basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NASIONALE SENIOR SERTIFIKAAT

GRAAD 12

WISKUNDE V2

NOVEMBER 2022

PUNTE: 150

TYD: 3 uur

Hierdie vraestel bestaan uit 13 bladsye en 1 inligtingsblad.

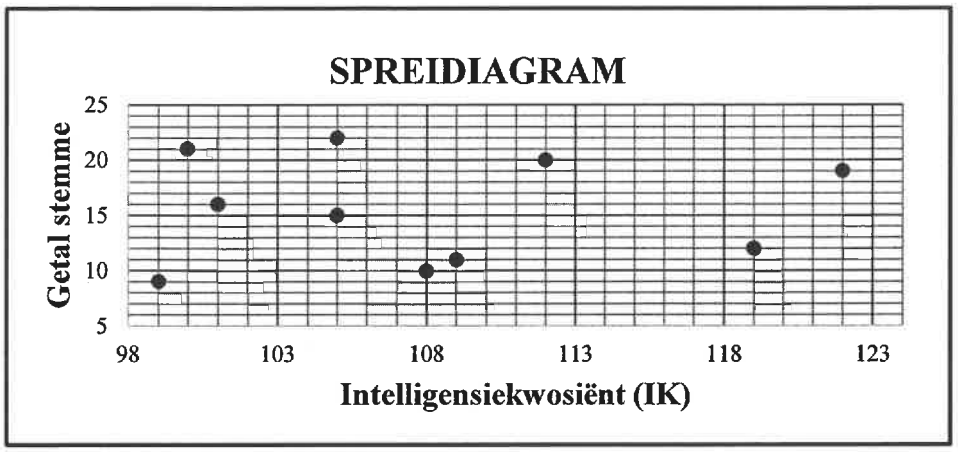
INSTRUKSIES EN INLIGTING

Lees die volgende instruksies noukeurig deur voordat die vraestel beantwoord word.

1. Hierdie vraestel bestaan uit 10 vrae.
2. Beantwoord AL die vrae in die SPESIALE ANTWOORDEBOEK wat verskaf word.
3. Dui ALLE berekeninge, diagramme, grafieke, ens. wat jy in die beantwoording van die vrae gebruik, duidelik aan.
4. Slegs antwoorde sal NIE noodwendig volpunte verdien NIE.
5. Jy mag 'n goedgekeurde wetenskaplike sakrekenaar gebruik (nieprogrammeerbaar en niegrafies), tensy anders vermeld.
6. Indien nodig, rond antwoorde tot TWEE desimale plekke af, tensy anders vermeld.
7. Diagramme is NIE noodwendig volgens skaal geteken NIE.
8. 'n Inligtingsblad met formules is aan die einde van die vraestel ingesluit.
9. Skryf netjies en leesbaar.

VRAAG 1

Die matriekklas van 'n sekere hoërskool moes vir die voorsitter van die VRL (verteenwoordigende raad van leerders) stem. Die spreidiagram hieronder toon die IK (intelligensiekwosiënt) van die 10 leerders wat die meeste stemme gekry het en die getal stemme wat hulle gekry het.



Voor die verkiesing is die gewildheid van elk van hierdie tien leerders bepaal en 'n gewildheidspunt (uit 100) is aan elkeen toegeken. Die gewildheidspunt en die getal stemme van dieselfde 10 leerders wat die meeste stemme gekry het, word in die tabel hieronder getoon.

Gewildheidspunt (x)	32	89	35	82	50	59	81	40	79	65
Getal stemme (y)	9	22	10	21	11	15	20	12	19	16

1.1 Bereken die:

1.1.1 Gemiddelde getal stemme wat hierdie 10 leerders gekry het (2)

1.1.2 Standaardafwyking van die getal stemme wat hierdie 10 leerders gekry het (1)

1.2 Die leerders wat minder stemme as een standaardafwyking onder die gemiddelde gekry het, is nie vir 'n onderhoud genooi nie. Hoeveel leerders is genooi? (2)

1.3 Bepaal die vergelyking van die kleinstekwadrate-regressielyn vir die data wat in die tabel gegee is. (3)

1.4 Voorspel die aantal stemme wat 'n leerder met 'n gewildheidspunt van 72 sal ontvang. (2)

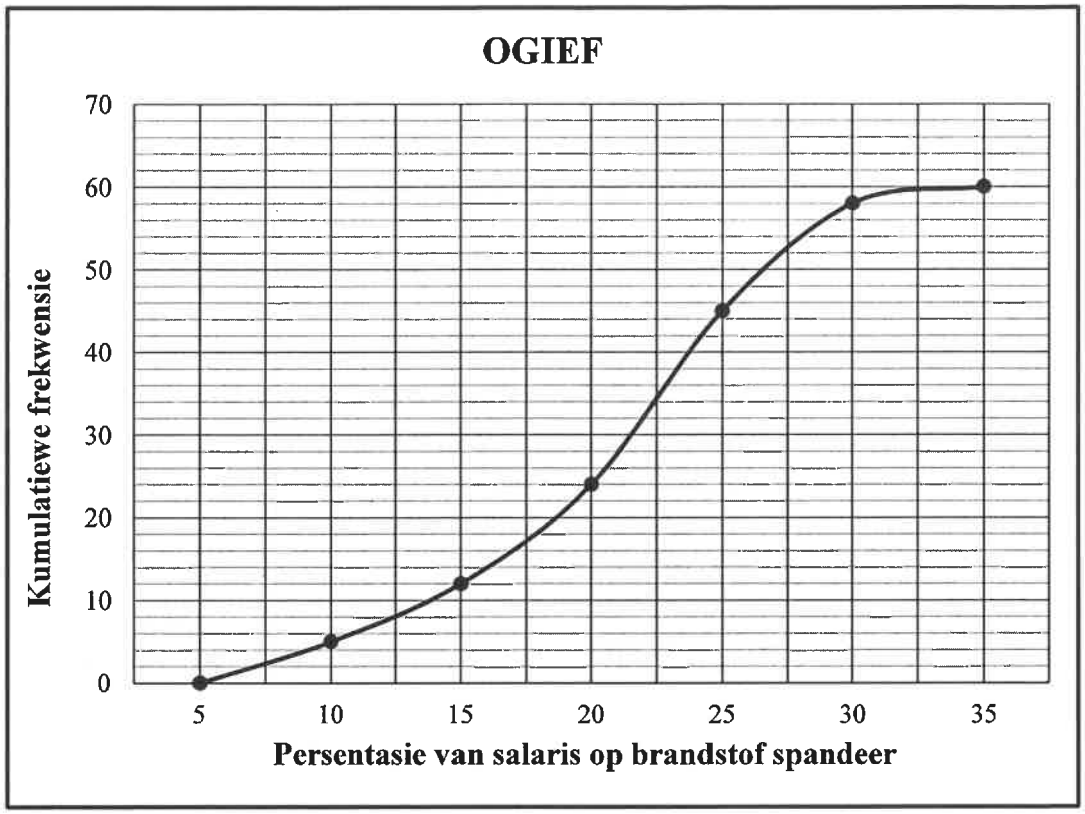
1.5 Gebruik die spreidiagram en tabel hierbo om 'n rede te verskaf waarom:

1.5.1 IK nie 'n goeie aanduider is van die aantal stemme wat 'n leerder kan ontvang nie (1)

1.5.2 Die voorspelling in VRAAG 1.4 betroubaar is (1)
[12]

VRAAG 2

'n Maatskappy het navorsing onder al hulle werknemers gedoen oor watter persentasie van hulle maandelikse salaris in 'n sekere maand aan brandstof spandeer is. Die data word in die ogief (kumulatiewe frekwensiegrafiek) hieronder voorgestel.



2.1 Hoeveel mense werk by hierdie maatskappy? (1)

2.2 Skryf die modale klas van die data neer. (1)

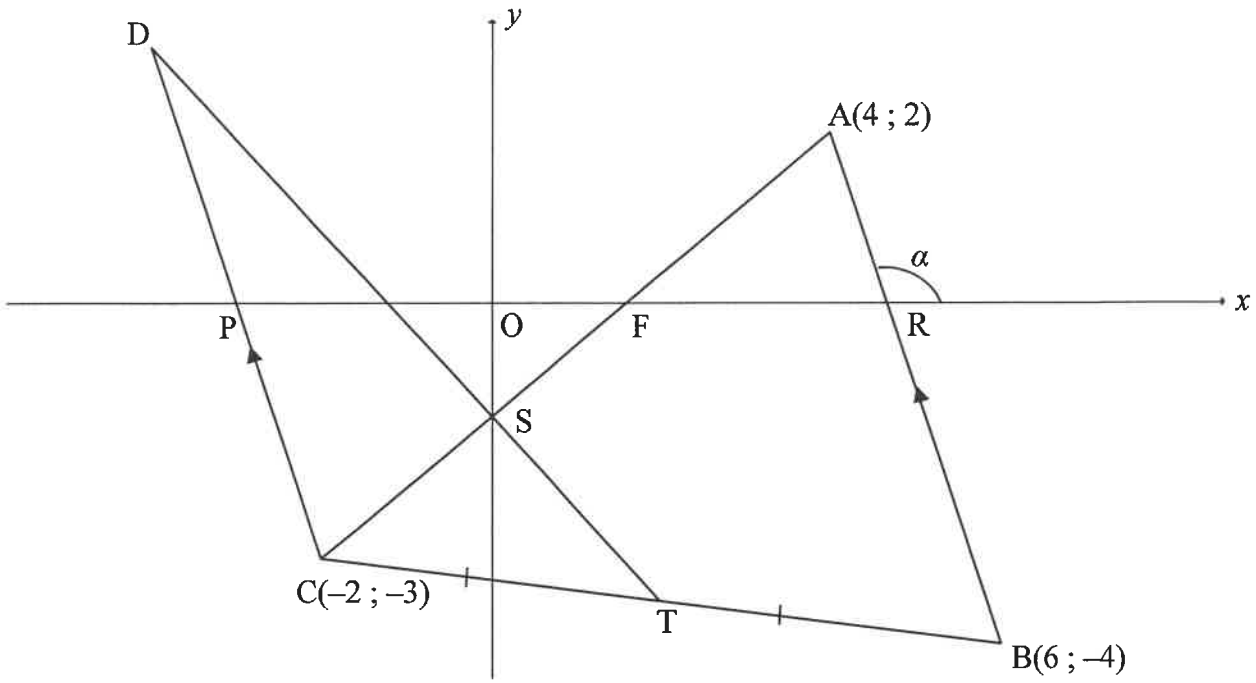
2.3 Hoeveel werknemers het meer as 22,5% van hulle maandelikse salaris aan brandstof spandeer? (2)

2.4 'n Werknemer het R2 400 van sy salaris aan brandstof in hierdie spesifieke maand spandeer. Bepaal die maandelikse salaris van hierdie werknemer indien hy 7% van sy salaris aan brandstof spandeer. (2)

2.5 Die maandelikse salarisse van hierdie werknemers bly konstant en die getal liter brandstof gebruik in elke maand bly ook konstant. Indien die brandstofprys aan die begin van die volgende maand van R21,43 per liter na R22,79 per liter styg, hoe sal die ogief hierbo verander? (2)
[8]

VRAAG 3

In die diagram is A(4 ; 2), B(6 ; –4) en C(–2 ; –3) hoekpunte van ΔABC. T is die middelpunt van CB. Die vergelyking van lyn AC is $5x-6y=8$. Die inklinasiehoek van AB is α. ΔDCT word getrek sodanig dat CD ∥ BA. Die lyne AC en DT sny mekaar by S, die y-afsnit van AC. P, F en R is onderskeidelik die x-afsnitte van DC, AC en AB.



3.1 Bereken die:

3.1.1 Gradiënt van AB (2)

3.1.2 Grootte van α (2)

3.1.3 Koördinate van T (2)

3.1.4 Koördinate van S (2)

3.2 Bepaal die vergelyking van CD in die vorm $y=mx+c$. (3)

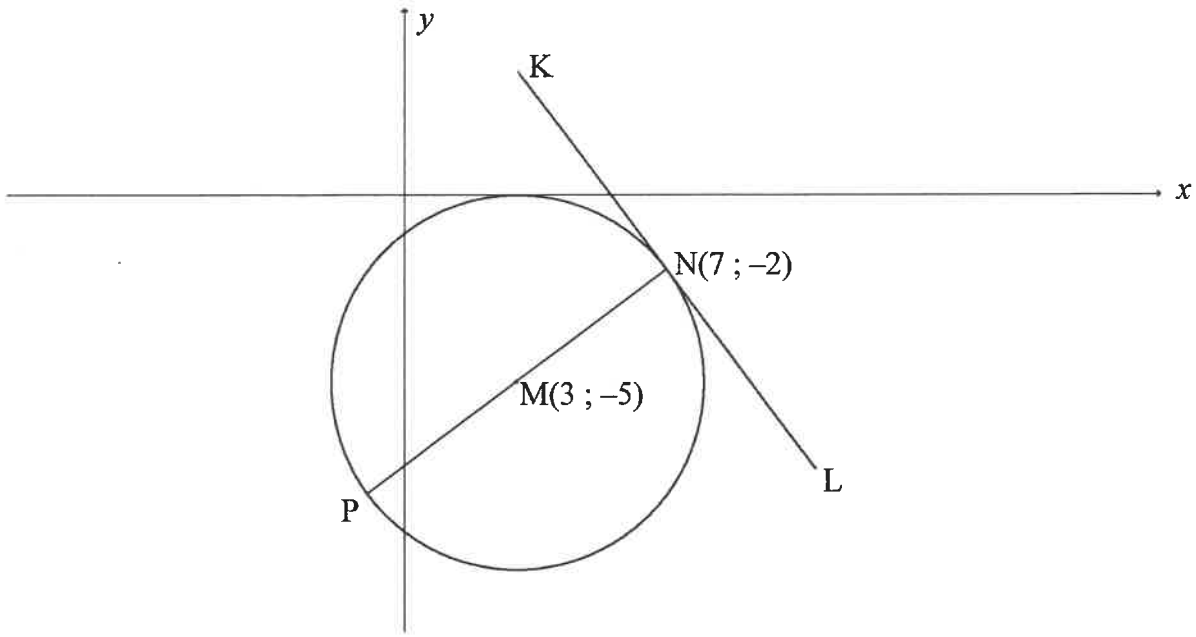
3.3 Bereken die:

3.3.1 Grootte van $D\hat{C}A$ (4)

3.3.2 Oppervlakte van POSC (5)
[20]

VRAAG 4

In die diagram is M(3 ; –5) die middelpunt van die sirkel met middellyn PN. KL is 'n raaklyn aan die sirkel by N(7 ; –2).



4.1 Bereken die koördinate van P. (2)

4.2 Bepaal die vergelyking van:

4.2.1 Die sirkel in die vorm $(x-a)^2+(y-b)^2=r^2$ (3)

4.2.2 KL in die vorm $y=mx+c$ (5)

4.3 Vir watter waardes van k sal $y=-\frac{4}{3}x+k$ 'n snylyn van die sirkel wees? (4)

4.4 Punte A(t ; t) en B word nie op die diagram getoon nie.

Vanaf punt A word 'n ander raaklyn aan die sirkel met middelpunt M getrek om by B te raak.

4.4.1 Toon dat die lengte van raaklyn AB gegee word deur $\sqrt{2t^2+4t+9}$. (2)

4.4.2 Bepaal die minimum lengte van AB. (4)
[20]

VRAAG 5

5.1 Gegee dat $\sqrt{13}\sin x+3=0$, waar $x\in(90°;270°)$.

Sonder die gebruik van 'n sakrekenaar, bepaal die waarde van:

5.1.1 $\sin(360°+x)$ (2)

5.1.2 $\tan x$ (3)

5.1.3 $\cos(180°+x)$ (2)

5.2 Bepaal die waarde van die volgende uitdrukking, **sonder die gebruik van 'n sakrekenaar**:

$$\frac{\cos(90°+\theta)}{\sin(\theta-180°)+3\sin(-\theta)}$$ (5)

5.3 Bepaal die algemene oplossing van die volgende vergelyking:

$(\cos x+2\sin x)(3\sin 2x-1)=0$ (6)

5.4 Gegee die identiteit: $\cos(x+y).\cos(x-y)=1-\sin^2 x-\sin^2 y$

5.4.1 Bewys die identiteit. (4)

5.4.2 Bepaal vervolgens die waarde van $1-\sin^2 45°-\sin^2 15°$, **sonder die gebruik van 'n sakrekenaar**. (3)

5.5 Beskou die trigonometriese uitdrukking: $16\sin x.\cos^3 x-8\sin x.\cos x$

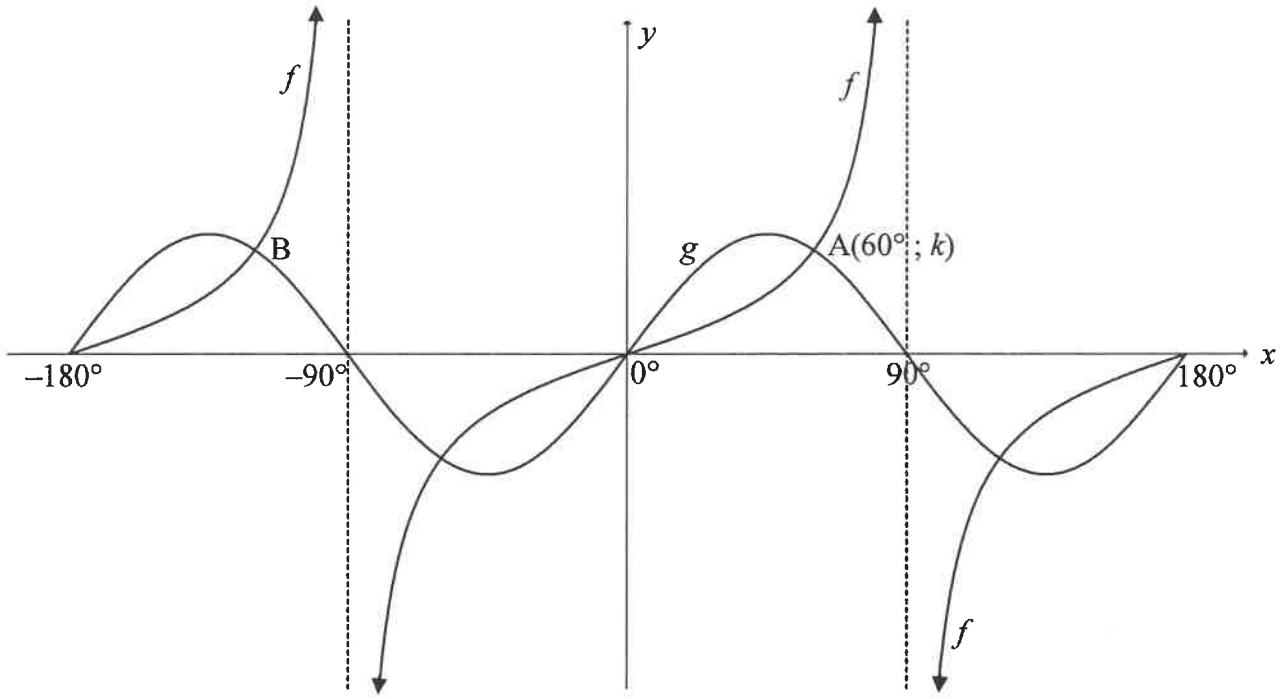
5.5.1 Herskryf die uitdrukking as 'n enkele trigonometriese verhouding. (4)

5.5.2 Vir watter waarde van x in die interval $x\in[0°;90°]$ sal $16\sin x.\cos^3 x-8\sin x.\cos x$ 'n minimum waarde hê? (1)

[30]

VRAAG 6

In die diagram hieronder is die grafieke van $f(x)=\tan x$ en $g(x)=2\sin 2x$ vir die interval $x\in[-180°\,;\,180°]$ geskets. A$(60°\,;\,k)$ en B is twee snypunte van f en g.



6.1 Skryf die periode van g neer. (1)

6.2 Bereken die:

6.2.1 Waarde van k (1)

6.2.2 Koördinate van B (1)

6.3 Skryf die waardeversameling van $2g(x)$ neer. (2)

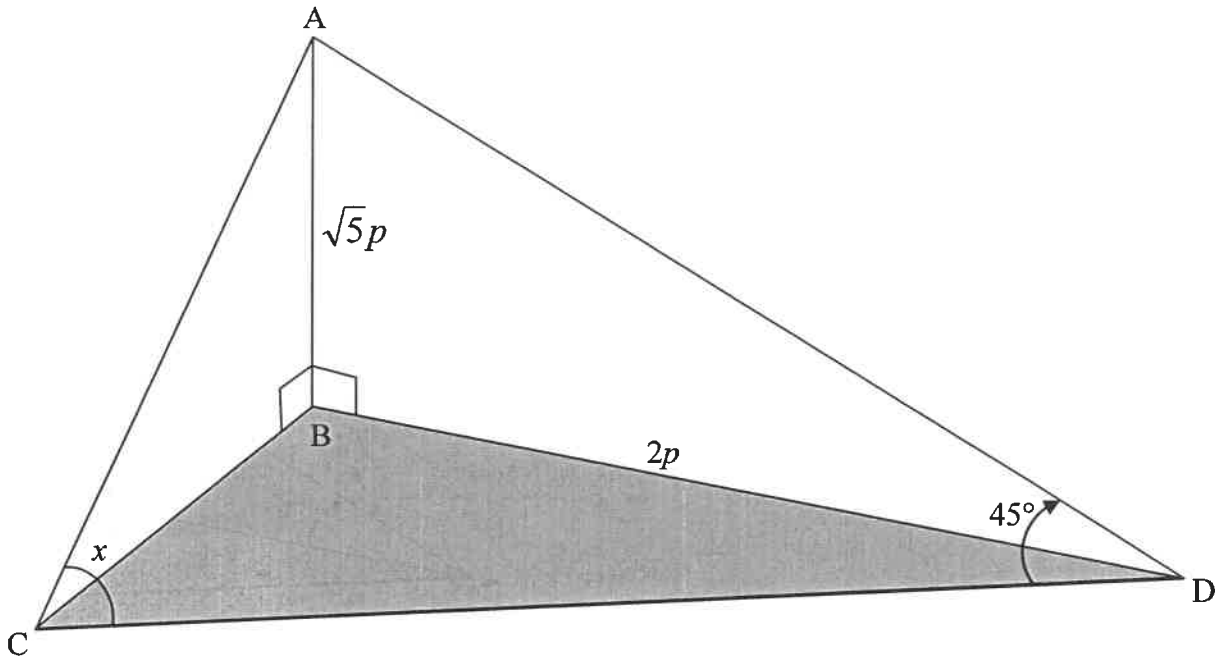
6.4 Vir watter waardes van x sal $g(x+5°)-f(x+5°)\le 0$ in die interval $x\in[-90°\,;\,0°]$? (2)

6.5 Bepaal die waardes van p waarvoor $\sin x.\cos x=p$ presies twee reële wortels in die interval $x\in[-180°\,;\,180°]$ sal hê. (3)

[10]

VRAAG 7

AB is 'n vertikale vlagpaal wat $\sqrt{5}p$ meter lank is. AC en AD is twee kabels wat die vlagpaal anker. B, C en D is in dieselfde horisontale vlak.
BD = $2p$ meter, $A\hat{C}D = x$ en $A\hat{D}C = 45°$.



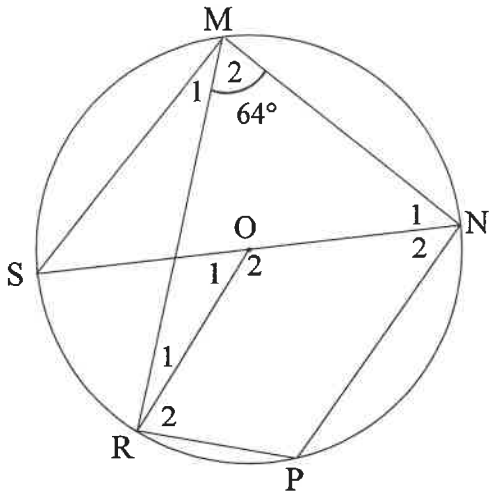
7.1 Bepaal die lengte van AD in terme van p. (2)

7.2 Toon dat die lengte van $CD = \dfrac{3p(\sin x + \cos x)}{\sqrt{2}\sin x}$. (5)

7.3 Indien dit verder gegee word dat $p = 10$ en $x = 110°$, bereken die oppervlakte van ΔADC. (3)
[10]

VRAAG 8

8.1 In die diagram is O die middelpunt van die sirkel. MNPR is 'n koordevierhoek en SN is 'n middellyn van die sirkel. Koord MS en radius OR is getrek. $\hat{M}_2 = 64°$.



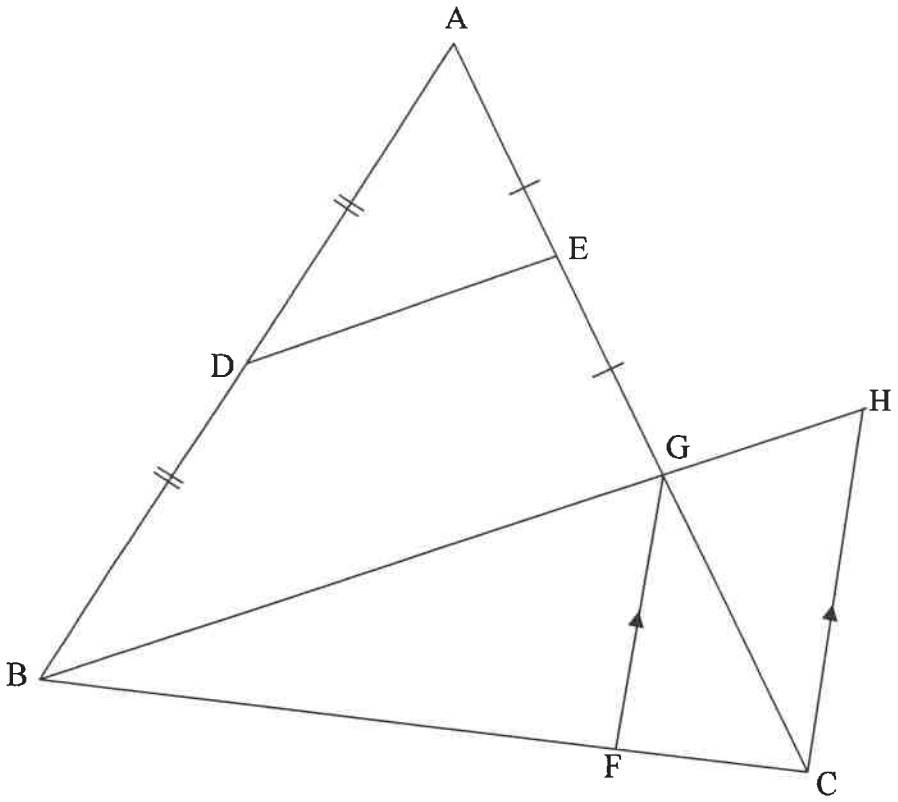
Bepaal, met redes, die grootte van die volgende hoeke:

8.1.1 $\hat{P}$ (2)

8.1.2 $\hat{M}_1$ (2)

8.1.3 $\hat{O}_1$ (2)

8.2 In die diagram is ΔABG geskets. D en E is middelpunte van AB en AG onderskeidelik. AG en BG word na C en H onderskeidelik verleng. F is 'n punt op BC sodanig dat FG || CH.

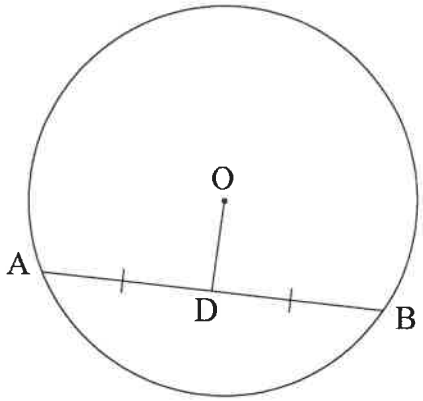


8.2.1 Gee 'n rede waarom DE || BH. (1)

8.2.2 Indien dit verder gegee word dat $\frac{FC}{BF}=\frac{1}{4}$, DE = $3x - 1$ en GH = $x + 1$, bereken, met redes, die waarde van x. (6)
[13]

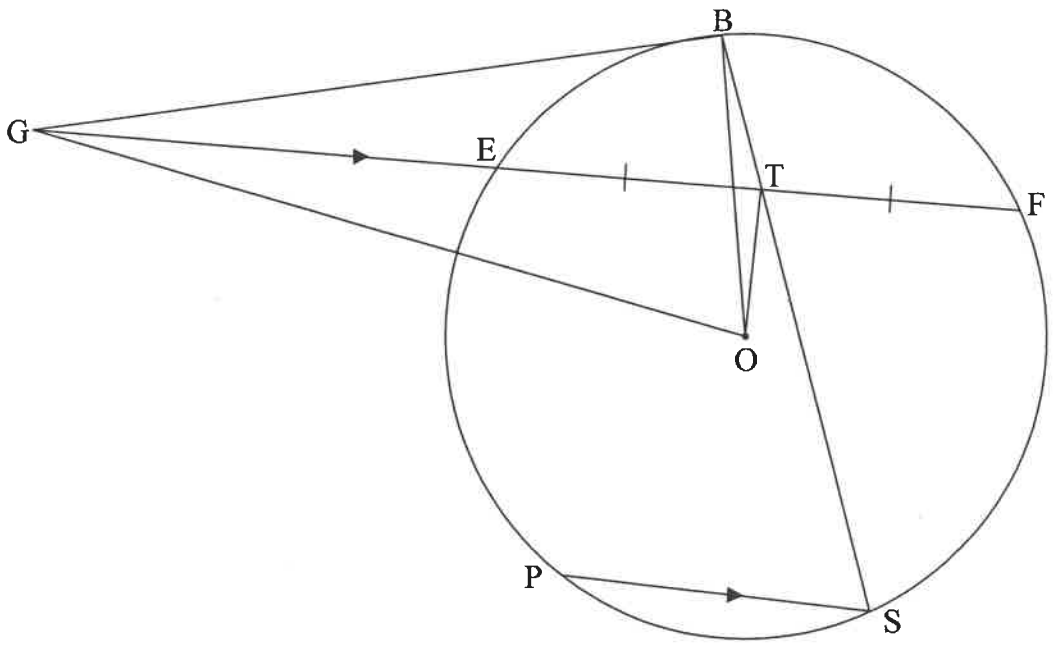
VRAAG 9

9.1 In die diagram is O die middelpunt van 'n sirkel. OD halveer koord AB.



Bewys die stelling wat beweer dat die lyn wat vanaf die middelpunt van 'n sirkel getrek word en 'n koord halveer, loodreg op die koord is, met ander woorde OD ⊥ AB. (5)

9.2 In die diagram is E, B, F, S en P punte op die sirkel met middelpunt O. GB is 'n raaklyn aan die sirkel by B. FE word verleng om die raaklyn by G te ontmoet. OT is getrek sodanig dat T die middelpunt van EF is. GO en BO is getrek. BS is deur T getrek. PS || GF.



Bewys, met redes, dat:

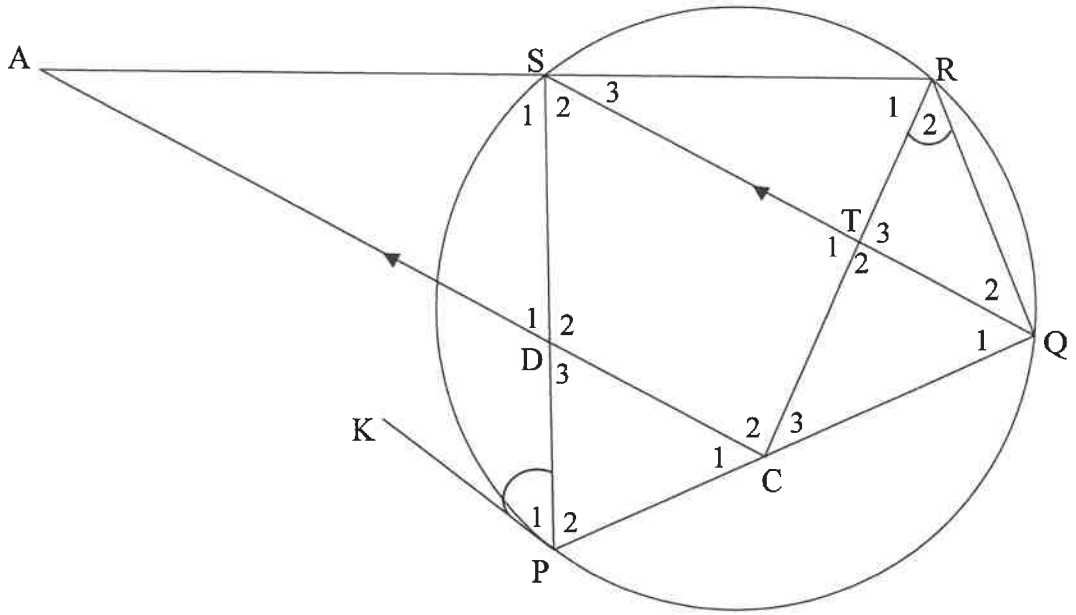
9.2.1 OTBG 'n koordevierhoek is (5)

9.2.2 $G\hat{O}B = \hat{S}$ (4)

[14]

VRAAG 10

In die diagram is PQRS 'n koordevierhoek. KP is 'n raaklyn aan die sirkel by P. C en D is punte op koorde PQ en PS onderskeidelik en CD verleng, ontmoet RS verleng by A. CA || QS. RC is getrek. $\hat{P}_1 = \hat{R}_2$.



Bewys, met redes, dat:

10.1 $\hat{S}_1 = \hat{T}_2$ (4)

10.2 $\frac{AD}{AR} = \frac{AS}{AC}$ (5)

10.3 $AC \times SD = AR \times TC$ (4)
[13]

TOTAAL: 150

INLIGTINGSBLAD

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

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

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

$$T_n = ar^{n-1} \qquad S_n = \frac{a\left(r^n - 1\right)}{r-1} \;; r \neq 1 \qquad S_\infty = \frac{a}{1-r} \;; -1 < r < 1$$

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

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

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad \mathrm{M}\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta$$

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

In ΔABC: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

$$\text{area } \Delta ABC = \frac{1}{2}ab.\sin C$$

$$\sin(\alpha+\beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta \qquad \sin(\alpha-\beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$$

$$\cos(\alpha+\beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta \qquad \cos(\alpha-\beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases} \qquad \sin 2\alpha = 2\sin\alpha.\cos\alpha$$

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

$$P(A) = \frac{n(A)}{n(S)} \qquad P(A \text{ of } B) = P(A) + P(B) - P(A \text{ en } B)$$

$$\hat{y} = a + bx \qquad b = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sum(x-\bar{x})^2}$$

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Candidate Barcode label/Stafieskodeplakker

NSC Answer Book
NSS-antwoordeboek

National Senior Certificate/*Nasionale Senior Sertifikaat* (Grade 12/*Graad 12*) – November 2022

CENTRE NUMBER *SENTRUMNOMMER*	
EXAMINATION NUMBER *EKSAMENNOMMER*	
DATE *DATUM*	
BOOK NUMBER *BOEKNOMMER*	OF *VAN*	BOOKS *BOEKE*
SUBJECT CODE *VAKKODE*	
PAPER NUMBER *VRAESTELNOMMER*	2
SUBJECT NAME *VAKNAAM*	**MATHEMATICS/*WISKUNDE***

MARKER/*NASIENER*				MODERATOR'S INITIALS IN RELEVANT BLOCK *MODERATOR SE VOORLETTERS IN RELEVANTE BLOKKIE*													
Question *Vraag*	Marks *Punte*	Marker's Code & Initials *Nasiener se kode & Voorletters*		Marks *Punte*	SM	Marks *Punte*	DCM *AHN*	Marks *Punte*	CM *HN*	Marks *Punte*	IM	Marks *Punte*	EM
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9													
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	TOTAL *TOTAAL*												

CONTROLLED AND CERTIFIED CORRECT (SURNAME AND INITIALS OF EA) *GEKONTROLEER EN AS KORREK GESERTIFISEER (VAN EN VOORLETTERS VAN EA)*		READ INSTRUCTIONS ON THE NEXT PAGE. *LEES INSTRUKSIES OP VOLGENDE BLADSY.*

This answer book consists of 23 pages./*Hierdie antwoordeboek bestaan uit 23 bladsye.*

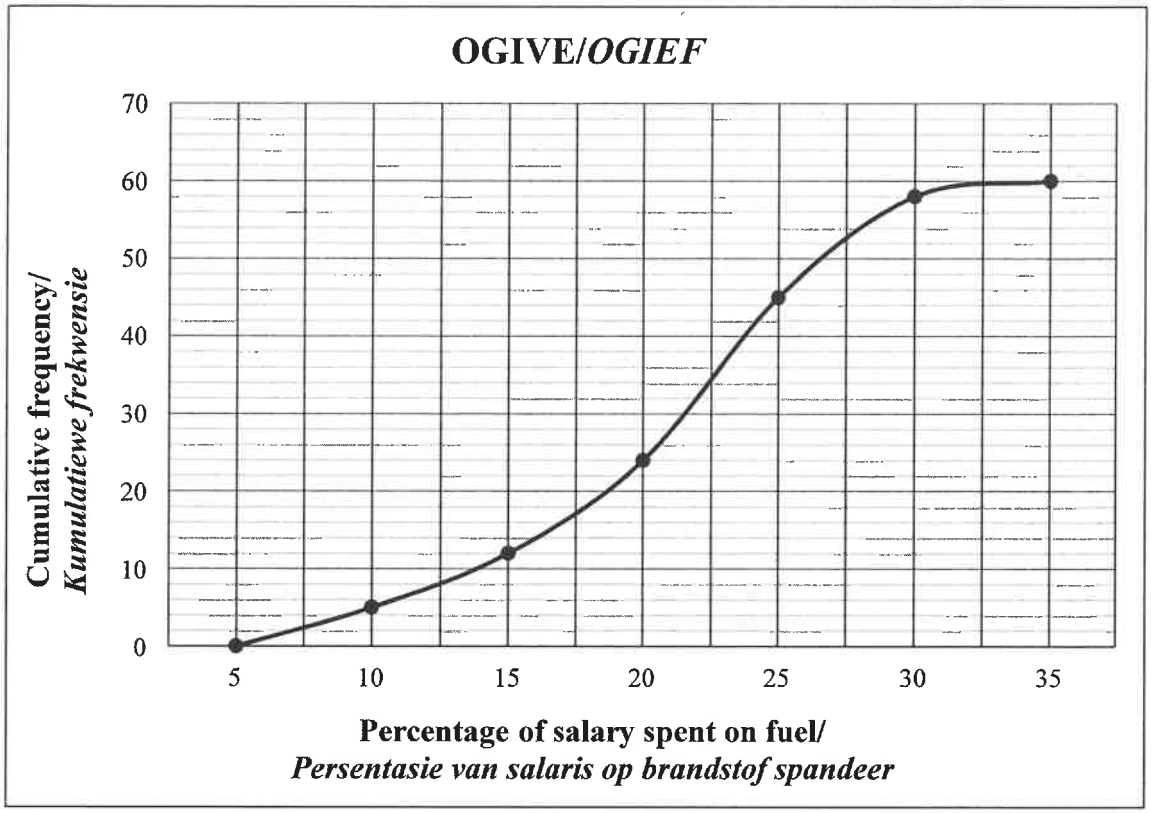
PLEASE FOLLOW THESE INSTRUCTIONS CAREFULLY	*VOLG ASSEBLIEF HIERDIE INSTRUKSIES NOUKEURIG*
1. Clearly write your examination number and centre number in the space provided and attach your barcode label in the space provided.	1. *Skryf jou eksamennommer en sentrumnommer duidelik in die ruimtes verskaf en plak jou stafieskodeplakker in die ruimte verskaf.*
2. Remember that your own name (or the name of your school) may not appear anywhere on or in this answer book.	2. *Onthou dat jou eie naam (of die naam van jou skool) nie op of in hierdie antwoordeboek mag voorkom nie.*
3. Answer ALL questions in the spaces provided.	3. *Beantwoord ALLE vrae in die ruimtes wat voorsien is.*
4. No pages may be torn from this answer book.	4. *Geen bladsye mag uit hierdie antwoordeboek geskeur word nie.*
5. Read the instructions printed on your timetable carefully as well as any other instructions which may be given in each examination paper.	5. *Lees die instruksies wat op jou eksamenrooster gedruk is, sorgvuldig deur, asook enige ander instruksies wat op elke eksamenvraestel gegee word.*
6. Candidates may not retain an answer book or remove it from the examination room.	6. *Geen antwoordeboek mag deur die kandidaat behou of uit die eksamenlokaal verwyder word nie.*
7. Answers must be written in black/blue ink as distinctly as possible. Do not write in the margins.	7. *Skryf die antwoorde so duidelik moontlik met swart/blou ink. Laat die kantlyne oop.*
8. Write the numbers of the questions you have answered on the front cover of the answer book where marks are to be recorded.	8. *Skryf die nommers van die vrae wat jy beantwoord het op die voorblad van die antwoordeboek waar die punte aangebring word.*
9. If you require additional space for your answers: 9.1 Use the additional space provided at the end of the answer book. 9.2 When answering a question in the additional space, indicate clearly the question number in the column on the LHS. 9.3 Rule off after each answer.	9. *In geval jy bykomende ruimte benodig vir jou antwoorde:* *9.1 Gebruik die bykomende ruimte wat aan die einde van die antwoordeboek voorsien word.* *9.2 As 'n vraag in die bykomende ruimte beantwoord word, dui duidelik die vraagnommer in die kolom aan die LK aan.* *9.3 Trek 'n lyn na elke antwoord.*
10. Draw a neat line through any work/rough work that must not be marked.	10. *Trek 'n netjiese lyn deur enige werk/rofwerk wat nie nagesien moet word nie.*

QUESTION/*VRAAG* 1

Popularity score (x)/ *Gewildheidspunt* (x)	32	89	35	82	50	59	81	40	79	65
Number of votes (y)/ *Getal stemme* (y)	9	22	10	21	11	15	20	12	19	16

	Solution/*Oplossing*	**Marks *Punte***
1.1.1		(2)
1.1.2		(1)
1.2		(2)
1.3		(3)
1.4		(2)
1.5.1		(1)
1.5.2		(1)
		[12]

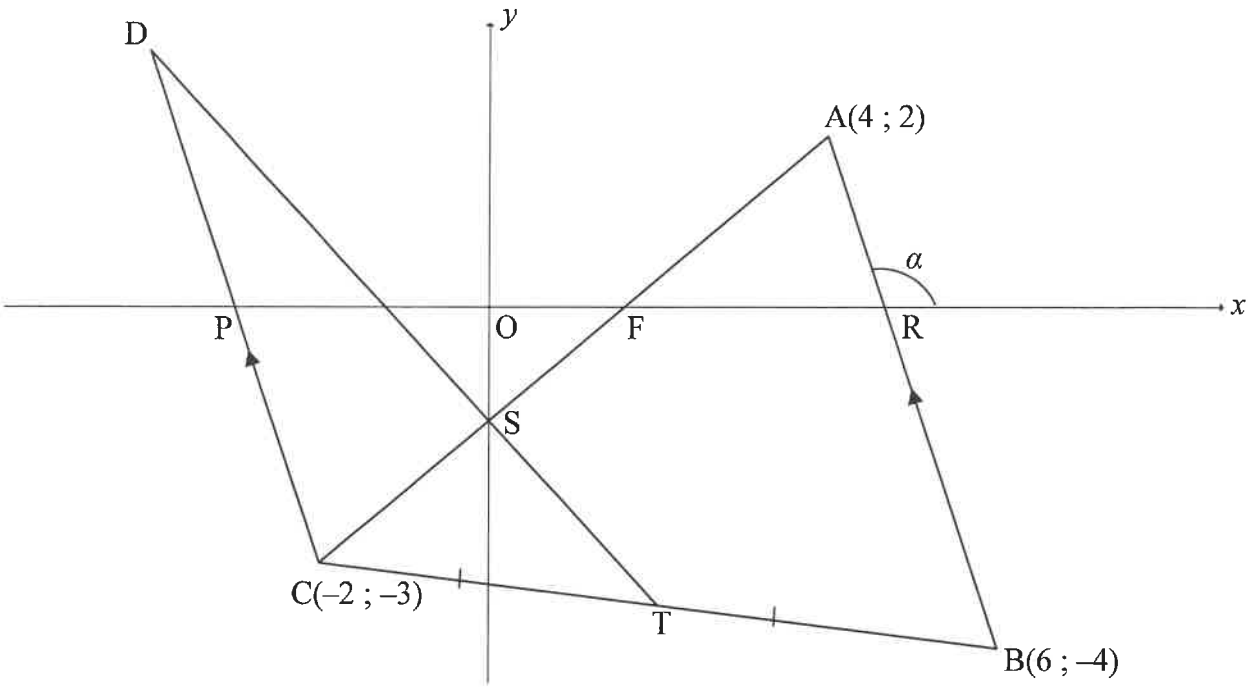
QUESTION/*VRAAG* 2



	Solution/*Oplossing*	**Marks** ***Punte***
2.1		(1)
2.2		(1)
2.3		(2)
2.4		(2)

2.5		(2)
		[8]

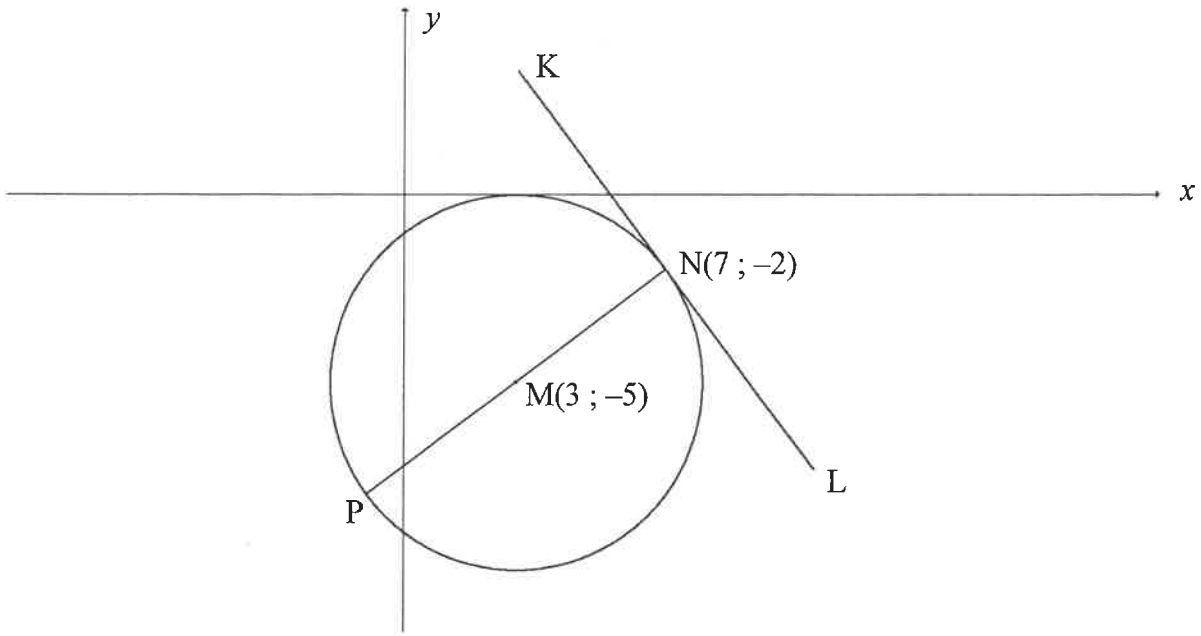
QUESTION/*VRAAG* 3



	Solution/*Oplossing*	**Marks** ***Punte***
3.1.1		(2)
3.1.2		(2)
3.1.3		(2)

	Solution/*Oplossing*	**Marks** ***Punte***
3.1.4		(2)
3.2		(3)
3.3.1		(4)
3.3.2		(5)
		[20]

QUESTION/*VRAAG* 4



	Solution/*Oplossing*	**Marks** ***Punte***
4.1		(2)
4.2.1		(3)
4.2.2		(5)

	Solution/*Oplossing*	**Marks** ***Punte***
4.3		(4)
4.4.1		(2)
4.4.2		(4)
		[20]

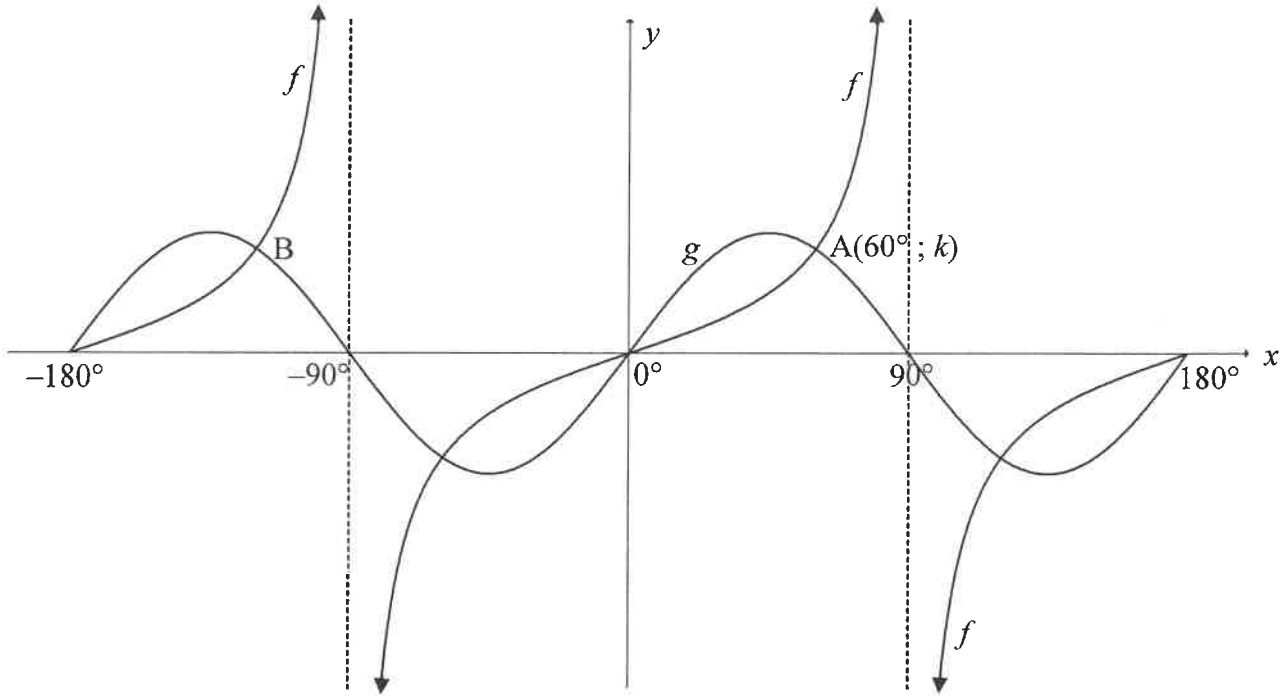
QUESTION/*VRAAG* 5

	Solution/*Oplossing*	**Marks** ***Punte***
5.1.1		(2)
5.1.2		(3)
5.1.3		(2)
5.2		(5)

	Solution/*Oplossing*	**Marks** ***Punte***
5.3		(6)
5.4.1		(4)
5.4.2		(3)

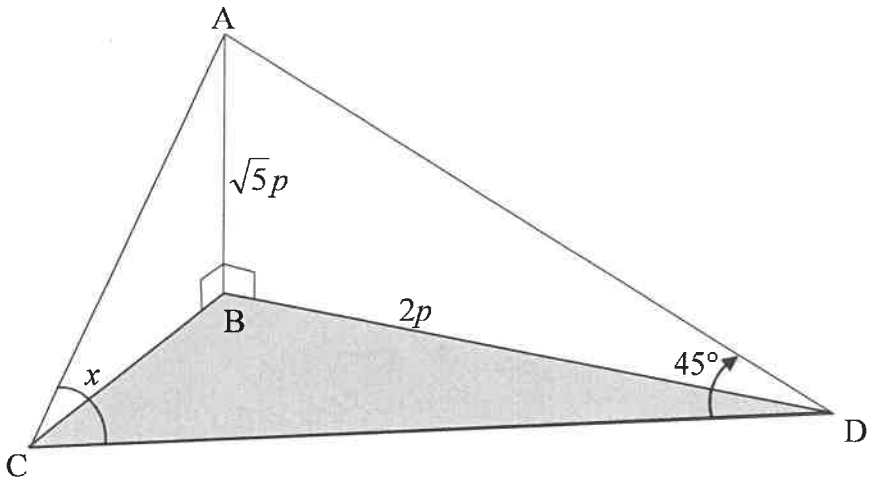
	Solution/*Oplossing*	**Marks** ***Punte***
5.5.1		(4)
5.5.2		(1)
		[30]

QUESTION/*VRAAG* 6



	Solution/*Oplossing*	Marks *Punte*
6.1		(1)
6.2.1		(1)
6.2.2		(1)
6.3		(2)
6.4		(2)
6.5		(3)
		[10]

QUESTION/*VRAAG* 7

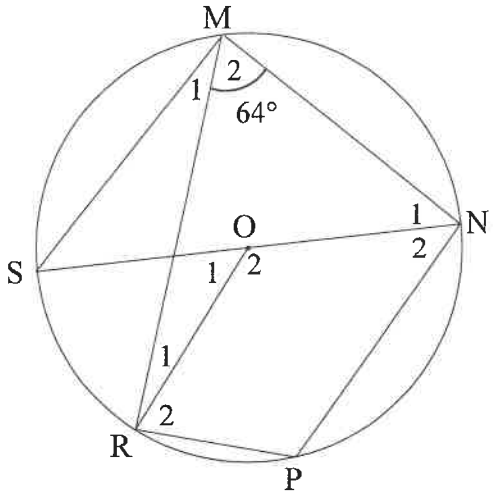


	Solution/*Oplossing*	**Marks** ***Punte***
7.1		(2)
7.2		(5)
7.3		(3)
		[10]

Provide reasons for your statements in QUESTIONS 8, 9 and 10.
Verskaf redes vir jou bewerings in VRAAG 8, 9 en 10.

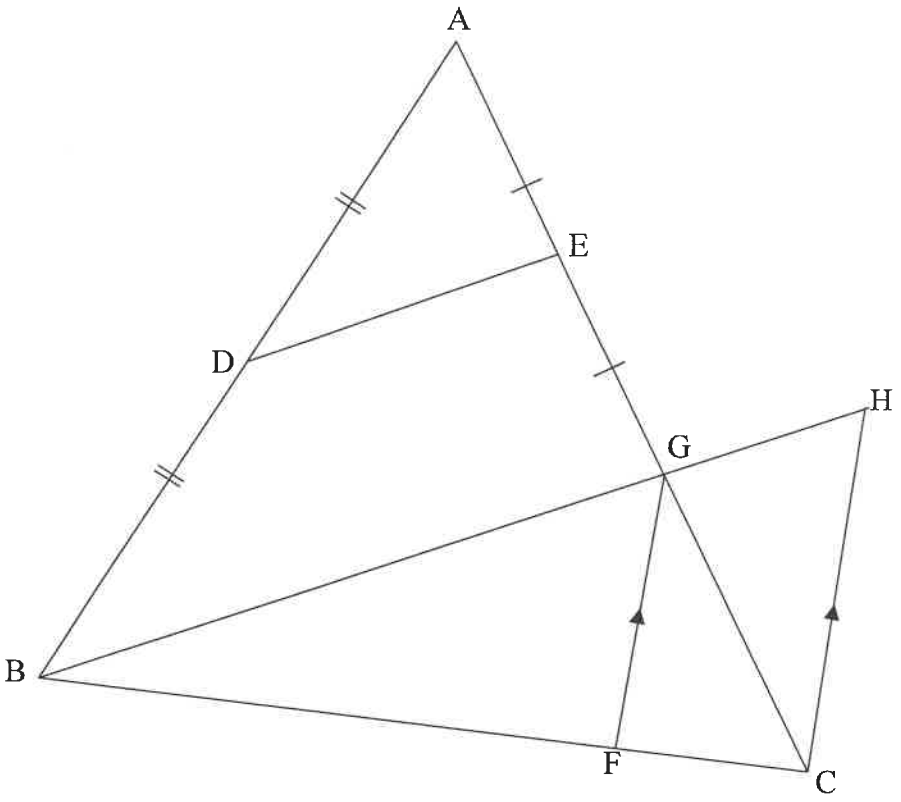
QUESTION/*VRAAG* 8

8.1



	Solution/*Oplossing*	**Marks** ***Punte***
8.1.1		(2)
8.1.2		(2)
8.1.3		(2)

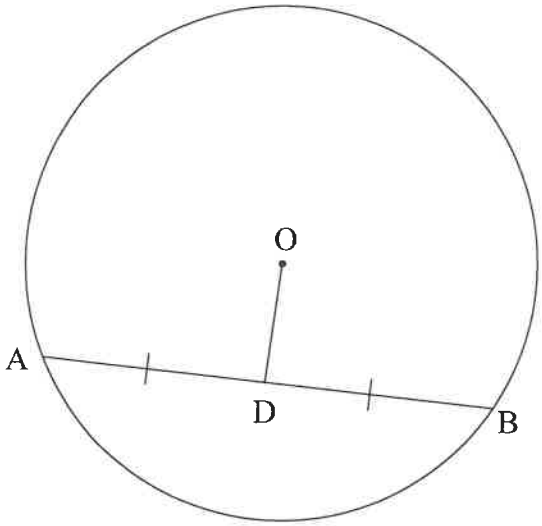
8.2



	Solution/*Oplossing*	**Marks Punte**
8.2.1		(1)
8.2.2		(6)
		[13]

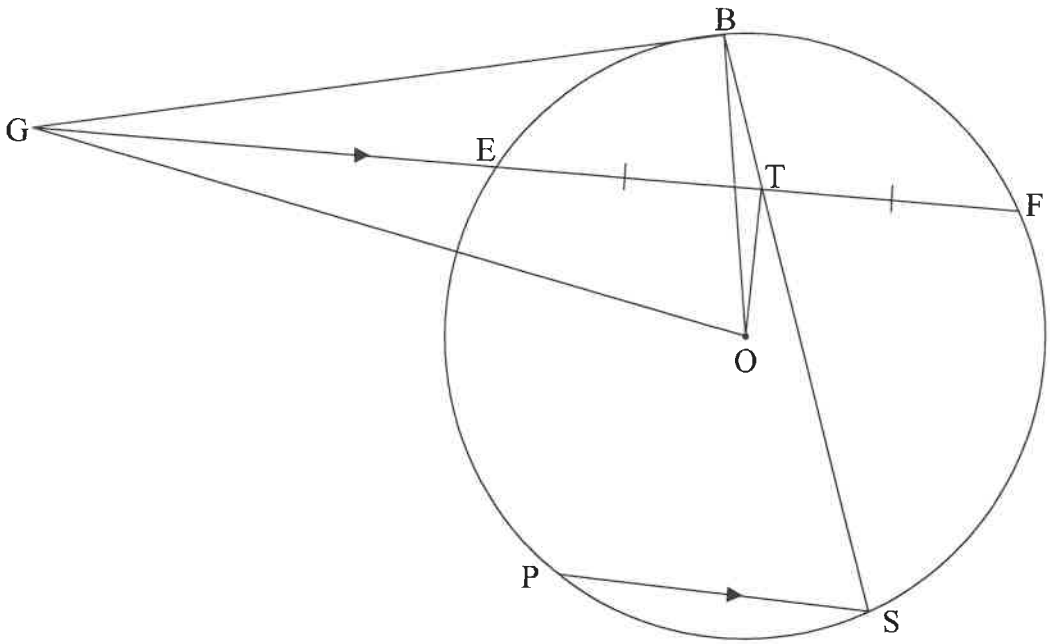
QUESTION/*VRAAG* 9

9.1



	Solution/*Oplossing*	**Marks** ***Punte***
9.1		(5)

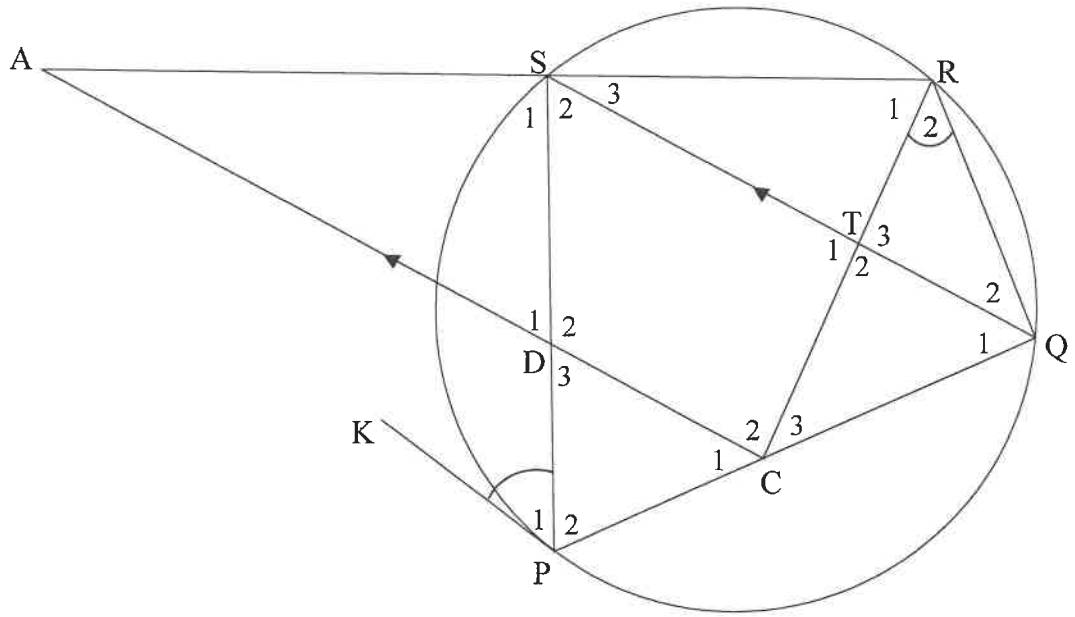
9.2



	Solution/*Oplossing*	**Marks** ***Punte***
9.2.1		(5)

	Solution/*Oplossing*	**Marks** ***Punte***
9.2.2		(4)
		[14]

QUESTION/*VRAAG* 10



	Solution/*Oplossing*	Marks *Punte*
10.1		(4)

	Solution/*Oplossing*	**Marks** ***Punte***
10.2		(5)
10.3		(4)
		[13]

	Additional space/*Bykomende ruimte*	**Marks** ***Punte***

	Additional space/*Bykomende ruimte*	**Marks** ***Punte***

TOTAL/*TOTAAL*: 150

RE-MARK/RE-CHECK *HERMERK/HERSIEN*				
Question *Vraag*	Marks *Punte*			Initials *Voorletters*
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
TOTAL *TOTAAL*				
HASH TOTAL *KAF-TOTAAL*				

basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE 12/*GRAAD 12*

MATHEMATICS P2/*WISKUNDE V2*

NOVEMBER 2022

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 24 pages.
Hierdie nasienriglyne bestaan uit 24 bladsye.

NOTE:

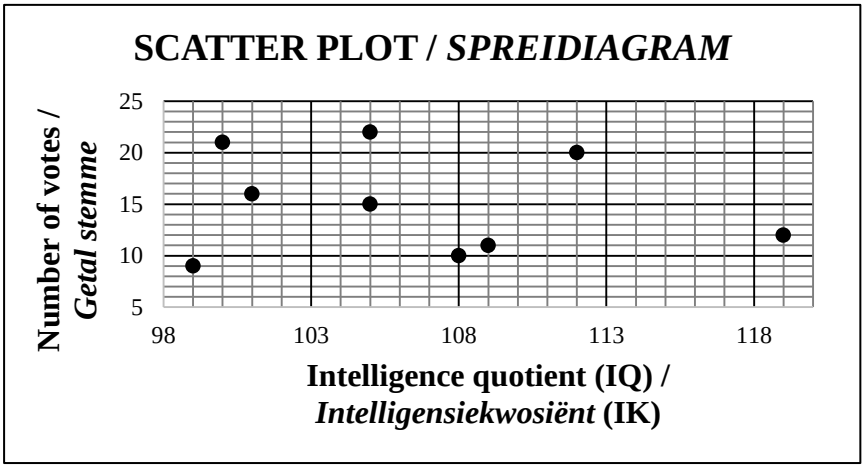
- **If a candidate answers a question TWICE, only mark the FIRST attempt.**
- **If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed out version.**
- **Consistent accuracy applies in ALL aspects of the marking memorandum. Stop marking at the second calculation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

NOTA:

- ***As 'n kandidaat 'n vraag TWEE KEER beantwoord, merk slegs die EERSTE poging.***
- ***As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, merk die doodgetrekte poging.***
- ***Volgehoue akkuraatheid word in ALLE aspekte van die memorandum toegepas. Hou op nasien by die tweede berekeningsfout.***
- ***Aanvaar van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat nie.***

GEOMETRY/*MEETKUNDE*	
S	**A mark for a correct statement** **(A statement mark is independent of a reason)**
	'n Punt vir 'n korrekte bewering ***('n Punt vir 'n bewering is onafhanklik van die rede)***
R	**A mark for the correct reason** **(A reason mark may only be awarded if the statement is correct)**
	'n Punt vir 'n korrekte rede ***('n Punt word slegs vir die rede toegeken as die bewering korrek is)***
S/R	**Award a mark if statement AND reason are both correct**
	Ken 'n punt toe as die bewering EN rede beide korrek is

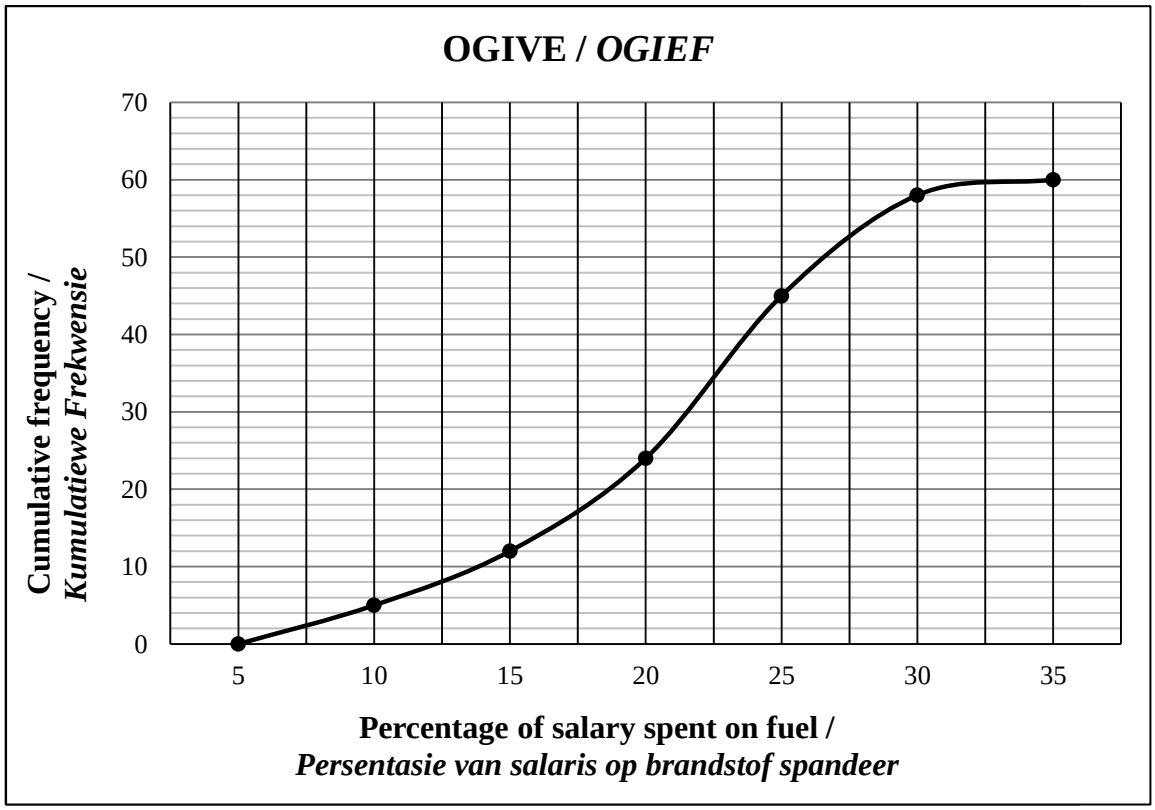
QUESTION/*VRAAG* 1



Popularity score (*x*) *Gewildheidspunt* **(*x*)**	32	89	35	82	50	59	81	40	79	65
Number of votes (*y*) *Getal stemme* **(*y*)**	9	22	10	21	11	15	20	12	19	16

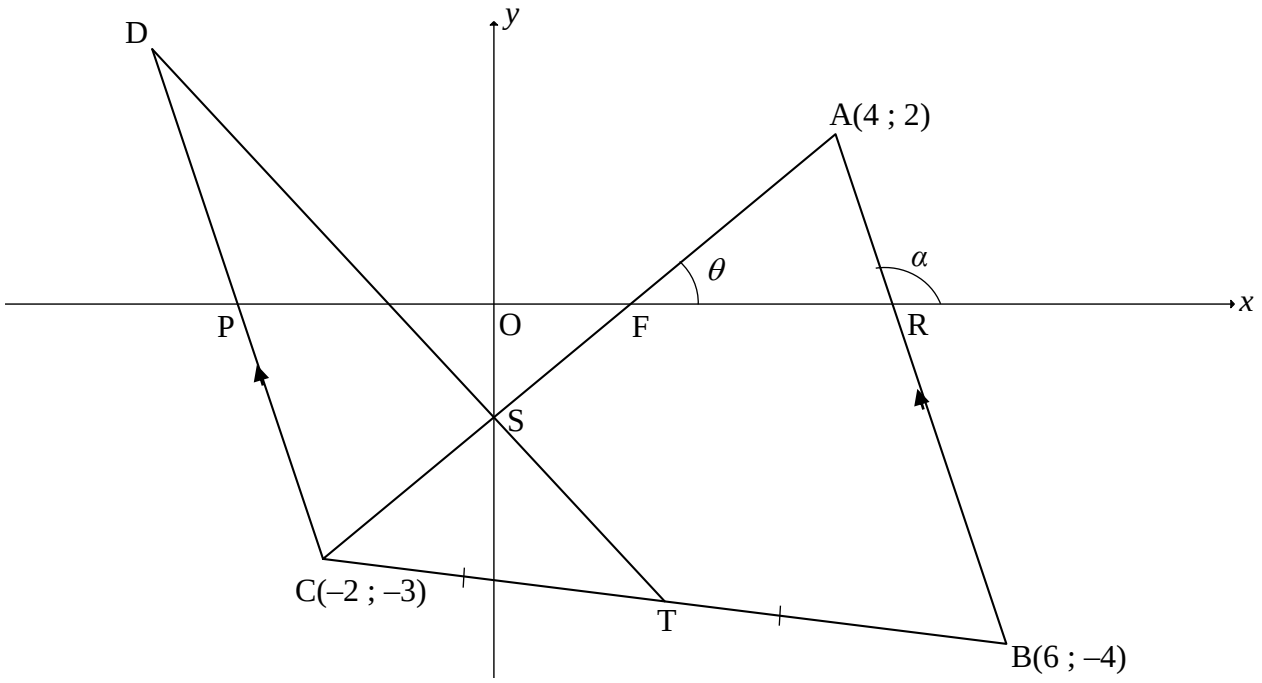
1.1.1	$\bar{y} = \frac{155}{10}$ $= 15,5$ ANSWER ONLY: Full marks	✓155 ✓answer (2)
1.1.2	SD = 4,59	✓ answer (1)
1.2	$\bar{y} - \text{SD}$ = 15,5 – 4,59 = 10,91 ∴ 10 – 2 = 8 learners	✓ value of $\bar{y} - \text{SD}$ ✓ answer (2)
1.3	a = 1,7709… b = 0,2243… $\hat{y} = 1,77 + 0,22x$	✓ a ✓ b ✓ equation (3)
1.4	$\hat{y} = 1,77 + 0,22(72)$ = 17,61 ≈ 18 votes **OR/*OF*** $\hat{y} = 17,92 \approx 18$ votes	✓ substitution ✓ answer (2) ✓✓ answer (2)
1.5.1	Points are all scattered therefore low correlation and unrealistic prediction./*Punte is versprei daarom 'n lae korrelasie en onrealistiese voorspelling.*	✓ R (1)
1.5.2	r = 0,98/correlation very strong/*korrelasie baie sterk* ∴ a reliable prediction/*'n betroubare voorspelling*	✓ S (1)
		[12]

QUESTION/*VRAAG* 2



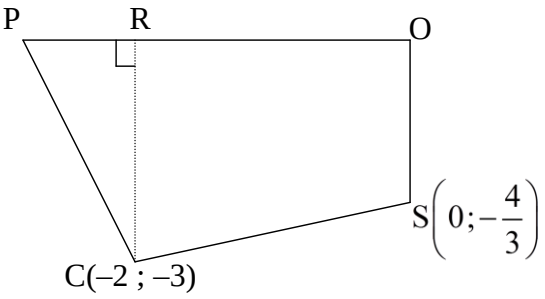
2.1	60 employees	✓ answer (A) (1)
2.2	$20 < x \leq 25$	✓ answer (1)
2.3	60 – 34 = 26 employees ANSWER ONLY: Full marks	✓ 34 ✓ answer (2)
2.4	$\text{Salary} = \frac{100}{7} \times 2400$ Salary = R34 285,71 ANSWER ONLY: Full marks	✓ method ✓ answer (2)
2.5	∴ Ogive/Cumulative frequency graph will shift to the right/will become steeper. ∴ *Ogief/Kumulatiewe frekwensie grafiek sal na regs skuif/sal steiler wees.*	✓✓ answer (2)
		[8]

QUESTION/*VRAAG* 3



3.1.1	$m_{AB}=\frac{2-(-4)}{4-6}$ **OR** $m_{AB}=\frac{-4-2}{6-4}$ $m_{AB}=-3$ ANSWER ONLY: Full marks	✓ substitution ✓ answer (2)
3.1.2	$\tan\alpha=m_{AB}=-3$ $\alpha=108{,}43°$ ANSWER ONLY: Full marks	✓ $\tan\alpha=m_{AB}=-3$ ✓ answer (2)
3.1.3	$T\left(\frac{x_1+x_2}{2};\frac{y_1+y_2}{2}\right)$ $T\left(\frac{-2+6}{2};\frac{-3-4}{2}\right)$ $T\left(2;\frac{-7}{2}\right)$	✓ $x_T=2$ ✓ $y_T=\frac{-7}{2}$ (2)
3.1.4	$5(0)-6y=8$ $y=-\frac{4}{3}$ $S\left(0;\frac{-4}{3}\right)$	✓ $x_S=0$ ✓ $y_S=\frac{-4}{3}$ (2)
3.2	$m_{CD}=m_{AB}=-3$ $-3=-3(-2)+c$ OR $y-(-3)=-3(x-(-2))$ $c=-9$ $y=-3x-9$ $y=-3x-9$	✓ gradient ✓ substitution of C(–2 ; –3) ✓ equation (3)

3.3.1	$5x-6y=8$ $y=\frac{5}{6}x-\frac{8}{6}$ $\tan\theta=m_{AC}=\frac{5}{6}$ $\theta=39{,}81°$ $\hat{A}=108{,}43°-39{,}81°$ $=68{,}62°$ $D\hat{C}A=68{,}62°$ [alt ∠s ; DC||AB]	✓ $\tan\theta=m_{AC}=\frac{5}{6}$ ✓ $\theta=39{,}81°$ ✓ $\hat{A}=68{,}62°$ ✓ answer (4)
3.3.2	$P(-3;0)$ and F(1,6 ; 0) Area POSC = Area ΔFPC – Area ΔOFS $=\frac{1}{2}(4,6)(3)-\frac{1}{2}(1,6)\left(\frac{4}{3}\right)$ = 6,9 – 1,07 = 5,83 units^2 **OR/*OF*** $P(-3;0)$ $FC=\sqrt{\left(-2-\frac{8}{5}\right)^2+(-3-0)^2}=\frac{3\sqrt{61}}{5}$ $\text{Area }\Delta PFC=\frac{1}{2}(PF)(FC)\sin O\hat{F}S$ $=\frac{1}{2}\left(\frac{23}{5}\right)\left(\frac{3\sqrt{61}}{5}\right)\sin 39{,}81°$ $=6{,}90$ $\text{Area }\Delta OFS=\frac{1}{2}\left(\frac{8}{5}\right)\left(\frac{4}{3}\right)$ = 1,07 Area POSC = 6,90 – 1,07 = 5,83 units^2 **OR/*OF***	✓ $P(-3;0)$ ✓ method ✓ $\frac{1}{2}(4,6)(3)$ ✓ $\frac{1}{2}(1,6)\left(\frac{4}{3}\right)$ ✓ answer (5) ✓ $P(-3;0)$ ✓ $\frac{1}{2}\left(\frac{23}{5}\right)\left(\frac{3\sqrt{61}}{5}\right)\sin 39{,}81°$ ✓ $\frac{1}{2}\left(\frac{8}{5}\right)\left(\frac{4}{3}\right)$ ✓ method ✓ answer (5)



$P(-3;0)$ ✓ $P(-3;0)$

Area of POSC = Area of OSCR + Area of ΔPRC ✓ method

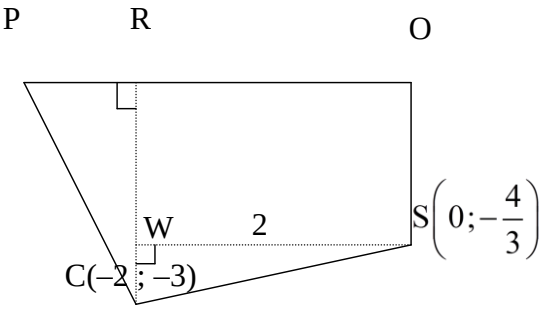
$$=\frac{1}{2}\left(\frac{4}{3}+3\right)\times 2+\frac{1}{2}(1\times 3)$$ ✓ $\frac{1}{2}\left(\frac{4}{3}+3\right)\times 2$ ✓ $\frac{1}{2}(1\times 3)$

$$=\frac{35}{6}$$

$$=5,83\text{ units}^2$$ ✓ answer

(5)

OR/
OF



$P(-3;0)$ ✓ $P(-3;0)$

Area POSC = Area ROSW + Area ΔPRC + Area ΔWSC ✓ method

$$=\left(\frac{4}{3}\right)(2)+\frac{1}{2}(1)(3)+\frac{1}{2}(2)\left(\frac{5}{3}\right)$$ ✓ $\frac{1}{2}(1)(3)$ ✓ $\left(\frac{4}{3}\right)(2)+\frac{1}{2}(2)\left(\frac{5}{3}\right)$

$$=\frac{35}{6}$$

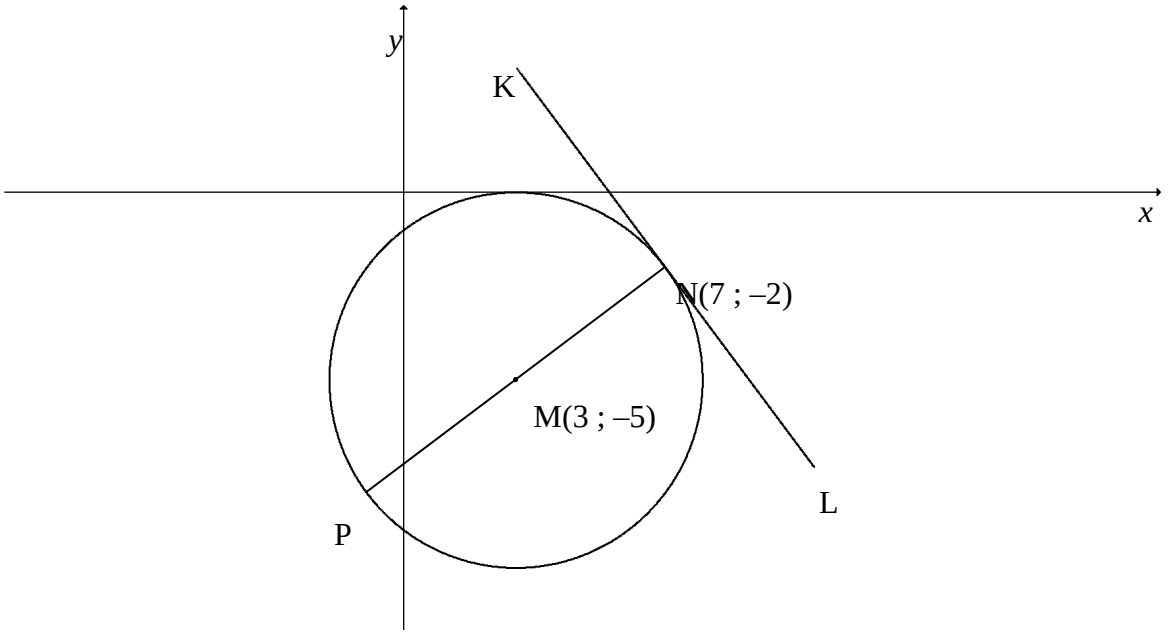
$$=5,83\text{units}^2$$ ✓ answer

(5)

OR/*OF*

	$P(-3;0)$ Area of $\Delta PSC = \frac{1}{2}(PC)(CS)\sin D\hat{C}A$ $= \frac{1}{2}\left(\sqrt{10}\right)\left(\frac{\sqrt{61}}{3}\right)\sin 68,62°$ $= 3,833..$ Area of $\Delta POS = \frac{1}{2}(PO)(OS)$ $= \frac{1}{2}(3)\left(\frac{4}{3}\right)$ $= 2$ Area POSC $= 3,833\ldots + 2$ $= 5,83 \text{units}^2$	✓ $P(-3;0)$ ✓ $\frac{1}{2}\left(\sqrt{10}\right)\left(\frac{\sqrt{61}}{3}\right)\sin 68,62°$ ✓ $\frac{1}{2}(3)\left(\frac{4}{3}\right)$ ✓ method ✓ answer (5)
		[20]

QUESTION/*VRAAG* 4



4.1	$P(x;y)$; $N(7;-2)$; $M(3;-5)$ $\frac{x+7}{2}=3$ $\quad$ $\frac{y-2}{2}=-5$ $x=-1$ $\quad$ $y=-8$ $P(-1;-8)$	✓ $x_P=-1$ ✓ $y_P=-8$ (2)
4.2.1	$r^2=(7-3)^2+(-2-(-5))^2$ **OR/*OF*** $r^2=(-1-3)^2+(-8-(-5))^2$ $r^2=25$ $(x-3)^2+(y+5)^2=25$	✓ substitution into distance formula ✓ $(x-3)^2+(y+5)^2$ ✓ $r^2=25$ (3)
4.2.2	$m_{\text{radius}}=\frac{-5-(-2)}{3-7}=\frac{3}{4}$ $m_{\text{tangent}}=-\frac{4}{3}$ [radius ⊥ tangent/*raaklyn ⊥ radius*] $-2=-\frac{4}{3}(7)+c$ **OR** $y-(-2)=-\frac{4}{3}(x-7)$ $c=\frac{22}{3}$ $\quad$ $y=-\frac{4}{3}x+\frac{22}{3}$ $y=-\frac{4}{3}x+\frac{22}{3}$	✓ substitution ✓ $m_{\text{radius}}=\frac{-3}{-4}=\frac{3}{4}$ ✓ $m_{\text{tangent}}=-\frac{4}{3}$ ✓ substitution of *m* and N(7 ; –2) ✓ equation (5)
4.3	$-8=-\frac{4}{3}(-1)+c$ $\therefore\ c=-\frac{28}{3}$ $-\frac{28}{3}<k<\frac{22}{3}$	✓ subst *m* and P ✓ value of *c* ✓✓ answer (4)

4.4.1	$AB^2 = AM^2 - MB^2$ $AB^2 = \left[(t-3)^2 + (t+5)^2\right] - 5^2$ $= t^2 - 6t + 9 + t^2 + 10t + 25 - 25$ $AB = \sqrt{2t^2 + 4t + 9}$	✓ substitution into Pythagoras ✓ simplification (A) (2)
4.4.2	$t = \frac{-4}{2(2)}$ $= -1$ Minimum at $t = -1$ $AB = \sqrt{2(-1)^2 + 4(-1) + 9}$ $AB = \sqrt{7}$ **OR/*OF*** $4t + 4 = 0$ $t = -1$ Minimum at $t = -1$ $AB = \sqrt{2(-1)^2 + 4(-1) + 9}$ $AB = \sqrt{7}$ **OR/*OF*** Length of $AB = \sqrt{2t^2 + 4t + 9}$ $= \sqrt{2\left(t^2 + 2t + \frac{9}{2}\right)}$ $= \sqrt{2\left[(t+1)^2 + \frac{7}{2}\right]}$ $= \sqrt{2(t+1)^2 + 7}$ Minimum at $t = -1$ $AB = \sqrt{2(-1)^2 + 4(-1) + 9}$ $AB = \sqrt{7}$	✓ substitution into correct formula ✓ $t = -1$ ✓ substitution ✓ answer (4) ✓ derivative = 0 ✓ $t = -1$ ✓ substitution ✓ answer (4) ✓ completing of the square ✓ $t = -1$ ✓ substitution ✓ answer (4)
		[20]

QUESTION/*VRAAG* 5

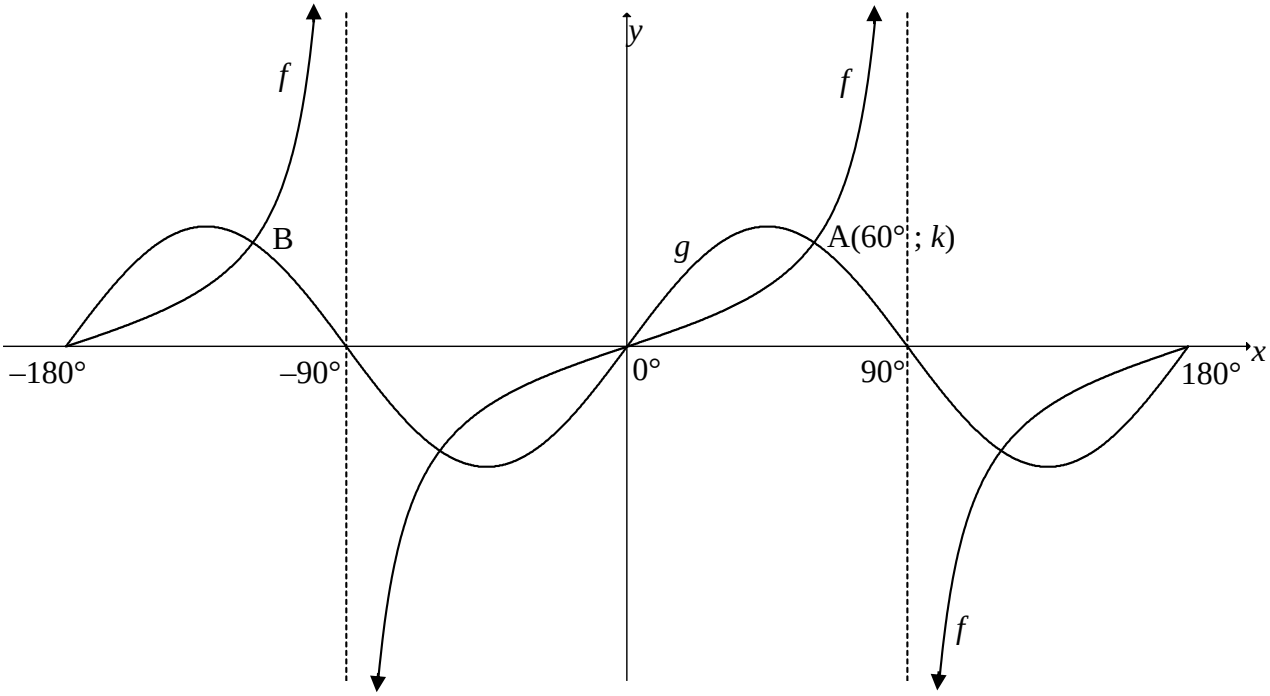
5.1.1	$\sin(360°+x)$ $=\sin x$	✓ + ✓ $\sin x$ (2)
5.1.2	$x-\text{coordinate}=\sqrt{\left(\sqrt{13}\right)^2-(-3)^2}$ $=-2$ $\tan x=\frac{-3}{-2}$ $=\frac{3}{2}$ **OR/*OF*** $x-\text{coordinate}=\sqrt{\left(\sqrt{13}\right)^2-(3)^2}$ $=2$ $\tan x=\frac{3}{2}$	✓✓ substitution ✓ method (3) ✓✓ substitution ✓ method (3)
5.1.3	$\cos(180°+x)$ $=-\cos x$	✓ – ✓ $\cos x$ (2)
5.2	$\frac{\cos(90°+\theta)}{\sin(\theta-180°)+3\sin(-\theta)}$ $=\frac{-\sin\theta}{\sin(-(180°-\theta))-3\sin\theta}$ $=\frac{-\sin\theta}{-\sin\theta-3\sin\theta}$ $=\frac{-\sin\theta}{-4\sin\theta}$ $=\frac{1}{4}$	✓ $-\sin\theta$ ✓ $-3\sin\theta$ ✓ $-\sin\theta$ ✓ simplification ✓ answer (5)

5.3	$(\cos x + 2\sin x)(3\sin 2x - 1) = 0$ $\cos x + 2\sin x = 0$ or $3\sin 2x - 1 = 0$ $\tan x = -\frac{1}{2}$ $\sin 2x = \frac{1}{3}$ ref $\angle = 26{,}565...°$ ref $\angle = 19{,}471...°$ $x = 153{,}43° + k.180° ;\ k \in Z$ $x = 9{,}74° + k.180°;\ k \in Z$ **OR/*OF*** or $x = 153{,}43° + k.360° ;\ k \in Z$ $x = 80{,}26° + k.180°;$ $k \in Z$ or $x = 333{,}43° + k.360° ;\ k \in Z$	✓ both equations ✓ $\tan x = -\frac{1}{2}$ ✓ $\sin 2x = \frac{1}{3}$ ✓ $x = 153{,}43°$ **OR** $x = 153{,}43°$ &$333{,}43°$ ✓ $x = 9{,}74°$ & $80{,}26°$ ✓ $+ k.180° ;\ k \in Z$ (6)
5.4.1	$\text{LHS} = \cos(x+y).\cos(x-y)$ $= [\cos x.\cos y - \sin x.\sin y][\cos x.\cos y + \sin x.\sin y]$ $= \cos^2 x.\cos^2 y - \sin^2 x.\sin^2 y$ $= (1-\sin^2 x)(1-\sin^2 y) - \sin^2 x.\sin^2 y$ $= 1 + \sin^2 x.\sin^2 y - \sin^2 x - \sin^2 y - \sin^2 x.\sin^2 y$ $= 1 - \sin^2 x - \sin^2 y$ = RHS	✓ expansion ✓ simplification ✓ square identity ✓ product (4)
5.4.2	$1 - \sin^2 45° - \sin^2 15°$ $= \cos(45° + 15°).\cos(45° - 15°)$ $= \cos 60°.\cos 30°$ $= \left(\frac{1}{2}\right)\left(\frac{\sqrt{3}}{2}\right)$ $= \frac{\sqrt{3}}{4}$ **OR/*OF***	✓ identifying x and y ✓ substitution ✓ answer (3)

	$1-\sin^2 45°-\sin^2 15°$ $=\sin^2 15°+\cos^2 15°-\sin^2 45°-\sin^2 15°$ $=\cos^2 15°-\left(\frac{\sqrt{2}}{2}\right)^2$ $=\cos^2 15°-\frac{1}{2}$ $=\frac{2\cos^2 15°-1}{2}$ $=\frac{\cos 30°}{2}$ $=\frac{\sqrt{3}}{2}\times\frac{1}{2}$ $=\frac{\sqrt{3}}{4}$	✓ identity ✓ substitution ✓ answer (3)
	OR $1-\sin^2 45°-\sin^2 15°$ $=\cos^2 45°-\sin^2(45°-30°)$ $=\left(\frac{1}{\sqrt{2}}\right)^2-(\sin 45°\cos 30°-\cos 45°\sin 30°)^2$ $=\frac{1}{2}-\left(\frac{1}{\sqrt{2}}\times\frac{\sqrt{3}}{2}-\frac{1}{\sqrt{2}}\times\frac{1}{2}\right)^2$ $=\frac{1}{2}-\left(\frac{\sqrt{3}}{2\sqrt{2}}-\frac{1}{2\sqrt{2}}\right)^2$ $=\frac{1}{2}-\left(\frac{\sqrt{3}}{2\sqrt{2}}-\frac{1}{2\sqrt{2}}\right)^2$ $=\frac{1}{2}-\left(\frac{3}{8}-\frac{\sqrt{3}}{4}+\frac{1}{8}\right)$ $=\frac{\sqrt{3}}{4}$	✓ expansion ✓ substitution ✓ answer (3)

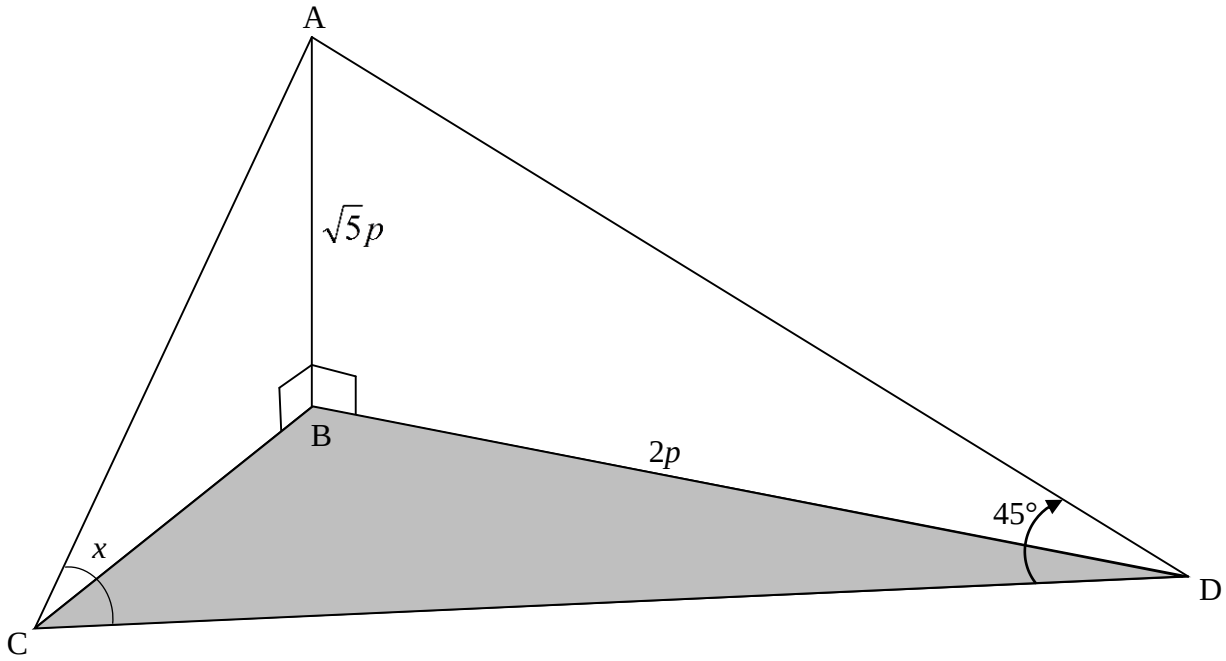
5.5.1	$16\sin x.\cos^3 x - 8\sin x.\cos x$ $= 8\sin x.\cos x(2\cos^2 x - 1)$ $= 4\sin 2x(\cos 2x)$ $= 2\sin 4x$ **OR/*OF*** $16\sin x.\cos^3 x - 8\sin x.\cos x$ $= 16\cos^2 x\left(\frac{1}{2}\sin 2x\right) - 8\left(\frac{1}{2}\sin 2x\right)$ $= 8\left(2\cos^2 x - 1\right)\left(\frac{1}{2}\sin 2x\right)$ $= 4\sin 2x.\cos 2x$ $= 2\sin 4x$	✓ factorisation ✓ $4\sin 2x$ ✓ $\cos 2x$ ✓ double angle (4) ✓ factorisation ✓ $4\sin 2x$ ✓ $\cos 2x$ ✓ double angle (4)
5.5.2	$16\sin x.\cos^3 x - 8\sin x.\cos x = 2\sin 4x$ Minimum at $x = 67{,}5°$	✓ answer (1)
		[30]

QUESTION/*VRAAG* 6



6.1	180°	✓ answer (1)
6.2.1	$k=\sqrt{3}=1,73$	✓ answer (1)
6.2.2	$B\left(-120°;\sqrt{3}\right)$	✓ $x=-120°$ (1)
6.3	Range of g: $y\in[-2;\ 2]$ Range of $2g(x)$: $y\in[-4;\ 4]$ **OR/*OF*** Range of g: $-2\le y\le 2$ Range of $2g(x)$: $-4\le y\le 4$ ANSWER ONLY: Full marks	✓ $y\in[-2;\ 2]$ ✓ answer (2) ✓ $-2\le y\le 2$ ✓ answer (2)
6.4	$x\in[-65°;\ -5°]$ **OR/*OF*** $-65°\le x\le -5°$	✓✓ $x\in[-65°;\ -5°]$ (2) ✓✓ $-65°\le x\le -5°$ (2)
6.5	$\sin x.\cos x=p$ $4\sin x.\cos x=4p$ $2\sin 2x=4p$ $4p=\pm 2$ $\therefore\ p=-\frac{1}{2}$ or $\frac{1}{2}$ ANSWER ONLY: Full marks	✓ $2\sin 2x=4p$ ✓ $4p=\pm 2$ ✓ answers (3)
		[10]

QUESTION/*VRAAG* 7

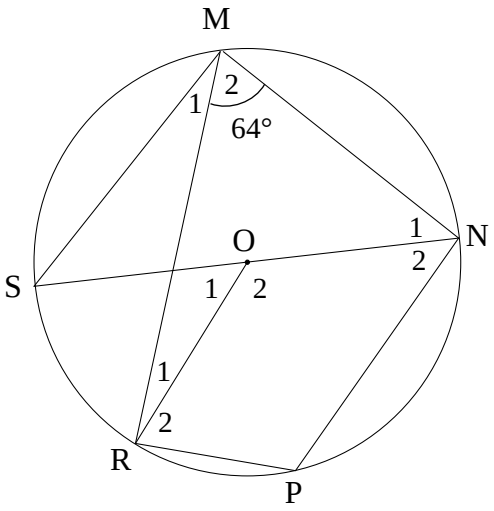


7.1	$AD^2 = AB^2 + BD^2$ $AD^2 = \left(\sqrt{5}p\right)^2 + (2p)^2$ $AD^2 = 9p^2$ $AD = 3p$	✓ substitution in Pythagoras ✓ answer (2)
7.2	$\frac{CD}{\sin(135° - x)} = \frac{3p}{\sin x}$ $CD = \frac{3p\sin(135° - x)}{\sin x}$ $CD = \frac{3p(\sin 135°\cos x - \cos 135°\sin x)}{\sin x}$ $CD = \frac{3p(\sin 45°\cos x + \cos 45°\sin x)}{\sin x}$ $CD = \frac{3p\left(\frac{\sqrt{2}}{2}\cos x + \frac{\sqrt{2}}{2}\sin x\right)}{\sin x}$ $CD = \frac{3p\left(\frac{\sqrt{2}}{2}\right)(\cos x + \sin x)}{\sin x}$ $CD = \frac{3p(\sin x + \cos x)}{\sqrt{2}\sin x}$	✓ correct use of sine rule ✓ $135° - x$ ✓ compound angle ✓ special values ✓ factorisation (5)

7.3	$\text{Area } \Delta ADC = \frac{1}{2}(AD)(CD)\sin A\hat{D}C$ $= \frac{1}{2}(3p)\left(\frac{3p(\sin x + \cos x)}{\sqrt{2}\sin x}\right)(\sin 45°)$ $= \frac{1}{2}(30)\left(\frac{30(\sin 110° + \cos 110°)}{\sqrt{2}\sin 110°}\right)\sin 45°$ $= 143{,}11 m^2$	✓ correct use of area rule ✓ substitution in area rule ✓ answer (3)
		[10]

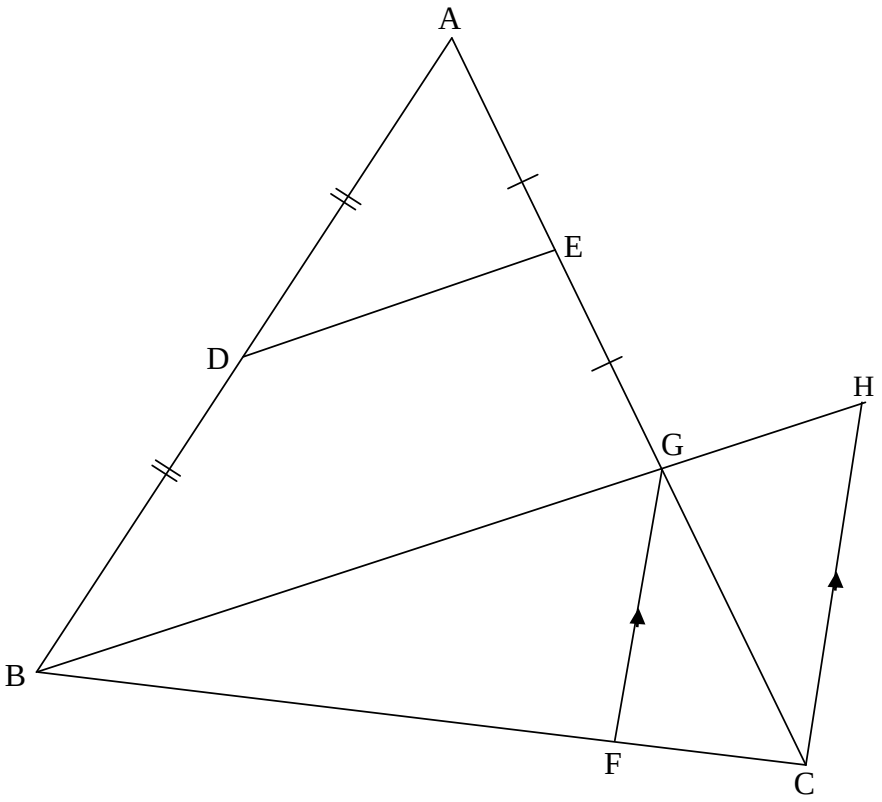
QUESTION/*VRAAG* 8

8.1



8.1.1	$\hat{P} = 116°$	[opp ∠s of cyclic quad/*teenoorst. ∠e van kvh*]	✓ S ✓ R (2)
8.1.2	$\hat{M}_1 + 64° = 90°$ $\hat{M}_1 = 26°$	[∠ in semi-circle/∠ *in halwe sirkel*]	✓ R ✓ S (2)
8.1.3	$\hat{O}_1 = 52°$	[∠ at centre = 2 x ∠ at circumference/*midpts. ∠ = 2 x omtreks. ∠*]	✓ S ✓R (2)

8.2

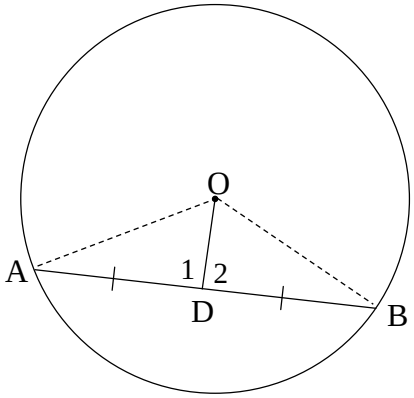


8.2.1	Midpt theorem/*Midpt. Stelling* **OR/*OF*** Converse prop intercept theorem	✓ R (1) ✓ R (1)
8.2.2	BG = 2DE or $6x - 2$ [Midpt theorem/*Midpt. stelling*] BG = $6x - 2$ $\frac{GH}{BG} = \frac{FC}{BF}$ [line ‖ one side of Δ **OR** prop theorem; FG ‖ CH / *lyn* ‖ *een sy v.* Δ] $\frac{x+1}{6x-2} = \frac{1}{4}$ $4x + 4 = 6x - 2$ $2x = 6$ $x = 3$ **OR/*OF***	✓ S ✓ R ✓ S ✓R ✓ equation into x ✓ answer (6)

	$\frac{BF}{FC} = \frac{BG}{GH}$	[line ‖ one side of Δ **OR** prop theorem; FG ‖ CH / *lyn* ‖ *een sy v.* Δ]	✓ S ✓ R
	$\frac{AE}{AG} = \frac{DE}{BG}$	[ΔADE ||| ΔABG]	✓ S ✓R
	$BG = 4x + 4$		
	$\frac{1}{2} = \frac{3x-1}{4x+4}$		✓ equation into x
	$\therefore 4x + 4 = 6x - 2$		
	$\therefore x = 3$		✓ answer (6)
			[13]

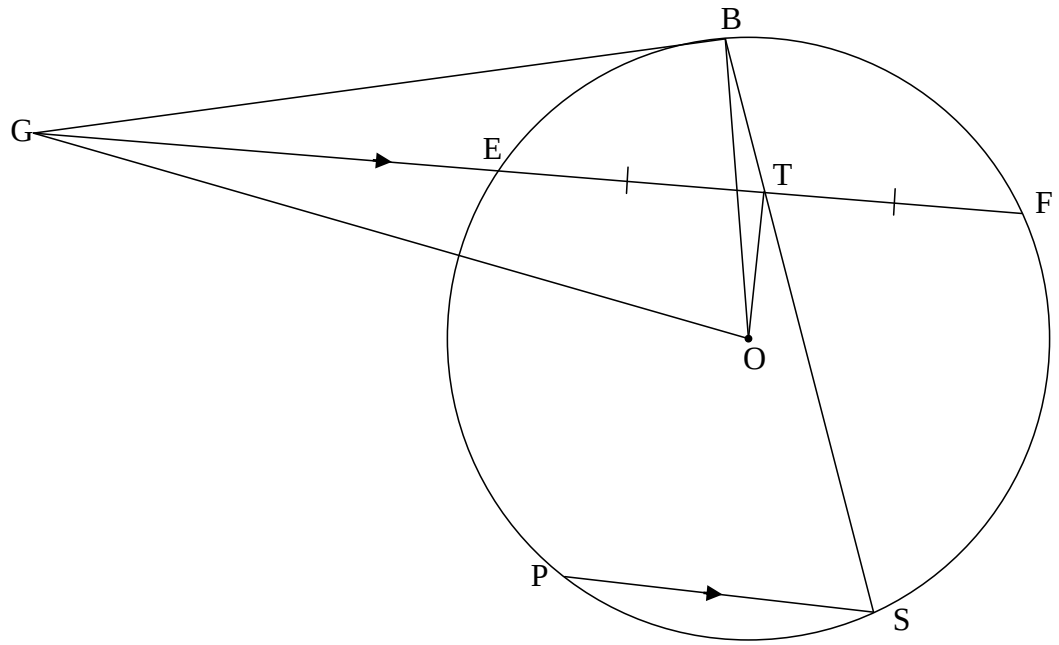
QUESTION/*VRAAG* 9

9.1



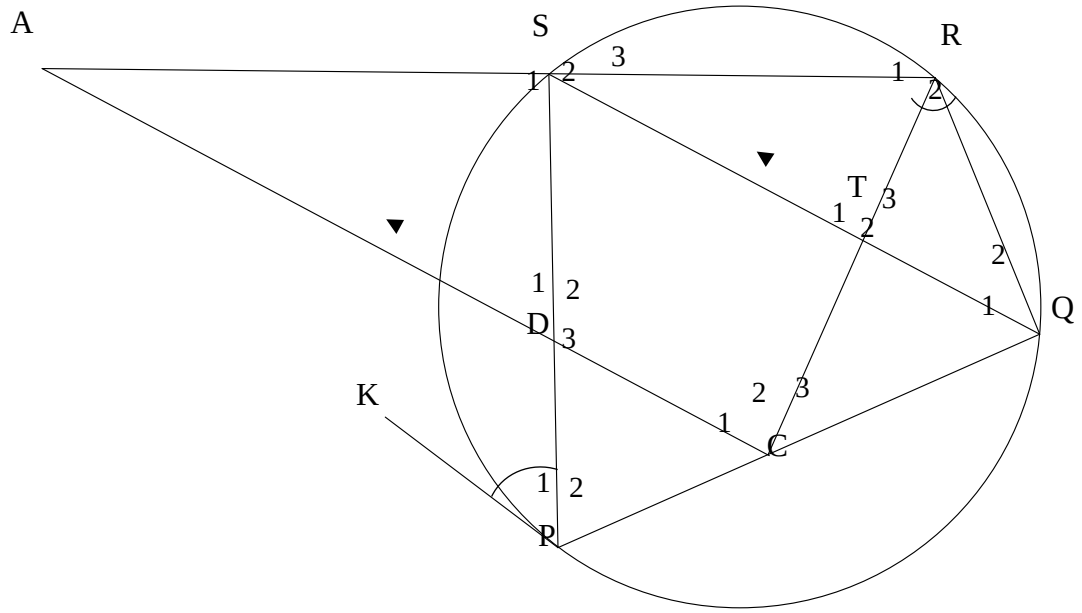
9.1.1	Construction: Draw OA and OB In ΔADO and ΔBDO OA = OB [radii/*radiusse*] OD = OD [common side/*gemeenskaplike sy*] AD = DB [given/*gegee*] $\therefore \Delta ADO \equiv \Delta BDO$ [S;S;S] ADB is a straight line $\therefore \hat{D}_1 = \hat{D}_2$ $\Delta ADO \equiv \Delta BDO$ $\therefore OD \perp AB$ [∠s on a str line/*∠e op 'n reguitlyn*] **OR/*OF*** Construction: Draw OA and OB In ΔADO and ΔBDO AD = DB [given/*gegee*] $\hat{A} = \hat{B}$ [∠s opp; ∠s sides /*∠e teenoor gelyke sye*] OA = OB [radii/*radiusse*] $\therefore \Delta ADO \equiv \Delta BDO$ [S;∠;S] ADB is a straight line $\therefore \hat{D}_1 = \hat{D}_2$ $\Delta ADO \equiv \Delta BDO$ $\therefore OD \perp AB$ [∠s on a str line/*∠e op 'n reguitlyn*]	✓ construction ✓ first pair of sides ✓ other 2 pairs ✓ R ✓ R (5) ✓ construction ✓ first pair of sides ✓ other 2 pairs ✓ R ✓ R (5)

9.2



9.2.1	$O\hat{T}G = 90°$ [line from centre to midpt of chord/ *midpt. sirkel; midpt. koord*] $O\hat{B}G = 90°$ [tan ⊥ radius/*raaklyn ⊥ radius*] $\therefore O\hat{T}G = O\hat{B}G = 90°$ $\therefore$ OTBG is a cyclic quadrilateral [line subtends equal ∠s **OR** converse ∠s in the same segment/ *lyn onderspan gelyke ∠e*]	✓S ✓R ✓ S ✓ R ✓ R (5)
9.2.2	$\hat{S} = B\hat{T}G$ [corresp ∠s; GF || PS / *ooreenk.* ∠s; GF || PS] But $B\hat{T}G = G\hat{O}B$ [∠s in the same segment/*∠e in dies. sirkelsegment*] $G\hat{O}B = \hat{S}$	✓ S ✓ R ✓ S ✓ R (4)
		[14]

QUESTION/*VRAAG* 10



10.1	$\hat{P}_1 = \hat{Q}_1$	[tan-chord theorem/∠ *tussen raaklyn en koord*]	✓ S
	$\hat{S}_1 = \hat{Q}_1 + \hat{Q}_2$	[ext ∠ of cyclic quad/*buite ∠ v. kvh*]	✓ S / R
	$\therefore \hat{S}_1 = \hat{P}_1 + \hat{Q}_2$		
	$\hat{T}_2 = \hat{R}_2 + \hat{Q}_2$	[ext ∠ of Δ/*buite ∠ v. Δ*]	✓ S
	but $\hat{P}_1 = \hat{R}_2$	[given/*gegee*]	
	$\hat{T}_2 = \hat{P}_1 + \hat{Q}_2$		✓ S
	$\therefore \hat{S}_1 = \hat{T}_2 = \hat{P}_1 + \hat{Q}_2$		(4)
10.2	In Δ ASD and ΔACR		✓ identifying Δ's
	$\hat{A} = \hat{A}$	[common ∠/*gemeenskaplike ∠*]	✓ S
	$\hat{S}_1 = \hat{T}_2$	[proven/*reeds bewys*]	
	$\hat{T}_2 = \hat{C}_2$	[alt ∠s; QS || CA/verw. ∠*e*; QS || CA]	✓ S / R
	$\therefore \hat{S}_1 = \hat{C}_2$		✓ S
	$\hat{D}_1 = \hat{R}_1$	[sum of ∠s in Δ/*∠e v. Δ*]	✓ S
	ΔASD ||| ΔACR		
	$\therefore \frac{AD}{AR} = \frac{AS}{AC}$	[corresponding sides in proportion/ *ooreenstemmende sy in dies. verhouding*]	
	OR/*OF*		(5)

	In Δ ASD and ΔACR $\hat{A} = \hat{A}$ [common $\angle$/*gemeenskaplike* $\angle$] $\hat{S}_1 = \hat{T}_2$ [proven/*gegee*] $\hat{T}_2 = \hat{C}_2$ [alt $\angle$s; QS $\parallel$ CA/verw. $\angle e$; QS $\parallel$ CA] $\therefore \hat{S}_1 = \hat{C}_2$ $\Delta ASD \,\|\|\| \,\Delta ACR$ [$\angle;\angle;\angle$] $\therefore \frac{AD}{AR} = \frac{AS}{AC}$ [corresponding sides in proportion/ *ooreenstemmende sy in dies. verhouding*]	✓ identifying Δ's ✓ S ✓ S/R ✓ S ✓ R (5)
10.3	$\frac{AS}{AC} = \frac{SD}{CR}$ [$\Delta ASD \,\|\|\| \,\Delta ACR$] $\therefore AS = \frac{AC \times SD}{CR}$ $\frac{AS}{AR} = \frac{CT}{CR}$ [line $\parallel$ one side of Δ OR prop theorem; TS $\parallel$ CA/*lyn* $\parallel$ *een sy v.* Δ] $\therefore AS = \frac{AR \times CT}{CR}$ $\therefore \frac{AC \times SD}{CR} = \frac{AR \times CT}{CR}$ $\therefore AC \times SD = AR \times CT$	✓ S ✓ S ✓ R ✓ equating (4)
		[13]

TOTAL/*TOTAAL*: 150