education

Department:
Education
PROVINCE OF KWAZULU-NATAL

MATHEMATICS

COMMON TEST

MARCH 2019

MARKING GUIDELINES

NATIONAL
SENIOR CERTIFICATE

GRADE 11

MARKS: **75**

These marking guideline consists of 8 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

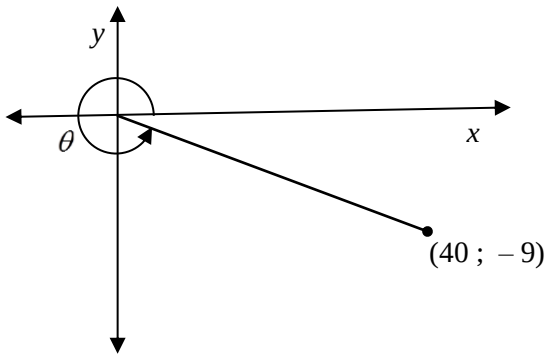
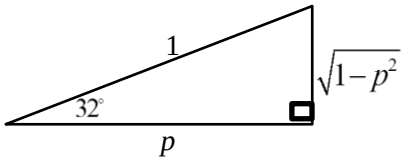
1.1.1	$7x^2 - 2x - 3 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(7)(-3)}}{2(7)}$ $x = -0{,}53$ or $x = 0{,}81$	✓ substituting in correct formula ✓ *x*-values ✓ *x*-values (3)
1.1.2	$(x-2)^2 - 4 = 0$ $(x-2)^2 = 4$ $x - 2 = \pm 2$ $x = 4$ or $x = 0$ **OR** $(x-2)^2 - 4 = 0$ $x^2 - 4x + 4 - 4 = 0$ $x^2 - 4x = 0$ $x(x-4) = 0$ $x = 4$ or $x = 0$	✓ isolate $(x-2)^2$ ✓ ± 2 ✓ both answers **OR** ✓ $x^2 - 4x + 4$ ✓ factors ✓ both answers (3)
1.1.3	$\sqrt{7x+2} + 2x = 0$ $(\sqrt{7x+2})^2 = (-2x)^2$ $7x + 2 = 4x^2$ $4x^2 - 7x - 2 = 0$ $(4x+1)(x-2) = 0$ $x = -\frac{1}{4}$ or $x = 2$ $\therefore x = -\frac{1}{4}$ only	✓ isolate $\sqrt{7x+2}$ ✓standard form ✓ factors ✓ correct solution (4)

1.1.4	$x^2 - x - 56 < 0$ $(x-8)(x+7) < 0$ CV $x = 8$ *or* $x = -7$ + | − | + -7 8 $-7 < x < 8$	✓correct factors ✓✓correct solution (3)
1.2	$2x+y=1$ and $2x^2-xy+y^2=4$ $y=1-2x$ $2x^2-x(1-2x)+(1-2x)^2=4$ $2x^2-x+2x^2+1-4x+4x^2=4$ $8x^2-5x-3=0$ $(8x+3)(x-1)=0$ $x=-\frac{3}{8}$ or $x=1$ $y=1-2\left(-\frac{3}{8}\right)$ or $y=1-2(1)$ $y=1\frac{3}{4}$ or $y=-1$ **OR** $2x+y=1$ and $2x^2-xy+y^2=4$ $x=\frac{1-y}{2}$ $2\left(\frac{1-y}{2}\right)^2-y\left(\frac{1-y}{2}\right)+y^2=4$ $2\left(\frac{1-2y+y^2}{4}\right)-y\left(\frac{1-y}{2}\right)+y^2-4=0$ $1-2y+y^2-y+y^2+2y^2-8=0$ $4y^2-3y-7=0$ $(4y-7)(y+1)=0$ $y=1\frac{3}{4}$ or $y=-1$ $x=\frac{1-1\frac{3}{4}}{2}$ or $x=\frac{1-(-1)}{2}$ $x=-\frac{3}{8}$ or $x=1$	$y=1-2x$ ✓substitution ✓ standard form ✓ factors ✓ *x* values ✓*y* values (6) **OR** $x=\frac{1-y}{2}$ ✓substitution ✓ standard form ✓ factors ✓ *y* values ✓*x* values (6)
		[19]

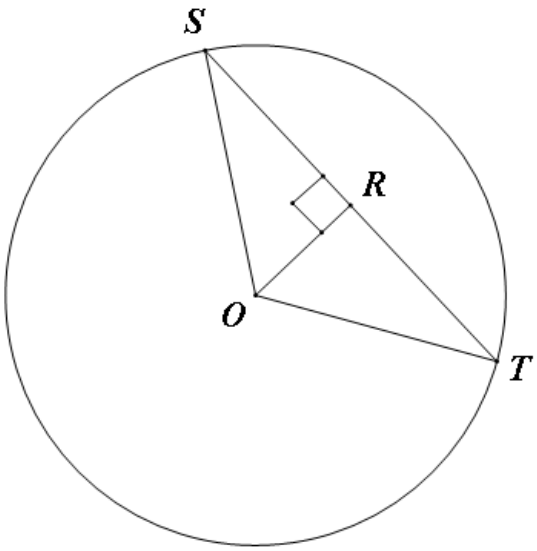
QUESTION 2

2.1	$x^{\frac{3}{4}} = 64$ $\left(x^{\frac{3}{4}}\right)^{\frac{4}{3}} = (2^6)^{\frac{4}{3}}$ $x = 256$ or 2^8	✓ raising both sides to the $\frac{4}{3}$ ✓ answer (2)
2.2.1	$\frac{5^{-x}.125^{1-x}.25^{2x}}{5}$ $= \frac{5^{-x}.\left(5^3\right)^{1-x}.\left(5^2\right)^{2x}}{5}$ $= \frac{5^{-x}.5^{3-3x}.5^{4x}}{5}$ $= 5^{-x+3-3x+4x-1}$ $= 5^2$ $=25$	✓rewriting as base 3 ✓using exponential rules ✓ answer (3)
2.2.2	$\sqrt{12} - \sqrt{147} + 3^{1,5}$ $= \sqrt{4 \times 3} - \sqrt{49 \times 3} + 3^{\frac{3}{2}}$ $= 2\sqrt{3} - 7\sqrt{3} + \sqrt{9 \times 3}$ $= 2\sqrt{3} - 7\sqrt{3} + 3\sqrt{3}$ $= -2\sqrt{3}$	✓ simplifying surds ✓ $3\sqrt{3}$ ✓ answer (3)
2.3	$\frac{5^{2006} - 5^{2004} + 24}{5^{2004} + 1} = a$ $\frac{5^{2004}(5^2 - 1) + 24}{5^{2004} + 1} = a$ $\frac{5^{2004}(24) + 24}{5^{2004} + 1} = a$ $\frac{24(5^{2004} + 1)}{5^{2004} + 1} = a$ $a = 24$	✓factorising ✓factorising ✓answer (3)
		[11]

QUESTION 3

3.1	 $x^2 + y^2 = r^2$ $40^2 + (-9)^2 = r^2$ $r = 41$ $\sin\theta + \cos\theta$ $= \frac{-9}{41} + \frac{40}{41}$ $= \frac{31}{41}$	✓ correct sketch in 4th quadrant ✓ value of r ✓ substitution ✓ answer (4)
3.2	$\frac{\sin(90^\circ - \theta).\tan(360^\circ - \theta).\sin(\theta - 180^\circ)}{1 - \cos^2\theta}$ $= \frac{\cos\theta.-\tan\theta.-\sin\theta}{\sin^2\theta}$ $= \frac{\cos\theta.-\frac{\sin\theta}{\cos\theta}.-\sin\theta}{\sin^2\theta}$ $= 1$	$\cos\theta$ $-\tan\theta$ $-\sin\theta$ $\sin^2\theta$ $\frac{\sin\theta}{\cos\theta}$ ✓ answer (6)
3.3.1	$\cos 212^\circ$ $= \cos(180^\circ + 32^\circ)$ $= -\cos 32^\circ$ $= -p$	$-\cos 32^\circ$ ✓ answer (2)
3.3.2	$\sin(-328^\circ)$ $= \sin 32^\circ$ $= \sqrt{1 - \cos^2 32^\circ}$ $= \sqrt{1 - p^2}$ 	$\sin 32^\circ$ ✓ correct sketch or identity ✓ answer (3)
		[15]

QUESTION 4

4.1		
	Construction: Draw OS and OT.	✓ construction
	Proof: In ΔOSR and ΔOTR: 1. OS = OT [radii] 2. OR = OR [common] 3. $S\hat{R}O = T\hat{R}O = 90°$ [$\angle s$ on a straight line] $\therefore \Delta OSR \equiv \Delta OTR$ [90°; H; S] $\therefore$ SR = RT [$\equiv \Delta s$]	✓ S/R ✓ S (OR is common) ✓ S/R ✓ S/R (5)
4.2	OD $\perp$ AC [line from centre to midpoint of chord] $OA^2 = AD^2 + OD^2$ [Pythagoras] $= 24^2 + 7^2$ $= 625$ OA = 25 mm OB = OA [radii] $\therefore BD = 25 - 7 = 18$ mm	✓ S/R ✓ S/R ✓ length of the radius ✓ S/R ✓ answer (5)
		[10]

QUESTION 5

5.1.1	$\hat{F}=\frac{1}{2}G\hat{O}L$ [$\angle$ at centre $=2\times\angle$ at circumference] $=68°$	✓ R ✓ answer (2)
5.1.2	$\hat{F}+\hat{H}_1=180°$ [opp. $\angle$s of cyclic quadrilateral] $\hat{H}_1=180°-68°$ $=112°$ $\hat{K}=\hat{H}_1$ [ext. $\angle$ of cyclic quadrilateral] $=112°$ **OR** $\hat{H}_2=\hat{F}=68°$ [ext. $\angle$ of cyclic quadrilateral] $\hat{K}=112°$ [opp. $\angle$s of cyclic quadrilateral]	✓ R ✓ size of $\hat{H}_1$ ✓ R ✓ answer (4) **OR** ✓ S ✓ R ✓ S ✓ R (4)
5.2.1	$\hat{C}=x$ [$\angle$s in the same segment] $\hat{A}_1=\hat{C}=x$ [alt. $\angle$s; BA $\parallel$ CD] $\hat{D}_2=\hat{A}_1=x$ [$\angle$s in the same segment] $\hat{D}_4=\hat{B}=x$ [tan-chord theorem] **OR** $\hat{D}_2=x$ [alt. $\angle$s; BA $\parallel$ CD] $\hat{A}_1=\hat{D}_2=x$ [$\angle$s in the same segment] $\hat{C}=\hat{B}=x$ [$\angle$s in the same segment] $\hat{D}_4=\hat{B}=x$ [tan-chord theorem]	✓ S ✓ R ✓ S/R ✓ S/R ✓ S ✓ R (6) **OR** ✓ S/R ✓ S ✓ R ✓ S/R ✓ S ✓ R (6)
5.2.2	$\hat{D}_3=90°$ [$\angle$ in a semicircle] $\hat{E}=180°-(\hat{B}+B\hat{D}E)$ [sum of $\angle$s in Δ] $=180°-(x+90°+x)$ $=90°-2x$ **OR** $\hat{D}_3=90°$ [$\angle$ in a semicircle] $\hat{E}+C\hat{D}E=180°$ [co-interior $\angle$s; BA $\parallel$ CD] $\hat{E}=180°-C\hat{D}E$ $=180°-(x+90°+x)$ $=90°-2x$	✓ S ✓ R ✓ S ✓ answer (4) **OR** ✓ S ✓ R ✓ S ✓ answer (4)

5.2.3	$\hat{A}_2 = 180^\circ - \left(\hat{B} + \hat{D}_3 + \hat{A}_1\right)$ [sum of $\angle$s in ΔABD] $= 180^\circ - \left(x + 90^\circ + x\right)$ $= 90^\circ - 2x$ $\therefore \hat{A}_2 = \hat{E}$ [both $= 90^\circ - 2x$] $\therefore$ AE is a tangent to the circle through A, D and E [converse: tan-chord-theorem]	✓ S $\hat{A}_2 = 90^\circ - 2x$ $\hat{A}_2 = \hat{E}$ ✓ R (4)
	OR $\hat{D}_1 = 180^\circ - \left(\hat{D}_2 + \hat{D}_3 + \hat{D}_4\right)$ [$\angle$s on a straight line] $= 180^\circ - \left(x + 90^\circ + x\right)$ $= 90^\circ - 2x$ $\hat{D}_1 = \hat{A}_2$ [tan-chord-theorem] $\therefore \hat{A}_2 = 90^\circ - x$ $\therefore \hat{A}_2 = \hat{E}$ [both $= 90^\circ - 2x$] $\therefore$ AE is a tangent to the circle through A, D and E [converse: tan-chord-theorem]	**OR** ✓ S $\hat{A}_2 = 90^\circ - 2x$ $\hat{A}_2 = \hat{E}$ ✓ R (4)
		[20]

TOTAL MARKS: 75