basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE/ NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P2

NOVEMBER 2020

MARKS: 150

TIME: 3 hours

This question paper consists of 14 pages, 1 information sheet and an answer book of 24 pages.

INSTRUCTIONS AND INFORMATION

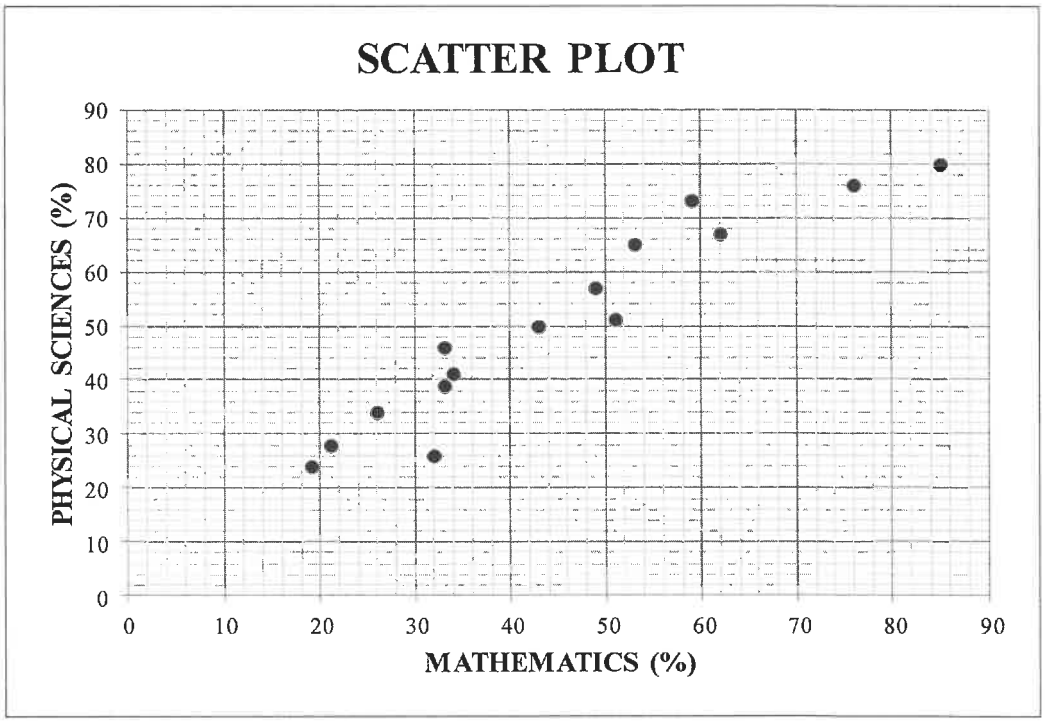
Read the following instructions carefully before answering the questions.

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. that 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

A Mathematics teacher was curious to establish if her learners' Mathematics marks influenced their Physical Sciences marks. In the table below, the Mathematics and Physical Sciences marks of 15 learners in her class are given as percentages (%).

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



1.1 Determine the equation of the least squares regression line for the data. (3)

1.2 Draw the least squares regression line on the scatter plot provided in the ANSWER BOOK. (2)

1.3 Predict the Physical Sciences mark of a learner who achieved 69% for Mathematics. (2)

1.4 Write down the correlation coefficient between the Mathematics and Physical Sciences marks for the data. (1)

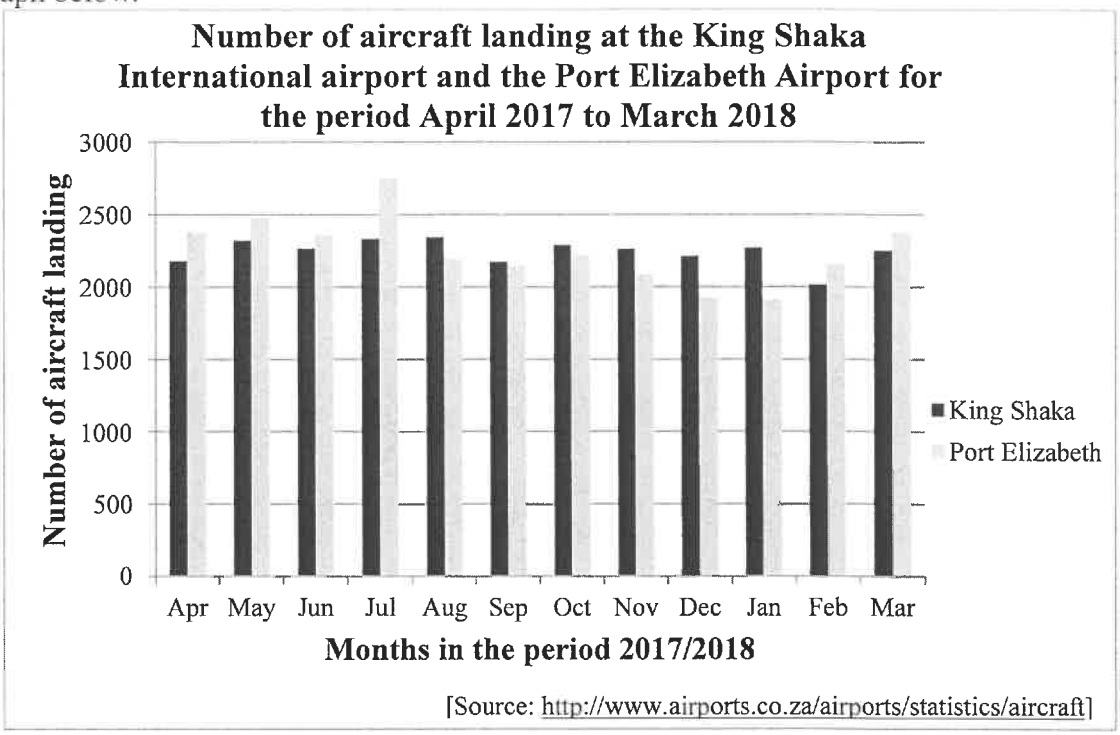
1.5 Comment on the strength of the correlation between the Mathematics and Physical Sciences marks for the data. (1)

1.6 What trend did the teacher observe between the results of the two subjects? (1)

[10]

QUESTION 2

The number of aircraft landing at the King Shaka International Airport and the Port Elizabeth Airport for the period starting in April 2017 and ending in March 2018, is shown in the double bar graph below.



[Source: http://www.airports.co.za/airports/statistics/aircraft]

2.1 The number of aircraft landing at the Port Elizabeth Airport exceeds the number of aircraft landing at the King Shaka International Airport during some months of the given period. During which month is this difference the greatest? (1)

2.2 The number of aircraft landing at the King Shaka International Airport during these months are:

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

Calculate the mean for the data. (2)

2.3 Calculate the standard deviation for the number of aircraft landing at the King Shaka International Airport for the given period. (2)

2.4 Determine the number of months in which the number of aircraft landing at the King Shaka International Airport were within one standard deviation of the mean. (3)

2.5 Which ONE of the following statements is CORRECT?

A. During December and January, there were more landings at the Port Elizabeth Airport than at the King Shaka International Airport.

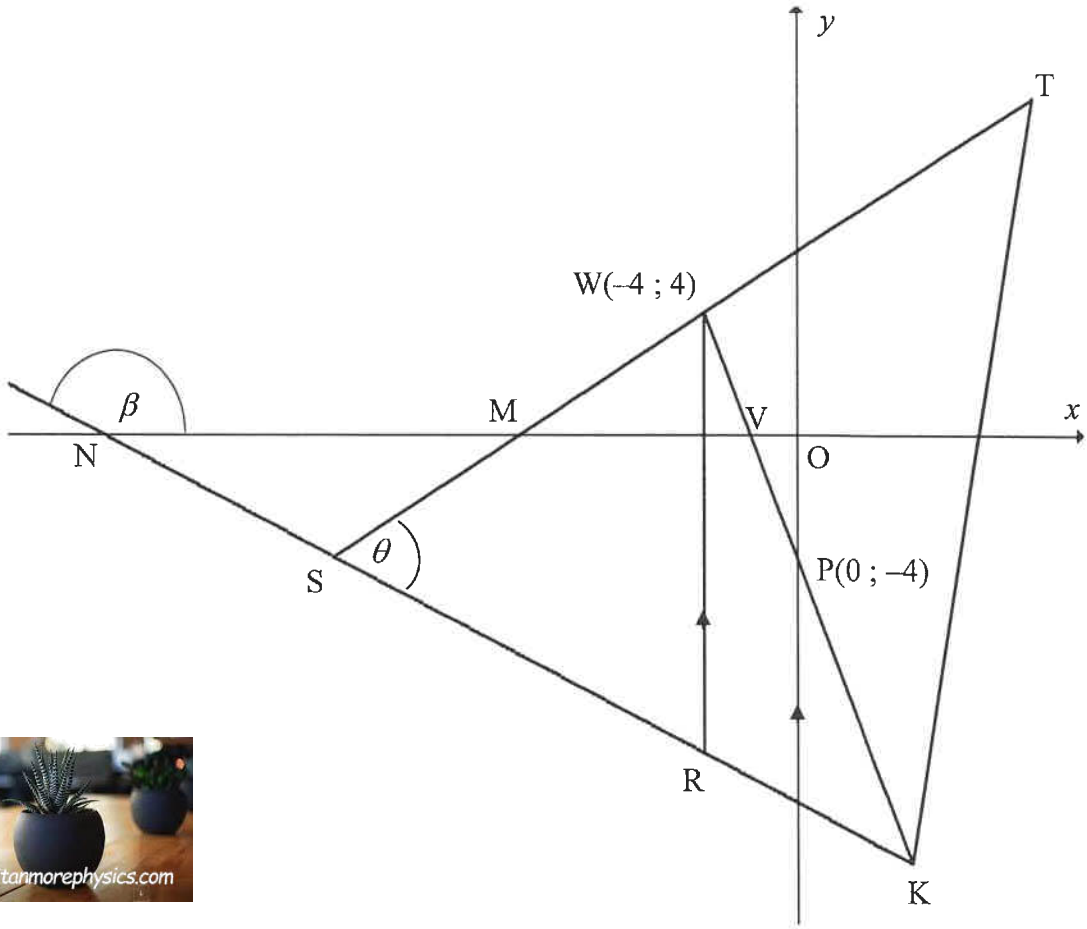
B. There was a greater variation in the number of aircraft landing at the King Shaka International Airport than at the Port Elizabeth Airport for the given period.

C. The standard deviation of the number of landings at the Port Elizabeth Airport will be higher than the standard deviation of the number of landings at the King Shaka International Airport. (1)

[9]

QUESTION 3

ΔTSK is drawn. The equation of ST is $y = \frac{1}{2}x + 6$ and ST cuts the x-axis at M. W(–4 ; 4) lies on ST and R lies on SK such that WR is parallel to the y-axis. WK cuts the x-axis at V and the y-axis at P(0 ; –4). KS produced cuts the x-axis at N. $T\hat{S}K = \theta$.



3.1 Calculate the gradient of WP. (2)

3.2 Show that WP ⊥ ST. (2)

3.3 If the equation of SK is given as $5y + 2x + 60 = 0$, calculate the coordinates of S. (4)

3.4 Calculate the length of WR. (4)

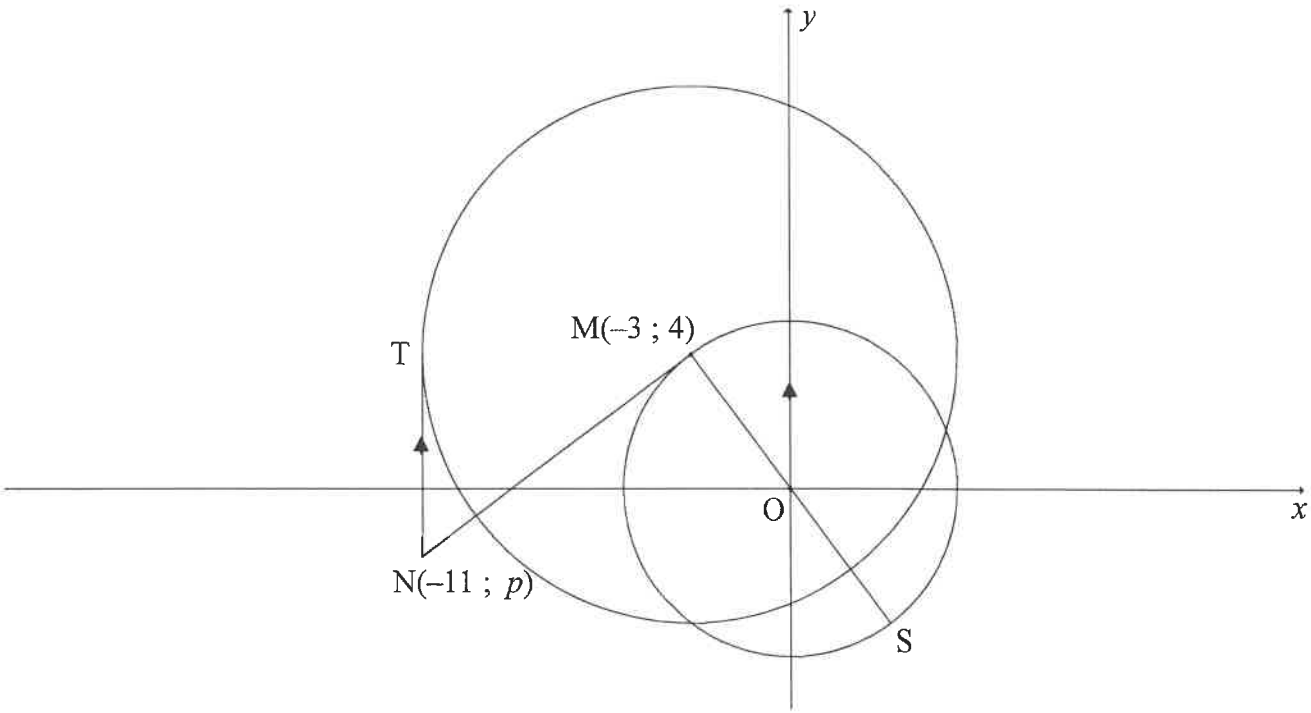
3.5 Calculate the size of θ. (5)

3.6 Let L be a point in the third quadrant such that SWRL, in that order, forms a parallelogram. Calculate the area of SWRL. (4)

[21]

QUESTION 4

M(–3 ; 4) is the centre of the large circle and a point on the small circle having centre O(0; 0). From N(–11 ; p), a tangent is drawn to touch the large circle at T with NT is parallel to the y-axis. NM is a tangent to the smaller circle at M with MOS a diameter.



4.1 Determine the equation of the small circle. (2)

4.2 Determine the equation of the circle centred at M in the form $(x-a)^2+(y-b)^2=r^2$ (3)

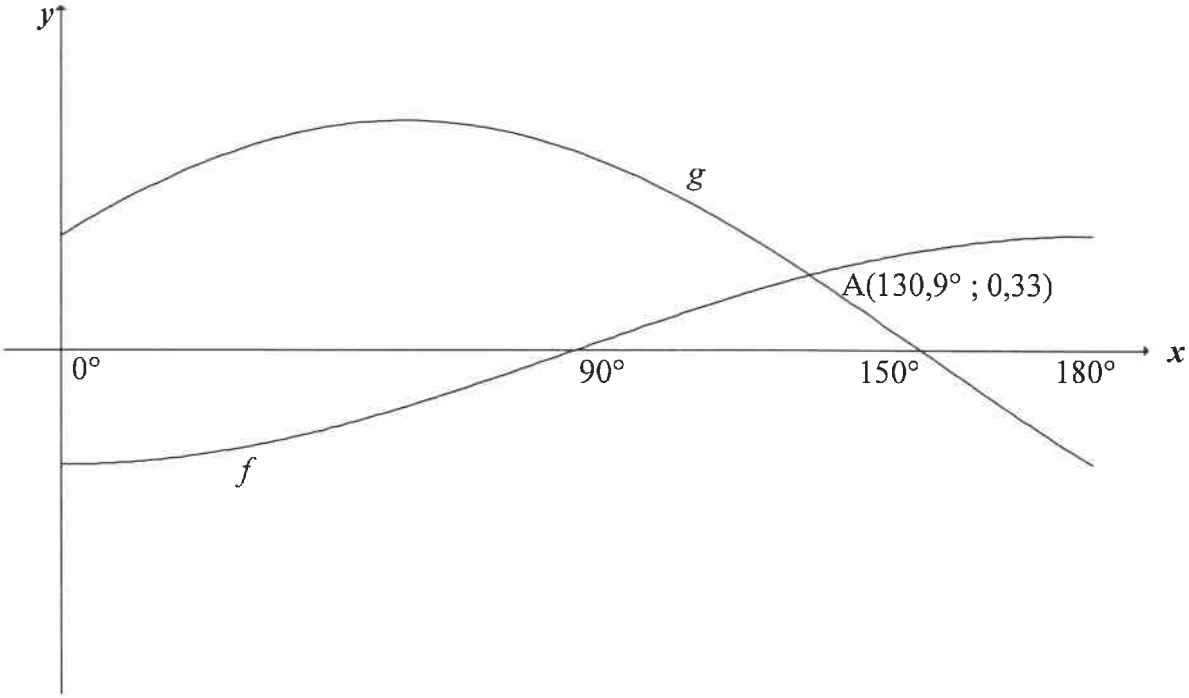
4.3 Determine the equation of NM in the form $y=mx+c$ (4)

4.4 Calculate the length of SN. (5)

4.5 If another circle with centre B(–2 ; 5) and radius k touches the circle centred at M, determine the value(s) of k, correct to ONE decimal place. (5)
[19]

QUESTION 5

The graphs of $f(x) = -\frac{1}{2}\cos x$ and $g(x) = \sin(x + 30°)$, for the interval $x \in [0°; 180°]$, are drawn below. A(130,9° ; 0,33) is the approximate point of intersection of the two graphs.



5.1 Write down the period of g. (1)

5.2 Write down the amplitude of f (1)

5.3 Determine the value of $f(180°) - g(180°)$ (1)

5.4 Use the graphs to determine the values of x, in the interval $x \in [0° ; 180°]$, for which:

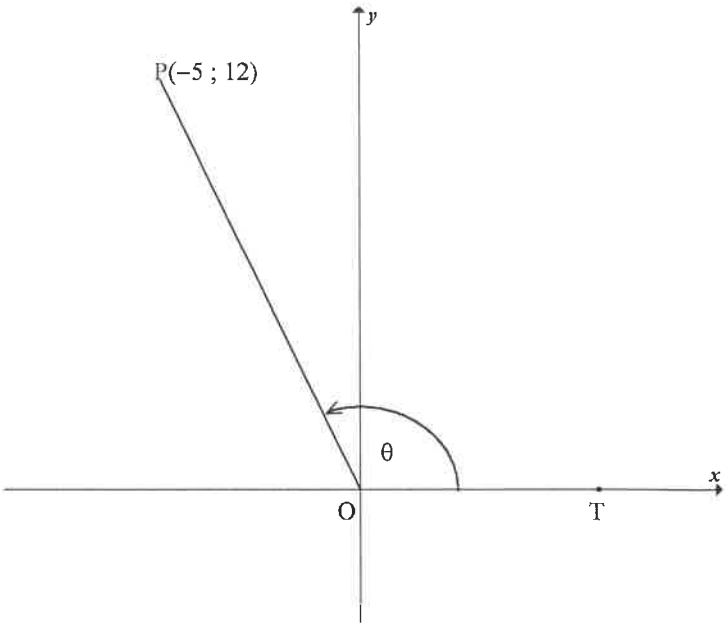
5.4.1 $f(x - 10°) = g(x - 10°)$ (1)

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

[8]

QUESTION 6

6.1 In the diagram, P(–5 ; 12) and T lies on the positive x-axis. $P\hat{O}T = \theta$



Answer the following **without using a calculator**:

6.1.1 Write down the value of $\tan\theta$ (1)

6.1.2 Calculate the value of $\cos\theta$ (3)

6.1.3 S(a ; b) is a point in the third quadrant such that $T\hat{O}S = \theta + 90°$ and OS = 6,5 units. Calculate the value of b. (4)

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

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

6.3 Determine the general solution of the following equation:

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

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

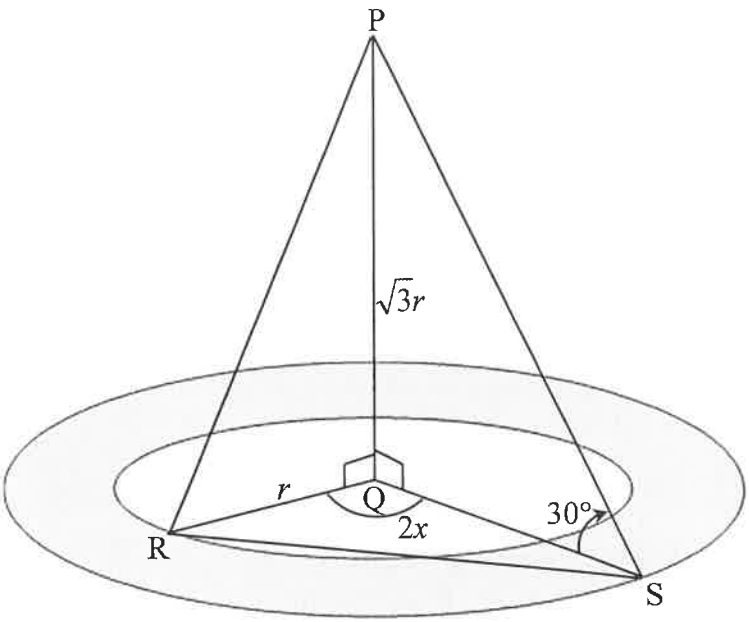
Determine the value of $\cos 2A$ **without using a calculator**. (5)

[24]

QUESTION 7

A landscape artist plans to plant flowers within two concentric circles around a vertical light pole PQ. R is a point on the inner circle and S is a point on the outer circle. R, Q and S lie in the same horizontal plane. RS is a pipe used for the irrigation system in the garden.

- The radius of the inner circle is r units and the radius of the outer circle is QS.
- The angle of elevation from S to P is $30°$.
- $R\hat{Q}S = 2x$ and $PQ = \sqrt{3}r$



7.1 Show that $QS = 3r$ (3)

7.2 Determine, in terms of r, the area of the flower garden. (2)

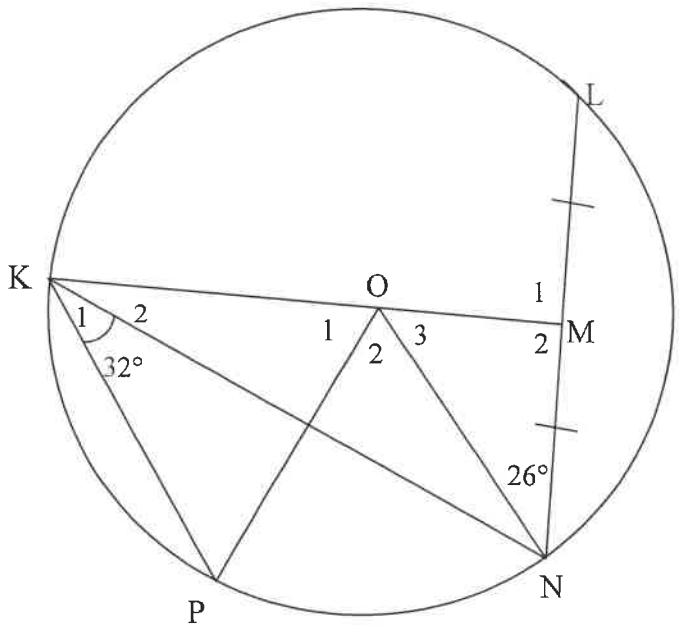
7.3 Show that $RS = r\sqrt{10 - 6\cos 2x}$ (3)

7.4 If $r = 10$ metres and $x = 56°$, calculate RS. (2)

[10]

QUESTION 8

8.1 O is the centre of the circle.. KOM bisects chord LN and $M\hat{N}O = 26°$. K and P are points on the circle with $N\hat{K}P = 32°$. OP is drawn.



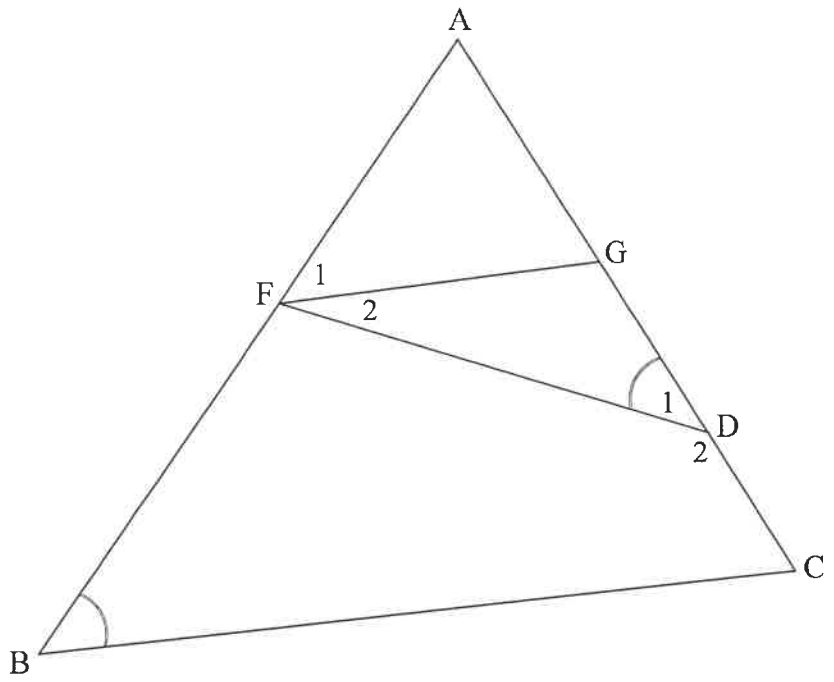
8.1.1 Determine, giving reasons, the size of:

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

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

8.1.2 Prove, giving reasons, that KN bisects $O\hat{K}P$. (3)

8.2 In ΔABC, F and G are points on sides AB and AC respectively. D is a point on GC such that $\hat{D}_1 = \hat{B}$.



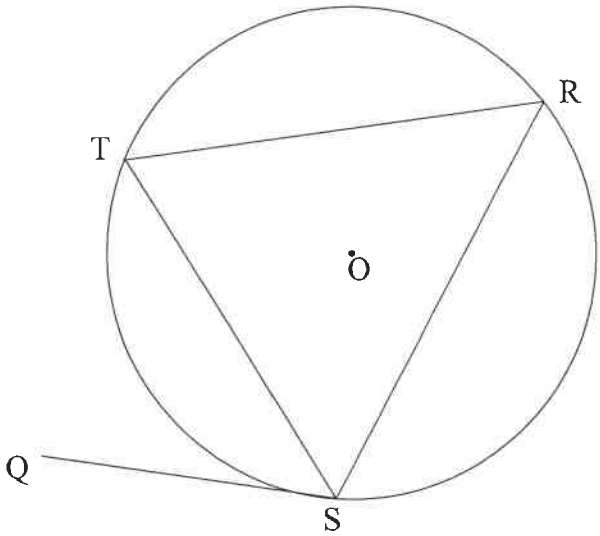
8.2.1 If AF is a tangent to the circle passing through points F, G and D, then prove, giving reasons, that FG || BC. (4)

8.2.2 If it is further given that $\frac{AF}{FB} = \frac{2}{5}$, $AC = 2x - 6$ and $GC = x + 9$, then calculate the value of x. (4)

[17]

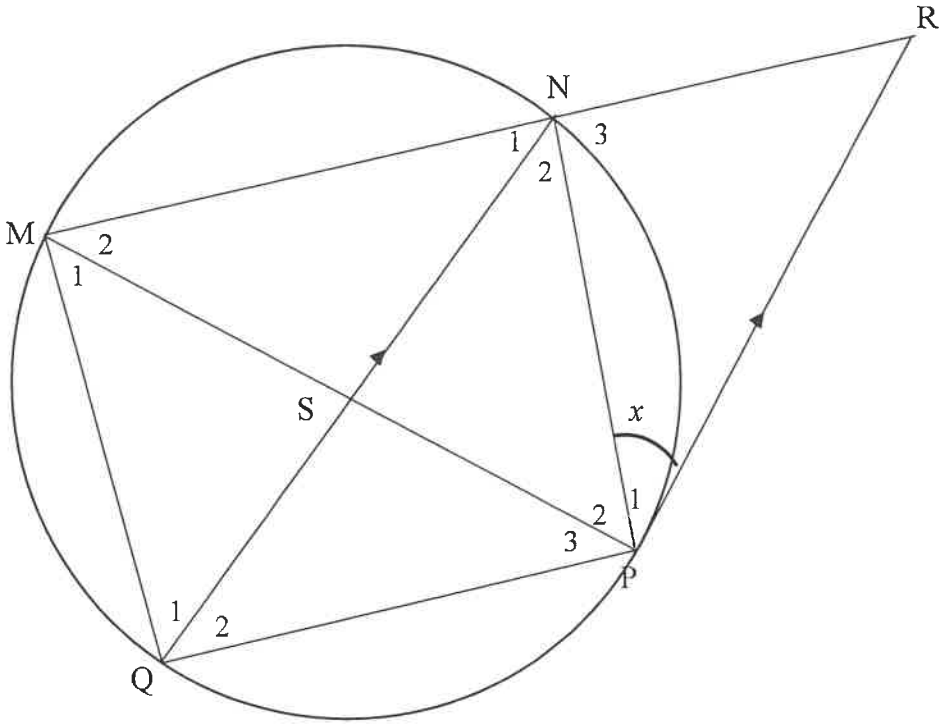
QUESTION 9

9.1 In the diagram, O is the centre of the circle. Points S, T and R lie on the circle. Chords ST, SR and TR are drawn in the circle. QS is a tangent to the circle at S.



Use the diagram to prove the theorem which states that $Q\hat{S}T = \hat{R}$. (5)

9.2 Chord QN bisects $M\hat{N}P$ and intersects chord MP at S. The tangent at P meets MN produced at R such that QN || PR. Let $\hat{P}_1 = x$.



9.2.1 Determine the following angles in terms of x. Give reasons

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

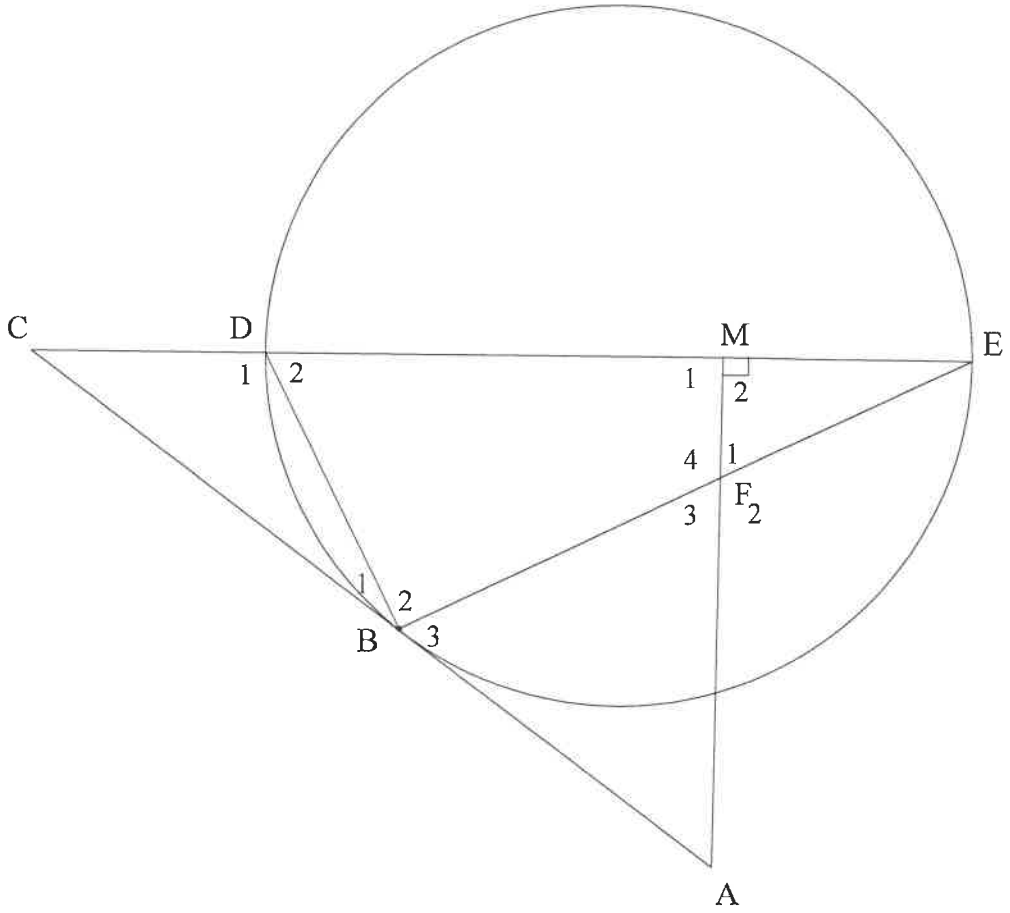
(b) $\hat{Q}_2$ (2)

9.2.2 Prove, giving reasons, that $\frac{MN}{NR} = \frac{MS}{SQ}$ (6)

[15]

QUESTION 10

In the diagram, a circle passes through D, B and E. Diameter ED of the circle is produced to C and AC is a tangent to the circle at B. M is a point on DE such that AM ⊥ DE. AM and chord BE intersect at F.



10.1 Prove, giving reasons, that:

10.1.1 FBDM is a cyclic quadrilateral (3)

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

10.1.3 $\Delta CDB \parallel\!| \Delta CBE$ (3)

10.2 If it is further given that $CD = 2$ units and $DE = 6$ units, calculate the length of:

10.2.1 BC (3)

10.2.2 DB (4)

[17]

TOTAL: 150

INFORMATION SHEET

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$\mathrm{P(A)} = \frac{n(\mathrm{A})}{n(\mathrm{S})}$ $\quad \mathrm{P(A\ or\ B) = P(A) + P(B) - P(A\ and\ B)}$

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

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Candidate Barcode label/Stafieskodeplakker

SC/NSC Answer Book
SS/NSS Antwoordeboek

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

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

MARKER/*NASIENER*				MODERATOR'S INITIALS IN RELEVANT BLOCK *MODERATOR SE VOORLETTERS IN RELEVANTE BLOKKIE*											
Question *Vraag*	Marks *Punte*	Marker's Code & Initials *Nasiener se kode & Voorletters*	Marks *Punte*	SM	Marks *Punte*	DCM *AHN*	Marks *Punte*	CM *HN*	Marks *Punte*	IM	Marks *Punte*	EM
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CONTROLLED AND CERTIFIED CORRECT
(SURNAME AND INITIALS OF EA)
GEKONTROLEER EN AS KORREK GESERTIFISEER (VAN EN VOORLETTERS VAN EA)

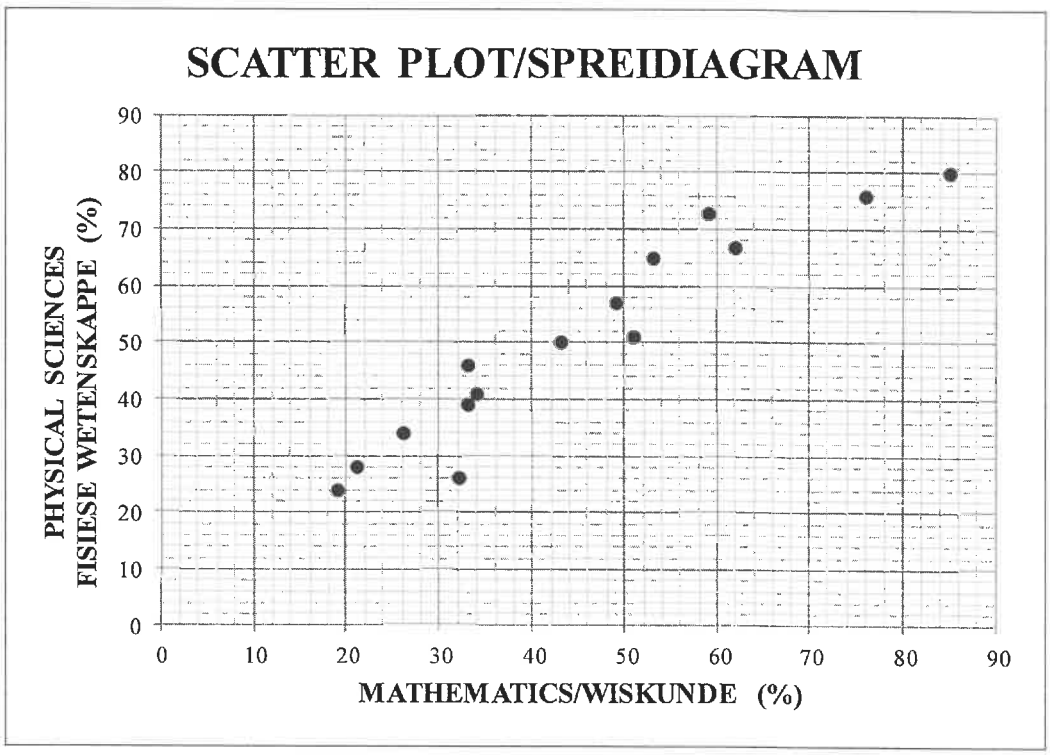
READ INSTRUCTIONS ON THE NEXT PAGE.
LEES INSTRUKSIES OP VOLGENDE BLADSY.

This answer book consists of 24 pages./*Hierdie antwoordeboek bestaan uit 24 bladsye.*

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

QUESTION/*VRAAG* 1

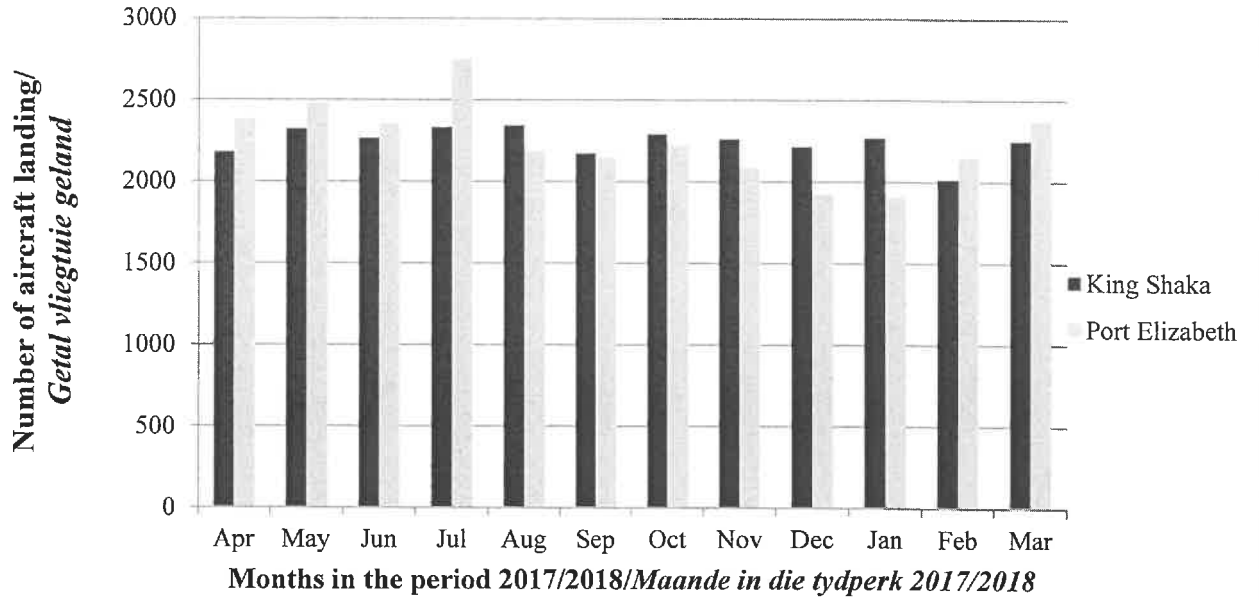
Mathematics ***Wiskunde*** **(as %)**	26	62	21	33	53	76	32	59	43	33	49	51	19	34	85
Physical Sciences ***Fisiese Wetenskappe*** **(as %)**	34	67	28	46	65	76	26	73	50	39	57	51	24	41	80

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

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

QUESTION/*VRAAG* 2

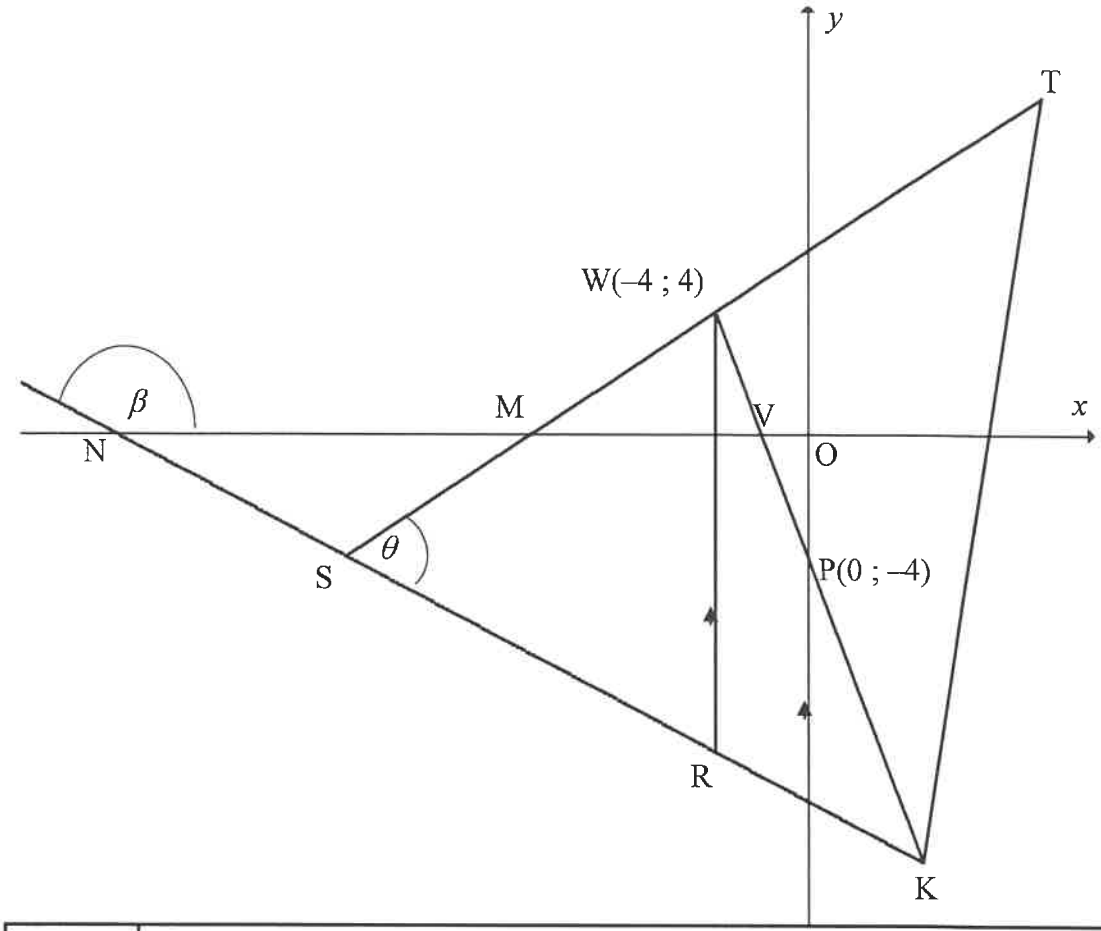
Number of aircraft landing at the King Shaka International airport and the Port Elizabeth Airport for the period April 2017 to March 2018/
Getal vliegtuie wat in die tydperk April 2017 tot Maart 2018 op die King Shaka Internasionale Lughawe en die Port Elizabeth-lughawe geland het



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

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

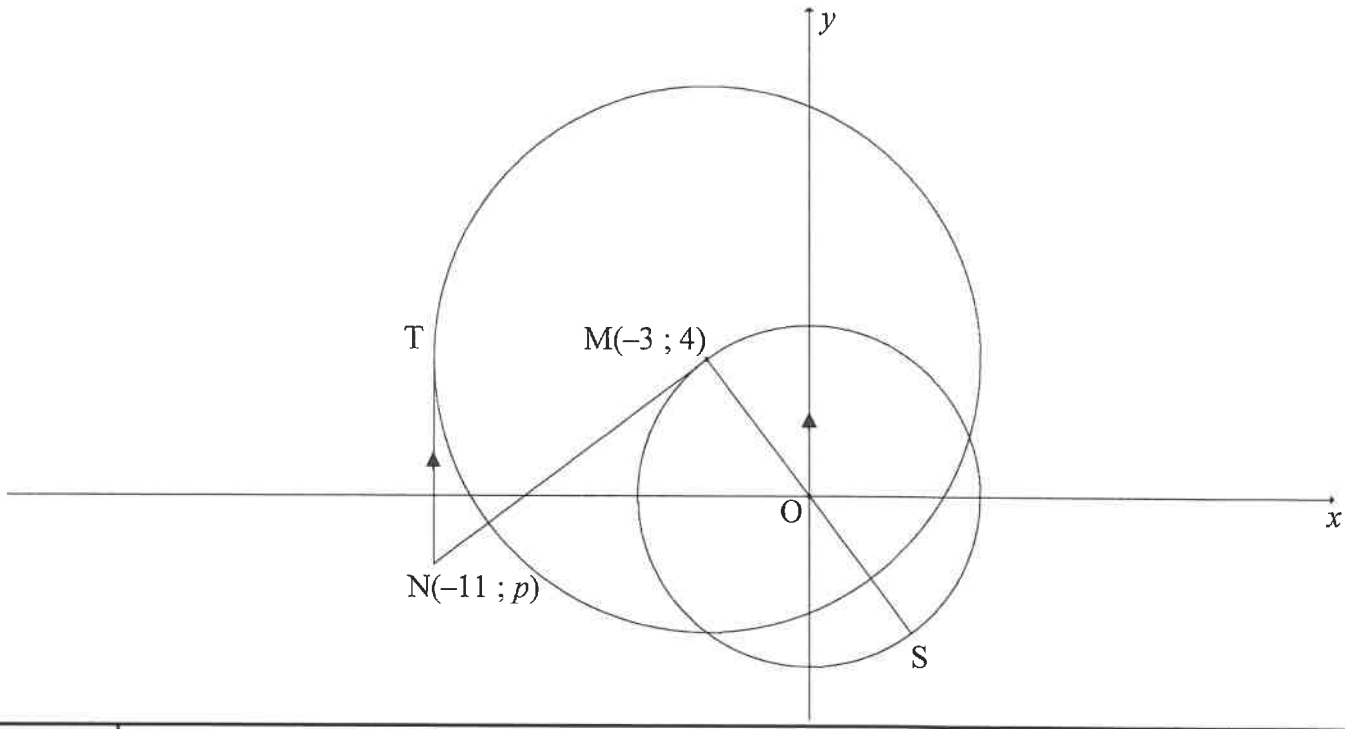
QUESTION/*VRAAG* 3



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

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

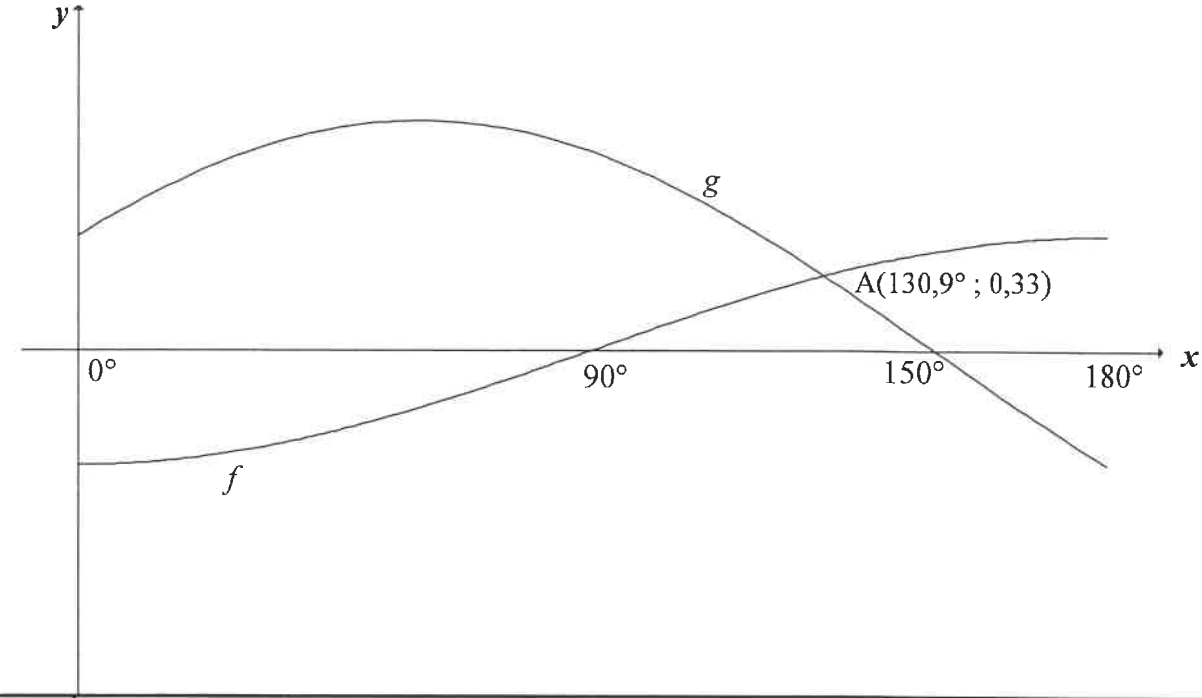
QUESTION/*VRAAG* 4



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

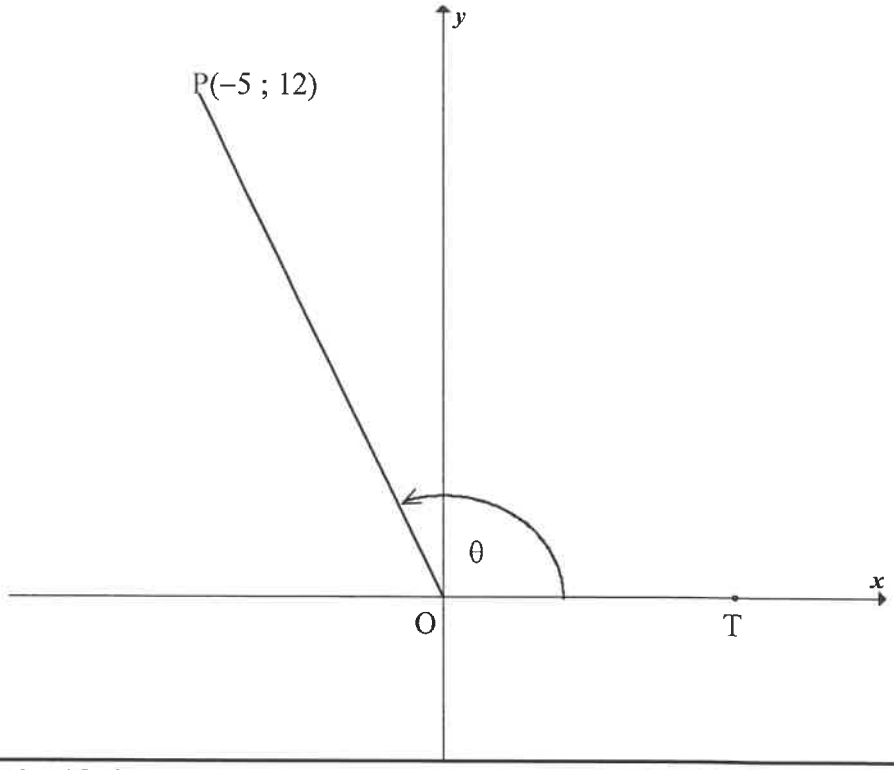
	Solution/*Oplossing*	Marks *Punte*
4.4		(5)
4.5		(5)
		[19]

QUESTION/*VRAAG* 5



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

QUESTION/*VRAAG* 6

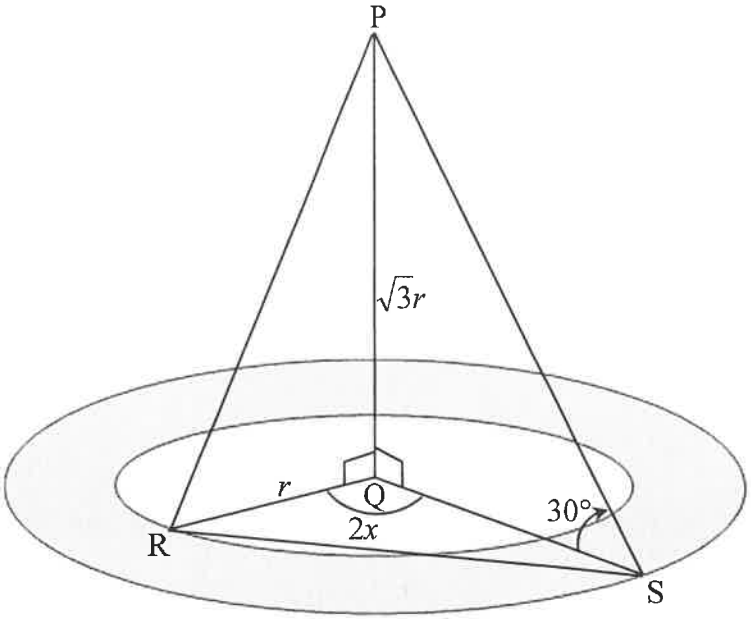


	Solution/*Oplossing*	**Marks** ***Punte***
6.1.1		(1)
6.1.2		(3)
6.1.3		(4)

6.2		(5)
6.3		(6)

6.4		(5)
		[24]

QUESTION/*VRAAG* 7



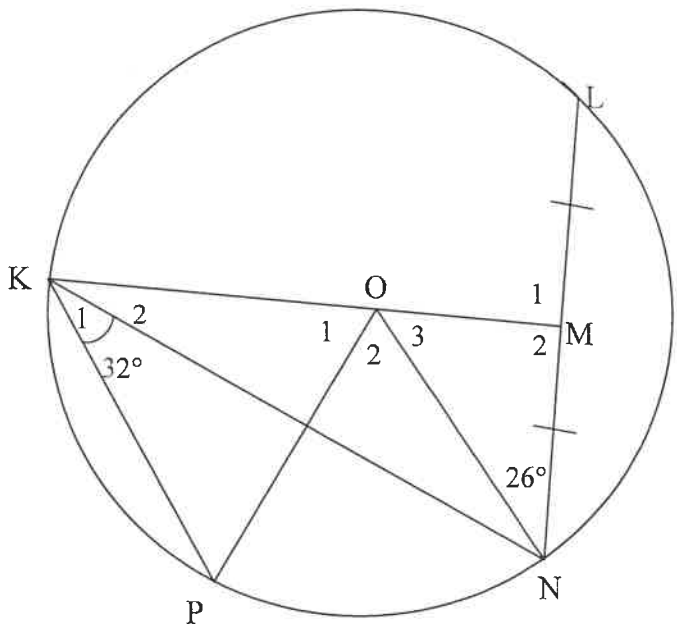
	Solution/*Oplossing*	Marks *Punte*
7.1		(3)
7.2		(2)
7.3		(3)

7.4		(2)
		[10]

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

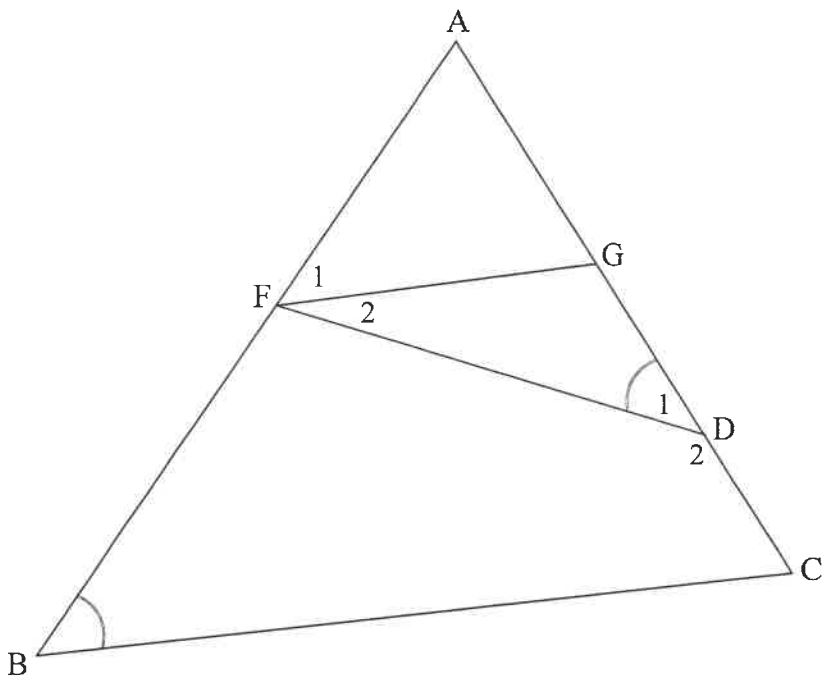
QUESTION/*VRAAG* 8

8.1



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

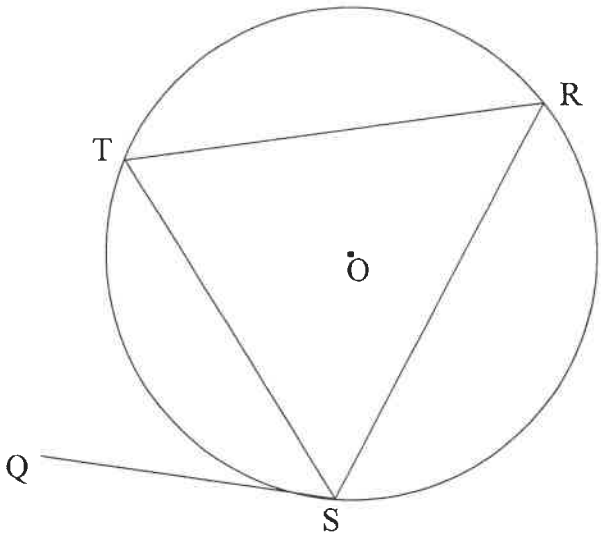
8.2



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

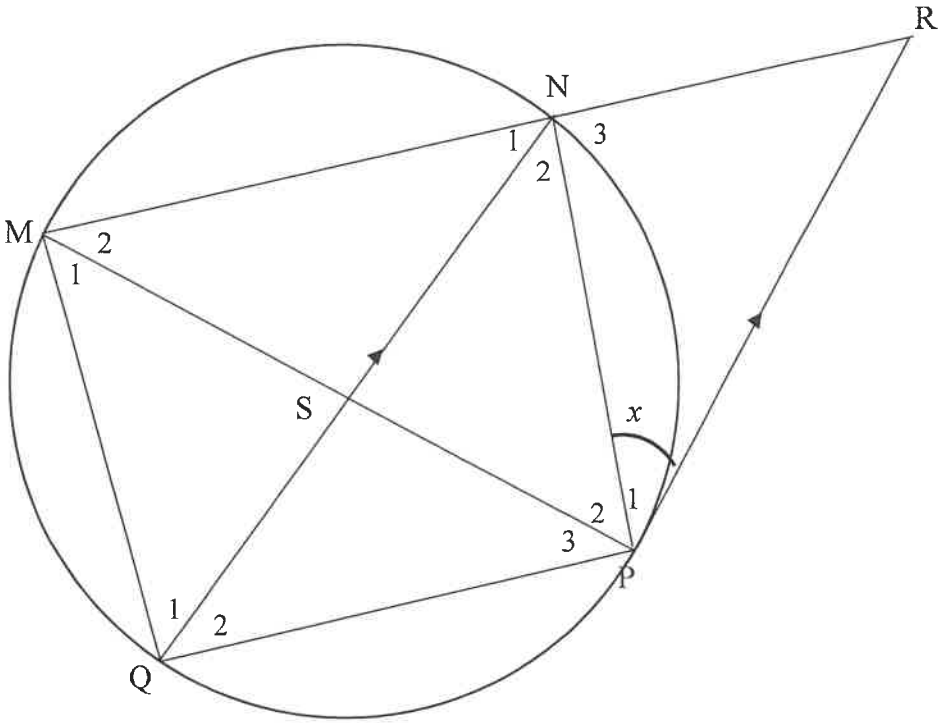
QUESTION/*VRAAG* 9

9.1



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

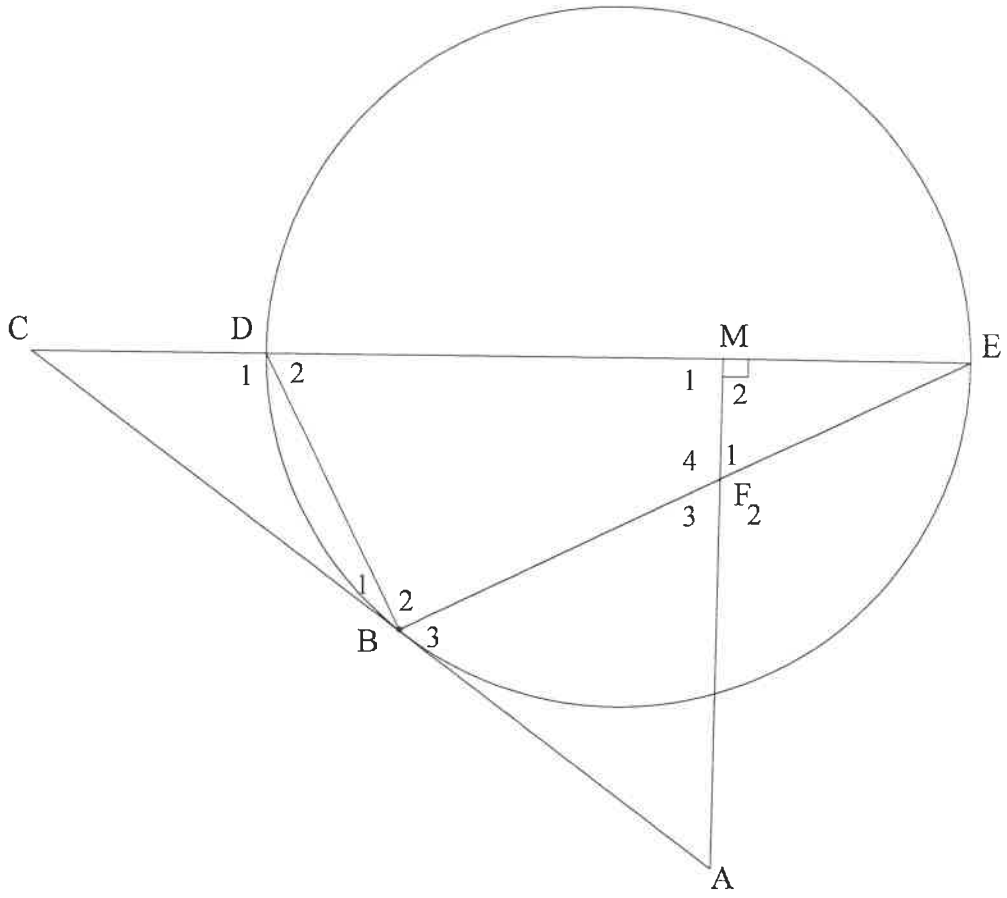
9.2



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

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

QUESTION/*VRAAG* 10



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

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

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

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

TOTAL/*TOTAAL*: 150

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

basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

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

GRADE/*GRAAD* 12

MATHEMATICS P2/*WISKUNDE V2*

NOVEMBER 2020

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

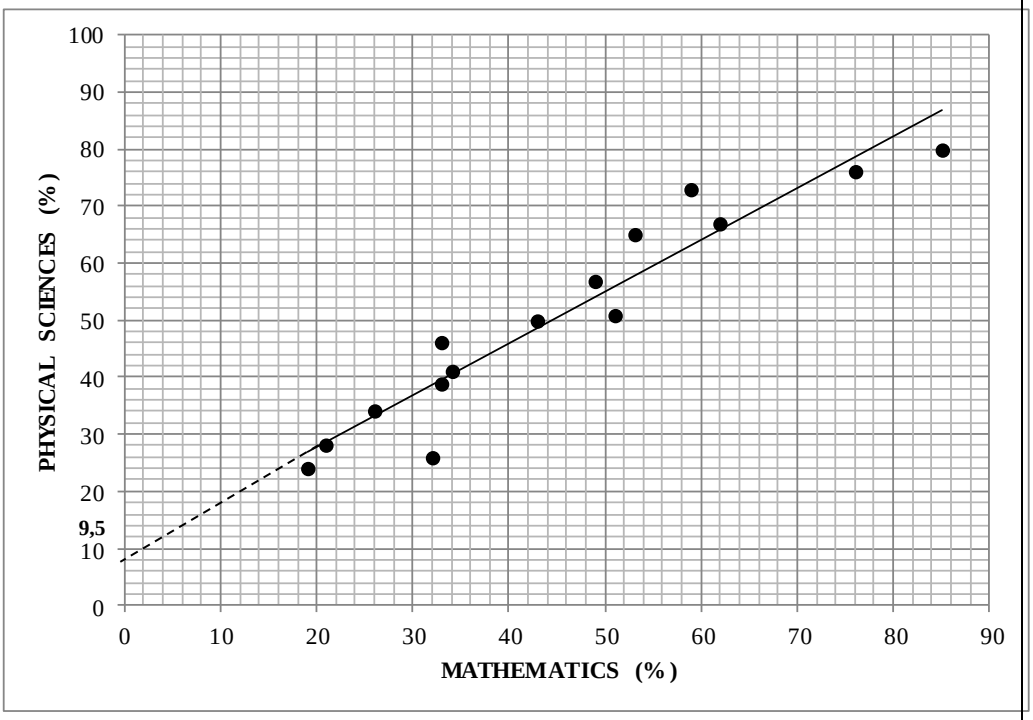
These marking guidelines consist of 27 pages.
Hierdie nasienriglyne bestaan uit 27 bladsye.

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

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

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

QUESTION/*VRAAG* 1

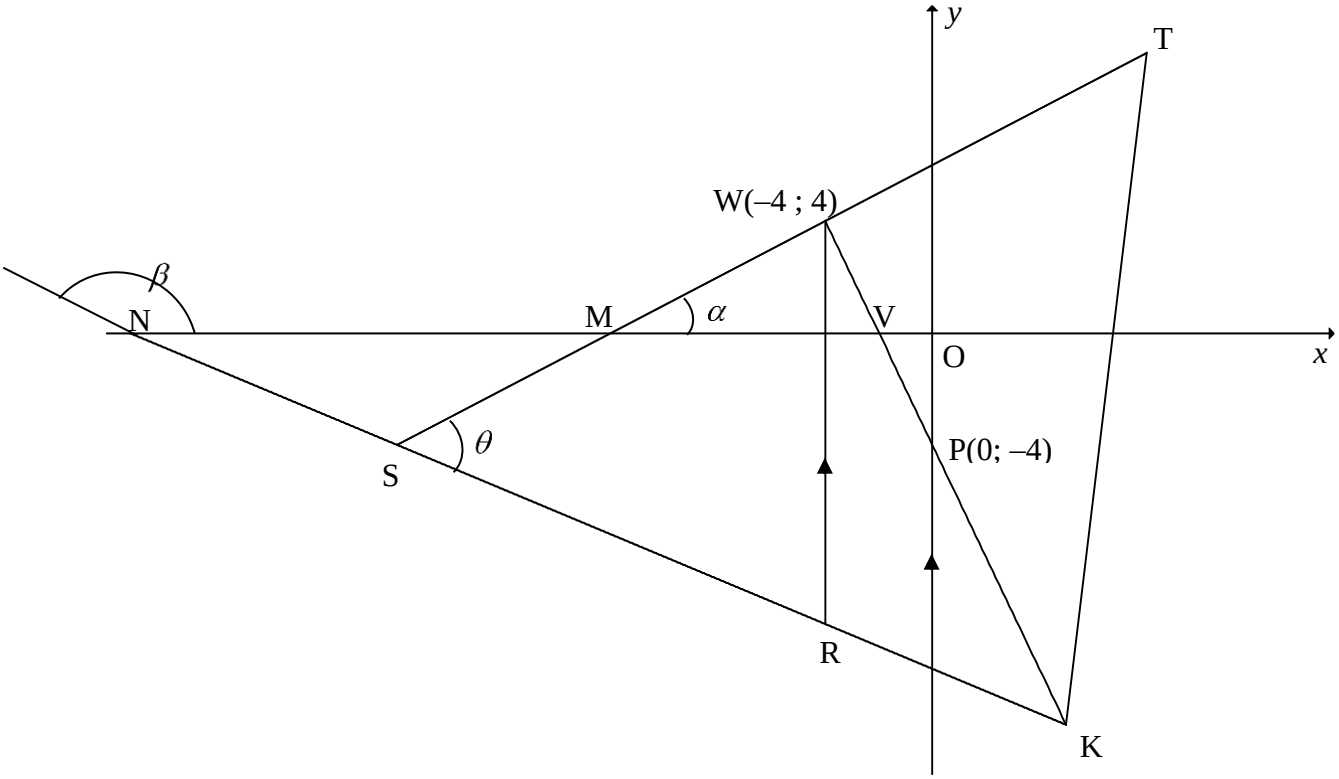
1.1	$a = 9{,}5$ $b = 0{,}909.. = 0{,}91$ $\hat{y} = 9{,}5 + 0{,}91x$	✓ $a = 9{,}5$ ✓ $b = 0{,}91$ ✓ equation (3)
1.2		✓✓ correct slope going through 2 points: (50 ; 55) or (40 ; 46) or (60 ; 64) or (0 ; 9,5) or (45 ; 50) (2)
1.3	Final exam mark ≈ 72,22% (calculator) **OR** $\hat{y} = 9{,}5 + 0{,}91(69)$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

QUESTION/*VRAAG* 2

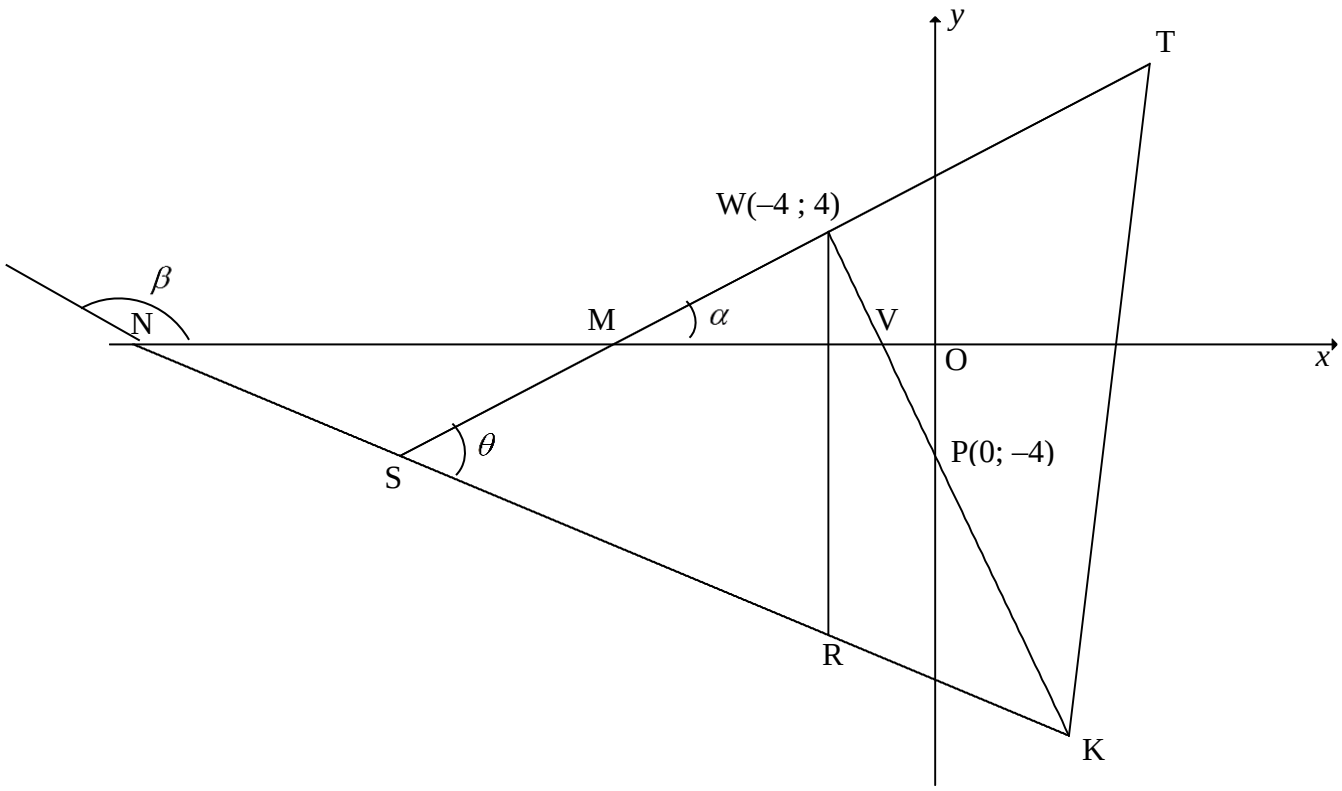
2 018	**2 175**	**2 182**	**2 215**	**2 254**	**2 263**	**2 267**	**2 271**	**2 293**	**2 323**	**2 334**	**2 346**

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

QUESTION/*VRAAG* 3



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

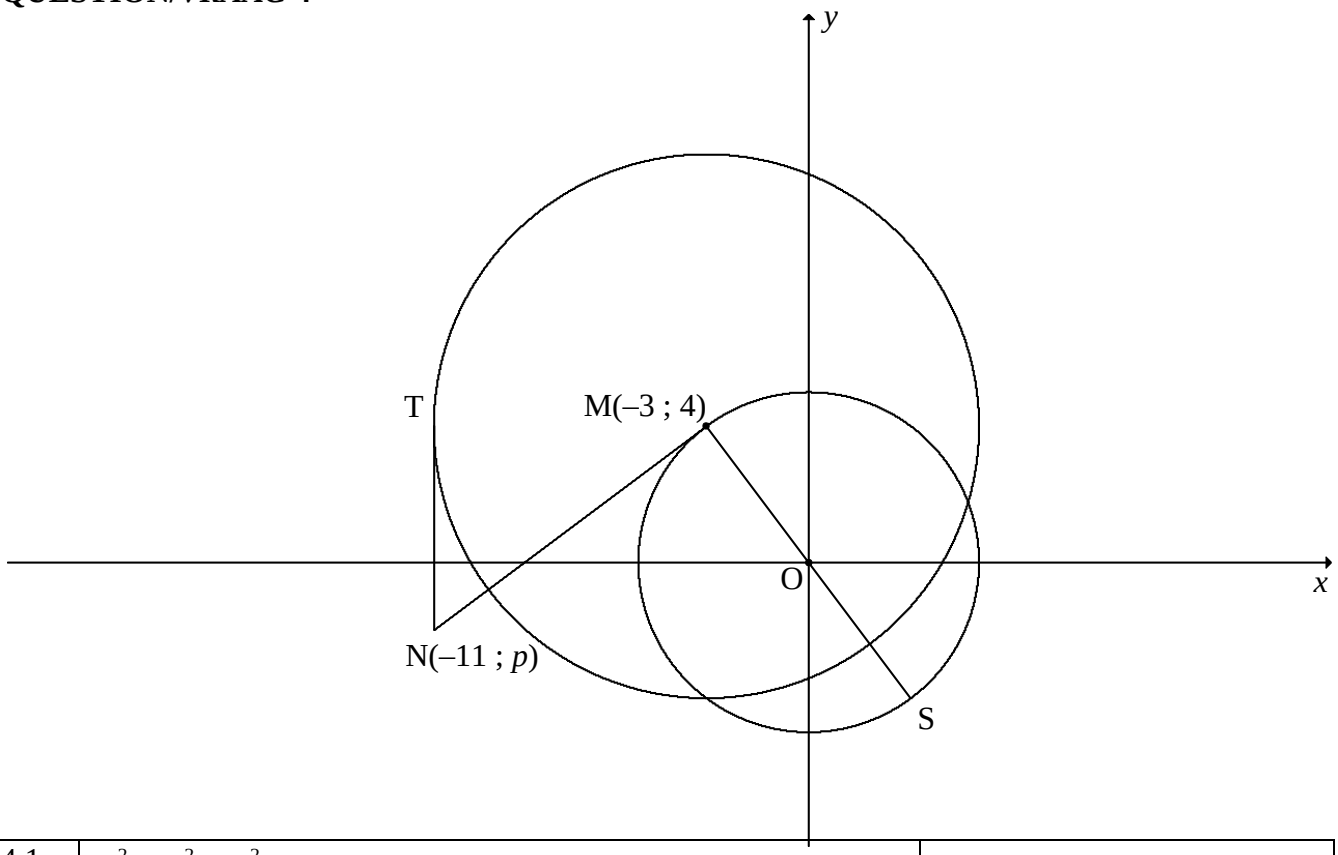


	$5y+2x+60=0$ $5\left(\frac{1}{2}x+6\right)+2x+60=0$ $\frac{5}{2}x+30+2x+60=0$ $\frac{9}{2}x=-90 \qquad \therefore x=-20$ $\therefore y=-\frac{2}{5}(-20)-12$ $\therefore y=-4$ $\therefore$ S(–20; –4) **OR** $5y+2x=-60$ .....(1) $2y-x=12$ .....(2) $(1)+2(2): 9y=-36$ $y=-4$ $2(-4)-x=12$ $x=-20$	✓ substitution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

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

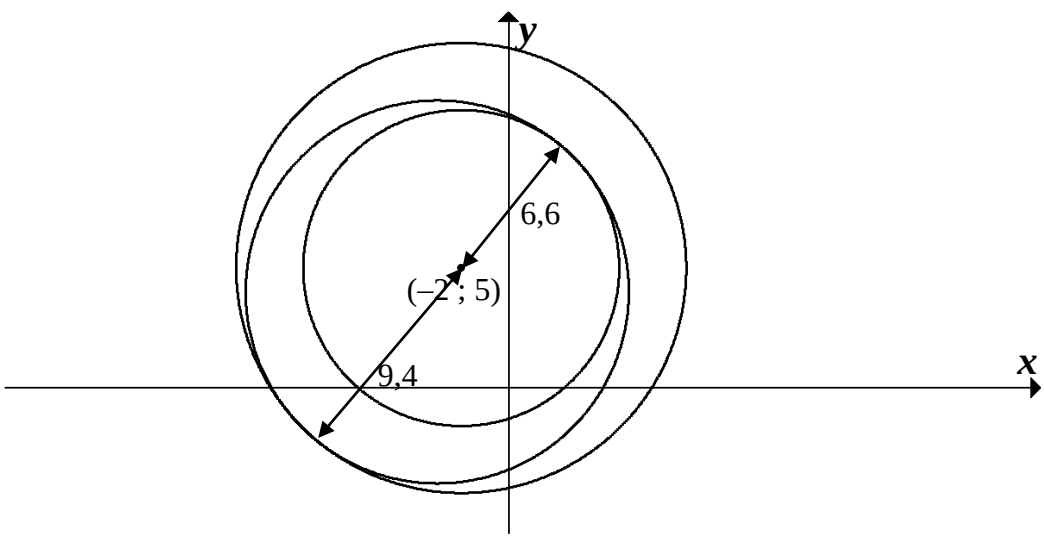
	In ΔSRW: $\perp h = -4-(-20)$ $\perp h = 16$units Area SWRL $= 16\times\frac{72}{5}$ $= 230{,}40$ square units **OR** $SW=\sqrt{(-20+4)^2+(-4-4)^2}=8\sqrt{5}=17{,}89$ $SR=\sqrt{(-20+4)^2+\left(-4+10\frac{2}{5}\right)^2}=\frac{16\sqrt{29}}{5}=17{,}23$ Area SWRL $= 2\times$ Area ΔSRW $=2\left(\frac{1}{2}SW\times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

QUESTION/*VRAAG* 4

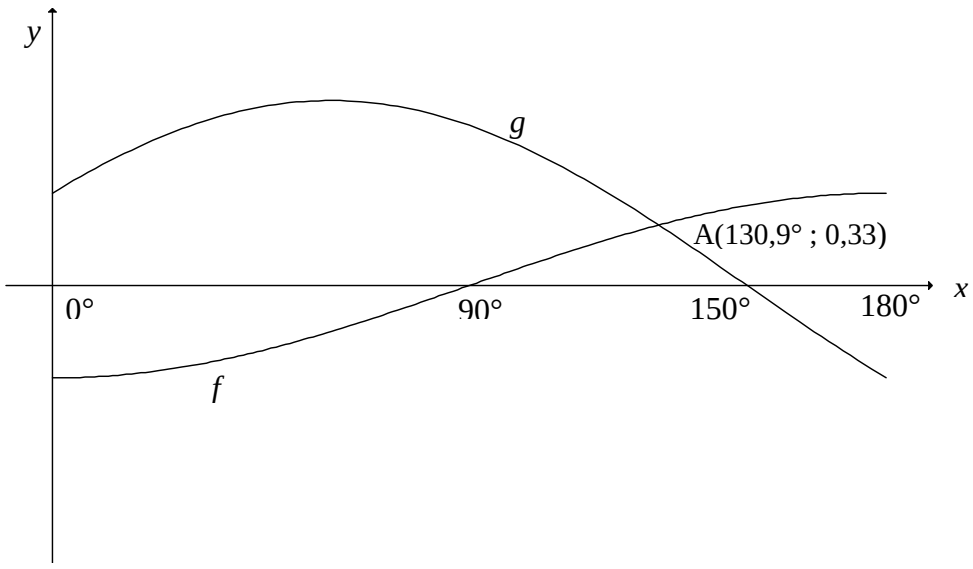


4.1	$x^2+y^2=r^2$ $\therefore r^2=(-3)^2+(4)^2=25$ $x^2+y^2=25$	✓ substitution ✓ answer (2)
4.2	TM ⊥ TN [tangent ⊥ radius] T(–11 ; 4) $r=-3-(-11)=8$ $(x+3)^2+(y-4)^2=64$	✓ $x_T=-11$ ✓ LHS ✓ RHS (3)
4.3	O (0 ; 0) and M(–3; 4) $m_{OM}=\frac{4-0}{-3-0}=-\frac{4}{3}$ OR $\frac{0-4}{0-(-3)}=-\frac{4}{3}$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

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

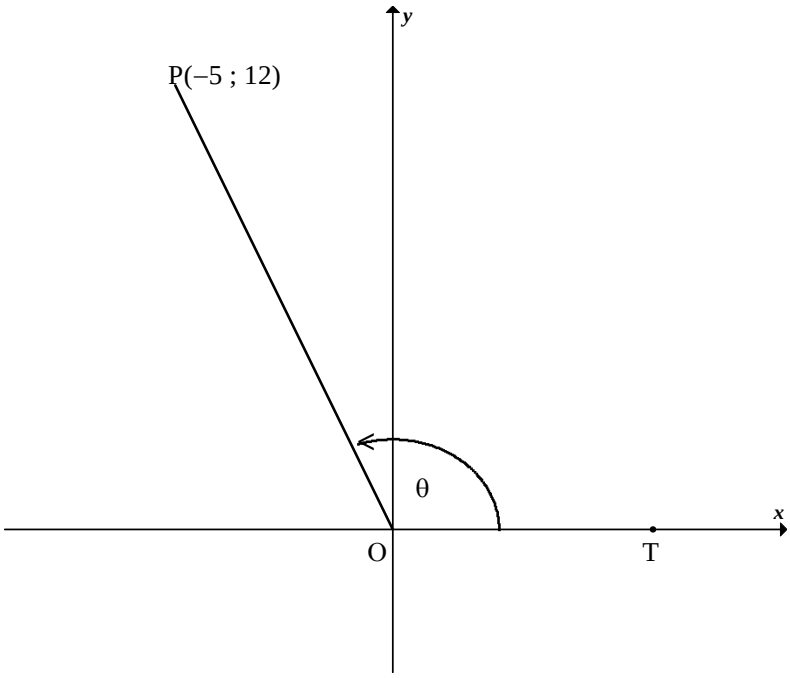


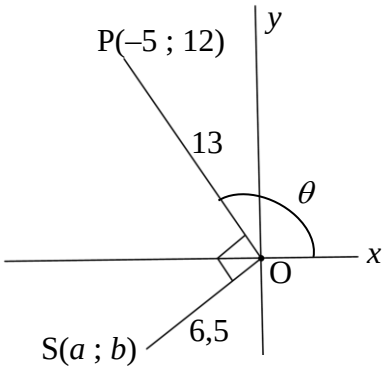
QUESTION/*VRAAG* 5



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

QUESTION/*VRAAG 6*

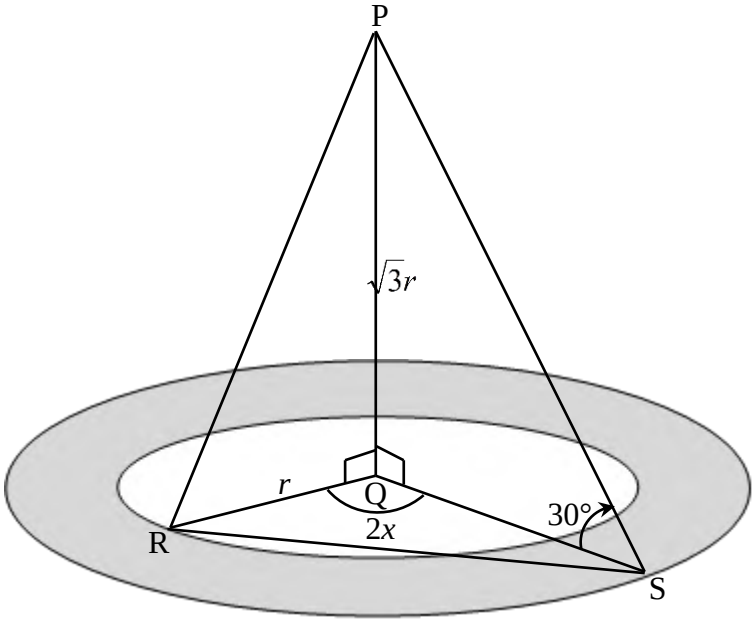


6.1.1	$\tan\theta = -\frac{12}{5}$ or $-2\frac{2}{5}$	✓answer (1)
6.1.2	$(OP)^2 = (-5)^2 + (12)^2$ $OP = 13$ $\cos\theta = -\frac{5}{13}$	✓ Pythagoras ✓ OP ✓ answer (3)
6.1.3	$\sin(\theta + 90°) = \frac{b}{6,5}$ $\cos\theta = \frac{b}{6,5}$ $\frac{-5}{13} = \frac{b}{6,5}$ $b = -\frac{5}{2}$  **OR** $\cos(90°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

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

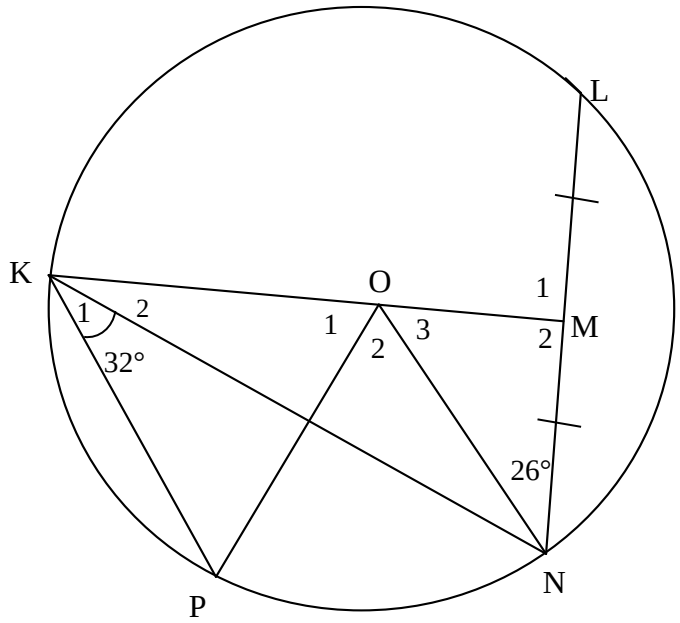
	$x^2 - 2 + \frac{1}{x^2} = 0$ $\left(x - \frac{1}{x}\right)^2 = 0$ $x^2 = 1$ $x = \pm 1$ $3\cos A = 2$ or $3\cos A = -2$ $\cos A = \frac{2}{3}$ or $\cos A = -\frac{2}{3}$ $\cos 2A = 2\cos^2 A - 1$ $= 2\left(\pm\frac{2}{3}\right)^2 - 1$ $= -\frac{1}{9}$	✓ $x = \pm 1$ ✓ $\cos A = \frac{2}{3}$ ✓ $\cos A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

QUESTION/*VRAAG* 7



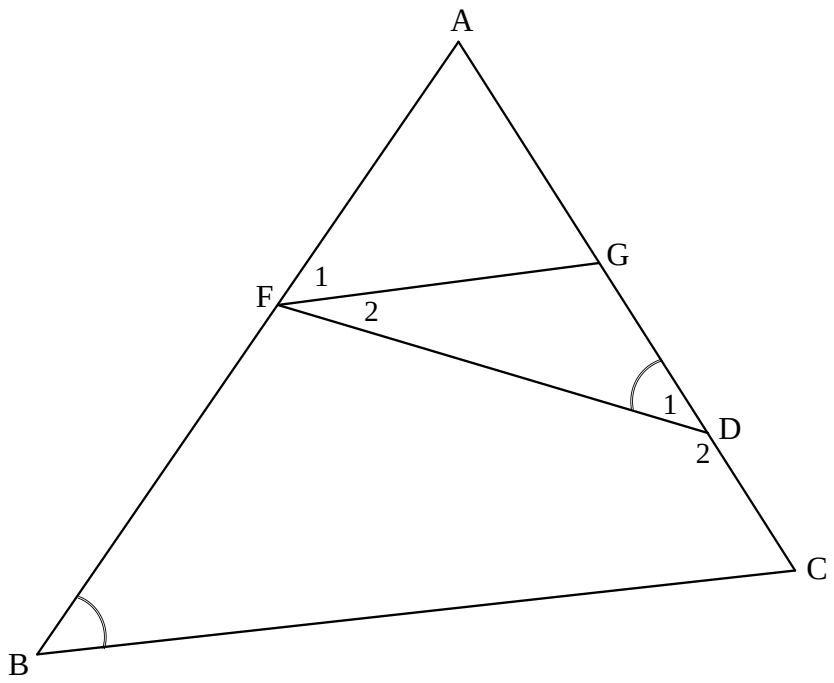
7.1	$\tan 30° = \frac{\sqrt{3}r}{QS}$ **OR** $\tan 60° = \frac{QS}{\sqrt{3}r}$ $QS = \frac{\sqrt{3}r}{\tan 30°}$ $\sqrt{3} = \frac{QS}{\sqrt{3}r}$ $= \frac{\sqrt{3}r}{\frac{1}{\sqrt{3}}}$ *or* $\frac{\sqrt{3}r}{\frac{\sqrt{3}}{3}}$ $QS = 3r$ $= 3r$	✓✓ trig ratio ✓ QS subject (3)
7.2	Area of flower garden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

QUESTION/*VRAAG* 8



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

8.2

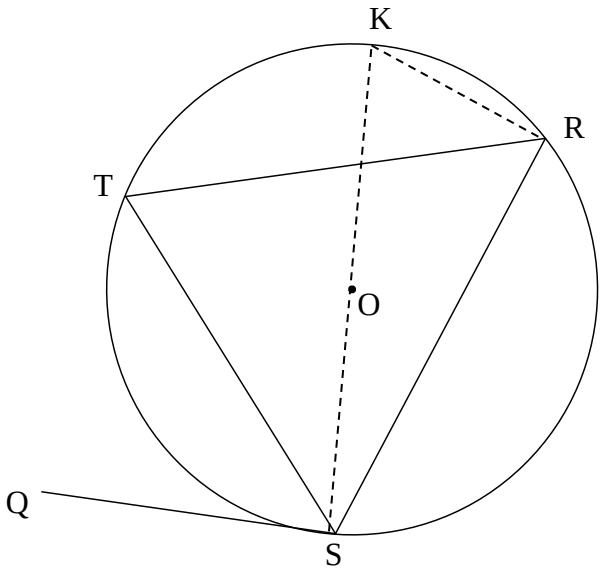


8.2.1	$\hat{F}_1 = \hat{D}_1$ [tan chord theorem/*raaklyn koordst*] $\hat{D}_1 = \hat{B}$ [Given/*Gegee*] $\therefore \hat{F}_1 = \hat{B}$ $\therefore FG \parallel BC$ [corresp ∠s =/*Ooreenkomstige∠e* =]	✓ S ✓ R ✓ $\hat{F}_1 = \hat{B}$ ✓ R (4)
8.2.2	$\frac{GC}{AC} = \frac{FB}{AB}$ [line ∥ one side of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

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

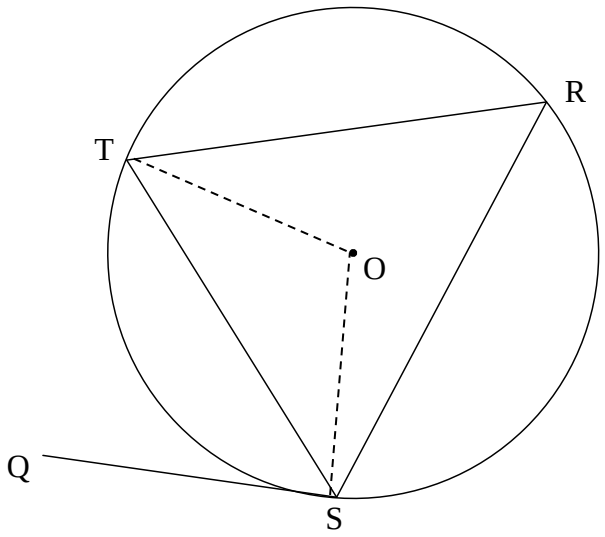
QUESTION/*VRAAG* 9

9.1



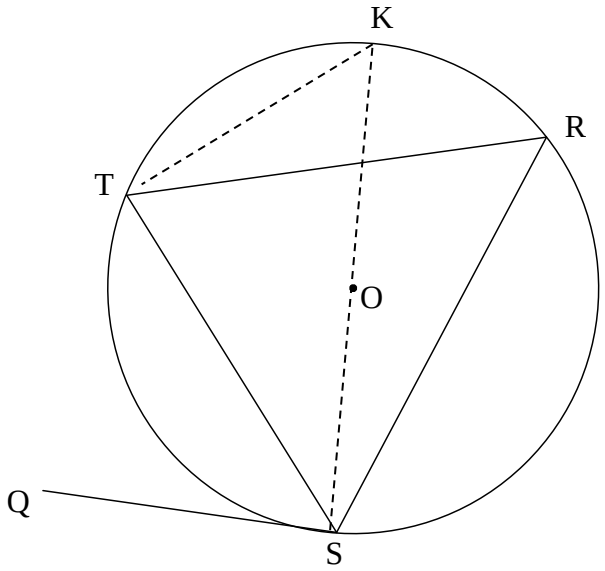
9.1	Construction: Draw diameter KS and draw KR *Konstruksie: Trek middellyn KS en verbind KR* $Q\hat{S}T = 90° - T\hat{S}K$ [radius ⊥ tangent/*raaklyn*] $S\hat{R}K = 90°$ [∠ in semi circle/*halfsirkel*] $\therefore S\hat{R}T = 90° - K\hat{R}T$ $T\hat{S}K = T\hat{R}K$ [∠s same segment/*∠e dieselfde segment*]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

OR



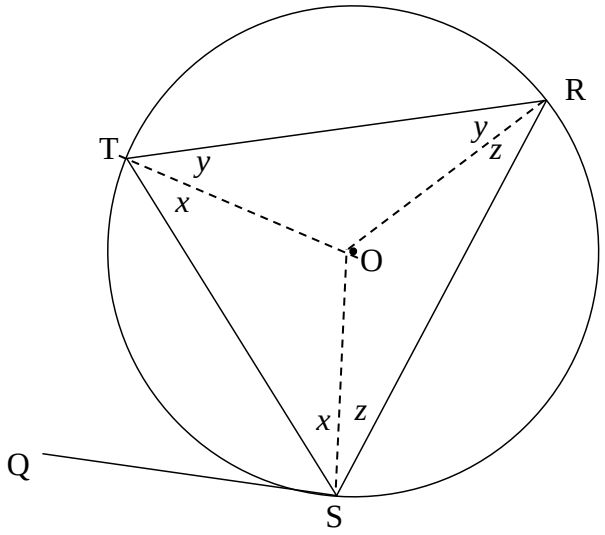
9.1	Construction: Draw radii OS and OT *Konstruksie: Trek radii OS en OT* $Q\hat{S}T = 90° - O\hat{S}T$ [radius ⊥ tangent/*raaklyn*] $O\hat{S}T = S\hat{T}O$ [∠s opp = sides/*∠e teenoor = sye*] $\therefore S\hat{O}T = 180° - 2O\hat{S}T$ [∠s of Δ/*∠e van Δ*] $\hat{R} = 90° - O\hat{S}T$ [∠ at centre = 2×∠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

OR



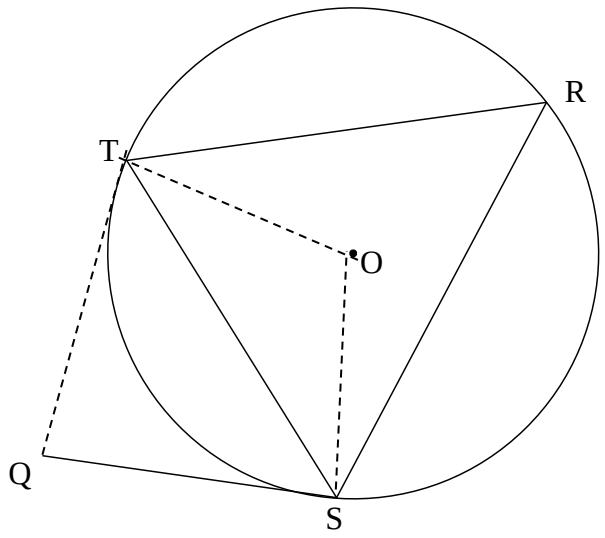
9.1	Construction: Draw diameter KS and join K to T. *Konstruksie: Trek middellyn KS en verbind K tot T* K $Q\hat{S}T = 90° - T\hat{S}K$ [radius ⊥ tangent/*raaklyn*] $S\hat{T}K = 90°$ [∠ in semi circle/*halfsirkel*] $\therefore \hat{K} = 90° - T\hat{S}K$ $\therefore Q\hat{S}T = \hat{K}$ but $\hat{R} =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

OR



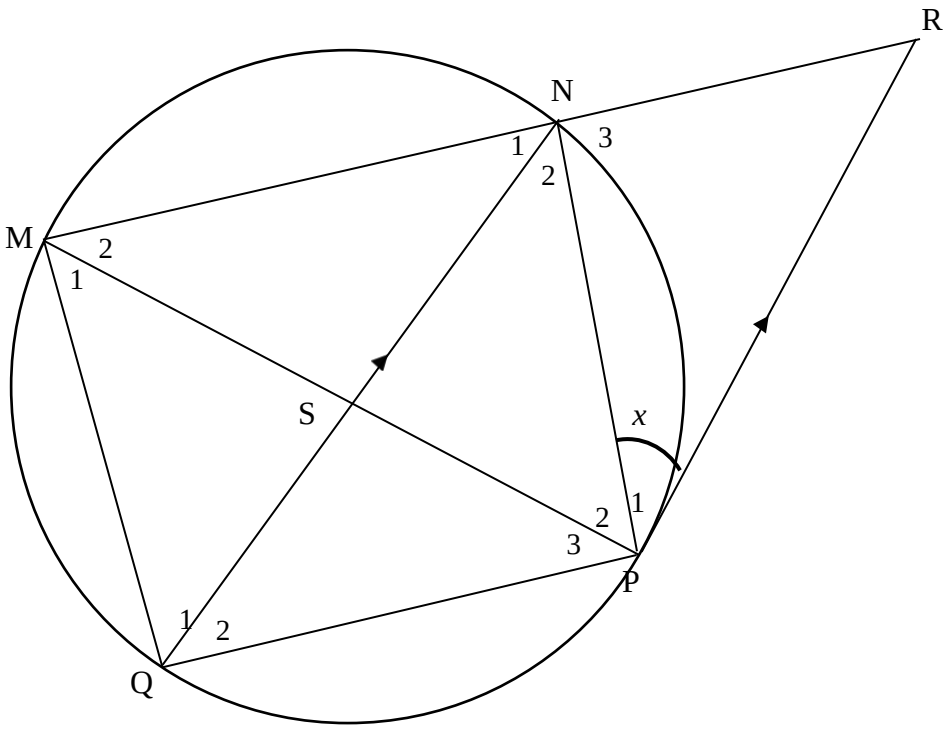
9.1	Construction: Draw radii OT, OR and OS *Konstruksie: Trek radiuse OT, OR en OS* $O\hat{S}T = O\hat{T}S$ [∠s opp = radii/*∠e teenoor = radiuse*] Also: $O\hat{T}R = O\hat{R}T$ and $O\hat{R}S = O\hat{S}R$ $2x + 2y + 2z = 180°$ [∠s of Δ] $x + y + z = 90°$ $y + z = 90° - x$ $O\hat{S}Q = 90°$ [radius ⊥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

OR



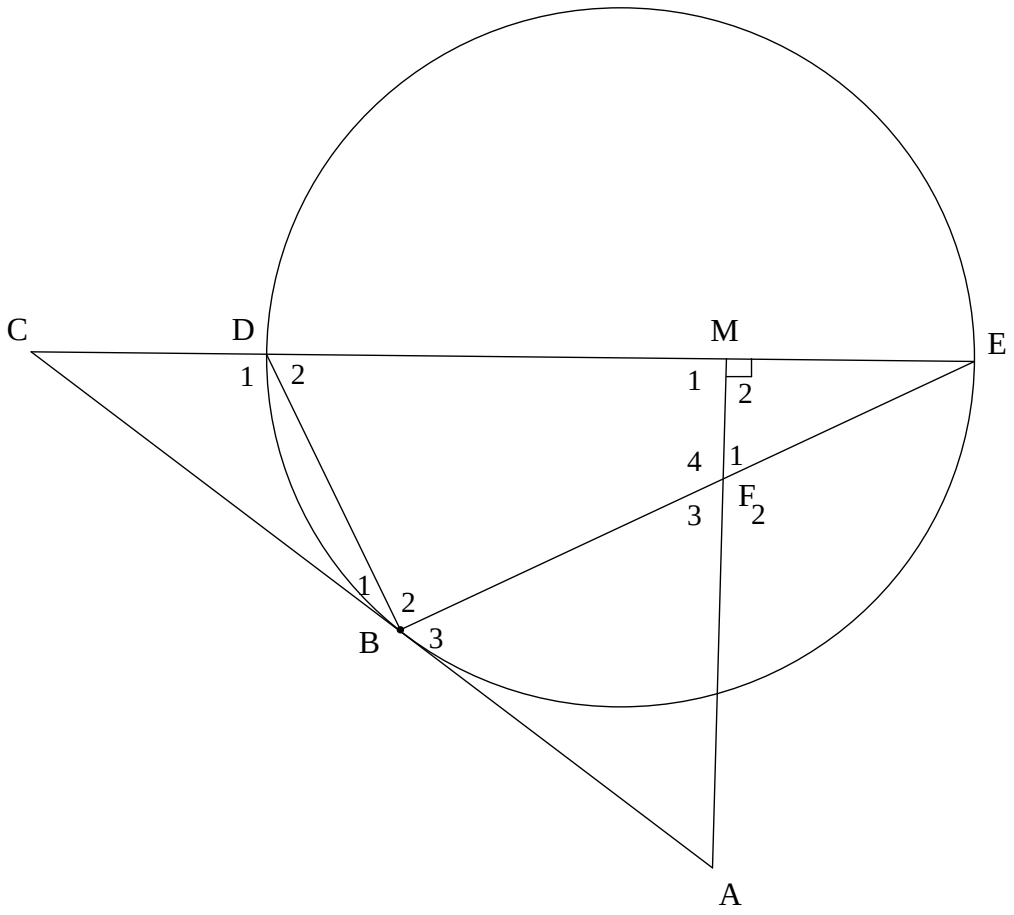
9.1	Construction: Draw radii OT and OS, tangent QT *Konstruksie: Trek radiuse OT en OS, raaklyn QT* $O\hat{S}Q = 90°$ [radius ⊥ tangent/*raaklyn*] $\therefore\ T\hat{S}Q = 90° - T\hat{S}O$ $\therefore\ T\hat{S}O = S\hat{T}O$ [∠s opp = radii/*∠e teenoor = radiuse*] $T\hat{O}S = 180° - 2T\hat{S}O$ [∠s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

9.2



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

QUESTION/*VRAAG* 10



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

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

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

TOTAL/*TOTAAL*: 150