education

Department:
Education
PROVINCE OF KWAZULU-NATAL

MATHEMATICS P2

COMMON TEST

JUNE 2019

MARKING GUIDELINE

NATIONAL SENIOR CERTIFICATE

GRADE 11

MARKS: 100

This marking guideline consists of 10 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

GRADE 11
Marking Guideline

QUESTION 1

1.1.1	$y=3$	✓ answer (1)
1.1.2	$x=-8$	✓ answer (1)
1.2.1	$m=\frac{y_2-y_1}{x_2-x_1}$ $=\frac{-3-2}{6-5}$ **OR** $=\frac{2-(-3)}{5-6}$ $=-5$	✓ correct substitution ✓ answer (2)
1.2.2	$\tan\theta=m$ $\tan\theta=-5$ reference angle: $78,7^\circ$ $\theta=180^\circ-78,7^\circ$ $=101,3^\circ$	✓ $\tan\theta=-5$ ✓ reference angle: $78,7^\circ$ ✓ $101,3^\circ$ (3)
1.2.3	$\frac{x+6}{2}=5$ and $\frac{y+(-3)}{2}=2$ $x=4$ $y=7$ B(4 ; 7)	✓ method ✓ $x=4$ ✓ $y=7$ (3)
1.2.4	$AC=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ $4\sqrt{5}=\sqrt{(6-p)^2+(-3-1)^2}$ $4\sqrt{5}=\sqrt{36-12p+p^2+16}$ $4\sqrt{5}=\sqrt{p^2-12p+52}$ $80=p^2-12p+52$ $p^2-12p-28=0$ $(p-14)(p+2)=0$ $p=-2$ or $p=14$ $p=-2$ **OR** $AC=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ $(p-6)^2+(1-(-3))^2=(4\sqrt{5})^2$ $(p-6)^2+16=80$ $(p-6)^2=64$ $p-6=\pm8$ $p=-2$ or $p=14$ $p=-2$	✓substitution into distance formula ✓ equating to $4\sqrt{5}$ ✓ squaring both sides ✓factors ✓answer (5) ✓substitution into distance formula ✓ equating to $4\sqrt{5}$ ✓ squaring both sides ✓ square rooting both sides ✓answer (5)
		[15]

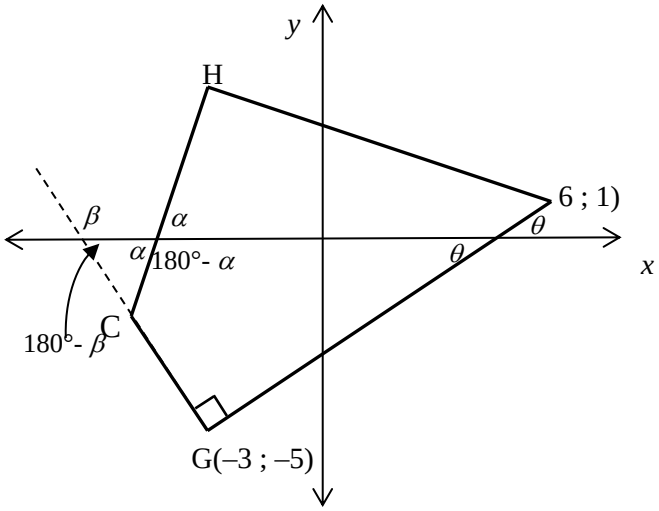
QUESTION 2

2.1	$m_{KM} = \frac{-1-9}{-2-(-6)}$ $= -\frac{5}{2}$ $m_{KL} = \frac{q-9}{-3-(-6)}$ $= \frac{q-9}{3}$ Because the points are collinear: $m_{KM} = m_{KL}$ $-\frac{5}{2} = \frac{q-9}{3}$ $2(q-9) = -15$ $q = \frac{3}{2}$	✓substitution to determine m_{KM} ✓ expression for m_{KL} ✓equating gradients ✓answer (4)
	OR $m_{KM} = \frac{-1-9}{-2-(-6)}$ $= -\frac{5}{2}$ $m_{LM} = \frac{-1-q}{-2-(-3)}$ $= -1-q$ Because the points are collinear: $m_{KM} = m_{LM}$ $-\frac{5}{2} = -1-q$ $q = \frac{3}{2}$	OR ✓substitution to determine m_{KM} ✓ expression for m_{LM} ✓equating gradients ✓answer (4)
	OR $m_{KL} = \frac{q-9}{-3-(-6)}$ $= \frac{q-9}{3}$ $m_{LM} = \frac{-1-q}{-2-(-3)}$ $= -1-q$ Because the points are collinear: $m_{KL} = m_{LM}$ $\frac{q-9}{3} = -1-q$ $q-9 = -3-3q$ $q = \frac{3}{2}$	OR ✓ expression for m_{KL} ✓ expression for m_{LM} ✓equating gradients ✓answer (4)

GRADE 11
Marking Guideline

2.2.1	$m_{DG}=\frac{y_2-y_1}{x_2-x_1}$ $=\frac{-5-1}{-3-6}$ $=\frac{2}{3}$ $m_{CG}=-\frac{3}{2}$ Equation of CG: $y=-\frac{3}{2}x+c$ **OR** $y-y_1=-\frac{3}{2}(x-x_1)$ $-5=-\frac{3}{2}(-3)+c$ **OR** $y-(-5)=-\frac{3}{2}(x-(-3))$ $c=-\frac{19}{2}$ **OR** $y+5=-\frac{3}{2}x-\frac{9}{2}$ $y=-\frac{3}{2}x-\frac{19}{2}$	✓ gradient of DG ✓ gradient of CG ✓ substitution of $(-3;-5)$ ✓ equation of CG (4)
2.2.2	At C: $-\frac{3}{2}x-\frac{19}{2}=3x+13$ $\frac{9}{2}x=-\frac{45}{2}$ $x=-5$ $y=3(-5)+13=-2$ C(–5 ; –2)	✓ equating equations of CG and CH ✓ x-value ✓ y-value (3)

2.2.3



α = angle of inclination of CH
$\tan\alpha = 3$ ✓ $\tan\alpha = 3$
$\alpha = 71,57°$ ✓ $71,57°$
β = angle of inclination of CG
$\tan\beta = -\frac{3}{2}$ ✓ $\tan\beta = -\frac{3}{2}$
$180° - \beta = 56,31°$ ✓ $56,31°$
$\hat{HCG} = \alpha + (180° - \beta)$ ext angle of triangle
$\hat{HCG} = 71,57° + 56,31°$
$= 127,88°$ ✓ answer

(5)

OR

α = angle of inclination of CH
$\tan\alpha = 3$ ✓ $\tan\alpha = 3$
$\alpha = 71,57°$
$180° - \alpha = 108,43°$ ✓ $108,43°$
θ = angle of inclination of GD
$\tan\theta = \frac{2}{3}$ ✓ $\tan\theta = \frac{2}{3}$
$\theta = 33,69°$ ✓ $33,69°$
$\hat{HCG} = 360° - (33,69° + 90° + 108,43°)$ ∠s of quad
$= 127,88°$ ✓ answer

(5)

[16]

GRADE 11
Marking Guideline

QUESTION 3

3.1.1	$y^2 = r^2 - x^2$ [Theorem of Pythagoras] $= 20^2 - (-16)^2$ $= 144$ $y = -12$	✓ substitution ✓ answer (2)
3.1.2(a)	$\sin(180^\circ - \theta) = \sin\theta$ $= \frac{-12}{20}$ $= -\frac{3}{5}$	✓ $\sin\theta$ ✓ answer (2)
3.1.2(b)	$\cos(180^\circ + \theta) = -\cos\theta$ $= -\left(\frac{-16}{20}\right)$ $= \frac{4}{5}$	✓ $-\cos\theta$ ✓ answer (2)
3.1.3	$\sin\theta = \frac{-3}{5} = \frac{y}{15}$ $y = -9$ $\cos\theta = \frac{-4}{5} = \frac{x}{15}$ $x = -12$ S(–12 ; –9)	✓ $\frac{-3}{5} = \frac{y}{15}$ ✓ y-coordinate ✓ $\frac{-4}{5} = \frac{x}{15}$ ✓ x-coordinate (4)
3.2	$\frac{\cos(-33^\circ).\tan 147^\circ}{2\cos 303^\circ.\sin 240^\circ}$ $= \frac{\cos 33^\circ.-\tan 33^\circ}{2\cos 57^\circ.-\sin 60^\circ}$ $= \frac{\cos 33^\circ.-\frac{\sin 33^\circ}{\cos 33^\circ}}{2\sin 33^\circ.-\frac{\sqrt{3}}{2}}$ $= \frac{1}{\sqrt{3}}$ or $\frac{\sqrt{3}}{3}$	✓ $\cos 33^\circ$ ✓ $-\tan 33^\circ$ ✓ $\cos 57^\circ$ ✓ $-\sin 60^\circ$ ✓ $\tan 33^\circ = \frac{\sin 33^\circ}{\cos 33^\circ}$ ✓ $\cos 57^\circ = \sin 33^\circ$ ✓ answer (7)
		[17]

QUESTION 4

4.1	$\frac{\sin^3 x+\sin x\cos^2 x}{\cos x}$ $=\frac{\sin x\left(\sin^2 x+\cos^2 x\right)}{\cos x}$ $=\frac{\sin x(1)}{\cos x}1$ $=\tan x$	✓factors ✓ $\sin^2 x+\cos^2 x=1$ ✓ $\frac{\sin x}{\cos x}=\tan x$ (3)
4.2	$\sin x=0,412$ $x=24,33°$ or $x=155,67°$	✓✓ answers (2)
4.3.1	$\tan 3x+2,64=0$ $\tan 3x=-2,64$ Reference angle: $69,25°$ $3x=110,75°+k.180°$ $x=36,92°+k.60°;\ k\in Z$ **OR** $\tan 3x+2,64=0$ $\tan 3x=-2,64$ Reference angle: $69,25°$ $3x=110,75°+k.360°$ or $3x=290,75°+k.360°$ $x=36,92°+k.120°$ or $x=96,92°+k.120°;\ k\in Z$	✓ $\tan 3x=-2,64$ ✓ $69,25°$ ✓ $3x=180°-69,25°$ ✓ General solution (4) ✓ $\tan 3x=-2,64$ ✓ $69,25°$ ✓ $3x=180°-69,25°$ or $3x=360°-69,25°$ ✓ General solution (4)
4.3.2	SS: $x\in\{-83,08°\ ;\ -23,08°\ ;\ 36,92°\}$	✓✓✓ answers NOTE: 1 mark for each correct answer (3)
4.4	$4\sin^2 x+7\cos x-4=0$ $4\left(1-\cos^2 x\right)+7\cos x-4=0$ $-4\cos^2 x+7\cos x=0$ $4\cos^2 x-7\cos x=0$ $\cos x\left(4\cos x-7\right)=0$ $\cos x=0$ or $\cos x=\frac{7}{4}$ no solution $\therefore x=90°$ or $270°$	✓ $\sin^2 x=1-\cos^2 x$ ✓standard form ✓ factors ✓no solution ✓ $90°$ ✓ $270°$ (6)
		[18]

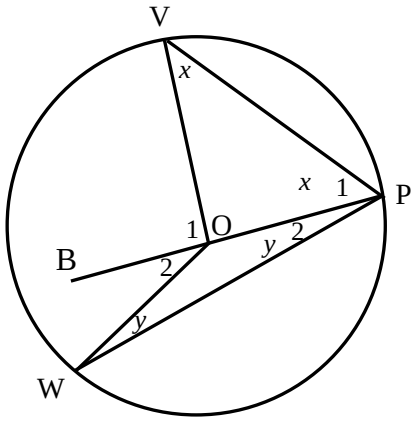
GRADE 11
Marking Guideline

QUESTION 5

5.1.1	$\hat{K} = \hat{H}_1 = 43°$ [tan-chord-theorem]	✓ S ✓ R (2)
5.1.2	$\hat{G} = 180° - \hat{L}_1 = 50°$ [co-interior ∠'s; GH || LG] $\hat{H}_3 = \hat{G} = 50°$ [tan-chord-theorem]	✓ S ✓ R ✓ S ✓ R (4)
5.2.1	$B\hat{E}D = \hat{C}_1 = 70°$ [ext. ∠ of a cyclic quad.]	✓ S ✓ R (2)
5.2.2	$\hat{C}_3 = \hat{A} = 32°$ [∠'s in same segment] $\hat{C}_2 = 180° - (\hat{C}_1 + \hat{C}_3)$ [∠'s on a straight line] $= 180° - (70° + 32°)$ $= 78°$	✓ S ✓ R ✓ R ✓ S (4)
5.2.3	$\hat{F}_2 = 90°$ [line from centre to midpoint of chord] $\hat{D}_1 = 180° - (\hat{F}_2 + \hat{C}_3)$ [sum of ∠'s of Δ] $= 180° - (90° + 32°)$ $= 58°$	✓ S ✓ R ✓ S (3)
5.2.4	$A\hat{E}D = 90°$ [∠ in a semi-circle] $\hat{E}_3 = 90° - B\hat{E}D$ $= 90° - 70°$ $= 20°$	✓ S ✓ R ✓ S (3)
		[18]

GRADE 11
Marking Guideline

QUESTION 6

6.1	Construction: Join PO and produce to B.  Proof: Let $\hat{V} = x$ $\hat{P}_1 = \hat{V} = x$ [VO = PO = radii; $\angle$'s opp. = sides] $\hat{O}_1 = \hat{V} + \hat{P}_1$ [ext. $\angle$ of Δ] $= 2x$ Let $\hat{W} = y$ $\hat{P}_2 = \hat{W} = y$ [WO = PO = radii; $\angle$'s opp. = sides] $\hat{O}_2 = \hat{W} + \hat{P}_2$ [ext. $\angle$ of Δ] $= 2y$ $\hat{O}_1 + \hat{O}_2 = 2x + 2y$ $V\hat{O}W = 2(x + y)$ $= 2\hat{P}$	✓ construction ✓ S/R ✓ S/R ✓ S ✓ S ✓ S (6)
6.2.1	Let $\hat{A} = x$ $\hat{F} = \hat{A} = x$ [$\angle$'s in same segment] $\hat{C}_2 = \hat{F} = x$ [$\angle$'s opp. = sides] $\hat{A} = \hat{C}_2$ [both = x] AB ‖ FC [alt. $\angle$'s are =]	 ✓ S ✓ R ✓ S ✓ R ✓ R (5)
6.2.2	$\hat{O} = 2\hat{A}$ [$\angle$ at centre = 2 × $\angle$ at circum.] $= 2x$ $\hat{E}_2 = \hat{F} + \hat{C}_2$ [ext. $\angle$ of Δ] $= 2x$ $\hat{O} = \hat{E}_2$ [both = 2 x] OBCE is a cyclic quad. [converse: $\angle$'s in same segment]	✓ S ✓ R ✓ S ✓ S ✓ R (5)
		[16]

GRADE 11
Marking Guideline

TOTAL: 100