Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 11

NOVEMBER 2015

MATHEMATICS P2/WISKUNDE V2 MEMORANDUM

MARKS/PUNTE: 150

This memorandum consists of 8 pages.
Hierdie memorandum bestaan uit 8 bladsye.

NOTE:
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed out version.
- Consistent accuracy applies in ALL aspects of the marking memorandum.
- Assuming answers/values in order to solve a problem is NOT acceptable.

LET WEL:
- *Indien 'n kandidaat 'n vraag twee keer beantwoord, merk slegs die eerste poging.*
- *Indien 'n kandidaat 'n antwoord doodgetrek het, maar nie oorgedoen het nie, merk die doodgetrekte antwoord.*
- *Volgehoue akkuraatheid geld in ALLE aspekte van die memorandum.*
- *Aanname van antwoorde/waardes om 'n probleem op te los, is Onaanvaarbaar.*

QUESTION/*VRAAG* 1: [12]

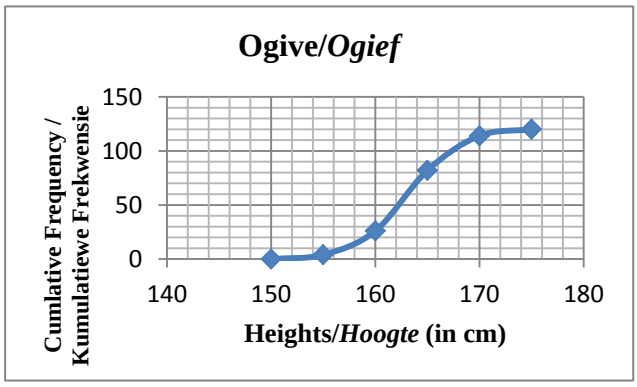
1.1

Height (cm) ***Hoogte (cm)***	**Frequency** ***Frekwensie***	**Cumulative frequency** ***Kumulatiewe frekwensie***
$150 < x \leq 155$	4	4
$155 < x \leq 160$	22	26
$160 < x \leq 165$	56	82
$165 < x \leq 170$	32	114
$170 < x \leq 175$	6	120

✓26

✓120 (2)

1.2



✓grounding at(150;0)/*anker by (150;0)*
✓ plotting (155;4)*/plot van (155;4)*
✓*plotting with upper limits/plot by boonste limiete*
✓ joining the points to form a smooth curve*/verbind punte om glade kurwe te vorm* (4)

1.3

(150, 160,5, 163, 166, 175)
OR/*OF*
Min = 150
Q_1 = 160,5
Q_2 = 163
Q_3 = 166
Max = 175

✓ 150
✓160,5
✓ 163
✓166
✓175 (5)

1.4 Skewed to the left / *Skeefgetrek na links.* ✓ answer/*antwoord* (1)

[12]

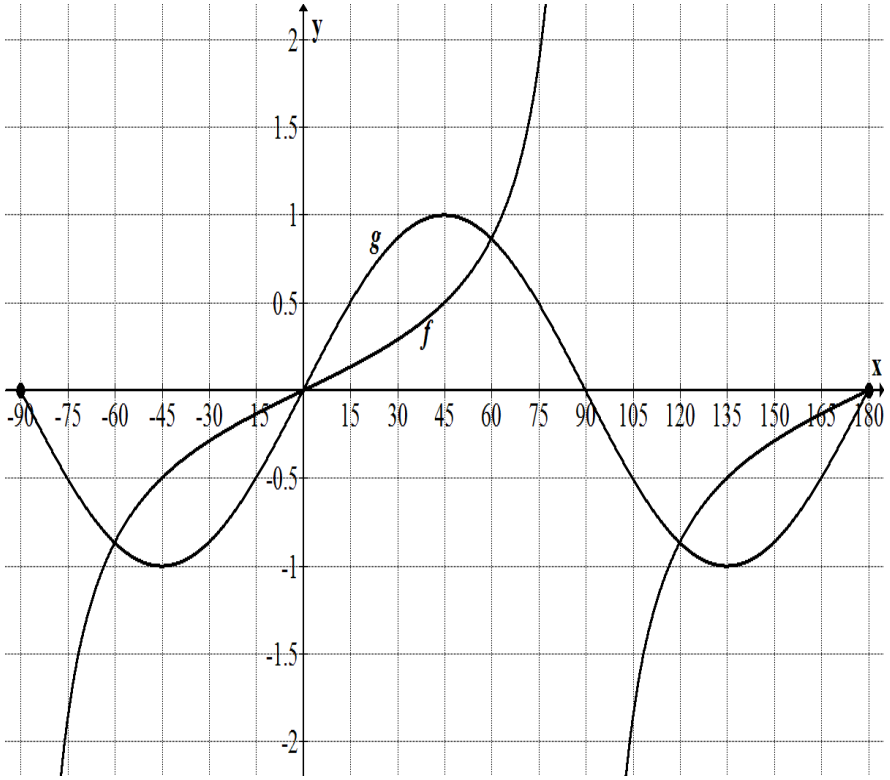
QUESTION/*VRAAG* 2 [7]		
2.1	$\bar{x} = \frac{2250+2250+3000+3300+3300+3300+3600+3900+4350+4350+5250}{10}$ $\bar{x} = \frac{35550}{10}$ = R3 555 **ANSWER ONLY : FULL MARKS** ***SLEGS ANTWOORD : VOLPUNTE***	✓ $\frac{35550}{10}$ ✓ answer/*antwoord* (2)
2.2	$\sigma = R\ 900{,}12$	✓ answer/*antwoord* (1)
2.3	(3555 – 900,12 ; 3555 + 900,12) = (2654,88 ; 4455,12) ∴ 7 workers lie within one standard deviation *werkers lê binne een standaardafwyking* ∴ $\frac{7}{10} = 70\%$ of workers lie within one standard deviation. *van die werkers lê binne een standaardafwyking*.	✓ ✓interval ✓ 7 ✓ answer/antwoord (4)
		[7]
QUESTION/*VRAAG* 3 [13]		
3.1	$m_{AB} = m_{BC} = m_{AC}$ $m_{BC} = \frac{y_2 - y_1}{x_2 - x_1}$ $\frac{-1-3}{4+2} = -\frac{2}{3}$ $\frac{-1-(a+2)}{4-(2a-11)} = -\frac{2}{3}$ $\frac{-3-a}{15-2a} = -\frac{2}{3}$ $30 - 4a = 9 + 3a$ $7a = 21$ $a = 3$	✓ $m_{AB} = m_{BC} = m_{AC}$ ✓ substitute into equation/*vervang in vgl* ✓ substituting into m_{AC}/*vervang in vgl* m_{AC} ✓ answer/*antw* (4)
3.2	$y - y_1 = m(x - x_1)$ $y - 5 = -\frac{2}{3}(x+5)$ $y = -\frac{2}{3}x + \frac{5}{3}$	✓ equation/*vgl* ✓ subst of *m* and(-5;5) into form/*vervang van m en (4;-1) in formule* ✓ equation/*vgl* (3)
3.3	Midpt $= \left[\frac{x_1+x_2}{2}; \frac{y_1+y_2}{2}\right]$ $= \left[\frac{-2-5}{2}; \frac{3+5}{2}\right]$ $= \left[-\frac{7}{2}; 4\right]$	✓✓ subst into correct formula/*vervang in korrekte formule* ✓ coordinates/*coordinate* (3)
3.4	$m_{CD} = 0$ $\frac{p-7+1}{4p-4} = \frac{0}{1}$ $p = 6$ OR/*OF* $p - 7 = -1$ $p = 6$	✓ correct m = 0 ✓ substitution into eqn/*vervang in vgl* ✓ answer/*antw* ✓✓ equating/ ✓ answer (3)
		[13]

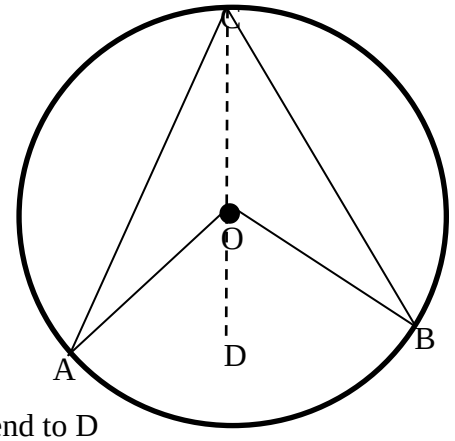
QUESTION/*VRAAG* 4: [13]		
4.1	$m_{NQ} = \frac{-12}{-6}$ $= 2$	✓ answer/*antw* (1)
4.2	$M_{NQ} \times M_{MP} = -1$ [NQ ⊥ MP] $m_{MP} = -\frac{1}{2}$	✓ answer/*antw* (1)
4.3	$m_{MP} = -\frac{1}{2}$ $\tan\theta = -\frac{1}{2}$ $Ref = 26{,}57°$ $\theta = 180° - 26{,}57°$ $\theta = 153{,}43°$	✓$m_{MP} = -\frac{1}{2}$ ✓$tan\theta = -\frac{1}{2}$ ✓value of θ/*waarde van* θ (3)
4.4	$y - y_1 = m(x - x_1)$ $y - 6 = -\frac{1}{2}(x - 0)$ $y = -\frac{1}{2}x + 6$	✓ equation/*vgl* ✓✓ subst of m = $-\frac{1}{2}$ and (0;6) into eqn/*vervang m = $-\frac{1}{2}$ en (0;6) in vgl* ✓answer/*antw* (4)
4.5	$m_{NQ} \times m_{MP} = -1$ $m_{MP} = -\frac{1}{2}$ $\frac{y_2 - y_1}{x_2 - x_1} = -\frac{1}{2}$ $\frac{y - 6}{x - 0} = -\frac{1}{2}$ $x = 2\,; y = 5$ P (2;5)	✓ $m_{NQ} \times m_{MP} = -1$ ✓$m_{MP} = -\frac{1}{2}$ ✓ subst into eqn/*vervang in vgl* ✓ P (2;5) (4)
4.6	MR = NR R = $\left[\frac{x_1+x_2}{2}\,;\,\frac{y_1+y_2}{2}\right]$ R = $\left[\frac{0-6}{2}\,;\,\frac{6-12}{2}\right]$ R = [-3;-3]	✓ Substitution/*vervang.* ✓ x value/*waarde* ✓ y value/*waarde* (3)
		[16]

QUESTION/*VRAAG* 5: [23]		
5.1.1	$\tan\theta = 3$ $\theta = 71{,}57°$	✓tan θ ✓answer/*antwoord* (2)
5.1.2	$OP^2 = (1)^2 + (3)^2$ $OP = \sqrt{10}$	✓OP^2 ✓answer/*antwoord* (2)
5.1.3a	$\sin\theta = \frac{3}{\sqrt{10}}$	✓answer/*antwoord* (1)
5.1.3b	$\cos(180° + \theta) = -\cos\theta$ $= -\frac{1}{\sqrt{10}}$ **ANSWER ONLY FULL MARKS/** ***SLEGS ANTWOORD:VOLPUNTE***	✓ -cosθ ✓ answer/*antwoord* (2)

5.2	$2\cos^2 x + 5\sin x = 4$ $2\cos^2 x + 5\sin x - 4 = 0$ $2(1 - \sin^2 x) + 5\sin x - 4 = 0$ $2\sin^2 x - 5\sin x + 2 = 0$ $(2\sin x - 1)(\sin x - 2) = 0$ $2\sin x = 1 \quad or \quad \cos x = 2$ $\sin x = \frac{1}{2}$ no soln $x = 30° + k.360°$ $x = 150° + k.360°, k \in Z$	✓ standard form/*st vorm* ✓ $1 - \sin^2 x$ ✓ $\sin x = ½$ or $\sin x = 2$ ✓ no soln ($\sin x = 2$) ✓ 30° ; 150° ✓ $k.360,\ k \in Z$ (6)
5.3	$\frac{\sin x. - \sin x}{\cos^2 x}$ $= \frac{-\sin^2 x}{\cos^2 x}$ = -tan x	✓ sin x ✓ -sin x ✓ $\cos^2$ x ✓ $\frac{-\sin^2 x}{\cos^2 x}$ ✓ tan x (5)
5.4	$\frac{\sin^2 x + (1 + \cos x)^2}{\sin x(1 + \cos x)}$ $\frac{\sin^2 x + 1 + 2\cos x + \cos^2 x}{\sin x(1 + \cos x)}$ $\frac{2 + 2\cos x}{\sin x(1 + \cos x)}$ $\frac{2(1 + \cos x)}{\sin x(1 + \cos x)}$ $\frac{2}{\sin x}$	✓ numerator / *teller* ✓ denominator / *noemer* ✓ expansion / uitbreiding ✓ simplification / *vereenvoudiging* ✓ factorisation / *faktorisering* (5)
		[23]
QUESTION/*VRAAG* 6: [11]		
6.1	$b^2 = a^2 + c^2 - 2ac\cos B$	✓ $a^2 + c^2$ ✓ $2ac\cos B$ (2)
6.2.1	$\frac{PS}{RS} = \tan P\hat{R}S$ $PS = RS.\tan 65°$ $PS = 158.\tan 65°$ PS = 338,83	✓ Ratio for *tan/verhou. vir tan* ✓ substitution 65°/*verv van 65°* ✓ answer/*antwoord* (3)
6.2.1	In ΔPQS $SQ^2 = PS^2 + PQ^2 - 2PS.SQ.\cos 30°$ $= 338{,}83^2 + 1\,500^2 - 2(338{,}83)(1500).\cos 30°$ = 1484499,606 SQ = 1218,40 m^2	✓use of cos formula/*gebruik van cos formule* ✓Substitution/*vervang* ✓ SQ (3)

6.2.3	In ΔRSQ: $\frac{RS}{SQ} = \tan\theta$ $\tan\theta = \frac{158}{1218{,}40}$ $\tan\theta = 0{,}129678266666$ $\theta = 7{,}39$	✓ $\frac{RS}{SQ} = \tan\theta$ ✓ $\tan\theta$ ✓ value of θ/*waarde van* θ (3)
6.2.4	Area of ΔSPQ = ½ SP.PQ.sin$\widehat{P}$ = ½ (338,83)(1 500)sin 30° =127061,25 m^2	✓ correct formula / *korrekte formule* ✓substitute / vervang (338,83), (1500) ✓ Sin 30^0 ✓answer / *antwoord* (4)
		[15]

QUESTION/*VRAAG* 7: [12]		
7.1		*f* ✓ asymtotes / *asimptote* ✓min value / *min waarde* ✓ max value / *maks waarde* *g* ✓ (-45°; -1) ✓ (45°; 1) ✓(135° ; -1) (6)
7.2	$x \in (-45; 0) \cup (45; 90) \cup (135; 180)$	✓-45 ✓45 ✓0 ✓90 ✓135 ✓180 (6)
7.3	90°	✓ answer / *antwoord* (1)
		[13]

QUESTION/*VRAAG* 8: [8]		
8.1	bisects the chord.	✓ answer/*antwoord* (1)
8.2.1	$OD^2 = OF^2 + DF^2$ (Pythagoras) $= 3^2 + 4^2$ (substitution/*vervang*) $= 25$ $OD = 5\ cm$	✓$OD^2 = OF^2 + DF^2$ ✓ method/*metode* ✓ answer/*antwoord* (3)
8.2.2	$AE^2 = AO^2 - OE^2$ (Pythagoras) $AE^2 = 5^2 - 4^2$ (substitution/*vervang*) $AE^2 = 9$ $AE = 3$ cm But AB = 2AE (OE ⊥ AB) AB = 2(3) = 6 cm	✓$AE^2 = AO^2 - OE^2$ method/*metode* ✓$AE = 3\ cm$ ✓ S/R ✓ answer/*antwoord* (4)
		[8]
QUESTION/*VRAAG* 9: [13]		
9.1	 CONSTR: Join CO, extend to D PROOF: In ΔAOC i) $\hat{O}_1 = \hat{A}_1 + \hat{C}_1$ (ext ∠ of Δ/*buitehoek van* Δ) ii) $\hat{O}_2 = \hat{B}_2 + \hat{C}_2$ (ext ∠ of Δ/*buitehoek van* Δ) iii) $\hat{O}_1 = 2\hat{C}_1$ (AO = OC) iv) $\hat{O}_2 = 2\hat{C}_2$ (BO = OC) ∴ $\hat{O}_1 + \hat{O}_2 = 2\hat{C}_1 + 2\hat{C}_2$ ∴ $A\hat{O}C = 2(\hat{C}_1 + \hat{C}_2)$ $= 2A\hat{C}B$	✓ construction/*konstr* ✓ S/R ✓ S/R ✓ S/R ✓ S/R ✓ conclusion / *gevolgtrekking* (6)
9.2.1	$\hat{D}_1 = 25°$ (radii equal/*radiusse gelyk*)	✓ S ✓R (2)
9.2.2	$\hat{O}_1 = 50°$ (ext ∠ of Δ/buitehoek van Δ)	✓ S ✓R (2)
9.2.3	$\hat{A}_1 = 25°$ (angles in same segment/ *hoeke in dieselfde segment)*	✓ S ✓R (2)
9.2.4	$\hat{E} = 155°$ (opp angles of cyclic quad/ *teenoorstaande hoeke van 'n koordevierhoek)*	✓ S ✓R (2)
		[14]

QUESTION/*VRAAG* 10: [6]		
10.1	$\hat{B}_1 = \hat{C}_2 = x$ (angles in the same segment/ *hoeke in dieselfde segment*) $\hat{B}_2 = \hat{C}_1 = x$ (tan chord/*tan koord)*	✓ S ✓R ✓ S ✓R (4)
10.2	$\hat{C}_1 = \hat{C}_2$ (both equal to *x/albei gelyk aan x)* ∴ DC *bisects/halveer* AĈF	✓S/R ✓ conclusion / *gevolgtrekking* (2)
		[6]
QUESTION/*VRAAG* 11 [11]		
11.1	Are supplementary **OR** add to 180°.	✓ answer/*antwoord* (1)
11.2.1	$\hat{C}_2 = \hat{A}$ (Ext ∠ of cyclic quad/*buitehoek van koordevhk*) $\hat{A} = \hat{D}_3 = x$ (corresponding angles, AB ‖ DC/ *Ooreenkomstige hoeke AB ‖ DC)* ∴ MC = MD (base angles of Δ equal/*basis hoeke van Δ gelyk)*	✓S ✓ R ✓S ✓ R ✓ R (5)
11.2.2	$\hat{M} = 180° - 2x$ (angles of Δ/*hoeke van Δ)*	✓S ✓R (2)
11.2.3	$\hat{O}_1 = 2x$ (∠ at centre = 2∠ at circumference/ ∠ *by middle = 2∠ by omtreks)* $\hat{M} + \hat{O}_1 = 180°$ ∴ *BODM is a cyclic quad.* ∴ *BODM is koordevierhoek*	✓S ✓ R ✓ S (3)
		[11]
QUESTION/*VRAAG* 12 [11]		
12.1	$Sh^2 = 8^2 + 3^2$ (Pythagoras) $Sh^2 = 64 + 9$ (substitution/*vervang*) $Sh = \sqrt{73}$ = 8,54 cm	✓ S ✓ method/*metode* ✓ answer/antwoord (3)
12.2	Area of Δ face = $\frac{1}{2}b.h$ = $\frac{1}{2}(6)(\sqrt{73})$ = 25,63 cm^2	✓ formula/*formule* ✓ substitution/*vervang* ✓answer/*antwoord* (3)
12.3	TSA = area of slanted faces + area of right prism *TBO = oppervlakte van skuinsvlakke + oppervlakte van reghoekige prisma* = 3(25,63) + 6^2 + 4(6 x 12) = 76,89 + 36 + 288 = 400,89 cm^2	✓✓ TSA ✓✓ substitute/*vervang* ✓ answer/*antwoord* (5)
		[11]
		TOTAL/*TOTAAL*: 150