



education

MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

NASIONALE
SENIOR SERTIFIKAAT

GRAAD 12

WISKUNDE V2
SEPTEMBER 2025

PUNTE: 150

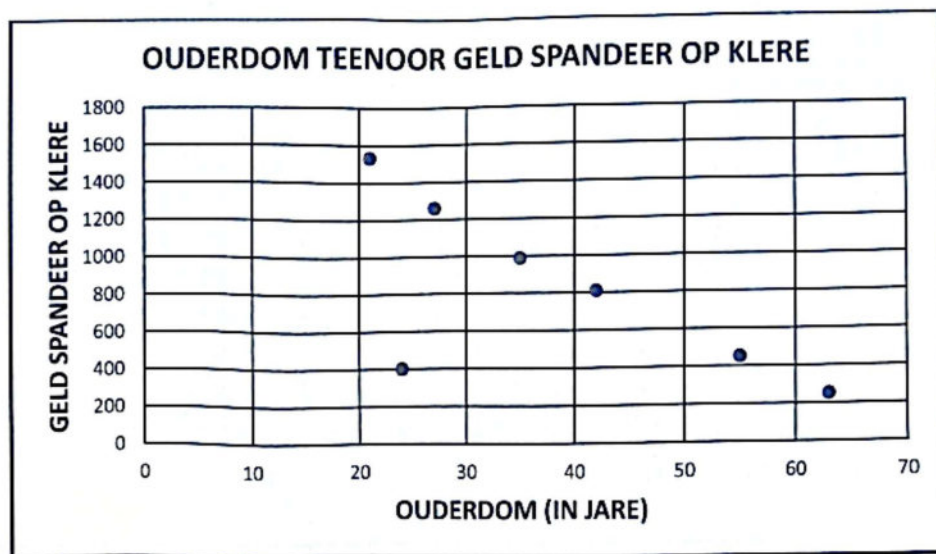
TYD: 3 URE

Hierdie vraestel bestaan uit 14 bladsye en 1 inligtingsblad, en 'n antwoordboek is voorsien.

VRAAG 1

Die verhouding tussen ouderdom en spandring van geld op klere per maand is oor jare ondersoek. Navorsing het die volgende resultate gelewer:

Ouderdom (in jare)	21	24	27	35	42	55	63
Geld spandeer op klere(in rand)	1534	400	1260	986	810	450	250

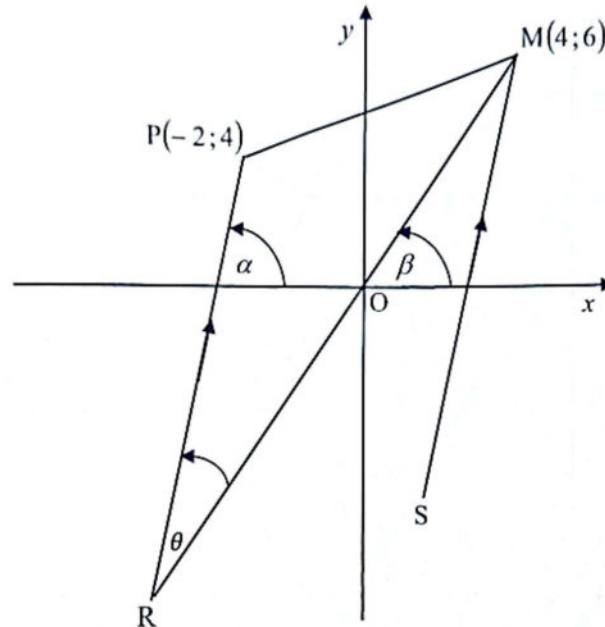


- 1.1 Bepaal die vergelyking van die kleinste kwadrate regressie lyn. (3)
- 1.2 Teken die kleinste kwadrate regressie lyn in die antwoordboek. (2)
- 1.3 Bereken die korrelasie koëffisiënt. (1)
- 1.4 Voorspel die geld spandeer deur 'n 50-jarige persoon op klere. (2)
- 1.5 Is die antwoord bereken in VRAAG 1.4 betroubaar? Verduidelik jou antwoord. (2)
- 1.6 Verduidelik die effek op die gradiënt van die regressielyn as die punt (24 ; 400) verwyder word. (1)

[11]

VRAAG 3

In die onderstaande diagram is $\triangle PMR$ geteken met hoekpunte $P(-2; 4)$, $M(4; 6)$ en R in die Kartesiese vlak. Lyn MR met lengte $4\sqrt{13}$ gaan deur die oorsprong O . $\widehat{PRM} = \theta$ en $PR \parallel MS$. Die vergelyking van MS is $y - 5x + 14 = 0$.

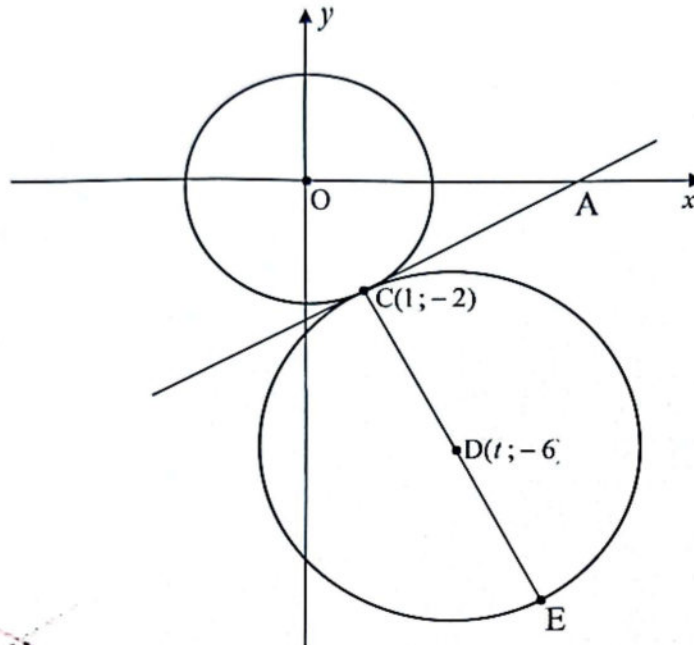


- 3.1 Bereken die gradiënt van MP . (2)
- 3.2 Bepaal die vergelyking van MR . (3)
- 3.3 Bepaal die vergelyking van PR . (3)
- 3.4 Bereken die koördinate van R . (3)
- 3.5 Bereken die grootte van θ afgerond tot TWEE desimale plekke. (4)
- 3.6 Bereken die oppervlakte van $PMSR$ as dit gegee word dat $PMSR$ 'n parallellogram is. (4)

[19]

VRAAG 4

Die onderstaande skets bestaan uit twee sirkels wat mekaar uitwendig raak in die punt $C(1; -2)$. Die kleiner sirkel se oorsprong O , is die oorsprong. Die ander sirkel se middelpunt is $D(t; -6)$. CA is 'n gemeenskaplike raaklyn wat die x -as in A sny. CDE is 'n middellyn van die groter sirkel.



- 4.1 Gee 'n rede hoekom punte O , C en D op 'n reguit lyn lê. (2)
- 4.2 Bereken die gradiënt van OC . (2)
- 4.3 Wys vervolgens dat die waarde van $t = 3$. (2)
- 4.4 Bepaal die vergelyking van die raaklyn AC in die vorm $y = mx + c$. (3)
- 4.5 Bereken die koördinate van E . (2)
- 4.6 Bepaal die vergelyking van 'n sirkel deur die punte $A(5; 0)$, C en E in die vorm $(x - a)^2 + (y - b)^2 = r^2$. (5)
- 4.7 As 'n sirkel met middelpunt D en vergelyking $(x - 3)^2 + (y + 6)^2 = r^2$ die sirkel met middelpunt O twee keer moet sny, bereken al die moontlike waardes van r . (4)

[20]

VRAAG 5

- 5.1 As $\tan A = \frac{5}{12}$ en $A \in (180^\circ; 360^\circ)$, bereken, sonder die gebruik van 'n sakrekenaar, die waarde van:

5.1.1 $\cos A$ (3)

5.1.2 $\sin 2A$ (3)

5.2 Vereenvoudig : $\frac{1}{\cos(360^\circ - \theta) \cdot \sin(90^\circ - \theta)} - \tan^2(180^\circ + \theta)$ (6)

[12]

VRAAG 6

6.1 Gegee: $\frac{\sin(-2\theta) - \cos^2\theta + 1}{\sin\theta - 2\cos\theta} = \sin\theta$

6.1.1 Bewys die identiteit. (5)

6.1.2 Bereken die waardes van θ waarvoor die identiteit ongedefinieerd sal wees vir $\theta \in [-180^\circ; 180^\circ]$. (4)

- 6.3 Bepaal die algemene oplossing van die volgende vergelyking:

$$\sin(2x + 40^\circ)\cos(x + 30^\circ) - \cos(2x + 40^\circ)\sin(x + 30^\circ) = \cos(2x - 20^\circ) \quad (6)$$

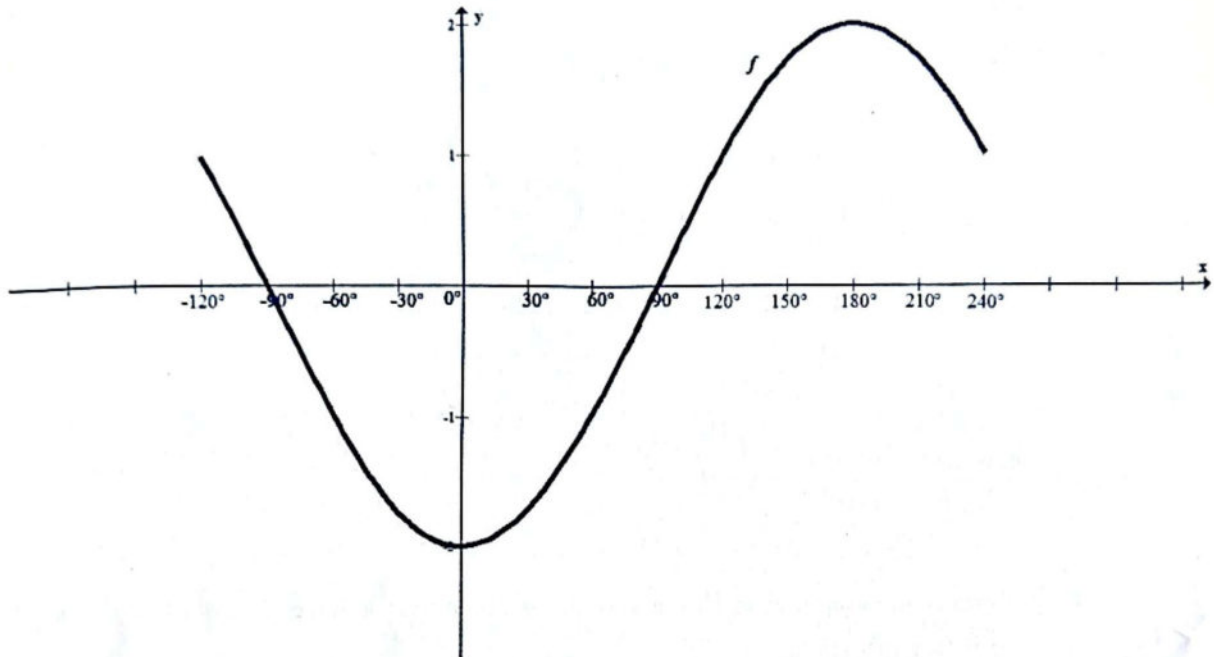
6.4 Gegee: $f(x) = 2\cos^2 x - 2$

Bepaal die maksimum waarde van $f(x)$. (3)

[18]

VRAAG 7

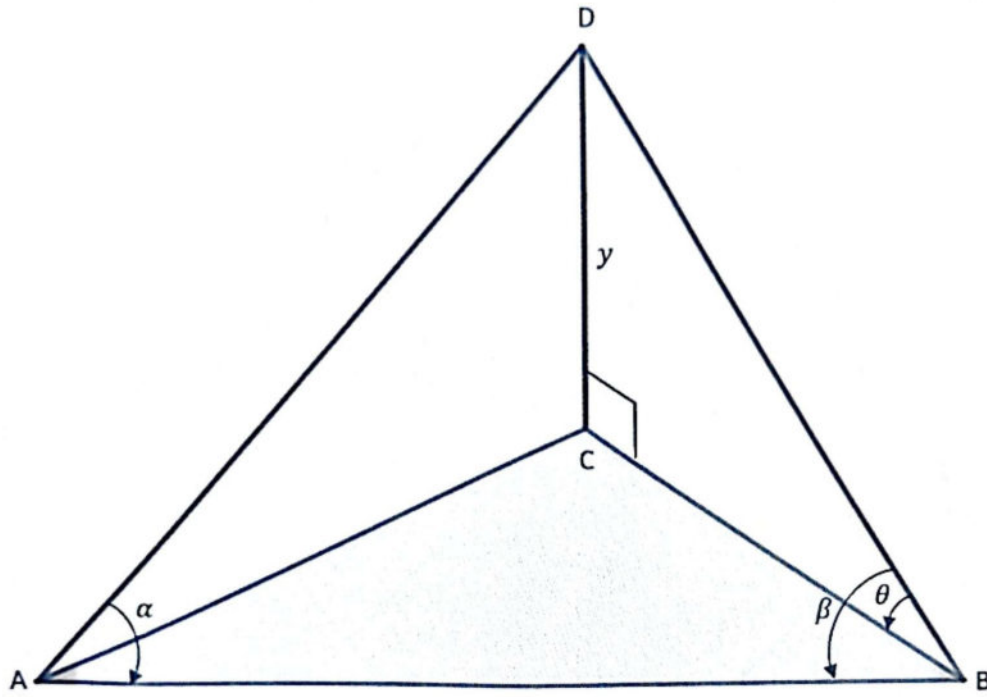
In die skets hieronder is die grafiek van $f(x) = -2 \cos x$ geteken vir $-120^\circ \leq x \leq 240^\circ$.



- 7.1 Skryf die amplitude van f neer. (1)
- 7.2 Gee die waardeversameling van $f(x) + 3$. (2)
- 7.3 Teken die grafiek van $g(x) = \sin(x + 60^\circ)$ vir $-120^\circ \leq x \leq 240^\circ$ op dieselfde assestelsel as die gegewe grafiek in die ANTWOORDBOEK. (3)
- 7.4 Vir watter waardes van k sal $f(x) = k$ geen reële wortels hê nie? (2)
- 7.5 Bepaal die waardes van x in die interval $-120^\circ \leq x \leq 240^\circ$ waarvoor $x \cdot g'(x) < 0$. (3)
- [11]

VRAAG 8

In die diagram gegee, is D 'n punt vertikaal bokant C. $DC = y$ meter. Die hoogtehoek van D vanaf B is θ . $\angle DAB = \alpha$ en $\angle DBA = \beta$.



8.1 Bepaal die lengte van DB in terme van y en θ . (3)

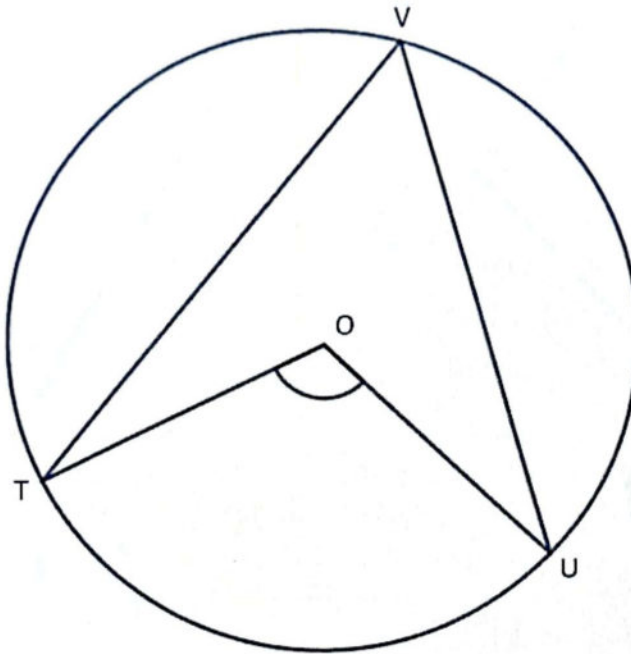
8.2 Bewys dat $AB = \frac{y \sin(\alpha + \beta)}{\sin \theta \sin \alpha}$ (4)

[7]

Gee redes vir jou bewerings in VRAE 9, 10 and 11.

VRAAG 9

9.1 In die onderstaande diagram is O die middelpunt van die sirkel TUV.

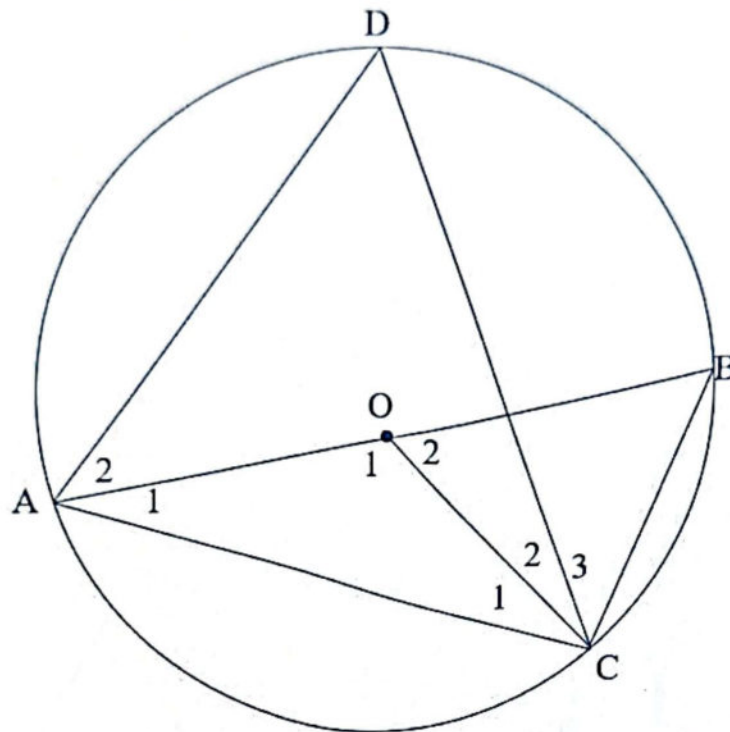


Gebruik die diagram in die ANTWOORDBOEK om die stelling te bewys wat beweer dat

$$\widehat{TÔU} = 2\widehat{T\hat{V}U}$$

(6)

9.2 O is die middelpunt van die sirkel. AB is 'n middellyn. $\hat{AOC} = 104^\circ$ en $\hat{DAB} = 32^\circ$.



Bereken die groottes van:

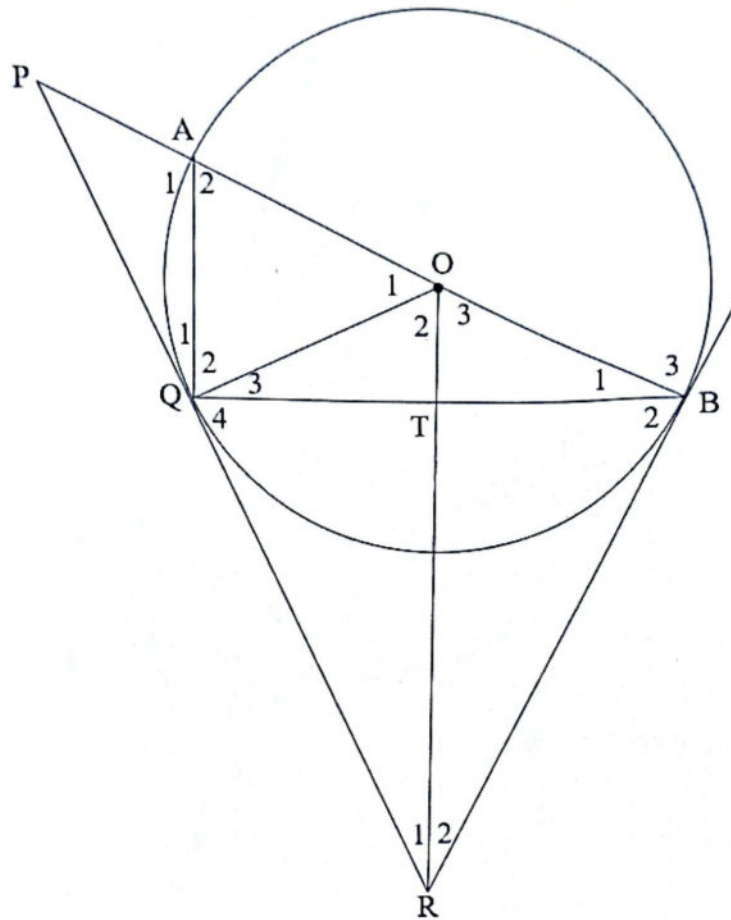
9.2.1 $\hat{D}$ (2)

9.2.2 $\hat{C}_3$ (1)

9.2.3 $\hat{A}_1$ (3)

9.2.4 $\hat{C}_2$ (3)

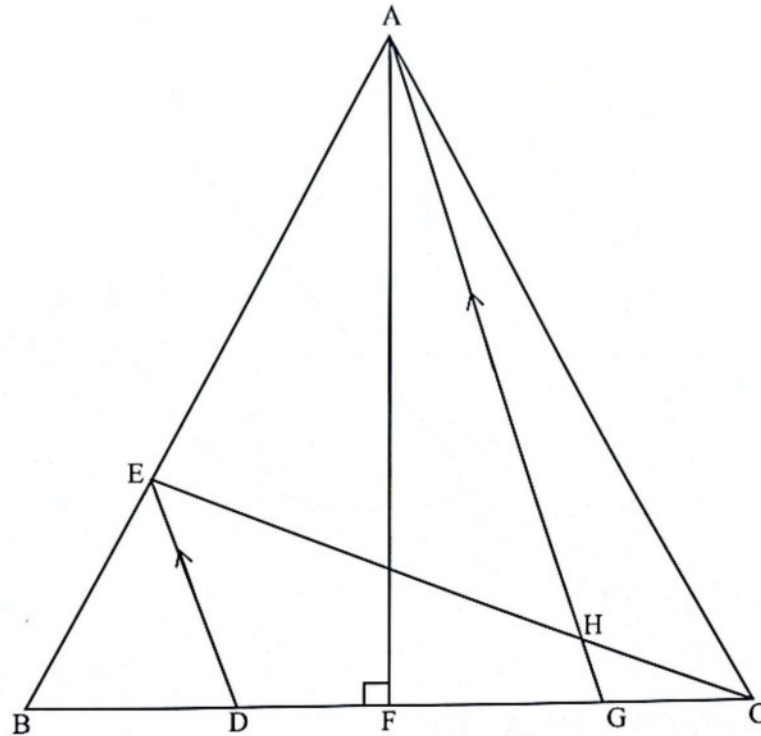
- 9.3 In die onderstaande skets is RQ en RB raaklyne aan die sirkel met middelpunt O in die punte Q en B respektiewelik en $TQ = TB$. Die radius BO verleng sny die sirkel in A en RQ verleng in P.



- 9.3.1 Bewys dat RBOQ 'n koordevierhoek is. (4)
- 9.3.2 Bewys dat RB 'n raaklyn aan die sirkel deur T, O en B is. (4)
- 9.3.3 Druk $\hat{P}$ uit in terme van $\hat{B}_1$. (3)
- [26]

VRAAG 10

In die diagram hieronder is $\frac{DG}{GC} = \frac{3}{2}$; $\frac{BE}{EA} = \frac{1}{2}$ en $AG \parallel DE$.



Bereken, met redes, die waardes van:

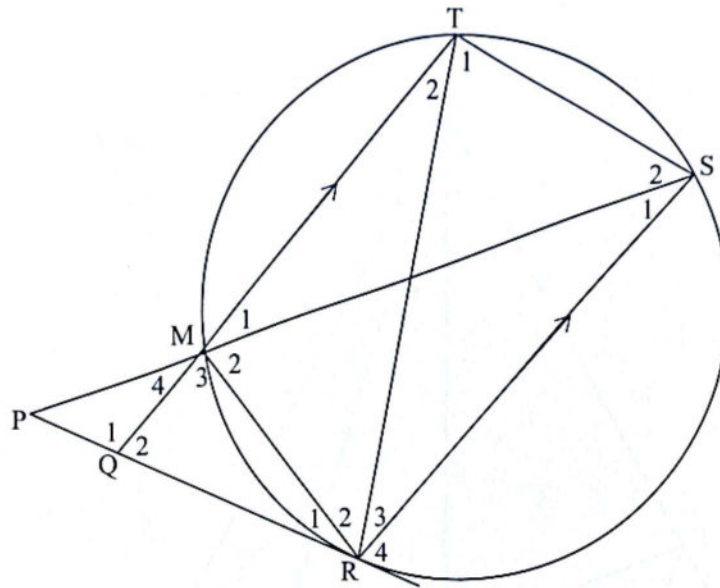
10.1 $\frac{EH}{HC}$ (2)

10.2 $\frac{\text{Oppervlakte } \triangle BAG}{\text{Oppervlakte } \triangle CAG}$ (3)

[5]

VRAAG 11

In die diagram hieronder is $RS \parallel QT$, en PR is 'n raaklyn aan die sirkel in R . SMP is 'n reguit lyn.



- 11.1 Hoekom is $\hat{R}_1 = \hat{T}_2$? (1)
- 11.2 Bewys dat $\triangle RTS \parallel \triangle RQM$. (4)
- 11.3 Bewys dat $RQ \times TS = QM \times RT$. (1)
- 11.4 Bereken die numeriese waarde van $\frac{PQ}{RT}$ as dit gegee is dat $\frac{PM}{ST} = \frac{2}{3}$ en $\frac{QM}{SM} = \frac{1}{2}$ (4)

[10]

TOTAL:

150

INLICHTINGSBLAD: WISKUNDE

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1 + ni) \quad A = P(1 - ni)$$

$$T_n = a + (n - 1)d$$

$$T_n = ar^{n-1}$$

$$F = \frac{x[(1+i)^n - 1]}{i}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$y = mx + c \quad y - y_1 = m(x - x_1)$$

$$(x - a)^2 + (y - b)^2 = r^2$$

$$\text{In } \triangle ABC: \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A$$

$$\text{area } \triangle ABC = \frac{1}{2} ab \cdot \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cdot \cos \beta - \sin \alpha \sin \beta$$

$$\cos 2\alpha = \cos^2 \alpha - \sin^2 \alpha$$

$$= 1 - 2\sin^2 \alpha$$

$$= 2\cos^2 \alpha - 1$$

$$\bar{x} = \frac{\sum fx}{n}$$

$$P(A) = \frac{n(A)}{n(S)}$$

$$\hat{y} = a + bx$$

$$A = P(1 - i)^n \quad A = P(1 + i)^n$$

$$S_n = \frac{n}{2} [2a + (n - 1)d]$$

$$S_n = \frac{a(r^n - 1)}{r - 1}; r \neq 1$$

$$S_\infty = \frac{a}{1 - r}; -1 < r < 1$$

$$P = \frac{x[1 - (1 + i)^{-n}]}{i}$$

$$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad m = \tan \theta$$

$$\sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$$

$$\cos(\alpha - \beta) = \cos \alpha \cdot \cos \beta + \sin \alpha \sin \beta$$

$$\sin 2\alpha = 2 \sin \alpha \cos \alpha$$

$$\sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

$$P(A \text{ of } B) = P(A) + P(B) - P(A \text{ en } B)$$

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$



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**NATIONAL
SENIOR CERTIFICATE
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SERTIFIKAAT**

GRADE 12 / GRAAD 12

MATHEMATICS PAPER 2/ WISKUNDE VRAESTEL 2

SEPTEMBER 2025

MARKING GUIDELINE / NASIENRIGLYN

MARKS / PUNTE: 150

These marking guidelines consist of 17 pages.

Hierdie nasienriglyn bestaan uit 17 bladsye.

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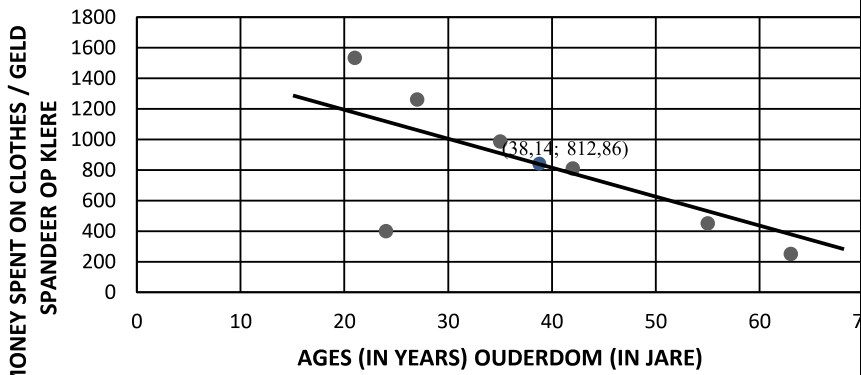
Please turn over / Blaai om asseblief

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 guideline.
- 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 nasienriglyn van toepassing.
- Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.

QUESTION 1		
1.1	$A = 1\,607,113187$ $B = -20,82319216$ $\hat{y} = 1607,11 - 20,82x$	✓ 1578,539116 ✓ $-22,32125028$ ✓ equation / vergelyking (3)
1.2	AGES VS SPENDING MONEY ON BUYING CLOTHES OUERDOM TEENoor GELD SPANDEER OP KLERE  MONEY SPENT ON CLOTHES / GELD SPANDEER OP KLERE AGES (IN YEARS) OUERDOM (IN JARE) (38,14; 812,86)	✓ shape/vorm ✓ passes through the mean point (38,14; 812,86) / deur die gemiddelde punt (2)
1.3	$r = -0,68 \quad -0,69995 \dots = -0,70$	✓ answer antwoord (1)
1.4	$\hat{y} = 1578,54 - 22,32(50) \quad 1607,11 - 20,82(50)$ $= 462,54 \quad 566,11$ OR / OF	✓ substitution / substitusie ✓ answer antwoord (2)

NCS–Marking Guideline/NSS-Nasienriglyn

	$\hat{y} = 462,48$ 565,95 (from calculator)(sakrekenaar)	OR / OF ✓ ✓ Answer
1.5	It is NOT reliable since there is NO STRONG correlation between the variables / It is FAIRLY reliable since there is an AVERAGE correlation between the variables. Dit is NIE betroubaar nie want daar is nie 'n STERK korrelasie tussen die veranderlikes nie / Dit is REDELIK betroubaar, want daar is 'n GEMIDDELDE korrelasie.	✓ Not reliable Nie betroubaar ✓ Not strong / nie sterk OR / OF ✓ Fairly reliable / redelik betroubaar ✓ average correlation / gemiddelde korrelasie (2)
1.6	The gradient will DECREASE (become more negative) when the point is removed. Die gradiënt sal VERMINDER (meer negatief word) as die punt verwyder word.	✓ increase (more negative) / vermeerder (meer negatief) (1)
		[11]

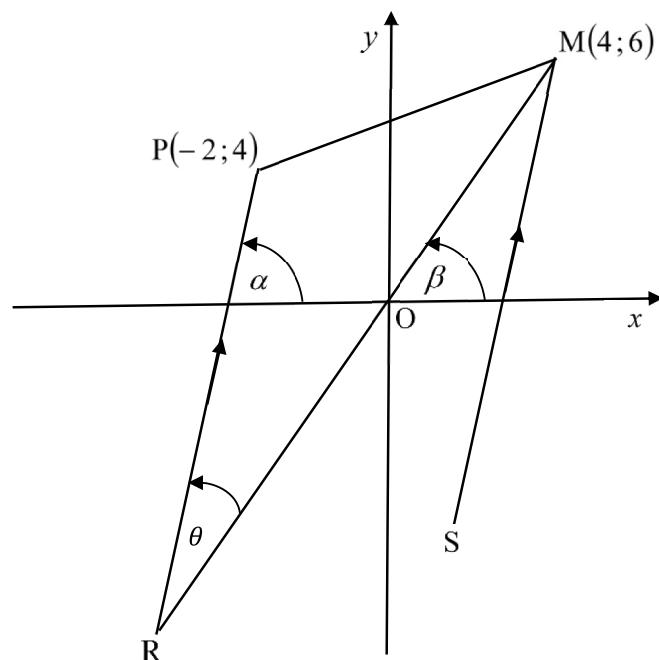
QUESTION 2 / VRAAG 2

Performance in programming test / Prestasie in programmeertoets Cumulative frequency / Kumulatiewe frekwensie Marks / Punte		
2.1.1	50 students/studente	✓ answer /antwoord (1)

NCS–Marking Guideline/NSS-Nasienriglyn

2.1.2	$\frac{75}{100} \times 50 = 37,5$ 65 marks/punte or/of 65%	✓ 37,5 ✓ 65 (2)																														
2.1.3	<table border="1"> <thead> <tr> <th>Marks(out of 100) Punte (uit 100)</th><th>Frequency(f) Frekwensie(f)</th><th>Cumulative frequency Kumulatiewe frekwensie</th></tr> </thead> <tbody> <tr> <td>$0 \leq x < 10$</td><td>1</td><td>1</td></tr> <tr> <td>$10 \leq x < 20$</td><td>3</td><td>4</td></tr> <tr> <td>$20 \leq x < 30$</td><td>4</td><td>8</td></tr> <tr> <td>$30 \leq x < 40$</td><td>11</td><td>19</td></tr> <tr> <td>$40 \leq x < 50$</td><td>12</td><td>31</td></tr> <tr> <td>$50 \leq x < 60$</td><td>9</td><td>40</td></tr> <tr> <td>$60 \leq x < 70$</td><td>4</td><td>44</td></tr> <tr> <td>$70 \leq x < 80$</td><td>5</td><td>49</td></tr> <tr> <td>$80 \leq x < 90$</td><td>1</td><td>50</td></tr> </tbody> </table>	Marks(out of 100) Punte (uit 100)	Frequency(f) Frekwensie(f)	Cumulative frequency Kumulatiewe frekwensie	$0 \leq x < 10$	1	1	$10 \leq x < 20$	3	4	$20 \leq x < 30$	4	8	$30 \leq x < 40$	11	19	$40 \leq x < 50$	12	31	$50 \leq x < 60$	9	40	$60 \leq x < 70$	4	44	$70 \leq x < 80$	5	49	$80 \leq x < 90$	1	50	✓ 1st 3 values / 1e 3 waardes ✓ all values / al die waardes (2)
Marks(out of 100) Punte (uit 100)	Frequency(f) Frekwensie(f)	Cumulative frequency Kumulatiewe frekwensie																														
$0 \leq x < 10$	1	1																														
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$50 \leq x < 60$	9	40																														
$60 \leq x < 70$	4	44																														
$70 \leq x < 80$	5	49																														
$80 \leq x < 90$	1	50																														
2.1.4	$\bar{x} = \frac{(1 \times 5) + (3 \times 15) + (4 \times 25) + (11 \times 35) + \dots + (1 \times 85)}{50}$ $= \frac{2290}{50} = 45,8$ OR / OF 45,8 (from calculator)(van sakrekenaar)	✓ mid pts / middelwaardes ✓ divide by 50 / deel deur 50 ✓ answer/ antwoord OR / OF ✓✓✓ answer / antwoord (3)																														
2.2	$\bar{x} = 25$ min $\sigma = 6$ min $= 25 + 6 = 31$ ∴ 2 vouchers will be free / 2 bewyse sal gratis wees	✓ 25 ✓ 6 ✓ 2 (3)																														
		[11]																														

QUESTION 3 / VRAAG 3

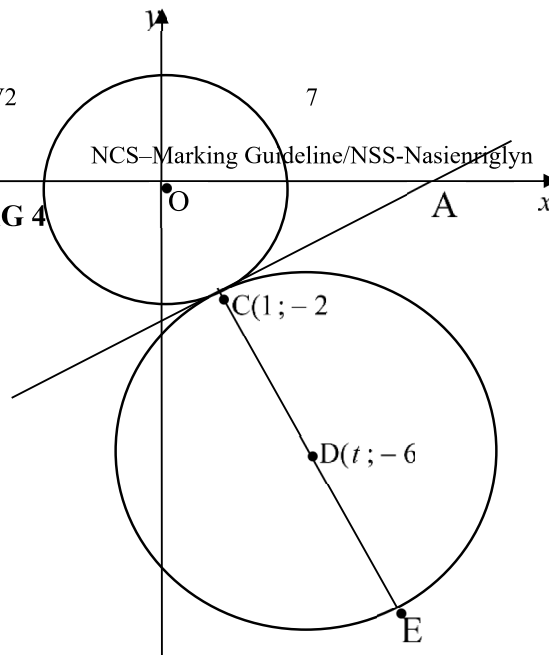


3.1	$m_{MP} = \frac{0-6}{0-4}$ $= \frac{3}{2}$	✓ Substitution into the correct formula vervang in korrekte formule ✓ $\frac{3}{2}$ (2)
3.2	$m_{MR} = \frac{0-6}{0-4}$ $= \frac{3}{2}$ Equation of MR is $y = \frac{3}{2}x$ (Vergelyking van MR)	✓ substitution vervang ✓ $\frac{3}{2}$ ✓ equation / vergelyking (3)
3.2	$y = 5x - 14$ $m_{MS} = m_{PR} = 5$ PR MS Equation of PR $y - y_1 = m(x - x_1)$ OR / OF $4 = 5(-2) + c$ $y - 4 = 5(x + 2)$ $4 + 10 = c$ $\therefore y = 5x + 14$ $c = 14$	✓ $m_{PR} = 5$ ✓ sub of/vervang (-2 ; 4) ✓ answer/antwoord OR / OF ✓ $m_{PR} = 5$ ✓ sub of /vervang (-2 ; 4) ✓ answer/antwoord (3)

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3.4	$y = \frac{3}{2}x$ and/en $y = 5x + 14$ $5x + 14 = \frac{3}{2}x$ $7x = -28$ $x = -4$ $y = -6$ $\therefore R(-4; -6)$	✓ equating /vergelykings gelyk ✓ $x = -4$ ✓ $y = -6$ (3)
3.5	$m_{PR} = 5$ $\tan \alpha = 5$ $\alpha = 78,69^\circ$ $m_{MR} = \frac{3}{2}$ $\tan \beta = \left(\frac{3}{2}\right)$ $\beta = 56,31^\circ$ $\therefore \theta = \alpha - \beta$ $= 22,38^\circ$	✓ $\tan \alpha = 5$ ✓ $78,69^\circ$ ✓ $56,31^\circ$ ✓ $22,38^\circ$ (4)
3.6	$PR = \sqrt{(-4+2)^2 + (-6-4)^2}$ $= \sqrt{104}$ or $2\sqrt{26}$ $MR = \sqrt{(4+4)^2 + (6+6)^2}$ $= \sqrt{208}$ or/of $4\sqrt{13}$ Area of $\triangle PMR$ / Oppervlakte van $\triangle PMR$ $= \frac{1}{2} PR.MR.\sin \theta$ $= \frac{1}{2} 2\sqrt{26}.4\sqrt{13}.\sin 22,38^\circ$ or $\frac{1}{2} \sqrt{104} .4\sqrt{13}.\sin 22,38^\circ$ $= 28$ Area PMSR = 56 units ² /eenhede ²	✓ PR ✓ MR ✓ Sub into the area rule/vervang in opp reël ✓ Answer /antwoord (4)
		[19]

QUESTION 4 / VRAAG 4



4.1	$OC \perp \text{tangent}$ [radius $\perp$ tangent] [radius $\perp$ raaklyn] $CE \perp \text{tangent}$ [radius $\perp$ tangent] [radius $\perp$ raaklyn] $\therefore O, C \text{ and } E \text{ lies on a straight line}$ [adjacent $\angle s = 180^\circ$] $\therefore O, C \text{ en } E \text{ lê op 'n reguit lyn.}$ [Aangrensende $\angle e = 180^\circ$]	$\checkmark$ both S / beide bewerings $\checkmark$ both reasons/ beide redes (2)
4.2	$m_{OC} = \frac{-2-0}{1-0} = -2$	$\checkmark$ subst into formula vervang in formule $\checkmark$ answer/antw (2)
4.3	$m_{CD} = -2$ $\frac{y_2 - y_1}{x_2 - x_1} = -2$ $\frac{-6+2}{t-1} = -2$ $t = 3$	$\checkmark m_{CD}$ $\checkmark$ subst / vervanging (2)
4.4	$m_{\text{tangent}} = \frac{1}{2}$ $AC: y - y_1 = m(x - x_1)$ $y + 2 = \frac{1}{2}(x - 1)$ $y = \frac{1}{2}x - \frac{5}{2}$	$\checkmark m$ $\checkmark$ subst/vervang (1;-2) $\checkmark$ equation vergelyking . (3)

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4.5	D is the midpoint of circle / D is die middelpunt van die sirkel $\frac{1+x}{2} = 3$ $x = 5$ $\frac{y-2}{2} = -6$ $y = -10$ $E(5; -10)$	✓ $x = 5$ ✓ $y = -10$ OR/OF answer only / slegs antw (2)
4.6	$\hat{ACD} = 90^\circ$ [radius $\perp$ tangent] [radius $\perp$ raaklyn] $\therefore AE$ is the diameter of circle ACE [converse $\angle$ in semi-circle] AE is die middellyn van die sirkel [hoek in halwe sirkel omgekeerde] $AE = \sqrt{(5-5)^2 + (0+10)^2}$ $AE = \sqrt{0+100}$ $AE = 10$ $\therefore \text{radius} = 5$ $\text{midpt}_{AE} = \left(\frac{5+5}{2}; \frac{-10}{2} \right)$ $= (5; -5) = \text{centre of circle} / \text{mdpt van sirkel}$ Vgl van sirkel/ Equation of circle ACE: $(x-5)^2 + (y+5)^2 = 25$	✓ S / R ✓ R ✓ Radius = 5 ✓ midpt/middelpunt ✓ LHS & RHS LK en RK (5)
4.7	Circle centre O: $x^2 + y^2 = 5$ Sirkel met middelpunt O Diameter = $2\sqrt{5}$ middellyn $\sqrt{20} < r < \sqrt{80}$ $2\sqrt{5} < r < 4\sqrt{5}$	✓ $r^2 = 5$ ✓ diameter middellyn ✓ $\sqrt{80} = 4\sqrt{5}$ ✓ endpoints eindpunte (4)
		[20]

QUESTION 5 / VRAAG 5

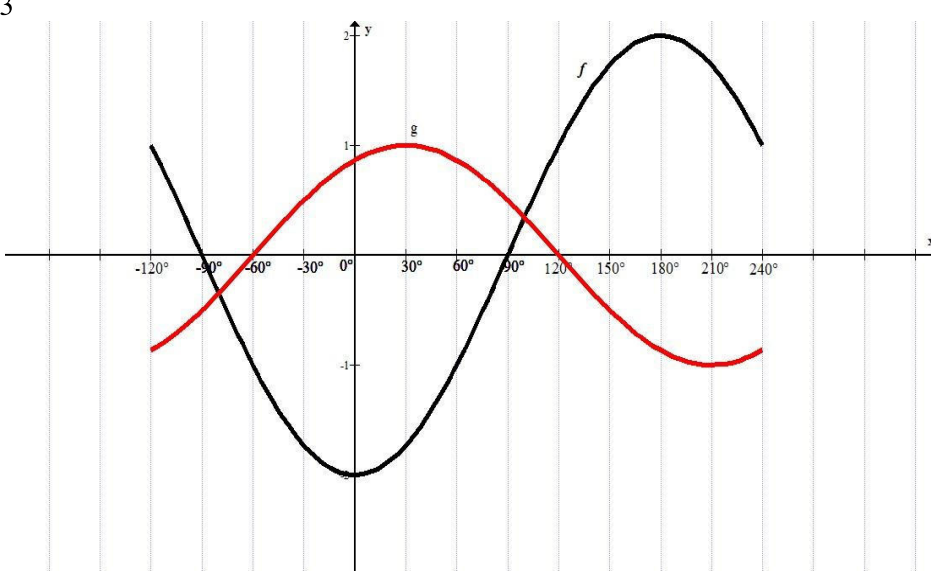
5.1		
5.1.1	$\cos A = -\frac{12}{13}$	✓ Diagram in quadrant 3 skets in kwadrant 3 ✓ $r = 13$ ✓ $-\frac{12}{13}$ (3)
5.1.2	$\begin{aligned}\sin 2A &= 2 \sin A \cos A \\ &= 2 \left(-\frac{5}{13}\right) \left(-\frac{12}{13}\right) \\ &= \frac{120}{169}\end{aligned}$	✓ $2 \sin A \cos A$ ✓ substitution / vervanging ✓ answer / antwoord (3)
5.2	$\begin{aligned}&= \frac{1}{\cos \theta \cdot \cos \theta} - (-\tan \theta)^2 \\ &= \frac{1}{\cos^2 \theta} - \tan^2 \theta \\ &= \frac{1}{\cos^2 \theta} - \frac{\sin^2 \theta}{\cos^2 \theta} \\ &= \frac{1 - \sin^2 \theta}{\cos^2 \theta} \\ &= \frac{\cos^2 \theta}{\cos^2 \theta} \\ &= 1\end{aligned}$	✓ $\cos \theta$ ✓ $\cos \theta$ ✓ $-\tan^2 \theta$ ✓ $\frac{\sin^2 \theta}{\cos^2 \theta}$ ✓ $\cos^2 \theta$ ✓ answer/antwoord (6)
		[12]

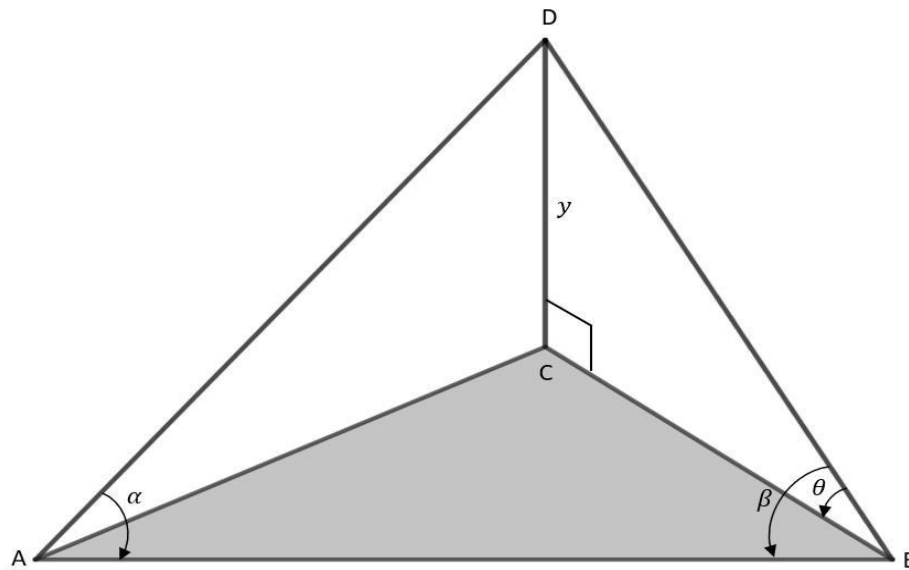
QUESTION 6 / VRAAG 6		
6.1.1	$LHS = \frac{-\sin 2\theta - \cos^2 \theta + 1}{\sin \theta - 2\cos \theta}$ $= \frac{-2\sin \theta \cdot \cos \theta - \cos^2 \theta + \sin^2 \theta + \cos^2 \theta}{\sin \theta - 2\cos \theta}$ $= \frac{\sin^2 \theta - 2\sin \theta \cdot \cos \theta}{\sin \theta - 2\cos \theta}$ $= \frac{\sin \theta (\sin \theta - 2\cos \theta)}{\sin \theta - 2\cos \theta}$ $= \sin \theta$ $\therefore LHS = RHS$ OR/OF $LHS = \frac{-\sin 2\theta - \cos^2 \theta + 1}{\sin \theta - 2\cos \theta}$ $= \frac{-2\sin \theta \cdot \cos \theta + \sin^2 \theta}{\sin \theta - 2\cos \theta}$ $= \frac{\sin^2 \theta - 2\sin \theta \cdot \cos \theta}{\sin \theta - 2\cos \theta}$ $= \frac{\sin \theta (\sin \theta - 2\cos \theta)}{\sin \theta - 2\cos \theta}$ $= \sin \theta$ $\therefore LHS = RHS$	✓ $-\sin 2\theta$ ✓ $2\sin \theta \cdot \cos \theta$ ✓ $\sin^2 \theta$ ✓ common factor / gemeensk faktor ✓ simplification vereenvoudiging OR /OF ✓ $-\sin 2\theta$ ✓ $2\sin \theta \cdot \cos \theta$ ✓ $\sin^2 \theta + \cos^2 \theta$ ✓ common factor/gemeensk faktor ✓ simplification / vereenvoudig (5)
6.1.2	$\sin \theta - 2\cos \theta = 0$ $\frac{\sin \theta}{\cos \theta} = \frac{2\cos \theta}{\cos \theta}$ $\tan \theta = 2$ $\theta = 63,43^\circ$ $\theta = \{-116,57^\circ; 63,43^\circ\}$	✓ $\sin \theta - 2\cos \theta = 0$ ✓ $\tan \theta = 2$ ✓ $-116,57^\circ$ ✓ $63,43^\circ$ (4)
6.2	$\sin[(2x + 40^\circ) - (x + 30^\circ)] = \cos(2x - 20^\circ)$ $\sin(x + 10^\circ) = \cos(2x - 20^\circ)$ $\cos[90^\circ - (x + 10^\circ)] = \cos(2x - 20^\circ)$ $90^\circ - (x + 10^\circ) = \pm(2x - 20^\circ) + k360^\circ \quad k \in Z$ $x = -60^\circ + k.360^\circ \quad k \in Z \quad \text{or} \quad x = 33,33^\circ - k.120^\circ \quad k \in Z$	✓ Compound angle / saamgestelde hoek ✓ $\sin(x + 10^\circ)$ ✓ $\cos[90^\circ - (x + 10^\circ)]$ ✓ equating <s/ stel <e gelyk ✓ $x = -60^\circ + k360^\circ$ ✓ $x = 33,33^\circ + k120^\circ$ (6)

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6.3	$f(x) = 2\cos^2 x - 2$ $= 2\cos^2 x - 1 - 1$ $= \cos 2x - 1$ Max value/Maks waarde = 0	✓ $2\cos^2 x - 1 - 1$ ✓ identity/identiteit ✓ answer/antwoord (3)
		[18]

QUESTION 7 / VRAAG 7

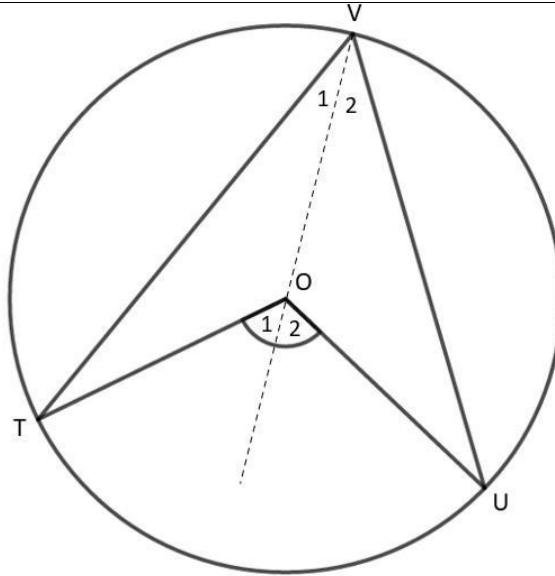
7.1	Amplitude = 2	✓ answer/antwoord (1)
7.2	$y \in [-2 + 3; 2 + 3]$ $y \in [1; 5]$	✓✓ $y \in [1; 5]$ (2)
7.3		✓ y-intercept y-afsnit ✓ x-intercepts x-afsnitte ✓ Min / Max points Min/maks punte (3)
7.4	$k < -2$ or/of $k > 2$	✓ $k < -2$ ✓ $k > 2$ (2)
7.5	$-120^\circ \leq x < 0^\circ$ $30^\circ < x < 210^\circ$	✓✓ $-120^\circ \leq x < 0^\circ$ ✓ $30^\circ < x < 210^\circ$ (3)
		[11]

QUESTION 8 / VRAAG 8

8.1	In $\triangle CDB$ $\sin \hat{B} = \frac{DC}{DB}$ $\sin \theta = \frac{y}{DB}$ $DB = \frac{y}{\sin \theta}$	✓ trig ratio/verhouding ✓ subst / vervang ✓ answer / antwoord (3)
8.2	In $\triangle ADB$: $\hat{ADB} = 180^\circ - (\alpha + \beta) \quad [\text{sum of } \angle\text{s in } \triangle][\text{som binne } \angle\text{e van } \triangle]$ $\frac{\sin \hat{A}}{DB} = \frac{\sin \hat{D}}{AB}$ $\frac{\sin \alpha}{\frac{y}{\sin \theta}} = \frac{\sin[180^\circ - (\alpha + \beta)]}{AB}$ $AB \cdot \sin \alpha \cdot \sin \theta = y \cdot \sin(\alpha + \beta)$ $AB = \frac{y \sin(\alpha + \beta)}{\sin \alpha \cdot \sin \theta}$	✓ $180^\circ - (\alpha + \beta)$ ✓ subst into sine rule/ vervang in sin-reël ✓ simplify/vereenvoudig ✓ $\sin(\alpha + \beta)$ (4)
		[7]

QUESTION 9 / VRAAG 9

9.1



Construction/Konstruksie: Join/verbind VO and extend to Z / en verleng na Z

In $\triangle TOV$:

$$TO = OV \quad [\text{radii}]$$

$$\hat{T} = \hat{V}_1 \quad [\angle\text{'s opp = sides}] [\text{hoeke teenoor gelyke sye}]$$

$$\hat{O}_1 = \hat{T} + \hat{V}_1 \quad [\text{ext } \angle \text{ of } \triangle] [\text{buitehoek van } \triangle]$$

$$\hat{O}_1 = 2\hat{V}_1$$

Similarly in $\triangle OUV$ / soortgelyk in $\triangle OUV$:

$$\hat{O}_2 = 2\hat{V}_2$$

$$\hat{O}_1 + \hat{O}_2 = 2\hat{V}_1 + 2\hat{V}_2$$

$$\hat{T}\hat{O}\hat{U} = 2(\hat{V}_1 + \hat{V}_2)$$

$$\therefore \hat{T}\hat{O}\hat{U} = 2\hat{T}\hat{V}\hat{U}$$

✓

construction/konstruksie

✓ S ✓ R

✓ S/R

✓ S

✓ S

(6)

9.2		
9.2.1	$\hat{AOC} = 2\hat{D}$ [$\angle$ at the centre = $2 \times \angle$ at circumference.] $104^\circ = 2\hat{D}$ [mdpts $\angle = 2 \times$ omtreks $\angle$] $\therefore \hat{D} = 52^\circ$	✓ S ✓ R (2)
9.2.2	$\hat{DAB} = \hat{C}_3 = 32^\circ$ [$\angle$ s in the same segment] [$\angle$ e in selfde sirkelsegment]	✓ S/R (1)
9.2.3	$\hat{A}_1 = \hat{C}_1$ [$\angle$'s opp = radii] [$\angle$ e teenoor gelyke radiusse] $\hat{A}_1 + \hat{C}_1 + \hat{O} = 180^\circ$ [sum of $\angle$'s in Δ] [som binne $\angle$ e van Δ] $2\hat{A}_1 + 104^\circ = 180^\circ$ $\hat{A}_1 = 38^\circ$	✓ S/R ✓ S/R ✓ answer/antwoord (3)
9.2.4	$\hat{ACB} = 90^\circ$ [$\angle$'s in the semi-circle] [$\angle$ e in halwe sirkel] $\hat{C}_3 = 32^\circ$ [$\angle$'s in same circle segment] [$\angle$ e in selfde sirkelsegment] Maar/ But $\hat{ACB} = \hat{C}_1 + \hat{C}_2 + \hat{C}_3$ $90^\circ = 38^\circ + \hat{C}_2 + 32^\circ$ $\hat{C}_2 = 20^\circ$	✓ S / R ✓ S/R ✓ answer (3)

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maar/ but $\hat{Q}_1 = \hat{B}_1$ [tan-chord theorem][raaklyn koord stelling] en/ and $\hat{Q}_3 = \hat{B}_1$ [$\angle$'s opp = sides][$\angle$ e teenoor gelyke sye] In $\triangle PQB$ $\hat{P} + \hat{B}_1 + \hat{Q}_1 + \hat{Q}_2 = 180^\circ$ [sum of $\angle$'s in $\triangle$][som binne $\angle$ e van $\triangle$] $\hat{P} + \hat{B}_1 + \hat{B}_1 + 90^\circ - \hat{B}_1 + \hat{B}_1 = 180^\circ$ $\hat{P} = 90^\circ - 2\hat{B}_1$	✓ answer/antwoord (3)
	[26]

QUESTION 10 / VRAAG 10

10.1	$\frac{DG}{GC} = \frac{EH}{HC}$ [prop theorem, $ED \parallel HG$] [eweredigheidstelling] $\frac{3}{2} = \frac{EH}{HC}$	✓ S ✓ R (2)
10.2	$\frac{BG}{BD} = \frac{AB}{BE}$ [prop theorem, $ED \parallel AG$] [eweredigheidstelling] $\frac{BG}{BD} = \frac{3}{1}$ $\frac{\text{Area of } \triangle ABG}{\text{Area of } \triangle CAG} = \frac{\frac{1}{2} \cdot BG \cdot h}{\frac{1}{2} \cdot GC \cdot h} = \frac{9}{2} \quad \text{OR /OF} \quad \frac{3}{\frac{1}{4}} = \frac{12}{1}$ $= \frac{9}{4}$	✓ S/ R ✓ S/ R ✓ answer/antwoord (3)
		[5]

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		TOTAL/TOTAAL:150
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