



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NASIONALE
SENIOR SERTIFIKAAT**

GRAAD 12

**WISKUNDE V2
NOVEMBER 2016**

PUNTE: 150

TYD: 3 uur

**Hierdie vraestel bestaan uit 14 bladsye, 1 inligtingsblad
en 'n antwoordeboek van 28 bladsye.**

INSTRUKSIES EN INLIGTING

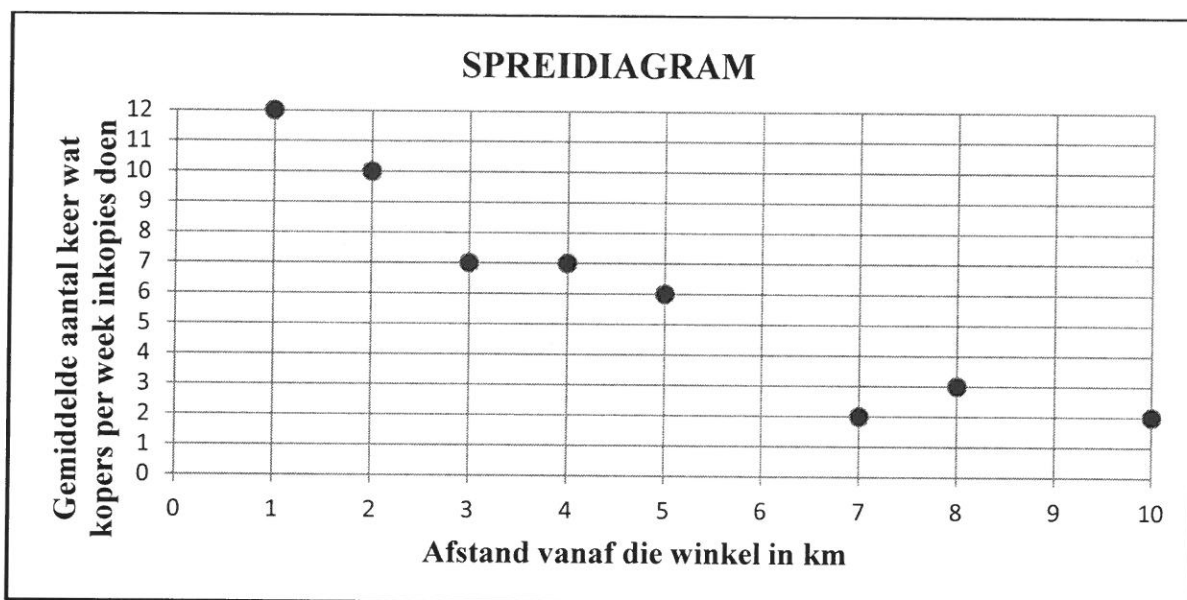
Lees die volgende instruksies aandagtig deur voordat jy die vrae beantwoord.

1. Hierdie vraestel bestaan uit 10 vrae.
2. Beantwoord AL die vrae in die ANTWOORDEBOEK wat verskaf word.
3. Dui ALLE berekeninge, diagramme, grafieke, ensovoorts wat jy in die beantwoording van die vrae gebruik, 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

'n Opname is by 'n plaaslike supermark gemaak oor die afstand wat kopers vanaf die winkel woon en die gemiddelde aantal keer wat hierdie kopers in 'n week inkopies doen. Die resultate word in die tabel hieronder getoon.

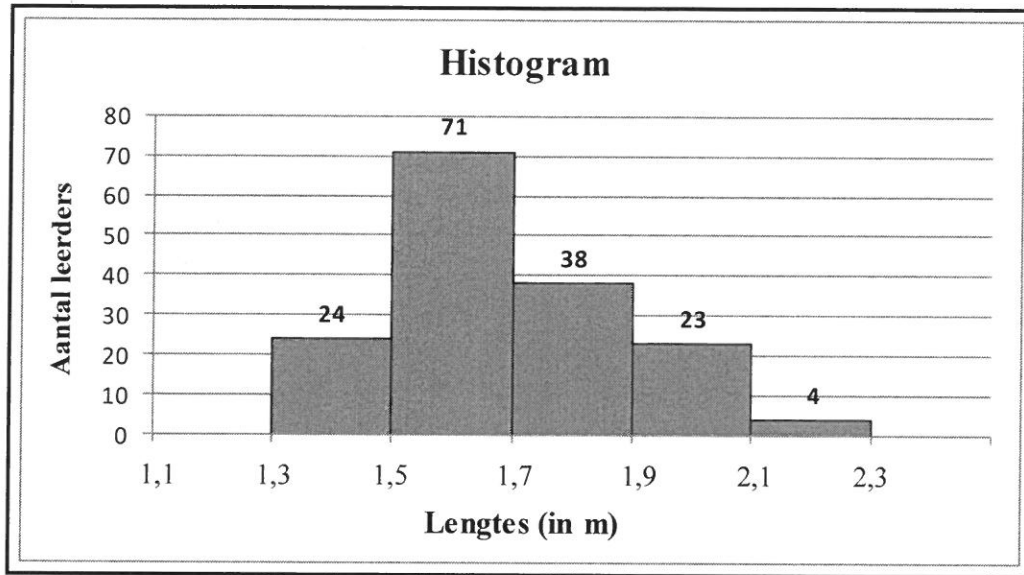
Afstand vanaf die winkel in km	1	2	3	4	5	7	8	10
Gemiddelde aantal keer wat kopers per week inkopies doen	12	10	7	7	6	2	3	2



- 1.1 Gebruik die spreidiagram om kommentaar te lewer op die sterkte van die verband tussen die afstand wat 'n koper vanaf die winkel woon en die gemiddelde aantal keer wat sy/hy in 'n week by die winkel inkopies doen. (1)
 - 1.2 Bereken die korrelasiekoëffisiënt van die data. (1)
 - 1.3 Bereken die vergelyking van die kleinstekwadrate-regressielyn van die data. (3)
 - 1.4 Gebruik jou antwoord by VRAAG 1.3 om die gemiddelde aantal keer te beraam wat 'n koper, wat 6 km vanaf die supermark woon, die winkel in 'n week sal besoek. (2)
 - 1.5 Skets die kleinstekwadrate-regressielyn op die spreidiagram wat in die ANTWOORDEBOEK verskaf is. (2)
- [9]**

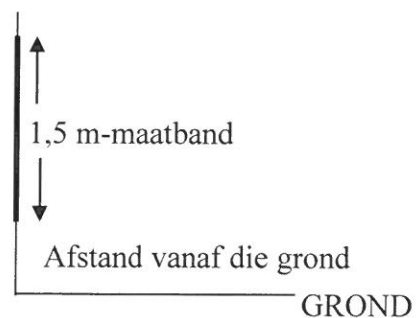
VRAAG 2

Die lengtes van 160 leerders in 'n skool word gemeet. Die lengte van die kortste leerder is 1,39 m en dié van die langste leerder is 2,21 m. Die lengtes word in die histogram hieronder voorgestel.



- 2.1 Beskryf die skeefheid van die data. (1)
- 2.2 Bereken die omvang (variasiewydte) van die lengtes. (2)
- 2.3 Voltooi die kumulatiewefrekwensie-kolom in die tabel wat in die ANTWOORDEBOEK gegee word. (2)
- 2.4 Skets 'n ogief (kumulatiewefrekwensie-kromme), wat die data voorstel, op die rooster wat in die ANTWOORDEBOEK gegee word. (4)
- 2.5 Tagtig leerders se lengtes is minder as x meter. Skat x . (2)

2.6 Die persoon wat die metings geneem het, het slegs 'n 1,5 m-maatband beskikbaar gehad. Om te kompenseer vir die kort maatband het hy besluit om die band teen 'n muur, 1 m vanaf die grond, te monteer. Nadat die metings aangeteken is, het hy ontdek dat die maatband 1,1 m vanaf die grond in plaas van 1 m, gemonteer was.



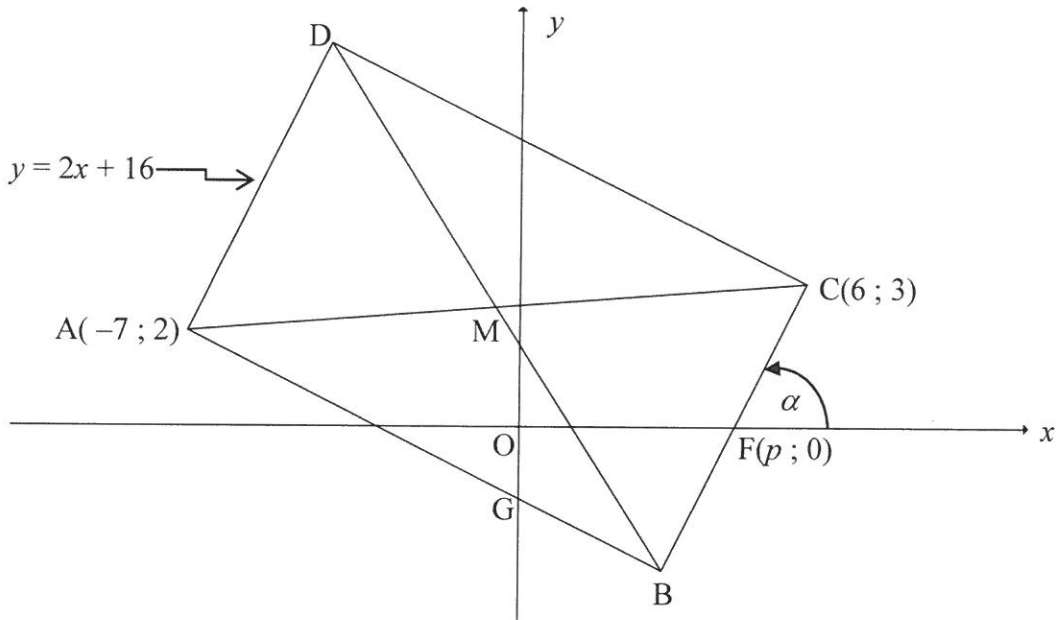
Watter invloed het hierdie fout op die volgende:

- 2.6.1 Gemiddelde van die datastel (1)
- 2.6.2 Standaardafwyking van die datastel (1)

[13]

VRAAG 3

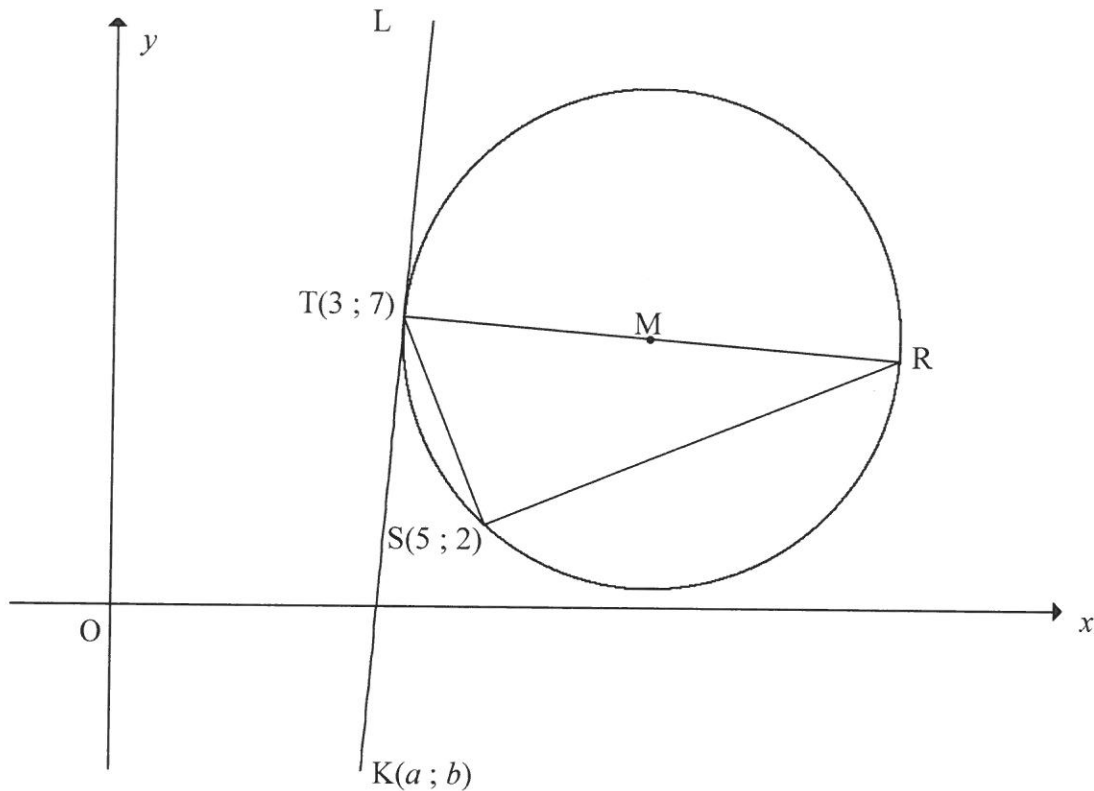
In die diagram is $A(-7 ; 2)$, B , $C(6 ; 3)$ en D die hoekpunte van reghoek $ABCD$. Die vergelyking van AD is $y = 2x + 16$. Lyn AB sny die y -as by G . Die x -afsnit van lyn BC is $F(p ; 0)$ en die inklinasiehoek van BC met die positiewe x -as is α . Die hoeklyne van die reghoek sny by M .



- 3.1 Bereken die koördinate van M . (2)
 - 3.2 Skryf die gradiënt van BC in terme van p neer. (1)
 - 3.3 Bereken vervolgens die waarde van p . (3)
 - 3.4 Bereken die lengte van DB . (3)
 - 3.5 Bereken die grootte van α . (2)
 - 3.6 Bereken die grootte van \widehat{OGB} . (3)
 - 3.7 Bepaal die vergelyking van die sirkel wat deur punt D , B en C gaan in die vorm $(x - a)^2 + (y - b)^2 = r^2$. (3)
 - 3.8 Indien AD so geskuif word dat $ABCD$ 'n vierkant word, sal BC 'n raaklyn wees aan die sirkel wat deur punt A , M en B gaan, waar M nou die snypunt van die hoeklyne van die vierkant $ABCD$ is? Motiveer jou antwoord. (2)
- [19]**

VRAAG 4

In die diagram gaan die sirkel, met middelpunt M , deur $T(3; 7)$, R en $S(5; 2)$. RT is 'n middellyn van die sirkel. $K(a; b)$ is 'n punt in die 4^{de} kwadrant sodat KTL 'n raaklyn aan die sirkel by T is.



- 4.1 Gee 'n rede waarom $\hat{T}SR = 90^\circ$. (1)
- 4.2 Bereken die gradiënt van TS . (2)
- 4.3 Bepaal die vergelyking van die lyn SR in die vorm $y = mx + c$. (3)
- 4.4 Die vergelyking van die sirkel hierbo is $(x - 9)^2 + \left(y - 6\frac{1}{2}\right)^2 = 36\frac{1}{4}$.
- 4.4.1 Bereken die lengte van TR in wortelvorm. (2)
- 4.4.2 Bereken die koördinate van R . (3)
- 4.4.3 Bereken $\sin R$. (3)
- 4.4.4 Toon dat $b = 12a - 29$. (3)
- 4.4.5 As $TK = TR$, bereken die koördinate van K . (6)

[23]

VRAAG 5

5.1 Gegee: $\sin 16^\circ = p$

Bepaal, **sonder om 'n sakrekenaar te gebruik**, die volgende in terme van p .

5.1.1 $\sin 196^\circ$ (2)

5.1.2 $\cos 16^\circ$ (2)

5.2 Gegee: $\cos(A - B) = \cos A \cos B + \sin A \sin B$

Gebruik die formule vir $\cos(A - B)$ en lei 'n formule af vir $\sin(A + B)$ (3)

5.3 Vereenvoudig $\frac{\sqrt{1 - \cos^2 2A}}{\cos(-A) \cdot \cos(90^\circ + A)}$ volledig, gegee dat $0^\circ < A < 90^\circ$. (5)

5.4 Gegee: $\cos 2B = \frac{3}{5}$ en $0^\circ \leq B \leq 90^\circ$

Bepaal, **sonder om 'n sakrekenaar te gebruik**, die waarde van ELK van die volgende in die eenvoudigste vorm:

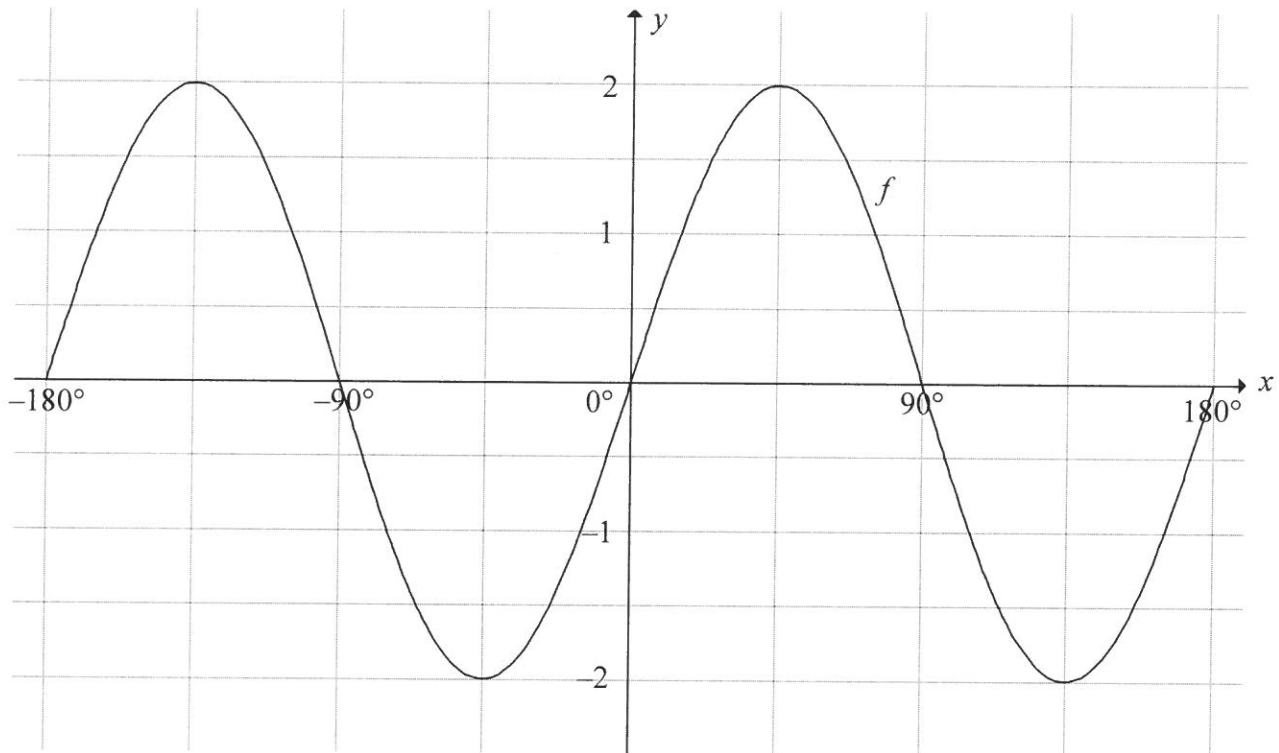
5.4.1 $\cos B$ (3)

5.4.2 $\sin B$ (2)

5.4.3 $\cos(B + 45^\circ)$ (4)
[21]

VRAAG 6

In die diagram is die grafiek van $f(x) = 2 \sin 2x$ geskets vir die interval $x \in [-180^\circ ; 180^\circ]$.

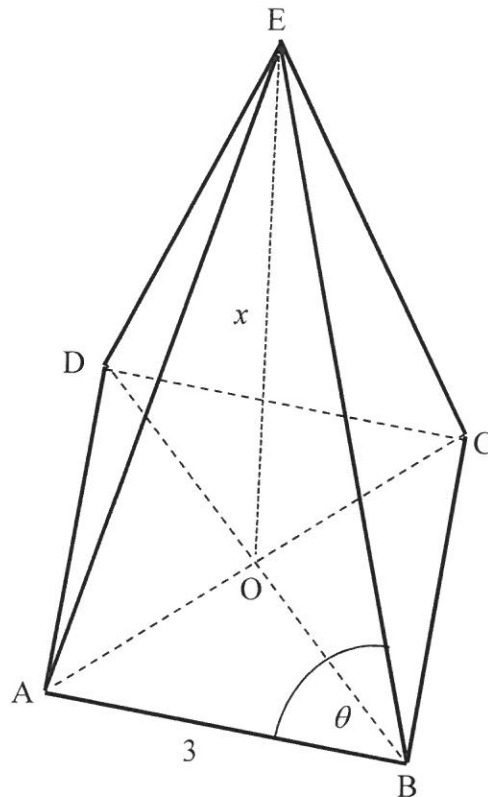


- 6.1 Skets, op die asstelsel waarop f in die ANTWOORDEBOEK geskets is, die grafiek van $g(x) = -\cos 2x$ vir $x \in [-180^\circ ; 180^\circ]$. Toon duidelik alle afsnitte met die asse, die koördinate van die draaipunte en die eindpunte van die grafiek. (3)
- 6.2 Skryf die maksimum waarde van $f(x) - 3$ neer. (2)
- 6.3 Bepaal die algemene oplossing van $f(x) = g(x)$. (4)
- 6.4 Bepaal vervolgens die waardes van x waarvoor $f(x) < g(x)$ in die interval $x \in [-180^\circ ; 0^\circ]$. (3)
- [12]**

VRAAG 7

E is die toppunt van 'n piramide met 'n vierkantige basis ABCD. O is die middelpunt van die basis. $\hat{E}BA = \theta$, $AB = 3$ m en EO, die loodregte hoogte van die piramide, is x .

$\text{Volume van piramide} = \frac{1}{3}(\text{oppervlakte van basis}) \times (\perp \text{ hoogte})$
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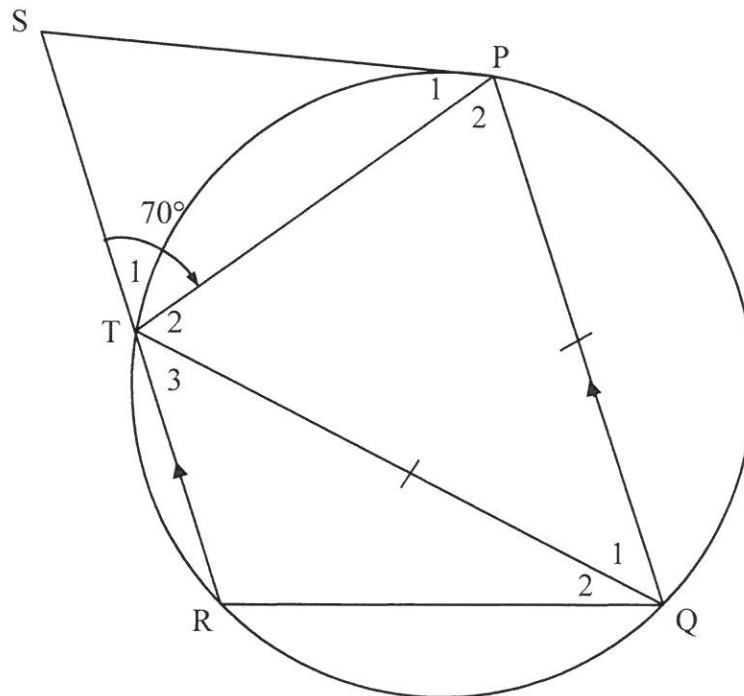


- 7.1 Bereken die lengte van OB. (3)
- 7.2 Toon dat $\cos\theta = \frac{3}{2\sqrt{x^2 + \frac{9}{2}}}$ (5)
- 7.3 As die volume van die piramide 15 m^3 is, bereken die waarde van θ . (4)
- [12]**

Gee redes vir ALLE bewerings en berekeninge in VRAAG 8, 9 en 10.

VRAAG 8

8.1 In die diagram hieronder is PQRT 'n koordevierhoek met $RT \parallel QP$. Die raaklyn by P ontmoet RT verleng by S. $QP = QT$ en $\hat{P}_2 = 70^\circ$.



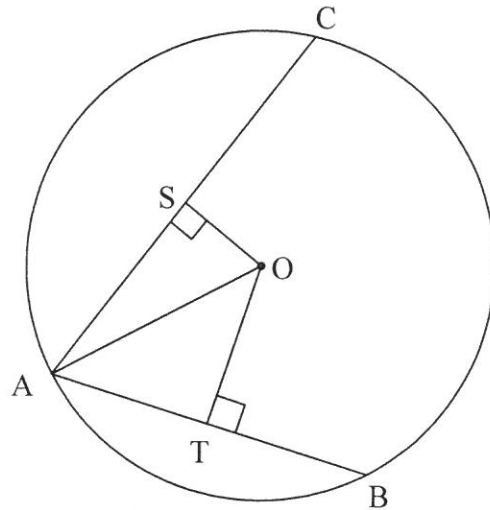
8.1.1 Gee 'n rede waarom $\hat{P}_2 = 70^\circ$. (1)

8.1.2 Bereken, met redes, die grootte van:

(a) \hat{Q}_1 (3)

(b) \hat{P}_1 (2)

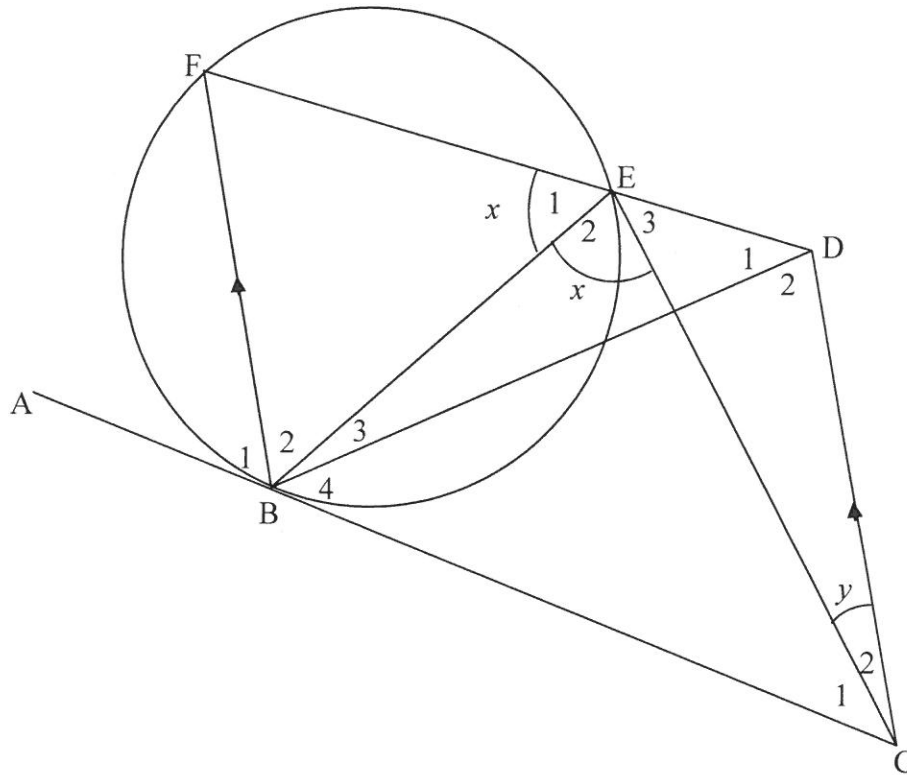
- 8.2 A, B en C is punte op die sirkel met middelpunt O. S en T is punte op AC en AB onderskeidelik sodat $OS \perp AC$ en $OT \perp AB$. $AB = 40$ en $AC = 48$.



- 8.2.1 Bereken AT. (1)
- 8.2.2 As $OS = \frac{7}{15}OT$, bereken die radius OA van die sirkel. (5)
[12]

VRAAG 9

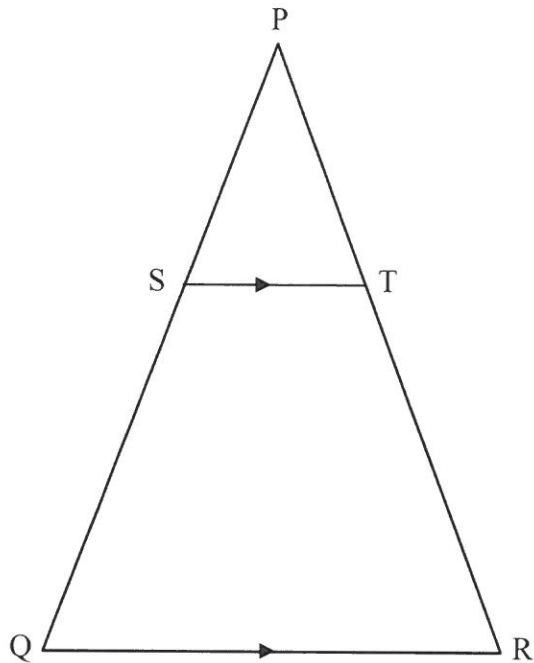
ABC is 'n raaklyn aan die sirkel BFE by B. Vanaf C word 'n reguitlyn ewewydig aan BF getrek om FE verleng by D te ontmoet. EC en BD word getrek. $\hat{E}_1 = \hat{E}_2 = x$ en $\hat{C}_2 = y$.



- 9.1 Gee 'n rede waarom ELK van die volgende WAAR is:
 - 9.1.1 $\hat{B}_1 = x$ (1)
 - 9.1.2 $\hat{BCD} = \hat{B}_1$ (1)
 - 9.2 Bewys dat BCDE 'n koordevierhoek is. (2)
 - 9.3 Watter ander TWEE hoeke is elk gelyk aan x ? (2)
 - 9.4 Bewys dat $\hat{B}_2 = \hat{C}_1$. (3)
- [9]**

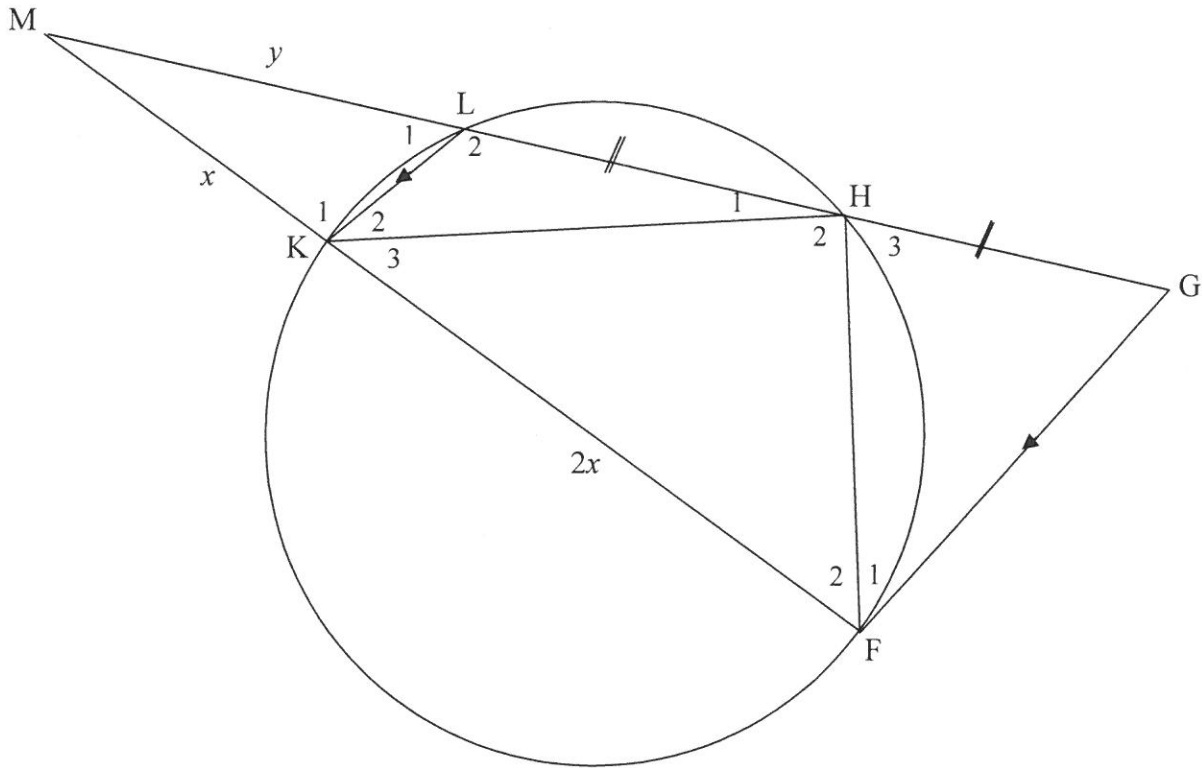
VRAAG 10

- 10.1 In die diagram is $\triangle PQR$ geskets. S en T is punte op sy PQ en PR onderskeidelik sodat $ST \parallel QR$.



Bewys die stelling wat beweer dat $\frac{PS}{SQ} = \frac{PT}{TR}$. (6)

10.2 In die diagram is HLKF 'n koordevierhoek. Die koorde HL en FK is verleng en ontmoet by M. Die lyn deur F ewewydig aan KL ontmoet MH verleng in G. $MK = x$, $KF = 2x$, $ML = y$ en $LH = HG$.



10.2.1 Gee 'n rede waarom $\hat{GFM} = \hat{LKM}$. (1)

10.2.2 Bewys dat:

(a) $GH = y$ (3)

(b) $\triangle MFH \parallel \triangle MGF$ (5)

(c) $\frac{GF}{FH} = \frac{3x}{2y}$ (2)

10.2.3 Toon dat $\frac{y}{x} = \sqrt{\frac{3}{2}}$ (3)
[20]

TOTAAL: 150

INLIGTINGSBLAD

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

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

$$A = P(1 - i)^n$$

$$A = P(1 + i)^n$$

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

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

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

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

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

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

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

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

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

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

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

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

$$m = \tan \theta$$

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

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

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

$$\text{oppervlakte } \Delta ABC = \frac{1}{2} ab \cdot \sin C$$

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

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

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

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

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

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

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

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

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

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

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

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



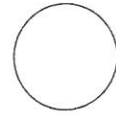
basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

Candidate Barcode Label/Stafieskodeplakker

NSC Answer Book
NSS-antwoordeboek

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



Sequence no on mark sheet
Volgnommer op puntestaaf

CENTRE NUMBER SENTRUMNOMMER										
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EXAMINATION NUMBER EKSAMENOMMER																			
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DATE DATUM									
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BOOK NUMBER BOEKNOMMER		OF VAN		BOOKS BOEKE
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SUBJECT CODE VAKKODE						
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PAPER NUMBER VRAESTELNOMMER	2
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SUBJECT NAME VAKNAAM	MATHEMATICS/WISKUNDE
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This answer book consists of 28 pages./*Hierdie antwoordeboek bestaan uit 28 bladsye.*

MARKER/NASIENER			MODERATOR'S INITIALS IN RELEVANT BLOCK MODERATORPARAAF IN BETROKKE BLOKKIE					
Question Vraag	Marks Punte	Marker's Code & Initials	Marks Punte	SM	DCM	CM	IM	EM
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RE-MARK/RE-CHECK/ HERNASIEN/HERKONTROLEER		
Question Vraag	Marks Punte	Initials Paraaf
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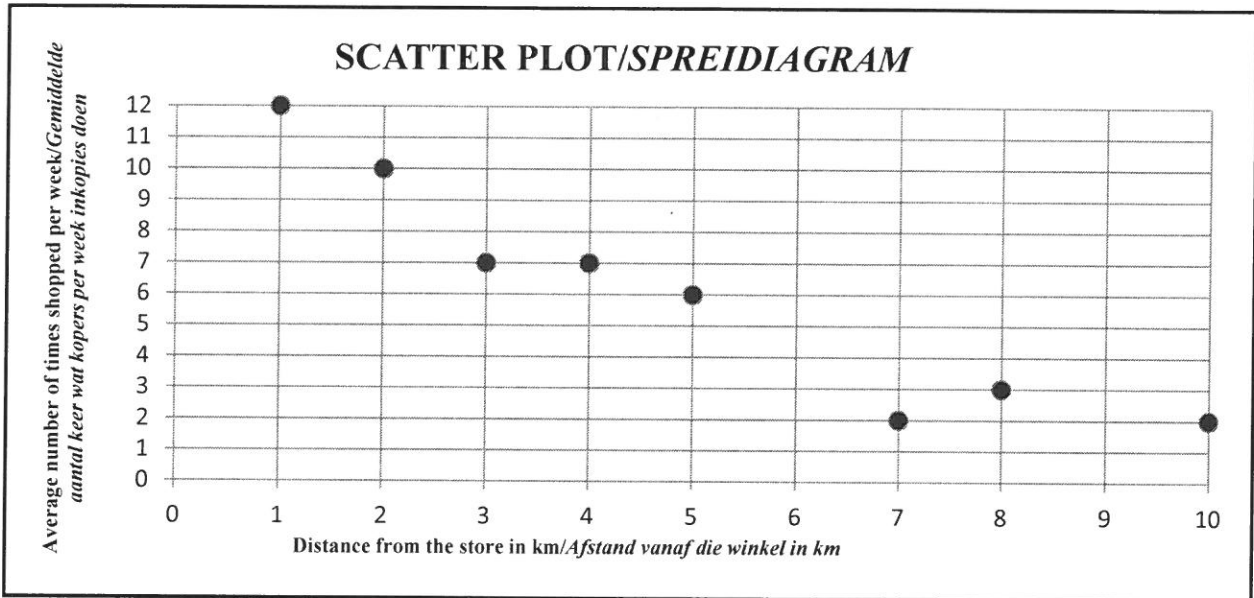
CONTROLLED AND CERTIFIED CORRECT (SURNAME AND INITIALS OF EA)	
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READ INSTRUCTIONS ON THE NEXT PAGE.
LEES INSTRUKSIES OP VOLGENDE BLADSY.

FOLLOW THESE INSTRUCTIONS CAREFULLY	VOLG HIERDIE INSTRUKSIES NOUKEURIG
1. Write your examination number and centre number clearly in the spaces provided and attach your examination number sticker in the space provided.	1. Skryf jou eksamennommer en sentrumnummer duidelik in die ruimtes soos verskaf en plak jou eksamennommeretiket in die ruimte soos 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 in elke eksamenvraestel gegee word.
6. Candidates may not retain an answer book or remove it from the examination room. Answer books must be returned to the Invigilator at the end of the examination session.	6. Geen antwoordeboek mag deur die kandidaat behou of uit die eksamenlokaal verwyder word nie. Antwoordeboeke moet aan die Toesighouer terugbesorg word aan die einde van die eksamensessie.
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. Moenie in die kantlyn skryf nie.
8. Indicate the questions you have answered by drawing a circle around the relevant numbers on the front cover of the answer book where marks are to be recorded.	8. Dui die vrae wat jy beantwoord het aan op die voorblad van die antwoordeboek waar die punte aangebring word, deur 'n kringetjie te trek om die nommers van die vrae wat jy beantwoord het.
9. Rule off through any work/rough work that must not be marked.	9. Trek 'n netjiese lyn deur enige werk/rofwerk wat nie nagesien moet word nie.
10. In the event that you use the additional space provided: 10.1 Write down the number of the question 10.2 Leave a line and rule off after your answer.	10. Ingeval jy die bykomende ruimte wat voorsien word, gebruik: 10.1 Skryf die nommer van die vraag neer 10.2 Laat 'n lyn oop en trek 'n lyn na jou antwoord.

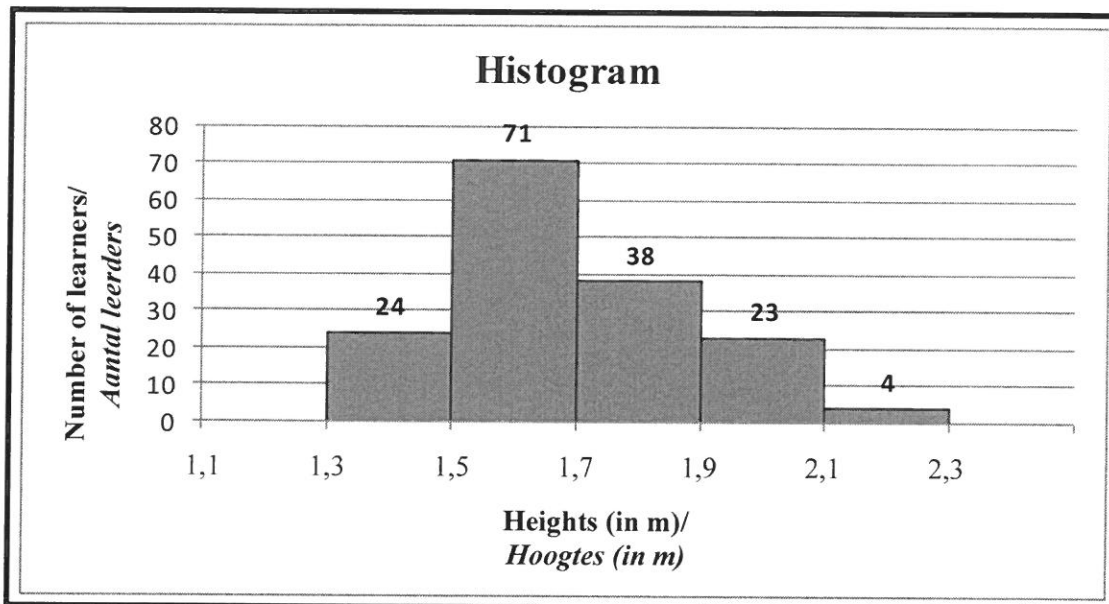
QUESTION/VRAAG 1

Distance from the store in km <i>Afstand vanaf die winkel in km</i>	1	2	3	4	5	7	8	10
Average number of times shopped per week <i>Gemiddelde aantal keer wat kopers per week inkopies doen</i>	12	10	7	7	6	2	3	2

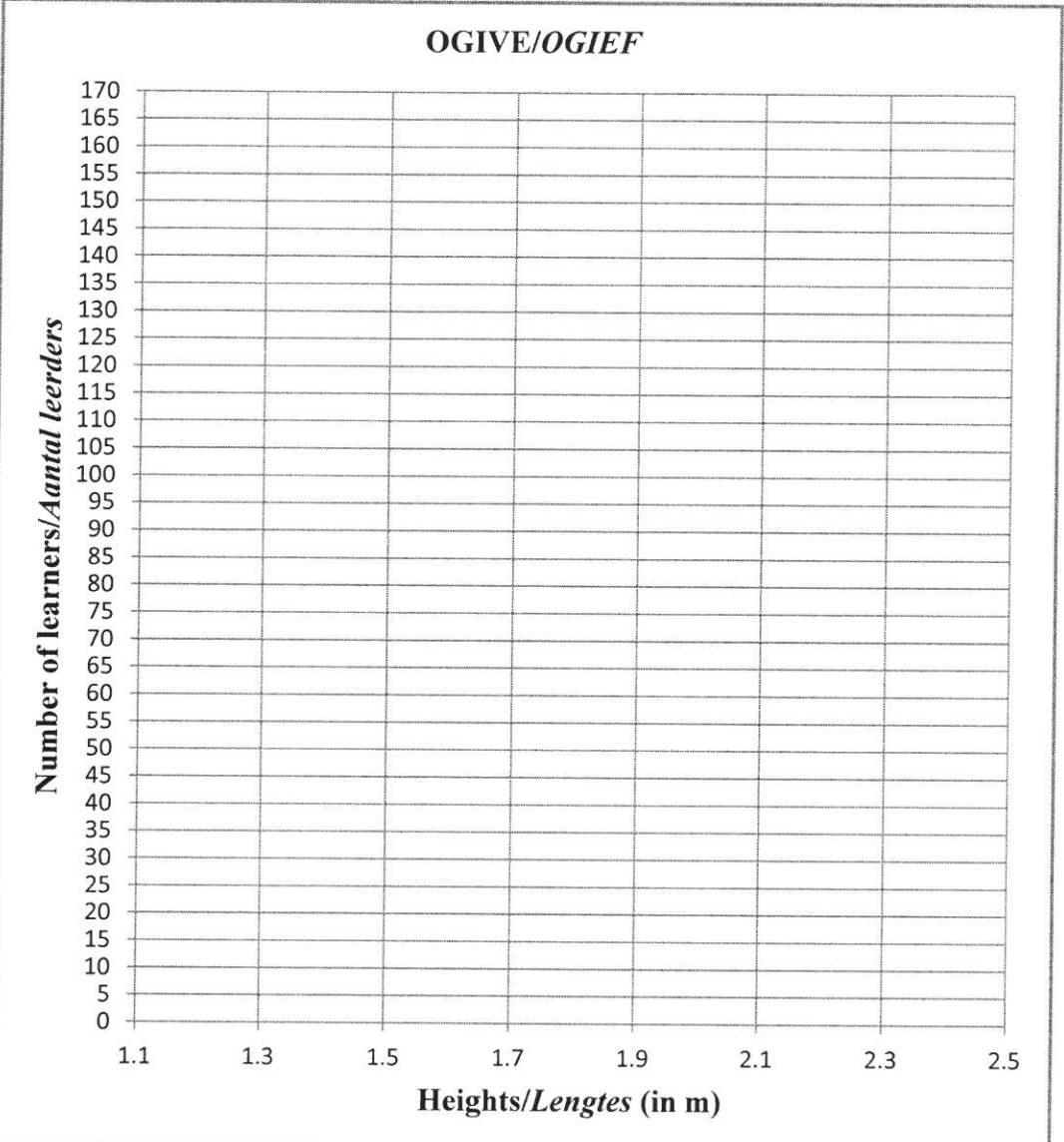


	Solution/Oplissing	Marks/Punte
1.1		(1)
1.2		(1)
1.3		(3)
1.4		(2)
1.5	Draw on the scatter plot above./ <i>Skets op die spreidiagram hierbo.</i>	(2)
		[9]

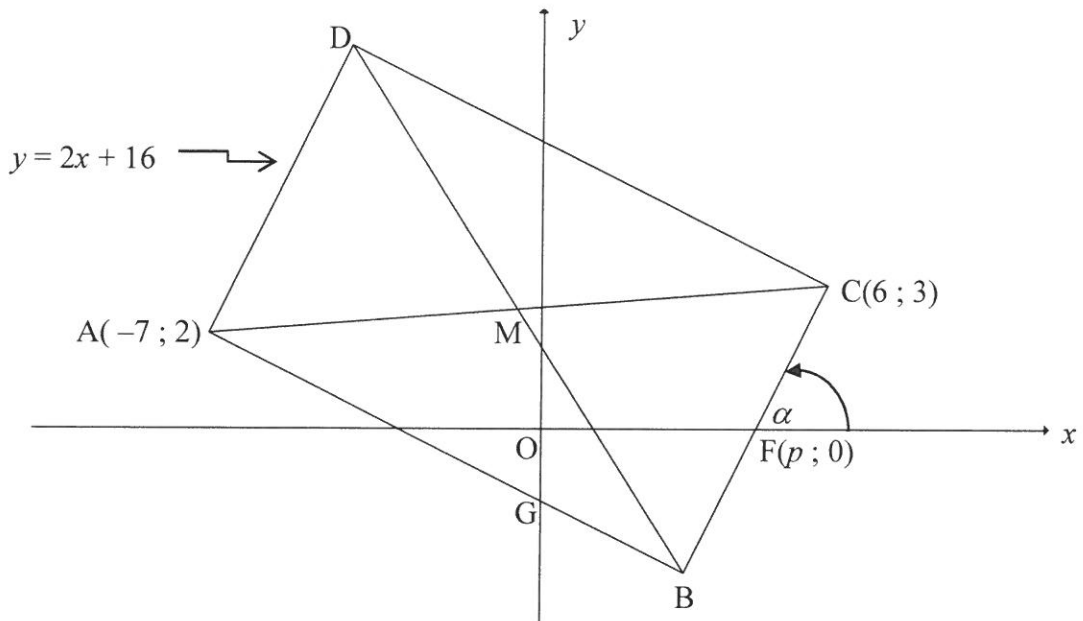
QUESTION/VRAAG 2



	Solution/Oplissing	Marks Punte												
2.1		(1)												
2.2		(2)												
2.3	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Intervals Klasse</th> <th>Cumulative frequency Kumulatiewe frekwensie</th> </tr> </thead> <tbody> <tr> <td>$1,3 \leq x < 1,5$</td> <td></td> </tr> <tr> <td>$1,5 \leq x < 1,7$</td> <td></td> </tr> <tr> <td>$1,7 \leq x < 1,9$</td> <td></td> </tr> <tr> <td>$1,9 \leq x < 2,1$</td> <td></td> </tr> <tr> <td>$2,1 \leq x < 2,3$</td> <td></td> </tr> </tbody> </table>	Intervals Klasse	Cumulative frequency Kumulatiewe frekwensie	$1,3 \leq x < 1,5$		$1,5 \leq x < 1,7$		$1,7 \leq x < 1,9$		$1,9 \leq x < 2,1$		$2,1 \leq x < 2,3$		(2)
Intervals Klasse	Cumulative frequency Kumulatiewe frekwensie													
$1,3 \leq x < 1,5$														
$1,5 \leq x < 1,7$														
$1,7 \leq x < 1,9$														
$1,9 \leq x < 2,1$														
$2,1 \leq x < 2,3$														

	Solution/Oplissing	Marks Punte
2.4	<p style="text-align: center;">OGIVE/OGIEF</p> 	(4)
2.5	<hr/> <hr/>	(2)
2.6.1	<hr/> <hr/>	(1)
2.6.2	<hr/> <hr/>	(1)
		[13]

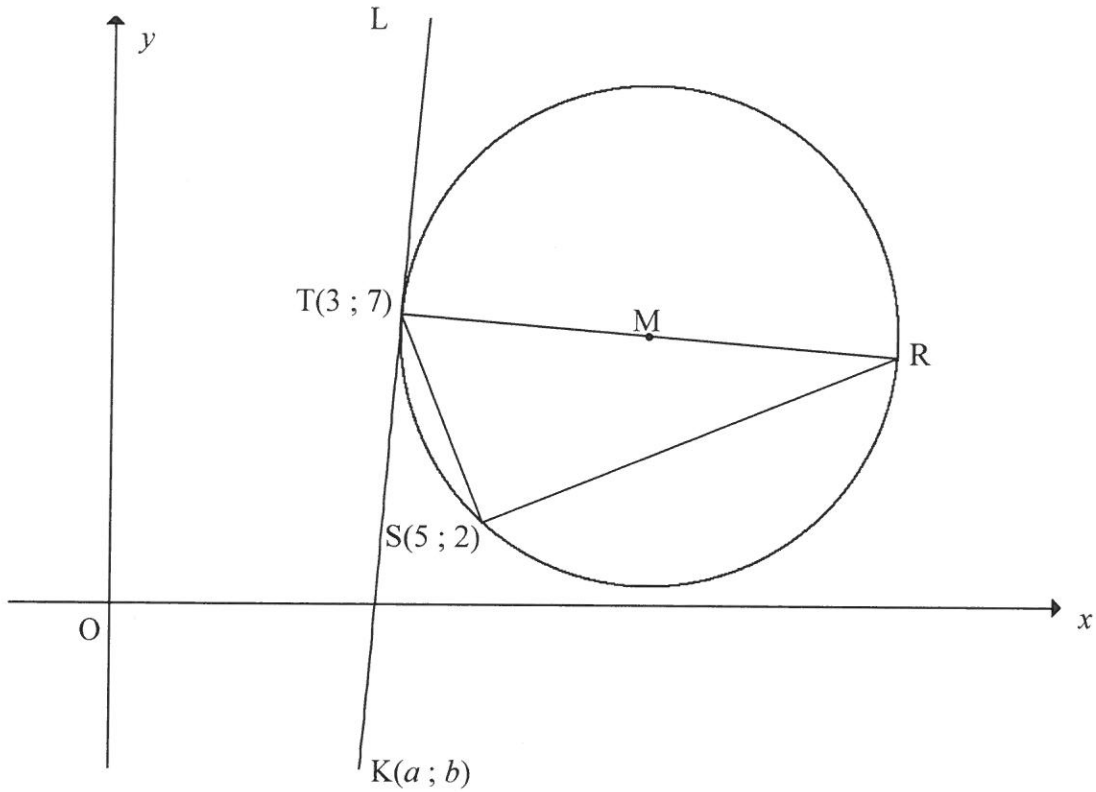
QUESTION/VRAAG 3



	Solution/Oplissing	Marks Punte
3.1		(2)
3.2		(1)
3.3		(3)

	Solution/Oplissing	Marks Punte
3.4		(3)
3.5		(2)
3.6		(3)
3.7		(3)
3.8		(2)
		[19]

QUESTION/VRAAG 4



	Solution/Oplissing	Marks Punte
4.1		(1)
4.2		(2)

	Solution/Oplissing	Marks Punte
4.3		(3)
4.4.1		(2)
4.4.2		(3)
4.4.3		(3)

QUESTION/VRAAG 5

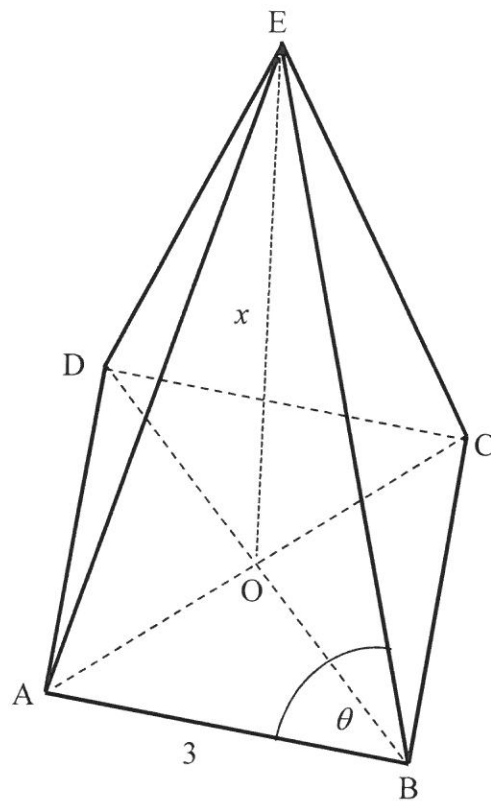
	Solution/Oplissing	Marks Punte
5.1.1		(2)
5.1.2		(2)
5.2		(3)
5.3		(5)

	Solution/Oplissing	Marks Punte
5.4.1		(3)
5.4.2		(2)
5.4.3		(4)
		[21]

QUESTION/VRAAG 7

Volume of pyramid = $\frac{1}{3}$ (area of base) \times (\perp height)

Volume van piramide = $\frac{1}{3}$ (oppervlakte van basis) \times (\perp hoogte)



	Solution/Oplissing	Marks Punte
7.1		(3)

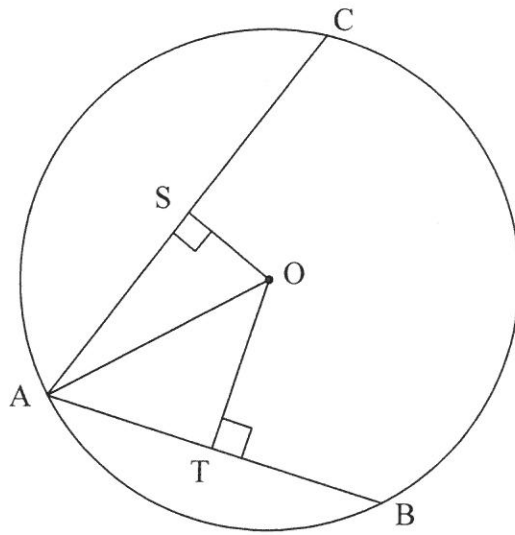
	Solution/Oplissing	Marks Punte
7.2		

(5)

7.3		
	(4)	
	[12]	

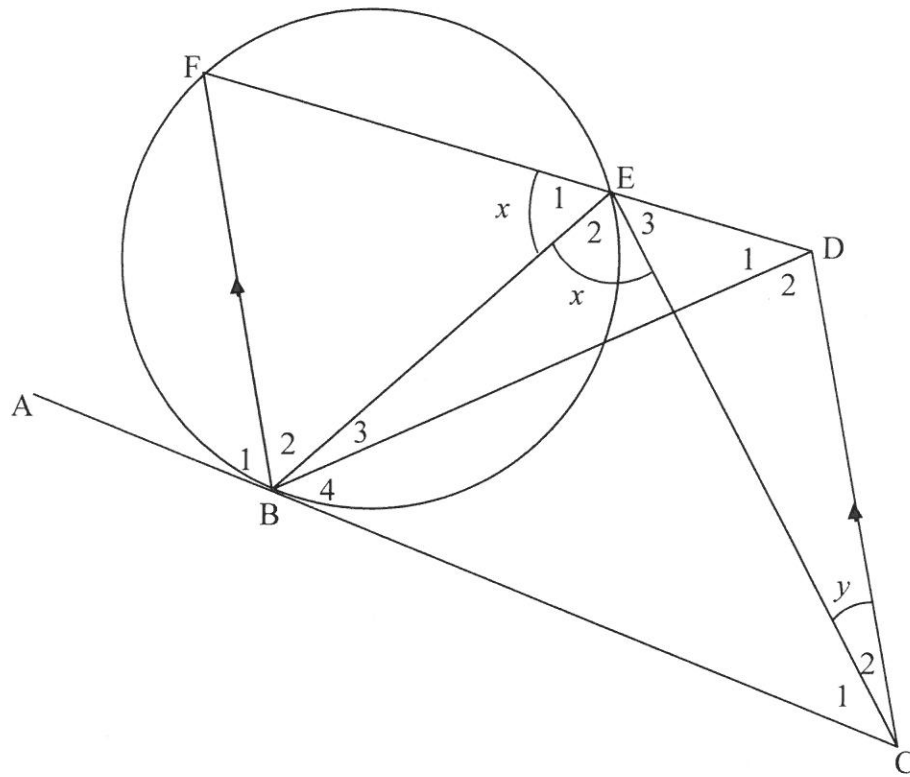
	Solution/Oplissing	Marks Punte
8.1.2(a)	<div style="border: 1px solid black; height: 180px; width: 100%;"></div>	(3)
8.1.2(b)	<div style="border: 1px solid black; height: 230px; width: 100%;"></div>	(2)

8.2



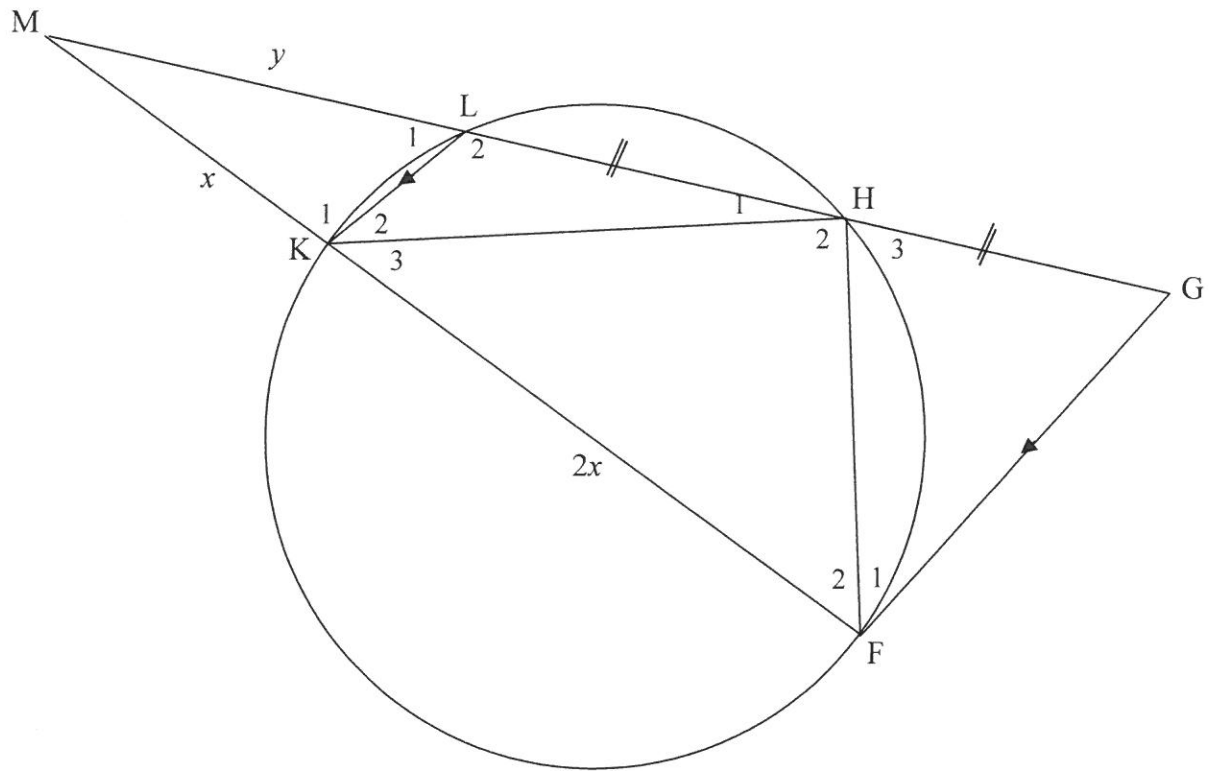
	Solution/Oplissing	Marks Punte
8.2.1		(1)
8.2.2		(5)
		[12]

QUESTION/VRAAG 9



	Solution/Oplissing	Marks Punte
9.1.1		(1)
9.1.2		(1)
9.2		(2)

10.2



	Solution/Oplissing	Marks Punte
10.2.1		(1)
10.2.2(a)		(3)

	Solution/Oplossing	Marks Punte
10.2.2(b)		(5)
10.2.2(c)		(2)
10.2.3		(3)
		[20]



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL/NASIONALE
SENIOR
CERTIFICATE/SERTIFIKAAT**

GRADE/GRAAD 12

MATHEMATICS P2/WISKUNDE V2

NOVEMBER 2016

MEMORANDUM

MARKS/PUNTE: 150

**This memorandum consists of 26 pages.
*Hierdie memorandum bestaan uit 26 bladsye.***

NOTE:

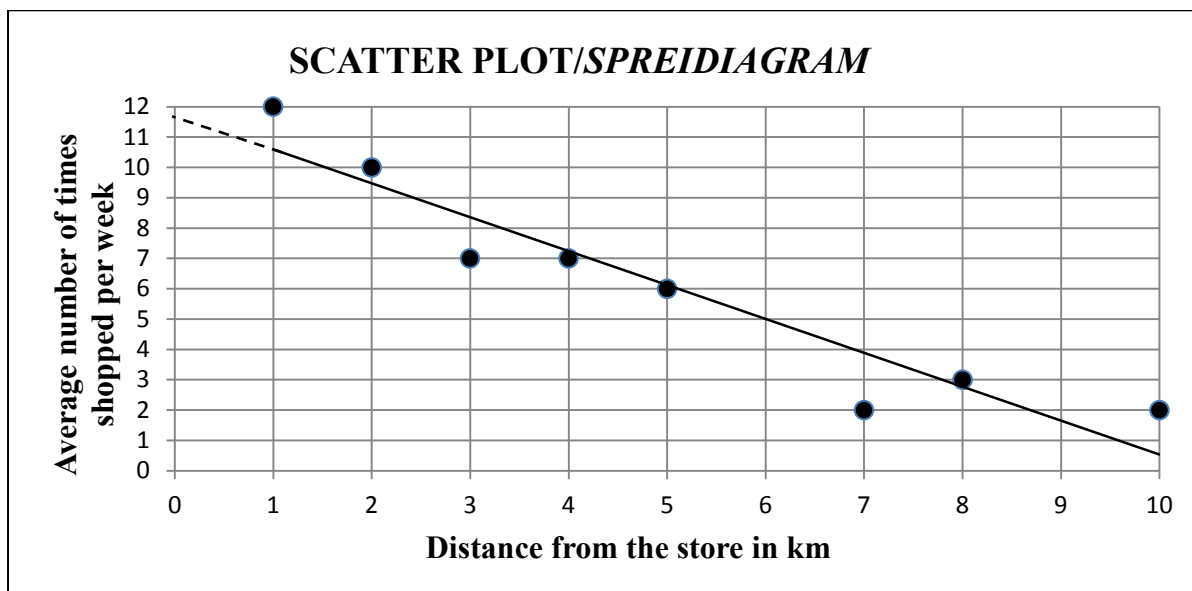
- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate has crossed out an attempt to answer a question and did not redo it, mark the crossed-out version.
- Consistent accuracy applies in ALL aspects of the marking memorandum. Stop marking at the second calculation error.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

LET WEL:

- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n poging om 'n vraag te beantwoord, doodgetrek en nie oorgedoen het nie, sien die doodgetrekte poging na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die memorandum van toepassing. Staak nasien by die tweede berekeningsfout.*
- *Om antwoorde/waardes om 'n probleem op te los, te veronderstel, word NIE toegelaat NIE.*

QUESTION/VRAAG 1

Distance from the store in km <i>Afstand vanaf die winkel in km</i>	1	2	3	4	5	7	8	10
Average number of times shopped per week <i>Gemiddelde aantal keer wat kopers die winkel per week besoek</i>	12	10	7	7	6	2	3	2

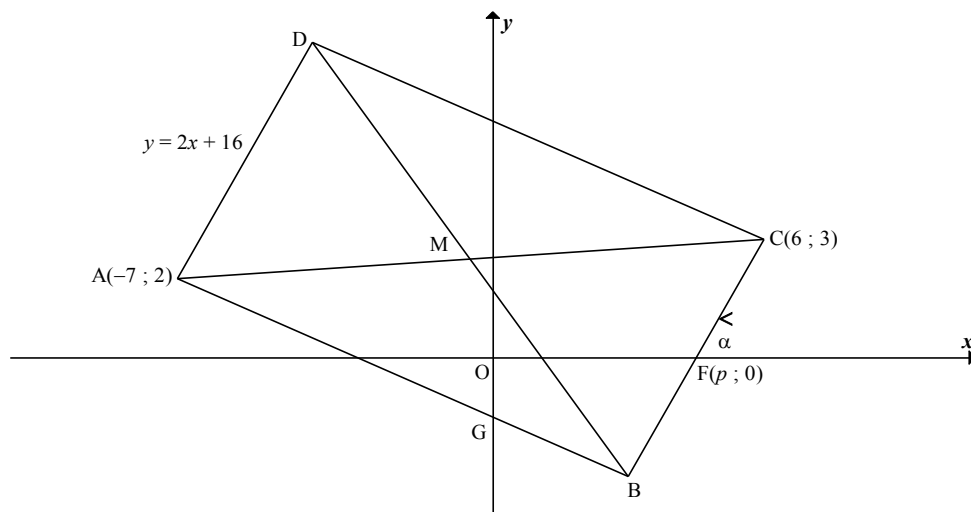


1.1	Strong/ <i>Sterk</i>	✓	(1)
1.2	-0,95 (-0,9462...)	✓	(1)
1.3	$a = 11,71$ (11,7132...) $b = -1,12$ (-1,1176...) $\hat{y} = -1,12x + 11,71$	✓ value of a ✓ value of b ✓ equation/vgl	(3)
1.4	$\hat{y} = -1,12(6) + 11,71$ = 5 times	✓ substitution ✓ answer	(2)
1.5	On scatter plot/ <i>Op spreidiagram</i>	✓✓ A line close to any 2 of the following points: (5 ; 6) or (10 ; $\frac{1}{2}$) or (6 ; 5) or (0 ; 11,7)	(2) [9]

QUESTION/VRAAG 2

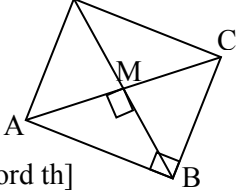
2.1	Positively skewed OR skewed to the right/ <i>positief skeef OF skeef na regs</i>	✓ answer (1)												
2.2	Range/ <i>Omvang</i> = $2,21 - 1,39 = 0,82$ m	✓ subtract values ✓ answer (2)												
2.3	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Intervals <i>Klasse</i></th> <th style="text-align: center;">Cumulative frequency <i>Kumulatiewe frekwensie</i></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$1,3 \leq x < 1,5$</td> <td style="text-align: center;">24</td> </tr> <tr> <td style="text-align: center;">$1,5 \leq x < 1,7$</td> <td style="text-align: center;">95</td> </tr> <tr> <td style="text-align: center;">$1,7 \leq x < 1,9$</td> <td style="text-align: center;">133</td> </tr> <tr> <td style="text-align: center;">$1,9 \leq x < 2,1$</td> <td style="text-align: center;">156</td> </tr> <tr> <td style="text-align: center;">$2,1 \leq x < 2,3$</td> <td style="text-align: center;">160</td> </tr> </tbody> </table>	Intervals <i>Klasse</i>	Cumulative frequency <i>Kumulatiewe frekwensie</i>	$1,3 \leq x < 1,5$	24	$1,5 \leq x < 1,7$	95	$1,7 \leq x < 1,9$	133	$1,9 \leq x < 2,1$	156	$2,1 \leq x < 2,3$	160	✓95 , 133, 156 ✓160 (2)
Intervals <i>Klasse</i>	Cumulative frequency <i>Kumulatiewe frekwensie</i>													
$1,3 \leq x < 1,5$	24													
$1,5 \leq x < 1,7$	95													
$1,7 \leq x < 1,9$	133													
$1,9 \leq x < 2,1$	156													
$2,1 \leq x < 2,3$	160													
2.4	<p style="text-align: center;">OGIVE/OGIEF</p>	✓ upper limits / <i>boonste limiete</i> ✓ cum <i>f</i> / <i>kum f</i> ✓ shape / <i>vorm</i> ✓ grounded <i>geanker</i> (4)												
2.5	method (using 80 to determine the height) 1,65 (accept any value between 1,6 and 1,69)	✓ method ✓ answer (2)												
2.6.1	The mean would change by 0,1 m <i>Die gemiddelde sal met 0,1 m verander</i>	✓ answer (1)												
2.6.2	No influence/change as there is no difference in variation of data./ <i>Geen invloed /verandering aangesien daar geen verskil in die variasie van die data is nie.</i>	✓ answer (1) [13]												

QUESTION/VRAAG 3



<p>3.1</p>	<p>M = Midpt of AC [diags of rectangle bisect/ hoekl v reghoek halveer]</p> $= M\left(\frac{-7+6}{2}; \frac{2+3}{2}\right)$ $= M\left(-\frac{1}{2}; \frac{5}{2}\right)$	<p>✓ x-value of M ✓ y-value of M (2)</p>
<p>3.2</p>	$m_{BC} = \frac{3-0}{6-p} = \frac{3}{6-p}$ <p>OR/OF</p> $m_{BC} = \frac{0-3}{p-6} = \frac{-3}{p-6}$	<p>✓ answer (1)</p> <p>✓ answer (1)</p>
<p>3.3</p>	$m_{AD} = m_{BC} \text{ [AD BC]}$ $m_{BC} = 2$ $\frac{3}{6-p} = 2$ $3 = 12 - 2p$ $p = 4\frac{1}{2}$ <p>OR/OF</p> $y - y_1 = 2(x - x_1)$ <p>C(6;3)</p> $y - 3 = 2(x - 6)$ $\therefore y = 2x - 9$ <p>but y = 0</p> $\therefore x = 4\frac{1}{2} = p$ <p>OR/OF</p>	<p>✓ $m_{BC} = 2$</p> <p>✓ equating</p> <p>✓ answer (3)</p> <p>✓ $m_{BC} = 2$</p> <p>✓ substituting (6; 3)</p> <p>✓ answer (3)</p>

	$y = 2x + c$ $3 = 12 + c$ $-9 = c$ $y = 2x - 9$ $0 = 2x - 9$ $x = \frac{9}{2} \quad \therefore p = \frac{9}{2}$	✓ $m_{BC} = 2$ ✓ substituting ✓ answer (3)
3.4	DB = AC [diag of rectangle = / <i>hoekl v reghoek</i> =] $AC = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $AC = \sqrt{(6 + 7)^2 + (3 - 2)^2}$ $AC = \sqrt{13^2 + 1^2}$ $AC = \sqrt{170}$ $\therefore DB = \sqrt{170}$ or 13,04	✓ substitution ✓ length of AC ✓ AC = BD (3)
3.5	$\tan \alpha = m_{BC} = 2$ $\therefore \alpha = 63,43^\circ$	✓ $\tan \alpha = m_{BC}$ ✓ $\alpha = 63,43^\circ$ (2)
3.6	In quadrilateral OFBG: $\widehat{OFB} = 63,43^\circ$ [vert opp \angle s/ <i>regoorst \anglee</i>] $\widehat{FOG} = \widehat{GBF} = 90^\circ$ $\therefore \widehat{OGB} = 360^\circ - [90^\circ + 90^\circ + 63,43^\circ]$ [sum \angle s quad/ <i>som \anglee vierh</i> = 360°] $\therefore \widehat{OGB} = 116,57^\circ$ OR/OF $m_{AB} = -\frac{1}{2}$ $90^\circ + \widehat{OGA} = 153,43^\circ$ $\therefore \widehat{OGA} = 63,43^\circ$ $\widehat{OGB} = 180^\circ - 63,43^\circ$ $= 116,57^\circ$ OR/OF $\widehat{FOG} = \widehat{GBF} = 90^\circ$ \therefore GOFB is cyc quad $\widehat{OGB} = 180^\circ - 63,43^\circ$ [\angle s of cyc quad = 180°] $= 116,57^\circ$ OR/OF $\widehat{OFB} = 63,43^\circ$ $\widehat{XOG} = \widehat{FBG} = 90^\circ$ \therefore OGBF is a cyclic quad $\therefore \widehat{OGB} = 180^\circ - 63,43^\circ$ $\widehat{OGB} = 116,57^\circ$	✓ size of \widehat{OFB} ✓ S ✓ answer (3) ✓ $m_{AB} = -\frac{1}{2}$ ✓ S ✓ answer (3) ✓ S ✓ S ✓ answer (3) ✓ S ✓ S ✓ answer (3)

<p>3.7</p>	<p>$M\left(-\frac{1}{2}; \frac{5}{2}\right)$ is the centre/<i>is die middelpunt</i></p> <p>$r = \frac{\sqrt{170}}{2} = \text{radius}$ [BD is diameter/<i>middel lyn</i>]</p> <p>$\left(x + \frac{1}{2}\right)^2 + \left(y - \frac{5}{2}\right)^2 = \left(\frac{\sqrt{170}}{2}\right)^2 = \frac{85}{2} = 42,5$</p>	<p>✓ M is centre</p> <p>✓ $r = \frac{\sqrt{170}}{2}$</p> <p>✓ equation</p> <p>(3)</p>
<p>3.8</p>	<p>$\hat{C}BM = \hat{B}AM = 45^\circ$ [diag of square bisect \angles/<i>hoekl v vierk halv \anglee</i>] $\therefore BC$ will be a tangent [converse tan chord th/<i>omgekeerde raakl-koordst</i>] OR/OF</p> <p>$\hat{A}MB = 90^\circ$ [diag of square bisect \perp] $\therefore AB$ is diameter $BC \perp AB$ $\therefore BC$ is tangent [line \perp radius <i>or</i> converse tan-chord th]</p> 	<p>✓S</p> <p>✓R</p> <p>(2)</p> <p>✓S</p> <p>✓R</p> <p>(2)</p> <p>[19]</p>

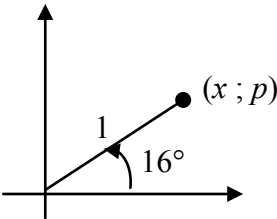
	$m_{TS} \times m_{RS} = -1 \quad [TS \perp SR]$ $\therefore m_{RS} = \frac{2}{5}$ $y - y_1 = \frac{2}{5}(x - x_1)$ $y - 2 = \frac{2}{5}(x - 5)$ $y = \frac{2}{5}x$	<p>✓ m_{RS}</p> <p>✓ substitution m and $(5 ; 2)$</p> <p>✓ equation (3)</p>
<p>4.4.1</p>	$r = \sqrt{36\frac{1}{4}}$ $TR = 2.r = 2\left(\sqrt{36\frac{1}{4}}\right) = \sqrt{145}$ <p>OR/OF</p> $TM = \sqrt{(3-9)^2 + \left(7-6\frac{1}{2}\right)^2} = \frac{\sqrt{145}}{2}$ $TR = 2.r = 2\left(\sqrt{36\frac{1}{4}}\right) = \sqrt{145}$	<p>✓ r</p> <p>✓ answer (2)</p> <p>✓ substitution</p> <p>✓ answer (2)</p>
<p>4.4.2</p>	$M\left(9 ; 6\frac{1}{2}\right)$ $\therefore \frac{x_R + 3}{2} = 9 \quad \text{and} \quad \frac{y_R + 7}{2} = 6\frac{1}{2}$ $\therefore R(15 ; 6)$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>Answer only: full marks Answer only: only 1 coordinate correct (1 mark)</p> </div> <p>OR/OF</p> $M\left(9 ; 6\frac{1}{2}\right)$ $\therefore R\left(9+6 ; 6\frac{1}{2}-\frac{1}{2}\right) = R(15 ; 6)$ <p>OR/OF</p>	<p>✓ M</p> <p>✓ x coordinate ✓ y coordinate (3)</p> <p>✓ M</p> <p>✓ x coordinate ✓ y coordinate (3)</p>

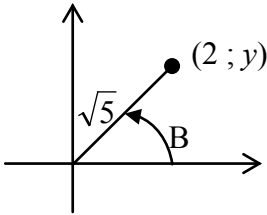
	$m_{TM} = \frac{9-3}{6\frac{1}{2}-7} = -\frac{1}{12}$ $TM : 7 = -\frac{1}{12}(3) + c \quad y = -\frac{1}{12}x + \frac{29}{4} \quad \dots\dots(1)$ $SR : y = \frac{2}{5}x \quad \dots\dots(2)$ $\frac{2}{5}x = -\frac{1}{12}x + \frac{29}{4}$ $\frac{29}{60}x = \frac{29}{4}$ $\therefore x = 15$ $\therefore y = \frac{2}{5}(15) = 6$	<p>✓ equating</p> <p>✓ x coordinate</p> <p>✓ y coordinate</p> <p>(3)</p>
<p>4.4.3</p>	$ST = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $ST = \sqrt{(5-3)^2 + (2-7)^2}$ $ST = \sqrt{4+25} = \sqrt{29}$ $\sin R = \frac{TS}{TR} = \frac{\sqrt{29}}{\sqrt{145}} \text{ or } \frac{\sqrt{5}}{5} \text{ or } \frac{1}{\sqrt{5}} \text{ or } 0,45$ <p>OR/OF</p> $TS = \sqrt{29}$ $SR = 2\sqrt{29}$ $\text{area of } \Delta TSR = \frac{1}{2}(\sqrt{29})(2\sqrt{29}) = 29$ $29 = \frac{1}{2}(\sqrt{145})(2\sqrt{29}) \sin R$ $\sin R = \frac{\sqrt{5}}{5} \text{ or } \frac{1}{\sqrt{5}}$	<p>✓ substitution</p> <p>✓ answer</p> <p>✓ ratio</p> <p>(3)</p> <p>✓ area</p> <p>✓ rule</p> <p>✓ ratio</p> <p>(3)</p>
<p>4.4.4</p>	$m_{TR} = \frac{7-6}{3-9} = -\frac{1}{12} \quad \text{OR/OF} \quad m_{TR} = \frac{7-6}{3-15} = -\frac{1}{12}$ $m_{TR} \times m_{KTL} = -1 \quad [r \perp \text{tangent}]$ $m_{KTL} = 12$ $y - y_1 = 12(x - x_1)$ $y - 7 = 12(x - 3)$ $y = 12x - 29$ <p>substitute K(a; b) :</p> $b = 12a - 29$ <p>OR/OF</p>	<p>✓ $m_{TR} = -\frac{1}{12}$</p> <p>✓ $m_{KTL} = 12$</p> <p>✓ $y = 12x - 29$</p> <p>(3)</p>

	$m_{TR} = \frac{7 - 6\frac{1}{2}}{3 - 9} = -\frac{1}{12}$ $m_{TR} \times m_{KTL} = -1 \quad [r \perp \text{tangent}]$ $\frac{b - 7}{a - 3} = 12$ $b - 7 = 12(a - 3)$ $b = 12a - 29$ <p>OR/OF</p> $KR^2 = TR^2 + TK^2$ $(a - 15)^2 + (b - 6)^2 = (15 - 3)^2 + (6 - 7)^2 + (a - 3)^2 + (b - 7)^2$ $-30a + 225 - 12b + 36 = 144 + 1 - 6a + 9 - 14b + 49$ $2b = 24a - 58$ $b = 12a - 29$	$\checkmark m_{TR} = -\frac{1}{12}$ $\checkmark m_{KTL} = 12$ $\checkmark \text{substitution}$ $(3 ; 7) \text{ \& } (a ; b)$ <p style="text-align: right;">(3)</p> $\checkmark \text{subst into Pyth}$ $\checkmark \text{multiplication}$ $\checkmark \text{simplification}$ <p style="text-align: right;">(3)</p>
<p>4.4.5</p>	$TK = TR$ $\sqrt{(a - 3)^2 + (b - 7)^2} = \sqrt{145}$ $(a - 3)^2 + (b - 7)^2 = 145$ <p>Substitute $b = 12a - 29$ [from 4.4.4]</p> $(a - 3)^2 + (12a - 29 - 7)^2 = 145$ $(a - 3)^2 + (12a - 36)^2 = 145$ $a^2 - 6a + 9 + 144a^2 - 864a + 1296 - 145 = 0$ $145a^2 - 870a + 1160 = 0$ $a = \frac{870 \pm \sqrt{(870)^2 - 4(145)(1160)}}{290}$ $a = 2 \text{ or } a = 4$ $\therefore b = 12(2) - 29 = -5 \quad \text{or} \quad b = 12(4) - 29 = 19$ $\therefore K(2 ; -5)$ <p>OR/OF</p>	$\checkmark \text{substitution into distance formula}$ $\checkmark \text{substitution of } b = 12a - 29$ $\checkmark \text{standard form}$ $\checkmark \text{subst into formula or factorise}$ $\checkmark \text{values of } a$ $\checkmark \text{value of } b$ <p style="text-align: right;">(6)</p>

<p style="text-align: center;">$TK = TR$</p> $\sqrt{(a-3)^2 + (b-7)^2} = \sqrt{145}$ $(a-3)^2 + (b-7)^2 = 145$ <p>Substitute $b = 12a - 29$ [from 4.4.4]</p> $(a-3)^2 + (12a-29-7)^2 = 145$ $(a-3)^2 + (12a-36)^2 = 145$ $(a-3)^2 + 144(a-3)^2 = 145$ $(a-3)^2 = 1$ $a-3 = \pm 1$ $a = 2 \text{ or } 4$ $\therefore b = 12(2) - 29 = -5 \quad \text{or} \quad b = 12(4) - 29 = 19$ $\therefore K(2; -5)$ <p>OR/OF</p> $KR^2 = TR^2 + TK^2$ $(a-15)^2 + (b-6)^2 = 145 + 145$ $(a-15)^2 + (12a-29-6)^2 = 290$ $(a-15)^2 + (12a-35)^2 = 290$ $a^2 - 30a + 225 + 144a^2 - 840a + 1225 = 290$ $145a^2 - 870a + 1160 = 0$ $a^2 - 6a + 8 = 0$ $\therefore (a-2)(a-4) = 0$ $a = 2 \text{ or } a = 4$ $\therefore b = 12(2) - 29 = -5 \quad \text{or} \quad b = 12(4) - 29 = 19$ $K(2; -5)$	<p>✓ substitution into distance formula</p> <p>✓ substitution of $b = 12a - 29$</p> <p>✓ $(a-3)^2 = 1$</p> <p>✓ ± 1</p> <p>✓ values of a</p> <p>✓ value of b</p> <p style="text-align: right;">(6)</p> <p>✓ substitution</p> <p>✓ substitution of $b = 12a - 29$</p> <p>✓ standard form</p> <p>✓ factors</p> <p>✓ values of a</p> <p>✓ value of b</p> <p style="text-align: right;">(6)</p>
	[23]

QUESTION/VRAAG 5

5.1.1	$\sin 196^\circ = -\sin 16^\circ$ $= -p$	✓ reduction ✓ answer (2)
5.1.2	$\cos 16^\circ = \sqrt{1 - \sin^2 16^\circ}$ $= \sqrt{1 - p^2}$ <p>OR/OF</p> $x^2 + p^2 = 1$ $x = \sqrt{1 - p^2}$ $\therefore \cos 16^\circ = \frac{\sqrt{1 - p^2}}{1} = \sqrt{1 - p^2}$ 	✓ statement ✓ answer (2) ✓ x in terms of p ✓ answer (2)
5.2	$\sin(A + B) = \cos[90^\circ - (A + B)]$ $= \cos[(90^\circ - A) - B]$ $= \cos(90^\circ - A)\cos B + \sin(90^\circ - A)\sin B$ $= \sin A \cos B + \cos A \sin B$	✓ co-ratio ✓ correct form ✓ expansion (3)
5.3	$\frac{\sqrt{1 - \cos^2 2A}}{\cos(-A) \cdot \cos(90^\circ + A)}$ $= \frac{\sqrt{\sin^2 2A}}{\cos A \cdot (-\sin A)}$ $= \frac{\sin 2A}{\cos A \cdot (-\sin A)}$ $= \frac{2 \sin A \cos A}{\cos A \cdot (-\sin A)}$ $= -2$ <p>OR/OF</p> $\frac{\sqrt{1 - \cos^2 2A}}{\cos(-A) \cos(90^\circ + A)} = \frac{\sqrt{1 - (2\cos^2 A - 1)^2}}{\cos A \cdot -\sin A}$ $= \frac{\sqrt{1 - (4\cos^4 A - 4\cos^2 A + 1)}}{\cos A \cdot -\sin A} = \frac{\sqrt{4\cos^2 A - 4\cos^4 A}}{\cos A \cdot -\sin A}$ $= \frac{\sqrt{4\cos^2 A(1 - \cos^2 A)}}{\cos A \cdot -\sin A} = \frac{\sqrt{4\cos^2 A \sin^2 A}}{\cos A \cdot -\sin A}$ $= \frac{2\cos A \sin A}{\cos A \cdot -\sin A}$ $= -2$ <p>OR/OF</p>	✓ $\sqrt{\sin^2 2A}$ ✓ $\cos A$ ✓ $-\sin A$ ✓ $2\sin A \cos A$ ✓ answer (5) ✓ $2\cos^2 A - 1$ ✓ $\cos A$ ✓ $-\sin A$ ✓ identity ✓ answer (5)

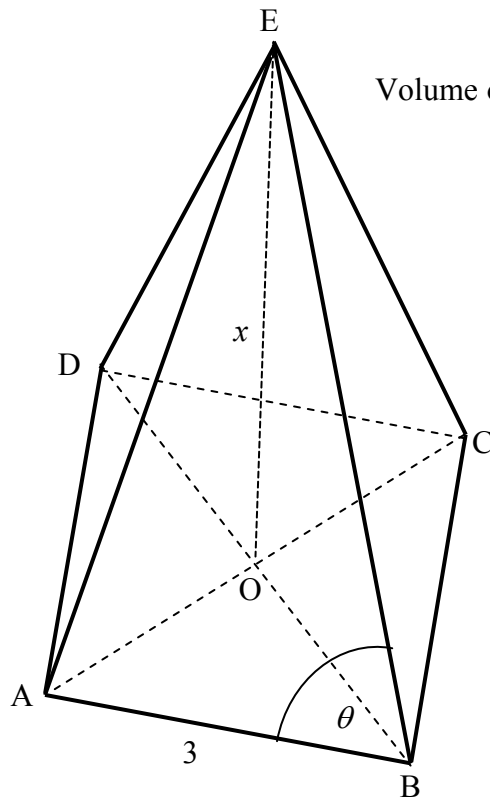
	$\frac{\sqrt{1 - (1 - 2\sin^2 A)^2}}{\cos A - \sin A}$ $= \frac{\sqrt{1 - (1 - 4\sin^2 A + 4\sin^2 A)}}{\cos A - \sin A}$ $= \frac{\sqrt{4\sin^2 A(1 - \sin^2 A)}}{\cos A - \sin A}$ $= \frac{2\sin A \sqrt{\cos^2 A}}{\cos A - \sin A}$ $= -2$	<p>✓ $1 - 2\sin^2 A$ ✓ $\cos A$ ✓ $-\sin A$</p> <p>✓ identity ✓ answer</p> <p>(5)</p>
<p>5.4.1</p>	$\cos 2B = \frac{3}{5}$ $2\cos^2 B - 1 = \frac{3}{5}$ $\cos^2 B = \frac{4}{5}$ $\therefore \cos B = \sqrt{\frac{4}{5}} \text{ or } \frac{2}{\sqrt{5}} \text{ or } \frac{2\sqrt{5}}{5} \quad [0^\circ \leq B \leq 90^\circ]$ <p>OR/OF</p> $\cos B = \frac{\sqrt{\cos 2B + 1}}{2}$ $= \frac{\sqrt{\frac{3}{5} + 1}}{2}$ $= \frac{2\sqrt{5}}{5}$	<p>✓ identity ✓ value of $\cos^2 B$ ✓ answer</p> <p>(3)</p> <p>✓ $= \frac{\sqrt{\cos 2B + 1}}{2}$ ✓ value of $\cos^2 B$ ✓ answer</p> <p>(3)</p>
<p>5.4.2</p>	$\sin^2 B = 1 - \cos^2 B$ $= 1 - \left(\frac{2}{\sqrt{5}}\right)^2$ $= \frac{1}{5} \quad \therefore \sin B = \frac{1}{\sqrt{5}} \text{ or } \frac{\sqrt{5}}{5}$ <p>OR/OF</p> $(2)^2 + y^2 = (\sqrt{5})^2$ $4 + y^2 = 5$ $y^2 = 1$ $y = 1$ $\therefore \sin B = \frac{1}{\sqrt{5}} \text{ or } \frac{\sqrt{5}}{5}$ 	<p>✓ $\sin^2 B = \frac{1}{5}$ ✓ answer</p> <p>(2)</p> <p>✓ $y = 1$ ✓ answer</p> <p>(2)</p>

	<p>OR/OF</p> $\cos 2B = \frac{3}{5}$ $1 - 2\sin^2 B = \frac{3}{5}$ $\sin^2 B = \frac{1}{5}$ $\therefore \sin B = \frac{1}{\sqrt{5}} \text{ or } \frac{\sqrt{5}}{5}$	<p>✓ $\sin^2 B = \frac{1}{5}$</p> <p>✓ answer</p> <p>(2)</p>
<p>5.4.3</p>	<p>$\cos(B + 45^\circ) = \cos B \cdot \cos 45^\circ - \sin B \cdot \sin 45^\circ$</p> $= \left(\frac{2}{\sqrt{5}}\right)\left(\frac{1}{\sqrt{2}}\right) - \left(\frac{1}{\sqrt{5}}\right)\left(\frac{1}{\sqrt{2}}\right)$ $= \frac{2}{\sqrt{10}} - \frac{1}{\sqrt{10}}$ $= \frac{1}{\sqrt{10}} \text{ or } \frac{\sqrt{10}}{10}$ <p>OR/OF</p> <p>$\cos(B + 45^\circ) = \cos B \cdot \cos 45^\circ - \sin B \cdot \sin 45^\circ$</p> $= \left(\frac{2}{\sqrt{5}}\right)\left(\frac{\sqrt{2}}{2}\right) - \left(\frac{1}{\sqrt{5}}\right)\left(\frac{\sqrt{2}}{2}\right)$ $= \frac{2\sqrt{2}}{2\sqrt{5}} - \frac{\sqrt{2}}{2\sqrt{5}}$ $= \frac{\sqrt{2}}{2\sqrt{5}} \text{ or } \frac{\sqrt{10}}{10}$	<p>✓ expansion</p> <p>✓ $\left(\frac{1}{\sqrt{2}}\right)$</p> <p>✓ $\left(\frac{2}{\sqrt{5}}\right) \& \left(\frac{1}{\sqrt{5}}\right)$</p> <p>✓ answer</p> <p>(4)</p> <p>✓ expansion</p> <p>✓ $\left(\frac{1}{\sqrt{2}}\right)$</p> <p>✓ $\left(\frac{2}{\sqrt{5}}\right) \& \left(\frac{1}{\sqrt{5}}\right)$</p> <p>✓ answer</p> <p>(4)</p>
		<p>[21]</p>

QUESTION/VRAAG 6

<p>6.1</p>		<p>✓ x- intercepts/ afsnitte</p> <p>✓ y- intercept/ afsnit</p> <p>✓ turning pts/ draaipste</p> <p>(3)</p>
<p>6.2</p>	<p>$f(x) - 3 = 2 \sin 2x - 3$ ∴ maximum value = $2 - 3 = -1$</p>	<p>✓ ✓ answer</p> <p>(2)</p>
<p>6.3</p>	<p>$2 \sin 2x = -\cos 2x$ $\tan 2x = -\frac{1}{2}$ $\text{ref}\angle = 26,57^\circ$ $2x = 153,43^\circ + k \cdot 180^\circ; k \in Z$ $x = 76,72^\circ + k \cdot 90^\circ; k \in Z$ or $x = -13,28^\circ + k \cdot 90^\circ; k \in Z$</p> <p>OR/OF</p> <p>$2 \sin 2x = -\cos 2x$ $\tan 2x = -\frac{1}{2}$ $\text{ref}\angle = 26,57^\circ$ $2x = 153,43^\circ + k \cdot 360^\circ$ or $333,43^\circ + k \cdot 360^\circ; k \in Z$ $x = 76,72^\circ + k \cdot 180^\circ$ or $166,72^\circ + k \cdot 180^\circ; k \in Z$</p>	<p>✓ $\tan 2x = -\frac{1}{2}$</p> <p>✓ $2x = 153,43^\circ$ or $-26,56^\circ$</p> <p>✓ $76,72^\circ$ or $-13,28^\circ$</p> <p>✓ $k \cdot 90^\circ; k \in Z$</p> <p>(4)</p> <p>✓ $\tan 2x = -\frac{1}{2}$</p> <p>✓ $2x = 153,43^\circ$ & $333,43^\circ$</p> <p>✓ $76,72^\circ$ & $166,72^\circ$</p> <p>✓ $k \cdot 180^\circ; k \in Z$</p> <p>(4)</p>
<p>6.4</p>	<p>$x \in (-103,28^\circ; -13,28^\circ)$</p> <p>OR/OF</p> <p>$-103,28^\circ < x < -13,28^\circ$</p>	<p>✓ ✓ values ✓ notation</p> <p>(3)</p> <p>✓ ✓ values ✓ notation</p> <p>(3)</p> <p>[12]</p>

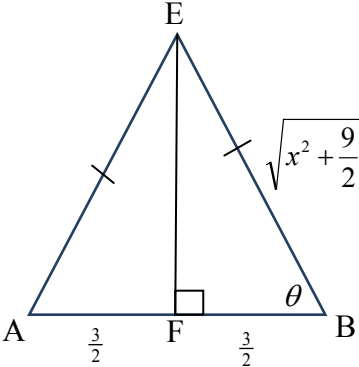
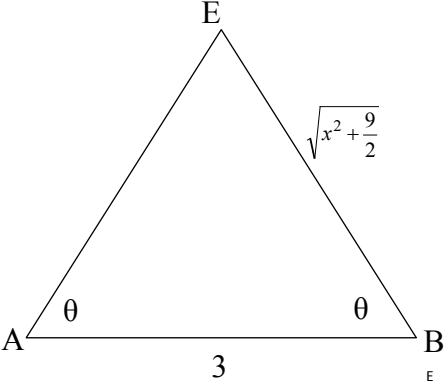
QUESTION/VRAAG 7



Volume of pyramid = $\frac{1}{3}$ (area of base) \times (\perp height)

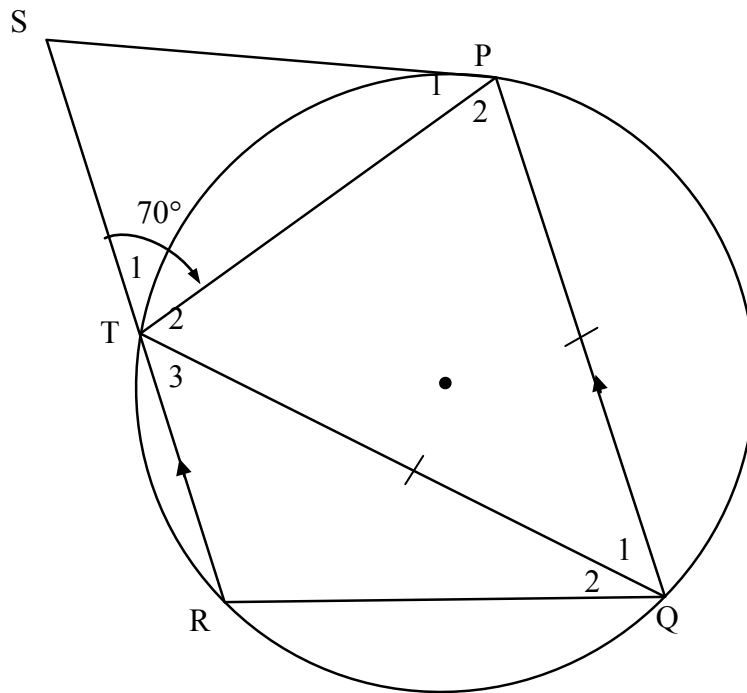
<p>7.1</p>	<p>$DB^2 = 3^2 + 3^2$ [Theorem of Pyth] $= 18$ $DB = \sqrt{18}$ $OB = \frac{1}{2} DB = \frac{\sqrt{18}}{2}$ or $\frac{3}{\sqrt{2}}$ or $\frac{3\sqrt{2}}{2}$ or 2,12 OR/OF $\sin 45^\circ = \frac{OB}{3}$ $OB = 3 \sin 45^\circ$ $OB = \frac{3\sqrt{2}}{2}$ or $\frac{3}{\sqrt{2}}$ or 2,12 OF/OR $\cos 45^\circ = \frac{OB}{3}$ $\frac{1}{\sqrt{2}} = \frac{OB}{3}$ $OB = \frac{3}{\sqrt{2}}$ or $\frac{3\sqrt{2}}{2}$ or 2,12</p>	<p>✓ substitution into Pyth ✓ value of DB ✓ answer (3) ✓ correct ratio ✓ OB as subject ✓ answer (3) ✓ correct ratio ✓ special angle ✓ answer (3)</p>
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	<p>OR/OF $\hat{A}OB = 90^\circ$ (diagonals bisect \perp) $OB = OA$ $AB^2 = AO^2 + BO^2$ [pyth] $\therefore AB^2 = 2OB^2$ $2OB^2 = 3^2$ $\therefore OB = \frac{3}{\sqrt{2}}$ or $\frac{3\sqrt{2}}{2}$ or 2,12</p>	<p>✓ $OB = OA$ ✓ Pyth ✓ answer (3)</p>
<p>7.2</p>	<p>$BE^2 = EO^2 + OB^2$ (Pyth) $BE^2 = x^2 + \left(\frac{3}{\sqrt{2}}\right)^2$ $BE = \sqrt{x^2 + \frac{9}{2}}$ $AE^2 = AB^2 + EB^2 - 2AB \cdot EB \cos \theta$ $\cos \theta = \frac{AB^2 + EB^2 - AE^2}{2AB \cdot EB} = \frac{AB^2}{2AB \cdot EB}$ [EB = AE] $\cos \theta = \frac{AB}{2EB}$ $\cos \theta = \frac{3}{2\sqrt{x^2 + \frac{9}{2}}}$</p> <p>OR/OF $BE^2 = EO^2 + OB^2$ (Pyth) $BE^2 = x^2 + \left(\frac{3}{\sqrt{2}}\right)^2$ $BE = \sqrt{x^2 + \frac{9}{2}}$ $AE^2 = AB^2 + EB^2 - 2AB \cdot EB \cos \theta$ $\left(\sqrt{x^2 + \frac{9}{2}}\right)^2 = 9 + \left(\sqrt{x^2 + \frac{9}{2}}\right)^2 - 2(3)\left(\sqrt{x^2 + \frac{9}{2}}\right) \cdot \cos \theta$ $\cos \theta = \frac{9}{6\sqrt{x^2 + \frac{9}{2}}}$ $= \frac{3}{2\sqrt{x^2 + \frac{9}{2}}}$</p>	<p>✓ substitution into Pyth ✓ length of BE ✓ correct cosine rule ✓ $\cos \theta$ as subject ✓ simplification (5)</p> <p style="text-align: right;">s</p> <p>✓ substitution into Pyth ✓ length of BE ✓ correct cosine rule ✓ substituting ✓ $\cos \theta$ as subject (5)</p>

	<p>OR/OF $BE^2 = EO^2 + OB^2$ (Pyth) $BE^2 = x^2 + \left(\frac{3}{\sqrt{2}}\right)^2$ $BE = \sqrt{x^2 + \frac{9}{2}}$ $\cos \theta = \frac{\frac{3}{2}}{\sqrt{x^2 + \frac{9}{2}}}$ $= \frac{3}{2\sqrt{x^2 + \frac{9}{2}}}$</p>  <p>OR/OF $\hat{E} = 180^\circ - 2\theta$ $\sin E = \sin 2\theta$ $\therefore \frac{3}{\sin 2\theta} = \frac{\sqrt{x^2 + \frac{9}{2}}}{\sin \theta}$ $\therefore \frac{3}{2 \sin \theta \cos \theta} = \frac{\sqrt{x^2 + \frac{9}{2}}}{\sin \theta}$ $\therefore \frac{3}{2 \cos \theta} = \sqrt{x^2 + \frac{9}{2}}$ $\cos \theta = \frac{3}{2\sqrt{x^2 + \frac{9}{2}}}$</p> 	<p>✓ substitution into Pyth ✓ length of BE ✓ sketch with values ✓ $\frac{3}{2}$ ✓ substitution</p> <p>(5)</p> <p>✓ $\hat{E} = 180^\circ - 2\theta$ ✓ $\sin E = \sin 2\theta$ ✓ subst into sine rule ✓ diagram ✓ $2 \sin \theta \cos \theta$</p> <p>(5)</p>
<p>7.3</p>	<p>Volume = $\frac{1}{3}$(area of base) × (⊥ height) $15 = \frac{1}{3}(9) \times x$ $x = 5$ $\cos \theta = \frac{3}{2\sqrt{25 + \frac{9}{2}}}$ $\therefore \theta = 73,97^\circ$</p>	<p>✓ substitution ✓ x-value ✓ substitution ✓ answer</p> <p>(4) [12]</p>

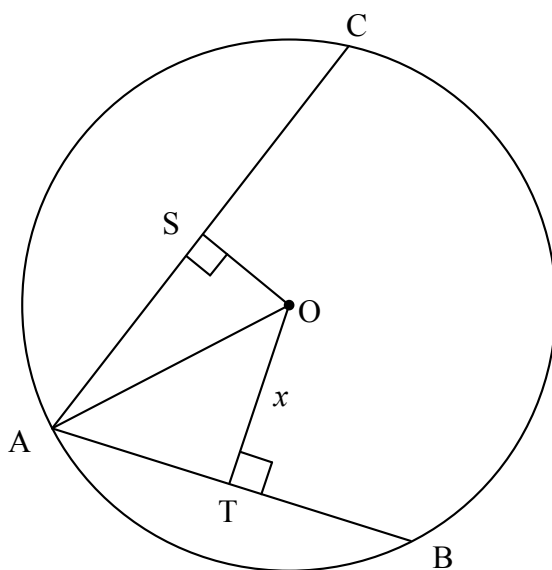
QUESTION/VRAAG 8

8.1



8.1.1	Alternate angles / <i>verwiss hoeke</i> , $PQ \parallel SR$	✓ R (1)
8.1.2(a)	$\hat{T}_2 = 70^\circ$ [∠s opp = sides/∠e teenoor = sye] $\therefore \hat{Q}_1 = 180^\circ - 2(70^\circ)$ [∠s/e Δ = 180°] $= 40^\circ$	✓ S ✓ R ✓ answer (3)
8.1.2(b)	$\hat{P}_1 = 40^\circ$ [tangent chord th/raakl-koordst]	✓ S ✓ R (2)

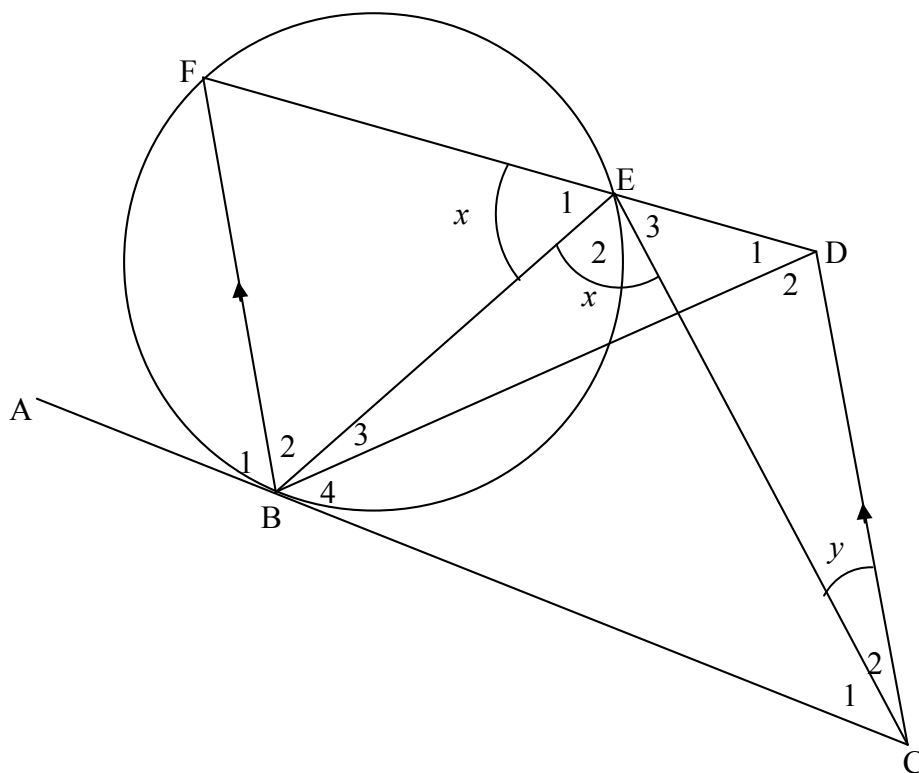
8.2



8.2.1	AT = 20 [line from centre \perp to chord/lyn vanaf midpt \perp koord]	\checkmark S (1)
8.2.2	$AO^2 = OS^2 + AS^2 \quad [\text{Pyth : } \Delta AOS]$ $OT^2 + AT^2 = OS^2 + AS^2 \quad [\text{Pyth : } \Delta AOT]$ <p>But AS = 24 [line from centre \perp to chord/lyn vanaf midpt \perp koord]</p> $OT^2 + 400 = \left(\frac{7}{15} OT\right)^2 + 576$ $176 = \frac{176}{225} OT^2$ $OT^2 = 225$ $OT = 15$ $\therefore AO = \sqrt{225 + 400}$ $= 25$ <p>OR/OF Let OS = 7, then OT = 15 In ΔAOT: $AO^2 = 20^2 + 15^2$ $= 625$ $AO = 25$ In ΔAOS: $AO^2 = 24^2 + 7^2$ $= 625$ $AO = 25$ $\therefore OA = 25$</p> <p>OR/OF</p>	\checkmark equating \checkmark AS = 24 \checkmark substitution $OS = \frac{7}{15} OT$ \checkmark OT \checkmark radius (5) $\checkmark\checkmark$ testing in ΔAOT $\checkmark\checkmark$ testing in ΔAOS \checkmark conclusion (5)

$AO^2 = OS^2 + AS^2 \quad [\text{Pyth : } \Delta AOS]$ $OT^2 + AT^2 = OS^2 + AS^2 \quad [\text{Pyth : } \Delta AOT]$ <p>Let $OT = 15x$. Then $OS = 7x$ But $AS = 24$ [line from centre \perp to chord/lyn vanaf midpt \perp koord]</p> $(15x)^2 + 400 = (7x)^2 + 576$ $225x^2 + 400 = 49x^2 + 576$ $176x^2 = 176$ $x = 1$ $\therefore AO = \sqrt{225 + 400} = 25$ <p>OR/OF $AS = 24$ [line from centre \perp to chord/lyn vanaf midpt \perp koord]</p> $AO^2 = OS^2 + AS^2 \quad [\text{Pyth : } \Delta AOS]$ $= \left(\frac{7}{15}OT\right)^2 + AS^2$ $AO^2 = \frac{49}{225}(AO^2 - 20^2) + 24^2 \quad [\text{Pyth : } \Delta AOT]$ $\frac{176}{225}AO^2 = \frac{4400}{9}$ $AO^2 = 625$ $AO = 25$	<p>✓ equating</p> <p>✓ $AS = 24$ ✓ substitution</p> <p>✓ $x = 1$</p> <p>✓ radius (5)</p> <p>✓ $AS = 24$</p> <p>✓ substitution $OS = \frac{7}{15}OT$ ✓ equating ✓ subst Pyth</p> <p>✓ radius (5) [12]</p>
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QUESTION/VRAAG 9



9.1.1	tangent chord theorem/raaklyn-koordstelling	✓ R	(1)
9.1.2	corresponding/ooreenkomstige \angle s/e; $FB \parallel DC$	✓ R	(1)
9.2	$\hat{E}_1 = \hat{C}_D$ $\therefore BCDE = \text{cyclic quad}$ [converse ext \angle cyc quad/omgek: <i>buite \anglekdvh</i>]	✓ S ✓ R	(2)
9.3	$\hat{D}_2 = \hat{E}_2$ [\angle s in the same segment/ \angle e in dies segment] $\hat{D}_2 = \hat{F}_B D$ [alt \angle s, $BF \parallel CD$ /verwiss \angle e, $BF \parallel CD$]	✓ S ✓ S	(2)
9.4	$\hat{B}_3 = y$ OR $\hat{B}_3 = \hat{C}_2$ [\angle s in the same segment/ \angle e in dies segment] $\hat{B}_2 = x - y$ OR $\hat{B}_3 + \hat{B}_2 = x$ [from 9.3 and 9.4] $\hat{C}_1 = x - y$ [from 9.2 and 9.3] $\therefore \hat{B}_2 = \hat{C}_1$ OR/OF In $\triangle BFE$ and $\triangle BEC$ $\hat{E}_1 = \hat{E}_2$ [= x] $\hat{F} = \hat{B}_3 + \hat{B}_4$ [tan - chord theorem] $\therefore \triangle BFE \parallel \triangle CBE$ [\angle, \angle, \angle] $\therefore \hat{B}_2 = \hat{C}_1$	✓ S ✓ S ✓ S ✓ identifying Δ 's ✓ S ✓ S	(3) [9]

<p>10.2.2(b)</p>	<p>$\tilde{K}_1 = \hat{G}\hat{F}M$ $L\hat{K}M$ or $\tilde{K}_1 = M\hat{H}F$ $M\hat{H}F = \hat{G}\hat{F}M$ In ΔMFH and ΔMGF: $\hat{M} = \hat{M}$ $M\hat{H}F = \hat{G}\hat{F}M$ $\therefore \Delta MFH \parallel \Delta MGF$ OR/OR $\tilde{K}_1 = \hat{G}\hat{F}M$ $L\hat{K}M$ or $\tilde{K}_1 = M\hat{H}F$ $M\hat{H}F = \hat{G}\hat{F}M$ In ΔMFH and ΔMGF: $\hat{M} = \hat{M}$ $M\hat{H}F = \hat{G}\hat{F}M$ $\hat{F}_2 = \hat{G}$ $\therefore \Delta MFH \parallel \Delta MGF$</p>	<p>[corresponding/ooreenkomst \angle s; $GF \parallel LK$] [ext \angle cyclic quad/buite\anglekoordevh] [common/gemeen] [proven/bewys] [$\angle\angle\angle$] [corresponding/ooreenkomst \angle s; $GF \parallel LK$] [ext \angle cyclic quad/buite\anglekoordevh] [common/gemeen] [proven/bewys] [\angles of $\Delta = 180^\circ$]</p>	<p>$\checkmark S \checkmark R$ $\checkmark S$ $\checkmark S$ $\checkmark R$ (5) $\checkmark S \checkmark R$ $\checkmark S$ $\checkmark S$ $\checkmark S$ (5)</p>
<p>10.2.2(c)</p>	<p>$\therefore \frac{GF}{FH} = \frac{MF}{MH}$ $= \frac{3x}{2y}$</p>	<p>[$\parallel \Delta$s]</p>	<p>$\checkmark S \checkmark R$ (2)</p>
<p>10.2.3</p>	<p>$\frac{MF}{MH} = \frac{MG}{MF}$ $\frac{3x}{2y} = \frac{3y}{3x}$ $\frac{y^2}{x^2} = \frac{9}{6} = \frac{3}{2}$ $\frac{y}{x} = \sqrt{\frac{3}{2}}$</p>	<p>[$\parallel \Delta$s] [from 10.2.2(c)]</p>	<p>$\checkmark S$ \checkmark substitution \checkmark simplification (3) [20]</p>
<p>TOTAL MARKS</p>			<p>150</p>