basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 10

MATHEMATICS P2/*WISKUNDE V2*

NOVEMBER 2016

MEMORANDUM

MARKS/*PUNTE*: 100

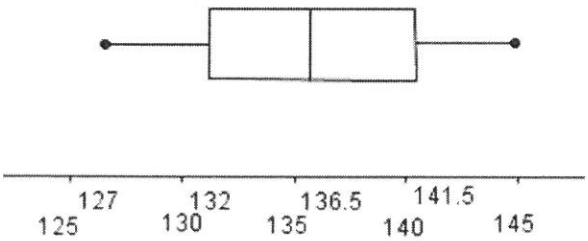
This memorandum consists of 15 pages.
Hierdie memorandum bestaan uit 15 bladsye.

8 Nov 2016

NOTE:
- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking memorandum.
- Assuming values/answers in order to solve a problem is unacceptable.

LET WEL:
- *As 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord deurgehaal en nie oorgedoen het nie, sien die deurgehaalde antwoord na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die memorandum van toepassing.*
- *Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.*

QUESTION 1/*VRAAG 1*

1.1	Median/*Mediaan* $= \frac{136+137}{2}$ $= 136,5$	✓ answer/*antwoord* (1)
1.2.1	Mean/*Gemiddelde* $= \frac{2728}{20}$ $= 136,4$ cm	✓ 2728 ✓ answer/*antwoord* Answer only/ *slegs antw* 2/2 (2)
1.2.2	Range/*Variasiewydte* = 145 – 127 = 18 cm	✓ answer/*antwoord* (1)
1.2.3	Lower quartile/*Onderste kwartiel* = 132 Upper quartile/*Boonste kwartiel* $= 141\frac{1}{2}$ Interquartile range/*IKO* $= 141\frac{1}{2} - 132$ = 9,5 cm	✓ Lower quartile/*Onderste kwartiel* ✓ Upper quartile/*Boonste kwartiel* ✓ answer/*antwoord* Answer only full marks *Slegs antw volpunte* (3)
1.3		✓ median/min/max/ *mediaan/min/maks* ✓Q_1 and/ *en* Q_3 CA from 1.1 & 1.2.3 *VA vanaf 1.1 & 1.2.3* (2) **[9]**

QUESTION 2/*VRAAG 2*

2.1	Modal class(*Module klas*) $100 \leq x < 110$	✓ answer/*antwoord* Do not penalise notation *Notasie word nie gepenaliseer nie* (1)
2.2	$110 \leq x < 120$	✓✓answer/*antwoord* Note: if learner identifies position of median only: 1/2 *Nota: Indien leerder slegs posisie van mediaan bepaal: 1/2* (2)
2.3	Estimate Mean IQ of students/*Geskatte gemiddelde IK* $= \frac{3480}{30}$ $= 116$	✓ 3480 ✓ 30 ✓ answer/*antwoord* CA on numerator only *VA slegs vir teller* Answer only/ *Slegs antw* 3/3 (3) **[6]**

QUESTION 3/*VRAAG 3*

3.1	AB $= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(3-1)^2 + (6-1)^2}$ $= \sqrt{29}$ AC $= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(6-1)^2 + (3-1)^2}$ $= \sqrt{29}$ AB = AC ∴ ΔABC is isosceles/*gelykbenig*	✓corr. subst. in corr. formula/*vervang in korrekte formule* ✓ distance/*afstand* AB ✓subst. in corr. formula/*vervang in korrekte formule* ✓AB = AC or / *of* ΔABC is isosceles / *gelykbenig* Wrong formula 0/4 marks *Verkeerde formule 0/4* (4)
3.2.1	AD is parallel to the *x*-axis/*AD parallel aan x-as* ∴ A and D have the same *y*-coordinates/*A en D het dieselfde*	

	y-koördinate But / *maar* AD = 5 units/*eenhede* ∴ D(8 ; 5) CD is perpendicular to the *x*-axis/*CD is loodreg op x-as* ∴ C and D have the same *x*-coordinate/*C en D het dieselfde x-koördinate* But C lies on the *x*-axis./*C lê op die x-as* ∴ C(8 ;0) **Or any other valid explanation / *of enige ander geldige rede***	✓explaining x-coordinate/ *x-koördinaat verduidelik* ✓explaining y-coordinate/ *y-koördinaat verduidelik* (2)

3.2.2	P is midpoint of AC the diagonals of the kite/ *P is middelpunt van AC, die hoeklyne van die vlieër* $\therefore$ P $\frac{3+8}{2}$; $\frac{5+0}{2}$ P ($\frac{11}{2}$; $\frac{5}{2}$)	✓ *x*-value/*waarde* ✓ *y*-value/*waarde* (2)
3.2.3.	B(–1 ; –4) D(8 ; 5) $m_{BD} = \frac{5+4}{8+1}$ $= 1$	✓ substitution/*vervang* ✓answer/*antwoord* Answer only 2/2 *Slegs antw 2/2* (2)
3.2.4	A(3 ; 5) & C(8 ; 0) AC = $\sqrt{(0-5)^2 + (8-3)^2}$ $= \sqrt{50}$ or/*of* $5\sqrt{2}$ or/*of* 7,07	✓ substitution/*vervang* ✓ answer/*antwoord* (2)
3.2.5	B(–1 ; –4) & D(8 ; 5) BD = $\sqrt{(5+4)^2 + (8+1)^2}$ $= \sqrt{162}$ Area = $\frac{1}{2}$ (BD.AC) $= \frac{1}{2}(\sqrt{162} \cdot \sqrt{50})$ $= 45$ OR / *OF* B(–1 ; –4) & D(8 ; 5) BD = $\sqrt{(5+4)^2 + (8+1)^2}$ $= \sqrt{162}$ A(3 ; 5) & P(5,5 ; 2,5) AP = $\sqrt{(3-5{,}5)^2 + (5-2{,}5)^2}$ $= \frac{5\sqrt{2}}{2}$ Area ADCB = area ΔABD + area ΔCBD = 2 (0,5 X BD X AP) = $2(\frac{1}{2} \times \sqrt{162} \times \frac{5\sqrt{2}}{2})$ = 45	✓ length/*lengte* BD ✓ substitution in corr formula/ *vervang in korr formule* ✓ answer/*antwoord* correct area formula only 1/3 *slegs korrekte areaformule 1/3* (3) **OR/*OF*** ✓ length/*lengte* BD ✓ length/*lengte* AP ✓ answer/*antwoord* (3) **[15]**

QUESTION 4/*VRAAG 4*

4.1.1(a)	$\frac{b}{c}$	✓ answer/*antwoord* (1)
4.1.1(b)	$\frac{a}{b}$	✓ answer/*antwoord* (1)
4.1.1(c)	$\frac{b}{c}$	✓✓ answer/*antwoord* 0 or / *of* 2 marks /*punte* (2)
4.1.2	$\tan\theta = \frac{a}{b}$ $\tan 50° = \frac{5}{b}$ $\therefore b = \frac{5}{\tan 50°}$ $b = 4{,}20$	✓ correct subst in ratio/ *korr subst in verhouding* ✓ *b* value/*waarde* (penalise for rounding off only in this question) (*afronding word slegs in hierdie vraag gepenaliseer)* (2)
4.2	$2\text{cosec } 38{,}2° + \cos 3(146{,}4°)$ $= 2(\frac{1}{\sin 38.2º}) + \cos 3(146{,}4°)$ $= 3{,}42$	✓ $(\frac{1}{\sin 38.2º})$ or/*of* 2(1,617) or/*of* 3,234 ✓✓ answer accurate/ *antwoord akkuraat* [Answer only – full marks] *[Slegs antwoord – volpunte]* (3)
4.3	$\frac{\sin 45° . \tan^2 60°}{\cos 45°}$ $\frac{(\frac{1}{\sqrt{2}})(\frac{\sqrt{3}}{1})(\frac{\sqrt{3}}{1})}{\frac{1}{\sqrt{2}}}$ $\frac{\frac{3}{\sqrt{2}}}{\frac{1}{\sqrt{2}}}$ $\frac{3}{\sqrt{2}} \cdot \frac{\sqrt{2}}{1}$ 3	✓ $\frac{1}{\sqrt{2}} / \frac{\sqrt{2}}{2}$ ✓ $\frac{\sqrt{3}}{1}$ ✓ $\frac{1}{\sqrt{2}} / \frac{\sqrt{2}}{2}$ (denominator / *noemer*) ✓answer/*antwoord* **Answer only/ *Slegs antw 0/4*** (4)
4.4	$\cos\beta = \frac{3}{5}$ $y^2 = 5^2 - 3^2$	✓ $\cos\beta = \frac{3}{5}$ ✓application Pyth. Th. *toepassing van Pyth. St.*

	$y = 4$ $\therefore \cot\alpha = \frac{4}{3}$ **OR/*OF*** $\cos\beta = \frac{3}{5}$ $\beta = 53{,}13^{o}$ $\propto = 36{,}87^{o}$ $cot \propto = \frac{1}{tan36{,}87^{\circ}} = 1{,}33$	Or reason/ *of rede Pyth* ✓ $y = 4$ ✓answer/*antwoord* (4) ✓ $\cos\beta = \frac{3}{5}$ ✓ value of / *waarde van* β ✓ value of/*waarde van* $\propto$ ✓ answer / *antw* (4) [17]

QUESTION 5/*VRAAG 5*

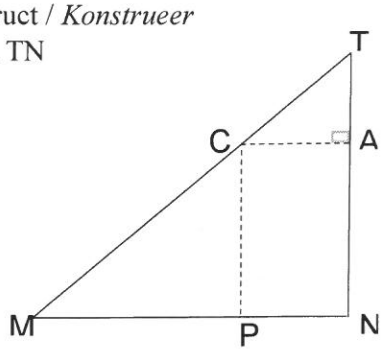
5.1.1	In ΔAMN $\tan \hat{M} = \frac{AN}{MN}$ $\tan 21° = \frac{AN}{15}$ $AN = 15.\tan 21°$ AN = 5,76 units/*eenhede*	✓ $\tan \hat{M} = \frac{AN}{MN}$ ✓ substitute/*vervang* ✓answer/*antwoord* (3)
5.1.2	PN = 2 (5,76) = 11,52 $\tan \hat{M} = \frac{PN}{MN}$ $= \frac{11,52}{15}$ $\hat{M} = 37,52°$ $\therefore P\hat{M}N = 37,52°$	✓ PN =11,52 ✓$\tan \hat{M} = \frac{11,52}{15}$ ✓ answer/*antwoord* (3)
5.1.3	$\sin 37,52 = \frac{11,52}{MP}$ $MP = \frac{11,52}{\sin 37,52}$ MP = 18,92 (accept 18,91 also / *aanvaar ook 18,91*) **OR/*OF*** $MP^2 = 15^2 + 11,52^2$ *Pyth* MP = 18,91 **ANY OTHER VALID METHOD/** ***ENIGE ANDER GELDIGE METODE***	✓ $\sin 37,52° = \frac{11,52}{MP}$ ✓ MP subject/*onderwerp* ✓answer/*antwoord* (3) ✓ using Pyth *gebruik* ✓ subst ✓answer/*antw* (3)
5.2	$2\sin(\theta + 15°) = 1,462$ $\sin(\theta + 15°) = 0,731$ $\therefore \theta + 15° = 46,97°$ $\theta = 46,97° - 15°$ $\theta = 31,97°$	✓0,731 ✓46,97° ✓answer/*antwoord* Answer only /*slegs antw* 3/3 (3) **[12]**

QUESTION 6/*VRAAG 6*

6.1	$a = 2$	✓answer/*antwoord* (1)
6.2	Period/*periode* $f = 360°$	✓answer/*antwoord* (1)
6.3	$y \in [0 ; 2]$ or / *of* $0 \leq y \leq 2$	✓0 and 2 ✓notation / *notasie* (2)
6.4	$0° < x < 180°$	✓critical values/ *kritiese waardes* ✓correct inequalities / *korrekte ongelykhede* (2)
6.5	$y = -\cos x - 1 + 2$ $= -\cos x + 1$	✓ $-\cos x - 1$ ✓ $+ 2$ OR /*OF* ✓ ✓ answer/*antwoord* Answer only *Slegs antw* 2/2 (2) **[8]**

QUESTION 7/*VRAAG 7*

7.1	$\frac{LM}{3100} = tan\beta = 0,21$ $\therefore\ LM = 3100 \times 0,21 = 651\ m$ $\frac{TN}{3100} = tan\theta = 0,35$ $\therefore\ TN = 3100 \times 0,35 = 1085\ m$ $\frac{LM}{TN} = \frac{651}{1085} = \frac{3}{5}$ **OR / *OF*** $\tan\beta = \frac{LM}{MN} = 0,21 \qquad \tan\theta = \frac{TN}{MN} = 0,35$ $\frac{LM}{MN} \div \frac{TN}{MN} = \frac{0,21}{0,35}$ $\frac{LM}{TN} = \frac{0,21}{0,35}$ $= \frac{3}{5}$ ∴ LM : TN 3 : 5	✓ $\frac{LM}{3100} = tan\beta = 0,21$ ✓ 651m ✓ 1085m ✓ answer/ *antwoord* ✓ $\tan\beta = \frac{LM}{MN}$ ✓ $\tan\theta = \frac{TN}{MN}$ ✓ $\frac{LM}{MN} \div \frac{TN}{MN} = \frac{0,21}{0,35}$ ✓ answer/*antw* LM : TN (4)
7.2.1	$tan\theta = 0,35$ $\theta = 19,29°$ ∴ $\hat{MTN} = 70,71°$	✓ $\theta = 19,29°$ ✓ answer/ *antwoord* (2)
7.2.2	$\cos 19,29° = \frac{3100}{TM}$ TM = 3284,39 CM = 2884,39 ∴ $\sin 19,29° = \frac{CP}{2884,39}$ ∴ CP = 2884,39(sin 19,29°) CP = 952,86 m	✓ $\cos 19,29° = \frac{3100}{TM}$ ✓ TM = 3284,39 ✓ CM = 2884,39 ✓ $\sin 19,29° = \frac{CP}{2884,39}$ ✓ answer/ *antwoord* (5)

	OR / *OF* Construct / *Konstrueer* CA ⊥ TN  	✓ construction of CA *Konstrueer CA*
	In Δ TAC : $\frac{TA}{400} = \cos 70{,}0995 \ldots$	✓ $\frac{TA}{400} = \cos 70{,}0995 \ldots$
	$\therefore\ TA = 400 \cos 70{,}0995 \ldots = 132{,}14 \ldots .$	✓ 132,14
	Then CP = 1085 − 132,14... = 952,86 m	✓ subtracting / *aftrek* ✓ answer / *antw* (4) **[11]**

QUESTION 8/ *VRAAG 8*

8.1	is a parallelogram/*is 'n parallelogram*	✓answer/*antwoord* (1)
8.2	In Δ ABD and/*en* Δ CDB $\hat{D}_1 = \hat{B}_2$ [alt. angles/ *verw. hoek* ,AD ∥ BC] $\hat{B}_1 = \hat{D}_2$ [alt. angles/ *verw. hoek* ,AB ∥ DC] BD = BD [common side/ *dieselfde sy*] ∴ Δ ABD ≡ Δ CDB [A,A,S] ∴ AB = DC, AD = BC	✓S ✓R ✓S/R ✓S/R ✓S/R ✓S Penalise once for leaving out ∥ lines in reason *Penaliseer slegs een keer vir* ∥ *lyne in rede* (6)
8.3.1	Let/*Laat* $\hat{N}_{1=}\ \hat{N}_{2=}\ x$ [ON bisects/*halveer* $\hat{KNM}$] Let/*Laat* $\hat{M}_{1=}\ \hat{M}_{2=}\ y$ [OM bisects/*halveer* $\hat{NMP}$] ∴ $2x + 2y = 180°$ [co-int./*ko-bin. hoek* KN ∥ PM] ∴ $x + y = 90°$ $\hat{O}_2 + x + y = 180°$ [int. angles of/*binnehoeke van* Δ] ∴ $\hat{O}_2 + 90° = 180°$ ∴ $\hat{O}_2 = 90°$	✓S/R ✓S/R ✓substitution/*vervang* $(x + y = 90°)$ (3)
8.3.2	$\hat{N}_2 = \hat{O}_1$ [alt. angle/*verw. hoek* KP ∥ NM] $\hat{O}_1 = \hat{N}_1$ ∴ $KO = KN$ [opp. Angles =/*oorst hoeke* =] $\hat{O}_3 = \hat{M}_1$ [alt angle/*verw.* KP ∥ MN] $\hat{O}_3 = \hat{M}_2$ ∴ $OP = PM$ [sides opp. = angles] *[sye oor. = hoeke]* But/*Maar* KN = PM [opp. sides =/*oor sye* =] ∴ KO = OP ∴ O is the midpoint/*middelpunt*	✓ S/R ✓ S ✓ S/R ✓ S/R ✓ S/R ✓ S (6) **[16]**

QUESTION 9/*VRAAG 9*

9.1	half the length of /*die helfde van die lengte van*	✓ half /*helfte* (1)
9.2	AB ∥ QR [line joining midpoint or midpoint theorem] [*lyn deur middelpunte of middelpuntstelling*] AB = $\frac{1}{2}$ QR [line joining midpoint] [*lyn deur middelpunte*] DE ∥ QR [line joining midpoint/*lyn deur middelpunte*] DE = $\frac{1}{2}$ QR ∴ AB ∥ DE and/*en* AB = DE ∴ ADEB is a parm. [one pair of opp. sides = and ∥] *[een paar teenoorstande sye = en ∥]*	✓R ✓S/R ✓S ✓S (both/*albei*) ✓ R (5) **[6]**

TOTAL/*TOTAAL*: 100