basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR SERTIFIKAAT/ NASIONALE SENIOR SERTIFIKAAT

GRAAD 12

WISKUNDE V2

NOVEMBER 2020

PUNTE: 150

TYD: 3 uur

Hierdie vraestel bestaan uit 14 bladsye, 1 inligtingsblad en 'n antwoordeboek van 24 bladsye.

Kopiereg voorbehou

INSTRUKSIES EN INLIGTING

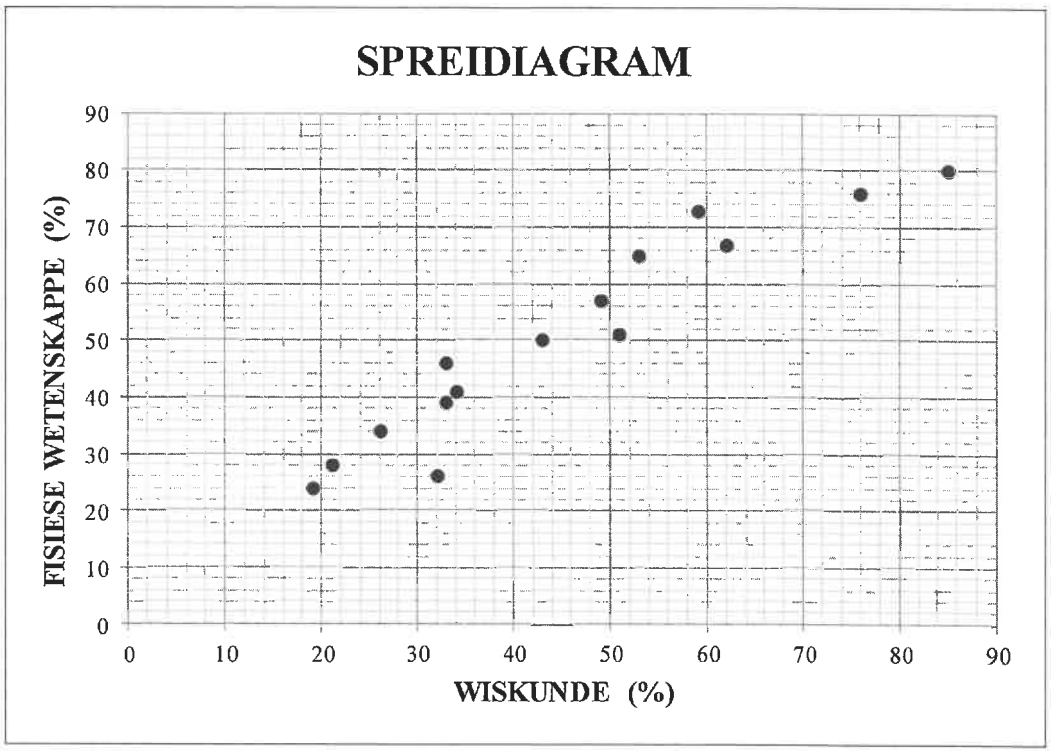
Lees die volgende instruksies aandagtig deur voordat die vraestel beantwoord word.

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 gebruik in die beantwoording van die vrae, duidelik aan.
4. Slegs antwoorde sal NIE noodwendig volpunte verdien NIE.
5. Jy kan 'n goedgekeurde wetenskaplike sakrekenaar gebruik (nieprogrammeerbaar en niegrafies), tensy anders vermeld.
6. Indien nodig, rond antwoorde tot TWEE desimale plekke af, tensy anders gemeld.
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

'n Wiskunde-onderwyseres was nuuskierig om vas te stel of haar leerders se Wiskundepunte hulle Fisiese Wetenskappe-punte beïnvloed het. In die tabel hieronder word 15 van die leerders in haar klas se Wiskunde- en Fisiese Wetenskappe-punte as 'n persentasie (%) getoon.

WISKUNDE (AS %)	26	62	21	33	53	76	32	59	43	33	49	51	19	34	85
FISIESE WETENSKAPPE (AS %)	34	67	28	46	65	76	26	73	50	39	57	51	24	41	80



1.1 Bepaal die vergelyking van die kleinstekwadrate-regressielyn vir die data. (3)

1.2 Skets die kleinstekwadrate-regressielyn op die spreidiagram wat in die ANTWOORDEBOEK verskaf word. (2)

1.3 Voorspel die Fisiese Wetenskappe-punt van 'n leerder wat 69% in Wiskunde behaal het. (2)

1.4 Skryf die korrelasiekoëffisiënt tussen die Wiskunde- en Fisiese Wetenskappe-punte vir die data neer. (1)

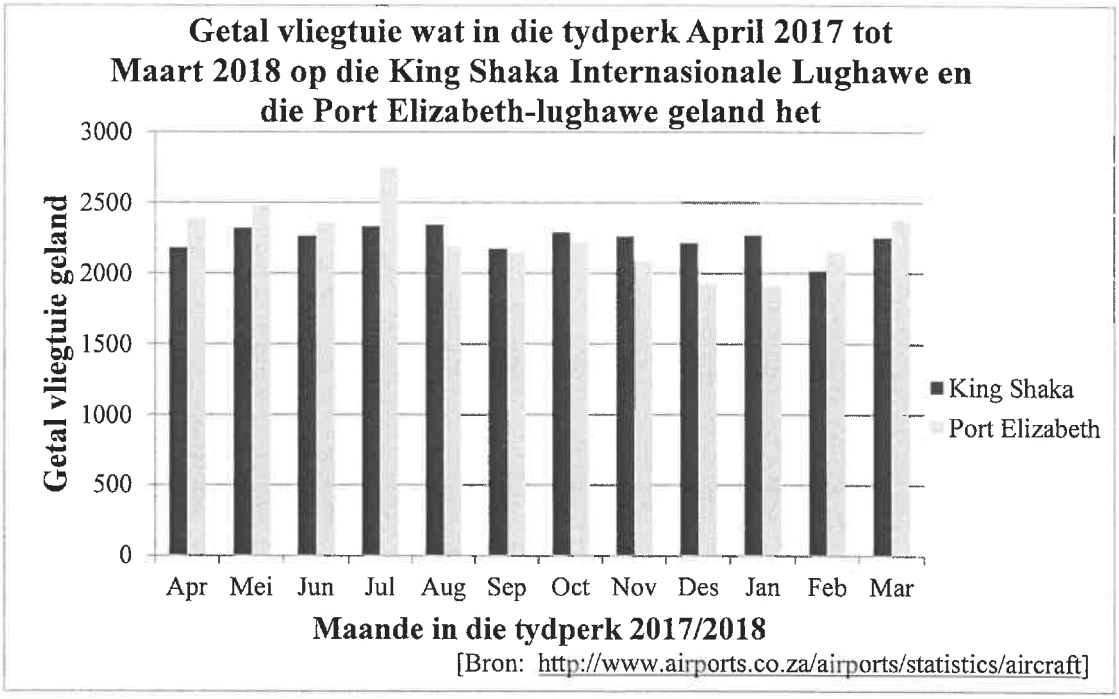
1.5 Lewer kommentaar op die sterkte van die korrelasie tussen die Wiskunde- en Fisiese Wetenskappe-punte van die data. (1)

1.6 Watter tendens het die onderwyseres tussen die uitslae van die twee vakke waargeneem? (1)

[10]

VRAAG 2

Die getal vliegtuie wat in die tydperk vanaf April 2017 tot Maart 2018 op die King Shaka Internasionale Lughawe en die Port Elizabeth-lughawe geland het, word in die dubbelstaafgrafiek hieronder getoon.



2.1 Die getal vliegtuie wat gedurende party maande van die gegewe tydperk op die Port Elizabeth-lughawe geland het, oorskry die getal landings op die King Shaka Internasionale Lughawe. Gedurende watter maand is hierdie verskil die grootste? (1)

2.2 Die getal vliegtuie wat maandeliks op die King Shaka Internasionale Lughawe geland het is:

2 182	2 323	2 267	2 334	2 346	2 175
2 293	2 263	2 215	2 271	2 018	2 254

Bereken die gemiddelde getal van die data (2)

2.3 Bereken die standaardafwyking van die getal vliegtuiglandings op die King Shaka Internasionale Lughawe vir die gegewe tydperk. (2)

2.4 Bepaal die getal maande waartydens die getal vliegtuiglandings op die King Shaka Internasionale Lughawe binne een standaardafwyking vanaf die gemiddelde was. (3)

2.5 Watter EEN van die volgende bewerings is KORREK?

A. Daar was meer landings in Desember en Januarie op die Port Elizabeth-lughawe as op die King Shaka Internasionale Lughawe.

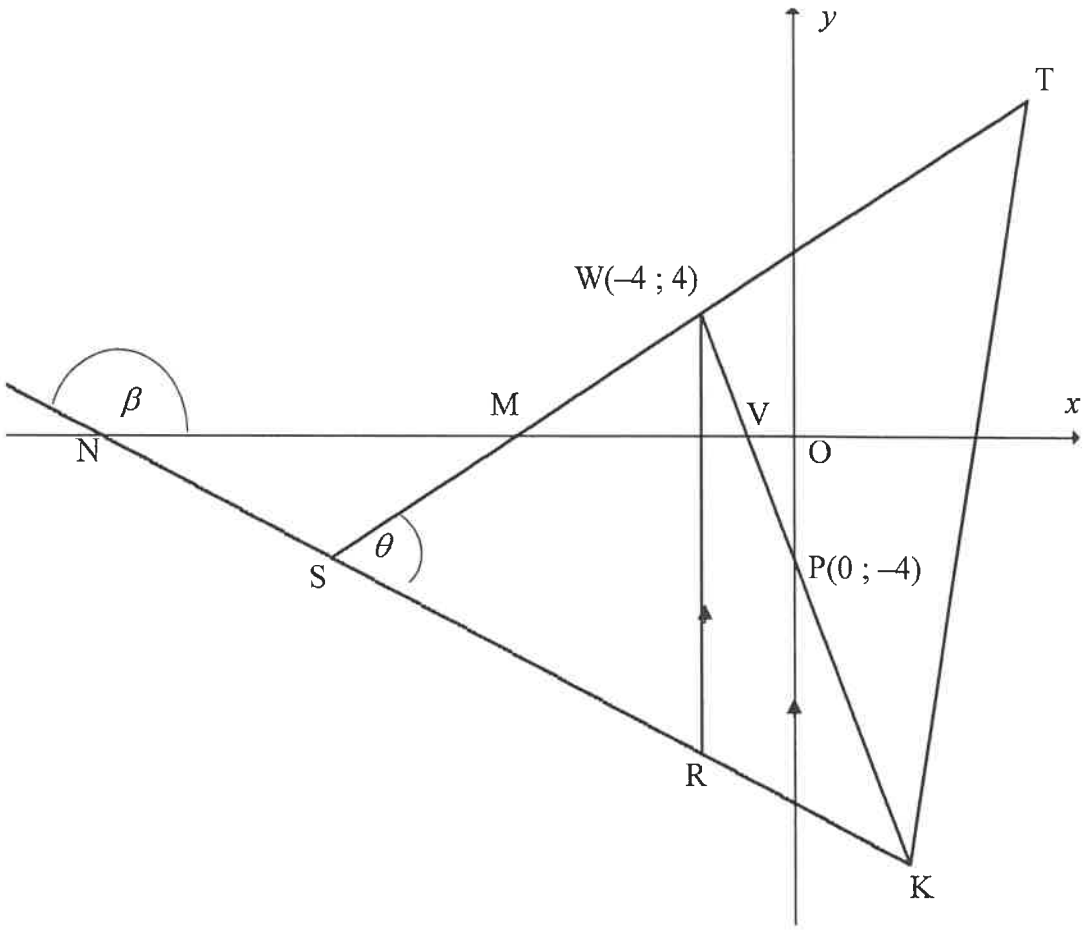
B. Daar was vir die gegewe tydperk 'n groter variasie in die getal vliegtuiglandings op die King Shaka Internasionale Lughawe as op die Port Elizabeth-lughawe.

C. Die standaardafwyking van die getal vliegtuiglandings op die Port Elizabeth-lughawe sal hoër wees as die standaardafwyking van die getal vliegtuiglandings op die King Shaka Internasionale Lughawe. (1)

[9]

VRAAG 3

ΔTSK is geskets. Die vergelyking van ST is $y = \frac{1}{2}x + 6$ en ST sny die x-as by M. W(–4 ; 4) lê op ST en R lê op SK sodanig dat WR ewewydig aan die y-as is. WK sny die x-as by V en die y-as by P(0 ; –4). KS verleng, sny die x-as by N. $T\hat{S}K = \theta$.



3.1 Bereken die gradiënt van WP. (2)

3.2 Toon dat WP ⊥ ST. (2)

3.3 As die vergelyking van SK as $5y + 2x + 60 = 0$ gegee word, bereken die koördinate van S. (4)

3.4 Bereken die lengte van WR. (4)

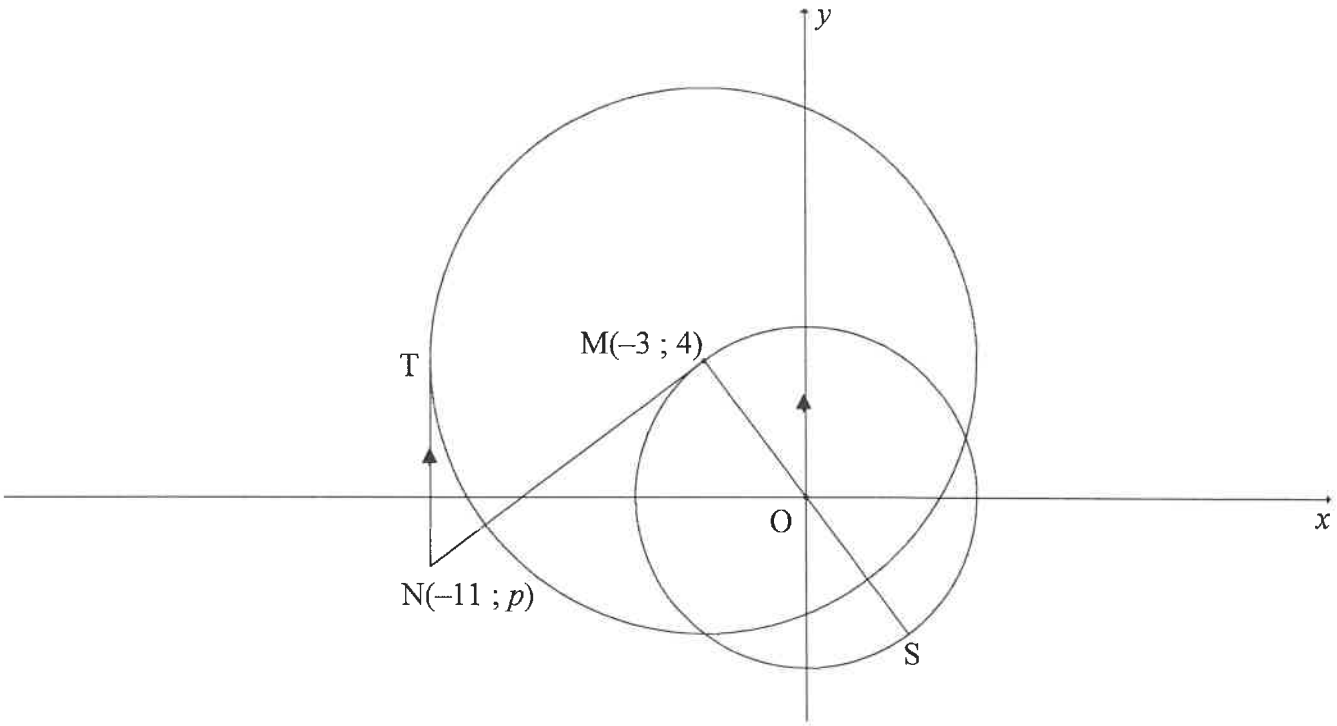
3.5 Bereken die grootte van θ. (5)

3.6 Laat L 'n punt in die derde kwadrant wees sodanig dat SWRL, in daardie volgorde, 'n parallelogram vorm. Bereken die oppervlakte van SWRL. (4)

[21]

VRAAG 4

M(–3 ; 4) is die middelpunt van die groot sirkel en 'n punt op die kleiner sirkel met middelpunt O(0 ; 0). Vanaf N(–11 ; p) is 'n raaklyn getrek aan die groter sirkel by T met NT ewewydig aan die y-as. NM is 'n raaklyn aan die kleiner sirkel by M met MOS 'n middellyn.



4.1 Bepaal die vergelyking van die klein sirkel. (2)

4.2 Bepaal die vergelyking van die sirkel met middelpunt M in die vorm $(x-a)^2+(y-b)^2=r^2$ (3)

4.3 Bepaal die vergelyking van NM in die vorm $y=mx+c$ (4)

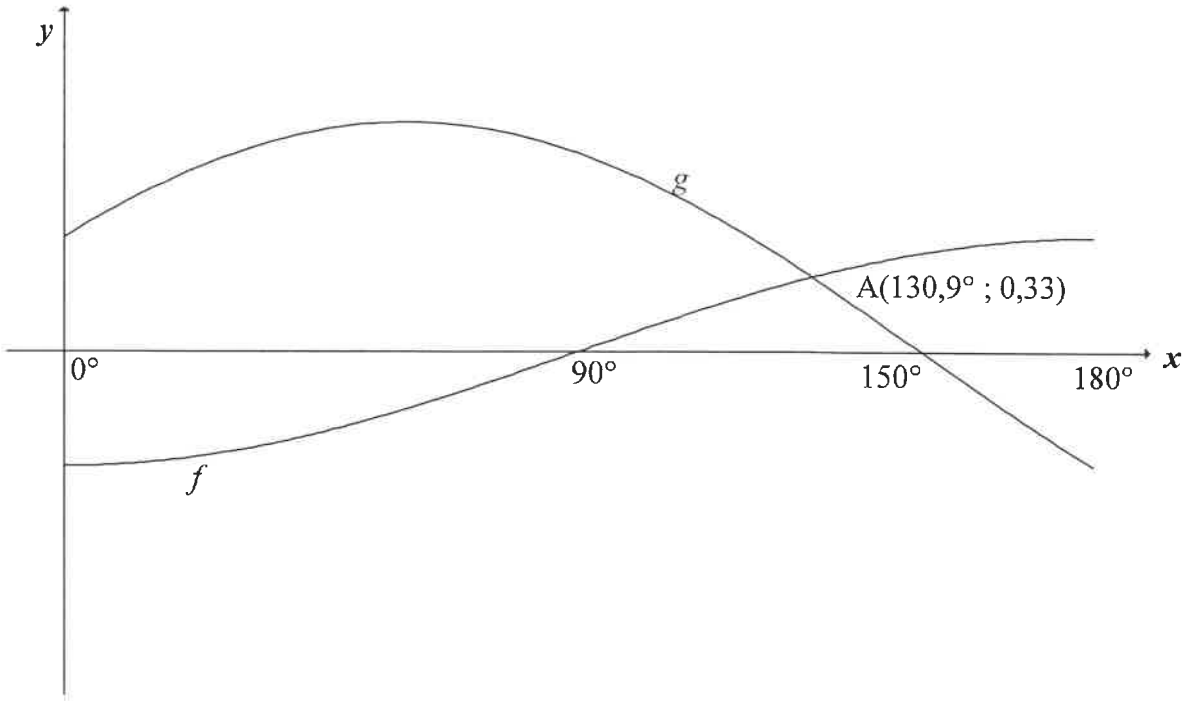
4.4 Bereken die lengte van SN. (5)

4.5 Indien nog 'n sirkel met middelpunt B(–2 ; 5) en radius k die sirkel met middelpunt M raak, bepaal die waarde(s) van k, korrek tot EEN desimale syfer. (5)

[19]

VRAAG 5

Die grafieke van $f(x)=-\frac{1}{2}\cos x$ en $g(x)=\sin(x+30°)$, vir die interval $x\in[0°;180°]$, is hieronder geskets. A(130,9° ; 0,33) is die benaderde snypunt van die twee grafieke.



5.1 Skryf die periode van g neer. (1)

5.2 Skryf die amplitude van f neer. (1)

5.3 Bepaal die waarde van $f(180°)-g(180°)$ (1)

5.4 Gebruik die grafieke om die waardes van x in die interval $x\in[0°\ ;\ 180°]$ te bepaal, waarvoor:

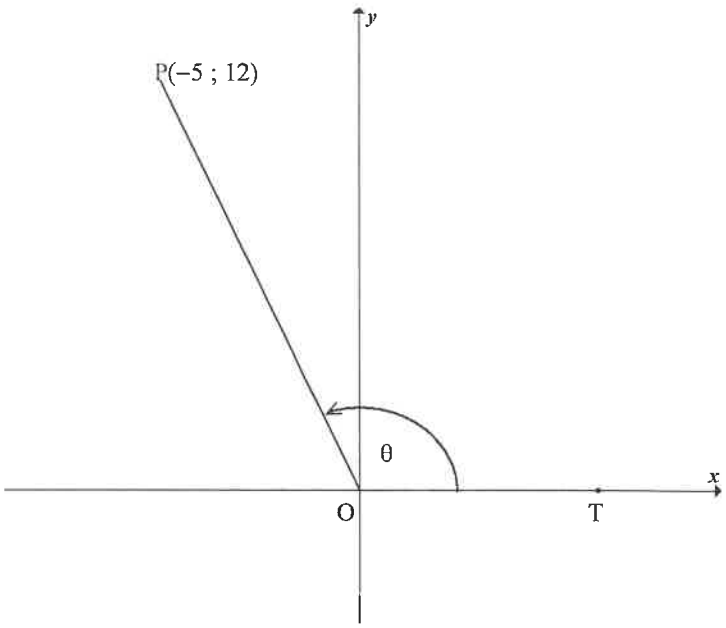
5.4.1 $f(x-10°)=g(x-10°)$ (1)

5.4.2 $\sqrt{3}\sin x+\cos x\geq 1$ (4)

[8]

VRAAG 6

6.1 In die diagram is P(–5 ; 12) en T lê op die positiewe x-as. $P\hat{O}T = \theta$.



Beantwoord die volgende vrae **sonder om 'n sakrekenaar te gebruik.**

6.1.1 Skryf die waarde van $\tan\theta$ neer. (1)

6.1.2 Bereken die waarde van $\cos\theta$ (3)

6.1.3 S(a ; b) is 'n punt in die derde kwadrant sodat $T\hat{O}S = \theta + 90°$ en OS = 6,5 eenhede. Bepaal die waarde van b. (4)

6.2 Bepaal, **sonder om 'n sakrekenaar te gebruik**, die waarde van die volgende trigonometriese uitdrukking:

$$\frac{\sin 2x.\cos(-x) + \cos 2x.\sin(360° - x)}{\sin(180° + x)}$$ (5)

6.3 Bepaal die algemene oplossing van die volgende vergelyking:

$$6\sin^2 x + 7\cos x - 3 = 0$$ (6)

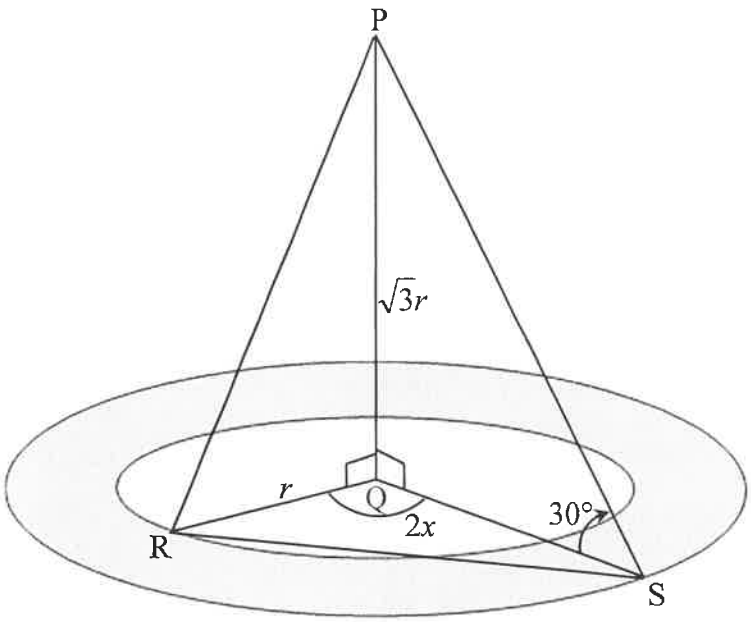
6.4 Gegee: $x + \frac{1}{x} = 3\cos A$ en $x^2 + \frac{1}{x^2} = 2$

Bepaal die waarde van cos 2A, **sonder om 'n sakrekenaar te gebruik.** (5)
[24]

VRAAG 7

'n Landskapkunstenaar beplan om blomme binne twee konsentriese sirkels rondom 'n vertikale lamppaal PQ te plant. R is 'n punt op die binneste sirkel en S is 'n punt op die buitenste sirkel. R, Q en S lê op dieselfde horisontale vlak. RS is 'n pyp wat vir die besproeiingstelsel van die tuin gebruik word.

- Die radius van die binneste sirkel is r eenhede en die radius van die buitenste sirkel is QS.
- Die hoogtehoek vanaf S na P is $30°$.
- $R\hat{Q}S = 2x$ en $PQ = \sqrt{3}r$



7.1 Toon dat $QS = 3r$ (3)

7.2 Bepaal, in terme van r, die oppervlakte van die blomtuin. (2)

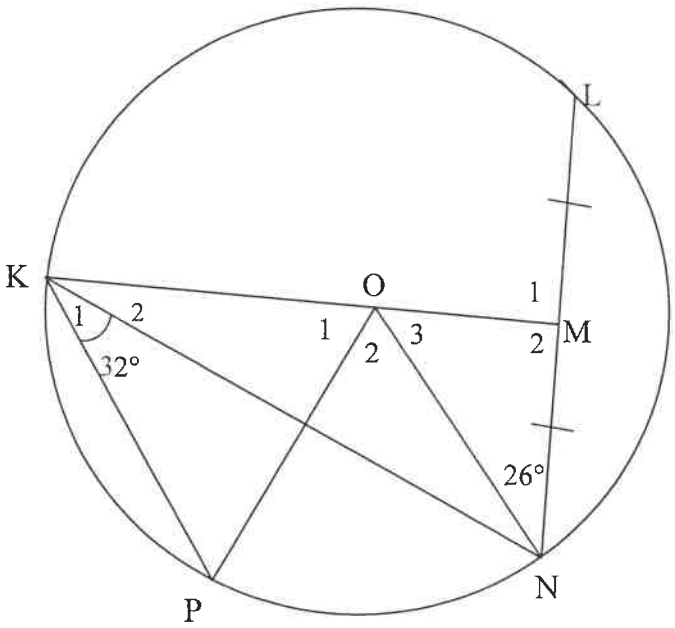
7.3 Toon aan dat $RS = r\sqrt{10 - 6\cos 2x}$ (3)

7.4 Indien $r = 10$ meter en $x = 56°$, bereken RS. (2)

[10]

VRAAG 8

8.1 O is die middelpunt van die sirkel. KOM halveer koord LN en $M\hat{N}O = 26°$. K en P is punte op die sirkel met $N\hat{K}P = 32°$. OP is getrek.



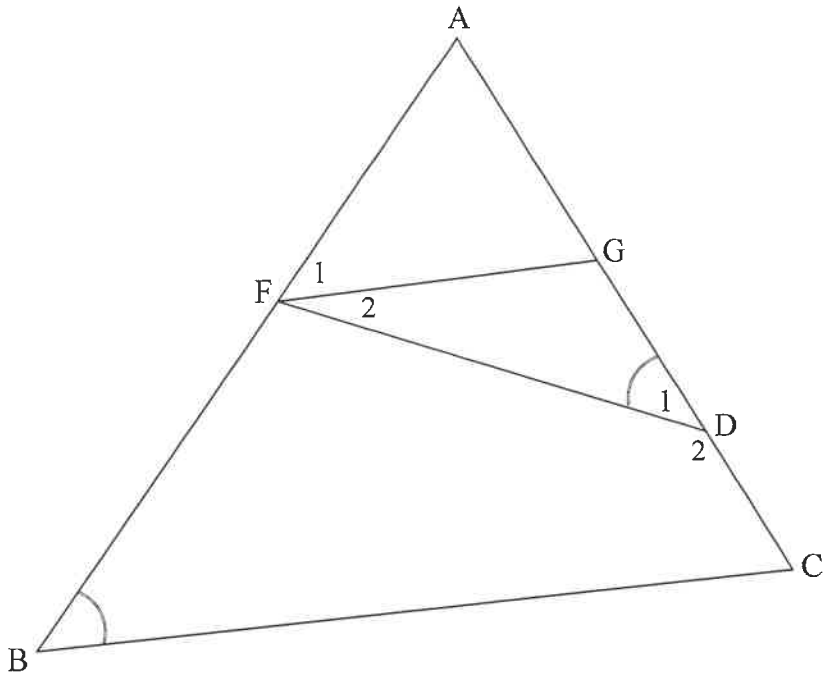
8.1.1 Bepaal, met redes, die grootte van:

(a) $\hat{O}_2$ (2)

(b) $\hat{O}_1$ (4)

8.1.2 Bewys, met redes, dat KN vir $O\hat{K}P$ halveer. (3)

8.2 In ΔABC is F en G punte op sye AB en AC onderskeidelik. D is 'n punt op GC sodat $\hat{D}_1 = \hat{B}$.



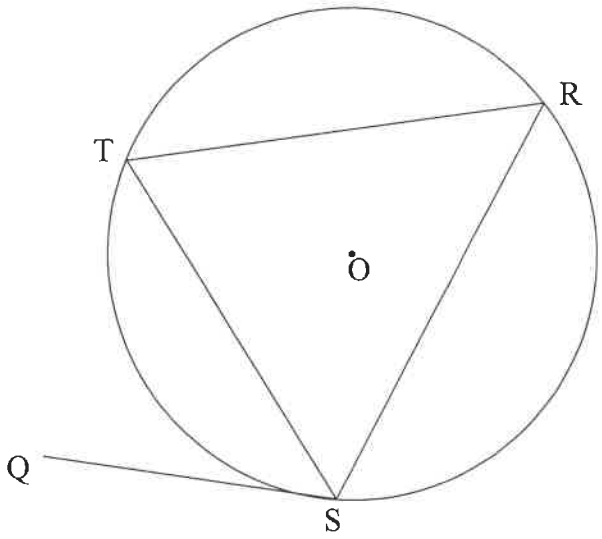
8.2.1 Indien AF 'n raaklyn is aan die sirkel wat deur die punte F, G en D gaan, bewys, met redes, dat FG || BC. (4)

8.2.2 As verder gegee word dat $\frac{AF}{FB} = \frac{2}{5}$, $AC = 2x - 6$ en $GC = x + 9$, bereken die waarde van x. (4)

[17]

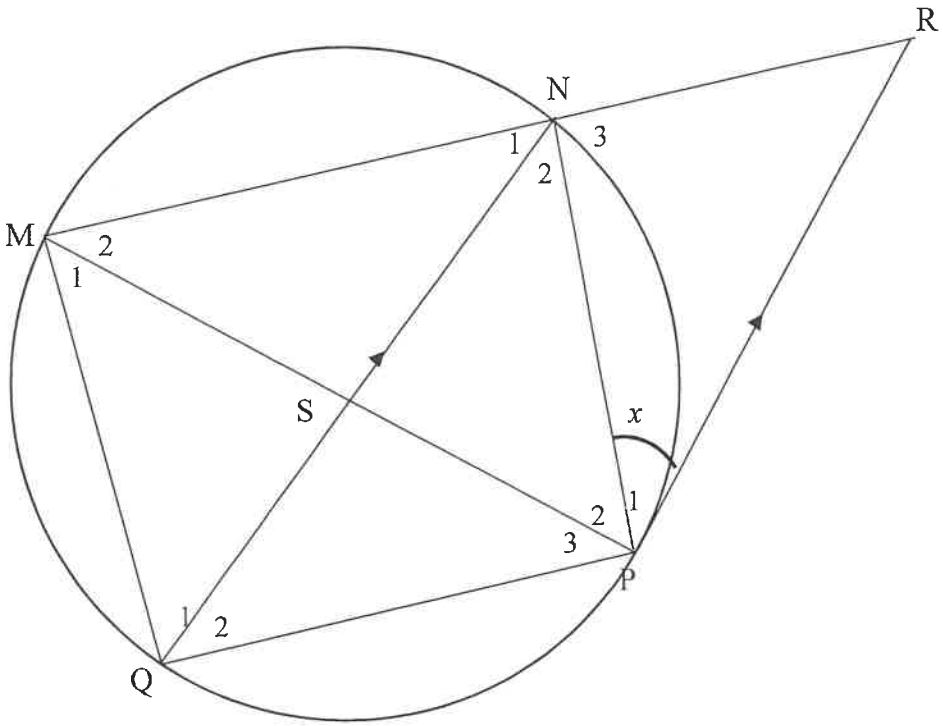
VRAAG 9

9.1 In die diagram is O die middelpunt van die sirkel. Punte S, T en R lê op die sirkel. Koorde ST, SR en TR is in die sirkel getrek. QS is 'n raaklyn aan die sirkel by S.



Gebruik die diagram om die stelling te bewys wat beweer dat $Q\hat{S}T = \hat{R}$. (5)

9.2 Koord QN halveer $M\hat{N}P$ en sny koord MP by S. Die raaklyn by P sny MN verleng by R sodanig dat QN || PR. Stel $\hat{P}_1 = x$.



9.2.1 Bepaal die volgende hoeke in terme van x. Gee redes.

(a) $\hat{N}_2$ (2)

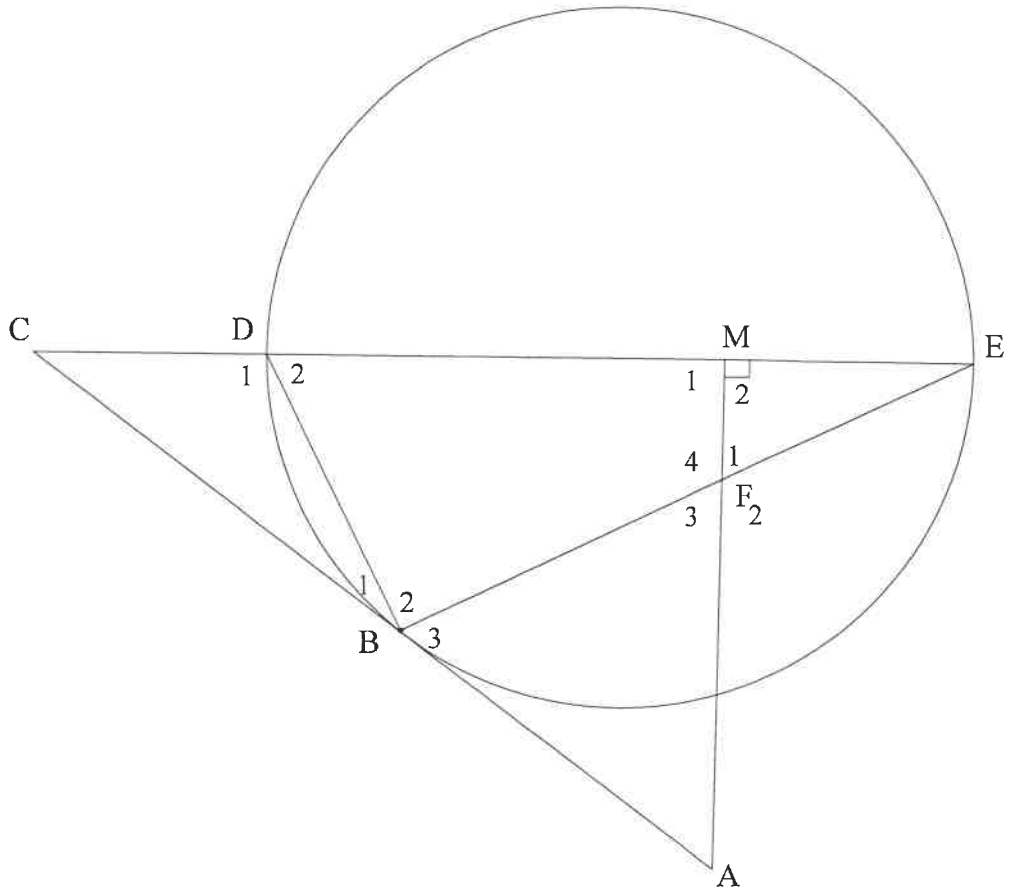
(b) $\hat{Q}_2$ (2)

9.2.2 Bewys, met redes, dat $\frac{MN}{NR} = \frac{MS}{SQ}$. (6)

[15]

VRAAG 10

In die diagram gaan 'n sirkel deur D, B en E. Middellyn ED van die sirkel word verleng na C en AC is 'n raaklyn aan die sirkel by B. M is 'n punt op DE sodanig dat AM ⊥ DE. AM en koord BE sny mekaar by F.



10.1 Bewys, met redes, dat:

10.1.1 FBDM 'n koordevierhoek is (3)

10.1.2 $\hat{B}_3 = \hat{F}_1$ (4)

10.1.3 $\Delta CDB \;|||\; \Delta CBE$ (3)

10.2 As verder gegee word dat CD = 2 eenhede en DE = 6 eenhede, bereken die lengte van:

10.2.1 BC (3)

10.2.2 DB (4)

[17]

TOTAAL: 150

Kopiereg voorbehou

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:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

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

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

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

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

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

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

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Candidate Barcode label/Stafieskodeplakker

SC/NSC Answer Book
SS/NSS Antwoordeboek

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

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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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 24 pages./*Hierdie antwoordeboek bestaan uit 24 bladsye.*

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Please turn over/*Blaai om asseblief*

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 verskaf 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 question paper.	*5. Lees die instruksies, wat op jou eksamenrooster gedruk is, sorgvuldig deur, asook enige ander instruksies wat op elke vraestel 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, clearly indicate 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 verskaf 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.*

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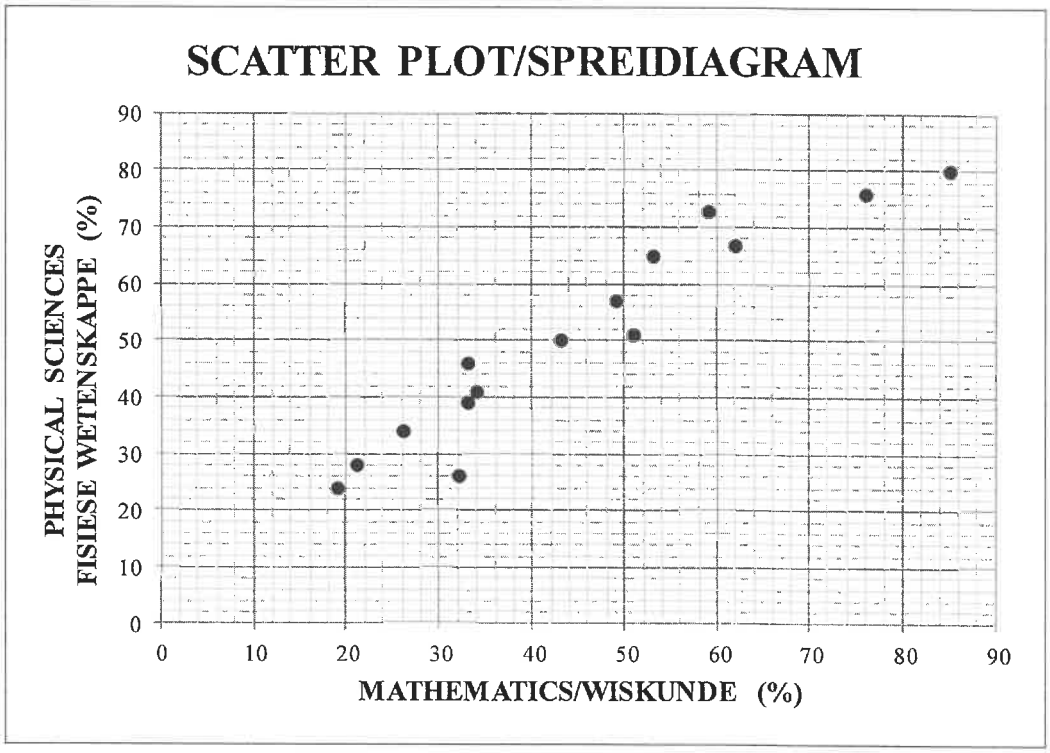
QUESTION/*VRAAG* 1

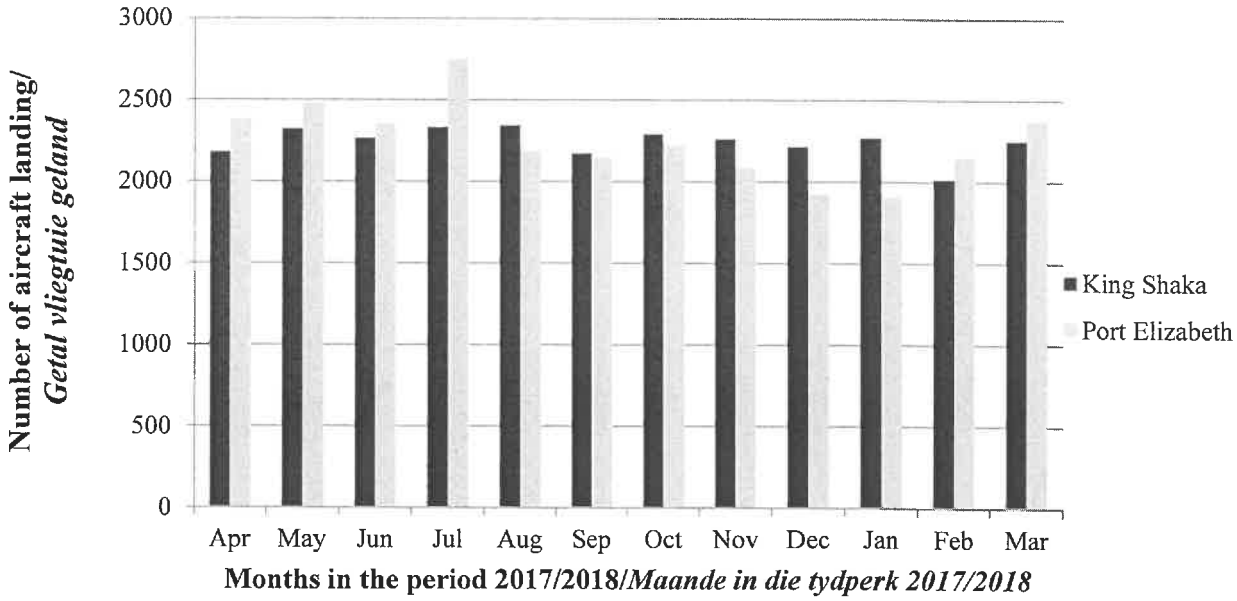
Mathematics ***Wiskunde*** **(as %)**	26	62	21	33	53	76	32	59	43	33	49	51	19	34	85
Physical Sciences ***Fisiese Wetenskappe*** **(as %)**	34	67	28	46	65	76	26	73	50	39	57	51	24	41	80

	Solution/*Oplossing*	**Marks** ***Punte***
1.1		(3)
1.2		(2)
1.3		(2)

	Solution/*Oplossing*	**Marks** ***Punte***
1.4		(1)
1.5		(1)
1.6		(1)
		[10]

QUESTION/*VRAAG* 2

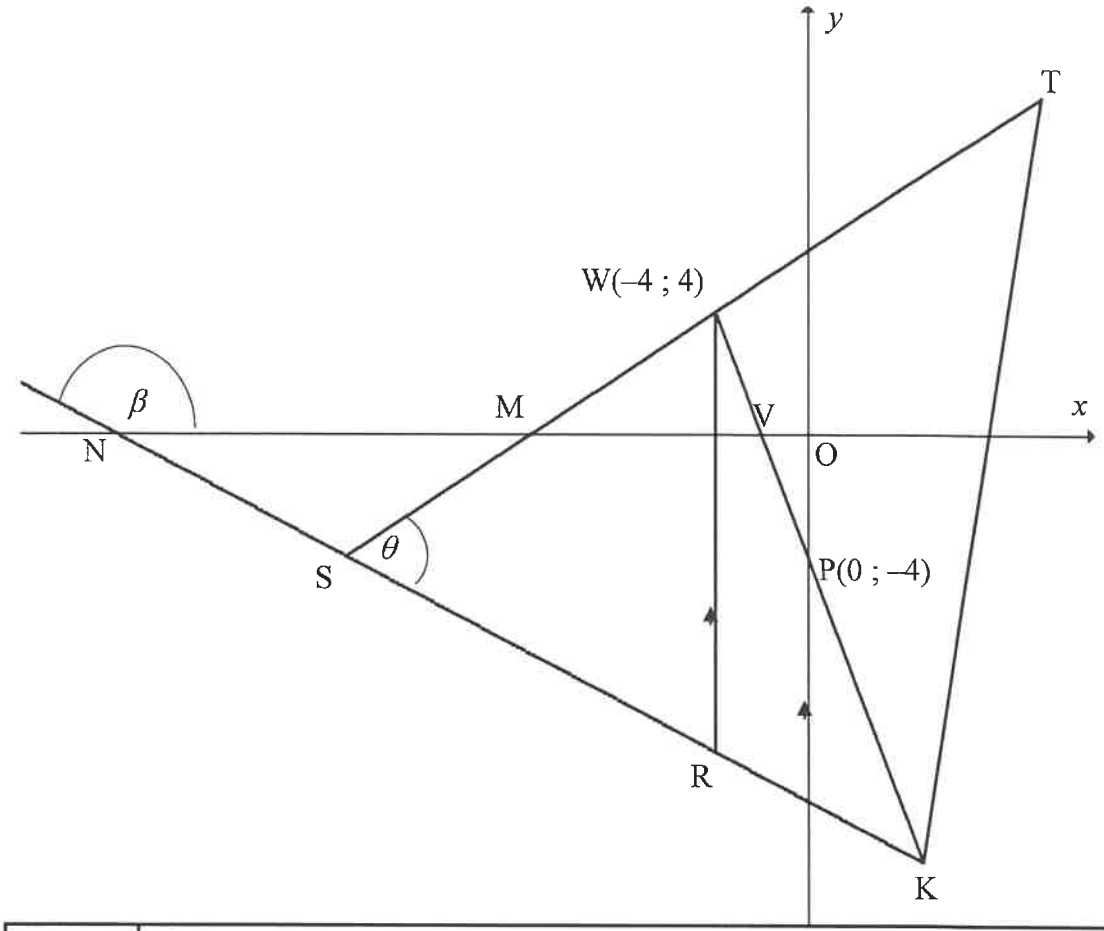
Number of aircraft landing at the King Shaka International airport and the Port Elizabeth Airport for the period April 2017 to March 2018/
Getal vliegtuie wat in die tydperk April 2017 tot Maart 2018 op die King Shaka Internasionale Lughawe en die Port Elizabeth-lughawe geland het



Source/Bron: http://www.airports.co.za/airports/statistics/aircraft

	Solution/*Oplossing*	**Marks** ***Punte***
2.1		(1)
2.2		(2)
2.3		(2)
2.4		(3)
2.5		(1)
		[9]

QUESTION/*VRAAG* 3



	Solution/*Oplossing*	**Marks** ***Punte***
3.1		(2)
3.2		(2)
3.3		(4)

	Solution/*Oplossing*	**Marks** ***Punte***
3.4		(4)
3.5		(5)
3.6		(4)
		[21]

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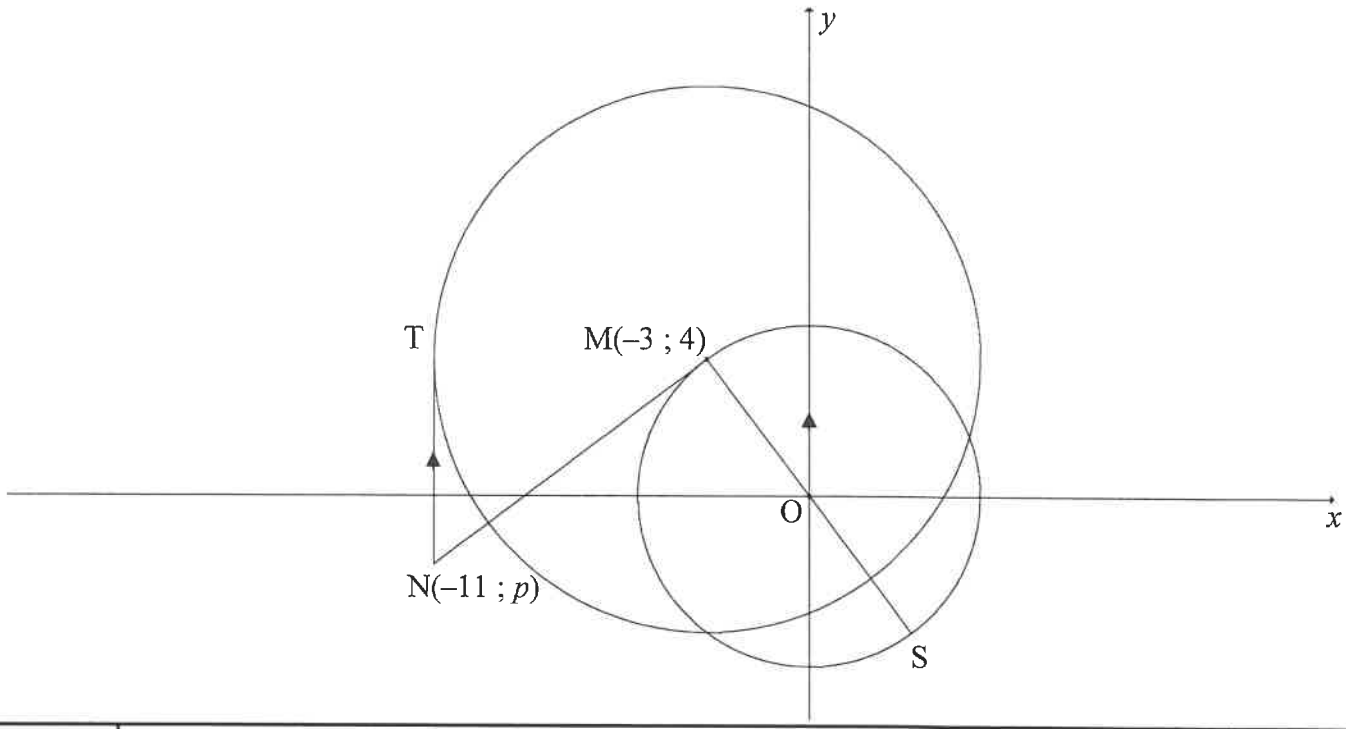
QUESTION/*VRAAG* 4



	Solution/*Oplossing*	**Marks** ***Punte***
4.1		(2)
4.2		(3)
4.3		(4)

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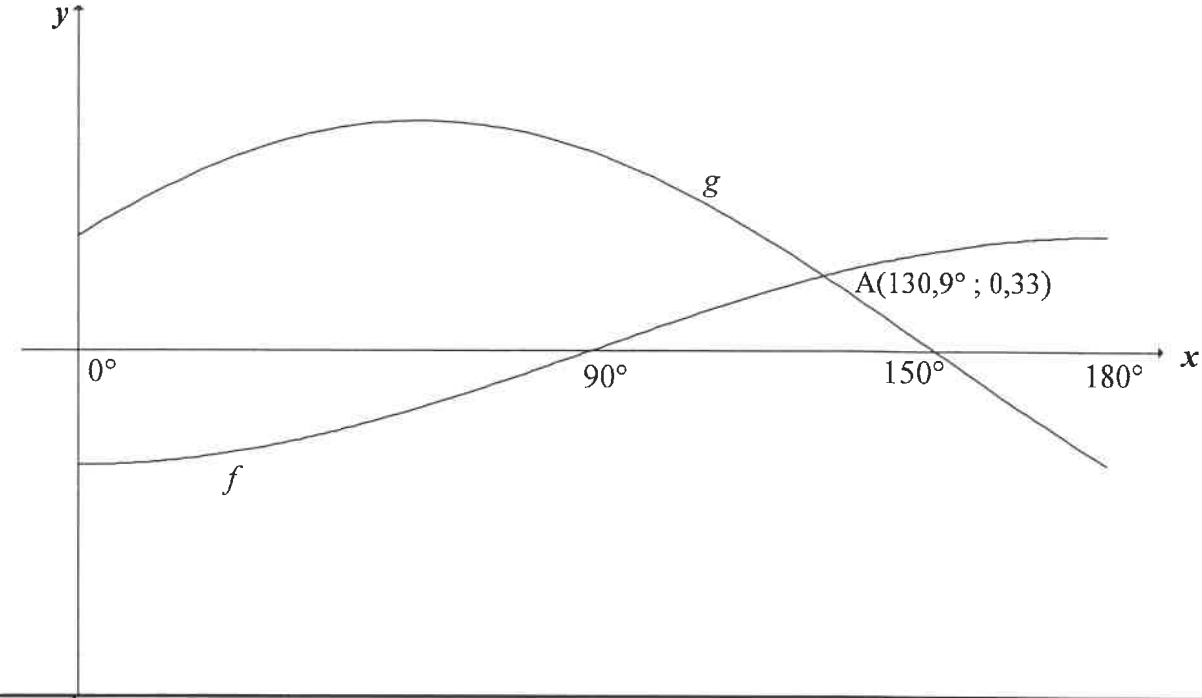
	Solution/*Oplossing*	**Marks** ***Punte***
4.4		(5)
4.5		(5)
		[19]

QUESTION/*VRAAG* 5



	Solution/*Oplossing*	**Marks *Punte***
5.1		(1)
5.2		(1)
5.3		(1)
5.4.1		(1)
5.4.2		(4)
		[8]

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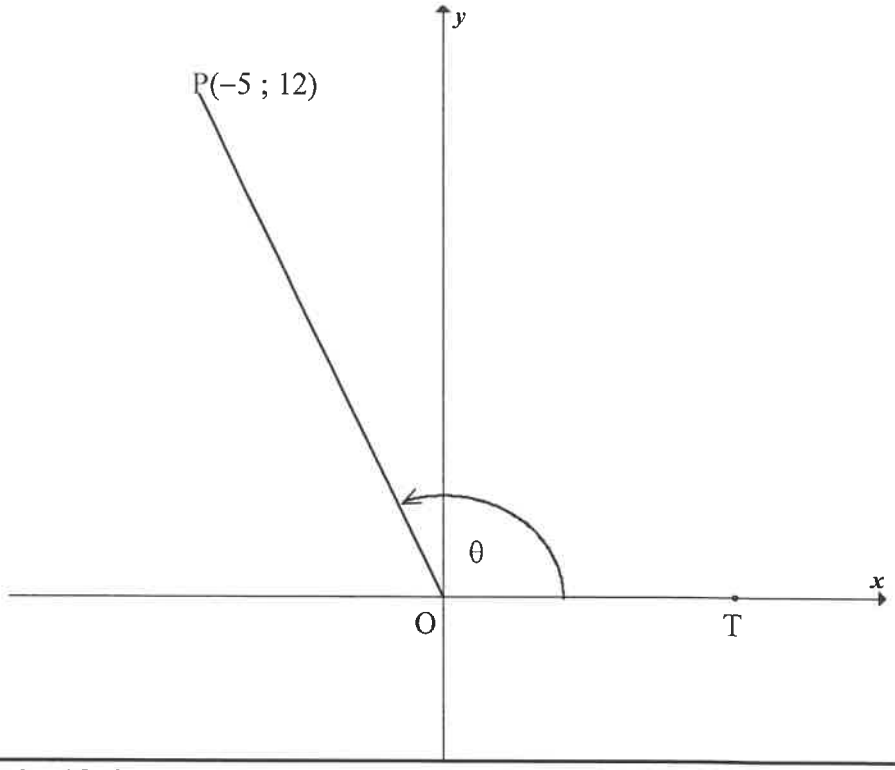
QUESTION/*VRAAG* 6



	Solution/*Oplossing*	**Marks** ***Punte***
6.1.1		(1)
6.1.2		(3)
6.1.3		(4)

6.2		(5)
6.3		(6)

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6.4		(5)
		[24]

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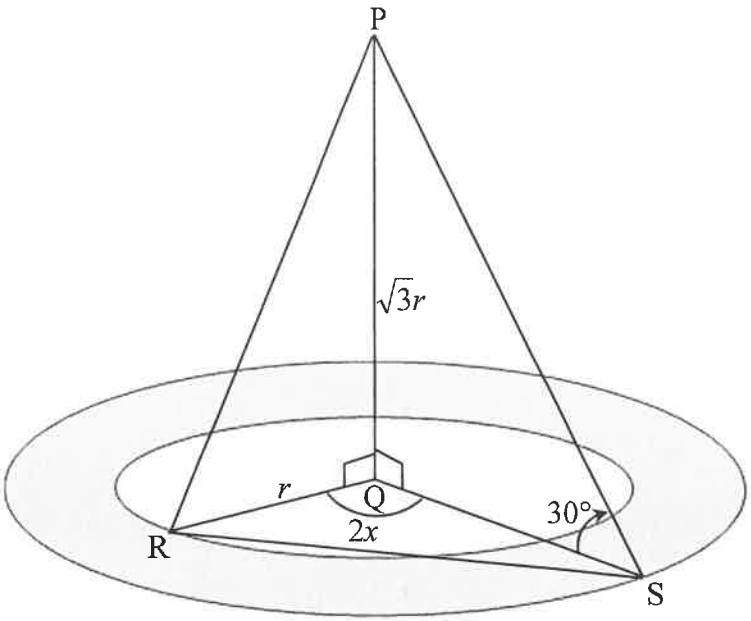
QUESTION/*VRAAG* 7



	Solution/*Oplossing*	**Marks** ***Punte***
7.1		(3)
7.2		(2)
7.3		(3)

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7.4		(2)
		[10]

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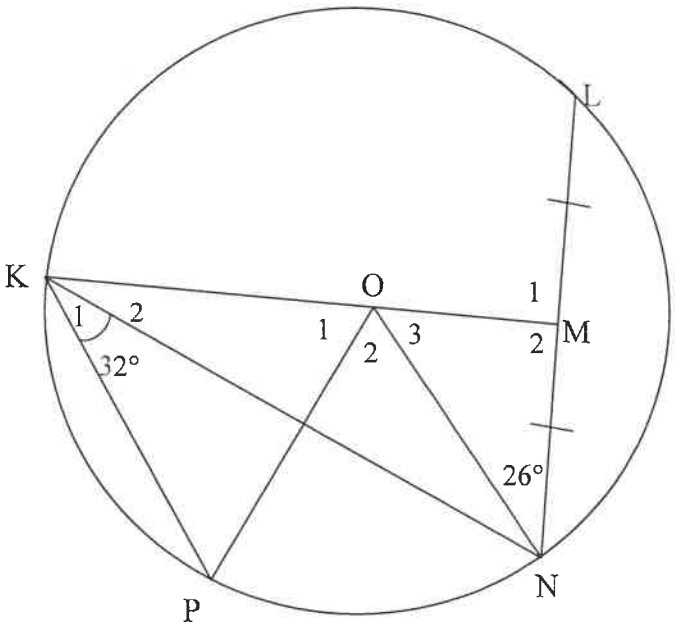
Give reasons for your statements in QUESTIONS 8, 9 and 10.
Verskaf redes vir jou bewerings in VRAAG 8, 9 en 10.

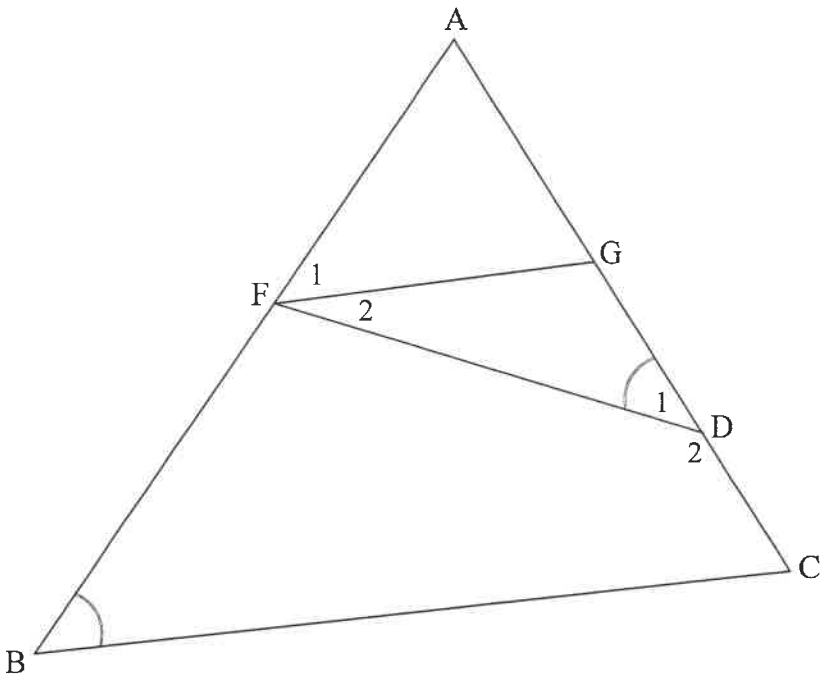
QUESTION/*VRAAG* 8

8.1



	Solution/*Oplossing*	**Marks** ***Punte***
8.1.1(a)		(2)
8.1.1(b)		(4)
8.1.2		(3)

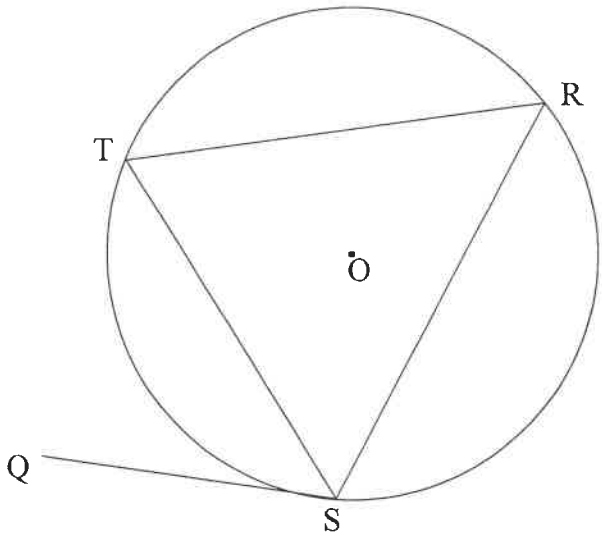
8.2



	Solution/*Oplossing*	**Marks** ***Punte***
8.2.1		(4)
8.2.2		(4)
		[17]

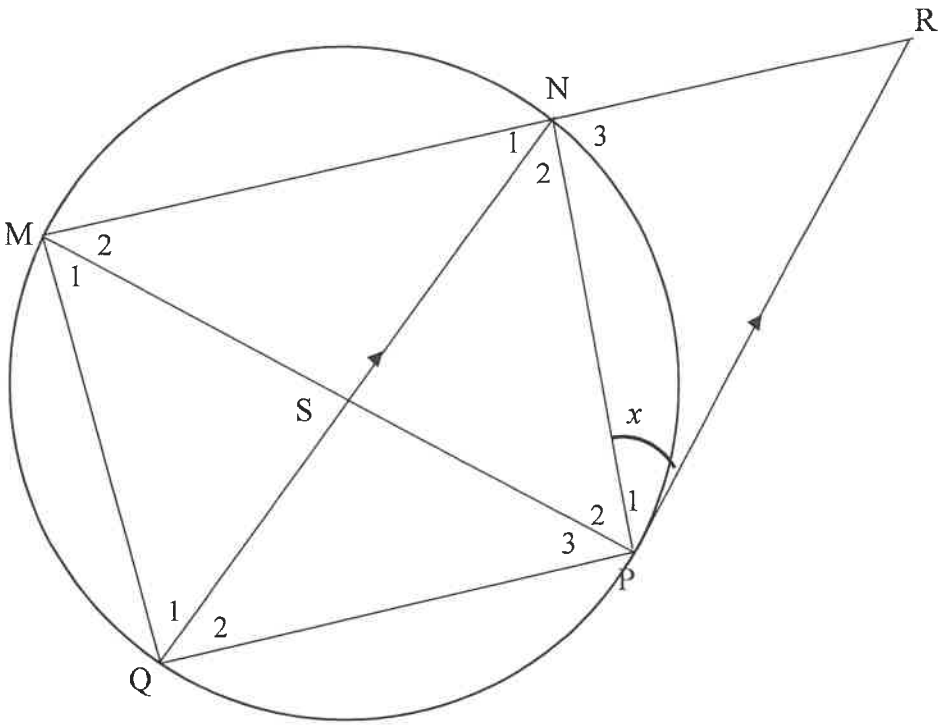
QUESTION/*VRAAG* 9

9.1



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

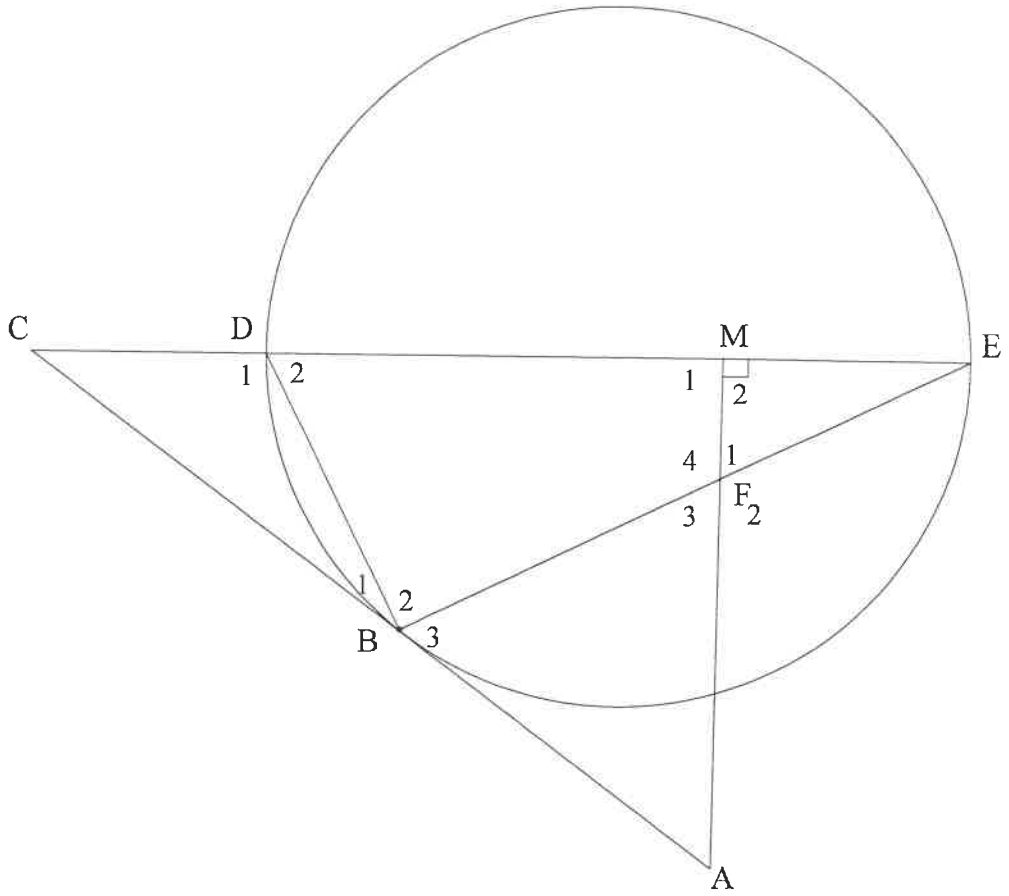
9.2



	Solution/*Oplossing*	**Marks *Punte***
9.2.1(a)		(2)
9.2.1(b)		(2)
9.2.2		

	Solution/*Oplossing*	**Marks** ***Punte***
9.2.2 (contd)		(6)
		[15]

QUESTION/*VRAAG* 10



	Solution/*Oplossing*	**Marks** ***Punte***
10.1.1		(3)
10.1.2		(4)

	Solution/*Oplossing*	**Marks** ***Punte***
10.1.3		(3)
10.2.1		(3)
10.2.2		(4)
		[17]

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

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

TOTAL/*TOTAAL*: 150

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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*				

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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE/*SENIOR SERTIFIKAAT*
NATIONAL SENIOR CERTIFICATE/
NASIONALE SENIOR SERTIFIKAAT

GRADE/*GRAAD* 12

MATHEMATICS P2/*WISKUNDE V2*

NOVEMBER 2020

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 27 pages.
Hierdie nasienriglyne bestaan uit 27 bladsye.

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NOTE:

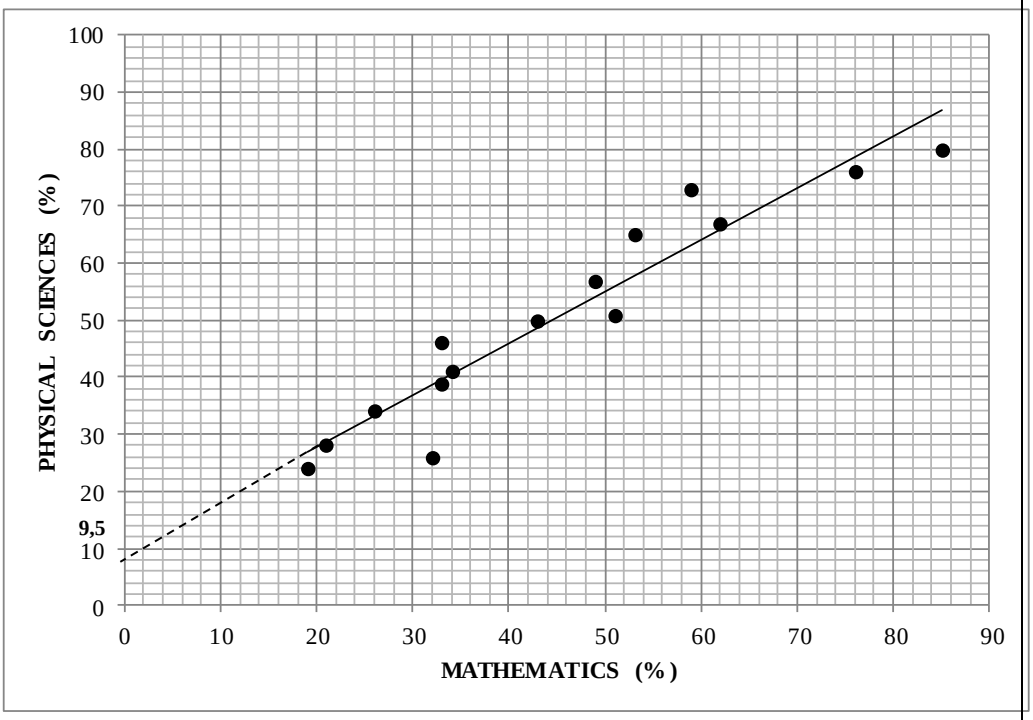
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed out version.
- Consistent accuracy applies in ALL aspects of the marking memorandum. Stop marking at the second calculation error.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

LET WEL:

- *As 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, sien die doodgetrekte poging na.*
- *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	
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

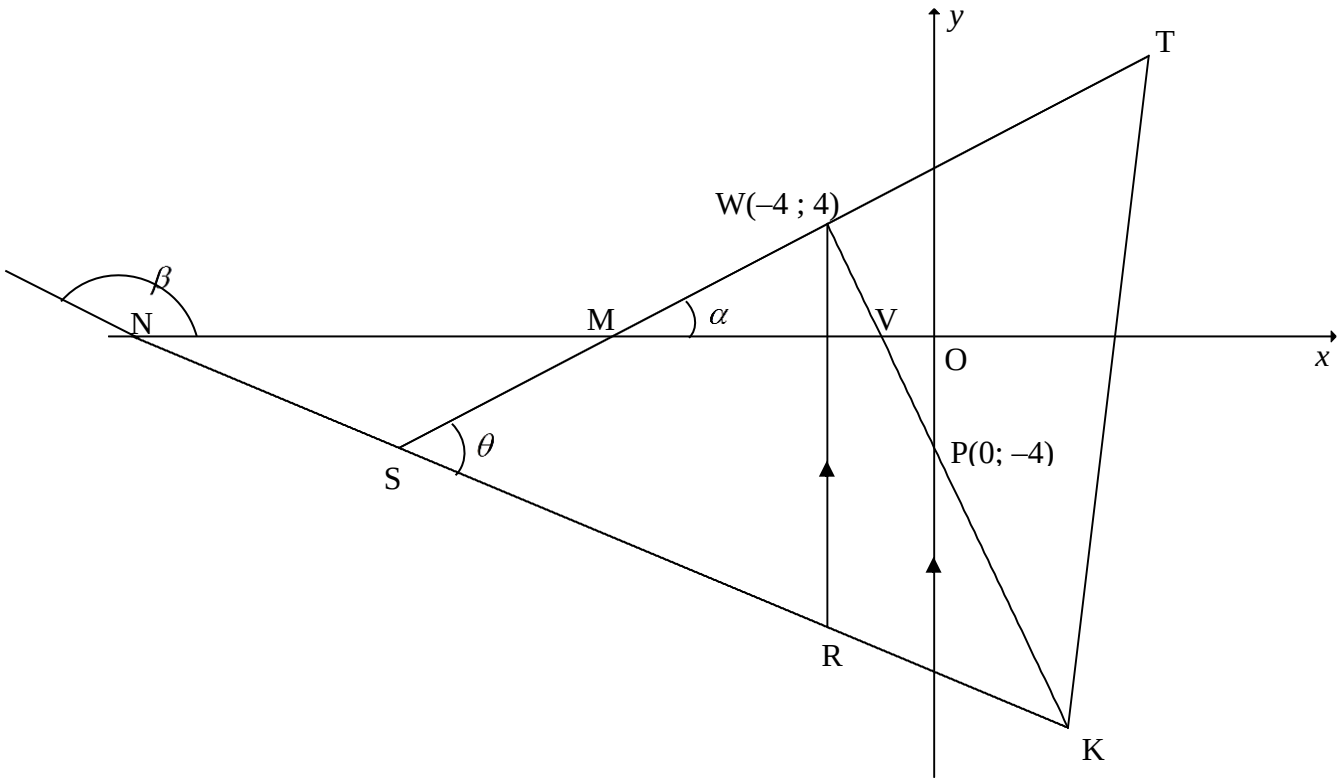
1.1	$a = 9{,}5$ $b = 0{,}909.. = 0{,}91$ $\hat{y} = 9{,}5 + 0{,}91x$	✓ $a = 9{,}5$ ✓ $b = 0{,}91$ ✓ equation (3)
1.2		✓✓ correct slope going through 2 points: (50 ; 55) or (40 ; 46) or (60 ; 64) or (0 ; 9,5) or (45 ; 50) (2)
1.3	Final exam mark ≈ 72,22% (calculator) **OR** $\hat{y} = 9{,}5 + 0{,}91(69)$ ≈ 72,29%	✓✓ answer (2) ✓ substitution ✓ answer (2)
1.4	r = 0,95	✓ answer(A) (1)
1.5	There is a **very strong positive** correlation between the Mathematics and Physical Sciences mark. *Daar is 'n baie sterk positiewe korrelasie tussen die Wiskunde en Fisiese Wetenskappunte.*	✓ **strong**/ ***sterk*** (1)
1.6	The teacher concludes that the higher the learners' Mathematics marks, the higher the learners' Physical Sciences marks. *Die onderwyser het waargeneem dat hoe hoër die wiskunde punte is, hoe hoër is die Fisiese Wetenskappunte.*	✓ answer (1)
		[10]

QUESTION/*VRAAG* 2

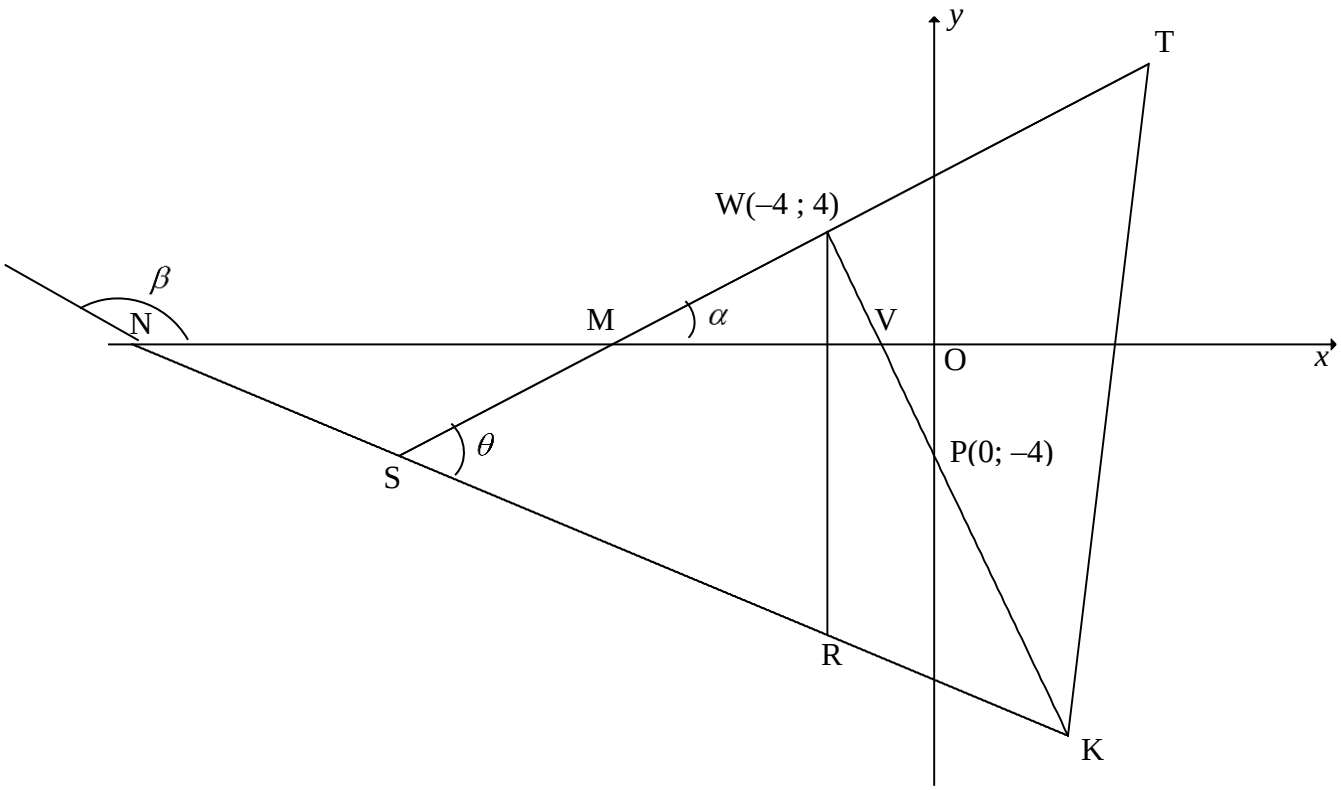
2 018	**2 175**	**2 182**	**2 215**	**2 254**	**2 263**	**2 267**	**2 271**	**2 293**	**2 323**	**2 334**	**2 346**

2.1	July / *Julie*	✓ answer (1)
2.2	$\bar{x} = \frac{26\,941}{12}$ Answer only: Full marks = 2 245,083.. ≈ 2 245,08 aircraft landings	✓ 26 941 ✓ answer (2)
2.3	Standard deviation for landings at the King Shaka International airport: $\sigma = 86{,}30$	✓✓ answer (2)
2.4	$(\bar{x} - \sigma\,;\, \bar{x} + \sigma)$ = (2 245,08 – 86,30 ; 2 245,08 + 86,30) limit = (2 158,78 ; 2 331,38) There were **9** months when the aircraft arrivals at the King Shaka International airport were within one standard deviation of the mean.	✓ $\bar{x} - \sigma$ ✓ $\bar{x} + \sigma$ ✓ answer (3)
2.5	The standard deviation of the number of landings at the Port Elizabeth Airport will be higher than the standard deviation of the number of arrivals at the King Shaka International Airport **OR C.**	✓ answer (1)
		[9]

QUESTION/*VRAAG* 3



3.1	$m_{WP} = \frac{4-(-4)}{-4-0} = \frac{8}{-4}$ $m_{WP} = -2$	✓ substitution of W and P ✓ m_{WP} (2)
3.2	$m_{ST} = \frac{1}{2}$ (given) $(m_{WP})(m_{ST}) = (-2)\left(\frac{1}{2}\right)$ $= -1$ $\therefore ST \perp WP$	✓ $(m_{WP})(m_{ST})$ ✓ $(m_{WP})(m_{ST}) = -1$ (2)
3.3	$5y + 2x + 60 = 0$ $\therefore y = -\frac{2}{5}x - 12$ $-\frac{2}{5}x - 12 = \frac{1}{2}x + 6$ $-4x - 120 = 5x + 60$ $9x = -180$ $x = -20$ $\therefore y = -\frac{2}{5}(-20) - 12$ $\therefore y = -4$ $\therefore S(-20; -4)$ **OR**	✓ equating ✓ x value ✓ substitution ✓ y value (4)

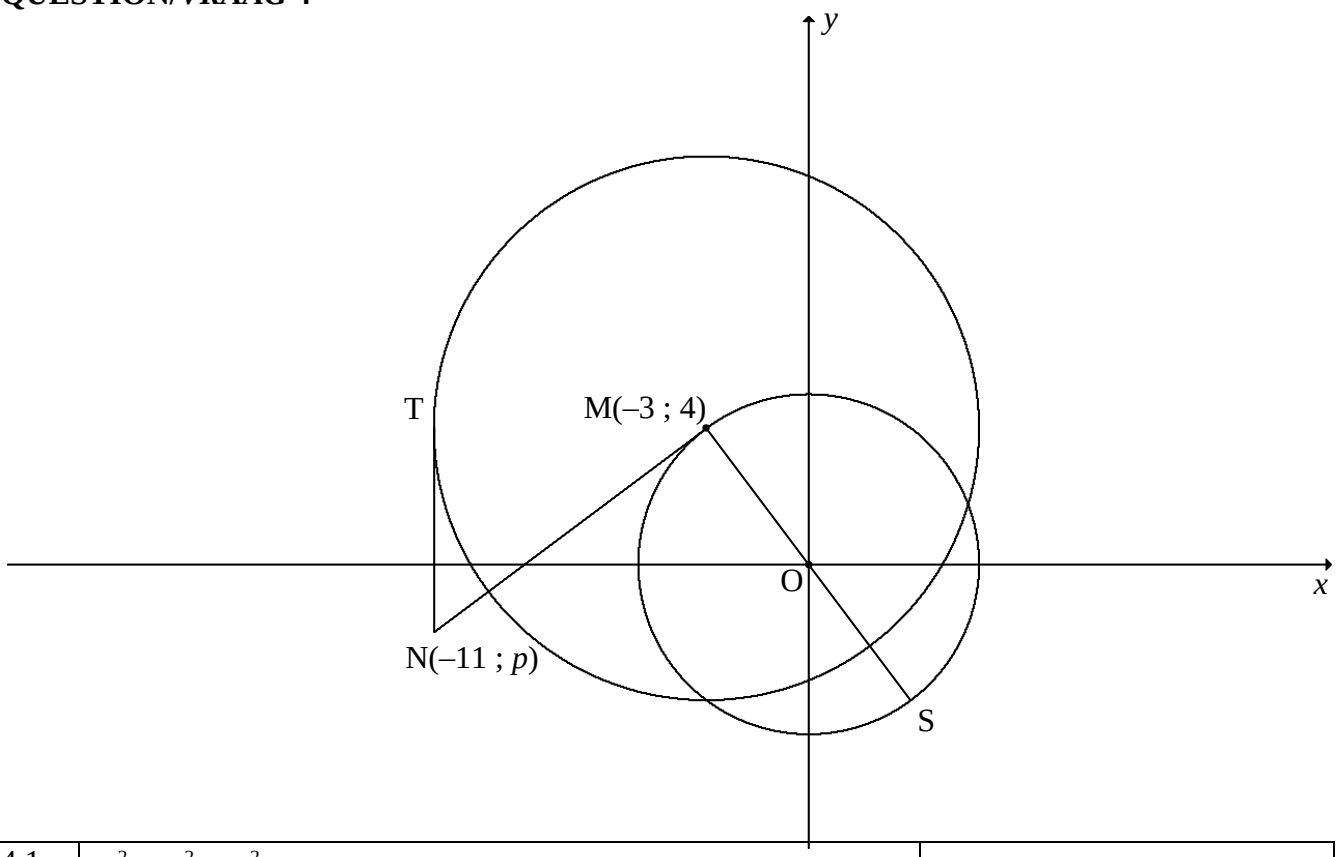


	$5y+2x+60=0$ $5\left(\frac{1}{2}x+6\right)+2x+60=0$ $\frac{5}{2}x+30+2x+60=0$ $\frac{9}{2}x=-90 \qquad \therefore x=-20$ $\therefore y=-\frac{2}{5}(-20)-12$ $\therefore y=-4$ $\therefore$ S(–20; –4) **OR** $5y+2x=-60$ .....(1) $2y-x=12$ .....(2) $(1)+2(2): 9y=-36$ $y=-4$ $2(-4)-x=12$ $x=-20$	✓ substitution ✓ x value ✓ substitution ✓ y value (4) ✓ adding ✓ y value ✓ substitution ✓ x value (4)

3.4	$y=-\frac{2}{5}(-4)-12$ OR $5y+2(-4)+60=0$ $y=-\frac{52}{5}$ $\therefore \text{R}\left(-4;-\frac{52}{5}\right)$ OR R(–4 ; –10,4) $\therefore \text{WR}=4-\left(-\frac{52}{5}\right)$ OR WR = $\sqrt{(-4-(-4))^2+(4-\left(-\frac{52}{5}\right))^2}$ $\therefore \text{WR}=\frac{72}{5}$ units or $\text{WR}=14\frac{2}{5}$ units **OR** WR = ST – SK $=\frac{1}{2}x+6-\left(-\frac{2}{5}x-12\right)$ $=\frac{9}{10}x+18$ $=\frac{9}{10}(-4)+18$ $=14,4$ units	✓ substitution ✓ *y* value ✓ method or subst into distance formula ✓ answer (4) ✓ substitution ✓ simplification ✓ subst *x* = –4 ✓ answer (4)
3.5	$m_{\text{SK}}=-\frac{2}{5}$ $\beta=158,19...°$ (Ref. $\angle$ =21, 801…°) $\text{M}\hat{\text{N}}\text{S}=21,80...°$ $m_{\text{ST}}=\frac{1}{2}$ $\text{N}\hat{\text{M}}\text{S}=26,56...°$ $\theta=21,80...°+26,56...°$ [ext $\angle$ of Δ] $\theta=48,366...°=48,37°$	✓ m_{SK} ✓ size of β ✓ size of $\text{N}\hat{\text{M}}\text{S}$ ✓ method ✓ answer (5)
3.6	In ΔSRW: $\perp h$ = –4 – (–20) $\perp h$ = 16units Area $\Delta\text{SRW}=\frac{1}{2}(\perp h)(\text{WR})$ $=\frac{1}{2}(16)\left(\frac{72}{5}\right)$ $=115,2$ square units Area SWRL = 2Area ΔSRW =2(115,2) = 230,4square units **OR**	✓ $\perp h$ ✓ substitution ✓ area Δ ✓ answer (4)

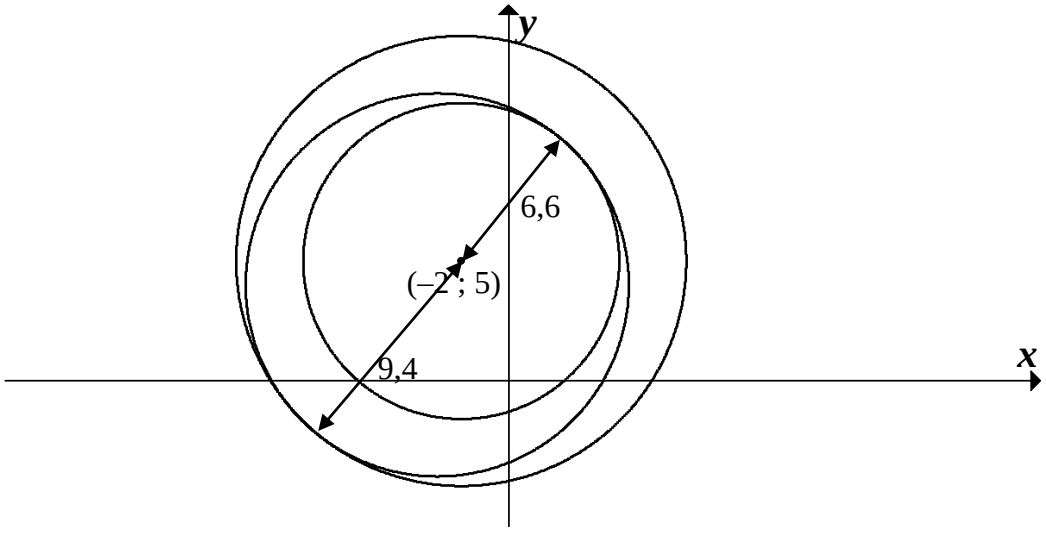
	In ΔSRW: $\perp h = -4 - (-20)$ $\perp h = 16$units Area SWRL $= 16 \times \frac{72}{5}$ $= 230{,}40$ square units **OR** $SW = \sqrt{(-20+4)^2 + (-4-4)^2} = 8\sqrt{5} = 17{,}89$ $SR = \sqrt{(-20+4)^2 + \left(-4+10\frac{2}{5}\right)^2} = \frac{16\sqrt{29}}{5} = 17{,}23$ Area SWRL $= 2 \times$ Area ΔSRW $= 2\left(\frac{1}{2} SW \times SR \sin\theta\right)$ $= 2\left(\frac{1}{2} 8\sqrt{5} \times \frac{16\sqrt{29}}{5} \sin 48{,}37°\right)$ $= 230{,}41$square units	✓ $\perp h$ ✓ ✓ substitution ✓ answer (4) ✓$SW = 8\sqrt{5}$ ✓$SR = \frac{16\sqrt{29}}{5}$ ✓substitution ✓answer (4)
		[21]

QUESTION/*VRAAG* 4

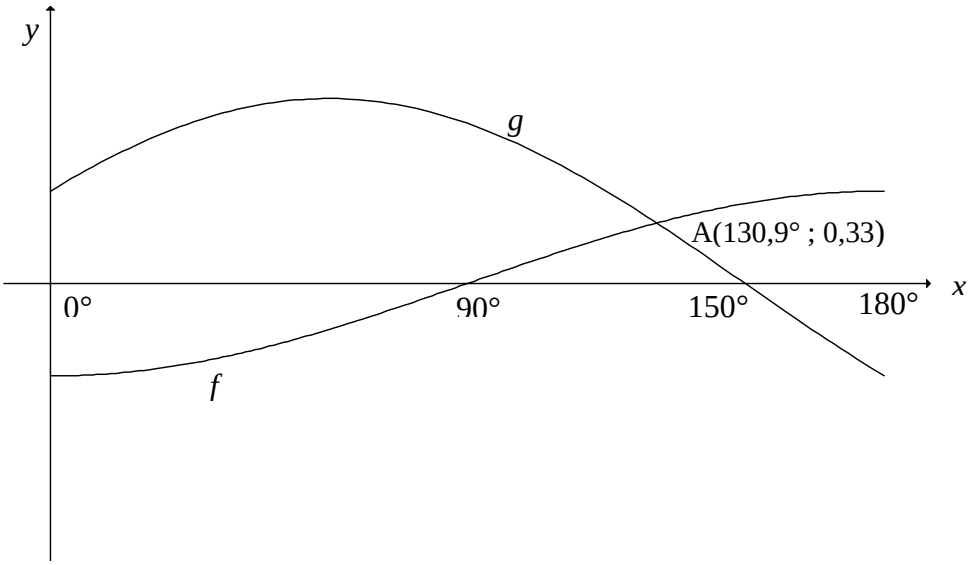


4.1	$x^2 + y^2 = r^2$ $\therefore r^2 = (-3)^2 + (4)^2 = 25$ $x^2 + y^2 = 25$	✓ substitution ✓ answer (2)
4.2	TM ⊥ TN [tangent ⊥ radius] T(–11 ; 4) $r = -3 - (-11) = 8$ $(x+3)^2 + (y-4)^2 = 64$	✓ $x_T = -11$ ✓ LHS ✓ RHS (3)
4.3	O (0 ; 0) and M(–3; 4) $m_{OM} = \frac{4-0}{-3-0} = -\frac{4}{3}$ OR $\frac{0-4}{0-(-3)} = -\frac{4}{3}$ $m_{NM} = \frac{3}{4}$ $y - 4 = \frac{3}{4}(x-(-3))$ **OR** $y = \frac{3}{4}x + c$ $y - 4 = \frac{3}{4}x + \frac{9}{4}$ $4 = \frac{3}{4}(-3) + c$ $\therefore y = \frac{3}{4}x + \frac{25}{4}$ $c = \frac{25}{4}$ $y = \frac{3}{4}x + \frac{25}{4}$	✓ $m_{OM} = -\frac{4}{3}$ ✓ $m_{NM} = \frac{3}{4}$ ✓ substitution of *m* and M ✓ equation (4)

4.4	N(–11 ; *p*) $y=\frac{3}{4}x+\frac{25}{4}$ $p=\frac{3}{4}(-11)+\frac{25}{4}$ OR $\frac{4-p}{-3-(-11)}=\frac{3}{4}$ $p=-2$ $\therefore \text{N}(-11;-2)$ $\frac{-3+x_S}{2}=0$ and $\frac{4+y_S}{2}=0$ $\therefore \text{S}(3;-4)$ $\text{SN}=\sqrt{(-11-3)^2+(-2-(-4))^2}$ $=10\sqrt{2}$ units or 14,14 units	✓ subst $x = -11$ into eq or gradient ✓ $p=-2$ ✓ x_S ✓ y_S ✓ answer (CA) (5)
4.5	B(– 2; 5) BM = $\sqrt{2}$ units Radius of circle centred at M = 8 units $k=8-\sqrt{2}$ or $k=8+\sqrt{2}$ = 6,59 units = 9,41 units = 6,6 units = 9,4 units	✓ $\sqrt{2}$ ✓✓ $k = 6,6$ ✓✓ $k = 9,4$ (5)
		[19]

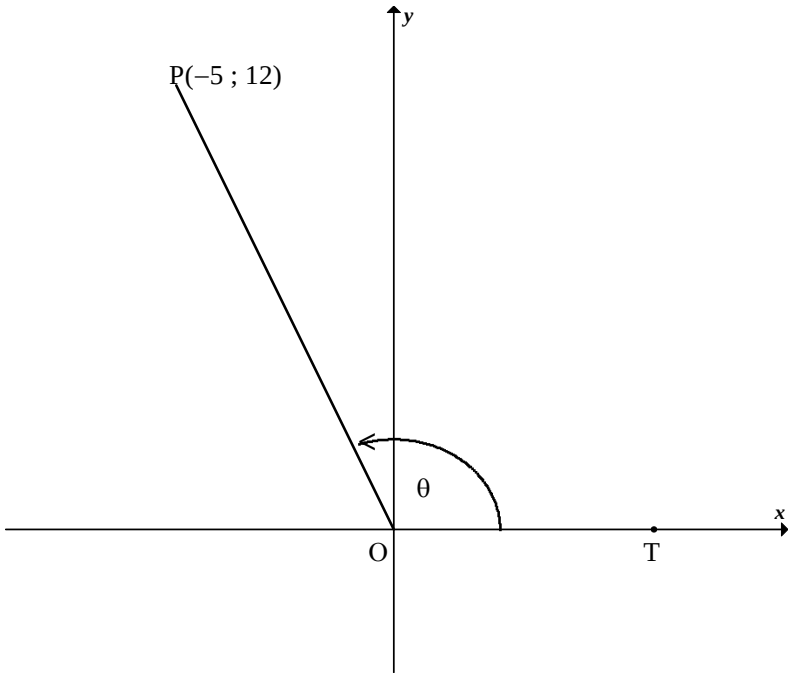


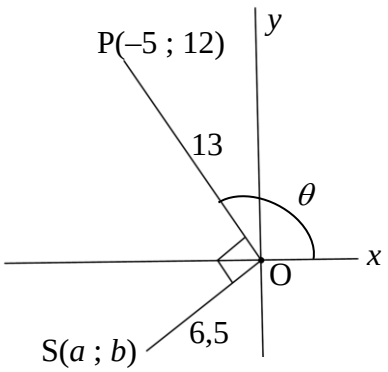
QUESTION/*VRAAG* 5



5.1	Period of $g = 360°$	✓ answer (1)
5.2	Amplitude of $f = \frac{1}{2}$	✓ answer (A) (1)
5.3	$f(180°) - g(180°)$ $= \frac{1}{2} - \left(-\frac{1}{2}\right)$ $= 1$	✓ 1 (1)
5.4.1	$x = 140,9°$	✓ $x = 140,9°$ (1)
5.4.2	$\sqrt{3}\sin x + \cos x \geq 1$ $\frac{\sqrt{3}}{2}\sin x + \frac{1}{2}\cos x \geq \frac{1}{2}$ $\sin x\cos 30° + \cos x\sin 30° \geq \frac{1}{2}$ $\sin(x + 30°) \geq \frac{1}{2}$ $\sin(x + 30°) = \frac{1}{2}$ at $x = 0°$ or $x = 120°$ $\therefore x \in [0°;120°]$ **OR** $0° \leq x \leq 120°$	✓ dividing by 2 ✓ $\cos 30°; \sin 30°$ ✓ $\sin(x + 30°) \geq \frac{1}{2}$ ✓ interval (4)
		[8]

QUESTION/*VRAAG 6*

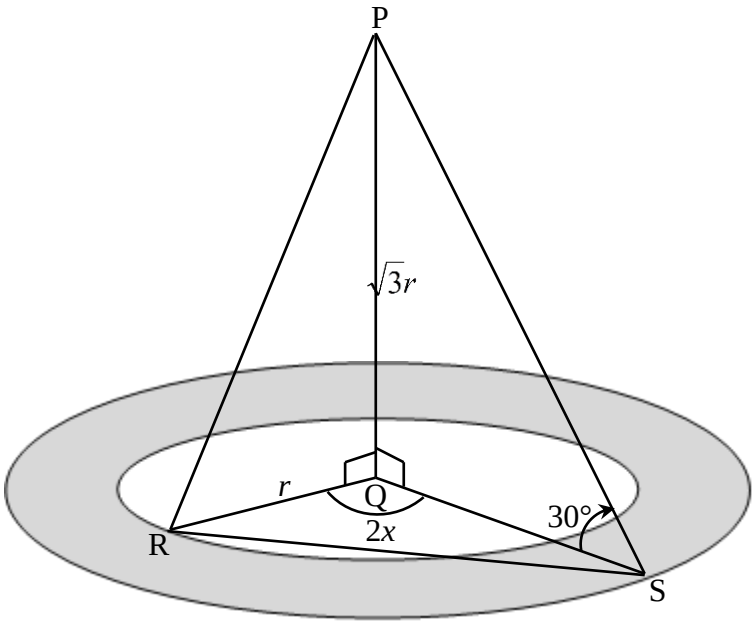


6.1.1	$\tan\theta = -\frac{12}{5}$ or $-2\frac{2}{5}$	✓answer (1)
6.1.2	$(OP)^2 = (-5)^2 + (12)^2$ $OP = 13$ $\cos\theta = -\frac{5}{13}$	✓ Pythagoras ✓ OP ✓ answer (3)
6.1.3	$\sin(\theta + 90°) = \frac{b}{6,5}$ $\cos\theta = \frac{b}{6,5}$ $\frac{-5}{13} = \frac{b}{6,5}$ $b = -\frac{5}{2}$ **OR** $\cos(90° + \theta) = \frac{a}{6,5}$ $-\sin\theta = \frac{a}{6,5}$ $-\frac{12}{13} = \frac{a}{6,5} \quad \therefore a = -6$ $b = \sqrt{(6,5)^2 - (-6)^2} = -\frac{5}{2}$ 	✓ $\sin(\theta + 90°) = \frac{b}{6,5}$ ✓ $\cos\theta$ ✓ $\frac{-5}{13} = \frac{b}{6,5}$ ✓ value of b (4) ✓ $\cos(\theta + 90°) = \frac{a}{6,5}$ ✓ $-\sin\theta$ ✓ value of a ✓ value of b (4)

6.2	$\dfrac{\sin 2x.\cos(-x)+\cos 2x.\sin(360°-x)}{\sin(180°+x)}$ $=\dfrac{\sin 2x\ \cos x\ +\ \cos 2x(-\sin x)}{-\sin x}$ $=\dfrac{\sin(2x-x)}{-\sin x}$ $=\dfrac{\sin x}{-\sin x}$ $=-1$	✓ $\cos(-x)=\cos x$ ✓ $\sin(360°-x)=-\sin x$ ✓ $\sin(180°+x)=-\sin x$ ✓ numerator = $\sin x$ ✓ answer (5)
6.3	$6\sin^2 x+7\cos x-3=0$ $6(1-\cos^2 x)+7\cos x-3=0$ $6-6\cos^2 x+7\cos x-3=0$ $6\cos^2 x-7\cos x-3=0$ $(3\cos x+1)(2\cos x-3)=0$ $\cos x=-\dfrac{1}{3}$ or $\cos x=\dfrac{3}{2}$ (N/A) $\therefore x=109{,}47°+k.360°;\ k\in Z$ or $x=250{,}53°+k.360°;\ k\in Z$	✓ identity ✓ standard form ✓ factors ✓ both solutions of cos x ✓ $x=109{,}47°$ & $250{,}53°$ ✓ $+k.360°;\ k\in Z$ (6)
6.4	$x+\dfrac{1}{x}=3\cos A$ $(3\cos A)^2=\left(x+\dfrac{1}{x}\right)^2$ $9\cos^2 A=x^2+\dfrac{1}{x^2}+2$ $9\cos^2 A=2+2$ $\cos^2 A=\dfrac{4}{9}$ $\cos 2A=2\cos^2 A-1$ $=2\left(\dfrac{4}{9}\right)-1$ $=-\dfrac{1}{9}$ **OR**	✓squaring both sides ✓ $9\cos^2 A=x^2+\dfrac{1}{x^2}+2$ ✓ $\cos^2 A=\dfrac{4}{9}$ ✓ $\cos 2A=2\cos^2 A-1$ ✓ answer (5)

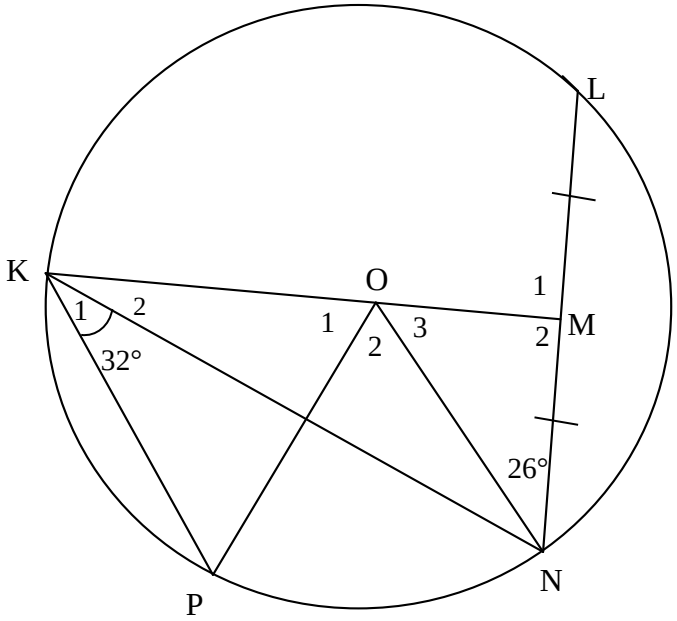
	$x^2 - 2 + \frac{1}{x^2} = 0$ $\left(x - \frac{1}{x}\right)^2 = 0$ $x^2 = 1$ $x = \pm 1$ $3\cos A = 2 \quad \text{or} \quad 3\cos A = -2$ $\cos A = \frac{2}{3} \quad \text{or} \quad \cos A = -\frac{2}{3}$ $\cos 2A = 2\cos^2 A - 1$ $= 2\left(\pm\frac{2}{3}\right)^2 - 1$ $= -\frac{1}{9}$	✓ $x = \pm 1$ ✓ $\cos A = \frac{2}{3}$ ✓ $\cos A = -\frac{2}{3}$ ✓double angle identity ✓ answer (5)
		[24]

QUESTION/*VRAAG* 7



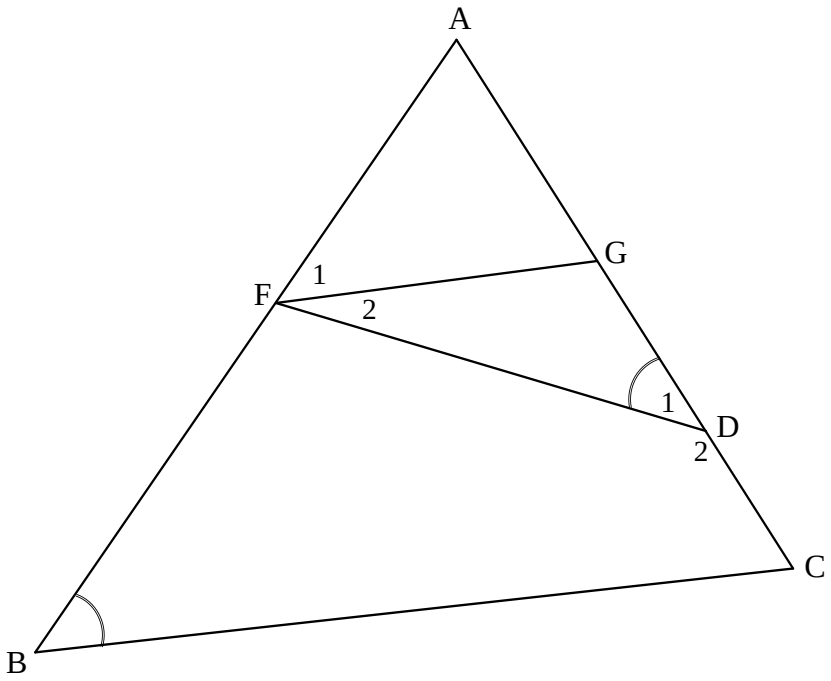
7.1	$\tan 30° = \frac{\sqrt{3}r}{QS}$ **OR** $\tan 60° = \frac{QS}{\sqrt{3}r}$ $QS = \frac{\sqrt{3}r}{\tan 30°}$ $\sqrt{3} = \frac{QS}{\sqrt{3}r}$ $= \frac{\sqrt{3}r}{\frac{1}{\sqrt{3}}}$ *or* $\frac{\sqrt{3}r}{\frac{\sqrt{3}}{3}}$ $QS = 3r$ $= 3r$	✓✓ trig ratio ✓ QS subject (3)
7.2	Area of flower garden $= \pi(3r)^2 - \pi r^2$ $= 9\pi r^2 - \pi r^2$ $= 8\pi r^2$	✓ substitution into difference of areas ✓ answer (2)
7.3	$RS^2 = r^2 + (3r)^2 - 2(r)(3r)\cos 2x$ $= r^2 + 9r^2 - 6r^2\cos 2x$ $= 10r^2 - 6r^2\cos 2x$ $= r^2(10 - 6\cos 2x)$ $RS = r\sqrt{10 - 6\cos 2x}$	✓substitution into cosine rule correctly ✓ $10r^2 - 6r^2\cos 2x$ ✓ $r^2(10 - 6\cos 2x)$ (3)
7.4	$RS = 10\sqrt{10 - 6\cos 2(56)}$ $= 34{,}9966...$ ≈ 35 m	✓substitution ✓ answer (2)
		[10]

QUESTION/*VRAAG* 8



8.1.1(a)	$\hat{O}_2 = 64°$ [∠ at centre = 2 ×∠ at circumference/ *Middelpts ∠ = 2 ×∠ omtreks∠*]	✓ S ✓ R (2)
8.1.1(b)	$\hat{M}_2 = 90°$ [Line from centre to midpt of chord/*lyn v midpt na midpt v koord*] $K\hat{O}N = 90° + 26° = 116°$ [ext ∠ of Δ/*buite ∠ van* Δ] $\hat{O}_1 = 116° - 64° = 52°$ **OR** $\hat{M}_2 = 90°$ [Line from centre to midpt of chord/*lyn v midpt na midpt v koord*] $\hat{O}_3 = 64°$ [sum of ∠s in Δ] $\hat{O}_1 = 52°$ [∠s on straight line/*op 'n reguitlyn*]	✓ S ✓ R ✓ S ✓ answer (4) ✓ S ✓ R ✓ S ✓ answer (4)
8.1.2	$P\hat{K}O + \hat{P} = 128°$ [sum of ∠s in Δ/*som ∠e van* Δ] $P\hat{K}O = \hat{P}$ [∠s opp = sides/*∠e teenoor = sye*] $= 64°$ $\therefore \hat{K}_2 = 32°$ *or* $\hat{K}_2 = \hat{K}_1$ $\therefore$ KN bisects/*halveer* $O\hat{K}P$ **OR** $\hat{K}_2 = K\hat{N}O$ [∠s opp = sides/*∠e teenoor = sye*] $\hat{K}_2 + K\hat{N}O = 64°$ [sum of ∠s in Δ/*som ∠e van* Δ] $\therefore \hat{K}_2 = 32°$ *or* $\hat{K}_2 = \hat{K}_1$ $\therefore$ KN bisects/*halveer* $O\hat{K}P$	✓ S ✓ S ✓ S (3) ✓ S ✓ S ✓ S (3)

8.2

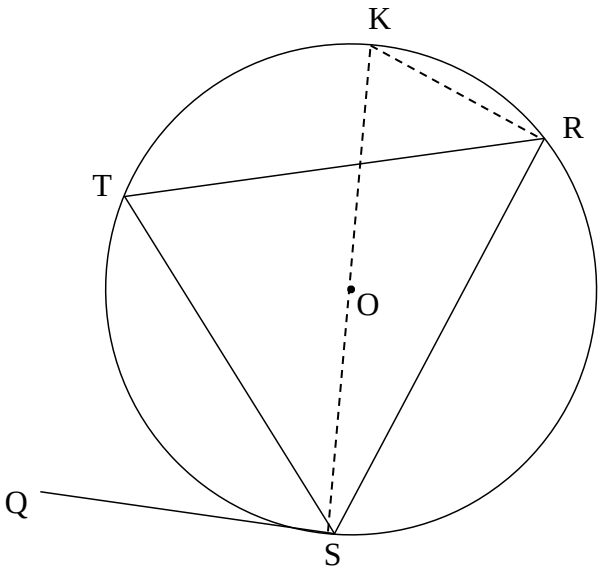


8.2.1	$\hat{F}_1 = \hat{D}_1$ [tan chord theorem/*raaklyn koordst*] $\hat{D}_1 = \hat{B}$ [Given/*Gegee*] $\therefore \hat{F}_1 = \hat{B}$ $\therefore FG \parallel BC$ [corresp ∠s =/*Ooreenkomstige∠e* =]	✓ S ✓ R ✓ $\hat{F}_1 = \hat{B}$ ✓ R (4)
8.2.2	$\frac{GC}{AC} = \frac{FB}{AB}$ [line ‖ one side of Δ/*lyn* ‖ *een sy v Δ*] $\frac{x+9}{2x-6} = \frac{5}{7}$ $7x + 63 = 10x - 30$ $3x = 93$ $x = 31$ **OR** $AG = 2x - 6 - (x+9) = x - 15$ $\frac{AG}{GC} = \frac{AF}{FB}$ [line ‖ one side of Δ/*lyn* ‖ *een sy v Δ*] $\frac{x-15}{x+9} = \frac{2}{5}$ $5x - 75 = 2x + 18$ $3x = 93$ $x = 31$ **OR**	✓ S ✓ R ✓ substitution ✓ answer (4) ✓ S ✓ R ✓ substitution ✓ answer (4)

	$\frac{AF}{AB}=\frac{AG}{AC}$ [line ∥ one side of Δ /lyn ∥ een sy vΔ] $\frac{2}{7}=\frac{x-15}{2x-6}$ $7x-105=4x-12$ $3x=93$ $x=31$	✓ S ✓ R ✓ substitution ✓ answer (4)
		[17]

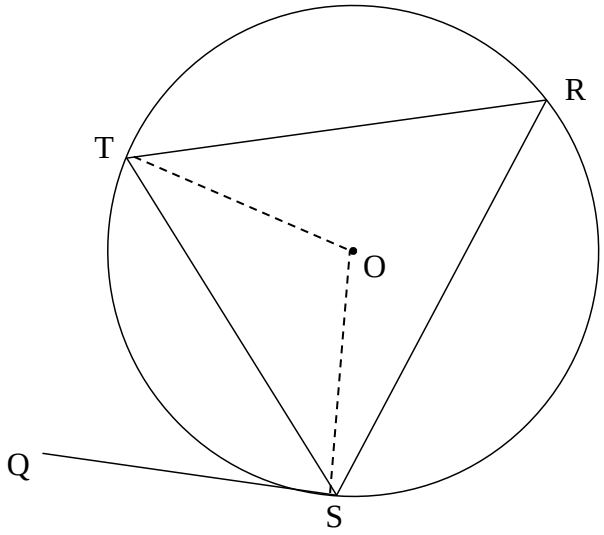
QUESTION/*VRAAG* 9

9.1



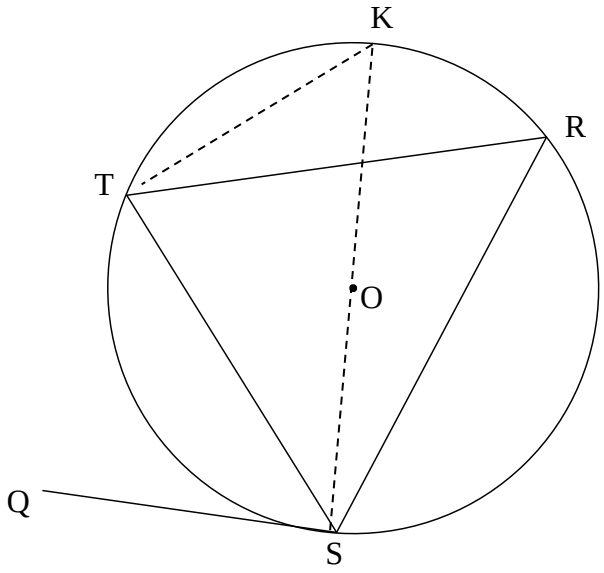
9.1	Construction: Draw diameter KS and draw KR *Konstruksie: Trek middellyn KS en verbind KR* $Q\hat{S}T = 90° - T\hat{S}K$ [radius ⊥ tangent/*raaklyn*] $S\hat{R}K = 90°$ [∠ in semi circle/*halfsirkel*] $\therefore S\hat{R}T = 90° - K\hat{R}T$ $T\hat{S}K = T\hat{R}K$ [∠s same segment/*∠e dieselfde segment*] $\therefore Q\hat{S}T = \hat{R}$	✓ construction ✓ S/R ✓ S/R ✓ S ✓ S/R (5)

OR



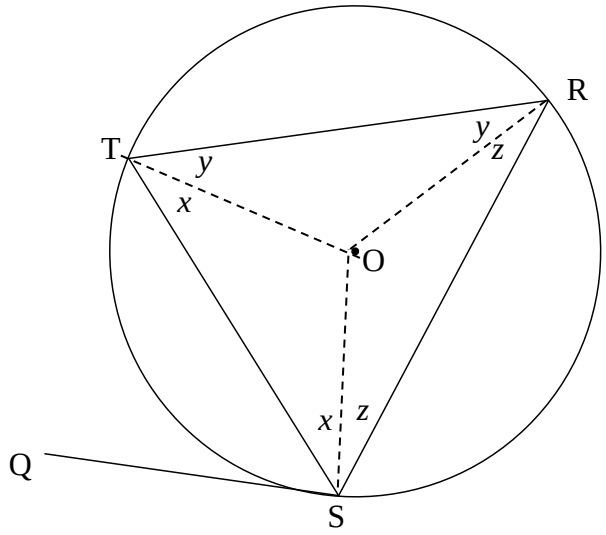
9.1	Construction: Draw radii OS and OT *Konstruksie: Trek radii OS en OT* $Q\hat{S}T = 90° - O\hat{S}T$ [radius ⊥ tangent/*raaklyn*] $O\hat{S}T = S\hat{T}O$ [∠s opp = sides/*∠e teenoor = sye*] $\therefore S\hat{O}T = 180° - 2O\hat{S}T$ [∠s of Δ/*∠e van Δ*] $\hat{R} = 90° - O\hat{S}T$ [∠ at centre = 2×∠ circumf/*midpts∠ = 2× omtreks∠*] $\therefore Q\hat{S}T = \hat{R}$	✓ construction ✓ S/R ✓ S/R ✓ S ✓ S/R (5)

OR



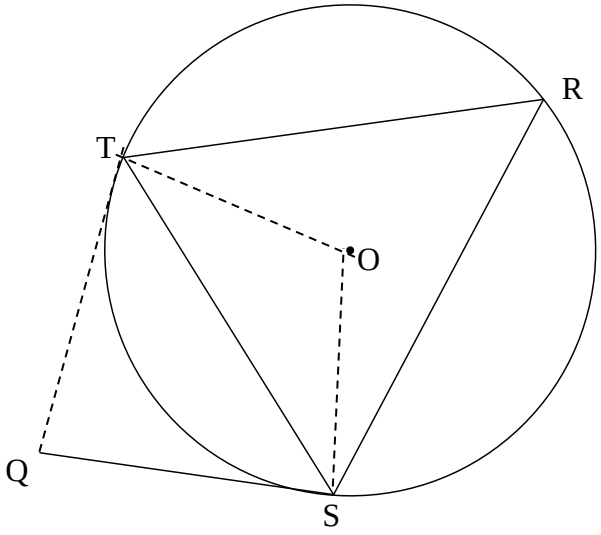
9.1	Construction: Draw diameter KS and join K to T. *Konstruksie: Trek middellyn KS en verbind K tot T* $Q\hat{S}T = 90° - T\hat{S}K$ [radius ⊥ tangent/*raaklyn*] $S\hat{T}K = 90°$ [∠ in semi circle/*halfsirkel*] $\therefore \hat{K} = 90° - T\hat{S}K$ $\therefore Q\hat{S}T = \hat{K}$ but $\hat{R} = \hat{K}$ [∠s same segment/*∠e dieselfde segment*] $\therefore Q\hat{S}T = \hat{R}$	✓ construction ✓ S/R ✓ S/R ✓ S ✓ S/R (5)

OR



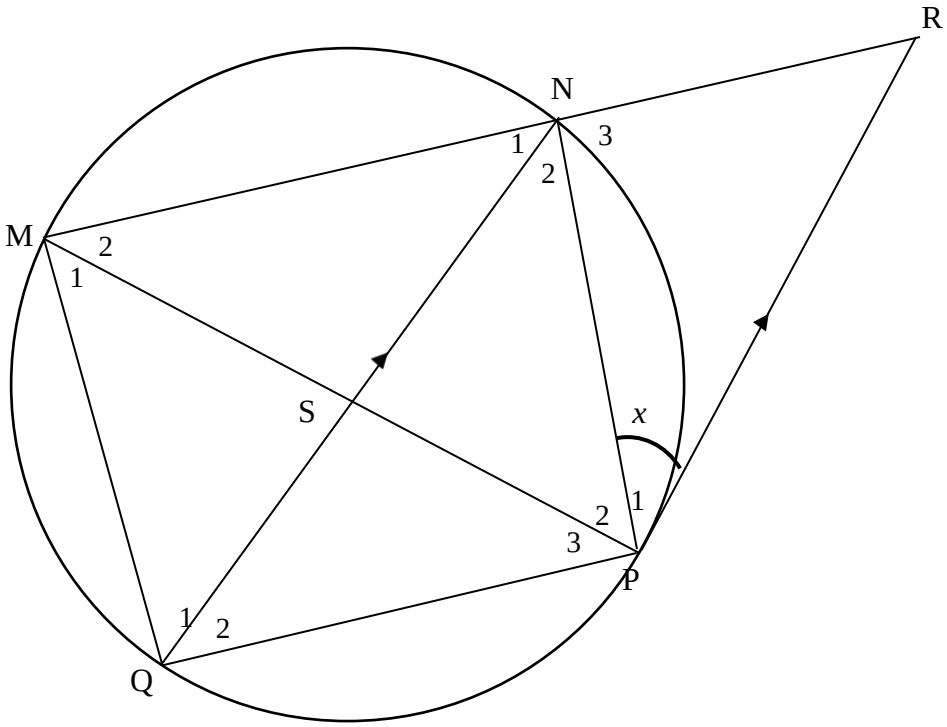
9.1	Construction: Draw radii OT, OR and OS *Konstruksie: Trek radiuse OT, OR en OS* $O\hat{S}T = O\hat{T}S$ [∠s opp = radii/*∠e teenoor = radiuse*] Also: $O\hat{T}R = O\hat{R}T$ and $O\hat{R}S = O\hat{S}R$ $2x + 2y + 2z = 180°$ [∠s of Δ] $x + y + z = 90°$ $y + z = 90° - x$ $O\hat{S}Q = 90°$ [radius ⊥ tangent/*raaklyn*] $\therefore\ T\hat{S}Q = 90° - x$ $\therefore\ T\hat{S}Q = y + z = \hat{R}$	✓ construction ✓ S/R ✓ S ✓ S/R ✓ S (5)

OR



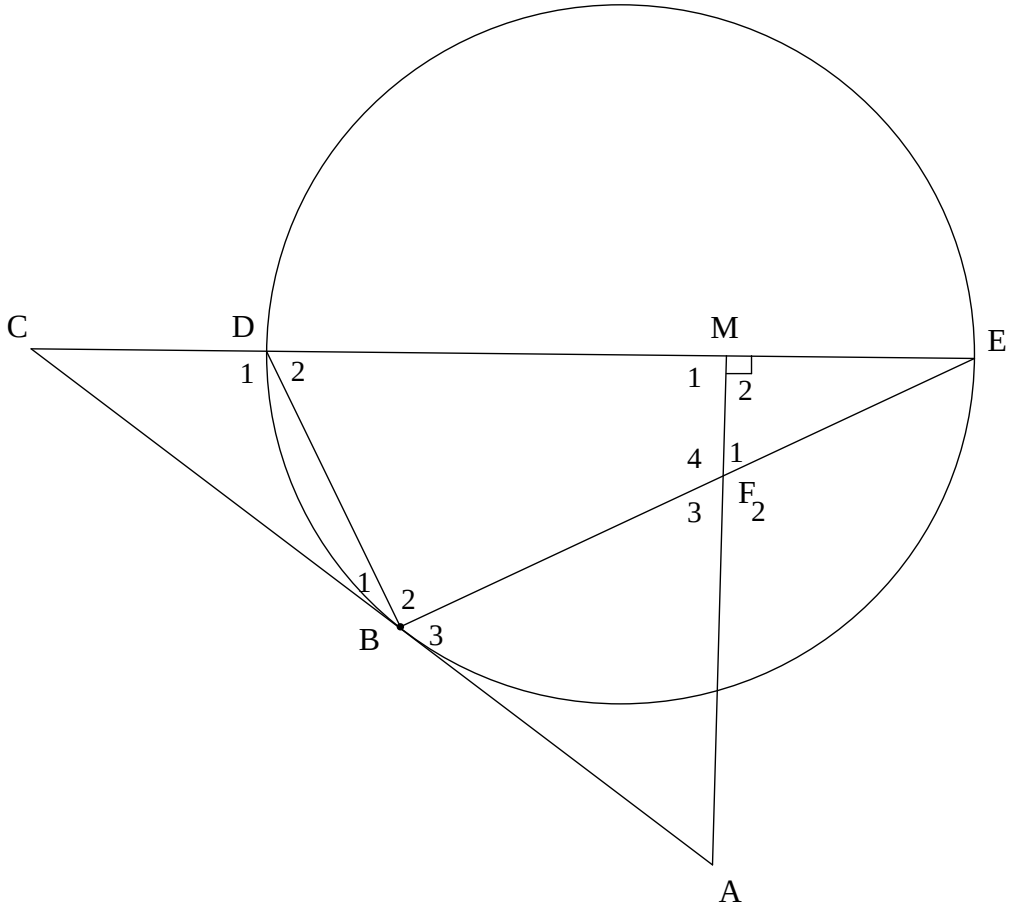
9.1	Construction: Draw radii OT and OS, tangent QT *Konstruksie: Trek radiuse OT en OS, raaklyn QT* $O\hat{S}Q = 90°$ [radius ⊥ tangent/*raaklyn*] $\therefore\ T\hat{S}Q = 90° - T\hat{S}O$ $\therefore\ T\hat{S}O = S\hat{T}O$ [∠s opp = radii/*∠e teenoor = radiuse*] $T\hat{O}S = 180° - 2T\hat{S}O$ [∠s of Δ] $\hat{R} = 90° - T\hat{S}O$ [∠ at centre = 2×∠ circumf/ *midpts∠ = 2× omtreks∠*] $\therefore\ T\hat{S}Q = \hat{R}$	✓ construction ✓ S/R ✓ S ✓ S ✓ S/R (5)

9.2



9.2.1(a)	$\hat{N}_2 = x$	[alt ∠s; PR ‖ NQ/*verw. ∠e;* PR ‖ NQ]	✓ S ✓ R (2)
9.2.1(b)	$\hat{Q}_2 = x$ OR $M_2 = x$ $\hat{Q}_2 = x$	[tan chord theorem/*raaklyn koordstelling*] [tan chord theorem/*raaklyn koordstelling*] [∠s in same segment/*∠e in dieselfde segm*]	✓ S ✓ R (2) ✓ S/R ✓ S/R (2)
9.2.2	$\frac{MN}{NR} = \frac{MS}{SP}$ $\hat{N}_1 = \hat{N}_2 = x$ $\hat{P}_3 = x$ $\hat{P}_3 = \hat{Q}_2$ SQ = PS $\frac{MN}{NR} = \frac{MS}{SQ}$	[QN ‖ PR; Prop Th] [given] [∠s in same segment/*∠e in dieselfde segm*] [= *x*] [sides opp = ∠/*sye teenoor = ∠e*]	✓ S ✓ R ✓ S ✓ S ✓ R ✓ R (6)
			[15]

QUESTION/*VRAAG* 10



10.1.1	$D\hat{B}E = 90°$ [∠ in semi-circle/∠ *in halfsirkel*] $\therefore D\hat{M}A = 90°$ [AM ⊥ DE] ∴ FBDM is a cyclic quadrilateral/*koordevh* [converse opp ∠s cyclic quad/*omgek teenoorst ∠e kvh*] **OR** $D\hat{B}E = 90°$ [∠ in semi-circle/∠ *in halfsirkel*] $\hat{M}_2 = D\hat{B}E = 90°$ ∴ FBDM is a cyclic quadrilateral/*koordevh* [converse ext∠ of cyclic quad/*omgek buite∠van kvh*]	✓ S ✓ R ✓ R (3) ✓ S ✓ R ✓ R (3)

10.1.2	$\hat{B}_3 = \hat{D}_2$ [tangent chord th/*raaklyn koordst*] $\hat{F}_1 = \hat{D}_2$ [ext ∠ cyc quad/*buite ∠ koordevh*] $\therefore \hat{B}_3 = \hat{F}_1$ **OR** $\hat{B}_1 = \hat{E} = x$ [tangent chord th/*raaklyn koordst*] $\hat{F}_1 = 90° - x$ [∠ sum in Δ/*∠ van Δ*] $\hat{D}_2 = 90° - x$ [∠ sum in Δ/*∠ van Δ*] $\therefore \hat{F}_1 = D_2$ $\hat{B}_3 = \hat{D}_2$ [tangent chord th/*raaklyn koordst*] $\therefore \hat{B}_3 = \hat{F}_1$ **OR** $\hat{B}_1 = \hat{E} = x$ [tangent chord th/*raaklyn koordst*] $\hat{B}_3 = 90° - x$ [straight line/*reguitlyn*] $\hat{F}_1 = 90° - x$ [sum of ∠s Δ/*som van ∠e van Δ*] $\therefore \hat{B}_3 = \hat{F}_1$	✓ S ✓ R ✓ S ✓ R (4) ✓ S ✓ R ✓ $\hat{F}_1 = 90° - x$ $= \hat{D}_2$ ✓ R (4) ✓ S ✓ R ✓ S ✓ S (4)
10.1.3	In ΔCDB and ΔCBE $\hat{C} = \hat{C}$ [common ∠/*gemeenskaplike ∠*] $C\hat{B}D = C\hat{E}B$ [tangent chord th/*raaklyn koordst*] $C\hat{D}B = C\hat{B}E$ [∠ sum in Δ/*∠ van Δ*] ΔCDB ||| ΔCBE **OR** In ΔCDB and ΔCBE $C\hat{B}D = C\hat{E}B$ [tangent chord th/*raaklyn koordst*] $\hat{C} = \hat{C}$ [common ∠/*gemeenskaplike ∠*] ΔCDB ||| ΔCBE [∠, ∠, ∠]	✓ S ✓ S/R ✓ R (3) ✓ S/R ✓ S ✓ R (3)
10.2.1	$\frac{BC}{EC} = \frac{DC}{BC}$ [||| Δs] $BC^2 = EC \times DC$ $= 8 \times 2$ $= 16$ $BC = 4$	✓ ratio ✓ substitution ✓answer (3)

10.2.2	$\frac{BC}{EC} = \frac{DB}{BE}$ [||| Δs] $\frac{DB}{BE} = \frac{4}{8} = \frac{1}{2}$ $BE = 2DB$ $DB^2 + BE^2 = DE^2$ [Pyth theorem] $DB^2 + (2DB)^2 = 36$ $5DB^2 = 36$ $DB^2 = \frac{36}{5}$ $DB = \frac{6}{\sqrt{5}} = 2{,}68\text{ units}$	✓ BE = 2DB ✓ substitution into Pyth theorem ✓ $DB^2 = \frac{36}{5}$ ✓answer (4)
		[17]

TOTAL/*TOTAAL*: 150

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