}{\cos 70^\circ}$ $=\frac{-\cos 70^\circ}{\cos 70^\circ}$ $=-1$	✓ $-\sin 20^\circ$ ✓ $\cos 70^\circ$ ✓ co-function ✓ answer (4) OR ✓ $-\sin 20^\circ$ ✓ $\cos 70^\circ$ ✓ co-function ✓ answer (4)
3.2	$1+\sin x.\tan(180^\circ - x).\cos(-x)$ $=1+\sin x.-\tan x.\cos x$ $=1-\sin x.\frac{\sin x}{\cos x}.\cos x$ $=1-\sin^2 x$ $=\cos^2 x$	✓ $-\tan x$ ✓ $\cos x$ ✓ $\frac{\sin x}{\cos x}$ ✓ $1-\sin^2 x$ ✓ answer (5)

3.3	$\tan\theta = -\frac{1}{3}$  $r = \sqrt{x^2 + y^2}$ $= \sqrt{3^2 + (-1)^2}$ $= \sqrt{10}$ $30\sin^2\theta + \sqrt{40}\cos\theta$ $= 30\left(\frac{-1}{\sqrt{10}}\right)^2 + \sqrt{40}\left(\frac{3}{\sqrt{10}}\right)$ $= 30\left(\frac{1}{10}\right) + 2\sqrt{10}\left(\frac{3}{\sqrt{10}}\right)$ $= 3 + 6$ $= 9$	✓ standard form ✓ 4th quadrant ✓ value of r ✓ substitution ✓ simplification ✓ answer (6)
		[15]

QUESTION 4

4.1	$OE \perp AB$ [line from centre to midpoint of chord] $OE = x - 2$ $OA^2 = OE^2 + AE^2$ [Pythagoras] $x^2 = (x-2)^2 + 6^2$ $x^2 = x^2 - 4x + 4 + 36$ $4x = 40$ $x = 10$	✓S ✓R ✓ $OE = x - 2$ ✓R ✓ substitution ✓ simplification ✓ answer (7)
4.2	Contruction: Draw line HOJ  Let $\hat{H}_1 = x$. $\hat{F} = x$ [radii; ∠s opp. = sides] $\hat{O}_1 = 2x$ [ext. ∠ of ΔHFO] Let $\hat{H}_2 = y$. $\hat{G} = y$ [radii; ∠s opp. = sides] $\hat{O}_2 = 2y$ [ext. ∠ of ΔHGO] $\hat{O}_1 + O_2 = 2x + 2y$ $F\hat{O}G = 2(x + y)$ $F\hat{O}G = 2F\hat{H}G$	✓ construction ✓ S/R ✓ S/R ✓ S ✓ S (5)
4.3.1 (a)	$\hat{B} = 65°$ [∠ at centre = 2 × ∠ at circumference]	✓S ✓R (2)
4.3.1 (b)	$\hat{A} = 65°$ [∠s in the same segment] **OR** $\hat{A} = 65°$ [ext. ∠ of ΔAOE; ∠s opp. = radii]	✓S ✓R (2) OR ✓S ✓R (2)
4.3.1 (c)	$\hat{D} = 115°$ [opp. ∠s of a cyclic quadrilateral]	✓S ✓R (2)

4.3.2	$\hat{E}_3 + \hat{E}_2 = 180^\circ - 115^\circ$ [co-interior ∠s ; BE ∥ CD] $= 65^\circ$ $\hat{E}_1 + \hat{E}_2 = \hat{A}$ [∠s opp. = radii] $= 65^\circ$ $\therefore \hat{E}_1 = \hat{E}_3$	✓S ✓R ✓S ✓R (4)
		[22]

QUESTION 5

5.1	$\hat{K} = x$ [tan-chord-theorem] $\hat{R}_2 = \hat{K}$ $= x$ [radii; ∠s opp. = sides]	✓S ✓R ✓S/R (3)
5.2	$M\hat{R}P = 90^\circ$ [radius ⊥ tangent] $\therefore \hat{M}_3 = M\hat{R}P$ [both $= 90^\circ$] ∴ KM is a tangent at M to the circle through M, P and R [converse: tan-chord-theorem] OR $M\hat{R}P = 90^\circ$ [radius ⊥ tangent] $\hat{M}_1 = 2x$ [ext ∠ of ΔMKR] $\hat{M}_2 = 180^\circ - (90^\circ + 2x)$ [∠s on a straight line] $= 90^\circ - 2x$ $\hat{P} = 180^\circ - (90^\circ + 90^\circ - 2x)$ [sum of ∠s of ΔMPR] $= 2x$ $\hat{M}_1 = \hat{P}$ ∴ KM is a tangent at M to the circle through M, P and R [converse: tan-chord-theorem]	✓S ✓R ✓S ✓R (4) OR ✓S ✓R ✓S ✓R (4)
		[7]

TOTAL MARKS : 75