



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.
- Aannee van antwoorde/waardes om 'n probleem op te los, is Onaanvaarbaar.

QUESTION/VRAAG 1: [12]																				
1.1	<table><tr><th>Height (cm) <i>Hoogte (cm)</i></th><th>Frequency <i>Frekwensie</i></th><th>Cumulative frequency <i>Kumulatiewe frekwensie</i></th></tr><tr><td>$150 < x \leq 155$</td><td>4</td><td>4</td></tr><tr><td>$155 < x \leq 160$</td><td>22</td><td>26</td></tr><tr><td>$160 < x \leq 165$</td><td>56</td><td>82</td></tr><tr><td>$165 < x \leq 170$</td><td>32</td><td>114</td></tr><tr><td>$170 < x \leq 175$</td><td>6</td><td>120</td></tr></table>	Height (cm) <i>Hoogte (cm)</i>	Frequency <i>Frekwensie</i>	Cumulative frequency <i>Kumulatiewe frekwensie</i>	$150 < x \leq 155$	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)
Height (cm) <i>Hoogte (cm)</i>	Frequency <i>Frekwensie</i>	Cumulative frequency <i>Kumulatiewe frekwensie</i>																		
$150 < x \leq 155$	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																		
1.2	Ogive/Ogief	✓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 Q₁ = 160,5 Q₂ = 163 Q₃ = 166 Max = 175	✓ 150 ✓160,5 ✓ 163 ✓166 ✓175 (5)																		
1.4	Skewed to the left / Skeefgetrek na links.	✓ answer/antwoord (1)																		
			[12]																	

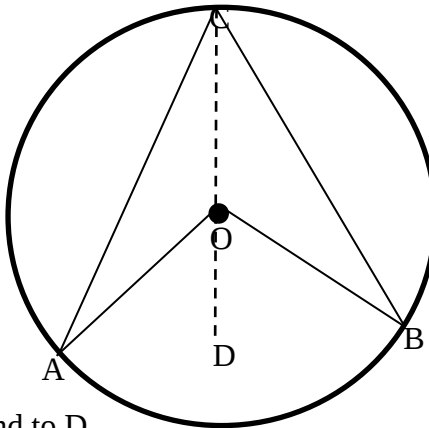
QUESTION/VRAAG 2 [7]		
2.1	$\bar{x} = \frac{2250+2250+3000+3300+3300+3300+3600+3900+4350+4350+5250}{10}$ $\bar{x} = \frac{35550}{10}$ $= R3\ 555$	$\checkmark \frac{35550}{10}$ $\checkmark \text{ answer/antwoord} \quad (2)$
2.2	$\sigma = R\ 900,12$	$\checkmark \text{ answer/antwoord} \quad (1)$
2.3	$(3555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

QUESTION/VRAAG 4: [13]		
4.1	$m_{NQ} = \frac{-12}{-6}$ $= 2$	✓ answer/antw (1)
4.2	$M_{NQ} \times M_{MP} = -1 \quad [NQ \perp MP]$ $m_{MP} = -\frac{1}{2}$	✓ answer/antw (1)
4.3	$m_{MP} = -\frac{1}{2}$ $\tan \theta = -\frac{1}{2}$ $Ref = 26,57^\circ$ $\theta = 180^\circ - 26,57^\circ$ $\theta = 153,43^\circ$	✓ $m_{MP} = -\frac{1}{2}$ ✓ $\tan \theta = -\frac{1}{2}$ ✓ 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	$\tan \theta = 3$ $\theta = 71,57^\circ$	✓ $\tan \theta$ ✓ 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	$\cos(180^\circ + \theta) = -\cos \theta$ $= -\frac{1}{\sqrt{10}}$	✓ $-\cos \theta$ ✓ answer/antwoord (2)
ANSWER ONLY FULL MARKS/ SLEGS ANTWOORD:VOLPUNTE		

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

6.2.3	In $\triangle RSQ$: $\frac{RS}{SQ} = \tan \theta$ $\tan \theta = \frac{158}{1218,40}$ $\tan \theta = 0,129678266666$ $\theta = 7,39$	$\checkmark \frac{RS}{SQ} = \tan \theta$ $\checkmark \tan \theta$ $\checkmark$ value of θ /waarde van θ (3)
6.2.4	Area of $\triangle SPQ = \frac{1}{2} SP \cdot PQ \cdot \sin \hat{P}$ $= \frac{1}{2} (338,83)(1\,500) \sin 30^\circ$ $= 127061,25 \text{ m}^2$	$\checkmark$ correct formula / korrekte formule $\checkmark$ substitute / vervang $(338,83), (1500)$ $\checkmark \sin 30^\circ$ $\checkmark$ answer / antwoord (4)
[15]		

QUESTION/VRAAG 7: [12]		
7.1		f $\checkmark$ asymptotes / asimptote $\checkmark$ min value / min waarde $\checkmark$ max value / maks waarde g $\checkmark (-45^\circ; -1)$ $\checkmark (45^\circ; 1)$ $\checkmark (135^\circ; -1)$
7.2	$x \in (-45; 0) \cup (45; 90) \cup (135; 180)$	$\checkmark -45$ $\checkmark 45$ $\checkmark 0$ $\checkmark 90$ $\checkmark 135$ $\checkmark 180$ (6)
7.3	90°	$\checkmark$ 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) $= 25$ $OD = 5 \text{ cm}$	✓ $OD^2 = OF^2 + DF^2$ ✓ method/metode ✓ answer/antwoord (3)
8.2.2	$AE^2 = AO^2 - OE^2$ (Pythagoras) $AE^2 = 5^2 - 4^2$ (substitution/vervang) $AE^2 = 9$ $AE = 3 \text{ cm}$ But $AB = 2AE$ ($OE \perp AB$) $AB = 2(3)$ $= 6 \text{ cm}$	✓ $AE^2 = AO^2 - OE^2$ method/metode ✓ $AE = 3 \text{ cm}$ ✓ S/R ✓ answer/antwoord (4)
[8]		
QUESTION/VRAAG 9: [13]		
9.1	 CONSTR: Join CO, extend to D PROOF: In $\triangle AOC$ i) $\hat{O}_1 = \hat{A}_1 + \hat{C}_1$ (ext $\angle$ of $\triangle$/buitehoek van $\triangle$) ii) $\hat{O}_2 = \hat{B}_2 + \hat{C}_2$ (ext $\angle$ of $\triangle$/buitehoek van $\triangle$) iii) $\hat{O}_1 = 2\hat{C}_1$ ($AO = OC$) iv) $\hat{O}_2 = 2\hat{C}_2$ ($BO = OC$) $\therefore \hat{O}_1 + \hat{O}_2 = 2\hat{C}_1 + 2\hat{C}_2$ $\therefore \hat{AOC} = 2(\hat{C}_1 + \hat{C}_2)$ $= 2\hat{ACB}$	✓ construction/konstr ✓ S/R ✓ S/R ✓ S/R ✓ S/R ✓ conclusion / gevolgtrekking (6)
9.2.1	$\hat{D}_1 = 25^\circ$ (radii equal/radiusse gelyk)	✓ S ✓ R (2)
9.2.2	$\hat{O}_1 = 50^\circ$ (ext $\angle$ of $\triangle$ /buitehoek van $\triangle$)	✓ S ✓ R (2)
9.2.3	$\hat{A}_1 = 25^\circ$ (angles in same segment/ hoeke in dieselfde segment)	✓ S ✓ R (2)
9.2.4	$\hat{E} = 155^\circ$ (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)	$\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ R	(4)
10.2	$\hat{C}_1 = \hat{C}_2$ (both equal to x /albei gelyk aan x) $\therefore$ DC bisects/halveer $\hat{A}\hat{C}\hat{F}$	$\checkmark$ S/R $\checkmark$ conclusion / gevolgtrekking	(2)
			[6]
QUESTION/VRAAG 11 [11]			
11.1	Are supplementary OR add to 180° .	$\checkmark$ answer/antwoord	(1)
11.2.1	$\hat{C}_2 = \hat{A}$ (Ext $\angle$ of cyclic quad/buitehoek van koordevhk) $\hat{A} = \hat{D}_3 = x$ (corresponding angles, $AB \parallel DC$ / Ooreenkomstige hoeke $AB \parallel DC$) $\therefore MC = MD$ (base angles of Δ equal/basis hoeke van Δ gelyk)	$\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ R $\checkmark$ R	(5)
11.2.2	$\hat{M} = 180^\circ - 2x$ (angles of Δ /hoeke van Δ)	$\checkmark$ S $\checkmark$ R	(2)
11.2.3	$\hat{O}_1 = 2x$ ($\angle$ at centre = $2 \angle$ at circumference/ $\angle$ by middle = $2 \angle$ by omtreks) $\hat{M} + \hat{O}_1 = 180^\circ$ $\therefore BODM$ is a cyclic quad. $\therefore BODM$ is koordevierhoek	$\checkmark$ S $\checkmark$ R $\checkmark$ S	(3)
			[11]
QUESTION/VRAAG 12 [11]			
12.1	$Sh^2 = 8^2 + 3^2$ (Pythagoras) $Sh^2 = 64 + 9$ (substitution/vervang) $Sh = \sqrt{73}$ $= 8,54 \text{ cm}$	$\checkmark$ S $\checkmark$ method/metode $\checkmark$ answer/antwoord	(3)
12.2	Area of Δ face $= \frac{1}{2} b \cdot h$ $= \frac{1}{2} (6)(\sqrt{73})$ $= 25,63 \text{ cm}^2$	$\checkmark$ formula/formule $\checkmark$ substitution/vervang $\checkmark$ answer/antwoord	(3)
12.3	TSA = area of slanted faces + area of right prism TBO = oppervlakte van skuinsvlakke + oppervlakte van reghoekige prisma $= 3(25,63) + 6^2 + 4(6 \times 12)$ $= 76,89 + 36 + 288$ $= 400,89 \text{ cm}^2$	$\checkmark\checkmark$ TSA $\checkmark\checkmark$ substitute/vervang $\checkmark$ answer/antwoord	(5)
			[11]
			TOTAL/TOTAAL: 150