basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIORSERTIFIKAAT-EKSAMEN/
NASIONALE SENIORSERTIFIKAAT-EKSAMEN

WISKUNDE V2

2021

PUNTE: 150

TYD: 3 uur

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

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 het om jou antwoorde te bepaal, duidelik aan.
4. Volpunte sal NIE noodwendig aan slegs antwoorde toegeken word NIE.
5. Jy mag 'n goedgekeurde, wetenskaplike sakrekenaar (nieprogrammeerbaar en niegrafies) gebruik, 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

1.1 Sam teken die hoeveelheid data (in MB) aan wat sy op elk van die eerste 15 dae in April gebruik het. Die inligting word in die tabel hieronder getoon.

26	13	3	18	12	34	24	58	16	10	15	69	20	17	40

1.1.1 Bereken die:

(a) Gemiddelde van die datastel (2)

(b) Standaardafwyking van die datastel (1)

1.1.2 Bepaal die getal dae waarop die hoeveelheid data wat gebruik is, meer as een standaardafwyking bokant die gemiddelde was. (2)

1.1.3 Bereken die maksimum totale hoeveelheid data wat Sam gedurende die res van die maand moet gebruik as haar algehele gemiddelde verbruik vir April 80% van die gemiddelde vir die eerste 15 dae moet wees. (3)

1.2 Die windspoed (in km per uur) en temperatuur (in °C) om 16:00 is vir 'n periode van 10 dae by 'n sekere dorp aangeteken. Die inligting word in die tabel hieronder getoon.

WINDSPOED IN km/h (x)	2	6	15	20	25	17	11	24	13	22
TEMPERATUUR IN °C (y)	28	26	22	22	16	20	24	19	26	19

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

1.2.2 Voorspel die temperatuur om 16:00 indien die windspoed van hierdie dorp op 'n sekere dag 9 km per uur was. (2)

1.2.3 Interpreteer die waarde van b in die konteks van die data. (1)
[14]

VRAAG 2

Die getal dae in 'n jaar waarop graad 8-leerders by 'n sekere hoërskool afwesig was, is aangeteken. Hierdie inligting word in die tabel hieronder voorgestel.

GETAL DAE AFWESIG	GETAL LEERDERS
$0 \leq x < 5$	34
$5 \leq x < 10$	45
$10 \leq x < 15$	98
$15 \leq x < 20$	43
$20 \leq x < 25$	7
$25 \leq x < 30$	3

2.1 Skryf die modale klas vir die data neer. (1)

2.2 Hoeveel leerders was vir minder as 15 dae van die skool afwesig? (1)

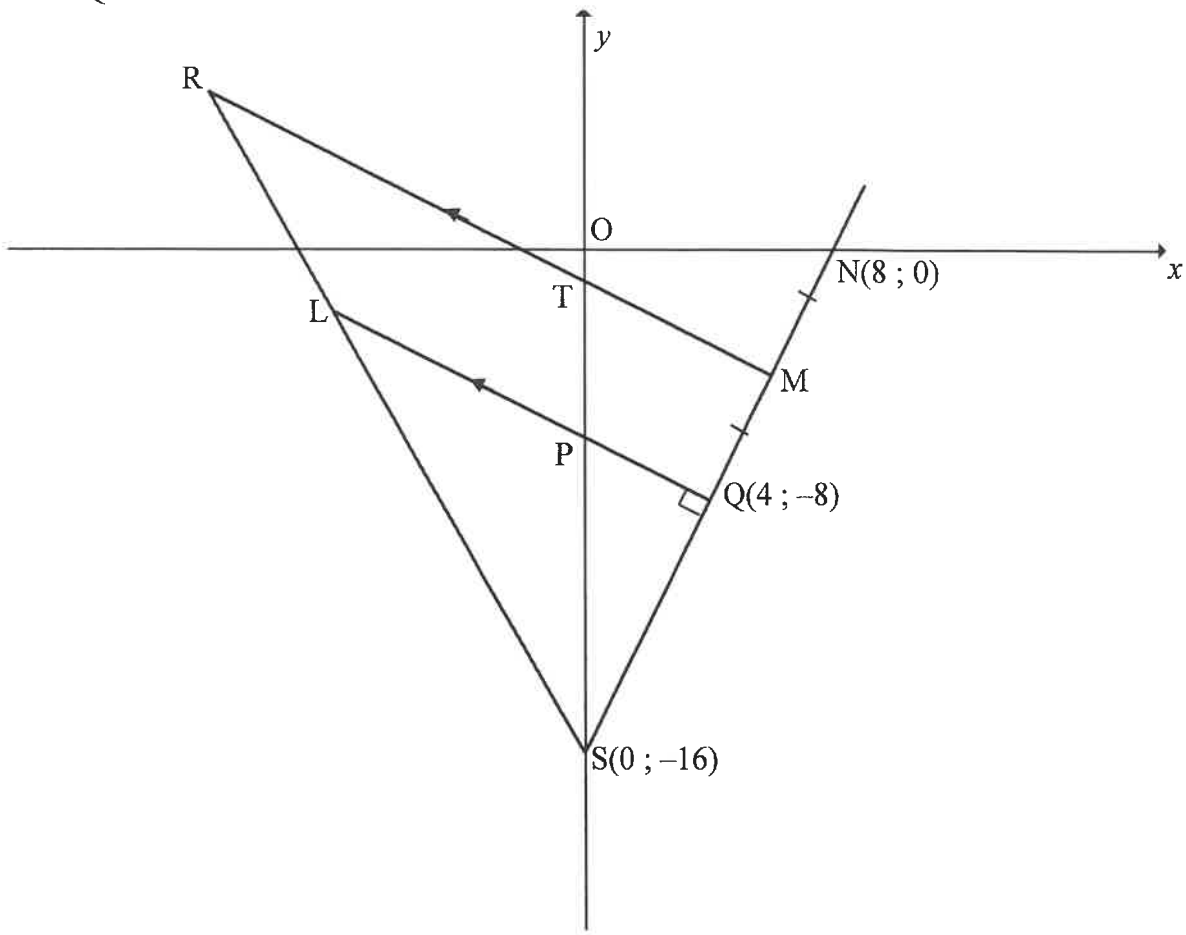
2.3 Hoeveel graad 8-leerders is daar by die skool? (1)

2.4 Skets 'n kumulatiewefrekwensie-grafiek (ogief) om die data hierbo voor te stel op die rooster wat in die ANTWOORDEBOEK verskaf word. (4)

2.5 Gebruik die kumulatiewefrekwensie-grafiek om die mediaan getal dae wat die graad 8-leerders afwesig was, te bepaal. (2)
[9]

VRAAG 3

In die diagram is S(0 ; –16), L en Q(4 ; –8) die hoekpunte van ΔSLQ met LQ loodreg op SQ. SL en SQ word onderskeidelik na R en M verleng sodanig dat RM || LQ. SM verleng sny die x-as by N(8 ; 0). QM = MN. T en P is onderskeidelik die y-afsnitte van RM en LQ.



3.1 Bereken die koördinate van M. (2)

3.2 Bereken die gradiënt van NS. (2)

3.3 Toon dat $y = -\frac{1}{2}x - 6$ die vergelyking van lyn LQ is. (3)

3.4 Bepaal die vergelyking van 'n sirkel met die middelpunt by O, die oorsprong, en wat ook deur S gaan. (2)

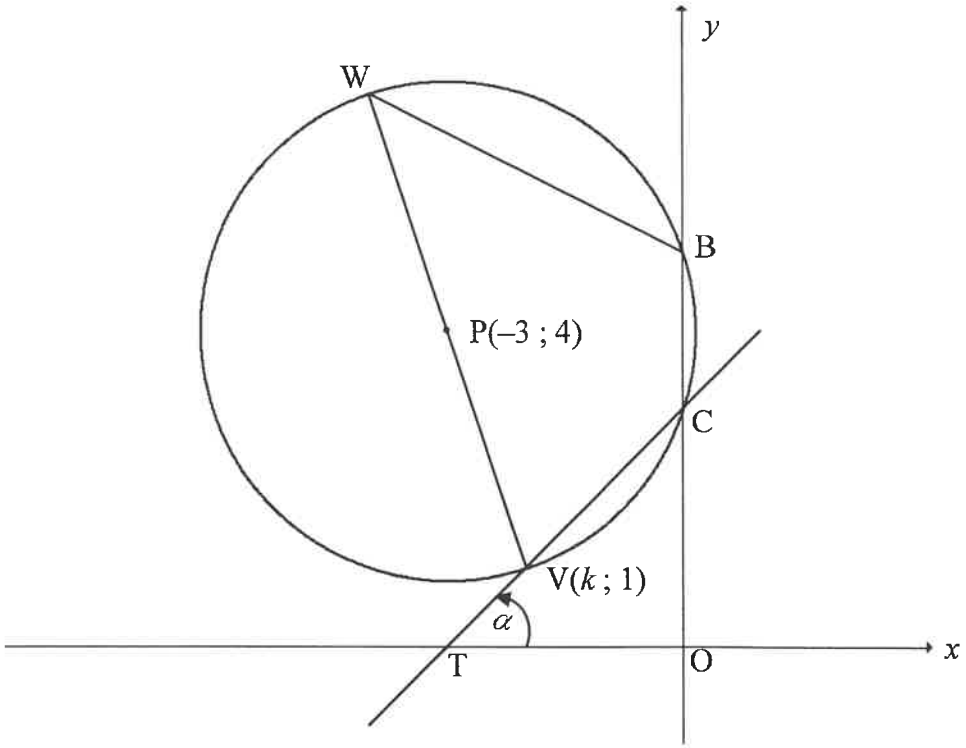
3.5 Bereken die koördinate van T. (3)

3.6 Bepaal $\frac{LS}{RS}$. (3)

3.7 Bereken die oppervlakte van PTMQ. (4)
[19]

VRAAG 4

In die diagram is P(–3 ; 4) die middelpunt van die sirkel. V(k ; 1) en W is die eindpunte van 'n middellyn. Die sirkel sny die y-as by B en C. BCVW is 'n koordevierhoek. CV is verleng om die x-as by T te sny. $\hat{OTC} = \alpha$.



4.1 Die radius van die sirkel is $\sqrt{10}$. Bereken die waarde van k as punt V regs van punt P geleë is. Toon ALLE berekeninge duidelik. (5)

4.2 Die vergelyking van die sirkel word as $x^2 + 6x + y^2 - 8y + 15 = 0$ gegee. Bereken die lengte van BC. (4)

4.3 As $k = -2$, bereken die grootte van:

4.3.1 α (3)

4.3.2 $V\hat{W}B$ (2)

4.4 'n Nuwe sirkel word verkry wanneer die gegewe sirkel om die lyn $y = 1$ gereflekteer word.

Bepaal die:

4.4.1 Koördinate van Q, die middelpunt van die nuwe sirkel (2)

4.4.2 Vergelyking van die nuwe sirkel in die vorm $(x-a)^2 + (y-b)^2 = r^2$ (2)

4.4.3 Vergelykings van die lyne wat ewewydig aan die y-as getrek is en wat deur die snypunte van die twee sirkels gaan (2)

[20]

VRAAG 5

5.1 Vereenvoudig die uitdrukking na 'n **enkele trigonometriese term:**

$$\tan(-x).\cos x.\sin(x-180°)-1$$ (5)

5.2 Gegee: $\cos 35° = m$

Sonder om 'n sakrekenaar te gebruik, bepaal die waarde van ELK van die volgende in terme van m:

5.2.1 $\cos 215°$ (2)

5.2.2 $\sin 20°$ (3)

5.3 Bepaal die algemene oplossing van:

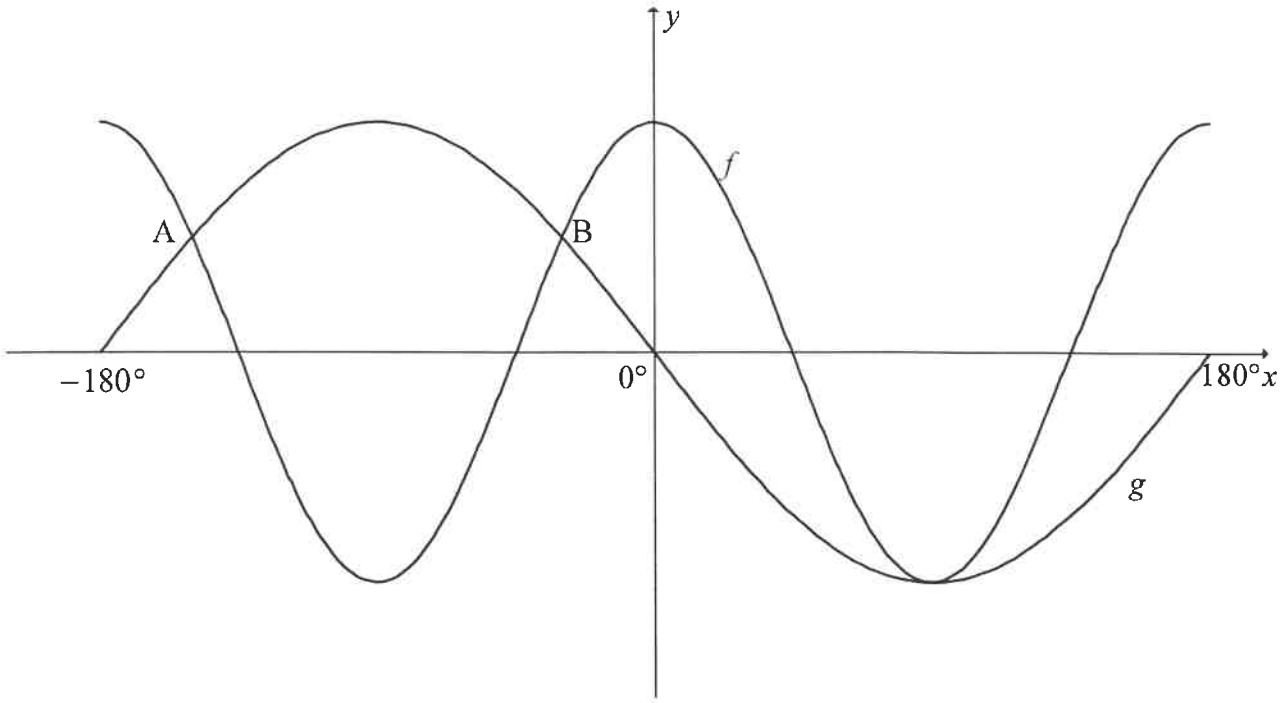
$$\cos 4x.\cos x + \sin 4x.\sin x = -0,7$$ (4)

5.4 Bewys die identiteit: $\dfrac{\sin 4x.\cos 2x - 2\cos 4x.\sin x.\cos x}{\tan 2x} = \cos^2 x - \sin^2 x$ (4)

[18]

VRAAG 6

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



6.1 **Sonder om 'n sakrekenaar te gebruik**, bepaal die waardes van x waarvoor $\cos 2x = -\sin x$ in die interval $x \in [-180° ; 180°]$. (6)

6.2 Gebruik die grafieke hierbo om die volgende vrae te beantwoord:

6.2.1 Hoeveel grade is punte A en B van mekaar af weg? (2)

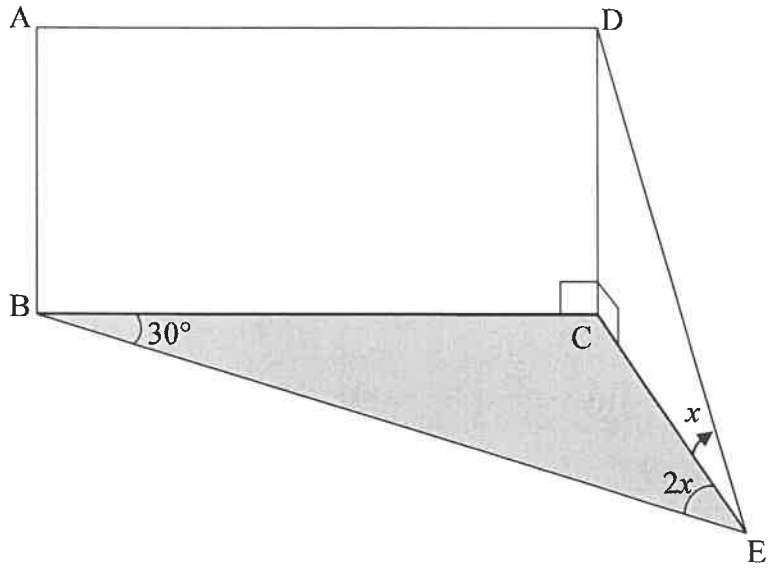
6.2.2 Vir watter waardes van x in die gegewe interval sal $f'(x).g'(x) > 0$? (2)

6.2.3 Bepaal die waardes van k waarvoor $\cos 2x + 3 = k$ geen oplossing sal hê nie. (3)

[13]

VRAAG 7

Punt B, C en E lê in dieselfde horisontale vlak. ABCD is 'n reghoekige stuk plank. CDE is 'n driehoekige stuk plank met 'n regte hoek by C. Elk van die stukke plank word reghoekig met die horisontale vlak geplaas en by DC aan mekaar geheg, soos in die diagram getoon. Die hoogtehoek vanaf E na D is x. $B\hat{E}C = 2x$ en $E\hat{B}C = 30°$.

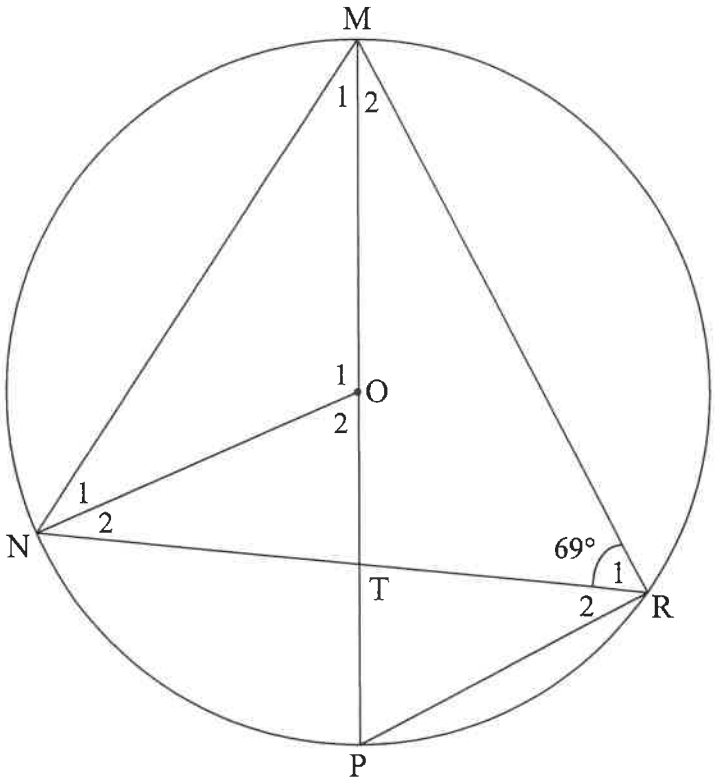


7.1 Toon dat $DC = \dfrac{BC}{4\cos^2 x}$ (6)

7.2 As $x = 30°$, toon dat die oppervlakte van $ABCD = 3AB^2$. (3)
[9]

VRAAG 8

8.1 In die diagram is MP 'n middellyn van 'n sirkel met middelpunt O. MP sny die koord NR by T. Radius NO en koord PR, MN en MR is getrek. $\hat{R}_1 = 69°$.



Bepaal, met redes, die grootte van:

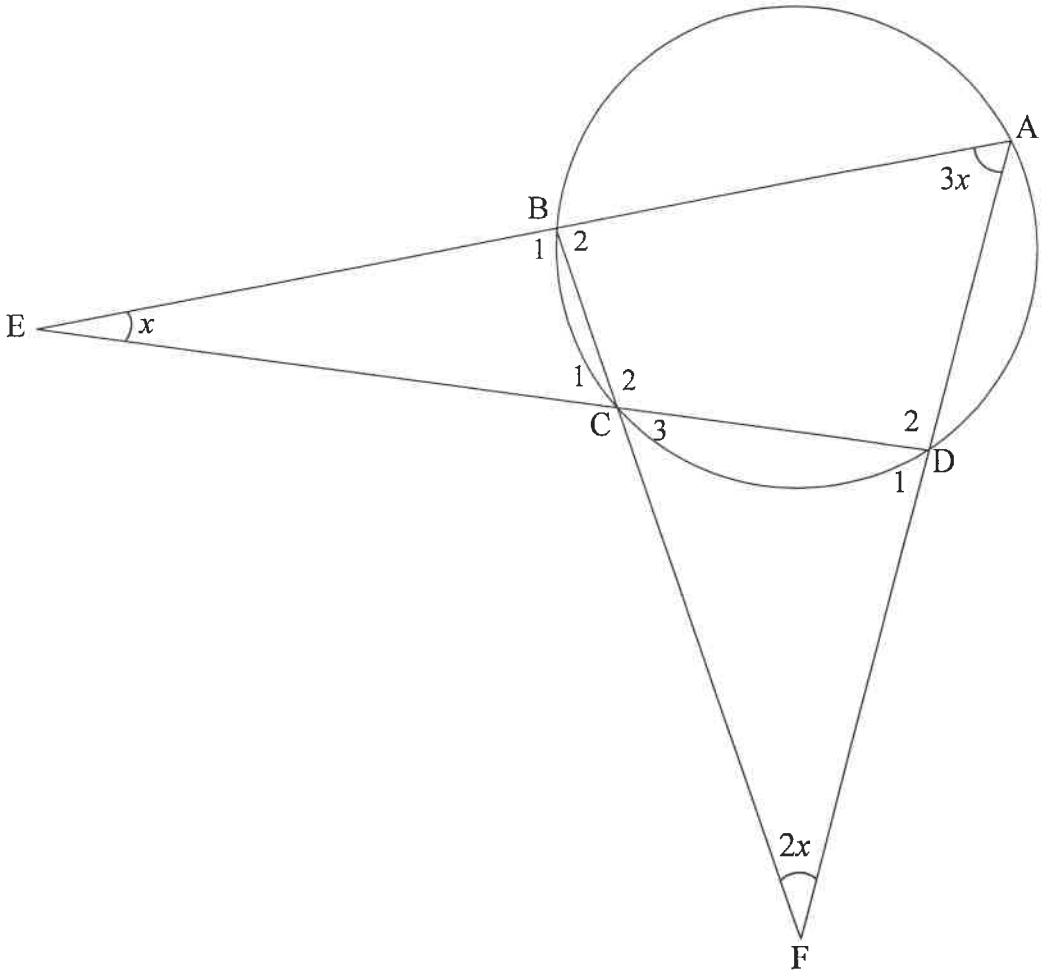
8.1.1 $\hat{R}_2$ (2)

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

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

8.1.4 $\hat{M}_2$, as verder gegee word dat NO || PR (4)

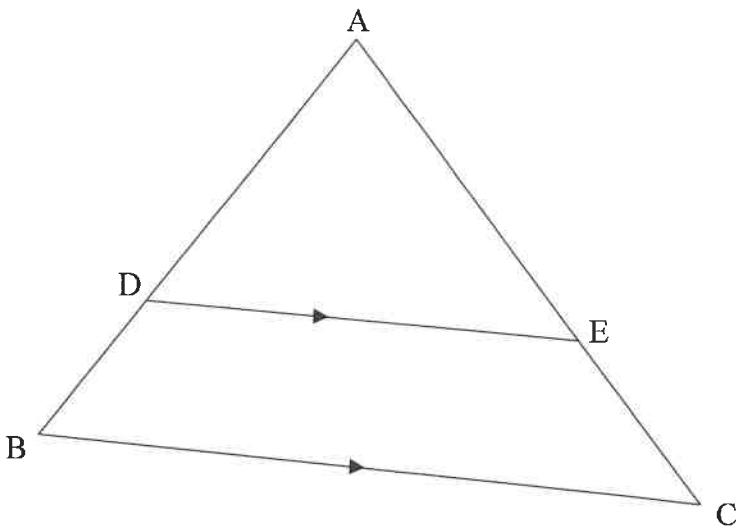
8.2 In die diagram hieronder is ABCD 'n koordevierhoek. AB en DC word verleng om by E te ontmoet. AD en BC word verleng om by F te ontmoet. $A\hat{F}B = 2x$, $D\hat{A}B = 3x$ en $A\hat{E}D = x$.



Bepaal, met redes, die waarde van x. (6)
[16]

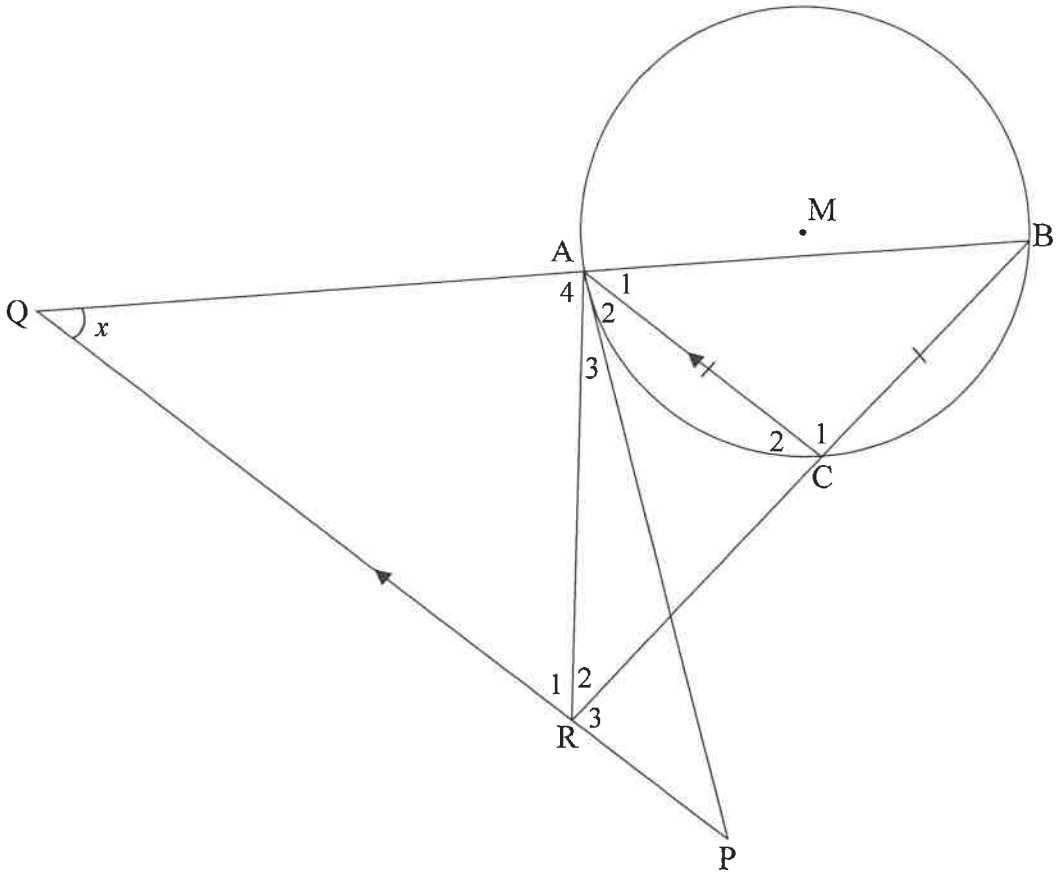
VRAAG 9

9.1 In die diagram is ABC 'n driehoek. D en E is punte op sy AB en AC onderskeidelik, sodanig dat DE || BC .



Gebruik die diagram hierbo om die stelling te bewys wat beweer dat 'n lyn wat ewewydig aan een sy van 'n driehoek getrek word, die ander twee sye eweredig verdeel, dus bewys dat $\frac{AD}{DB} = \frac{AE}{EC}$. (6)

9.2 In die diagram is M die middelpunt van die sirkel. A, B en C is punte op die sirkel sodanig dat AC = BC. PA is 'n raaklyn aan die sirkel by A. PQ is ewewydig aan CA getrek en ontmoet BA verleng by Q. BC verleng ontmoet PQ by R en AR is getrek.
Stel $\hat{Q} = x$.



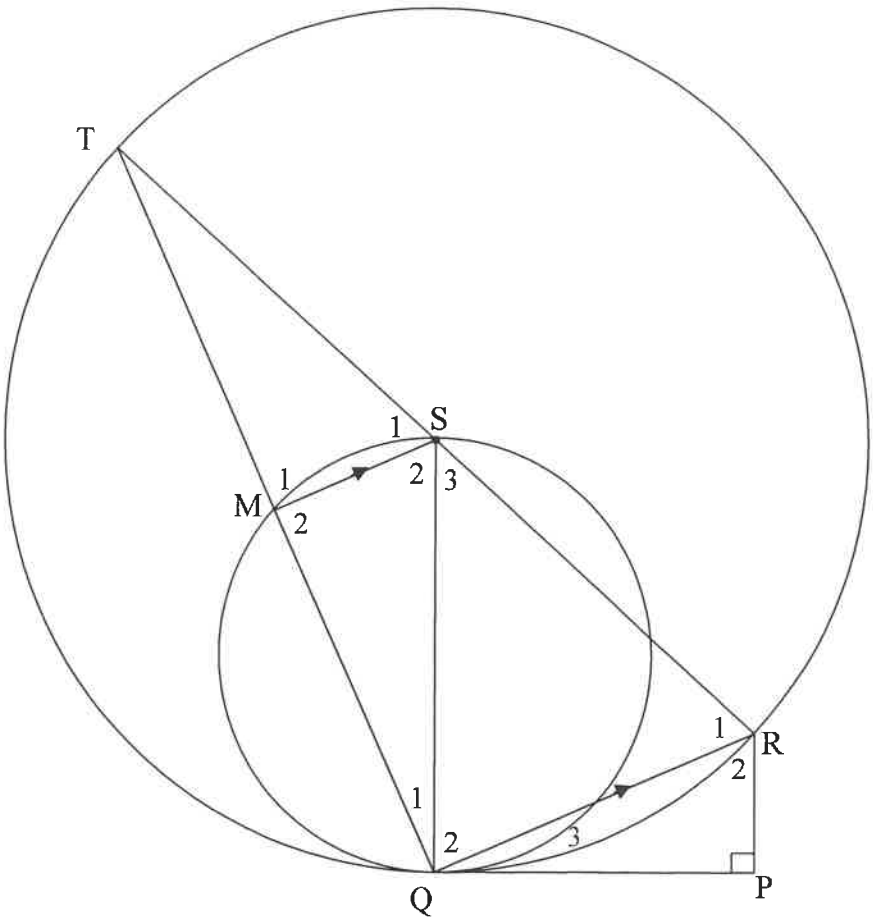
9.2.1 Bepaal, met redes, VIER ander hoeke wat ELK aan x gelyk is. (6)

9.2.2 Bewys dat ABPR 'n koordevierhoek is. (2)

9.2.3 Bewys dat $\frac{BA}{BQ} = \frac{BC}{QR}$. (3)
[17]

VRAAG 10

In die diagram is TSR 'n middellyn van die groter sirkel met middelpunt S. Koord TQ van die groter sirkel sny die kleiner sirkel by M. PQ is 'n gemeenskaplike raaklyn aan die twee sirkels by Q.
SQ is getrek.
RP $\perp$ PQ en MS $\parallel$ QR.



10.1 Bewys, met redes, dat:

10.1.1 SQ die middellyn van die kleiner sirkel is (3)

10.1.2 $RT = \dfrac{RQ^2}{RP}$ (6)

10.2 As MS = 14 eenhede en $PQ = \sqrt{640}$ eenhede, bereken, met redes, die lengte van die radius van die groter sirkel. (6)
[15]

TOTAAL: 150

INLIGTINGSBLAD

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

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

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

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

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

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

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

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

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

In ΔABC:

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

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

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

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

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

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

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

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

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

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Candidate Barcode label/Stafieskodeplakker

SC/NSC Answer Book
SS/NSS Antwoordeboek

Senior Certificate/National Senior Certificate/*Senior Sertifikaat/Nasionale Senior Sertifikaat (Grade 12/Graad 12) 2021*

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
1												
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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 24 pages./*Hierdie antwoordeboek bestaan uit 24 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 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.*

QUESTION/*VRAAG* 1

1.1

26	13	3	18	12	34	24	58	16	10	15	69	20	17	40

	Solution/*Oplossing*	**Marks/ *Punte***
1.1.1(a)		(2)
1.1.1(b)		(1)
1.1.2		(2)
1.1.3		(3)

1.2

WIND SPEED/*WINDSPOED* IN km/h (x)	2	6	15	20	25	17	11	24	13	22
TEMPERATURE/*TEMPERATUUR* IN °C (y)	28	26	22	22	16	20	24	19	26	19

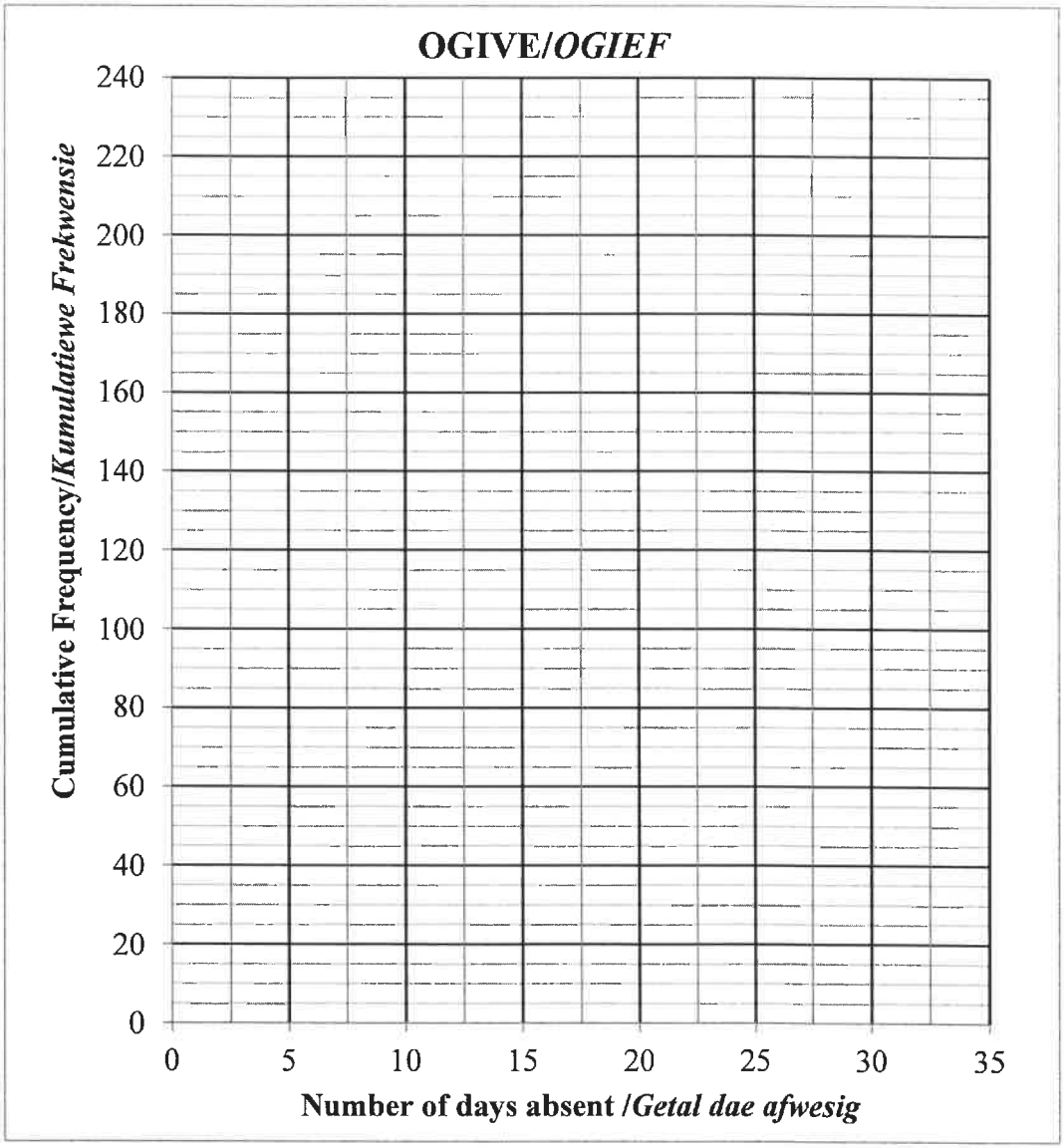
	Solution/*Oplossing*	**Marks/ *Punte***
1.2.1		(3)

	Solution/*Oplossing*	**Marks/ *Punte***
1.2.2		(2)
1.2.3		(1)
		[14]

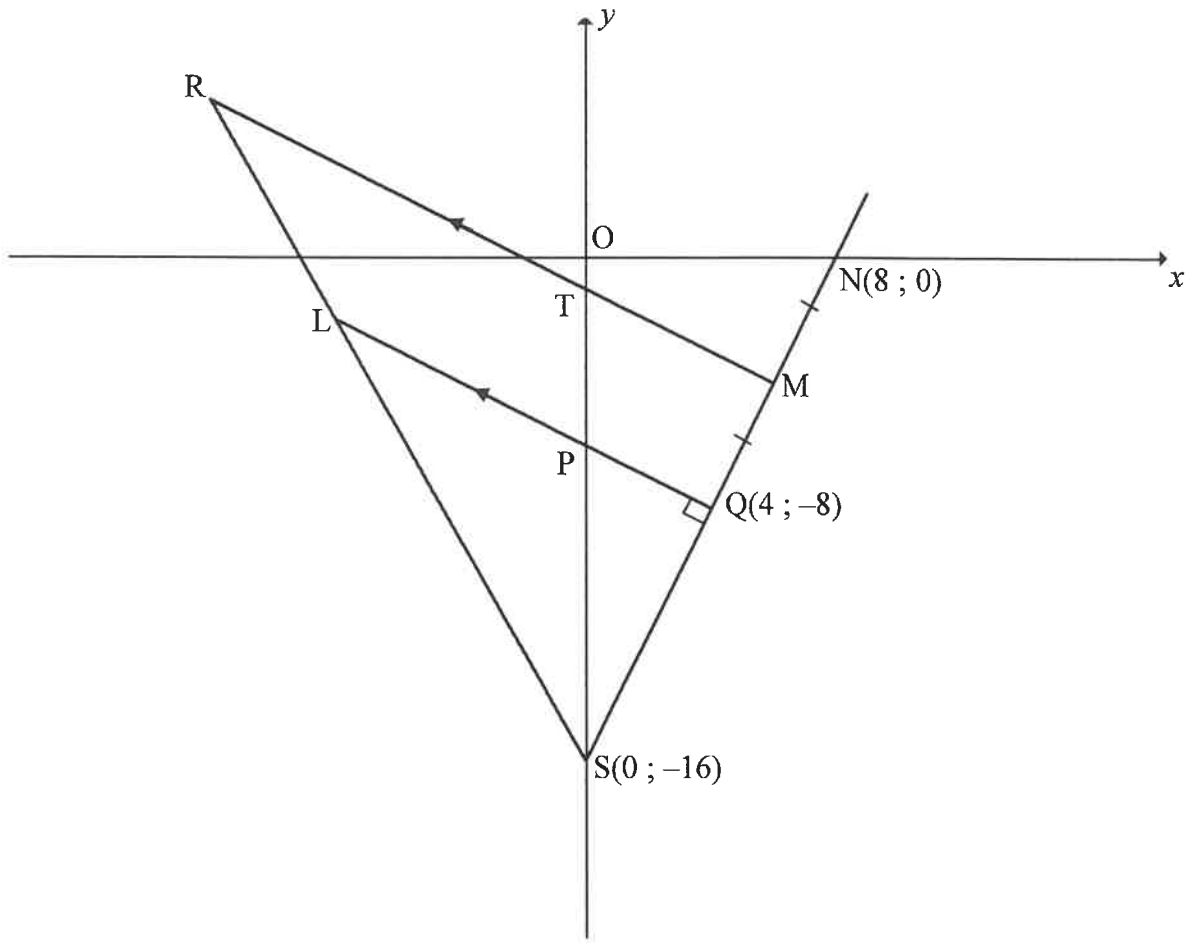
QUESTION/*VRAAG* 2

NUMBER OF DAYS ABSENT ***GETAL DAE AFWESIG***	**NUMBER OF LEARNERS** ***GETAL LEERDERS***
$0 \leq x < 5$	34
$5 \leq x < 10$	45
$10 \leq x < 15$	98
$15 \leq x < 20$	43
$20 \leq x < 25$	7
$25 \leq x < 30$	3

	Solution/*Oplossing*	**Marks/ *Punte***
2.1		(1)
2.2		(1)

	Solution/*Oplossing*	**Marks/ *Punte***
2.3		(1)
2.4		(4)
2.5		(2)
		[9]

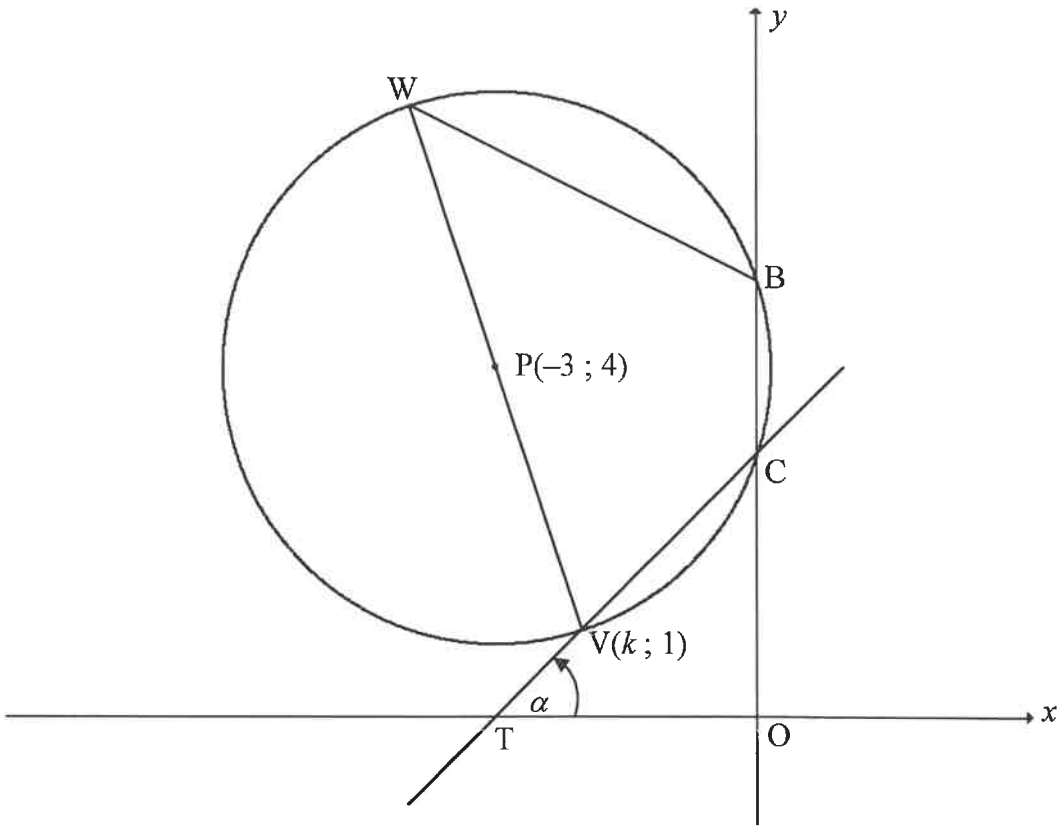
QUESTION/*VRAAG* 3



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

	Solution/*Oplossing*	**Marks/ *Punte***
3.3		(3)
3.4		(2)
3.5		(3)
3.6		(3)
3.7		(4)
		[19]

QUESTION/*VRAAG* 4



	Solution/*Oplossing*	**Marks/ *Punte***
4.1		(5)
4.2		(4)

	Solution/*Oplossing*	**Marks/ *Punte***
4.3.1		(3)
4.3.2		(2)
4.4.1		(2)
4.4.2		(2)
4.4.3		(2)
		[20]

QUESTION/*VRAAG* 5

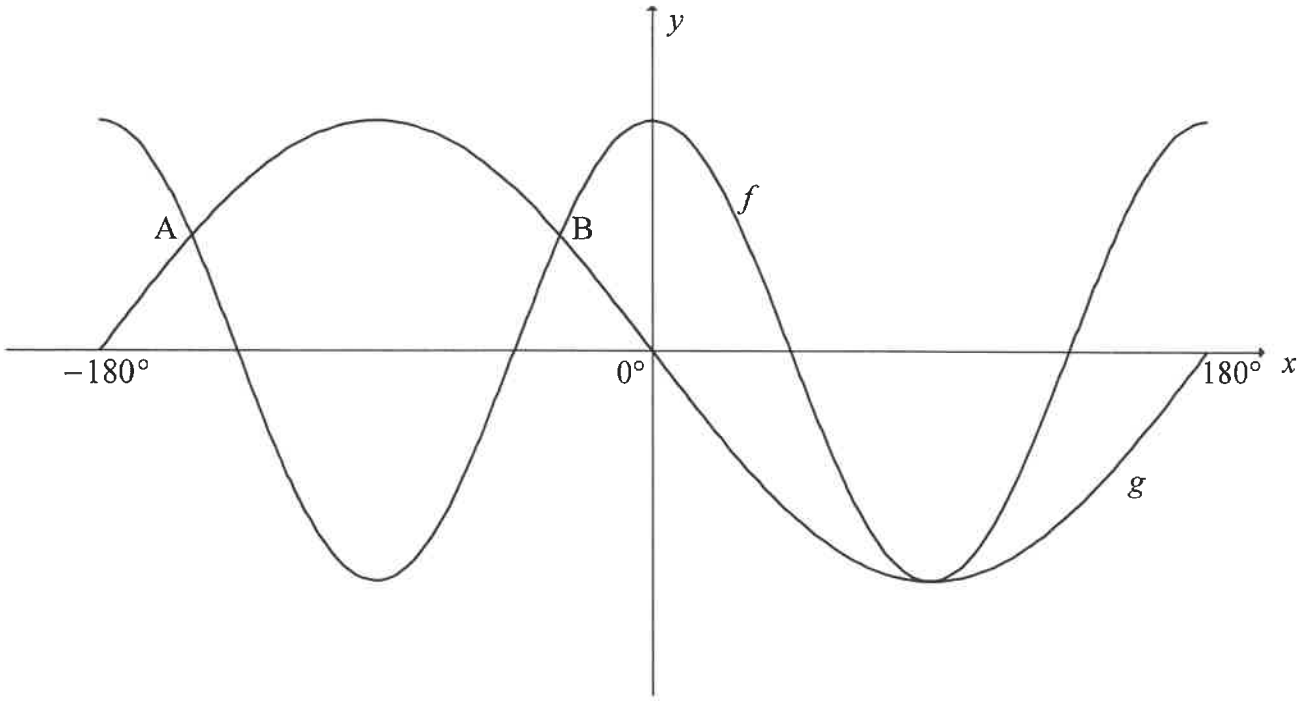
	Solution/*Oplossing*	**Marks/ *Punte***
5.1		(5)
5.2.1		(2)
5.2.2		(3)

	Solution/*Oplossing*	**Marks/ *Punte***
5.3		(4)
5.4		(4)
		[18]

QUESTION/*VRAAG* 6

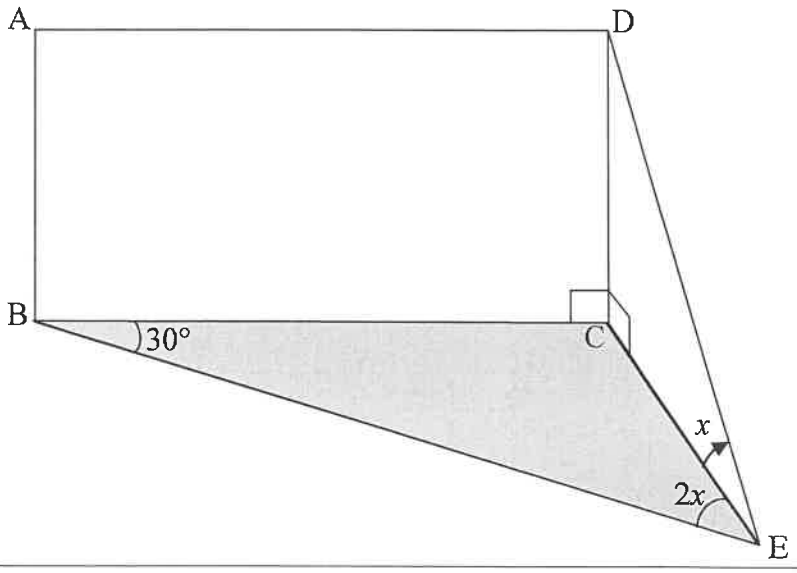
	Solution/*Oplossing*	**Marks/ *Punte***
6.1		(6)

6.2



	Solution/*Oplossing*	**Marks** ***Punte***
6.2.1		(2)
6.2.2		(2)
6.2.3		(3)
		[13]

QUESTION/*VRAAG* 7

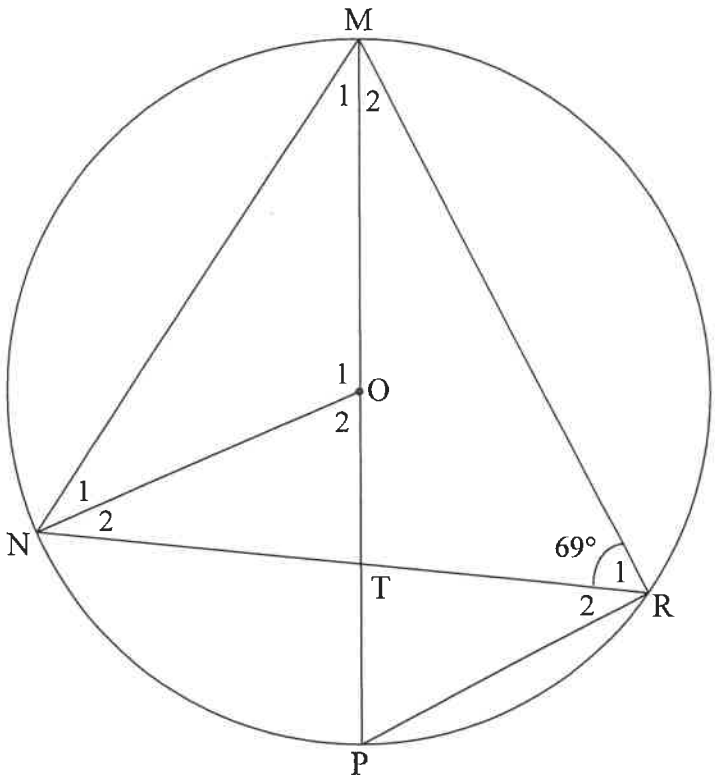


	Solution/*Oplossing*	**Marks/ *Punte***
7.1		(6)
7.2		(3)
		[9]

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

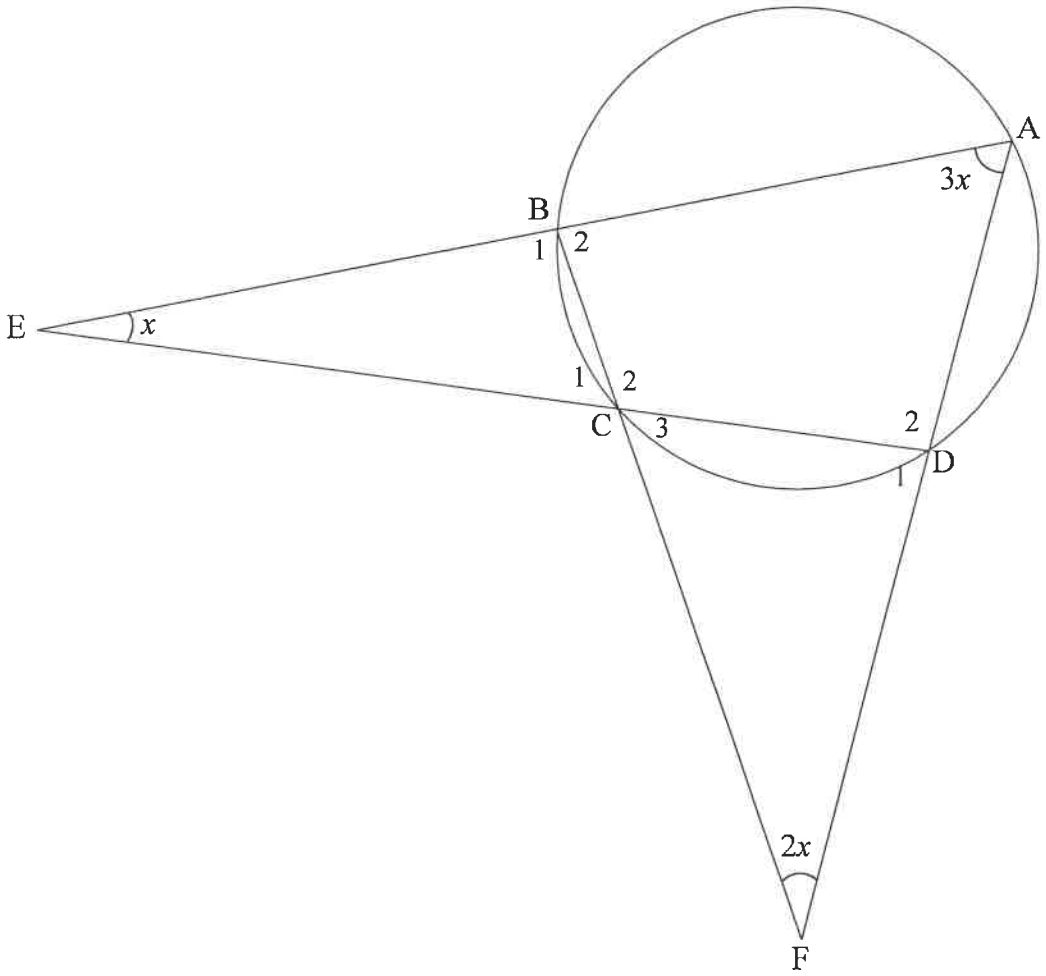
QUESTION/*VRAAG* 8

8.1



	Solution/*Oplossing*	**Marks/ *Punte***
8.1.1		(2)
8.1.2		(2)
8.1.3		(2)
8.1.4		(4)

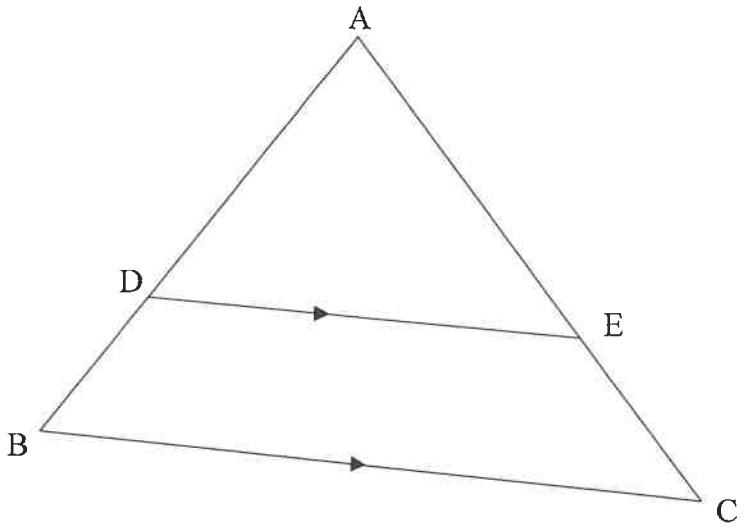
8.2



	Solution/*Oplossing*	**Marks/ *Punte***
8.2		(6)
		[16]

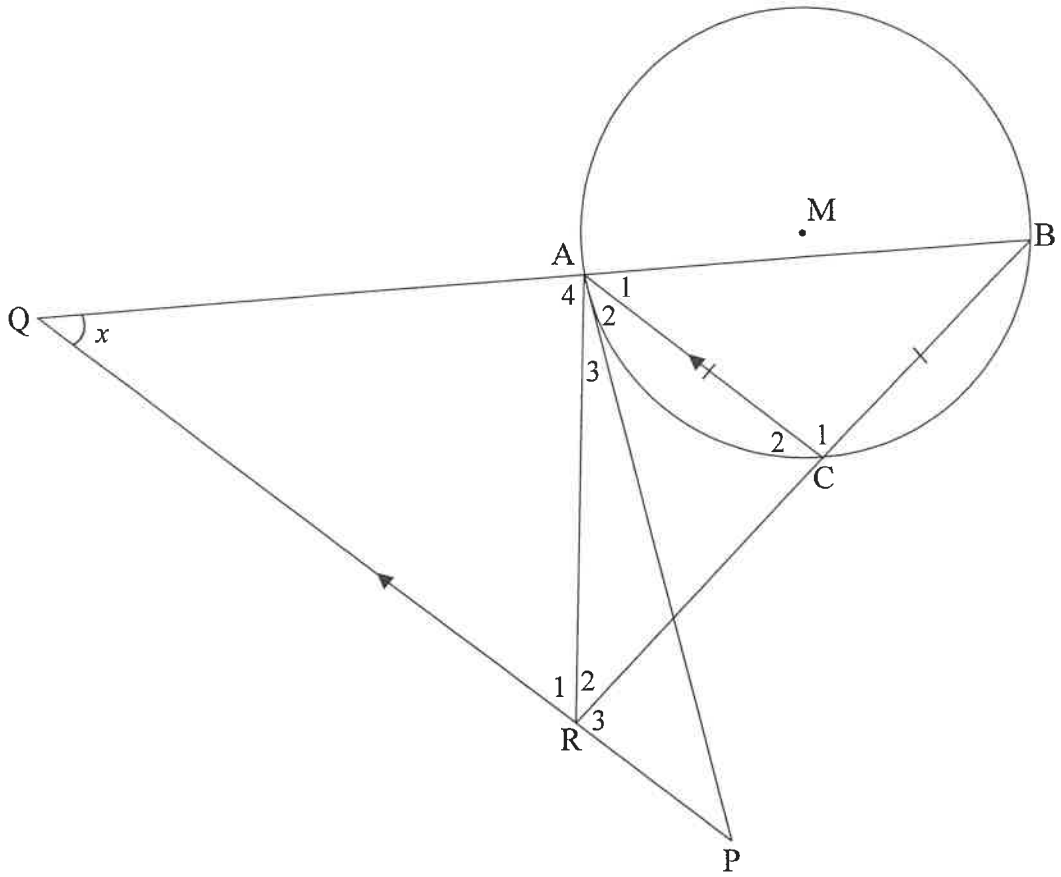
QUESTION/*VRAAG* 9

9.1



	Solution/*Oplossing*	**Marks/ *Punte***
9.1		(6)

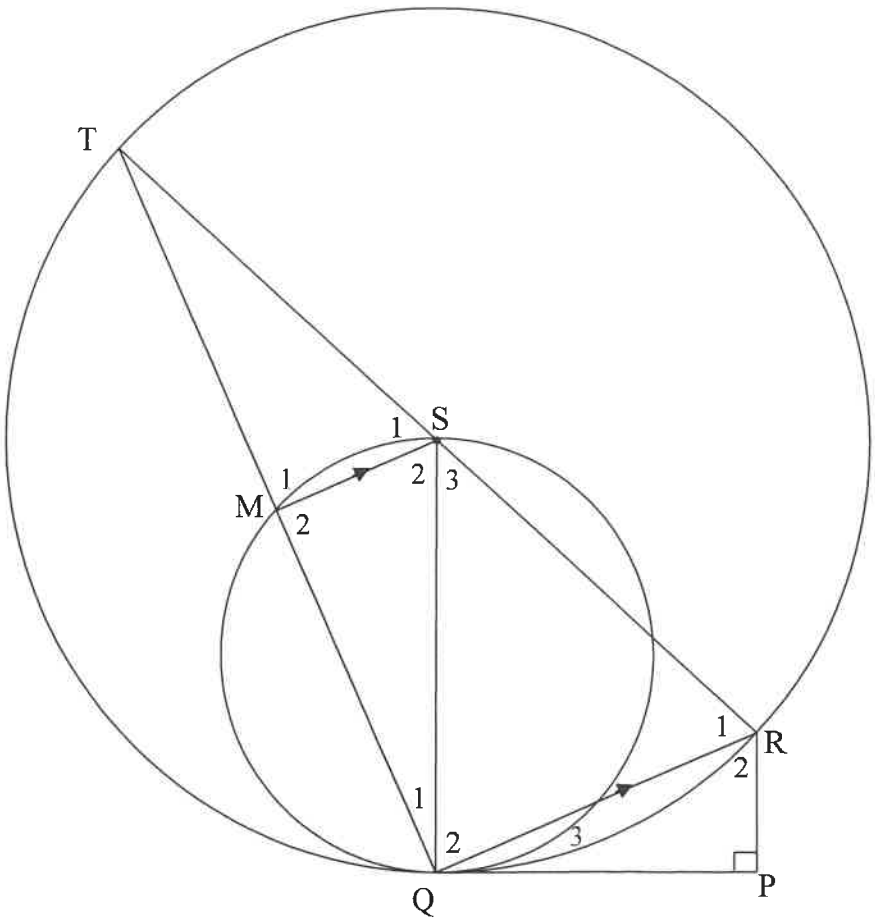
9.2



	Solution/*Oplossing*	**Marks/ *Punte***
9.2.1		(6)

	Solution/*Oplossing*	**Marks/ *Punte***
9.2.2		(2)
9.2.3		(3)
		[17]

QUESTION/*VRAAG* 10



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

	Solution/*Oplossing*	**Marks/ *Punte***
10.1.2		(6)
10.2		(6)
		[15]

	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

SENIOR CERTIFICATE EXAMINATIONS/
SENIORSERTIFIKAAT-EKSAMEN
NATIONAL SENIOR CERTIFICATE EXAMINATIONS/
NASIONALE SENIORSERTIFIKAAT-EKSAMEN

MATHEMATICS P2/
WISKUNDE V2

MARKING GUIDELINES/*NASIENRIGLYNE*

2021

MARKS: 150
PUNTE: 150

These marking guidelines consist of 23 pages.
Hierdie nasienriglyne bestaan uit 23 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.

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

26	13	3	18	12	34	24	58	16	10	15	69	20	17	40

1.1.1(a)	$\bar{x} = \frac{375}{15}$ $\bar{x} = 25\,\text{MB}$ Answer only: Full marks	✓ 375 ✓ answer (2)
1.1.1(b)	$\sigma = 17{,}65$ MB	✓answer (1)
1.1.2	25 + 17,65 = 42,65 $\therefore$ 2 days	✓ 42,65 ✓ 2 (2)
1.1.3	Overall $\bar{x} = \frac{80}{100} \times 25$ = 20 MB $\frac{375 + x}{30} = 20$ $x = 600 - 375$ $= 225$ maximum total amount of data that Sam must use for the remainder of the month: **225** MB	✓ Overall $\bar{x} = 20$ ✓ $\frac{375 + x}{30} = 20$ ✓ answer (3)

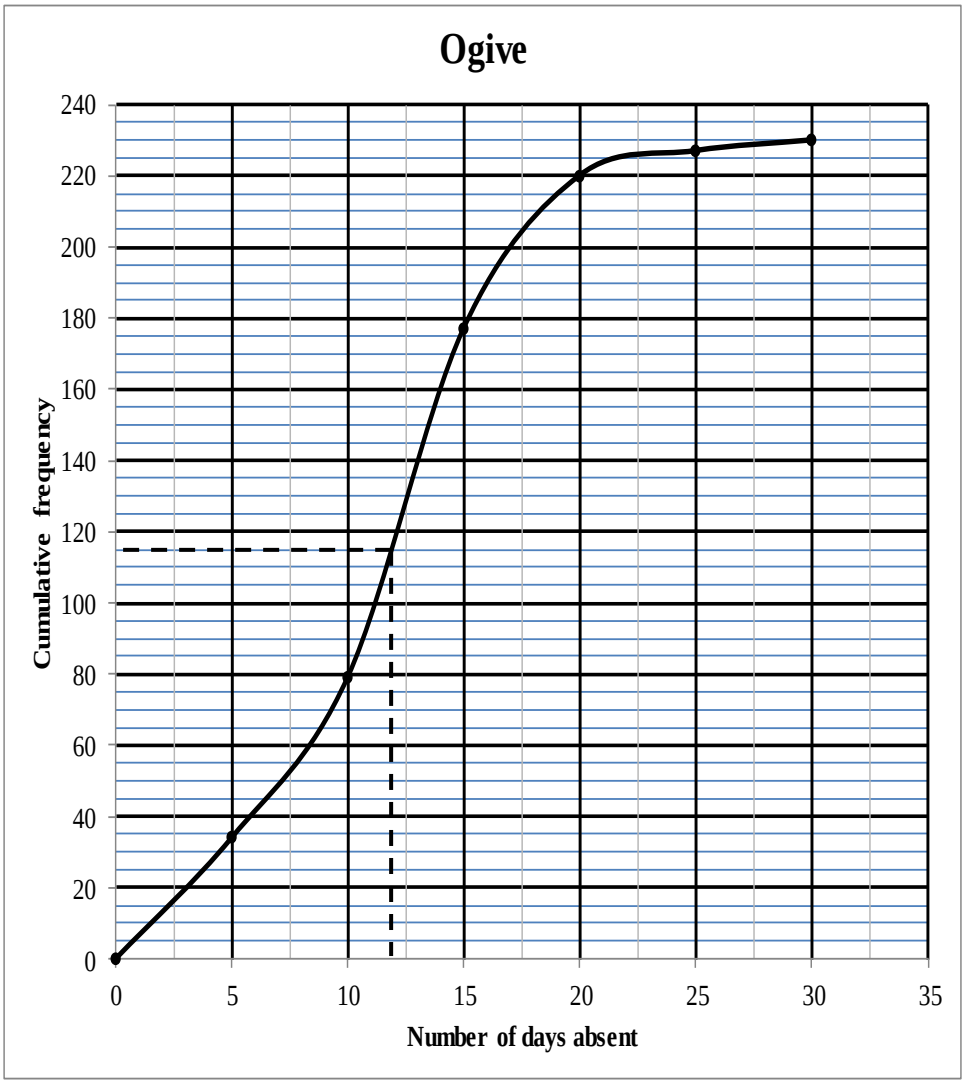
1.2

Wind speed in km/h (*x*)	2	6	15	20	25	17	11	24	13	22
Temperature in °C (*y*)	28	26	22	22	16	20	24	19	26	19

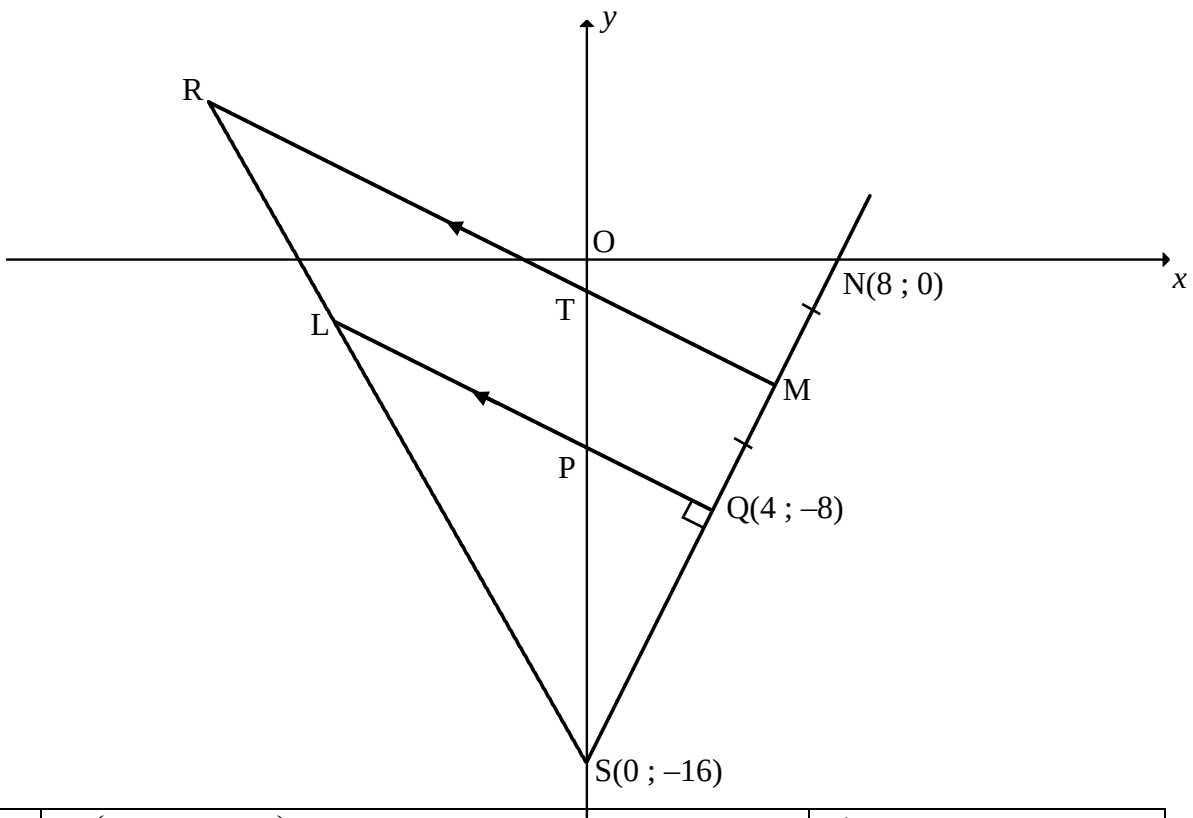
1.2.1	$a = 29{,}35$ $b = -0{,}46$ $\hat{y} = 29{,}35 - 0{,}46x$	✓ *a* ✓ *b* ✓ equation (3)
1.2.2	y = 25,20 °C (calculator) OR $\hat{y} = 29{,}35 - 0{,}46(9)$ y = 25,21 °C	✓✓ answer (2) ✓ substitution ✓ answer (2)
1.2.3	$b < 0$, indicating that as the wind speed increases the temperature decreases.	✓ interpretation (1)
		[14]

QUESTION/VRAAG 2

Number of days absent	Number of learners	Cumulative frequency
$0 \leq x < 5$	34	34
$5 \leq x < 10$	45	79
$10 \leq x < 15$	98	177
$15 \leq x < 20$	43	220
$20 \leq x < 25$	7	227
$25 \leq x < 30$	3	230

2.1	Modal class**:** $10 \leq x < 15$	✓ answer (1)
2.2	177 learners	✓ answer (1)
2.3	230 learners	✓ answer (1)
2.4		✓ grounding at (0; 0) ✓ shape ✓ upper limits ✓ All other points correct (4)
2.5	The median is at position 115. □value of median is 12 days (accept 11 – 14) Answer only: Full marks	✓ reading off at 115 ✓ answer (2)
		[9]

QUESTION/VRAAG 3

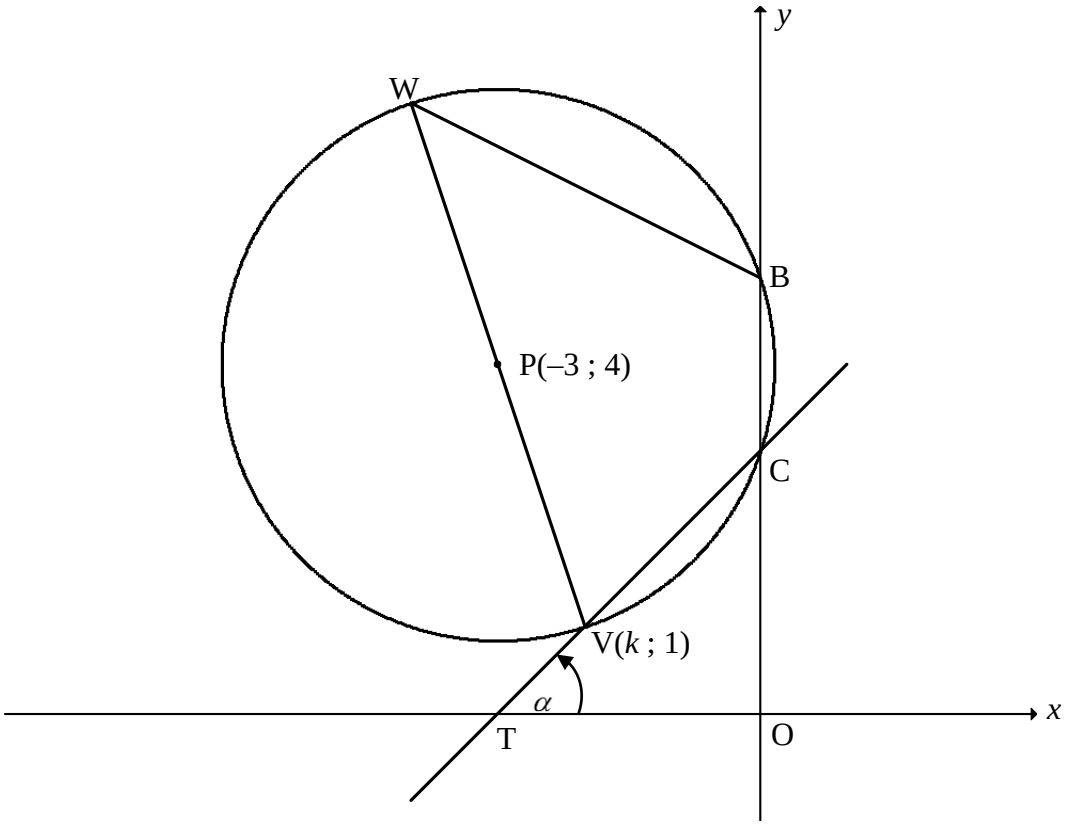


3.1	$M\left(\frac{4+8}{2};\frac{-8+0}{2}\right)$ $M(6;-4)$	✓ x_M ✓ y_M (2)
3.2	$m_{NS}=\frac{0-(-16)}{8-0}$ or $m_{NQ}=\frac{0-(-8)}{8-4}$ or $m_{QS}=\frac{-8-(-16)}{4-0}$ $=2$	✓ subst N and Q or N and Q or Q and S into gradient formula ✓ answer (2)
3.3	$m_{LQ}\times 2=-1$ [LQ ⊥ NS] $\therefore m_{LQ}=-\frac{1}{2}$ $-8=-\frac{1}{2}(4)+c$ **OR** $y+8=-\frac{1}{2}(x-4)$ $c=-6$ $y+8=-\frac{1}{2}x+2$ $\therefore y=-\frac{1}{2}x-6$	✓ m_{LQ} ✓ substitution of Q ✓ calculation of c or simplification (3)
3.4	OS is the radius of circle passing through S $(x-0)^2+(y-0)^2=(16)^2$ $x^2+y^2=256$ Answer only: Full marks	✓ identifying radius = 16 ✓ Equation of circle (2)

3.5	$m_{RM} = m_{LQ} = -\frac{1}{2}$ [RM ‖ LQ] $-4 = -\frac{1}{2}(6) + c$ **OR** $y + 4 = -\frac{1}{2}(x - 6)$ $c = -1$ $y + 4 = -\frac{1}{2}x + 3$ $\therefore y = -\frac{1}{2}x - 1$ T$(0;-1)$	✓ m_{RM} ✓ substitution of M$(6;-4)$ ✓ coordinates of T (3)
3.6	T$(0;-1)$, P$(0;-6)$ and S$(0;-16)$ $\therefore$ PS = 10 units and TS = 15 units $\frac{LS}{RS} = \frac{PS}{TS} = \frac{2}{3}$ [prop theorem; RM ‖ LP] **OR** [line ‖ one side of Δ/*lyn ‖ een sy v* Δ] Answer only: Full marks **OR** M(6 ; –4), Q(4 ; –8) and S(0 ; –16) MS = $\sqrt{180} = 6\sqrt{5}$ and QS = $\sqrt{80} = 4\sqrt{5}$ $\frac{LS}{RS} = \frac{QS}{MS} = \frac{2}{3}$ [prop theorem; RM ‖ LQ] **OR** [line ‖ one side of Δ/*lyn ‖ een sy v* Δ] Answer only: Full marks	✓ PS = 10 units ✓ TS = 15 units ✓ answer (3) ✓ MS $= 6\sqrt{5}$ units ✓ QS $= 4\sqrt{5}$ units ✓ answer (3)
3.7	area of PTMQ = area of ΔTSM – area of ΔPSQ $= \frac{1}{2}.ST.\perp h_M - \frac{1}{2}.PS.\perp h_Q$ $= \frac{1}{2}(15)(6) - \frac{1}{2}(10)(4)$ = 45 – 20 = 25 square units **OR** TM $= \sqrt{45} = 3\sqrt{5} = 6{,}71$ MQ $= \sqrt{20} = 2\sqrt{5} = 4{,}47$ PQ $= \sqrt{20} = 2\sqrt{5} = 4{,}47$ area of trapezium PTMQ = $\frac{1}{2}\left(3\sqrt{5} + 2\sqrt{5}\right)\left(2\sqrt{5}\right)$ $= \frac{1}{2}\left(5\sqrt{5}\right)\left(2\sqrt{5}\right)$ = 25 square units	✓ area of ΔTSM – area of ΔPSQ ✓ area ΔTSM = 45 ✓ area ΔPSQ = 20 ✓ answer (4) ✓ TM $= 3\sqrt{5}$ MQ $= 2\sqrt{5}$ PQ $= 2\sqrt{5}$ ✓ area of trapezium = $\frac{1}{2}$ (sum of ‖sides)(height) ✓ substitute into formula ✓ answer (4)

	OR $MQ = \sqrt{20} = 2\sqrt{5}$ $PQ = \sqrt{20} = 2\sqrt{5}$ $TP = 5$ area of PTMQ= area of ΔMTP+ area of ΔPQM $\text{area of PTMQ} = \frac{1}{2}\text{TP} \times \perp h_M + \frac{1}{2}\text{MQ} \times \text{PQ}$ area of PTMQ $= \frac{1}{2}(5) \times 6 + \frac{1}{2}\left(2\sqrt{5}\right)\left(2\sqrt{5}\right)$ area of PTMQ$= 10 + 15 = 25$	✓ area of ΔMTP + area of ΔPQM ✓ area ΔMTP = 10 ✓ area ΔPQM = 15 ✓ answer (4)
		[19]

QUESTION 4



4.1	$PV = r = \sqrt{10}$ $PV = \sqrt{(k-(-3))^2 + (1-4)^2} = \sqrt{10}$ $(PV)^2 = (k-(-3))^2 + (1-4)^2 = 10$ $k^2 + 6k + 9 + 9 = 10$ **OR** $(k+3)^2 + 9 = 10$ $k^2 + 6k + 8 = 0$ $(k+3)^2 = 1$ $(k+4)(k+2) = 0$ $k+3 = 1$ or $k+3 = -1$ $k = -4$ or $k = -2$ $\therefore k = -2$	✓ $PV = r = \sqrt{10}$ ✓ substitution into distance formula ✓ standard form ✓ factors ✓ answer (5)
4.2	$x^2 + 6x + y^2 - 8y + 15 = 0$ y-intercepts: $(0)^2 + 6(0) + y^2 - 8y + 15 = 0$ $(y-3)(y-5) = 0$ $y_C = 3$ or $y_B = 5$ $\therefore BC = 2$ units	✓ $x = 0$ ✓ factors ✓ both values ✓ answer (4)

4.3.1	$m_{TC} = \frac{3-1}{0-(-2)}$ $= 1$ $\tan\alpha = 1$ $\therefore \alpha = 45°$ **OR** $y = mx + 3$ $1 = m(-2) + 3$ $m_{TC} = 1$ $\tan\alpha = 1$ $\therefore \alpha = 45°$	✓ substitution into gradient formula ✓ $\tan\alpha = 1$ ✓ answer (3) ✓ substitution into equation of a line ✓ $\tan\alpha = 1$ ✓ answer (3)
4.3.2	$B\hat{C}V = 135°$ [ext ∠ of Δ/*buite* ∠ v Δ] $\therefore V\hat{W}B = 45°$ [opp ∠s of cyclic quad/*teenoorst.* ∠*e v kvh*] Answer only: Full marks **OR** $T\hat{C}O = 45°$ [∠s of Δ/∠*e v* Δ] $\therefore V\hat{W}B = 45°$ [ext ∠s of cyclic quad/*buite* ∠ *v kvh*] Answer only: Full marks	✓ $B\hat{C}V = 135°$ ✓ answer (2) ✓ $T\hat{C}O = 45°$ ✓ answer (2)
4.4.1	$Q(-3;-2)$	✓ x_Q ✓ y_Q (2)
4.4.2	$(x+3)^2 + (y+2)^2 = 10$	✓ LHS ✓ RHS (2)
4.4.3	$x = -2$ or $x = -4$	✓ $x = -2$ ✓ $x = -4$ (2)
		[20]

QUESTION/VRAAG 5

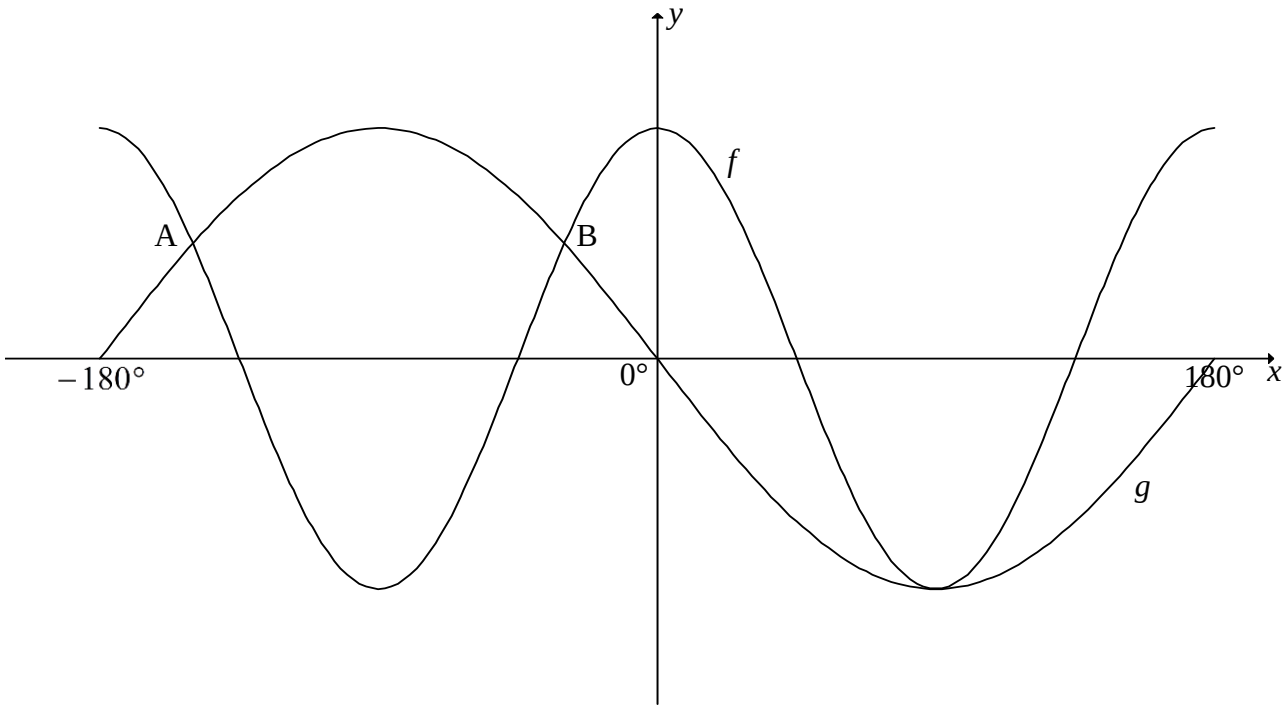
5.1	$\tan(-x).\cos x.\sin(x-180°)-1$ $=-\tan x.\cos x.\sin(-(180°-x))-1$ $=\frac{-\sin x}{\cos x}.\cos x.(-\sin x)-1$ $=\sin^2 x-1$ $=-\cos^2 x$	✓ $-\tan x$ ✓ $-\sin x$ ✓ $\frac{-\sin x}{\cos x}$ ✓ $\sin^2 x-1$ ✓ answer (5)
5.2.1	$\cos 215°$ $=-\cos 35°$ $=-m$	✓ reduction ✓ answer (2)
5.2.2	$\sin 20°$ $=\cos 70°$ $=\cos 2(35°)$ $=2\cos^2 35°-1$ $=2m^2-1$ OR $=\sin(55°-35°)$ $=\sin 55°\cos 35°-\cos 55°\sin 35°$ $=m.m-\sqrt{1-m^2}.\sqrt{1-m^2}$ $=m^2-(1-m^2)$ $=2m^2-1$	✓ co-function ✓ double angle expansion ✓ answer in terms of m (3) ✓ compound angle expansion ✓ $\cos 55°=\sqrt{1-m^2}$ or $\sin 35°=\sqrt{1-m^2}$ ✓ answer in terms of m (3)
5.3	$\cos 4x.\cos x+\sin 4x.\sin x=-0,7$ $\cos(4x-x)=-0,7$ ref $\angle = 45,57…°$ $3x=180°-45,57...°+k.360°$ or $3x=180°+45,57...°+k.360°$ $3x=134,43°+k.360°$ or $3x=225,57°+k.360°$ $x=44,81°+k.120°;\ k\in Z$ $x=75,19°+k.120°;\ k\in Z$	✓ compound angle ✓ $3x$ = 134,43° or 225,57° ✓ x = 44,81° or 75,19° ✓ $+k.120°;\ k\in Z$ (4)

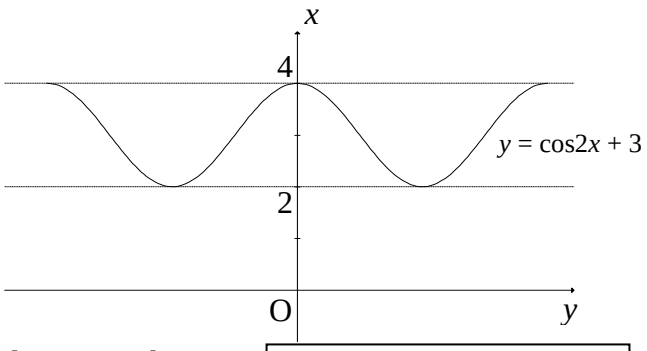
5.4	$\text{RHS} = \cos^2 x - \sin^2 x$ $\text{LHS} = \dfrac{\sin 4x.\cos 2x - 2\cos 4x.\sin x.\cos x}{\tan 2x}$ $= \dfrac{\sin 4x.\cos 2x - \cos 4x.\sin 2x}{\dfrac{\sin 2x}{\cos 2x}}$ $= \sin(4x-2x)\left(\dfrac{\cos 2x}{\sin 2x}\right)$ $= \cos 2x$ $= \cos^2 x - \sin^2 x$ LHS = RHS	✓ $\sin 2x$ ✓ $\dfrac{\sin 2x}{\cos 2x}$ ✓ $\sin(4x-2x)$ ✓ $\cos 2x$ (4)
		[18]

QUESTION/VRAAG 6

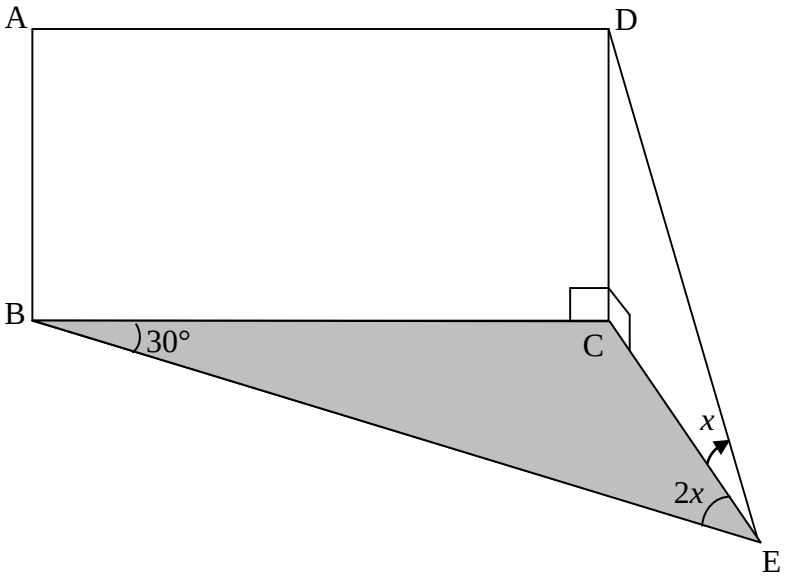
6.1	$1-2\sin^2 x=-\sin x$ $2\sin^2 x-\sin x-1=0$ $(2\sin x+1)(\sin x-1)=0$ $\sin x=-\frac{1}{2}$ or $\sin x=1$ ref $\angle = 30°$ ref $\angle = 90°$ $x=210°+k.360°$ $x=90°+k.360°$ or $x=330°+k.360°$ $x=-150°$ or $x=-30°$ or $x=90°$ **OR** $\cos 2x=-\sin x$ $\cos 2x=-\cos(90°-x)$ $2x=180°-(90°-x)+k.360°$ or $2x=180°+(90°-x)+k.360°$ $2x=90°+x+k.360°$ or $2x=270°-x+k.360°$ $x=90°+k.360°$ $x=90°+k.120°$ $x=-150°$ or $x=-30°$ or $x=90°$ **OR** $\cos 2x=-\sin x$ $\cos 2x=\cos(90°+x)$ $2x=90°+x+k.360°$ or $2x=360°-(90°+x)+k.360°$ $x=90°+k.360°$ or $3x=270°+k.360°$ $x=90°+k.120°$ $x=-150°$ or $x=-30°$ or $x=90°$ **OR** $\cos 2x=-\sin x$ $\sin(90°-2x)=-\sin x$ $90°-2x=180+x+k.360°$ or $90°-2x=360°-x+k.360°$ $x=-30°+k.120°$ $x=-270°+k.360°$ $x=-150°$ or $x=-30°$ or $x=90°$	✓ identity ✓ factors ✓ $\sin x=-\frac{1}{2}$ ✓ $\sin x=1$ ✓ –150° and –30° ✓ 90° (A) (6) ✓ co-functions ✓ $2x$ in quadrant 2 ✓ $2x$ in quadrant 3 ✓ both general solutions ✓ –150° and –30° ✓ 90° (A) (6) ✓ co-functions ✓ $2x$ in quadrant 1 ✓ $2x$ in quadrant 4 ✓ both general solutions ✓ –150° and –30° ✓ 90° (A) (6) ✓ co-functions ✓ $90°–2x$ in quadrant 3 ✓ $90°–2x$ in quadrant 4 ✓ both general solutions ✓ –150° and –30° ✓ 90° (A) (6)

6.2



6.2.1	A(–150°; 0,5) B(–30°; 0,5) AB = –30° – (–150°) AB = 120° Answer only: Full marks	✓ AB = –30° – (–150°) ✓ answer (2)
6.2.2	$x \in (0°; 90°)$ or $x \in (90°; 180°)$ **OR** $0° < x < 90°$ or $90° < x < 180°$	✓ $x \in (0°; 90°)$ ✓ $x \in (90°; 180°)$ (2) ✓ $0° < x < 90°$ ✓ $90° < x < 180°$ (2)
6.2.3	$\cos 2x = k - 3$ $k - 3 < -1$ or $k - 3 > 1$ $k < 2$ or $k > 4$ Answer only: Full marks **OR**  $k < 2$ or $k > 4$ Answer only: Full marks	✓ $k - 3 < -1$ or $k - 3 > 1$ ✓ $k < 2$ ✓ $k > 4$ (3) ✓ graph of $y = \cos 2x + 3$ ✓ $k < 2$ ✓ $k > 4$ (3)
		[13]

QUESTION/VRAAG 7

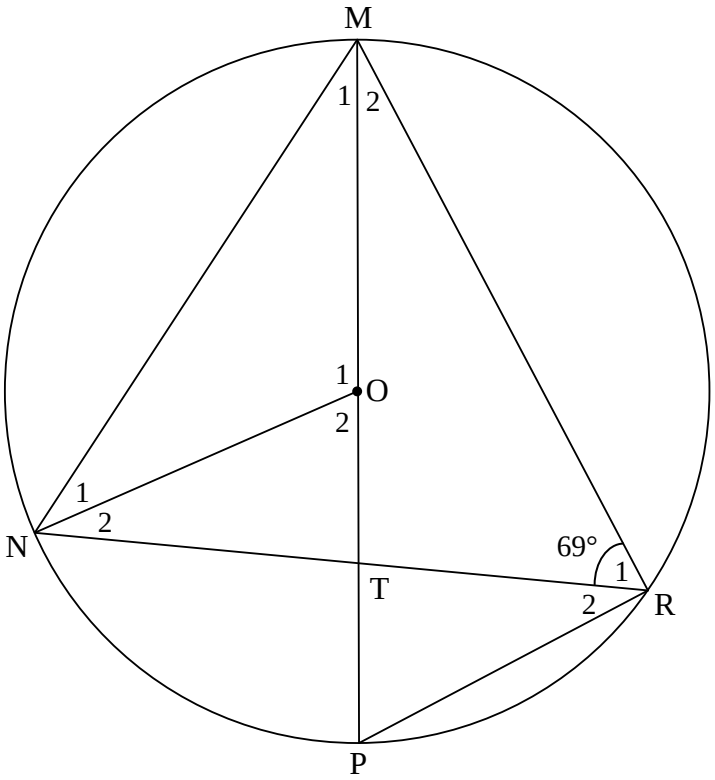


7.1	In ΔBCE: $\frac{CE}{\sin\hat{B}} = \frac{BC}{\sin B\hat{E}C}$ $\frac{CE}{\sin 30°} = \frac{BC}{\sin 2x}$ $CE = \frac{BC\sin 30°}{\sin 2x}$ In ΔCDE: $\frac{DC}{CE} = \tan D\hat{E}C$ $DC = \frac{BC.\sin 30°}{\sin 2x}(\tan x)$ $DC = \frac{BC}{4\sin x\cos x}\left(\frac{\sin x}{\cos x}\right)$ $DC = \frac{BC}{4\cos^2 x}$	✓ correct use of sine rule ✓ $CE = \frac{BC\sin 30°}{\sin 2x}$ ✓ correct trig ratio ✓ Subst CE ✓ $2\sin x\cos x$ ✓ $\frac{\sin x}{\cos x}$ (6)

7.2	$DC = \frac{BC}{4\cos^2 30°}$ $= \frac{BC}{4\left(\frac{\sqrt{3}}{2}\right)^2}$ $= \frac{BC}{3}$ $\therefore BC = 3DC$ But AB = DC [opp sides of rectangle/*teenoorst. sye v reghoek*] $\therefore BC = 3AB$ Area of rectangle = (AB)(BC) = (AB)(3AB) $=3AB^2$	✓ $DC == \frac{BC}{3}$ ✓ $BC = 3AB$ ✓ substitution into area formula (3)
		[9]

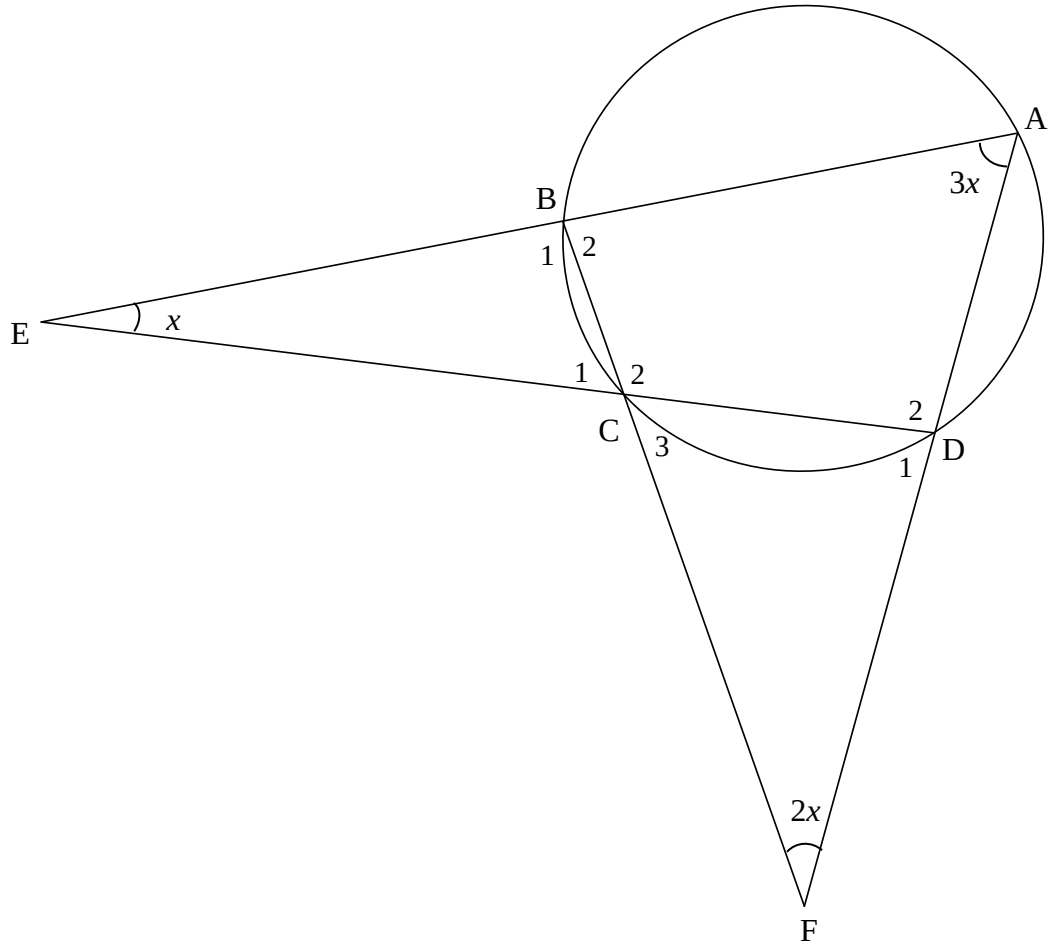
QUESTION/VRAAG 8

8.1



8.1.1	$M\hat{R}P = 90°$ [∠ in semi circle/∠ *in halwe sirkel*] $\hat{R}_2 = 21°$	✓ R ✓ S (2)
8.1.2	$\hat{O}_1 = 138°$ [∠ at centre = 2 ×∠ at circumference/ *midpts.* ∠ = 2× *omtreks* ∠]	✓ S ✓R (2)
8.1.3	$\hat{M}_1 = 21°$ [∠s in the same segment/∠*e in dieselfde sirkel segment*] (2) **OR** $\hat{M}_1 + N_1 = 180° - 138°$ [sum of ∠s in Δ/∠*e v* Δ] $\therefore \hat{M}_1 = 21°$ [∠s opp equal sides/∠*e teenoor gelyke sye*]	✓ S ✓R (2)
8.1.4	$\hat{O}_2 = 42°$ [∠s on a str line/∠*e op 'n reguitlyn*] $\hat{P} = 42°$ [alt ∠s; NO || PR/*Verw.* ∠*e*, NO || PR] $\hat{M}_2 = 48°$ [sum of ∠s in Δ/∠*e v* Δ] **OR** $\hat{N}_2 = \hat{R}_2 = 21°$ [alt ∠s; NO || PR/*Verw.* ∠*e*, NO || PR] $\hat{N}_1 = \hat{M}_1 = 21°$ [∠s opposite equal sides/∠*e teenoor gelyke sye*] $\hat{M}_2 = 48°$ [sum of ∠s of Δ NMR//∠*e v* ΔNMR]	✓ S ✓ S ✓R ✓ S (4) ✓ S ✓R ✓ S ✓ S (4)

8.2

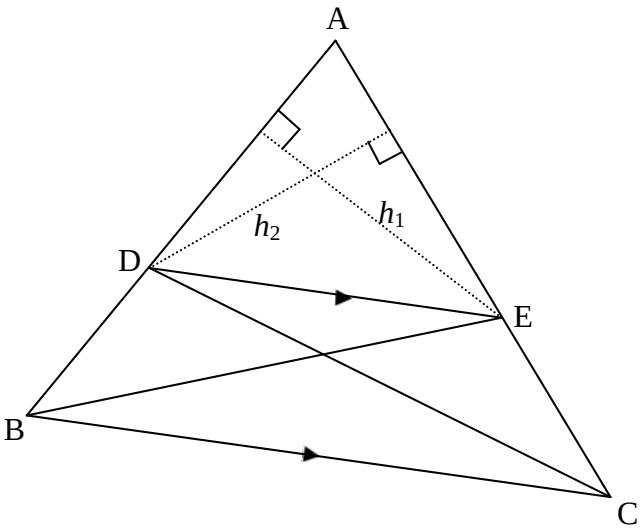


8.2	$\hat{D}_1 = 4x$	[ext $\angle$ of Δ/*buite* $\angle$ *v* Δ]	✓ S/R
	$\hat{D}_2 = 180° - 4x$	[$\angle$s on a str line/$\angle$*e op ´n reguitlyn*]	✓ S
	$\hat{B}_1 = 5x$	[ext $\angle$ of Δ/*buite* $\angle$ *v* Δ]	✓ S
	$\hat{B}_1 = \hat{D}_2$	[ext $\angle$ of cyclic quad/*buite* $\angle$ *v kvh*]	✓S ✓R
	$180° - 4x = 5x$		
	$9x = 180°$		
	$x = 20°$		✓ answer (6)
	OR		
	$\hat{C}_1 = 3x$	[ext $\angle$ of cyclic quad/*buite* $\angle$ *v kvh*]	✓ S ✓ R
	$\hat{B}_2 = 4x$	[ext $\angle$ of Δ/*buite* $\angle$ *v* Δ]	✓ S
	$\hat{C}_1 = \hat{C}_3 = 3x$	[vert opp $\angle$s]	✓ S
	$\hat{D}_2 = 5x$	[ext $\angle$ of Δ/*buite* $\angle$ *v* Δ]	
	$4x + 5x = 180°$	[opp $\angle$ of cyclic quad/*teenoorst.* $\angle$*e v kvh*]	✓S/R
	$x = 20°$		✓ answer (6)

	OR $\hat{C}_3 = 3x$ [ext ∠ of cyclic quad/*buite ∠ v kvh*] $\hat{D}_1 = 4x$ [ext ∠ of Δ/*buite ∠ v* Δ] $2x + 3x + 4x = 180°$ [sum of ∠s in Δ/*∠e v* Δ] $9x = 180°$ $x = 20°$	✓ S ✓R ✓ S ✓ S ✓R ✓ answer (6)
		[16]

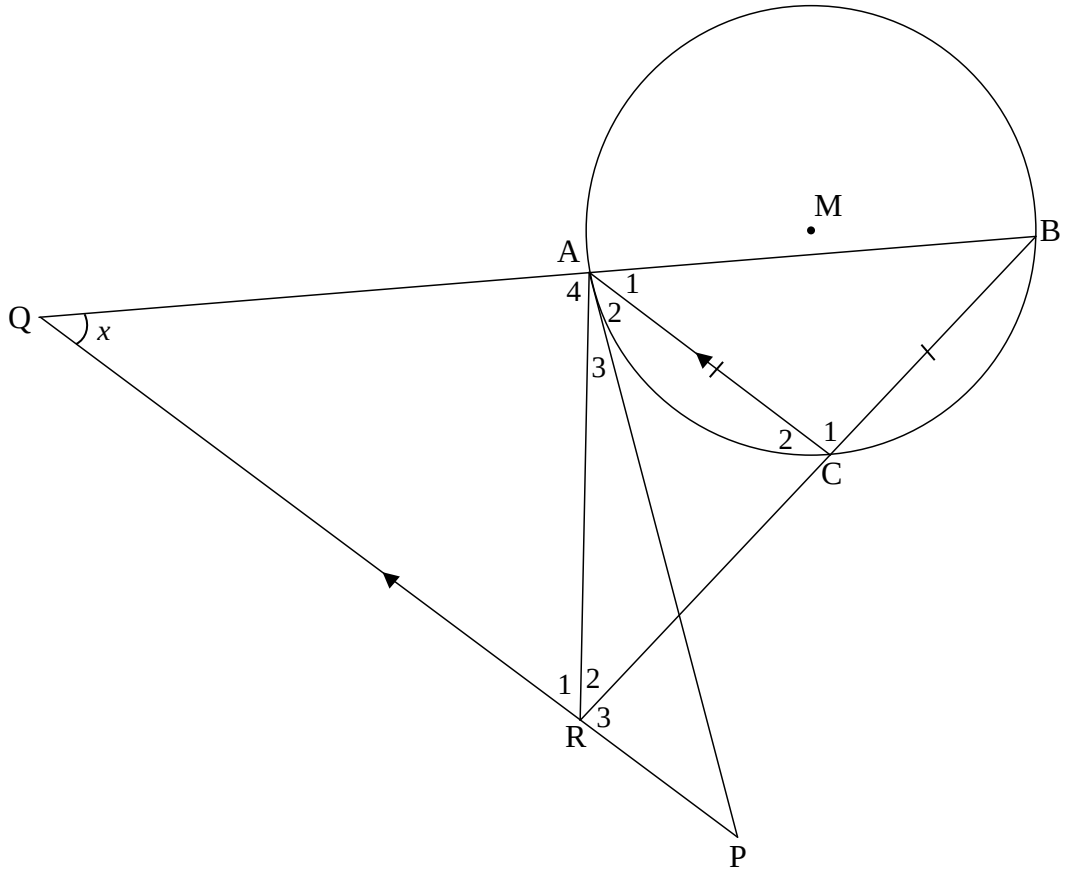
QUESTION/VRAAG 9

9.1



9.1	Constr: Join BE and CD and draw h_1 from E $\perp$ AD and h_2 from D $\perp$ AE *Konstr: Verbind BE en CD en trek h_1 vanaf* E $\perp$ AD *en h_2 vanaf* D $\perp$ AE Proof/*Bewys*: $\frac{\text{area } \Delta ADE}{\text{area } \Delta BDE} = \frac{\frac{1}{2}AD \times h_1}{\frac{1}{2}BD \times h_1} = \frac{AD}{BD}$ $\frac{\text{area } \Delta ADE}{\text{area } \Delta DEC} = \frac{\frac{1}{2}AE \times h_2}{\frac{1}{2}EC \times h_2} = \frac{AE}{EC}$ area ΔADE = area ΔADE [common/*gemeenskaplik*] But area ΔBDE = area ΔDEC [same base & height ; DE || BC/ *dies basis & hoogte ;* DE || BC] $\therefore \frac{\text{area } \Delta ADE}{\text{area } \Delta BDE} = \frac{\text{area } \Delta ADE}{\text{area } \Delta DEC}$ $\therefore \frac{AD}{BD} = \frac{AE}{EC}$	✓ constr/*konstr* ✓ $\frac{\text{area } \Delta ADE}{\text{area } \Delta BDE}$ ✓ $\frac{\frac{1}{2}AD \times h_1}{\frac{1}{2}BD \times h_1}$ **or R** ✓ $\frac{\text{area } \Delta ADE}{\text{area } \Delta DEC} = \frac{AE}{EC}$ ✓ S ✓R (6)

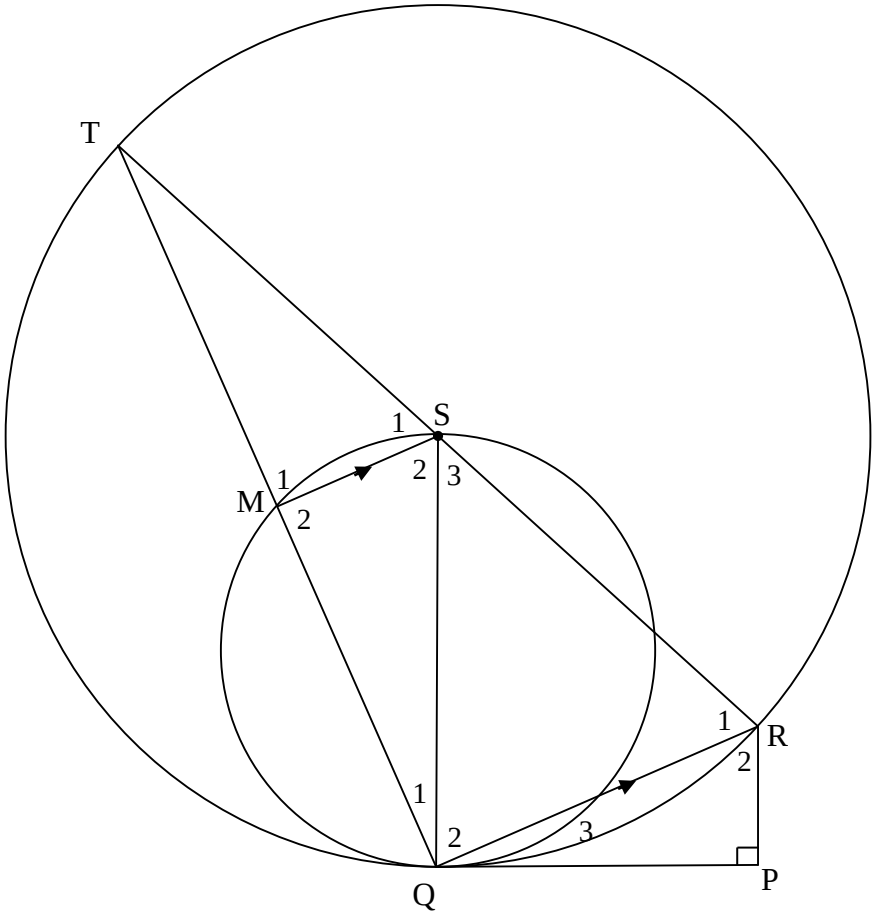
9.2



9.2.1	$\hat{A}_1 = x$ [corresp ∠s; PQ ‖ CA/*ooreenkomstige ∠e*, PQ ‖ CA] $\hat{B} = x$ [∠s opp equal sides/*∠e teenoor gelyke sye*] $\hat{A}_2 = x$ [tan-chord theorem/*∠ tussen raaklyn en koord*] $\hat{P} = x$ [alt ∠s; PQ ‖ CA/*verw. ∠e*, PQ ‖ CA]	✓ S ✓ R ✓ S/R ✓ S ✓ R ✓ S/R (6)
9.2.2	$\hat{B} = \hat{P}$ [proved in 9.2.1/*bewys in 9.2.1*] ∴ A, B, P and R are concyclic ∴ ABPR is a cyclic quadrilateral [conv ∠s in the same segment/ *koord onderspan gelyke omtreks ∠e*]	✓ S ✓ R (2)
9.2.3	$\frac{BA}{BQ} = \frac{BC}{BR}$ [prop th; AC ‖ QP] **OR** [line ‖ one side Δ/*lyn ‖ een syn v Δ*] But QR = BR [sides opp = ∠s/*sye teenoor = ∠e*] $\therefore \frac{BA}{BQ} = \frac{BC}{QR}$	✓ S ✓ R ✓ S (3)

	OR In Δ ABC and Δ BQR: $\hat{A}_1 = \hat{B} = x$ [proved in 9.2.1] $\hat{B} = \hat{Q} = x$ [proved in 9.2.1] $\hat{C}_1 = B\hat{R}Q = 180° - 2x$ [sum of $\angle$s of Δ] $\therefore \Delta ABC \mid\mid\mid \Delta BQR$ $\therefore \frac{BA}{BQ} = \frac{BC}{QR}$	✓ S ✓ S ✓ S (3)
	OR In Δ ABC and Δ BQR: $\hat{A}_1 = \hat{B} = x$ [proved in 9.2.1] $\hat{B} = \hat{Q} = x$ [proved in 9.2.1] $\hat{C}_1 = B\hat{R}Q = 180° - 2x$ [sum of $\angle$s of Δ] $\therefore \Delta ABC \mid\mid\mid \Delta BQR$ [$\angle\angle\angle$] $\therefore \frac{BA}{BQ} = \frac{BC}{QR}$	✓ S ✓ S ✓ R (3)
	OR In Δ ABC and Δ QBR: $\hat{B}$ is common $\hat{A}_1 = \hat{Q} = x$ [corres $\angle$s; PQ || CA] $\hat{C}_1 = B\hat{R}Q = 180° - 2x$ [sum of $\angle$s of Δ] $\therefore \Delta ABC \mid\mid\mid \Delta QBR$ [$\angle\angle\angle$] But QR = BR [sides opp = $\angle$s/*sye teenoor* = $\angle$*e*] $\therefore \frac{BA}{BQ} = \frac{BC}{QR}$	✓ S ✓ S ✓ S (3)
		[17]

QUESTION/VRAAG 10



10.1.1	$\hat{Q}_1 + \hat{Q}_2 = 90°$	[∠ in semi circle/*∠ in halwe sirkel*]	✓ S/R
	$\therefore \hat{M}_2 = 90°$	[co-interior ∠, MS || QR/*ko-binne ∠e*, MS || QR]	✓ S/R
	$\therefore$ SQ is a diameter	[converse: ∠ in semi circle/ *Omgekeerde: ∠ in halwe sirkel*]	✓ R (3)
	OR		
	MS || QR		
	$\frac{TS}{SR} = \frac{TM}{MQ} = \frac{1}{1}$	[prop theorem; SM || QR] **OR** [line || one side of Δ]/*lyn || een sy v*Δ	✓ S/R
	$\therefore TM = MQ$		
	$\therefore \hat{M}_2 = 90°$	[Line from centre bisects chord/*midpt. sirkel; midpt koord*]	✓ S/R
	$\therefore$ SQ is a diameter	[converse: ∠ in semi circle/ *Omgekeerde: ∠ in halwe sirkel*]	✓ R (3)
	OR		
	SQ ⊥ QP	[tan ⊥ rad/*raaklyn ⊥ radius*]	✓ S ✓ R
	$\therefore$ SQ is a diameter	[converse: tan ⊥ rad/*Omgekeerde: raaklyn ⊥ radius*]	✓ R (3)

10.1.2	In ΔRTQ and ΔRQP		
	$\hat{T} = \hat{Q}_3$	[tan-chord theorem/$\angle$ *tussen raaklyn en koord*]	✓ S ✓ R
	$\hat{Q}_1 + \hat{Q}_2 = 90°$	[co-interior $\angle$s, MS || QR/*ko-binne* $\angle$*e,* MS || QR] **or** [$\angle$ in semi circle/$\angle$ *in halwe sirkel*]	✓ S
	$\therefore \hat{Q}_1 + \hat{Q}_2 = \hat{P} = 90°$		✓ S
	$\hat{R}_1 = \hat{R}_2$	[$\angle$s of Δ/$\angle$*e van* Δ]	✓ S
	$\Delta RTQ \text{ ||| } \Delta RQP$		
	$\frac{RT}{RQ} = \frac{RQ}{RP}$		✓ ratio
	$RT = \frac{RQ^2}{RP}$		(6)
	OR		
	In ΔRTQ and ΔRQP		
	$\hat{T} = \hat{Q}_3$	[tan-chord theorem $\angle$*tussen raaklyn en koord*]	✓ S ✓ R
	$\hat{Q}_1 + \hat{Q}_2 = 90°$	[co-interior $\angle$s, MS || QR/*ko-binne* $\angle$*e,* MS || QR] **or** [$\angle$ in semi circle/$\angle$ *in halwe sirkel*]	✓ S
	$\therefore \hat{Q}_1 + \hat{Q}_2 = \hat{P} = 90°$		✓ S
	$\Delta RTQ \text{ ||| } \Delta RQP$	[$\angle$,$\angle$,$\angle$]	✓ R
	$\frac{RT}{RQ} = \frac{RQ}{RP}$		✓ ratio
	$RT = \frac{RQ^2}{RP}$		(6)
10.2	QR = 28 units	[midpoint theorem/*midpt. stelling*]	✓ S ✓ R
	$RP^2 = 28^2 - \left(\sqrt{640}\right)^2$	[Pythagoras/*Pythagoras*]	✓ S
	RP = 12 units		✓ RP = 12
	$RT = \frac{RQ^2}{RP}$		
	$RT = \frac{28^2}{12}$		
	$RT = \frac{196}{3}$		✓ RT
	Radius = $\frac{98}{3}$ units		✓ answer (6)
			[15]

TOTAL/TOTAAL: 150