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PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

NATIONAL SENIOR CERTIFICATE/ NASIONALE SENIOR SERTIFIKAAT

GRADE/GRAAD 12

MATHEMATICS PAPER 2/ WISKUNDE VRAESTEL 2

SEPTEMBER 2017

MEMORANDUM

MARKS/ PUNTE: 150

This memo consists of 14 pages.
Hierdie memo bestaan uit 14 bladsye.

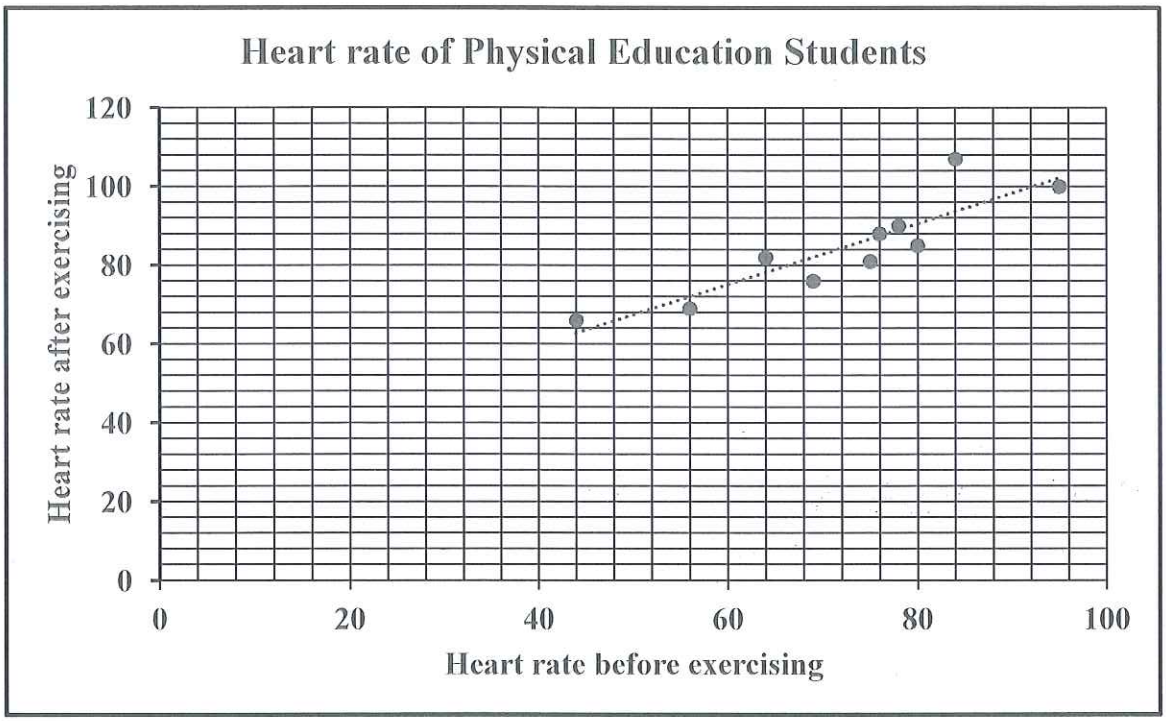
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QUESTION/*VRAAG 1*

1.1	$\tilde{x} = 16{,}52$	✓✓ (2)
1.2.1	Median/mediaan = 17	✓✓ (2)
1.2.2	$\delta x = 4{,}98$	✓✓ (2)
1.3	(11,54 ; 21,5) 11 learners will lie outside one standard deviation of the mean/ 11 leerders*srs lê buite een standaardafwyking van die gemiddeld.*	✓✓ boundaries/*grense* ✓ 11 (3)
1.4	It will have no effect./ *Dit sal geen effek hê nie.*	✓ (1)
		[10]

QUESTION/*VRAAG 2*



✓3 points correct/*punte korrek* ✓6 points correct /*punte korrek*
✓ALL the points correct/*AL die punte korrek* (3)

2.2	$a = 28{,}61$ $b = 0{,}77$ $\hat{y} = 28{,}61 + 0{,}77x$	✓a = 28,61 ✓b = 0,77 ✓equation/ *vergelyking* (3)
2.3	Refer to diagram./ verwys na diagram	✓ (0 ; 29) ✓ (72; 84) line should be close to the points above/ *lyn moet naastenby deur die punte gaan*(2)
2.4	$r = 0{,}88$	✓$r = 0{,}88$

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	a strong positive relation./*'n sterk positiewe korrelasie.*	✓strong /*sterk* (2)
		[10]

QUESTION/*VRAAG 3*

3.1.1	M(4; 2)	✓x −value/*waarde* ✓y −value/*waarde* (2)
3.1.2	$m_{AC} = \frac{6+2}{2-6}$ $= -2$	✓substitution/*vervang* ✓$m_{AC} = -2$ (2)
3.1.3	m of perpendicular bisector/*m van middelloodlyn* = $\frac{1}{2}$ $y-2 = \frac{1}{2}(x-4)$ $y = \frac{1}{2}x$	✓$m = \frac{1}{2}$ ✓substitute/*vervang m and en (4;2)* ✓answer /*antwoord* (3)
3.2	LHS/*LK* = 3 RHS/*RK* = $\frac{1}{2} \times 6$ = 3 LHS = RHS./ *LK* = *RK* (6;3) lies on the equation/ *lê op die vergelyking*	✓3 ✓$\frac{1}{2} \times 6$ ✓conclusion/*gevolgtrekking*(3)
3.3.	$m_{AC} = -2$ $y-6 = -2(x-2)$ $y = -2x + 10$	✓$m_{AC} = -2$ ✓substitute/*vervang m and/ en (2;6)* ✓answer /*antwoord* (3)
3.4.1	$\tan\beta = -2$ $\beta = 116,57°$	✓$\tan\beta = -2$ ✓$\beta = 116,57°$ (2)
3.4.2	BC: $y = -\frac{1}{2}x + \frac{1}{2}$ $\tan\theta = -\frac{1}{2}$ $\theta = 153,43°$ $\alpha = 153,43° - 116,57° = 36,86°$	✓$\tan\theta = -\frac{1}{2}$ ✓153,43° ✓36,86° (3)
3.5	P(1; 0) ; Q(5; 0)	✓y = 0 ✓(1;0) ✓ (5; 0) (3)
3.6	area$\Delta PQC = \frac{1}{2}PQ.perp\ h$ $= \frac{1}{2} . 4 . 2$ = 4 squared units/ vierkante eenhede.	✓$\frac{1}{2}PQ.perp\ h$ ✓substitute/ *vervang* ✓answer /*antwoord* (3)
3.7	$(x-2)^2 + (y-6)^2 = (x-6)^2 + (y+2)^2$ $x^2 - 4x + 4 + y^2 - 12y + 36 = x^2 - 12x + 36 + y^2 + 4y + 4$ 8x = 16y $x = 2y$ and /en $y = -2x + 10$ $\therefore y = -2(2y) + 10$	✓centre/ *middelpunt* ✓substitution/*vervang* ✓$r^2 = 20$ ✓equation/*vergelyking* (4)

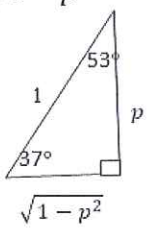
	$5y = 10 \qquad y = 2\ ;\ x = 4$ Centre/ middelpunt : (4; 2) $r^2 = (4-2)^2 + (2-6)^2 = 4 + 16 = 20$ Equation/ vergelyking: $(x-4)^2 + (y-2)^2 = 20$	
		[28]

QUESTION/*VRAAG 4*

4.1	$m_{tangent/raaklyn} = -2$ $m_{radius} = \frac{1}{2}$ (radius ⊥ *chord/ radius ⊥ koord*) $y - (-1) = \frac{1}{2}(x-2)$ $y = \frac{1}{2}x - 2$	✓ $m_{radius} = \frac{1}{2}$ ✓ substitute m and point */vervang m en punt* ✓ equation/ *vergelykng* (3)
4.2	$\frac{1}{2}x - 2 = -2x + 13$ $\frac{5}{2}x = 15$ $x = 6$ $y = -2(6) + 13 = 1$ B(6;1)	✓ equating / *stel gelyk* ✓ $x = 6$ ✓ $y = 1$ (3)
4.3	$r^2 = (6-2)^2 + (1+1)^2 = 20$ $(x-2)^2 + (y+1)^2 = 20$	✓ substitute/ *vervang* ✓ 20 ✓ equation */vergelyking* (3)
4.4	$x^2 - 16x + y^2 - 4y = -63$ $x^2 - 16x + 64 + y^2 - 4y + 4 = -63 + 64 + 4$ $(x-8)^2 + (y-2)^2 = 5$ Centre/middelpunt B(8; 2) r = $\sqrt{5}$ AB = $\sqrt{(8-2)^2 + (2+1)^2}$ = $\sqrt{36+9}$ = $\sqrt{45}$ = $3\sqrt{5}$ = sum of the radii./ som van die radii. Therefore circles touch externally./ *dus raak die sirkels uitwendig*	✓ $(x-8)^2 + (y-2)^2 = 5$ ✓ centre/ *middelpunt* B ✓ r = $\sqrt{5}$ ✓ AB = $3\sqrt{5}$ ✓ r +r = $3\sqrt{5}$ (5)
		[14]

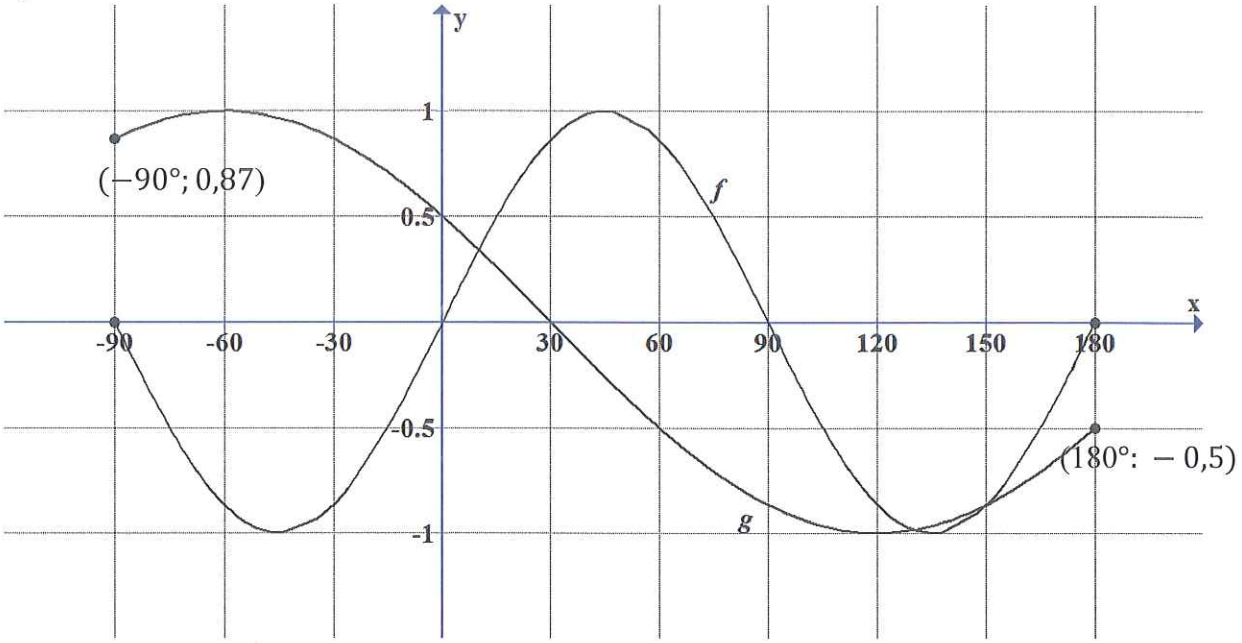
QUESTION/*VRAAG 5*

5.1.1	Sin577° $= -sin37°$ $= -p$	✓ $-sin37$ ✓ $-p$ (2)

5.1.2	$\cos 16°$ $=\cos(53° - 37°)$ $= \cos 53° \cos 37° + \sin 53° \sin 37°$ $= p\sqrt{1-p^2} + \sqrt{1-p^2}.p$ $= 2p\sqrt{1-p^2}$  ALT $\cos 16°$ $= \sin 74°$ $= 2\sin 37° \cos 37°$ $= 2p\sqrt{1-p^2}$	✓ $\cos(53° - 17°)$ ✓ expansion/ *Brei uit* ✓ substitute/*vervang* ✓ answer/ *antwoord* OR ✓✓ $= \sin 74°$ ✓ double angle/*dubbelhoek* ✓ substitute/*vervang* (4)
5.2.1	$\frac{6\sin x.\cos x}{\sin^2 x - \cos^2 x}$ $= \frac{3 \times 2\sin x \cos x}{-\cos 2x}$ $= \frac{3\sin 2x}{-\cos 2x}$ $= -3\tan 2x$	✓ $\sin x$ ✓ $\cos x$ ✓ $\cos^2 x$ ✓ $-\cos 2x$ ✓ $\sin 2x$ ✓ $-3\tan 2x$ (6)
5.2.2	$-3\tan 2 \times 15°$ $-3\tan 30°$ $= -3(\frac{1}{\sqrt{3}})$ $= \frac{-3}{\sqrt{3}}$ or $-\sqrt{3}$	✓ $-3\tan 30°$ ✓ answer/ *antwoord* (2)
		[14]

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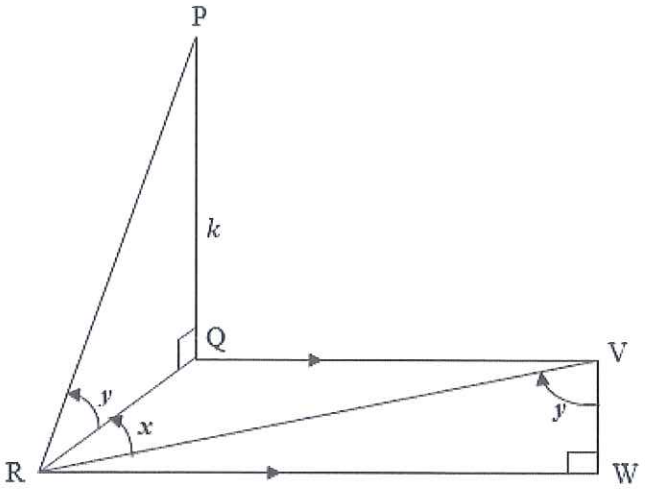
QUESTION/*VRAAG 6*



6.1		✓beginning- end points/ *begin − en einpunte* ✓turning points/draaipunte ✓intercepts/*afsnitte* (3)
6.2	$\sin 2x = \cos(x+60°)$ $\sin 2x = \sin(90° - (x+60°))$ $\sin 2x = \sin(30° - x)$ $2x = 30° - x + k.360°$ $3x = 30° + k.360°$ $x = 10° + k.120°, k \in Z$ OR /OF $2x = 180° - (30° - x) + k.360°$ $x = 150° + k.360°, k \in Z$	✓$\sin(90° - (x+60°))$ ✓$\sin(30° - x)$ ✓$2x = 30° - x + k.360°$ ✓$x = 10° + k.120°, k \in Z$ ✓$2x = 180° - (30° - x) + k.360°$ ✓$x = 150° + k.360°, k \in Z$ (6)
6.3	$10°; 130°; 150°$	✓for 2 correct values/ 2 *waardes korrek* ✓for all values correct/ *AL die waardes korrek* (2)
6.4	$(-90°; 0°) \cup (30°; 90°)$	✓$-90°; 0°$ ✓$30°; 90°$ ✓correct notation/*korrekte notasie* (3)
		[14]

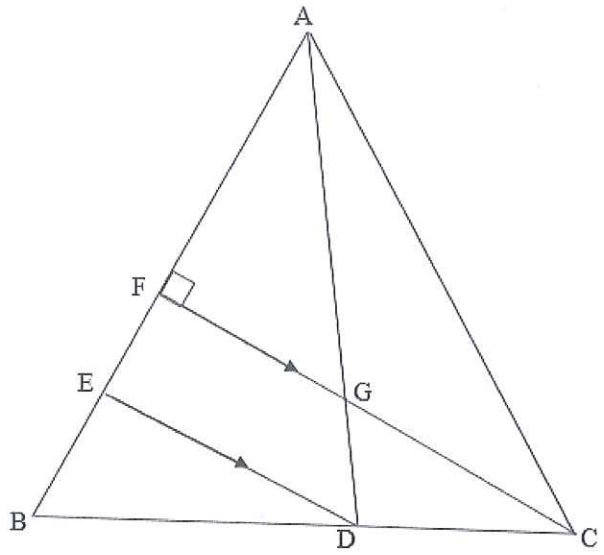
QUESTION/*VRAAG 7*

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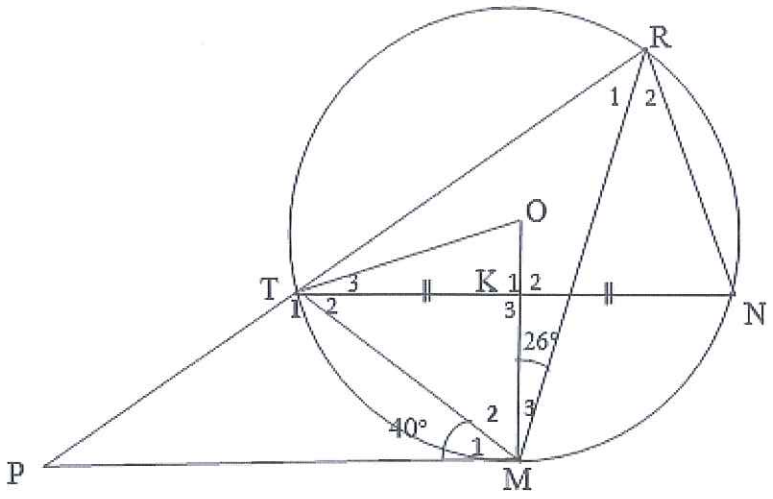
7.1	$V\hat{R}W = 90° - y$ (alt ∠s/verwiselende ∠e QV ∥RW) $Q\hat{V}R = 90° - y$ $R\hat{Q}V + x + 90° - y = 180°$ ($\angle' sof \Delta / \angle van \Delta$) $R\hat{Q}V = 90° - x + y$	✓$V\hat{R}W = 90° - y$✓R ✓$R\hat{Q}V + x + 90° - y = 180°$ (3)
7.2	$\frac{k}{RQ} = \tan y$ $RQ = \frac{k}{\tan y}$	✓$\frac{k}{RQ} = \tan y$ ✓answer/ *antwoord* (2)
7.3	$\frac{VR}{\sin(90° - (x - y))} = \frac{QR}{\sin(90° - y)}$ $VR = \frac{QR.\cos(x-y)}{\cos y}$ $= \frac{\frac{k}{\tan y} \times \cos(x-y)}{\cos y}$ $= \frac{\frac{k}{\frac{\sin y}{\cos y}} \times \cos(x-y)}{\cos y}$ $= \frac{k\cos(x-y)}{\sin y}$	✓apply sine rule/sin reël ✓co functions/ $ko - funksies$ ✓replace/ *vervang* QR ✓$\frac{\sin y}{\cos y}$ (4)
		[9]

QUESTION/*VRAAG 8*



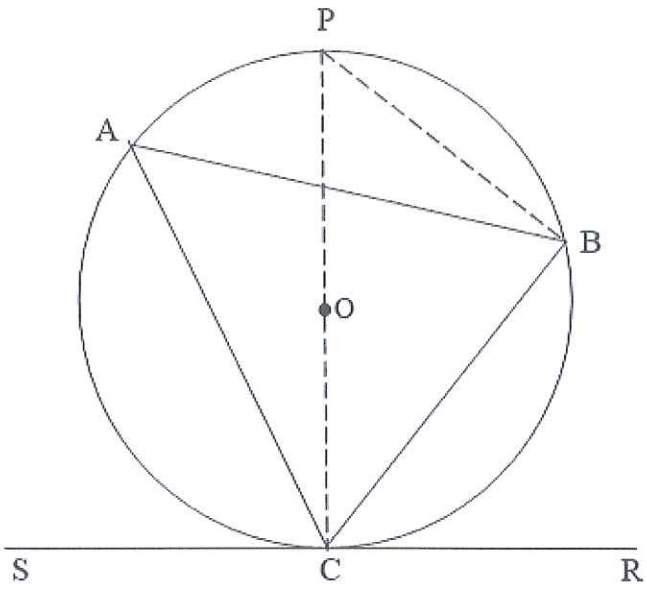
8.1	$\frac{BE}{EF}=\frac{3}{2}$ (line‖ to one side of ΔFBC) OR (prop theorem; ED‖FC)/ (*eweredigheidstelling*; ED‖FC) $\frac{BF}{FA}=\frac{5}{5}$ (given/ gegee) $\frac{AF}{AE}=\frac{5}{7}$	✓S✓R ✓ ✓$\frac{AF}{AE}=\frac{5}{7}$ (4)
8.2	In Δ AFG and/en ΔAED: $\hat{A}=\hat{A}$ $A\hat{F}G = A\hat{E}D$ (corresponding $\angle's$/ ooreenk $\angle e$;FC‖ ED) Δ AFG ||| ΔAED ($\angle\angle\angle$) $\frac{DE}{FG}=\frac{AE}{AF}(\|\|\| \Delta's)$ $\frac{DE}{FG}=\frac{7}{5}$	✓Δ AFG ||| ΔAED ✓S ✓S (3)
8.3	$\frac{\text{area of }\Delta GFA}{\text{area of }\Delta DEA}=\frac{\frac{1}{2}FG.FA}{\frac{1}{2}ED.AE}$ $=\frac{5}{7}\times\frac{5}{7}$ $=\frac{25}{49}$	✓$\frac{\frac{1}{2}FG.FA}{\frac{1}{2}ED.AE}$ ✓$\frac{5}{7}\times\frac{5}{7}$ ✓ answer/ *antwoord* (3)
		[10]

QUESTION/*VRAAG 9*

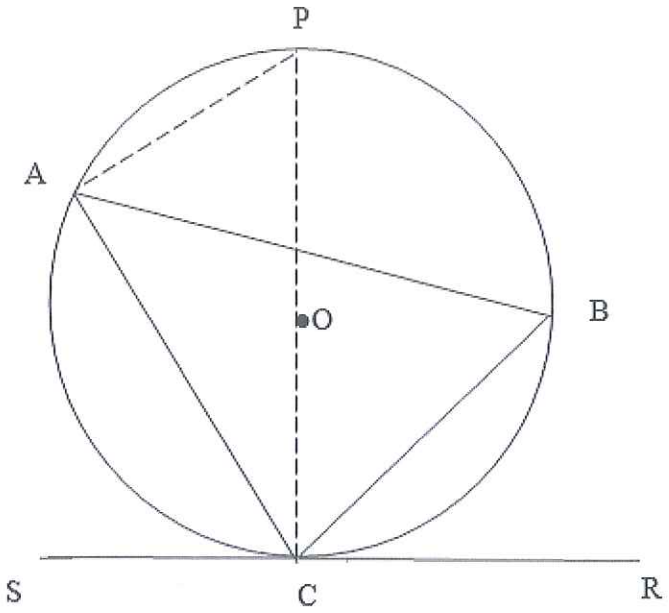


9.1	$\hat{R}_1 = 40°$ (tan – chord theorem/ $\angle tussen\ rkl\ en\ koord$) $T\hat{O}M = 80°$ ($\angle$ at centre $= 2\times \angle$ at circumference / $mdpts\angle = 2 \times omtreks\angle$)	✓S✓R ✓80°✓R (4)
9.2	$\hat{M}_2 = O\hat{T}M$ ($\angle' sopp = sides\ /\angle e\ teenoor = gelyke\ sye$) $\hat{M}_2 = 50°$ (tan $/rkl \perp r$) $\hat{N} = 76°$ ($\angle' s$ in same segment/ $\angle e\ in\ dieselfde\ segment$)	✓S✓R ✓S✓R (4)
9.3	$\hat{K}_1 = 90°$ (line from centre to midpoint of chord / I ($van\ mdpt\ van\ sirkel\ na\ mdpt\ van\ koord$) $\hat{T}_3 = 10$ ($\angle' s$ of ΔTOK)/ ($\angle e\ van\ \Delta$)	✓S✓R ✓S (3)
		[11]

QUESTION/*VRAAG 10*



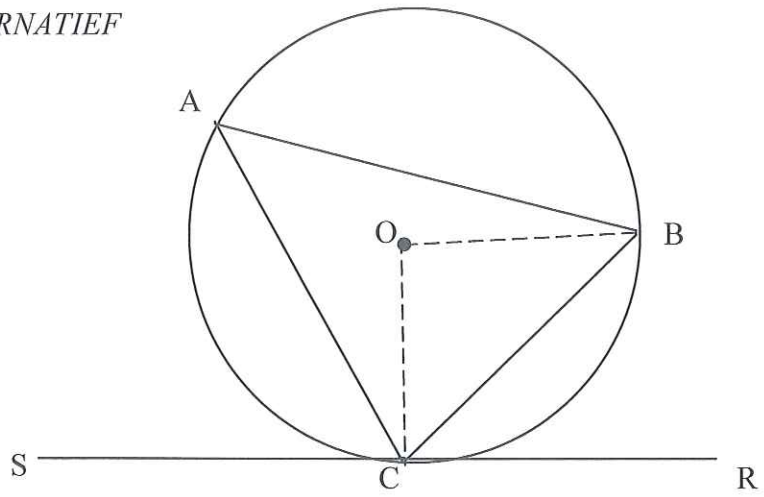
10.1	Construction/: Draw diameter PC and join P and B/ *Konstruksie: Trek middellyn PC en verbind P en B* $P\hat{B}C = 90°$ (∠ in semi circle/ sirkel) $\hat{P} + P\hat{C}B = 90°$ ($\angle's$ of a Δ /$\angle e\ van\ \Delta$) $P\hat{C}R = 90°$ (tangent ⊥ radius / rkl ⊥ radius) $\therefore \hat{P} = B\hat{C}R$ But/ maar $\hat{P} = \hat{A}$ (∠ in same segment /$\angle e\ in\ dieselfde\ segment$) $\therefore B\hat{C}R = \hat{A}$	✓construction/ *konstruksie* ✓SR ✓S ✓SR ✓S ✓S (6)



ALT

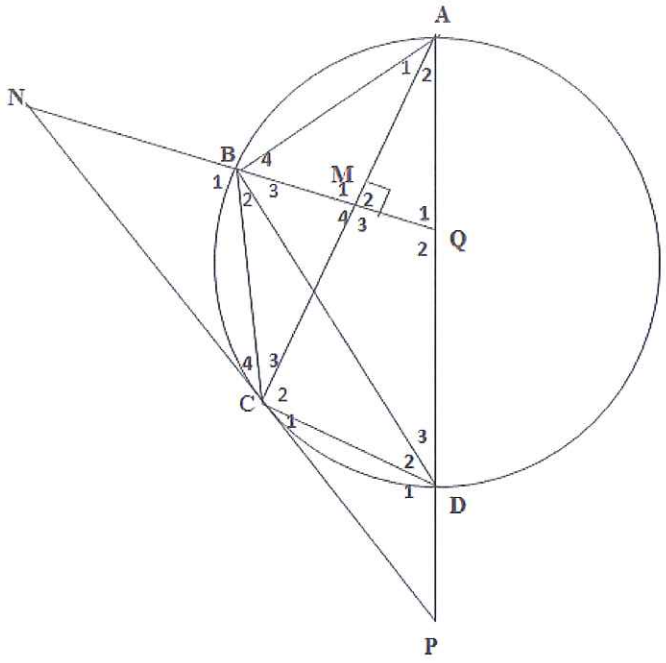
10.1	Construction: Draw diameter PC and join P and A. *Konstruksie: Trek middellyn PC en verbind P en* A $P\hat{A}C = 90°$ ($\angle$ in semi-circle/ sirkel) $C\hat{A}B = 90° - P\hat{A}B$ $P\hat{C}R = 90°$ (tangent $\perp$ radius/ rkl $\perp$ radius) $B\hat{C}R = 90° - P\hat{C}B$ $P\hat{A}B = P\hat{C}B$ ($\angle's$ in same segment/ $\angle e$ *in dieselfde segment*) $\therefore B\hat{C}R = C\hat{A}B$	✓ construction/ *konstruksie* ✓SR ✓S ✓SR ✓S ✓S (6)

ALTERNATIVE/ *ALTERNATIEF*



10.1	Construction: Join OC and OB. *Konstruksie: Trek OC en OB.* Let /laat $B\hat{C}R = x$ $O\hat{C}R = 90°$ (tan $/rkl \perp$ r) $\therefore O\hat{C}B = 90° - x$ $O\hat{B}C = 90° - x$ $(\angle' sopp = sides/\angle e\ teenoor = sye)$ $C\hat{O}B = 2x$ $(\angle' sof \Delta COB/\angle' e\ van\ \Delta COB)$ $\therefore C\hat{A}B = x$ (∠ at centre =2∠ at circumference/ (mdpts∠ $= 2\times omtreks\angle$) $B\hat{C}R = C\hat{A}B$	✓ construction/ *konstruksie* ✓SR ✓S ✓SR ✓S ✓S (6)

10.2



10.2.1	$\hat{C}_2 = 90°$ (∠ in semi circle/*sirkel)* $\hat{M}_2 = 90°$ (given/*gegee*) $\hat{C}_2 = \hat{M}_2$ NQ ‖CD (corresponding $\angle's$ = / *ooreenkomstige* $\angle e$ =)	✓S R ✓$\hat{C}_2 = \hat{M}_2$ ✓R (3)
10.2.2	$\hat{C}_1 = \hat{N}$ (corresponding angles / *ooreenkomstige* $\angle eNQ$ ‖ *CD*) $\hat{C}_1 = \hat{A}_2$ (tan chord theorem*)/(∠ tussen rkl en koord)* $\therefore \hat{A}_2 = \hat{N}$ ANCQ is a cyclic quadrilateral/ *koordevierhoek* (line CQ subtends equal angles)/(*CQ onderspan gelyke hoeke)*	✓S ✓S✓R ✓R (4)
10.2.3(a)	In Δ PCDand ΔPAC : $\hat{P}$ is common/ gemeenskaplik $\hat{C}_1 = \hat{A}_2$ (proven / bewys) $\hat{D}_1 = A\hat{C}P$ ($\angle's$ of/ van Δ) ΔPCD ||| ΔPAC ($\angle\angle\angle$)	 ✓S ✓S ✓R (3)
10.2.3(b)	$\frac{PC}{PA} = \frac{PD}{PC}$ (ΔPCD ||| ΔPAC) $PC^2 = PA.PD$	✓S ✓S (2)
10.2.4(a)	In Δ NBC and/ en ΔBCD: $\hat{N} = \hat{A}_2$ (proven / bewys) $\hat{N} = \hat{B}_2$ ($\hat{A}_2 = \hat{B}_2$; $\angle's$ in same segm/ $\angle e$ *in dsde segment*)) $\hat{C}_4 = \widehat{D}$ (tan-chord theorem/ ∠ tussen rkl en koord) $\hat{B}_1 = B\hat{C}D$ Δ NBC ||| ΔBCD ($\angle\angle\angle$)	 ✓$\hat{N} = \hat{B}_2$ ✓R ✓S✓R (4)
10.2.4(b)	$\frac{BC}{CD} = \frac{NB}{BC}$ (Δ NBC ||| ΔBCD) $BC^2 = CD.NB$	✓S ✓S (2)

10.2.5	$\frac{PC^2}{BC^2} = \frac{AP.DP}{CD.NB}$ $\frac{MC^2}{BC^2} = \frac{AP.DP}{CD.NB}$ (PC = MC) $MC^2 = BC^2 - BM^2$ (Pythagoras in ΔBMC)) $\frac{BC^2 - BM^2}{BC^2} = \frac{AP.DP}{CD.NB}$ $1 - \frac{BM^2}{BC^2} = \frac{AP.DP}{CD.NB}$	✓S ✓replacing/ *vervang* ✓S ✓replacing / *vervang* ✓manipulation/ *manipuleer* (5)
		[29]

TOTAL/*TOTAAL*: 150

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NATIONAL SENIOR CERTIFICATE

GRADE/GRAAD 12

MATHEMATICS P1/WISKUNDE V1

SEPTEMBER 2017

MEMORANDUM

MARKS/PUNTE: 150

This memorandum consists of 17 pages./Hierdie memorandum bestaan uit 17 bladsye.

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NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- *Consistent accuracy applies in ALL aspects of the marking memorandum.*

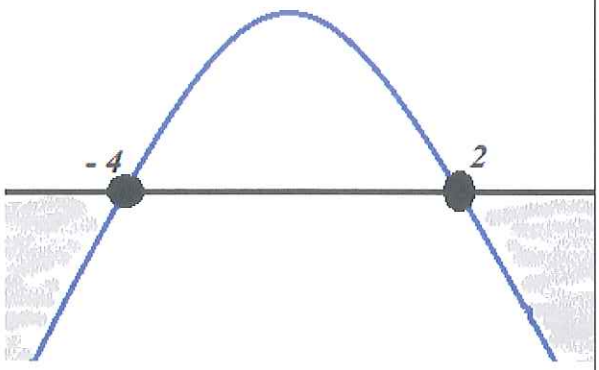
LET WEL:

- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die memorandum van toepassing.*

QUESTION /VRAAG 1

1.1.1	$x^2 = 8x$ $x^2 - 8x = 0$ $x(x-8) = 0$ $x = 0$ or/of $x = 8$ **or/of** $x^2 - 8x = 0$ $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ $= \frac{8 \pm \sqrt{64}}{2}$ $x = 0$ or $x = 8$ **or/of** $x^2 - 8x + 16 = 0 + 16$ $(x-4)^2 = 16$ $x - 4 = 4$ or/of $x - 4 = -4$ $x = 8$ or/of $x = 0$	✓standard form/standard vorm ✓factors/faktore ✓both values/beide waardes ✓standard form/standaardvorm ✓ correct substitution into correct formula/korrekte sustitusie in korrekte formule ✓answer/antwoord ✓completing the square/voltooiing van vierkant ✓square root both sides/vierkantsewortel beide kante ✓both answers/biede antwoorde	(3) (3) (3)

1.1.2	$4x^2 - 4x - 4 = 0$ $x^2 - x - 1 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-1)}}{2(1)}$ $x = \frac{1 \pm \sqrt{5}}{2}$ $x = \frac{1 + 2{,}236}{2}$ or/of $x = \frac{1 - 2{,}236}{2}$ $x = 1{,}618$ or/of $x = -0{,}618$ $x \approx 1{,}62$ or/of $x \approx -0{,}62$ or/of Use of a calculator ONLY ANSWER SLEGS ANTWOORD **ALTERNATIEF/ALTERNATIVE** $4x^2 - 4x - 4 = 0$ $x^2 - x - 1 = 0$ $x^2 - x + \frac{1}{4} = 1 + \frac{1}{4}$ $(x - \frac{1}{2})^2 = \frac{5}{4}$ $x - \frac{1}{2} = \pm\frac{\sqrt{5}}{2}$ $x = \frac{1}{2} \pm \frac{\sqrt{5}}{2}$ $x = \frac{1 \pm \sqrt{5}}{2}$ $x = \frac{1 \pm 2.236}{2}$ $x = 1{,}618$ or/of $x = -0{,}618$ $x \approx 1{,}62$ or/of $x \approx -0{,}62$	✓ correct substitution into correct formula/korrekte substitusie in korrekte formule ✓both answers/biede antwoorde ✓correct rounding off /korrekte afronding Maximum of 2 marks/ maksimum punte 2 ✓ Completing the square for adding $\frac{1}{4}$ on both sides / Voltooiing van die vierkant deur $\frac{1}{4}$ aan beide kante te voeg ✓ both answers/albei antwoorde ✓ correct rounding off/korrekte afronding	(3) (3)

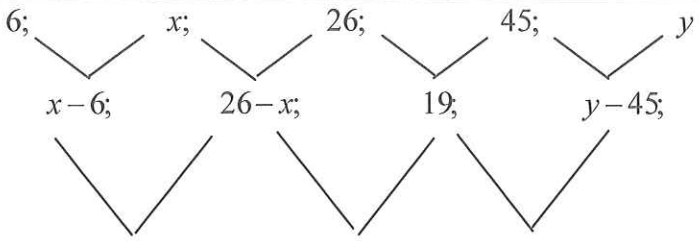
1.1.3	 $x \leq -4$ of/or $x \geq 2$: OR/OF ALTERNATIVE/ALTERNATIEF: $x \in (-\infty ; -4]$ Or $x \in [2 ; +\infty)$	✓ $x \leq -4$ ✓Or/of ✓ $x \geq 2$	(3)
1.1.4	$2.3^{x+1} - 3.3^{x-1} = 104$ $3^x(2.3^1 - 3.3^{-1}) = 104$ $3^x = 104 \div 5$ $3^x = 20,8$ $x = \frac{\log 20,8}{\log 3}$ $x = 2.76$	✓ factorise/faktoriseer ✓ simplification/vereenvoudiging ✓using logs/korrekte toepassing van logs ✓answer/antwoord	(4)
1.2		✓multiple with 100 / vermenigvuldig met 100	

	$\sqrt[5]{316,2}$ $=[3,162(100)]^{\frac{1}{5}}$ $=[\sqrt{10}(10^2)]^{\frac{1}{5}}$ $=[10^{\frac{5}{2}}]^{\frac{1}{5}}$ $=10^{\frac{1}{2}}$ $=\sqrt{10}$	✓ substitute/vervang $\sqrt{3,162}$ ✓ simplify/vereenvoudig ✓ antwoord/answer	(4)
	ALTERNATIVE/ALTERNATIEF $(10^{\frac{1}{2}})^{\frac{1}{5}}.(10^2)^{\frac{1}{5}}$ $=10^{\frac{1}{10}}.10^{\frac{4}{10}}$ $=10^{\frac{5}{10}}$ $=10^{\frac{1}{2}}$ $=\sqrt{10}$ OR ALTERNATIVE/ALTERNATIEF $\sqrt[5]{316,2}$ $=\sqrt[5]{100\sqrt{10}}$ $=10^{\frac{2}{5}}\times 10^{\frac{1}{5}\times\frac{1}{2}}$ $=10^{\frac{2}{5}}\times 10^{\frac{1}{10}}$ $=10^{\frac{2}{5}+\frac{1}{10}}$ $=10^{\frac{4+1}{10}}=10^{\frac{5}{10}}=10^{\frac{1}{2}}=\sqrt{10}=3,162$	$\sqrt[5]{316,2}=\sqrt[5]{100.\sqrt{10}}$ ✓ $=10^{\frac{2}{5}}.10^{\frac{1}{5}\times\frac{1}{2}}$ ✓ $=10^{\frac{2}{5}}.10^{\frac{1}{10}}$ ✓ $=10^{\frac{2}{5}+\frac{1}{10}}$ $=10^{\frac{4+1}{10}}$ ✓ $=10^{\frac{5}{10}}$ $=10^{\frac{1}{2}}$ $=\sqrt{10}=3,162$	(4)

1.3	$x = y + 1$ $0 = (2x - 1)(x + 2y - 3)$ substitute $x = y + 1$ $0 = [2(y + 1) - 1][(y + 1) + 2y - 3]$ $0 = [2y + 2 - 1][y + 1 + 2y - 3]$ $0 = [2y + 1][3y - 2]$ $2y + 1 = 0$ or/of $3y - 2 = 0$ $y = \frac{-1}{2}$ or/of $y = \frac{2}{3}$ $x = \frac{-1}{2} + 1$ or/of $x = \frac{2}{3} + 1$ $x = \frac{1}{2}$ or/of $x = \frac{5}{3}$ **ALTERNATIVE/ALTERNATIEF** $y = x - 1$ $0 = (2x - 1)(x + 2y - 3)$ $0 = [2x - 1)(x + 2(x - 1) - 3]$ $0 = (2x - 1)(x + 2x - 2 - 3)$ $0 = (2x - 1)(3x - 5)$ $x = \frac{1}{2}$ or/of $x = \frac{5}{3}$ $y = \frac{1}{2} - 1$ $y = \frac{5}{3} - 1$ $= \frac{-1}{2}$ $= \frac{2}{3}$ $\left(\frac{1}{2}; \frac{-1}{2}\right)$ or/of $\left(\frac{5}{3}; \frac{2}{3}\right)$	✓ substitute/vervang $(y + 1)$ ✓ simplify/vereenvoudig ✓ simplify/vereenvoudig ✓ values of /waardes van y ✓ substitute values of/vervang waardes van y ✓ values of /waardes van x ✓ substitute/vervang $(x - 1)$ ✓ simplify/vereenvoudig ✓ simplify/vereenvoudig ✓ values of /waardes van x ✓ substitute values of /vervang waardes van x ✓ values of y	(6) (6)

[23]

QUESTION 2/VRAAG 2

2.	 $(26-x)-(x-6)$; $19-(26-x)$; $(y-45)-19$;	First differences/eerste verskille	
2.1.1	$x-6$; $26-x$; 19; $y-45$	✓ $x-6$; $26-x$; ✓ 19; $y-45$	(2)
2.1.2	$32-2x=-7+x$ $\quad -7+x=y-64$ $39=3x$ $\quad -7+13=y-64$ $13=x$ $\quad 70=y$	✓ Equations/vergelykings second difference ✓ $x=13$ ✓ substitute the value of $x=13$ ✓ $y=70$	(4)
2.2	$\sum_{k=1}^{n}(4-3k)=-125$ $T_1=1=a$ $\quad T_2=4-6=-2$ $d=-2-1$ $d=-3$ $S_n=\frac{n}{2}[2a+(n-1)d]$ $-125=\frac{n}{2}[2(1)+(n-1)-3]$ $-250=n[2-3n+3]$ $0=-3n^2+5n+250$ $0=3n^2-5n-250$ $0=(3n+25)(n-10)$ $n=\frac{-25}{3}$ *or / of* $n=10$ Invalid	✓ value of/waarde van d ✓ substitution in the correct formula/vervanging in die korrekte formule ✓ correct equation/korrekte vergelyking ✓ factors ✓ selection of correct value/korrekte vergelyking	

	$n = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $n = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(3)(-250)}}{2(3)}$ $n = 10$ Or/of $n = -8{,}3$ nvt /not applicable: invalid		(5)

[11]

QUESTION 3/VRAAG 3

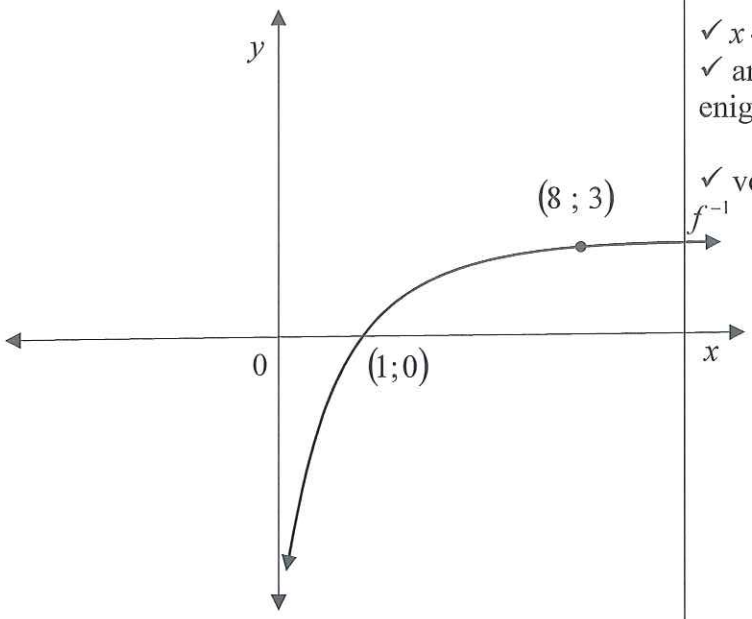
3.1.1	$T_1 = x(x+1)^0 = x$ $T_2 = x(x+1)^1$ $\frac{T_2}{T_1} = \frac{x(x+1)}{x} = x+1$	✓ Substitute $n = 0$ and n = 1 ✓ $r = x+1$ ANSWER ONLY, FULL MARKS	(2)
3.1.2	If a series converges /reeks konvergeer $-1 < r < 1;\ r \neq 0$ $-1 < x+1 < 1$ $-2 < x < 0$	✓ $-1 < r < 1$ ✓substituting r ✓ answer	(3)
3.2	$S_\infty = \frac{a}{1-r}$ $= \frac{x}{1-(x+1)}$ $= \frac{x}{1-x-1}$ $= \frac{x}{-x} = -1$	✓substitution in the correct formula/substitusie in die korrekte formule ✓ simplification ✓value of /waarde van x	(3)
3.3	$T_1 = x = 1$ $T_2 = x(x+1) = 1(1+1) = 2$ $T_3 = x(x+1)^2 = 1(1+1)^2 = 4$ $r = \frac{4}{2} = 2$ $1 + 2 + 4 + ...$	✓ ratio r /verhouding ✓ the series/reeks	(2)

3.4	$S_n = \frac{a(r^n - 1)}{r - 1}$ $S_{25} = \frac{(2^{25} - 1)}{2 - 1}$ $= 33554432 - 1$ $= 33554431$	✓ Substition in the correct formula/substitusie in die korrekte formule ✓✓answer/antwoord	(3)

[13]

QUESTION 4/VRAAG 4

4.1	$g(x) = -(x - p)^2 + q$ $= -(x - 3)^2 + 8$ $= -(x^2 - 6x + 9) + 8$ $= -x^2 + 6x - 9 + 8$ $\therefore y = -x^2 + 6x - 1$	✓ substituting B(3 ; 8) ✓ simplification ✓ equation	(3)
4.2	$g(x) = -(x - 3)^2 + 8$ Range : $g(x)$ $y \leq 8$, $y \in R$ Range of $g(x) - 2$ is $y \leq 6$, $y \in R$ **ALTERNATIVE/ALTERNATIEF** $y \in (-\infty ; 6]$	✓✓ answer	(2)
4.3	$-k < -6$ $k > 6$ **Recognising/weet dat:** $g(x)$ **has to move/shift more than 6 units down** $g(x)$ **skuif meer as 6 eenhede af**	✓ $-k < -6$ ✓ $k > 6$ (answer) **ANSWER ONLY : FULL MARKS**	(2)
4.4	$x = 2^y$ $y = \log_2 x$	✓Swopping x and y ✓Answer **ANSWER ONLY : FULL MARKS**	(2)

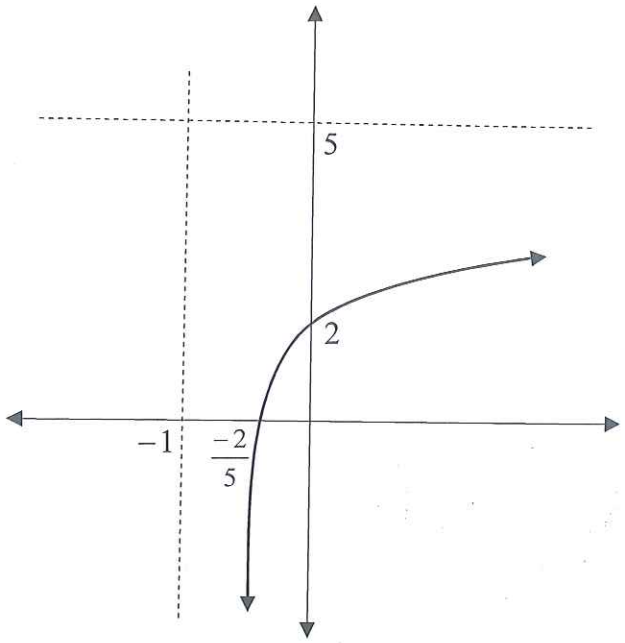
4.5		✓ x - afsnit/intercept ✓ any other coordinate /of enige ander koördinaat ✓ vorm/shape	(3)
4.6	$0 < x \leq 8$ ALTERNATIVE $x \in (0 ; 8]$	✓✓ answer	(2)
4.7	$x < 3$ ALTERNATIVE $x \in (-\infty ; 3)$	✓✓ answer	(2)

[16]

QUESTION 5/VRAAG 5

5.1.1	$x = -1$ $y = 5$	✓ $x = -1$ ✓ $y = 5$	(2)
5.1.2	$x \in R, x \neq -1$ ALTERNATIVE: $x \in (-\infty;-1) \cup (-1;\infty)$	✓✓ Gebied /domain	(2)

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5.2	$y=\frac{-3}{0+1}+5$ $y=2$ $\frac{-3}{x+1}+5=0$ $-3+5x+5=0$ $5x=-2$ $x=-\frac{2}{5}$	✓ $x=0$ ✓$y=2$ ✓ $y=0$ ✓ $x=-\frac{2}{5}$	(4)
5.3		✓ asymptotes/asymptote ✓ afsnitte/intercepts $\left(-\frac{2}{5};0\right)$ and/en (0;2) ✓ vorm/form	(3)
5.4	$h(x)=-\left(\frac{-3}{x+1-3}+5\right)$ $=-\left(\frac{-3}{x-2}+5\right)$ $=\frac{3}{x-2}-5$	✓(−) in $-\left(\frac{-3}{x+1-3}+5\right)$ ✓ -3 ✓ $h(x)=\frac{3}{x-2}-5$ VOLPUNTE VIR SLEGS ANTWOORD FULL MARKS IF ANSWER ONLY	(3)

[14]

QUESTION 6/VRAAG 6

6.1	$2000 = 1000\left(1+\frac{0,0875}{12}\right)^{n}$ $\log 2 = n\log\left(1+\frac{0,0875}{12}\right)$ $n = \frac{\log 2}{\log(1,007291)}$ $n = 95,4063387 = 95,41$ $n = 96$ *maande / months*	✓substitute into correct formula/ Vervanging in korrekte formule ✓Simplify/vereenvoudiging ✓correct use of logs/korrekte toepassing van logs ✓ answer/antwoord	(4)
6.2	$1+0,164 = [1+\frac{i_{nom}}{12}]^{12}$ $\sqrt[12]{1,164} = 1+\frac{i_{nom}}{12}$ $i_{nom} = 15,28\%$	✓ Correct substitution in correct formula/korrekte substitusie in korrekte formule ✓$\sqrt[12]{1,164}$ ✓answer/antwoord	(3)
6.3	$F = \frac{x[(1+i)^{n}-1]}{i}$ $2\,300\,000 = \frac{[(1+\frac{0,12}{4})^{32}-1]}{\frac{0,12}{4}}$ $x = R43\,807,22$	✓ $i = \frac{0,12}{4}$ ✓ $\frac{\left[\left(1+\frac{0,12}{4}\right)^{32}-1\right]}{\frac{0,12}{4}}$ ✓ $n = 32$ ✓ antwoord/answer	(4)
6.4.1	$A = P(1+i)^{n}$ $A = R135\,000\left(1+\frac{0,1475}{12}\right)^{2}$ $= R138\,339,15$	✓ Korrekte vervanging/correct substitution ✓ answer/antwoord	(2)
6.4.2	$P = \frac{x[1-(1+i)^{-n}]}{i}$ $R138\,339,15 = \frac{x\left[1-\left(1+\frac{0,1475}{12}\right)^{-18}\right]}{\frac{0,1475}{12}}$ $x = R8\,613,99$	✓ correct formula/korrekte formule ✓ korrekte vervanging/correct substitution ✓ $n = 18$ ✓answer/antwoord	(4)

[17]

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QUESTION 7/VRAAG 7 (- 1 penalty for wrong notation)

7.1	$f(x) = 5-2x^2$ $f(x+h) = 5-2(x+h)^2$ $= 5-2x^2-4hx-2h^2$ $f'(x) = \lim_{h\to 0}\frac{(5-2x^2-4hx-2h^2)-(5-2x^2)}{h}$ $= \lim_{h\to 0}\frac{-4hx-2h^2}{h}$ $= \lim_{h\to 0}\frac{h(-4x-2h)}{h}$ $= \lim_{h\to 0}(-4x-2h)$ $= -4x$	✓ simplifying of $f(x+h)$ ✓ formula/formule ✓ simplifying $-4xh-2h^2$ ✓ common factor/ gemeenskaplike faktor ✓ answer/antwoord	(5)
7.2.1	$D_x\left[x^4-2x+\frac{1}{x^2}\right]$ $D_x[x^4-2x+x^{-2}]$ $= 4x^3-2-2x^{-3}$	✓ x^{-2} ✓ $4x^3$ ✓ -2 ✓ $-2x^{-3}$	(4)
7.2.2	$y = \frac{2x-3}{\sqrt[4]{x}}$ $= 2x^{\frac{3}{4}} - 3x^{\frac{-1}{4}}$ $\frac{dy}{dx} = \frac{3}{2}x^{\frac{-1}{4}} + \frac{3}{4}x^{\frac{-5}{4}}$	✓ $2x^{\frac{3}{4}}$ ✓ $-3x^{\frac{-1}{4}}$ ✓ $\frac{3}{2}x^{\frac{-1}{4}}$ ✓ $\frac{3}{4}x^{\frac{-5}{4}}$	(4)

[13]

VRAAG 8/QUESTION 8

8.1.1	$-1 \le x \le 3$ ALTERNATIVE/ALTERNATIEF $x \in [-1; 3]$	✓✓ From C to B/van C tot B	(2)
8.1.2	$x < 3; x \neq -3$ ALTERNATIVE/ALTERNATIEF: $x \in (-\infty;3), x \neq -3$	✓ x and the inequality sign/ x en die *ongelykheidsteken* ✓ critical value /kritieke waarde ✓ excluding -3 /uitsluiting van -3	(3)

8.1.3	$x < -3$ of/or $x > 3$	✓✓ correct inequality sign and value of x /korrekte ongelykheidsteken en waarde van x ✓ or/of	(3)
8.2	$f'(x) = -3x^2 + 6x + 9$ $f''(x) = -6x + 6$ at the point *of* inflection $-6x + 6 = 0$ $x = 1$ $y = -(1)^3 + 3(1)^2 + 9(1) - 27$ $= -16$ inflection point is $(1 ; -16)$ $f'(1) = -3(1)^2 + 6(1) + 9$ $= 12$ $\therefore$ gradient is 12 Thus $-16 = 12(1) + c$ $c = -28$ Equation of tangent is $y = 12x - 28$ ALTERNATIVE Inflection point $(x ; y) = \left(\frac{-1+3}{2} ; \frac{-32+0}{2}\right)$ $= (1 ; -16)$ $f'(x) = -3x^2 + 6x + 9$ $f'(1) = -3(1)^2 + 6(1) + 9$ $= 12$ $\therefore$ gradient is 12 Thus equation is $y - (-16) = 12(x - 1)$ $y = 12x - 28$	✓ derivative of/afgeleide van f ✓ second derivative = 0 ✓ $y = -16$ ✓ value of/waarde van gradient ✓ equation ✓ $\left(\frac{-1+3}{2}\right)$ ✓ $\left(\frac{-32+0}{2}\right)$ ✓ $(1 ; -16)$ ✓ value of/waarde van gradient ✓ equation	(5) (5)
8.3.	$x > 1$ ALTERNATIVE $x \in (1 ; \infty)$	✓✓ answer	(2)

8.4	$FG = -x^2 + 9 - (-x^3 + 3x^2 + 9x - 27)$ $= x^3 - 4x^2 - 9x + 36$ for maximum length $\frac{d}{dx}\left(x^3 - 4x^2 - 9x + 36\right) = 0$ $3x^2 - 8x - 9 = 0$ $x = \frac{8 \pm \sqrt{(64) - 4(3)(-9)}}{2(3)}$ $x = 3,52 \quad or \quad x = -0,85$ $\therefore x = -0,85$	✓ $g(x) - f(x)$ ✓ simplification/vereenvoudiging ✓ derivative = 0/afgeleide =0 ✓ values of x/waarde van x ✓ .selecting the correct answer Selekteer korrekte antwoord	(5)

[20]

VRAAG 9/QUESTION 9

9.1	$ED: y + 2x = 10 \quad \therefore y = -2x + 10$ $B(x; y) = B(x; -2x + 10)$ $C(x; 0)$ $BC = y_B = -2x + 10$	✓ co-ordinates of B in terms of x /koördinate B in terme van x ✓ answer/antwoord	(2)
9.2	Area trapezium AOCB= $\frac{1}{2}(BC + AO) \times OC$ $= \frac{1}{2}(-2x + 10 + 8) \times x$ $= \frac{1}{2}(-2x + 18)x$ $= -x^2 + 9x$	✓ substitution in the correct Formula/vervanging in die korekte formule ✓ equation/vergelyking BD	(2)
9.3	MAX/MAKS IF: $D_x(-x^2 + 9x) = 0$ $\therefore -2x + 9 = 0$ $\therefore x = 4\frac{1}{2}$ $y = -2(4\frac{1}{2}) + 10$ $y = 1$ $\therefore B(4\frac{1}{2}; 1)$	✓correct derivative/korrekte afgeleide =0 ✓ substitution in the correct Formula/vervanging in die korekte formule ✓koördinate / co-ordinate B	(3)

[7]

VRAAG 10/QUESTION 10

10.1	P(Hokkie of sokker) =P(hokkie)+ P(sokker) – P(hokkie en sokker) = 0,4 +0,6-0,3 =0,7 of 70% P(hockey or soccer) = P(hockey) + P(soccer) – P(hockey and soccer) = 0,4+0,6 – 0,3 = 0,7 or 70%	✓ Gebruik van korrekte formule ✓ Vervanging ✓Antwoord **SLEGS ANTWOORD: VOLPUNTE** ✓ correct formula/korrekte formule ✓ substitution/sustitusie ✓ answer/antwoordr **ANSWER ONLY: FULL MARKS**	(3) (3)
10.2	P(Right) × P(Light) = P(Right and Light) P(Regs)×P(Lig) = P(Regs en Lig) $\frac{48}{60}\times\frac{20}{60}=\frac{a}{60}$ $\frac{4}{15}=\frac{a}{60}$ $a=\frac{4}{15}\times 60$ $a=16$ $b=4$ $c=32$ **ALTERNATIVE/ALTERNATIEF** P(Regs) × P(Donker) = P(Regs en Donker) P(Right) × P(Dark) = P(Right and Dark) $\frac{48}{60}\times\frac{40}{60}=\frac{c}{60}$ $\frac{8}{15}=\frac{c}{60}$ $c=32$ $b=4$ $a=16$	✓ using correct formula/gebruik korrekte formule ✓ correct substitution/korrekte substitisie ✓value /*waarde a* ✓ value/waarde b ✓ value /waarde c ✓correct formula/korrekte formule ✓correct substitution/korrekte vervanging ✓value/waarde c ✓ value/waarde a ✓ value/waarde b	(5) (5)

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	ALTERNATIVE/ALTERNATIEF P(Links) × P(Lig) = P(Links en Lig) P(Left) × P(Light) = P(Left and Light) $\frac{12}{60}\times\frac{20}{60}=\frac{b}{60}$ $\frac{1}{15}=\frac{b}{60}$ $b=4 \qquad a=16 \qquad c=32$	✓correct formula/korrekte formule ✓correct substitution/korrekte vervanging ✓ value/waarde c ✓ value/waarde a ✓ value/waarde b	(5)

[8]

QUESTION 11/VRAAG 11

11.1.1	$10^6 = 1000000$	✓10^6 Or/of ✓1 000 000	(1)
11.1.2	$n(E)=1\times8\times7\times6\times5\times1$ $=1680$ $n(S)=10^6$ $=1000000$ Propability: $=\frac{n(E)}{n(S)}=\frac{1680}{100\,0000}=$ $\frac{21}{12500}=1{,}68\times10^{-3}$	✓ 1680 . ✓ 1 000 000 ✓answer	(3)
11.2	$10!-(9!)(2!)$ $=3628800-725760$ $=2903040$ ALTERNATIVE/ALTERNATIEF $10!-(9!)(2!)=10\times9!-(9!)(2!)$ $=9!(10-2)$ $=(9!)\times8$ $=2903040$	✓10 ! ✓ (9 !) ✓ (2 !) ✓ antwoord/answer ✓10 ! ✓ (9 !) ✓ (2 !) ✓ antwoord/answer	(4)

[8]

TOTAL/TOTAAL: 150

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