



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P2

NOVEMBER 2022

Stannmorephysics.com

MARKS: 150

TIME: 3 hours



This question paper consists of 13 pages and 1 information sheet.



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INSTRUCTIONS AND INFORMATION

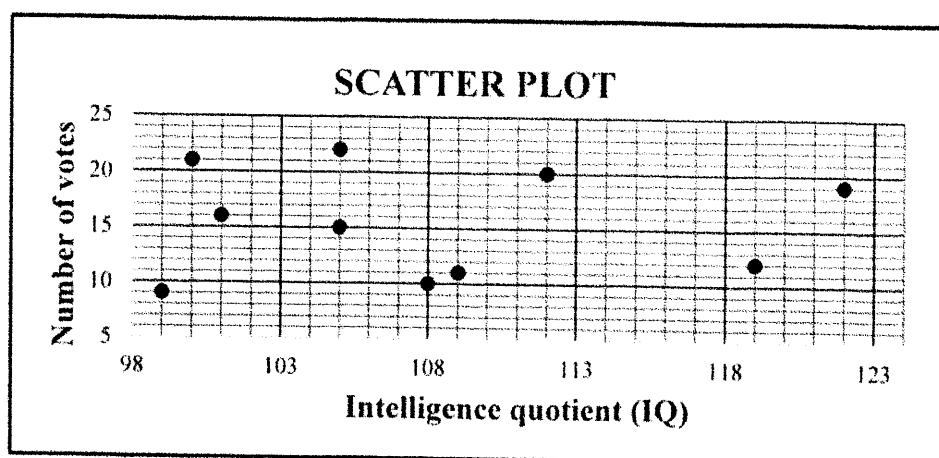
Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, etc. which you have used in determining your answers.
4. Answers only will NOT necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
6. If necessary, round off answers correct to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. An information sheet with formulae is included at the end of the question paper.
9. Write neatly and legibly.



QUESTION 1

The matric class of a certain high school had to vote for the chairperson of the RCL (representative council of learners). The scatter plot below shows the IQ (intelligence quotient) of the 10 learners who received the most votes and the number of votes that they received.



Before the election, the popularity of each of these ten learners was established and a popularity score (out of a 100) was assigned to each. The popularity scores and the number of votes of the same 10 learners who received the most votes are shown in the table below.

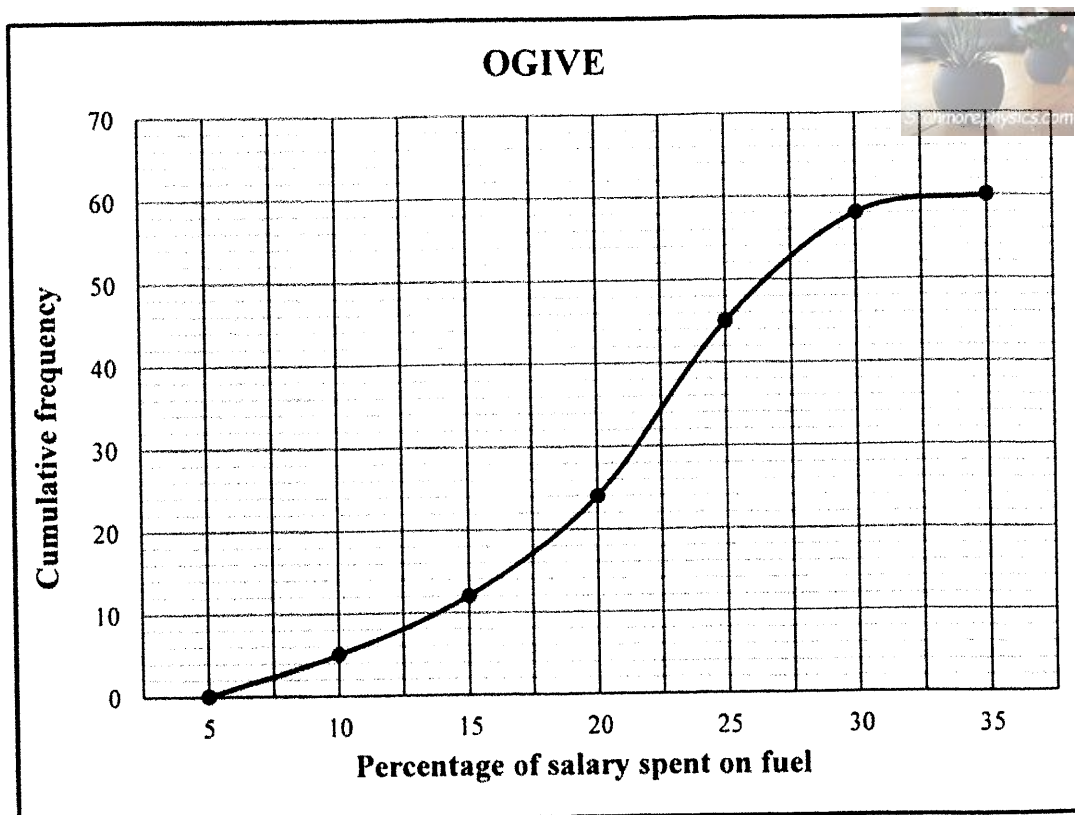
Popularity score (x)	32	89	35	82	50	59	81	40	79	65
Number of votes (y)	9	22	10	21	11	15	20	12	19	16

- 1.1 Calculate the:
 - 1.1.1 Mean number of votes that these 10 learners received (2)
 - 1.1.2 Standard deviation of the number of votes that these 10 learners received (1)
- 1.2 The learners who received fewer votes than one standard deviation below the mean were not invited for an interview. How many learners were invited? (2)
- 1.3 Determine the equation of the least squares regression line for the data given in the table. (3)
- 1.4 Predict the number of votes that a learner with a popularity score of 72 will receive. (2)
- 1.5 Using the scatter plot and table above, provide a reason why:
 - 1.5.1 IQ is not a good indicator of the number of votes that a learner could receive (1)
 - 1.5.2 The prediction in QUESTION 1.4 is reliable (1)



QUESTION 2

A company conducted research among all its employees on what percentage of their monthly salary was spent on fuel in a particular month. The data is represented in the ogive (cumulative frequency graph) below.

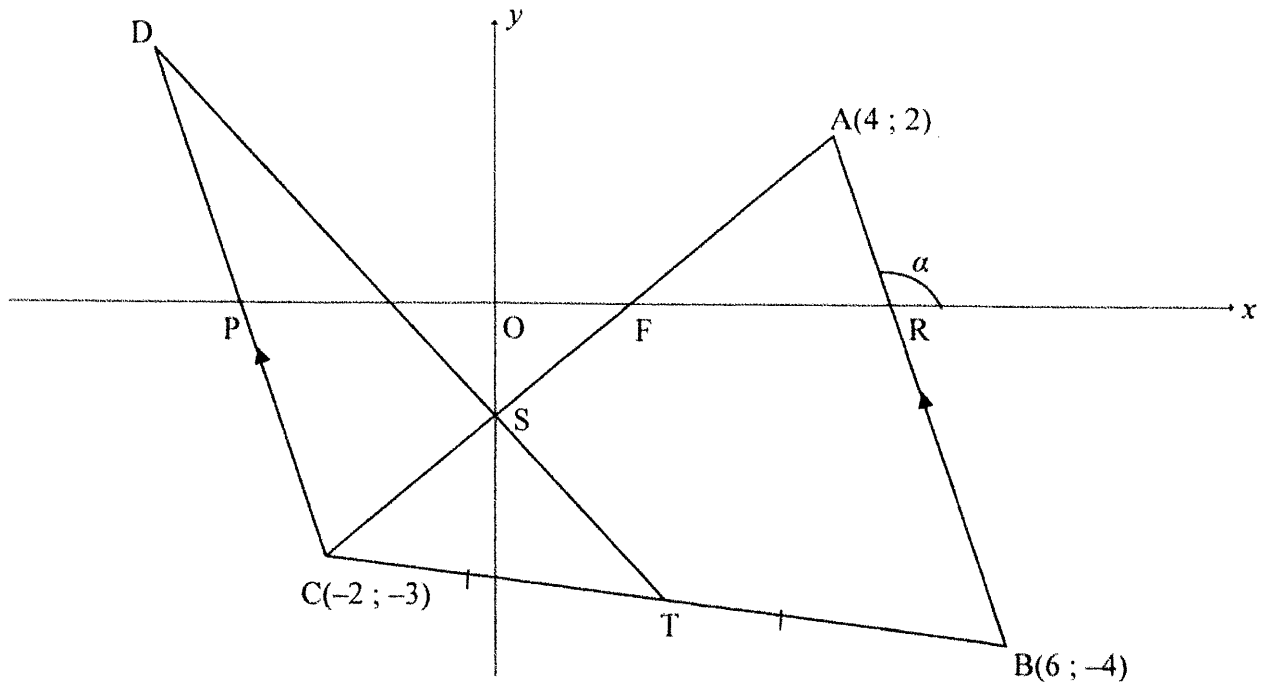


- 2.1 How many people are employed at this company? (1)
- 2.2 Write down the modal class of the data. (1)
- 2.3 How many employees spent more than 22,5% of their monthly salary on fuel? (2)
- 2.4 An employee spent R2 400 of his salary on fuel in that particular month. Determine the monthly salary of this employee if he spends 7% of his salary on fuel. (2)
- 2.5 The monthly salaries of these employees remains constant and the number of litres of fuel used in each month also remains constant. If the fuel price increases from R21,43 per litre to R22,79 per litre at the beginning of the next month, how will the above ogive change? (2)

[8]

QUESTION 3

In the diagram, $A(4; 2)$, $B(6; -4)$ and $C(-2; -3)$ are vertices of $\triangle ABC$. T is the midpoint of CB . The equation of line AC is $5x - 6y = 8$. The angle of inclination of AB is α . $\triangle DCT$ is drawn such that $CD \parallel BA$. The lines AC and DT intersect at S , the y -intercept of AC . P , F and R are the x -intercepts of DC , AC and AB respectively.

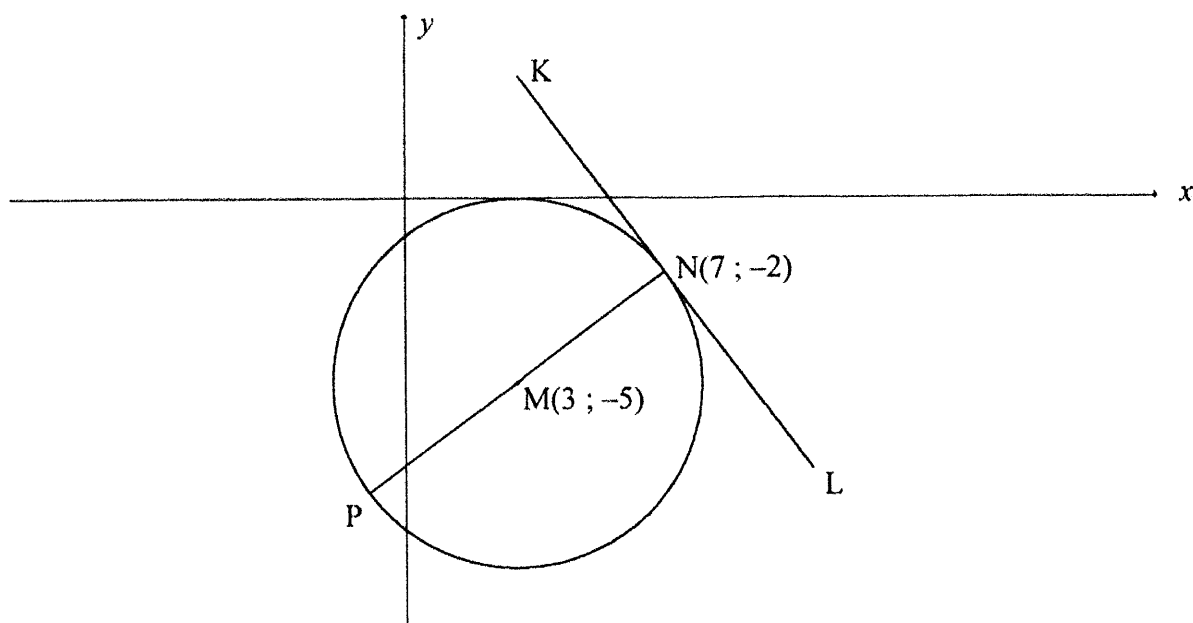


- 3.1 Calculate the:
- 3.1.1 Gradient of AB (2)
 - 3.1.2 Size of α (2)
 - 3.1.3 Coordinates of T (2)
 - 3.1.4 Coordinates of S (2)
- 3.2 Determine the equation of CD in the form $y = mx + c$. (3)
- 3.3 Calculate the:
- 3.3.1 Size of $\hat{DCA}$ (4)
 - 3.3.2 Area of $POSC$ (5)
- [20]**



QUESTION 4

In the diagram, $M(3; -5)$ is the centre of the circle having PN as its diameter. KL is a tangent to the circle at $N(7; -2)$.



- 4.1 Calculate the coordinates of P . (2)
- 4.2 Determine the equation of:
 - 4.2.1 The circle in the form $(x-a)^2 + (y-b)^2 = r^2$ (3)
 - 4.2.2 KL in the form $y = mx + c$ (5)
- 4.3 For which values of k will $y = -\frac{4}{3}x + k$ be a secant to the circle? (4)
- 4.4 Points $A(t; t)$ and B are not shown on the diagram.
From point A , another tangent is drawn to touch the circle with centre M at B .
 - 4.4.1 Show that the length of tangent AB is given by $\sqrt{2t^2 + 4t + 9}$. (2)
 - 4.4.2 Determine the minimum length of AB . (4)

[20]



QUESTION 5

5.1 Given that $\sqrt{13} \sin x + 3 = 0$, where $x \in (0^\circ ; 90^\circ)$.

Without using a calculator, determine the value of:

5.1.1 $\sin(360^\circ + x)$ (2)

5.1.2 $\tan x$ (3)

5.1.3 $\cos(180^\circ + x)$ (2)

5.2 Determine the value of the following expression, **without using a calculator**:

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

5.3 Determine the general solution of the following equation:

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

5.4 Given the identity: $\cos(x + y) \cdot \cos(x - y) = 1 - \sin^2 x - \sin^2 y$

5.4.1 Prove the identity. (4)

5.4.2 Hence, determine the value of $1 - \sin^2 45^\circ - \sin^2 15^\circ$, **without using a calculator**. (3)

5.5 Consider the trigonometric expression: $16 \sin x \cdot \cos^3 x - 8 \sin x \cdot \cos x$

5.5.1 Rewrite the expression as a single trigonometric ratio. (4)

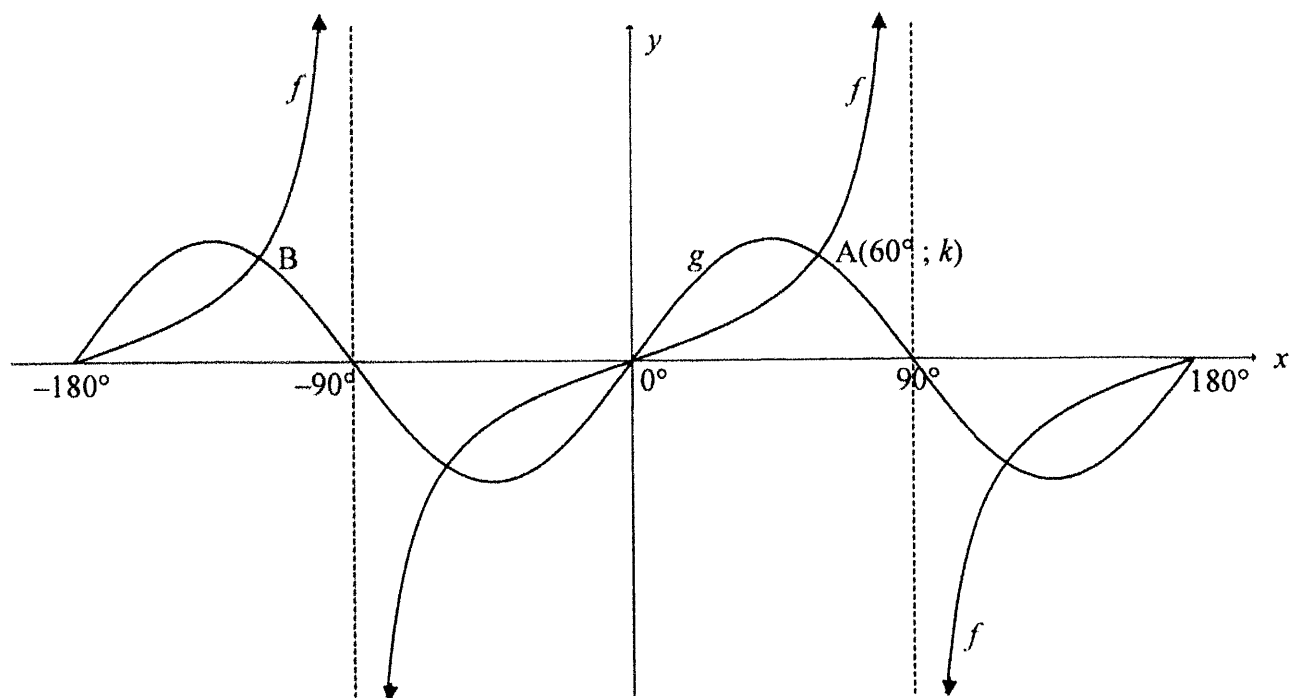
5.5.2 For which value of x in the interval $x \in [0^\circ ; 90^\circ]$ will $16 \sin x \cdot \cos^3 x - 8 \sin x \cdot \cos x$ have its minimum value? (1)

[30]



QUESTION 6

In the diagram below, the graphs of $f(x) = \tan x$ and $g(x) = 2\sin 2x$ are drawn for the interval $x \in [-180^\circ; 180^\circ]$. $A(60^\circ; k)$ and B are two points of intersection of f and g .

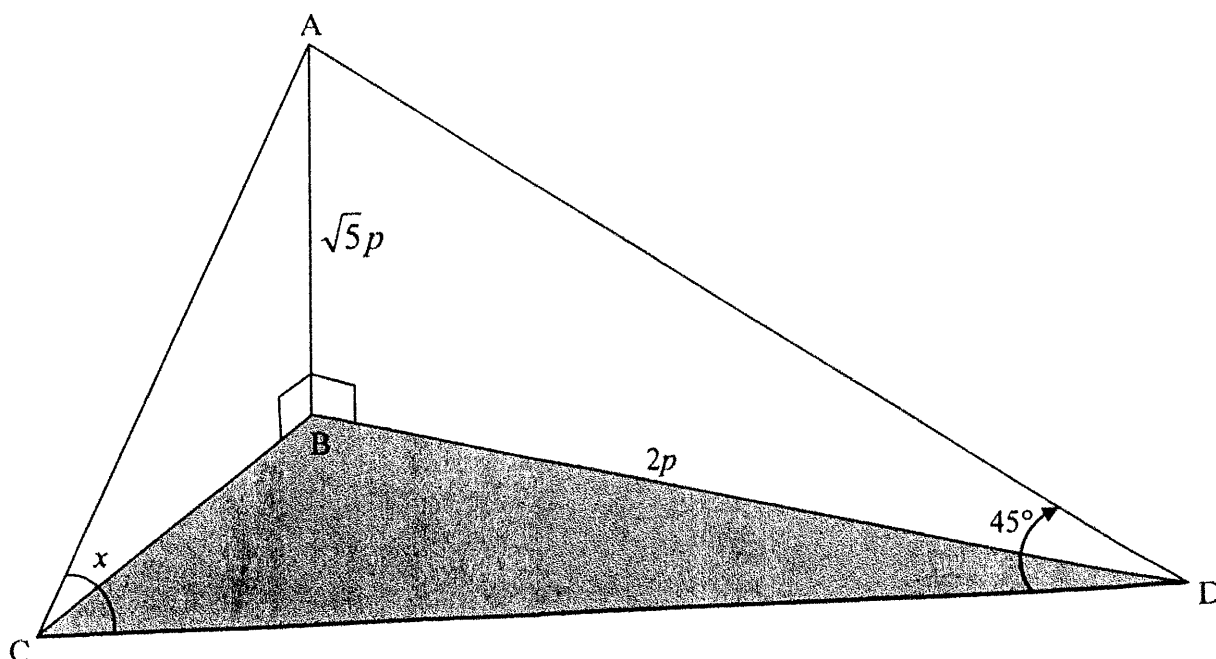


- 6.1 Write down the period of g . (1)
- 6.2 Calculate the:
- 6.2.1 Value of k (1)
- 6.2.2 Coordinates of B (1)
- 6.3 Write down the range of $2g(x)$. (2)
- 6.4 For which values of x will $g(x+5^\circ) - f(x+5^\circ) \leq 0$ in the interval $x \in [-90^\circ; 0^\circ]$? (2)
- 6.5 Determine the values of p for which $\sin x \cdot \cos x = p$ will have exactly two real roots in the interval $x \in [-180^\circ; 180^\circ]$. (3)
- [10]**



QUESTION 7

AB is a vertical flagpole that is $\sqrt{5}p$ metres long. AC and AD are two cables anchoring the flagpole. B, C and D are in the same horizontal plane. $BD = 2p$ metres, $\hat{ACD} = x$ and $\hat{ADC} = 45^\circ$.



7.1 Determine the length of AD in terms of p . (2)

7.2 Show that the length of $CD = \frac{3p(\sin x + \cos x)}{\sqrt{2} \sin x}$. (5)

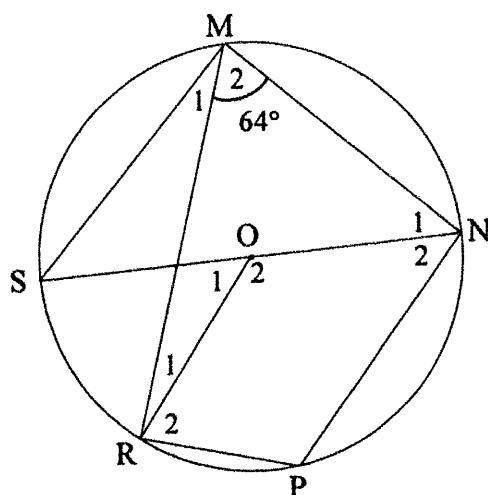
7.3 If it is further given that $p = 10$ and $x = 110^\circ$, calculate the area of $\triangle ADC$. (3)

[10]



QUESTION 8

- 8.1 In the diagram, O is the centre of the circle. $MNPR$ is a cyclic quadrilateral and SN is a diameter of the circle. Chord MS and radius OR are drawn. $\hat{M}_2 = 64^\circ$.



Determine, giving reasons, the size of the following angles:

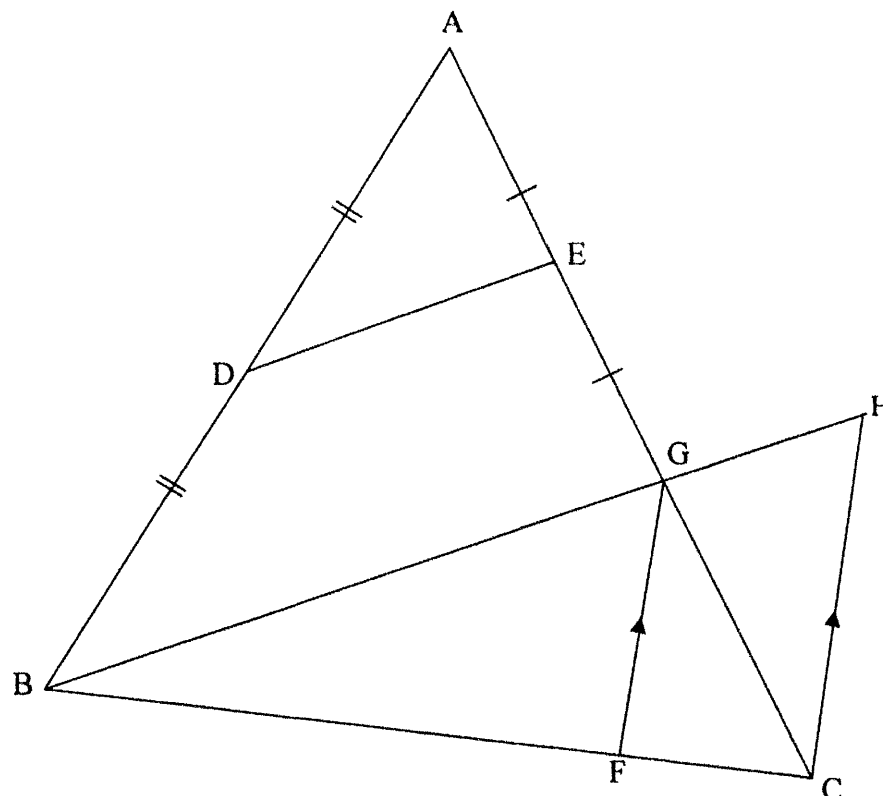
8.1.1 $\hat{P}$ (2)

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

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



- 8.2 In the diagram, $\triangle ABG$ is drawn. D and E are midpoints of AB and AG respectively. AG and BG are produced to C and H respectively. F is a point on BC such that $FG \parallel CH$.



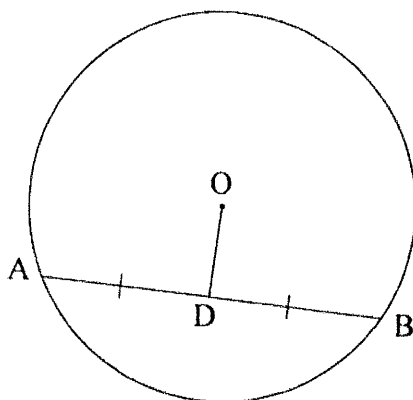
8.2.1 Give a reason why $DE \parallel BH$. (1)

8.2.2 If it is further given that $\frac{FC}{BF} = \frac{1}{4}$, $DE = 3x - 1$ and $GH = x + 1$, calculate, giving reasons, the value of x . (6)
 [13]



QUESTION 9

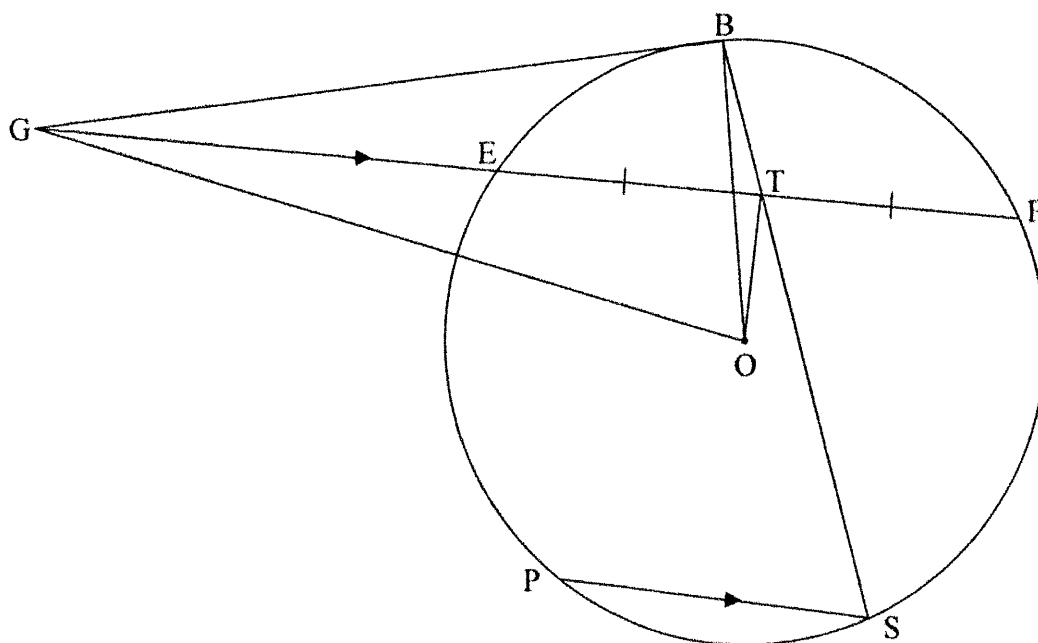
9.1 In the diagram, O is the centre of a circle. OD bisects chord AB .



Prove the theorem that states that the line from the centre of a circle that bisects a chord is perpendicular to the chord, i.e. $OD \perp AB$.

(5)

9.2 In the diagram, E , B , F , S and P are points on the circle centred at O . GB is a tangent to the circle at B . FE is produced to meet the tangent at G . OT is drawn such that T is the midpoint of EF . GO and BO are drawn. BS is drawn through T . $PS \parallel GF$.



Prove, giving reasons, that:

9.2.1 $OTBG$ is a cyclic quadrilateral

(5)

9.2.2 $\hat{GOB} = \hat{S}$

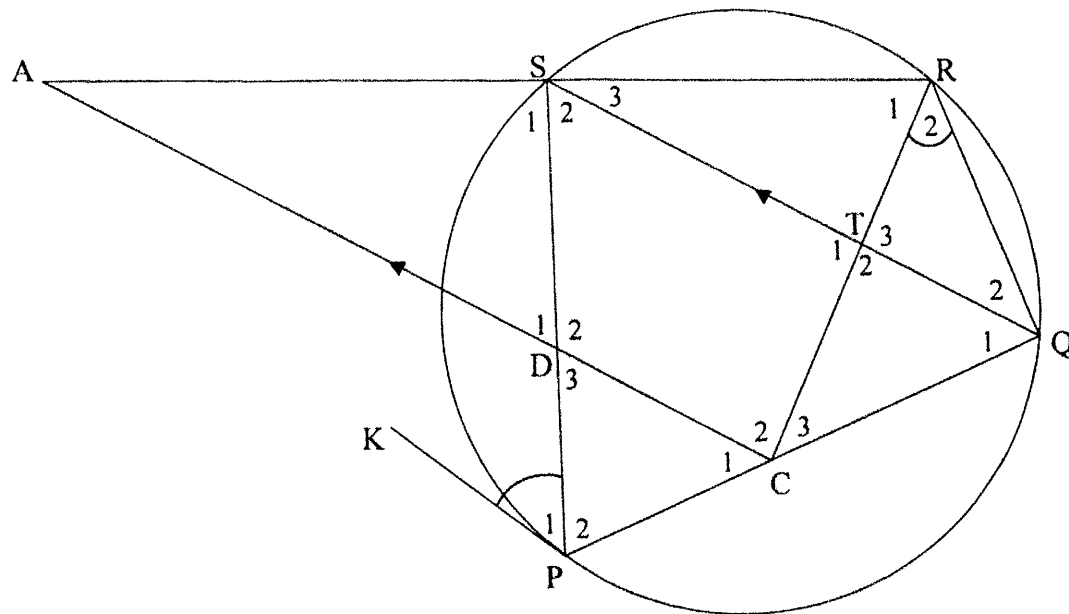
(4)

[14]



QUESTION 10

In the diagram, PQRS is a cyclic quadrilateral. KP is a tangent to the circle at P. C and D are points on chords PQ and PS respectively and CD produced meets RS produced at A. CA || QS. RC is drawn. $\hat{P}_1 = \hat{R}_2$.



Prove, giving reasons, that:

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

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

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

TOTAL: 150



INFORMATION SHEET

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$y = mx + c$$

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

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

$$m = \tan \theta$$

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

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

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

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

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

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

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

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

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

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

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

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

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

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

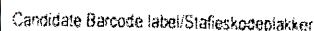
$$\hat{y} = a + bx$$

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





Department
Basic Education
REPUBLIC OF SOUTH AFRICA

NSC Answer Book
NSS-antwoordeboek

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

SUBJECT NAME FAKNAAM	MATHEMATICS/WISKUNDE
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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 INSTRUCTIES OP VOLGENDE BLADSY
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This answer book consists of 23 pages./Hierdie antwoordeboek bestaan uit 23 bladsye.



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



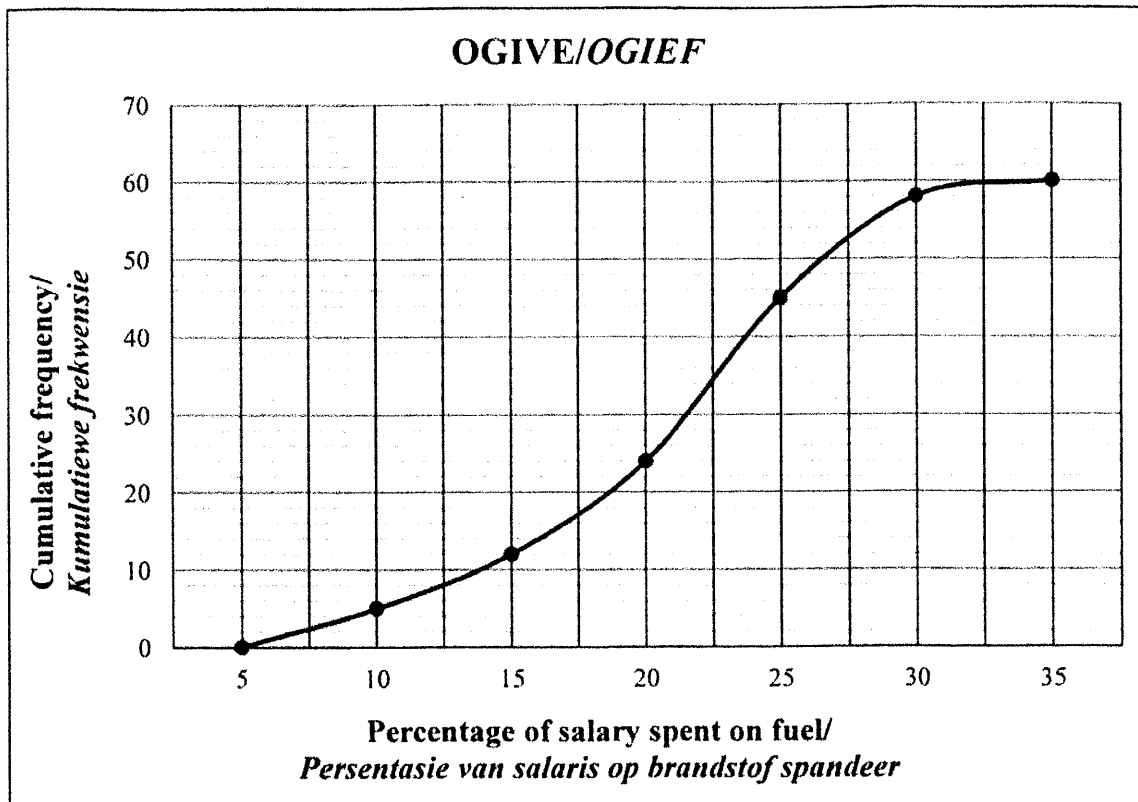
QUESTION/VRAAG 1

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

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



QUESTION/VRAAG 2



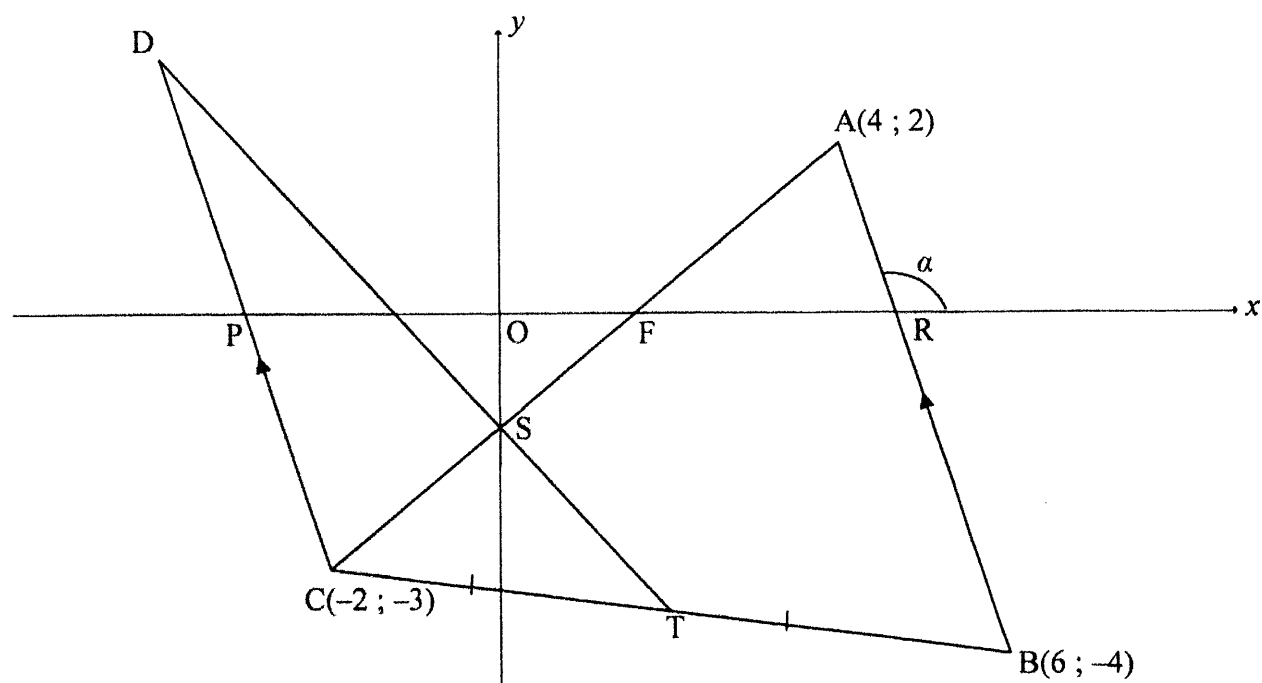
	Solution/Oplissing	Marks Punte
2.1		(1)
2.2		(1)
2.3		(2)
2.4		(2)



2.5		
		(2)
		[8]



QUESTION/VRAAG 3



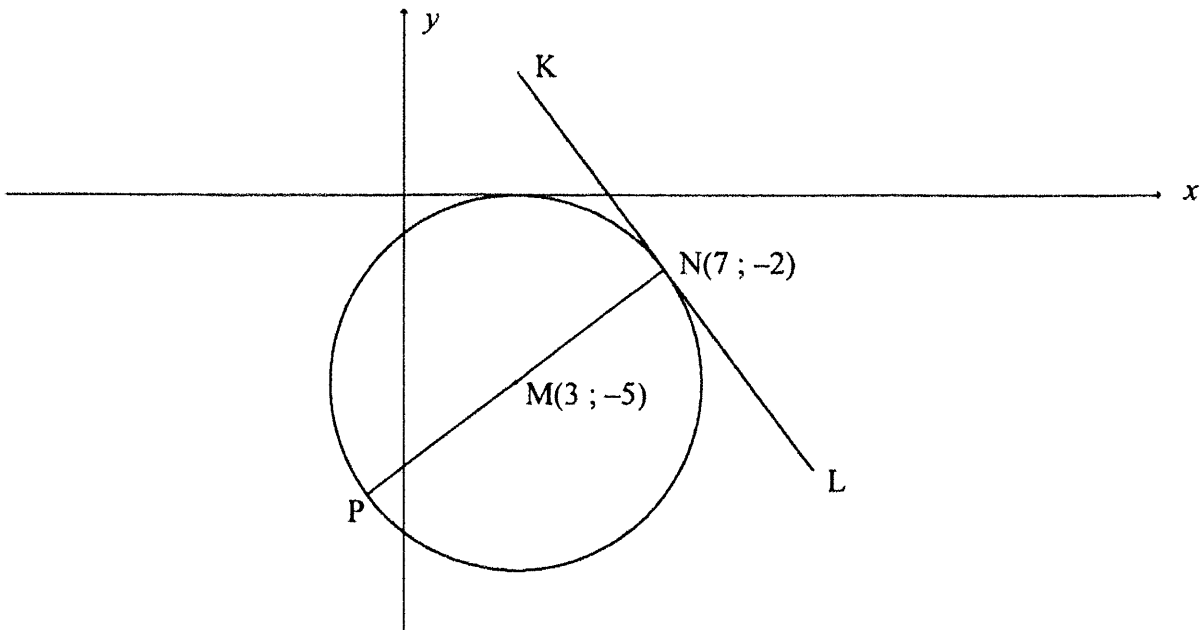
	Solution/Oplossing	Marks Punte
3.1.1		(2)
3.1.2		(2)
3.1.3		(2)



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



QUESTION/VRAAG 4



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



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



QUESTION/VRAAG 5

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

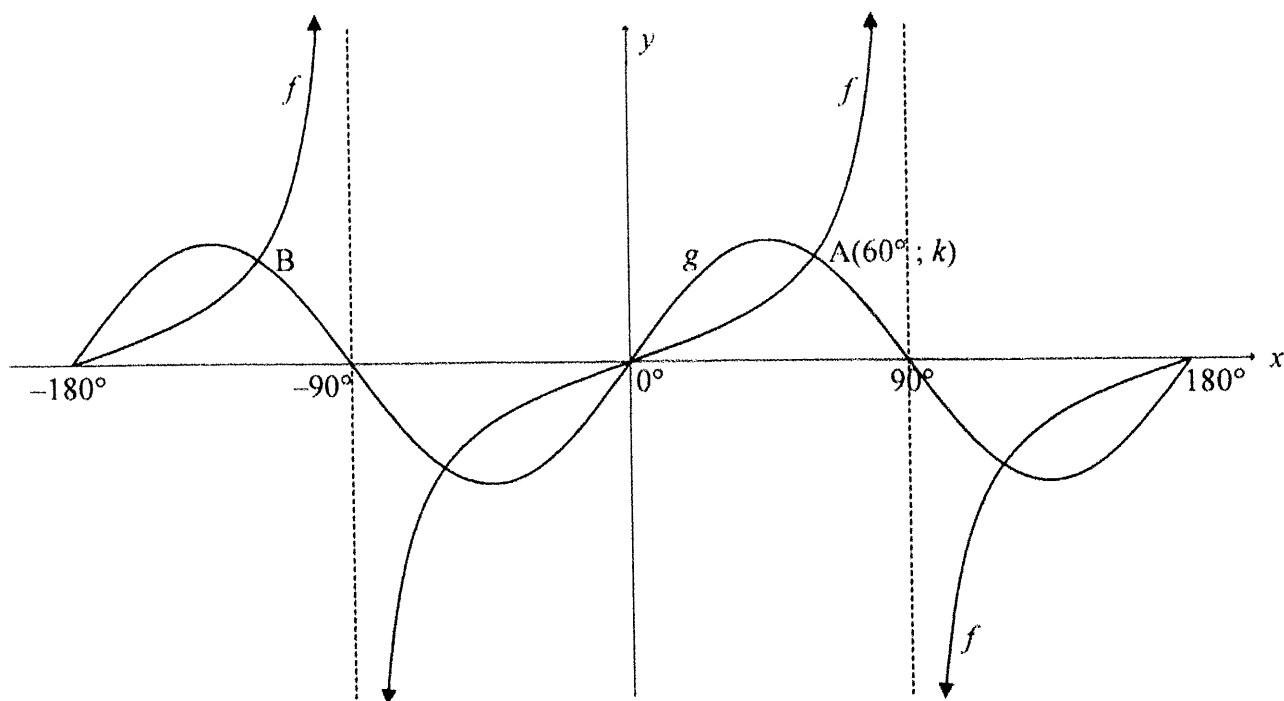


Solution/Oplossing		Marks Punte
5.3		(6)
5.4.1		(4)
5.4.2		(3)



[30]

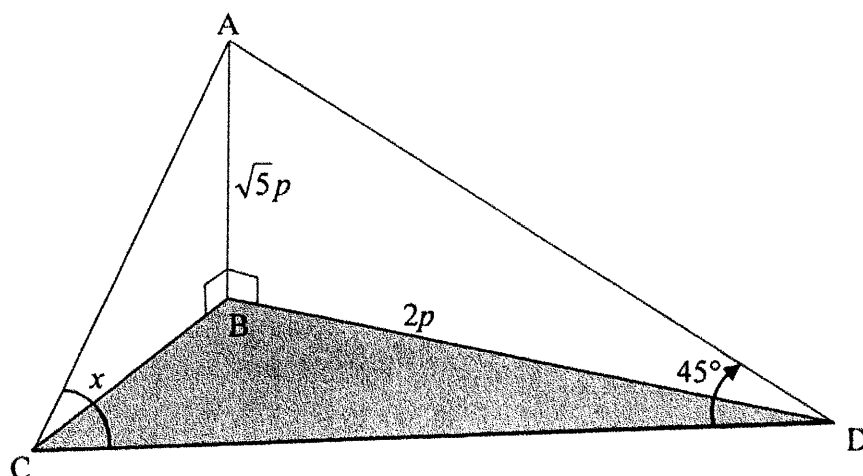
QUESTION/VRAAG 6



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



QUESTION/VRAAG 7



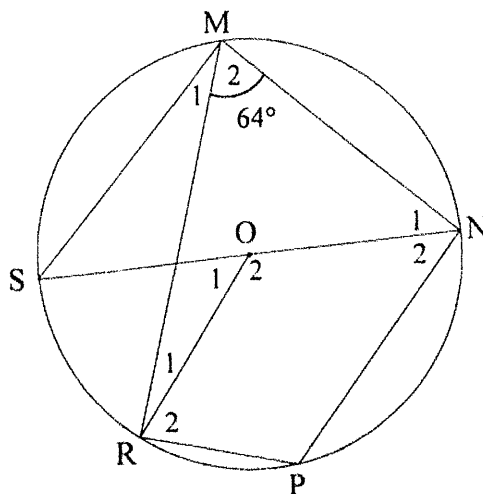
	Solution/Oplissing	Marks Punte
7.1		
		(2)
7.2		
		(5)
7.3		
		(3)
		[10]



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

QUESTION/VRAAG 8

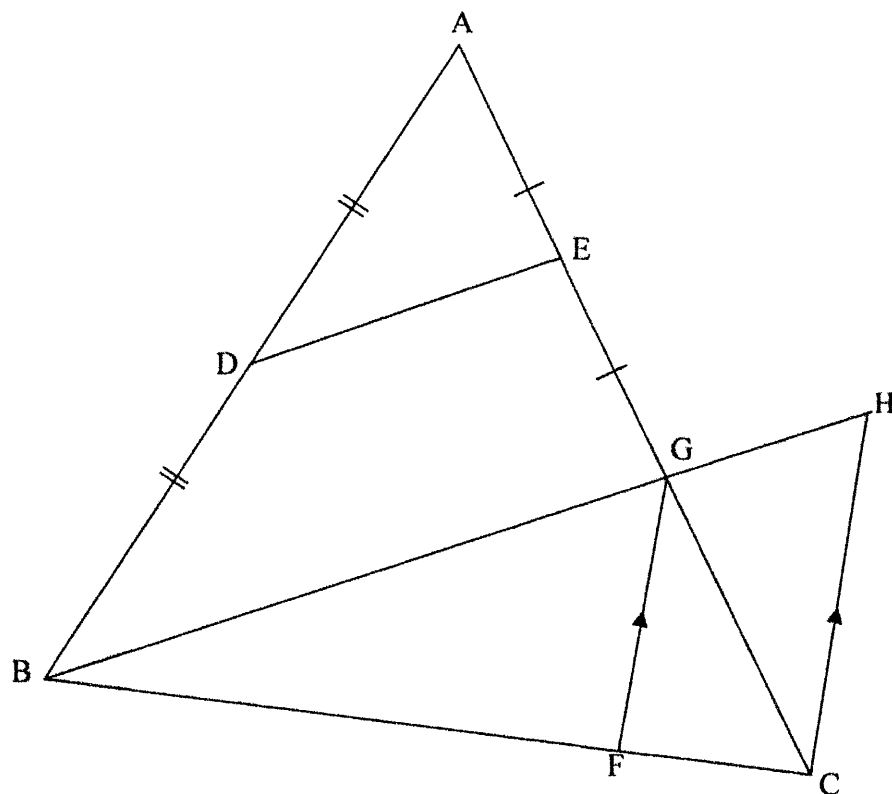
8.1



	Solution/Oplissing	Marks Punte
8.1.1		(2)
8.1.2		(2)
8.1.3		(2)



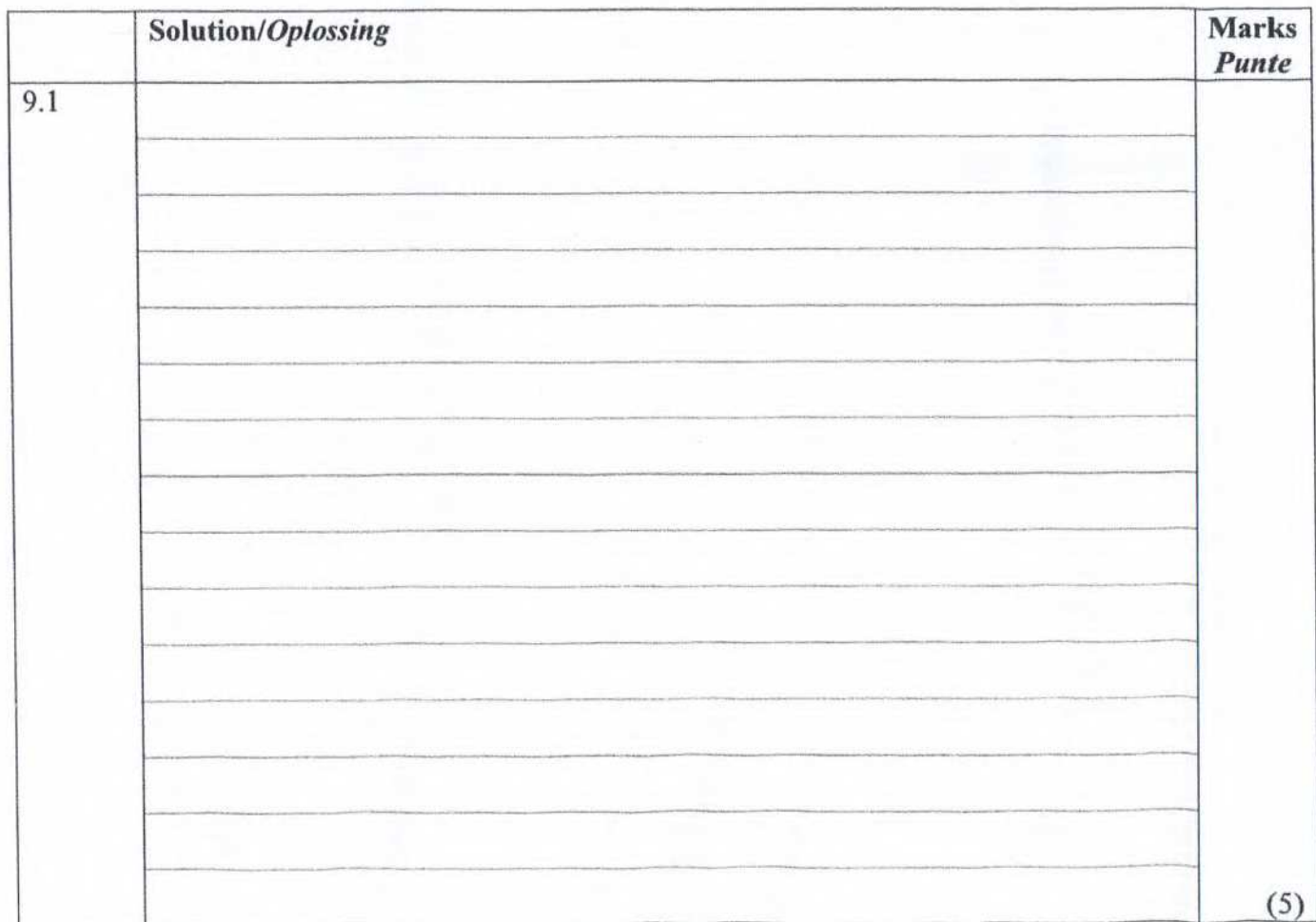
8.2



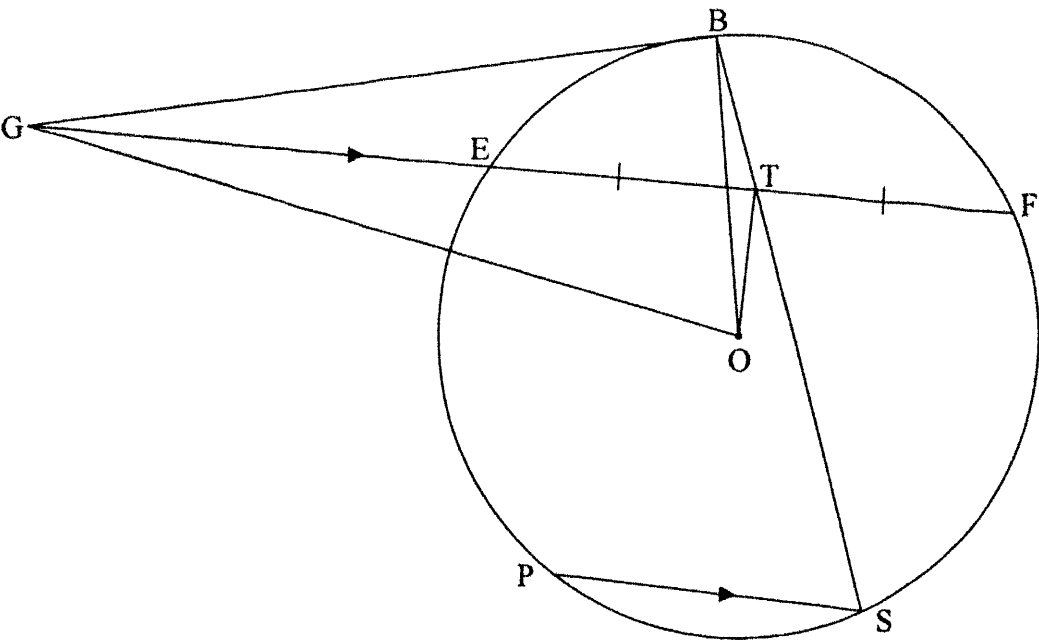
	Solution/Oplissing	Marks Punte
8.2.1		
		(1)
8.2.2		
		(6)
		[13]



9.1



9.2

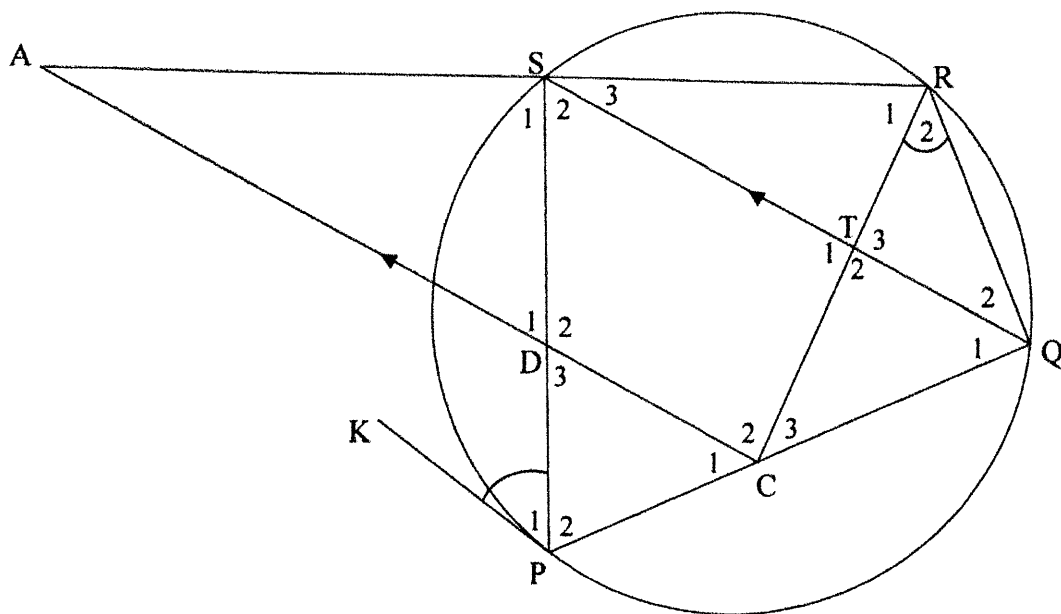


	Solution/Oplossing	Marks Punte
9.2.1		(5)

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



QUESTION/VRAAG 10



	Solution/Oplissing	Marks Punte
10.1		
		(4)



[13]

[illegible]

[illegible]

TOTAL/TOTAAL: 150



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





basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE/
NASIONALE
SENIOR SERTIFIKAAT**

GRADE 12/GRAAD 12

MATHEMATICS P2/WISKUNDE V2

NOVEMBER 2022

MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 150

**DEPARTMENT OF BASIC
EDUCATION**

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2022 -11- 16

**APPROVED MARKING GUIDELINE
PUBLIC EXAMINATION**

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

Approved by Umalusi External Moderator
16/11/2002

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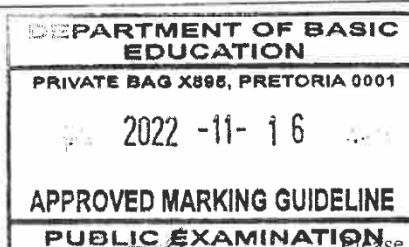
NOTE:

- 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.

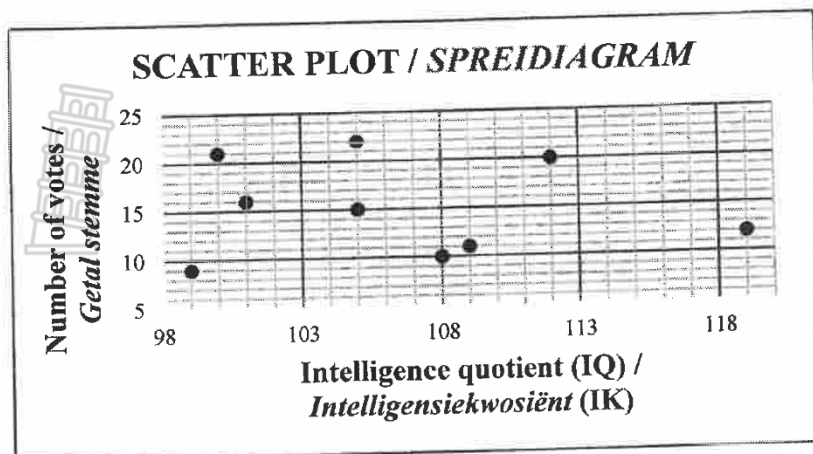
NOTA:

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

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



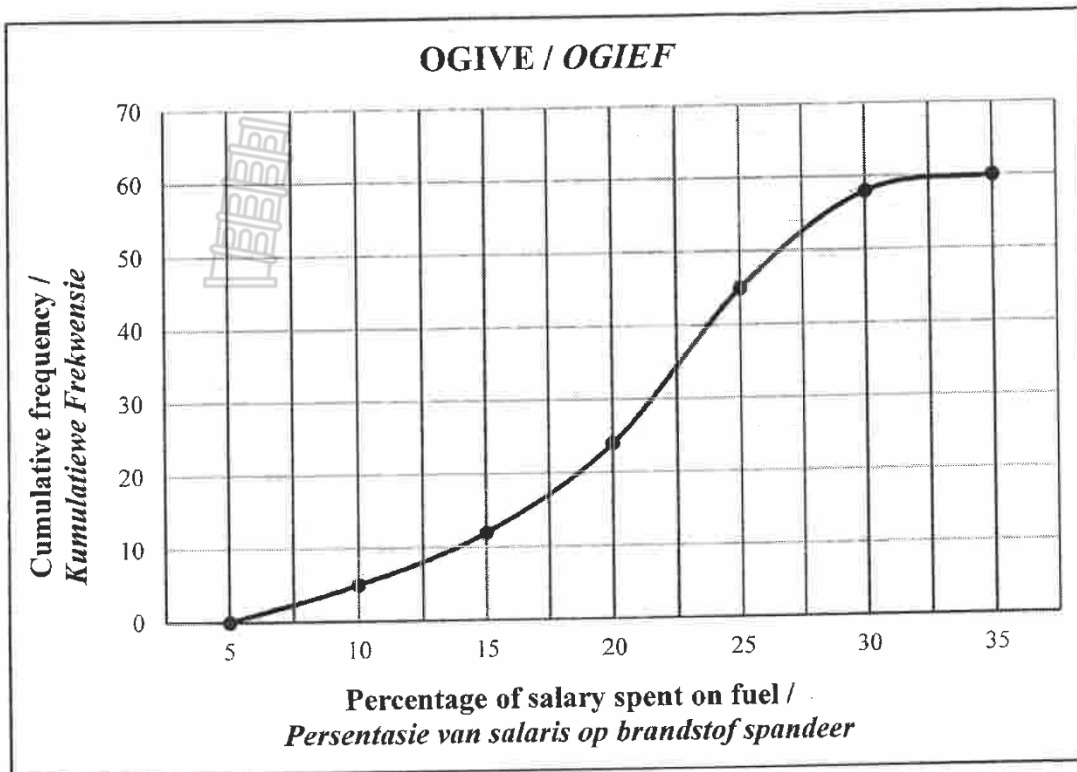
QUESTION/VRAAG 1



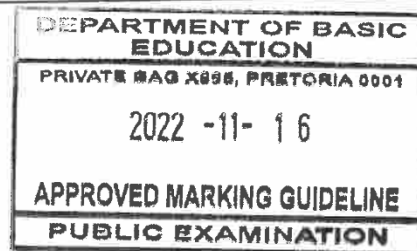
Popularity score (x) Gewildheidspunt (x)	32	89	35	82	50	59	81	40	79	65
Number of votes (y) Getal stemme (y)	9	22	10	21	11	15	20	12	19	16

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

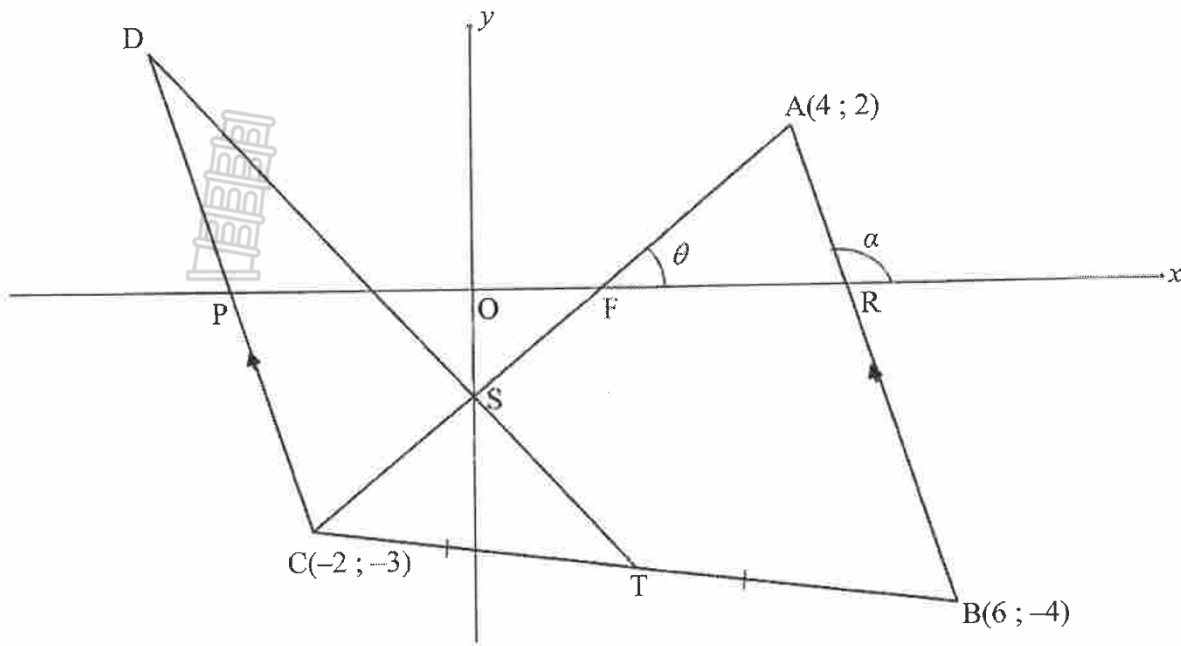
QUESTION/VRAAG 2



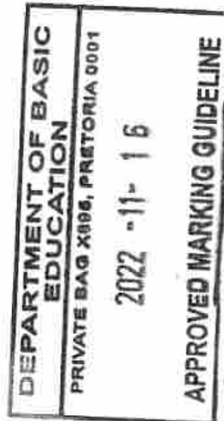
2.1	60 employees	✓ answer (A)	(1)
2.2	$20 < x \leq 25$	✓ answer	(1)
2.3	60 – 34 = 26 employees	ANSWER ONLY: Full marks ✓ 34 ✓ answer	(2)
2.4	Salary = $\frac{100}{7} \times 2400$ Salary = R34 285,71	ANSWER ONLY: Full marks ✓ method ✓ answer	(2)
2.5	∴ Ogive/Cumulative frequency graph will shift to the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



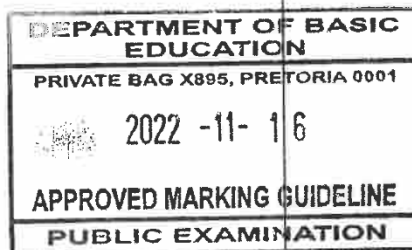
QUESTION/VRAAG 3



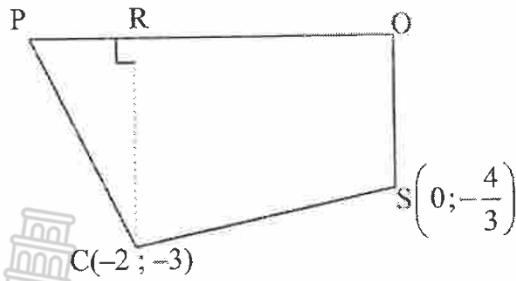
3.1.1	$m_{AB} = \frac{2 - (-4)}{4 - 6}$ OR $m_{AB} = \frac{-4 - 2}{6 - 4}$ $m_{AB} = -3$ ANSWER ONLY: Full marks	✓ substitution ✓ answer (2)
3.1.2	$\tan \alpha = m_{AB} = -3$ $\alpha = 108,43^\circ$ ANSWER ONLY: Full marks	✓ $\tan \alpha = m_{AB} = -3$ ✓ answer (2)
3.1.3	$T\left(\frac{x_1 + x_2}{2},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



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



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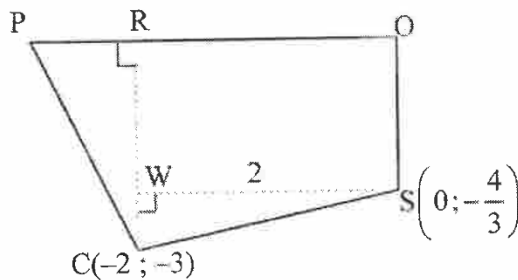


$P(-3;0)$

Area of POSC = Area of OSCR + Area of $\triangle PRC$

$$\begin{aligned}
 &= \frac{1}{2} \left(\frac{4}{3} + 3 \right) \times 2 + \frac{1}{2} (1 \times 3) \\
 &= \frac{35}{6} \\
 &= 5,83 \text{ units}^2
 \end{aligned}$$

OR/OF



$P(-3;0)$

Area POSC = Area ROSW + Area $\triangle PRC$ + Area $\triangle WSC$

$$\begin{aligned}
 &= \left(\frac{4}{3} \right) (2) + \frac{1}{2} (1) (3) + \frac{1}{2} (2) \left(\frac{5}{3} \right) \\
 &= \frac{35}{6} \\
 &= 5,83 \text{ units}^2
 \end{aligned}$$

OR/OF

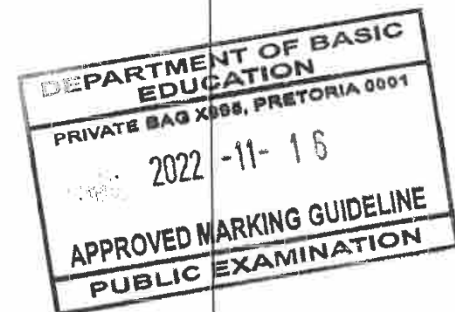
✓ $P(-3;0)$

✓ method

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

✓ answer

(5)



✓ $P(-3;0)$

✓ method

✓ $\frac{1}{2} (1) (3)$

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

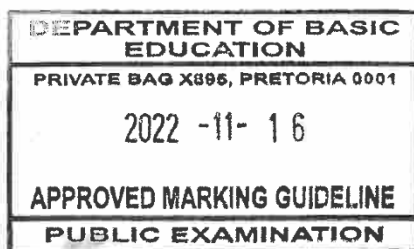
✓ answer

(5)

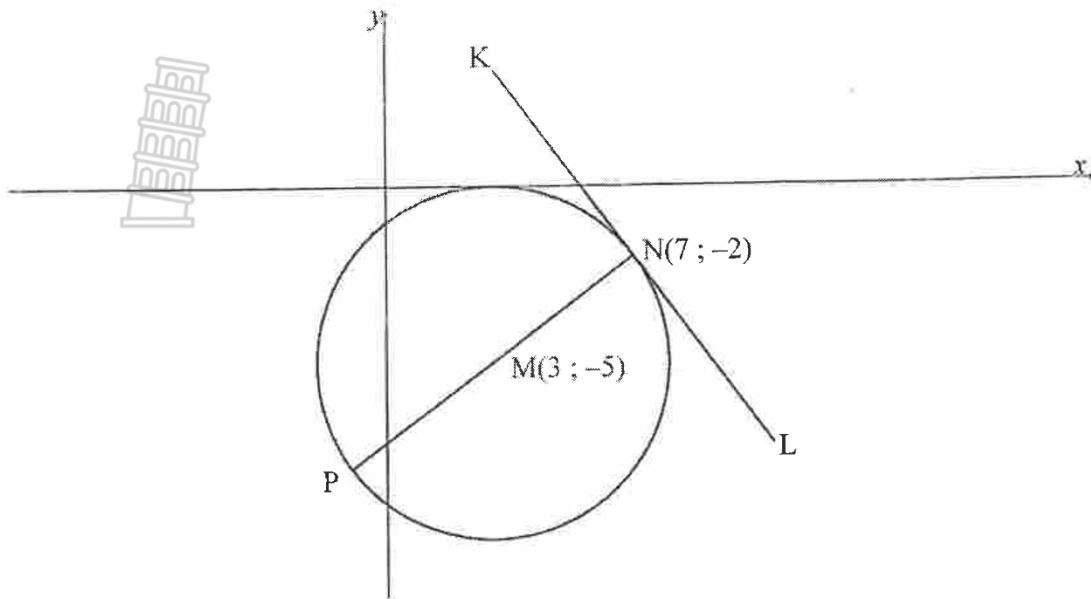


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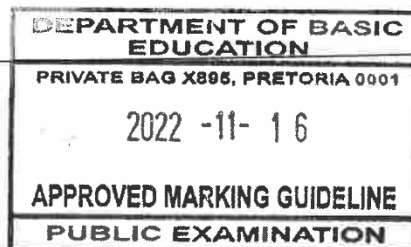
$P(-3;0)$ Area of $\Delta PSC = \frac{1}{2}(PC)(CS)\sin \hat{DCA}$  $= \frac{1}{2}(\sqrt{10})\left(\frac{\sqrt{61}}{3}\right)\sin 68,62^\circ$ $= 3,833..$ Area of $\Delta POS = \frac{1}{2}(PO)(OS)$ $= \frac{1}{2}(3)\left(\frac{4}{3}\right)$ $= 2$ Area POSC $= 3,833... + 2$ $= 5,83\text{units}^2$	✓ $P(-3;0)$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



QUESTION/VRAAG 4



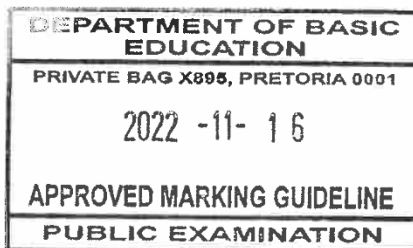
4.1	$P(x; y); N(7; -2); M(3; -5)$ $\frac{x+7}{2}=3 \quad \frac{y-2}{2}=-5$ $x=-1 \quad y=-8$ $P(-1; -8)$	$\checkmark x_p = -1 \quad \checkmark y_p = -8$ (2)
4.2.1	$r^2 = (7-3)^2 + (-2-(-5))^2$ OR/OR $r^2 = (-1-3)^2 + (-8-(-5))^2$ $r^2 = 25$ $(x-3)^2 + (y+5)^2 = 25$	$\checkmark$ substitution into distance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



4.4.1	$AB^2 = AM^2 - MB^2$ $AB^2 = [(t-3)^2 + (t+5)^2] - 5^2$ $= t^2 - 6t + 9 + t^2 + 10t + 25 - 25$ $AB = \sqrt{2t^2 + 4t + 9}$	✓ substitution into Pythagoras ✓ simplification (A) (2)
4.4.2	$t = \frac{-4}{2(2)}$ $= -1$ Minimum at $t = -1$ $AB = \sqrt{2(-1)^2 + 4(-1) + 9}$ $AB = \sqrt{7}$ OR/OF $4t + 4 = 0$ $t = -1$ Minimum at $t = -1$ $AB = \sqrt{2(-1)^2 + 4(-1) + 9}$ $AB = \sqrt{7}$ OR/OF Length of $AB = \sqrt{2t^2 + 4t + 9}$ $= \sqrt{2\left(t^2 + 2t + \frac{9}{2}\right)}$ $= \sqrt{2\left[(t+1)^2 + \frac{7}{2}\right]}$ $= \sqrt{2(t+1)^2 + 7}$ Minimum at $t = -1$ $AB = \sqrt{2(-1)^2 + 4(-1) + 9}$ $AB = \sqrt{7}$	✓ substitution into correct formula ✓ $t = -1$ ✓ substitution ✓ answer (4) ✓ derivative = 0 ✓ $t = -1$ ✓ substitution ✓ answer (4) ✓ completing of the square ✓ $t = -1$ ✓ substitution ✓ answer (4)
DEPARTMENT OF BASIC EDUCATION PRIVATE BAG X695, PRETORIA 0001 2022 -11- 16 APPROVED MARKING GUIDELINE PUBLIC EXAMINATION		[20]

QUESTION/VRAAG 5

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



5.3	$(\cos x + 2 \sin x)(3 \sin 2x - 1) = 0$ $\cos x + 2 \sin x = 0$ or $3 \sin 2x - 1 = 0$ $\tan x = -\frac{1}{2}$ $\sin 2x = \frac{1}{3}$ $\text{ref } \angle = 26,565 \dots^\circ$ $\text{ref } \angle = 19,471 \dots^\circ$ $x = 153,43^\circ + k.180^\circ; k \in \mathbb{Z}$ $x = 9,74^\circ + k.180^\circ; k \in \mathbb{Z}$ OR/OF or $x = 153,43^\circ + k.360^\circ; k \in \mathbb{Z}$ $x = 80,26^\circ + k.180^\circ;$ $k \in \mathbb{Z}$ or $x = 333,43^\circ + k.360^\circ; k \in \mathbb{Z}$	✓ both equations ✓ $\tan x = -\frac{1}{2}$ ✓ $\sin 2x = \frac{1}{3}$ ✓ $x = 153,43^\circ$ OR $x = 153,43^\circ \text{ \& } 333,43^\circ$ ✓ $x = 9,74^\circ \text{ \& } 80,26^\circ$ ✓ $+ k.180^\circ; k \in \mathbb{Z}$ (6)
5.4.1	$\text{LHS} = \cos(x+y) \cdot \cos(x-y)$ $= [\cos x \cdot \cos y - \sin x \cdot \sin y][\cos x \cdot \cos y + \sin x \cdot \sin y]$ $= \cos^2 x \cdot \cos^2 y - \sin^2 x \cdot \sin^2 y$ $= (1 - \sin^2 x)(1 - \sin^2 y) - \sin^2 x \cdot \sin^2 y$ $= 1 + \sin^2 x \cdot \sin^2 y - \sin^2 x - \sin^2 y - \sin^2 x \cdot \sin^2 y$ $= 1 - \sin^2 x - \sin^2 y = \text{RHS}$	✓ expansion ✓ simplification ✓ square identity ✓ product (4)
5.4.2	$1 - \sin^2 45^\circ - \sin^2 15^\circ$ $= \cos(45^\circ + 15^\circ) \cdot \cos(45^\circ - 15^\circ)$ $= \cos 60^\circ \cdot \cos 30^\circ$ $= \left(\frac{1}{2}\right)\left(\frac{\sqrt{3}}{2}\right)$ $= \frac{\sqrt{3}}{4}$ OR/OF DEPARTMENT OF BASIC EDUCATION PRIVATE BAG X808, PRETORIA 0001 2022 -11- 16 APPROVED MARKING GUIDELINE PUBLIC EXAMINATION	✓ identifying x and y ✓ substitution ✓ answer (3)

$$\begin{aligned}
 &1 - \sin^2 45^\circ - \sin^2 15^\circ \\
 &= \sin^2 15^\circ + \cos^2 15^\circ - \sin^2 45^\circ - \sin^2 15^\circ \\
 &= \cos^2 15^\circ - \left(\frac{\sqrt{2}}{2}\right)^2 \\
 &= \cos^2 15^\circ - \frac{1}{2} \\
 &= \frac{2\cos^2 15^\circ - 1}{2} \\
 &= \frac{\cos 30^\circ}{2} \\
 &= \frac{\sqrt{3}}{2} \times \frac{1}{2} \\
 &= \frac{\sqrt{3}}{4}
 \end{aligned}$$

✓ identity

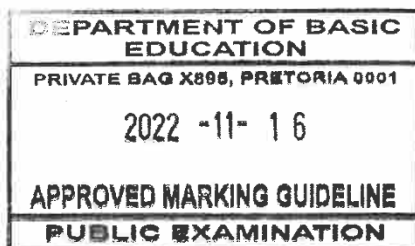
✓ substitution

✓ answer

(3)

OR

$$\begin{aligned}
 &1 - \sin^2 45^\circ - \sin^2 15^\circ \\
 &= \cos^2 45^\circ - \sin^2 (45^\circ - 30^\circ) \\
 &= \left(\frac{1}{\sqrt{2}}\right)^2 - (\sin 45^\circ \cos 30^\circ - \cos 45^\circ \sin 30^\circ)^2 \\
 &= \frac{1}{2} - \left(\frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} - \frac{1}{\sqrt{2}} \times \frac{1}{2}\right)^2 \\
 &= \frac{1}{2} - \left(\frac{\sqrt{3}}{2\sqrt{2}} - \frac{1}{2\sqrt{2}}\right)^2 \\
 &= \frac{1}{2} - \left(\frac{\sqrt{3}}{2\sqrt{2}} - \frac{1}{2\sqrt{2}}\right)^2 \\
 &= \frac{1}{2} - \left(\frac{3}{8} - \frac{\sqrt{3}}{4} + \frac{1}{8}\right) \\
 &= \frac{\sqrt{3}}{4}
 \end{aligned}$$



✓ expansion

✓ substitution

✓ answer

(3)

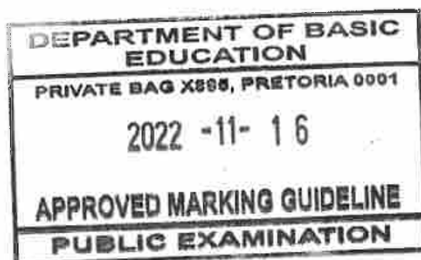
5.5.1

$$\begin{aligned}
 &16 \sin x \cdot \cos^3 x - 8 \sin x \cdot \cos x \\
 &= 8 \sin x \cdot \cos x (2 \cos^2 x - 1) \\
 &= 4 \sin 2x (\cos 2x) \\
 &= 2 \sin 4x
 \end{aligned}$$

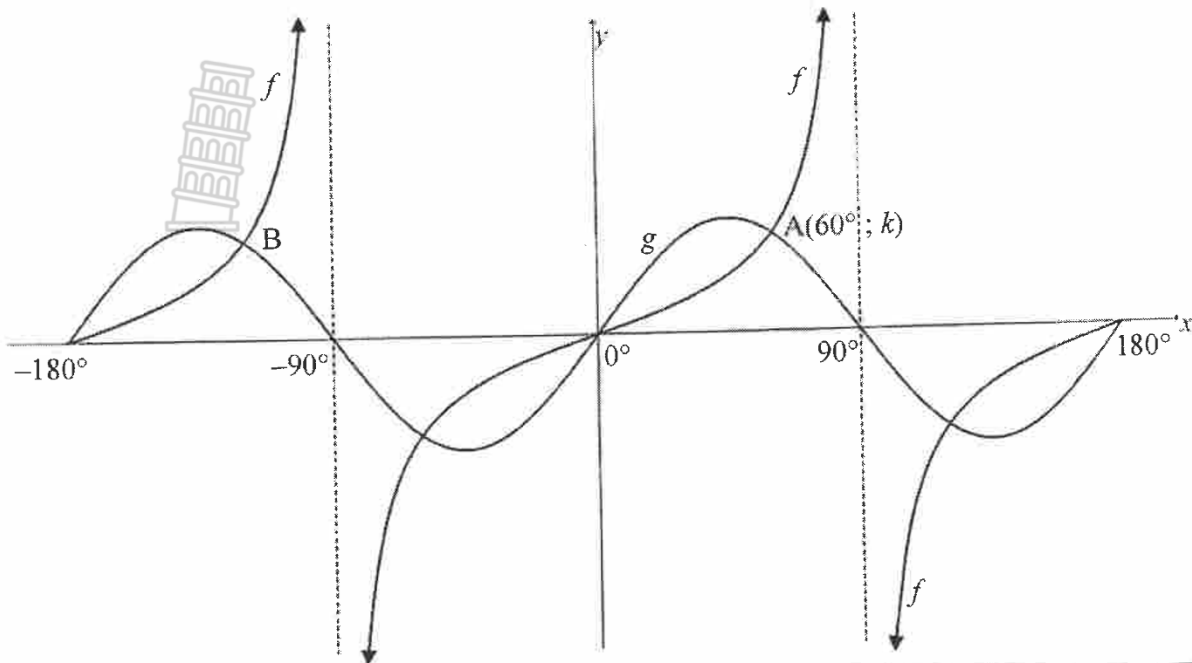
✓ factorisation

✓ 4sin2x ✓ cos2x

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

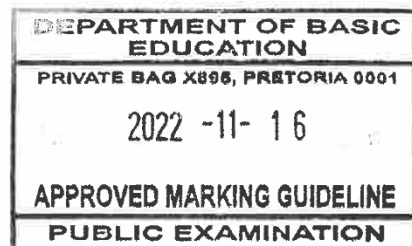
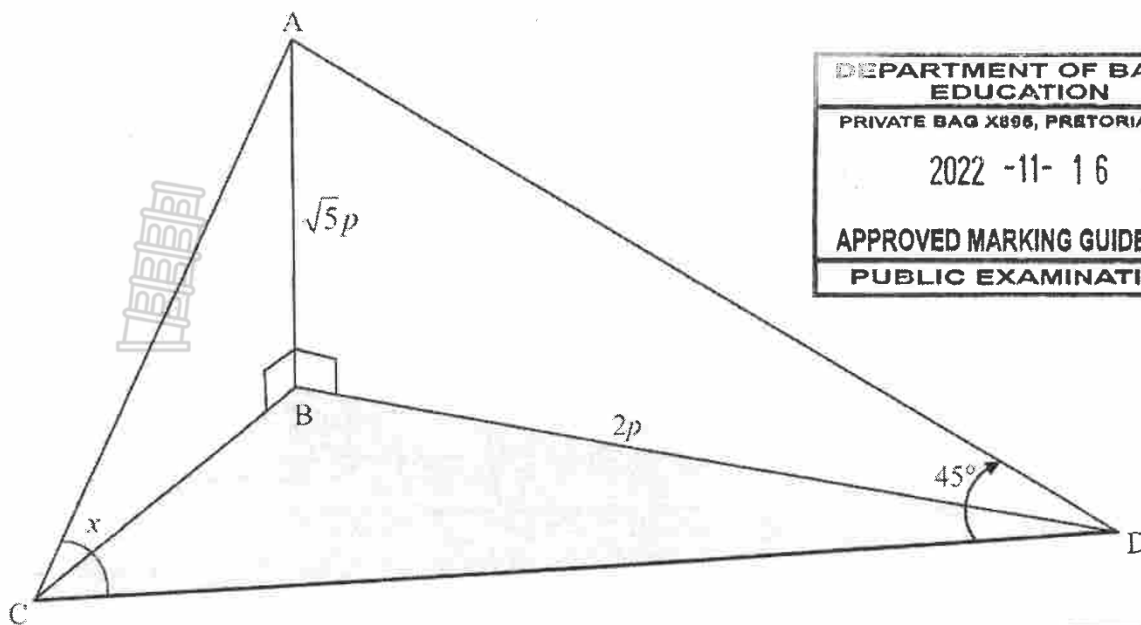


QUESTION/VRAAG 6



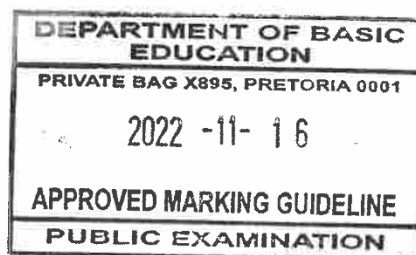
6.1	180°	✓ answer (1)
6.2.1	$k = \sqrt{3} = 1,73$	✓ answer (1)
6.2.2	$B(-120^\circ; \sqrt{3})$	✓ $x = -120^\circ$ (1)
6.3	Range of g : $y \in [-2; 2]$ Range of $2g(x)$: $y \in [-4; 4]$ OR/OF Range of g : $-2 \leq y \leq 2$ Range of $2g(x)$: $-4 \leq y \leq 4$	✓ $y \in [-2; 2]$ ✓ answer (2) ✓ $-2 \leq y \leq 2$ ✓ answer (2)
6.4	$x \in [-65^\circ; -5^\circ]$ OR/OF $-65^\circ \leq x \leq -5^\circ$	✓✓ $x \in [-65^\circ; -5^\circ]$ (2) ✓✓ $-65^\circ \leq x \leq -5^\circ$ (2)
6.5	$\sin x \cdot \cos x = p$ $4 \sin x \cdot \cos x = 4p$ $2 \sin 2x = 4p$ $4p = \pm 2$ $\therefore p = -\frac{1}{2} \text{ or } \frac{1}{2}$	✓ $2 \sin 2x = 4p$ ✓ $4p = \pm 2$ ✓ answers (3)

QUESTION/VRAAG 7



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

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



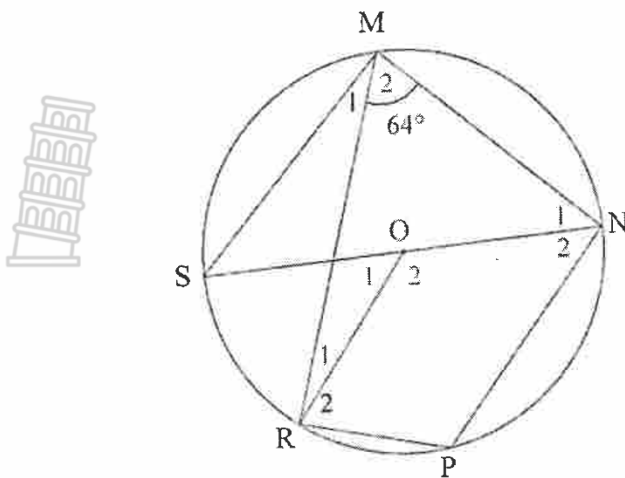
Copyright reserved/Kopiereg voorbehou

General *Ala*

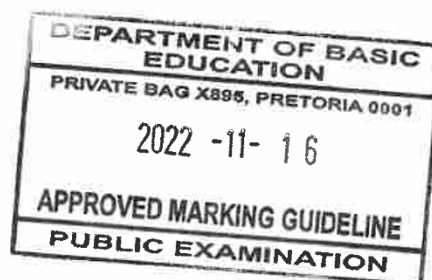
Please turn over/Blaai om asseblief

QUESTION/VRAG 8

8.1



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

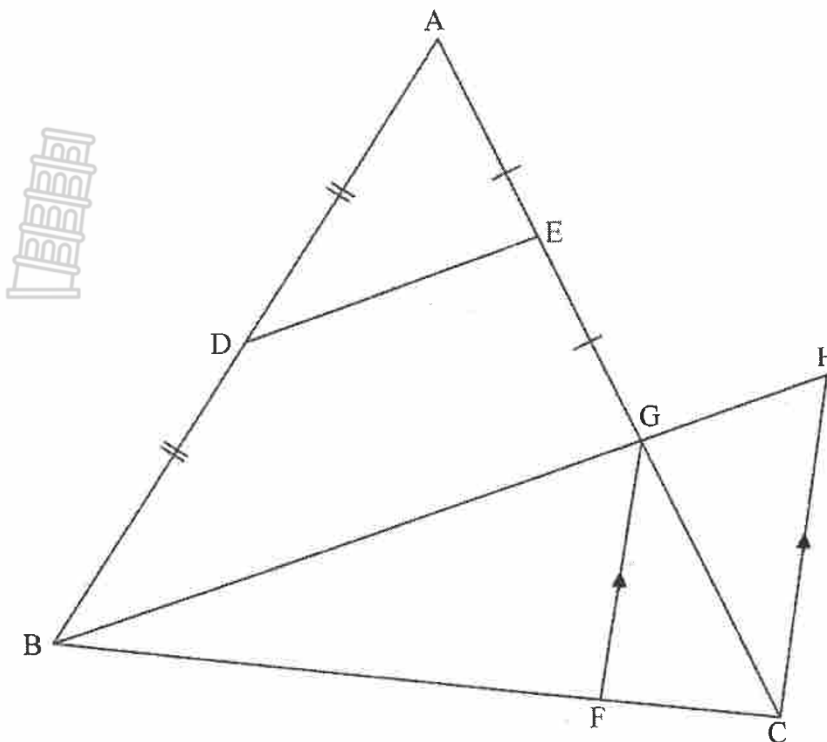


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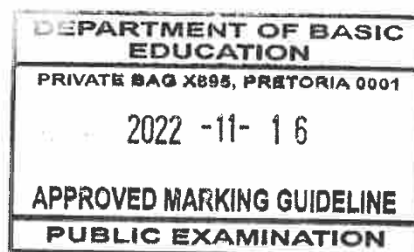
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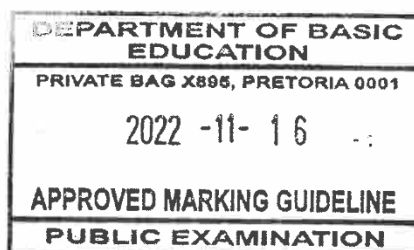
8.2



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



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



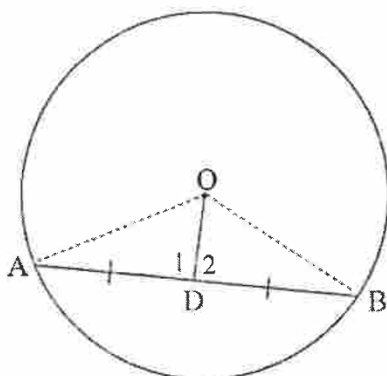
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Gerhard *Oliver*

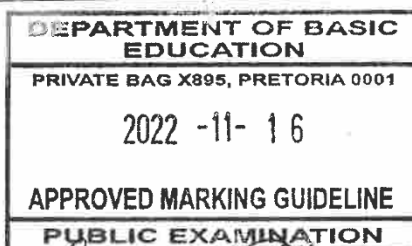
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QUESTION/VRAAG 9

9.1



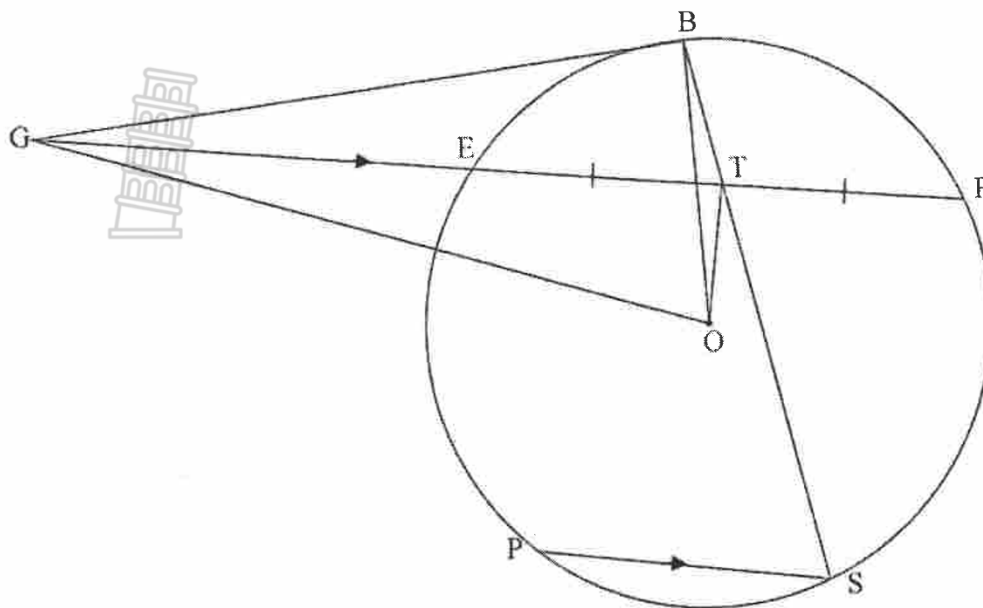
9.1.1	Construction: Draw OA and OB In $\triangle ADO$ and $\triangle BDO$ $OA = OB$ [radii/radiusse] $OD = OD$ [common side/gemeenskaplike sy] $AD = DB$ [given/gegee] $\therefore \triangle ADO \cong \triangle BDO$ [S;S;S] ADB is a straight line $\therefore \hat{D}_1 = \hat{D}_2$ $\triangle ADO \cong \triangle BDO$ $\therefore OD \perp AB$ [$\angle$s on a str line/$\angle$e op 'n reguitlyn] OR/OF Construction: Draw OA and OB In $\triangle ADO$ and $\triangle BDO$ $AD = DB$ [given/gegee] $\hat{A} = \hat{B}$ [$\angle$s opp; $\angle$s sides / $\angle$e teenoor gelyke sye] $OA = OB$ [radii/radiusse] $\therefore \triangle ADO \cong \triangle BDO$ [S;$\angle$;S] ADB is a straight line $\therefore \hat{D}_1 = \hat{D}_2$ $\triangle ADO \cong \triangle BDO$ $\therefore OD \perp AB$ [$\angle$s on a str line/$\angle$e op 'n reguitlyn]	✓ construction ✓ first pair of sides ✓ other 2 pairs ✓ R ✓ R (5) ✓ construction ✓ first pair of sides ✓ other 2 pairs ✓ R ✓ R (5)
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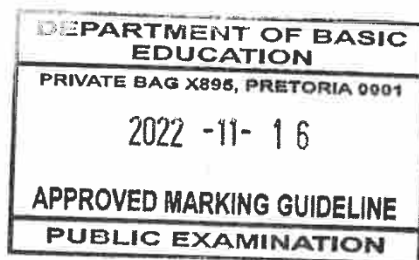
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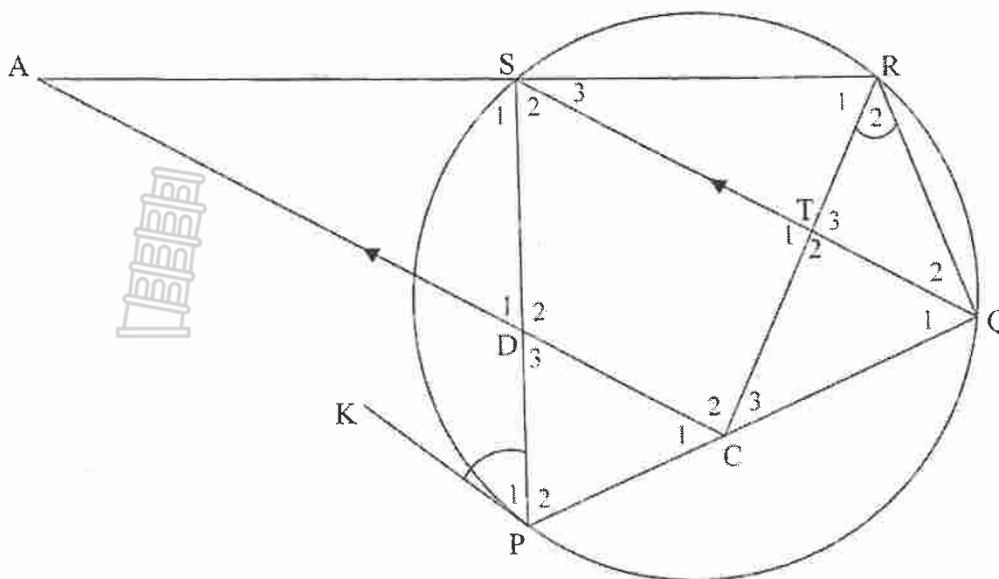
9.2



9.2.1	$\hat{O}TG = 90^\circ$ $\hat{O}BG = 90^\circ$ $\therefore \hat{O}TG = \hat{O}BG = 90^\circ$ $\therefore OTBG$ is a cyclic quadrilateral	[line from centre to midpt of chord/ midpt. sirkel; midpt. koord] [tan $\perp$ radius/raaklyn $\perp$ radius] [line subtends equal $\angle$ s OR converse $\angle$ s in the same segment/ lyn onderspan gelyke $\angle$ e]	$\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ R $\checkmark$ R	(5)
9.2.2	$\hat{S} = \hat{B}TG$ But $\hat{B}TG = \hat{G}OB$ $\hat{G}OB = \hat{S}$	[corresp $\angle$ s; $GF \parallel PS$ / ooreenk. $\angle$ s; $GF \parallel PS$] [$\angle$ s in the same segment/ $\angle$ e in dies. sirkelsegment]	$\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ R	(4)
				[14]



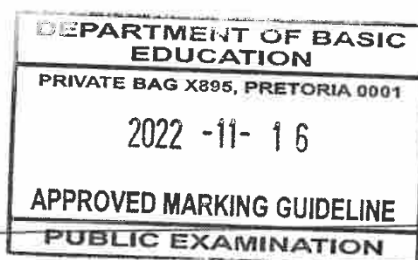
QUESTION/VRAG 10



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

(4)

(5)



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

TOTAL/TOTAAL: 150

