



education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 11

MATHEMATICS P2

NOVEMBER 2024

MARKS: 150

TIME: 3 hours



This question paper consists of 12 pages and 1 information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions:

1. This question paper consists of 11 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 formulas is included at the end of the paper.
9. Write neatly and legibly.



QUESTION 1

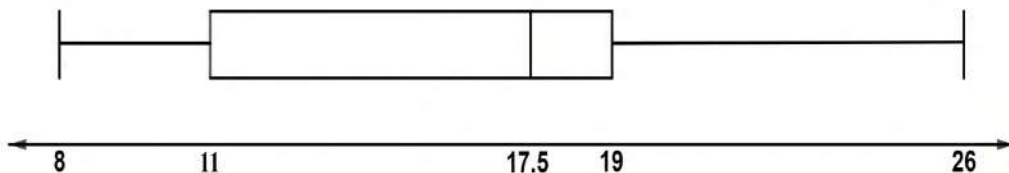
The traffic department set up a roadblock on the N12 between Potchefstroom and Klerksdorp. During the first hour, they stopped 11 minibus taxis. The following dataset is a summary of the number of passengers per minibus taxi.

18, 26, 25, 18, 16, 12, 10, 8, 18, 17, 8

- 1.1 Calculate the mean number of passengers per taxi. (2)
- 1.2 Calculate the standard deviation for this dataset. (1)
- 1.3 Taxis in which the number of passengers is more than one standard deviation above the average can be considered overloaded. How many taxis were overloaded? (2)
- 1.4 During the second hour of the roadblock, a further 5 minibus taxis were stopped. The number of passengers in these 5 taxis are: x , 13, 18, y , 20.

These 5 numbers are already arranged from smallest to largest.

The entire dataset for the first and second hours is collectively represented on a box-and-whisker diagram. The new average number of passengers for the 16 taxis is 16. The five-number summary can be seen on the diagram below.



- 1.4.1 Discuss the skewness of the data. (1)
- 1.4.2 What percentage of the minibus taxis had more than 11 passengers? (1)
- 1.4.3 Calculate the value of x and y . (4)

[11]

**QUESTION 2**

The traffic department has also conducted further investigation into where the best locations would be on the N12 to install speed cameras. Part of the investigation involved a survey of the different speeds of vehicles on the N12 between Potchefstroom and Klerksdorp.

The following table shows the results of the investigation:

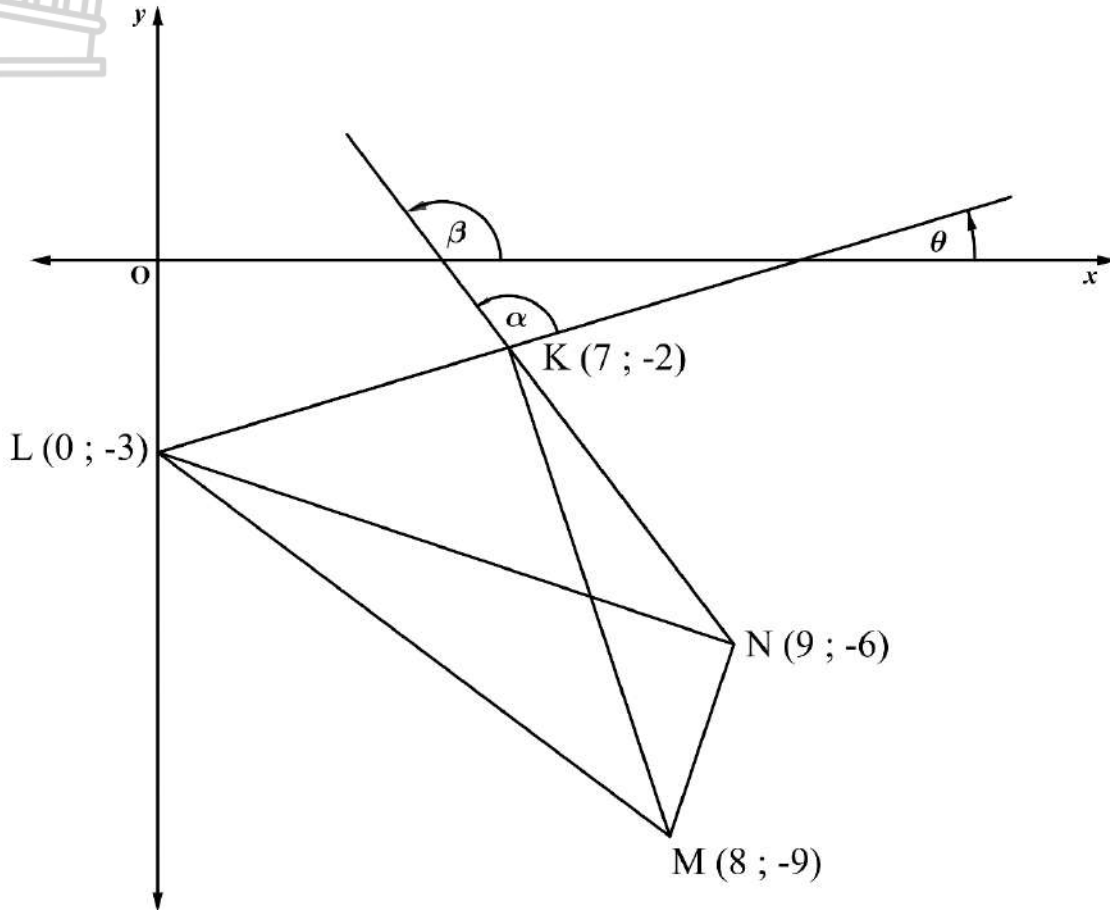
SPEED (d) (in km/h)	FREQUENCY (number of vehicles)	CUMULATIVE FREQUENCY
$40 < d \leq 60$	25	
$60 < d \leq 80$	46	
$80 < d \leq 100$	67	
$100 < d \leq 120$	79	
$120 < d \leq 140$	24	
$140 < d \leq 160$	8	
$160 < d \leq 180$	1	

- 2.1 Use the table in the answer book and complete the cumulative frequency column. (2)
- 2.2 How many vehicles were observed in the survey? (1)
- 2.3 Illustrate the information in the table by drawing a ogive (cumulative frequency curve). (4)
- 2.4 Use the ogive to determine the median of the data. Write down only the median speed. (2)
- [9]



QUESTION 3

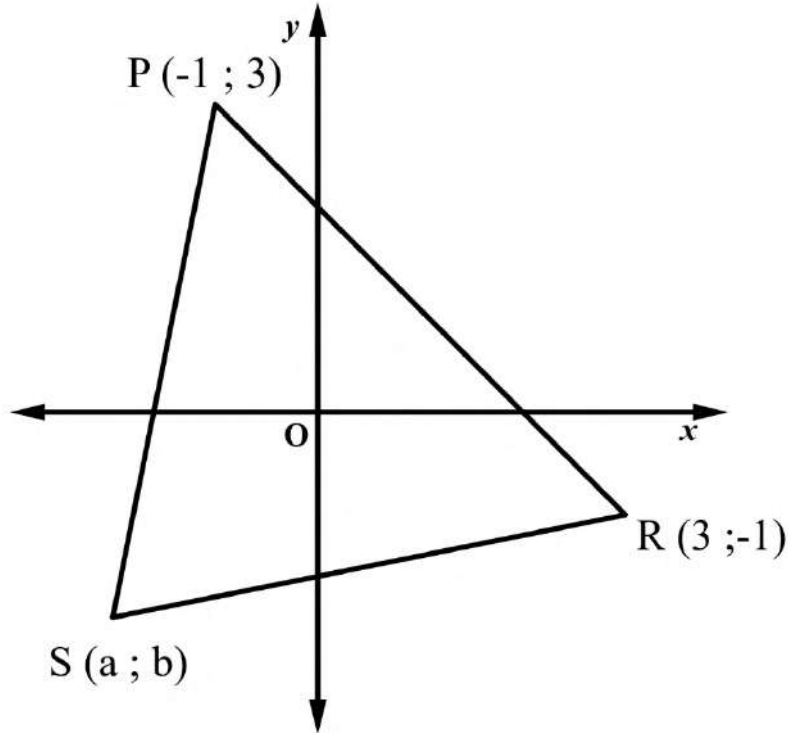
In the figure quadrilateral KLMN with vertices K (7 ; -2), L (0 ; -3), M (8 ; -9) and N (9 ; -6) are given. Extend NK to intersect the x -axis and form the angle β .
Extend LK to intersect the x -axis and form the angle θ .



- 3.1 Calculate the gradient of KN. (2)
 - 3.2 Hence, determine the equation of the straight line KN. (2)
 - 3.3 Calculate β , the inclination angle of KN. (3)
 - 3.4 Calculate the size of α . (4)
 - 3.5 Show that KL is perpendicular to KM. (2)
 - 3.6 Prove that KLMN is a cyclic quadrilateral. (5)
- [18]**

QUESTION 4

In the diagram below, $P(-1 ; 3)$, $R(3 ; -1)$ and $S(a ; b)$ are the vertices of ΔPRS .
Point T lies on the perpendicular bisector of PR.



- 4.1 Calculate the coordinates of T, the midpoint of PR. (2)
 - 4.2 Calculate the length of PR. (Leave the answer in simplest surd form.) (2)
 - 4.3 Determine the equation of ST, if $ST \perp PR$ and $m_{PR} = -1$. (3)
 - 4.4 Hence prove that $a = b$. (1)
 - 4.5 If the area of $\Delta PRS = 12$ square units and $a, b < 0$, determine the coordinates of S. (5)
- [13]**


QUESTION 5

Answer this question **without the use of a calculator**:

- 5.1 If $13\cos\theta - 12 = 0$ and $\tan\theta$ is positive, using a sketch, determine the value of:

$$\frac{3\cos(360^\circ - \theta) + 2\sin(360^\circ - \theta)}{\frac{1}{5}\tan(180^\circ + \theta)} \quad (7)$$

- 5.2 Simplify:

$$\frac{\tan 135^\circ \cdot \sin 210^\circ}{\cos 660^\circ + \cos 180^\circ} \quad (6)$$

- 5.3 If $\cos 42^\circ = p$, determine the following in terms of p :

5.3.1 $\cos 138^\circ$ (2)

5.3.2 $3\sin 48^\circ$ (2)

5.3.3 $\sin(-2202^\circ)$ (3)

- 5.4 Prove the following identity:

$$\frac{\sin x}{1 + \cos x} + \frac{1}{\tan x} = \frac{1}{\sin x} \quad (6)$$

- 5.5 Given: $(a^2 + b^2)\tan^2\theta = 2ab$ with $a > 0$, $b > 0$ and $\theta \in (0^\circ; 90^\circ)$. Calculate the value of $\sin\theta$ in terms of a and b .

(5)
[31]



QUESTION 6

6.1 Solve the following equation for $x \in [-180^\circ; 180^\circ]$.

$$\cos(x - 30^\circ) = \sin x \tag{5}$$

6.2 Draw the graphs of $f(x) = \cos(x - 30^\circ)$ and $g(x) = \sin x$ for the interval $x \in [-180^\circ; 180^\circ]$ on the same set of axes.

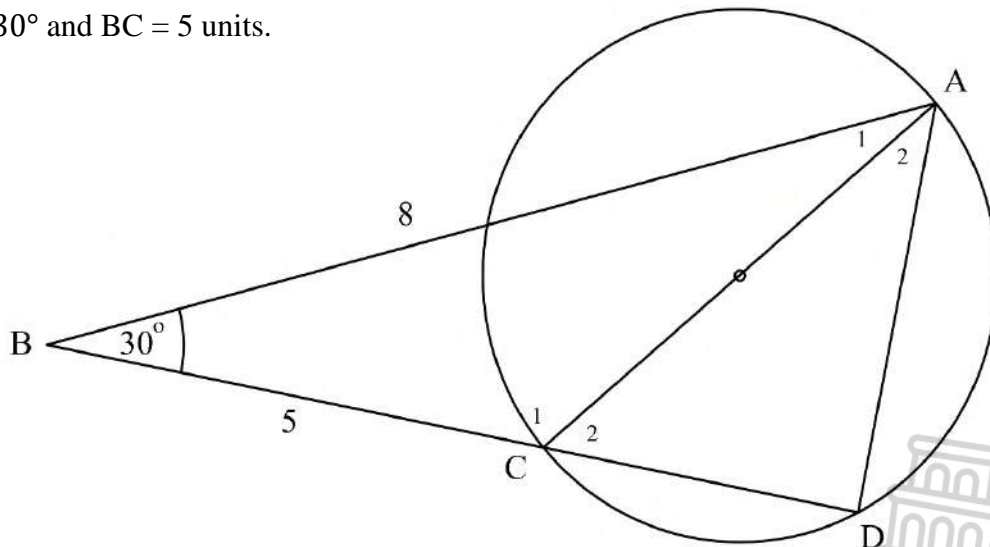
Clearly indicate the intersections with the axes as well as the turning points on the graph. (5)

6.3 For which values of x would $f(x) - g(x) \leq 0; x \in [0^\circ; 180^\circ]$? (2)
[12]

QUESTION 7

In the diagram below, circle ACD is given where AC is a diameter. DC is produced to B and $AB = 8$ units.

$\hat{B} = 30^\circ$ and $BC = 5$ units.



7.1 Prove that $AC = 4,44$ units (rounded off to TWO decimal places.) (2)

7.2 Calculate the following:

7.2.1 \hat{A}_1 (2)

7.2.2 \hat{C}_2 (1)

7.2.3 AD (3)

[8]

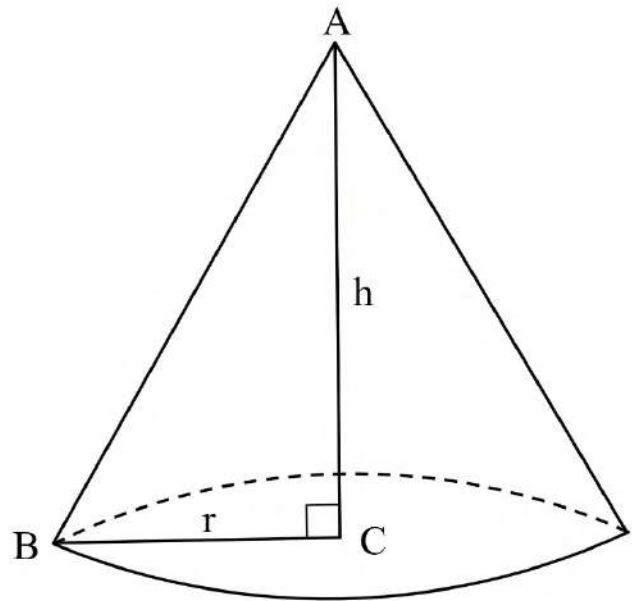
QUESTION 8

A mine dumps its waste at a landfill site where it takes the shape of a cone shown in the diagram below. The radius of the circular base is r meters, the height is h meters and the angle between the slant height and the base of the cone is 50° .

The circumference of the landfill site is 245 meters.

$$\text{Volume of cone} = \frac{1}{3}\pi r^2 h$$

$$\text{Total surface area of cone} = \pi r^2 + \pi r s$$



8.1 Determine the height of the mine waste, correct to ONE decimal place. (3)

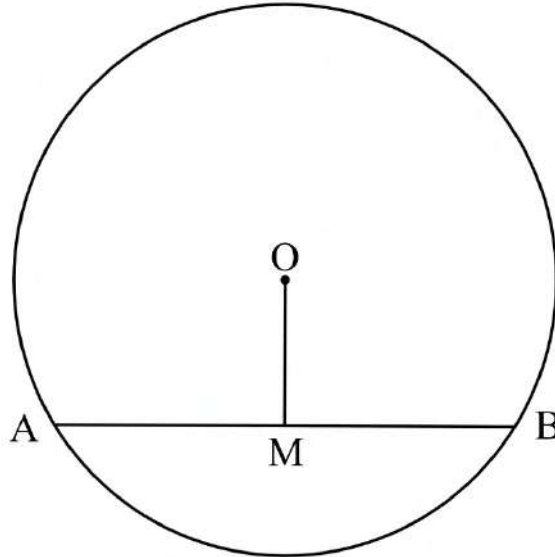
8.2 Determine the volume of the mine waste, rounded to the nearest cubic meter. (3)

[6]

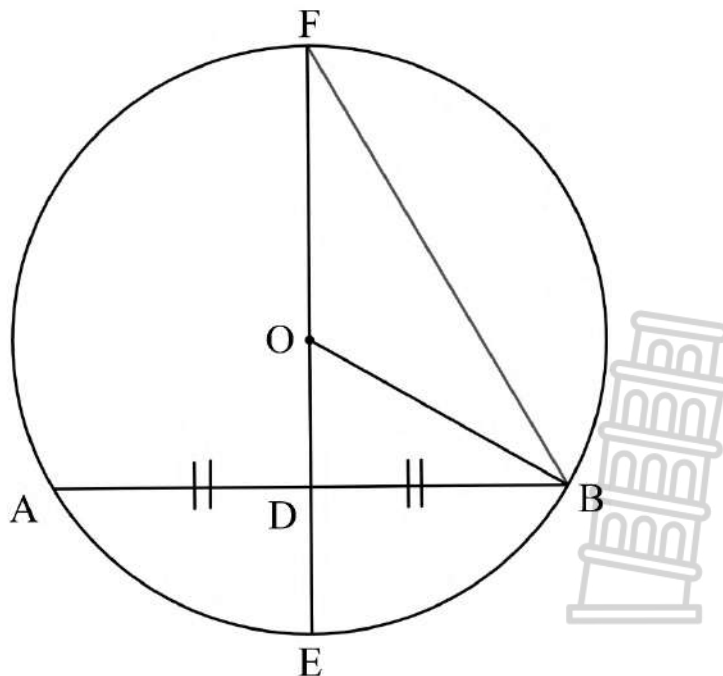


QUESTION 9

- 9.1 In the diagram, AB is a chord of a circle with center O. Prove the theorem that states: If M is the midpoint of AB, then $OM \perp AB$. (5)



- 9.2 In the diagram below O is the center of the circle with $AD = BD$. $OB = 20$ mm and $AB = 24$ mm.



Calculate the length of:

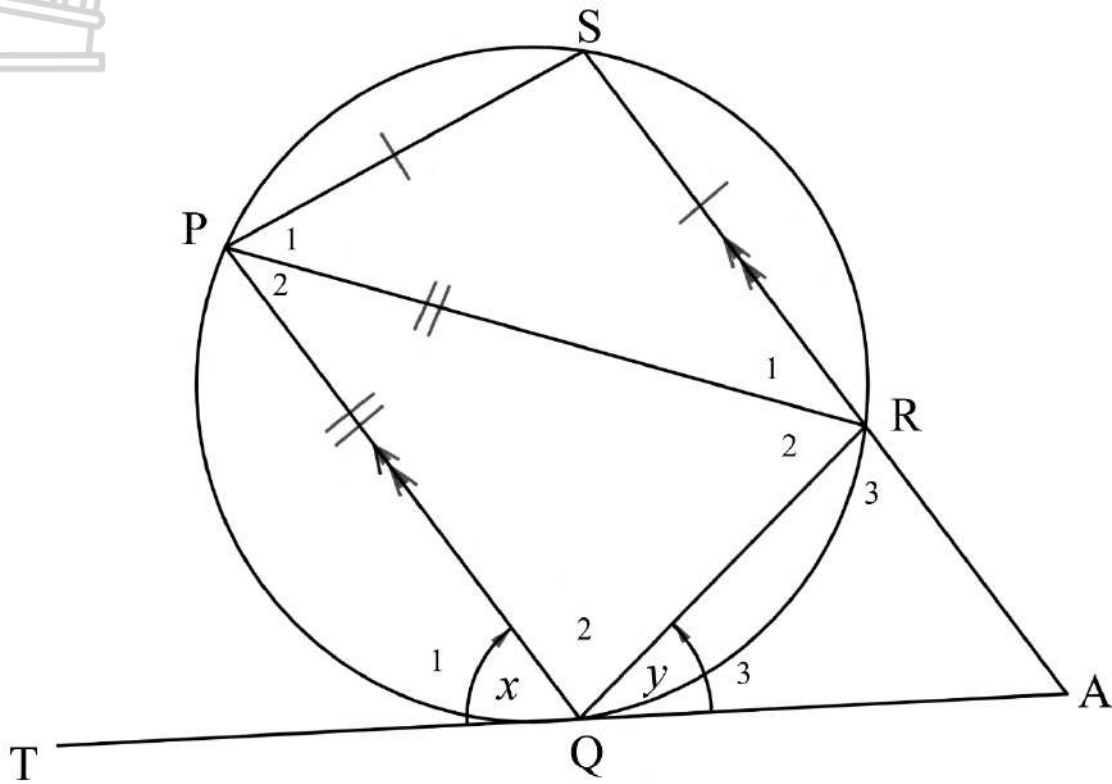
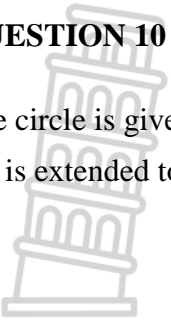
- 9.2.1 DE (4)

- 9.2.2 FB (3)

[12]

QUESTION 10

The circle is given below with TQA as a tangent. $PS = SR$ and $PQ = PR$. $PQ \parallel SR$.
 SR is extended to A. $\hat{Q}_1 = x$ and $\hat{Q}_3 = y$.

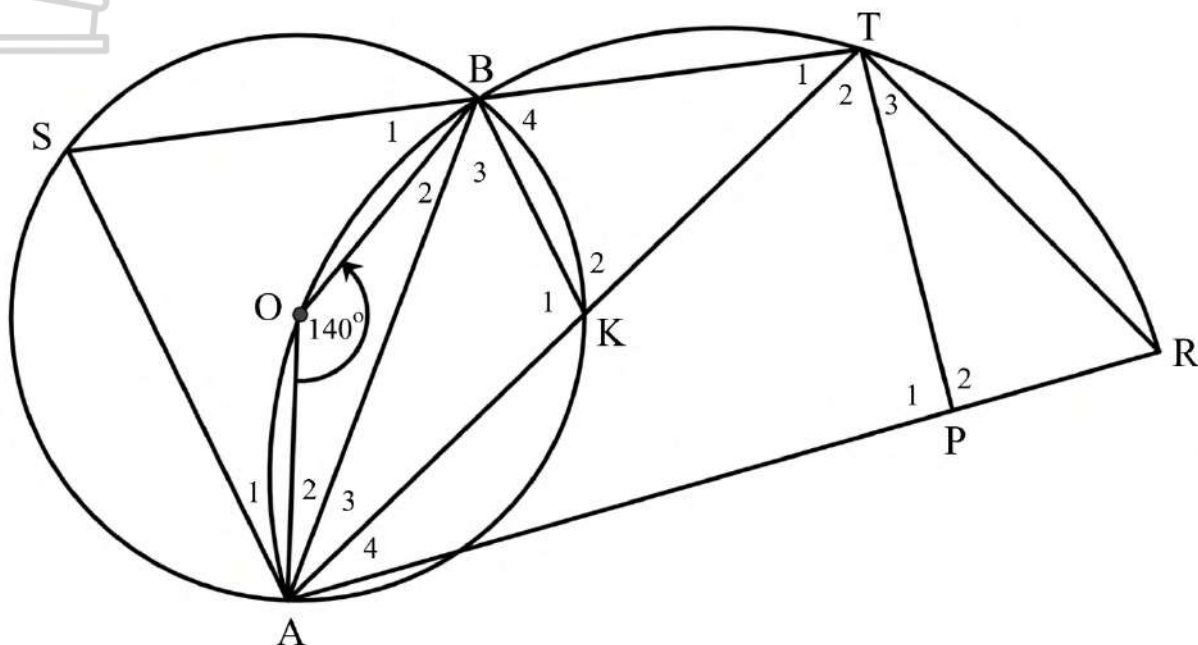
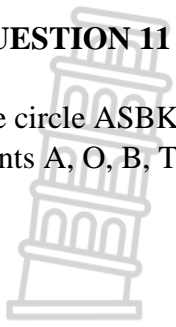


- 10.1 Give, with reasons, THREE angles equal to y . (6)
 - 10.2 Prove that $\hat{R}_3 = x$ (4)
 - 10.3 Prove that $\hat{S} = 180^\circ - x$. (1)
 - 10.4 Calculate the value of x and y . (6)
- [17]**



QUESTION 11

The circle ASBK with center O is given below. Furthermore, a semicircle is drawn through points A, O, B, T and R. P lies on AR. $\widehat{AOB} = 140^\circ$.



- 11.1 Calculate the size of \widehat{S} . (2)
- 11.2 Prove that $AS \parallel KB$. (5)
- 11.3 Calculate the size of \widehat{ATR} . (2)
- 11.4 Prove that TP will be a tangent to a circle passing through points B, K, and T if $\widehat{R} = 80^\circ$ and $TR = TP$. (4)

[13]

TOTAL: 150



INFORMATION SHEET: MATHEMATICS GR11

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

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

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

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

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

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

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

$$y = mx + c$$

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

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

$$m = \tan \theta$$

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

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

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

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

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

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

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



NAME OF LEARNER: NAAM VAN LEERDER:	
CLASS: KLAS:	



**PROVINCIAL ASSESSMENT/
PROVINSIALE ASSESSERING**

GRADE/GRAAD 11

MATHEMATICS P2/WISKUNDE V2

NOVEMBER 2024

**SPECIAL ANSWER BOOK
SPESIALE ANTWOORDEBOEK**

QUESTION VRAAG	MARK PUNT			INITIAL PARAAF	MODERATION MODERERING			INITIAL PARAAF
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
TOTAL TOTAAL (150)								



**This answer book consist of 21 pages.
Hierdie antwoordeboek bestaan uit 21 bladsye.**

QUESTION/VRAAG 1

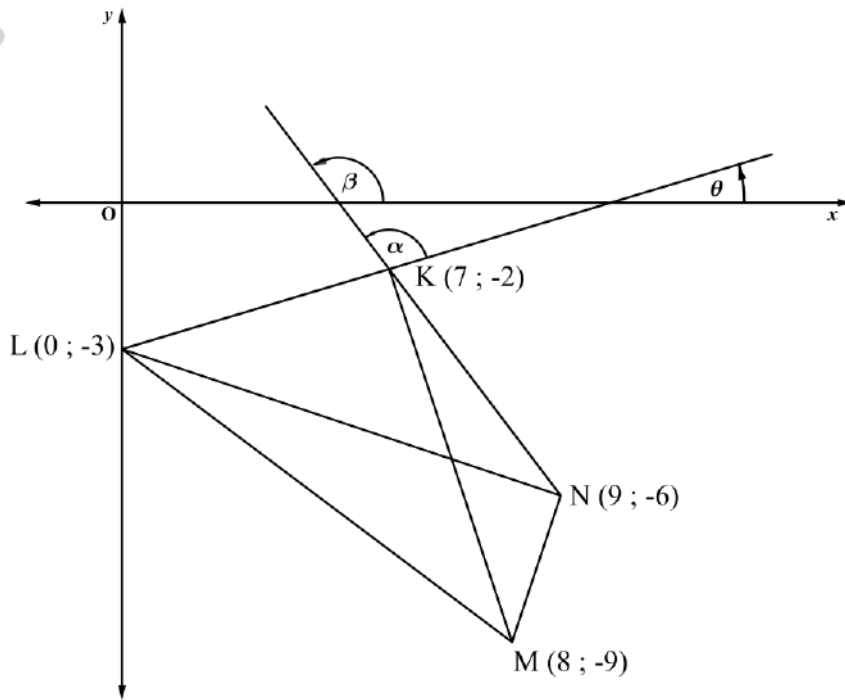
18, 26, 25, 18, 16, 12, 10, 8, 18, 17, 8

	Solution/Oplossing	Marks Punte
1.1		(2)
1.2		(1)
1.3		(2)
1.4.1		(1)
1.4.2		(1)
1.4.3		(4)
		[11]

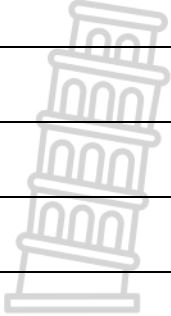
QUESTION/VRAAG 2

Solution/Oplossing				Marks Punte
2.1	SPEED (<i>d</i>) (in km/h)	FREQUENCY (number of vehicles)	CUMULATIVE FREQUENCY	(2)
	$40 < d \leq 60$	25		
	$60 < d \leq 80$	46		
	$80 < d \leq 100$	67		
	$100 < d \leq 120$	79		
	$120 < d \leq 140$	24		
	$140 < d \leq 160$	8		
	$160 < d \leq 180$	1		
2.2				(1)
2.3				(4)
2.4				(2)
				[9]

QUESTION/VRAAG 3

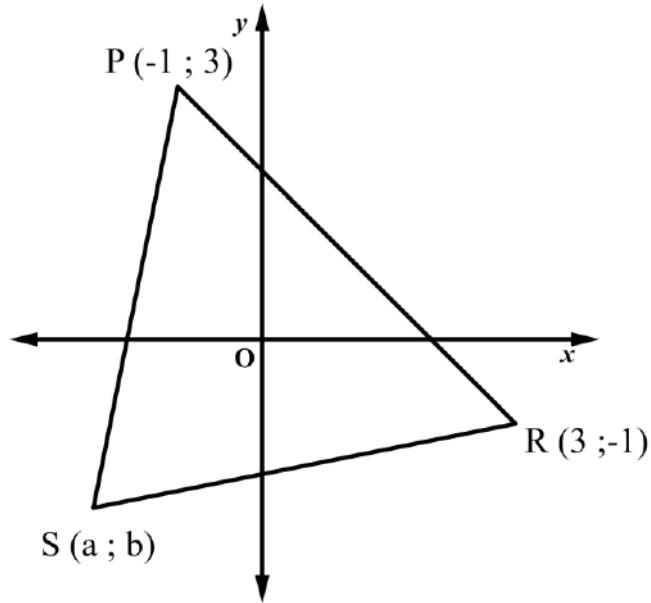


	Solution/Oplissing	Marks Punte
3.1		(2)
3.2		(2)
3.3		(3)

	Solution/Oplissing	Marks Punte
3.4		(4)
3.5		(2)
3.6		

		(5)
		[18]

QUESTION/VRAAG 4



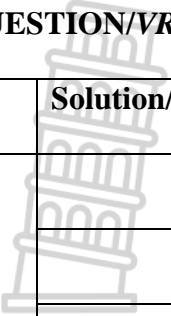
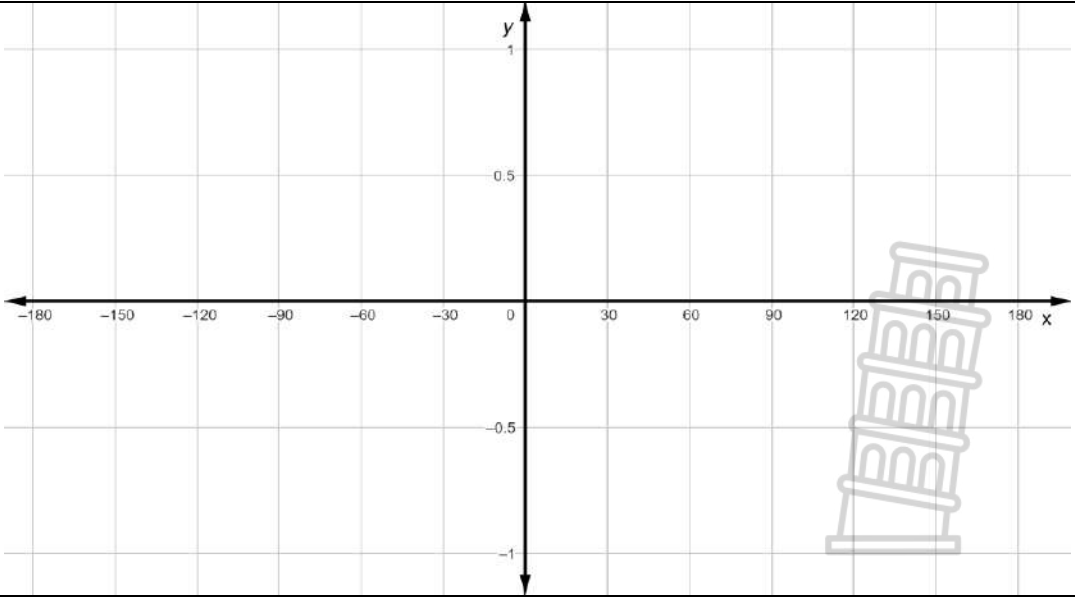
	Solution/Oplissing	Marks Punte
4.1		(2)
4.2		(2)

	Solution/Oplossing	Marks Punte
4.3		(3)
4.4		(1)
4.5		

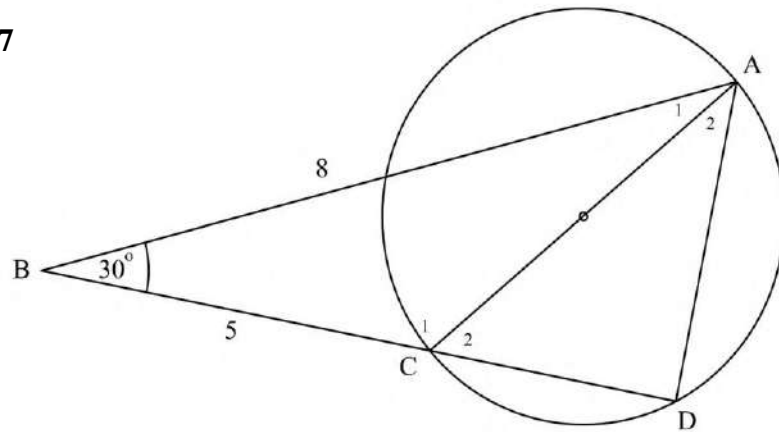
5.2		(6)
5.3.1		(2)
5.3.2		(2)
5.3.3		(3)

5.4		
	(6)	
5.5		
	(5)	
		[31]

QUESTION/VRAAG 6

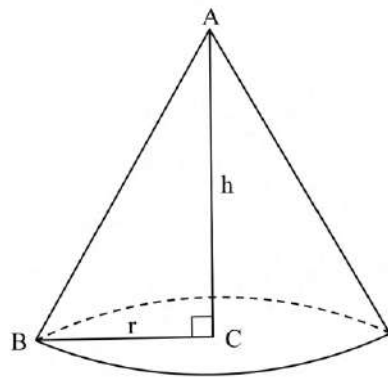
	Solution/Oplissing	Marks Punte
6.1		(5)
6.2		
6.3		(2)
		[12]

QUESTION/VRAAG 7

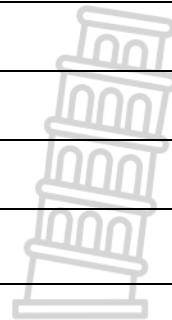


	Solution/Oplissing	Marks Punte
7.1		(2)
7.2.1		(2)
7.2.2		(1)
7.2.3		(3)
		[8]

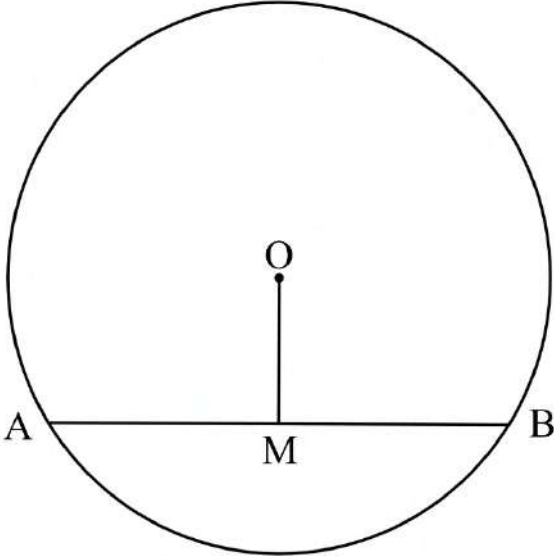
QUESTION/VRAAG 8

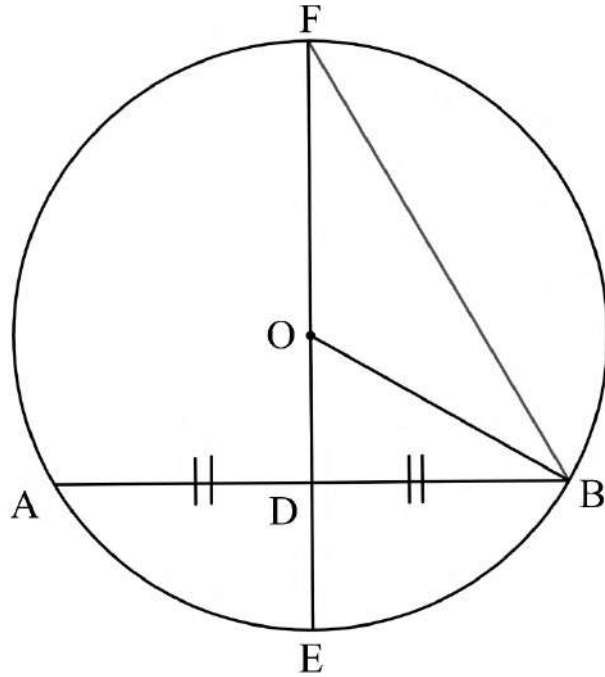


	Solution/Oplissing	Marks Punte
8.1		(3)
8.2		(3)
		[6]

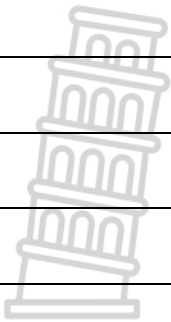


QUESTION/VRAAG 9

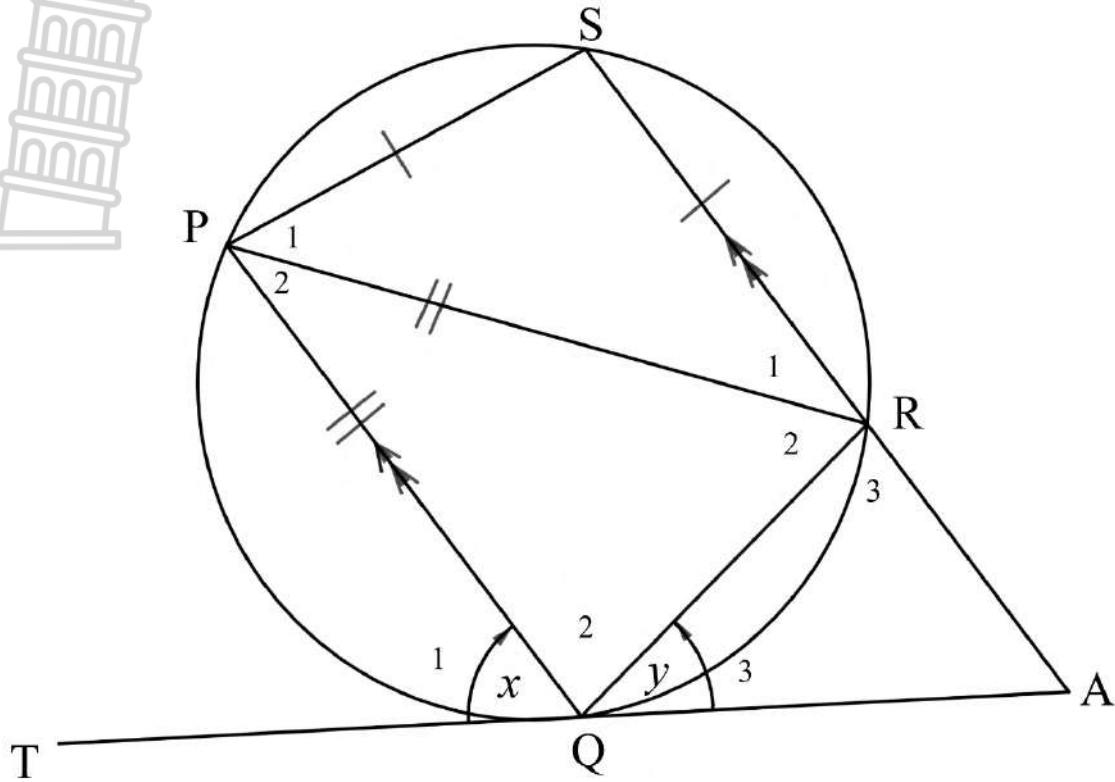
	Solution/Oplissing	Marks Punte
9.1	 <p>A circle with center O and a horizontal chord AB. M is the midpoint of AB, and OM is a vertical line segment from the center to the chord.</p>	(5)



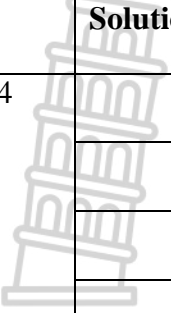
9.2.1		(4)
9.2.2		(3)
		[12]



QUESTION/VRAAG 10

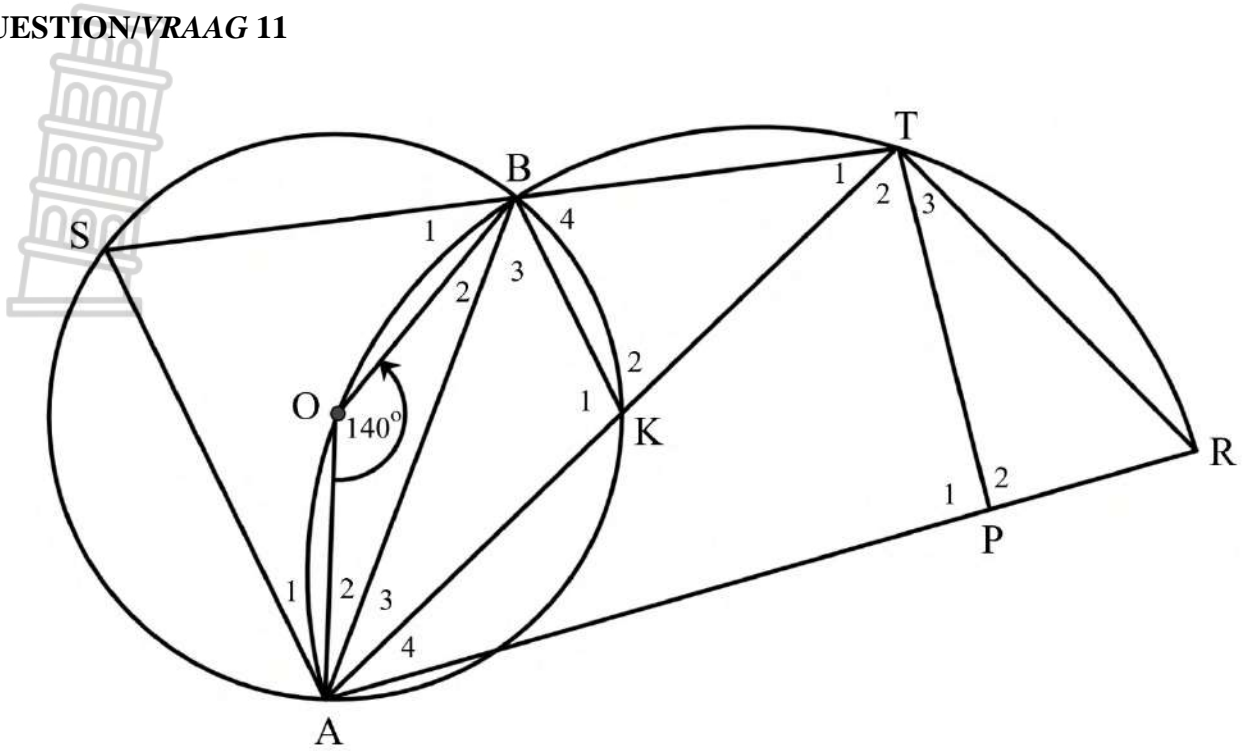


	Solution/Oplissing	Marks Punte
10.1		(6)
10.2		(4)
10.3		(1)

	Solution/Oplissing	Marks Punte
10.4		(6)
		[17]



QUESTION/VRAAG 11



	Solution/Oplissing	Marks Punte
11.1		(2)
11.2		(5)
11.3		(2)

	Solution/Oplissing	Marks Punte
11.4		
		(4)
		[13]
	TOTAL/TOTAAL:	150





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PROVINCIAL ASSESSMENT/ PROVINSIALE ASSESSERING

GRADE/GRAAD 11

MATHEMATICS P2/WISKUNDE V2

NOVEMBER 2024

MARKING GUIDELINES/ NASIENRIGLYNE

MARKS/PUNTE: 150



**These marking guidelines consist of 17 pages./
Hierdie nasienriglyne bestaan uit 17 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 Marking Guidelines. 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 Nasienriglyne 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 correct statement (A statement mark is independent of a reason)
	<i>'n Punt vir 'n korrekte bewering ('n Punt vir 'n bewering is onafhanklik van die rede)</i>
R	A mark for the correct reason. (A reason mark may only be awarded if the statement is correct)
	<i>'n Punt vir 'n korrekte rede ('n Punt word slegs vir die rede toegeken as die bewering korrek is)</i>
S/R	Award a mark if statement AND reason are both correct
	<i>Ken 'n punt toe as die bewering EN rede beide korrek is</i>

QUESTION/VRAAG 1

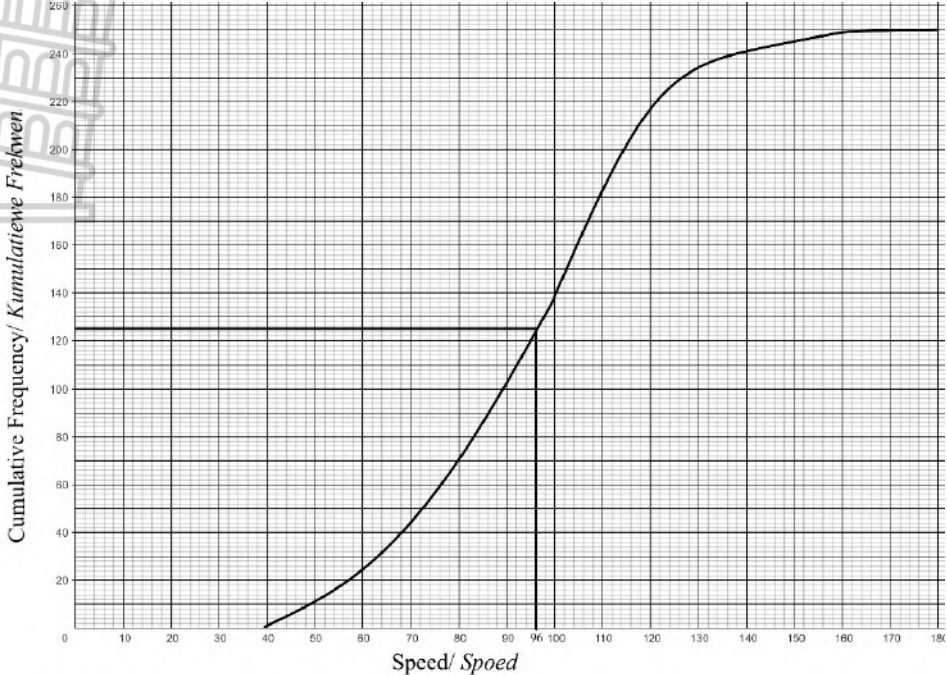
18, 26, 25, 18, 16, 12, 10, 8, 18, 17, 8

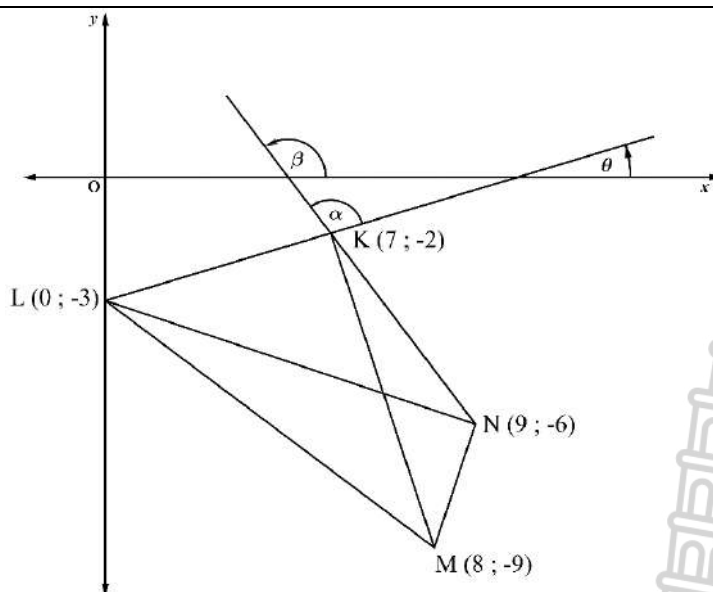
1.1	$\text{Mean/ Gemiddeld} = \frac{176}{11}$ $= 16$	✓ sum/som ✓ answer/antwoord answer only: full marks (2)
1.2	$\sigma = 5,83$	✓ $\sigma = 5,83$ (1)
1.3	Interval = $16 + 5,83$ $= 21,83$ \therefore 2 of the taxis are overloaded/ <i>van die taxi's was oorlaai.</i>	✓ interval ✓ answer/ antwoord (2)
1.4.1	Skewed to the left. / <i>Skeef na links.</i> $\bar{x} < Q_2$	✓ answer/ antwoord (1)
1.4.2	75%	✓ answer/ antwoord (1)
1.4.3	$x, 8, 8, 10, 12, 13, 16, 17, 18, 18, 18, 18, 18, y, 20, 25, 26$ $Q_3 = 19$ $\therefore \frac{3(16+1)}{4} = 12,75^{th}$ position/ <i>posisie</i> Between/ <i>tussen</i> 12 th and/ <i>en</i> 13 th position/ <i>posisie</i> $\frac{18 + y}{2} = 19$ $\therefore y = 20$ New/ <i>nuwe</i> $\bar{x}: \frac{247+x}{16} = 16$ $\therefore x = 9$	✓ $Q_3: \frac{3(16+1)}{4} = 12,75^{th}$ position/ <i>posisie</i> ✓ $y = 20$ ✓ $\bar{x}: \frac{247+x}{16} = 16$ ✓ $x = 9$ (4)
		[11]

QUESTION/VRAAG 2

2.1	SPEED (d) (in km/h)	FREQUENCY (number of vehicles)	CUMULATIVE FREQUENCY	✓ 25, 71, 138 ✓ 217, 241, 249, 250 (2)
	$40 < d \leq 60$	25	25	
	$60 < d \leq 80$	46	71	
	$80 < d \leq 100$	67	138	
	$100 < d \leq 120$	79	217	
	$120 < d \leq 140$	24	241	
	$140 < d \leq 160$	8	249	
	$160 < d \leq 180$	1	250	
2.2	250 vehicles/ <i>voertuie</i>			✓ answer (1)
2.3				✓ Grounding/ <i>grond</i> (40;0) ✓ Using upper intervals/ <i>gebruik boonste</i> <i>intervalle</i> ✓ End at/ <i>eindig by</i> (180;250) ✓ shape/ <i>vorm</i> (4)

QUESTION/VRAAG 3

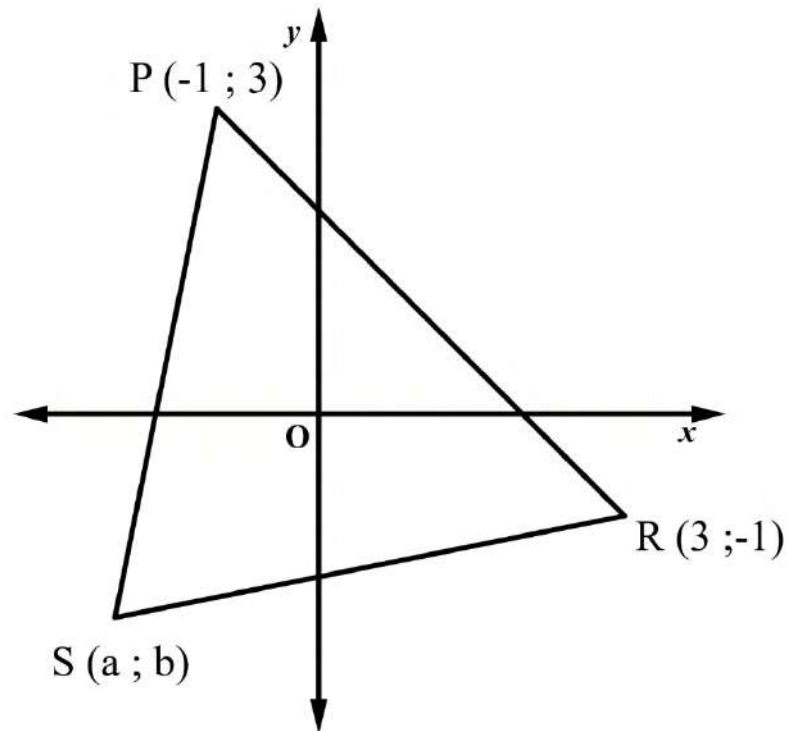
<p>2.4</p>	<p>Median at/ <i>mediaan by</i> 125</p>  <p>∴ 96 km/h Accept/ <i>aanvaar</i> (90 - 100)</p>	<p>✓✓ answer</p> <p>(2)</p>
		<p>[9]</p>



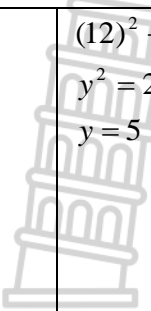
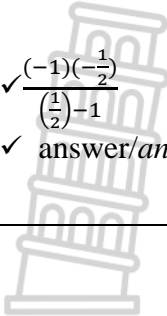
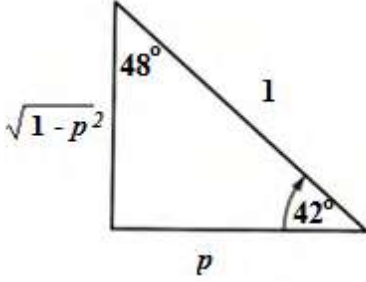
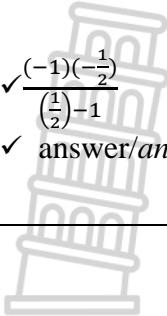
<p>3.1</p>	$m_{KN} = \frac{-6 - (-2)}{9 - 7}$ $m_{KN} = -2$	<p>✓ correct substitution into gradient formula korrekte vervanging in gradiënt formule ✓ $m_{AC} = 2$ (2)</p>
<p>3.2</p>	$y - y_1 = m(x - x_1)$ $y - (-2) = -2(x - 7)$ $y + 2 = -2x + 14$ $y = -2x + 12$ <p style="text-align: center;">OR/OF</p> $y = -2x + c$ $-2 = -2(7) + c$ $c = 12$ $y = -2x + 12$	<p>✓ subst./vervang (7 ; -2) ✓ $y = -2x + 12$ (2)</p>

3.3	$\tan \beta = m_{KN}$ $= -2$ $\beta = 180^\circ - 63,43^\circ$ $\beta = 116,57^\circ$	$\checkmark \tan \beta = -2$ $\checkmark \text{Ref } \angle / \text{Verw } \angle = 63,43^\circ$ $\checkmark \beta = 116,57^\circ$ <p style="text-align: right;">(3)</p>
3.4	$m_{KL} = \frac{-2 - (-3)}{7 - 0}$ $m_{KL} = \frac{1}{7}$ $\tan \theta = \frac{1}{7}$ $\theta = 8,13^\circ$ $\alpha = 116,57^\circ - 8,13^\circ \quad [\text{ext } \angle \text{ of } \Delta / \text{buite } \angle \text{ van } \Delta]$ $\alpha = 108,44^\circ$	$\checkmark m_{KL} = \frac{1}{7}$ $\checkmark \tan \theta = \frac{1}{7}$ $\checkmark \theta = 8,13^\circ$ $\checkmark \alpha = 108,44^\circ$ <p style="text-align: right;">(4)</p>
3.5	$m_{KM} = \frac{-9 - (-2)}{8 - 7}$ $m_{KM} = -7$ $m_{KL} = \frac{1}{7}$ $-7 \times \frac{1}{7} = -1$ $\therefore m_{KM} \times m_{KL} = -1$ $\therefore KL \perp KM$	$\checkmark m_{KM} = -7$ $\checkmark -7 \times \frac{1}{7} = -1$ <p style="text-align: right;">(2)</p>
3.6	$m_{LN} = \frac{-6 - (-3)}{9 - 0}$ $m_{LN} = -\frac{1}{3}$ $m_{MN} = \frac{-9 - (-6)}{8 - 9}$ $m_{MN} = 3$ $3 \times -\frac{1}{3} = -1$ $\therefore m_{LN} \times m_{MN} = -1$ $\therefore LN \perp NM$ $\therefore \hat{LNM} = 90^\circ$ <p>But/ maar $KL \perp KM$</p> $\therefore \hat{LKM} = 90^\circ$ $\therefore \hat{LKM} = \hat{LNM} = 90^\circ$ <p>∴ KLMN is cyclical quadrilateral/ koordevierhoek ... [converse \angle s in the same segment/ omgekeerde \angle e in dieselfde segment] OR/OF [line subtend equal \angle s / lyn onderspan gelyke \angle e]</p>	$\checkmark m_{LN} = -\frac{1}{3}$ $\checkmark m_{MN} = 3$ $\checkmark \hat{LNM} = 90^\circ$ $\checkmark \hat{LNM} = \hat{LKM} = 90^\circ$ $\checkmark \text{reason/rede}$ <p style="text-align: right;">(5)</p>
		[18]

QUESTION/VRAAG 4



4.1	$T\left(\frac{-1+3}{2}; \frac{3-1}{2}\right)$ $T(1; 1)$	✓ $x = 1$ ✓ $y =$ (2)
4.2	$d_{PR} = \sqrt{(-1-3)^2 + (3-(-1))^2}$ $d_{PR} = 4\sqrt{2}$	✓ correct subst in distance formula/ korrekte vervanging in afstandsformule. ✓ $d_{PR} = 4\sqrt{2}$ (2)
4.3	$m_{PR} \times m_2 = -1$ $(-1) \times (m_2) = -1$ $\therefore m_2 = 1$ $y - y_1 = m(x - x_1)$ $y - (1) = 1(x - 1)$ $y - 1 = x - 1$ $y = x$ <p style="text-align: center;">OR/OF</p> $y = 1x + c$ $1 = 1(1) + c$ $c = 0$ $y = x$	✓ $m_{ST} = 1$ ✓ subst./vervang (1; 1) ✓ $y = x$ (3)
4.4	Subst/ vervang $(a; b)$ in $y = x$ $y = x$ $\therefore a = b$	✓ Subst/ vervang $(a; b)$ in $y = x$ (1)

	$(12)^2 + y^2 = (13)^2$ $y^2 = 25$ $y = 5$  $\frac{3 \cos(360^\circ - \theta) + 2 \sin(360^\circ - \theta)}{\frac{1}{5} \tan(180^\circ + \theta)}$ $= \frac{3 \cos \theta - 2 \sin \theta}{\frac{1}{5} \tan \theta}$ $= \frac{3\left(\frac{12}{13}\right) - 2\left(\frac{5}{13}\right)}{\frac{1}{5}\left(\frac{5}{12}\right)}$ $= \frac{\frac{36}{13} - \frac{10}{13}}{\frac{1}{12}}$ $= \frac{26}{13} \times \frac{12}{1}$ $= 24$	$\checkmark y = 5$ $\checkmark 3 \cos \theta$ $\checkmark -2 \sin \theta$ $\checkmark \frac{1}{5} \tan \theta$ $\checkmark 3\left(\frac{12}{13}\right) - 2\left(\frac{5}{13}\right)$ $\checkmark \frac{1}{5}\left(\frac{5}{12}\right)$ \checkmark answer/antwoord (7)
<p>5.2</p>	$\frac{\tan 135^\circ \cdot \sin 210^\circ}{\cos 660^\circ + \cos 180^\circ}$ $= \frac{(-\tan 45^\circ) \cdot (-\sin 30^\circ)}{\cos 60^\circ - 1}$ $= \frac{(-1)\left(-\frac{1}{2}\right)}{\left(\frac{1}{2}\right) - 1}$ $= -1$	$\checkmark -\tan 45^\circ$ $\checkmark -\sin 30^\circ$ $\checkmark \cos 60^\circ$ $\checkmark -1$  $\checkmark \frac{(-1)\left(-\frac{1}{2}\right)}{\left(\frac{1}{2}\right) - 1}$ \checkmark answer/antwoord (6)
<p>5.3</p>		
<p>5.3.1</p>	$\cos 138^\circ$ $= -\cos 42^\circ$ $= -p$	$\checkmark -\cos 42^\circ$ $\checkmark -p$ (2)

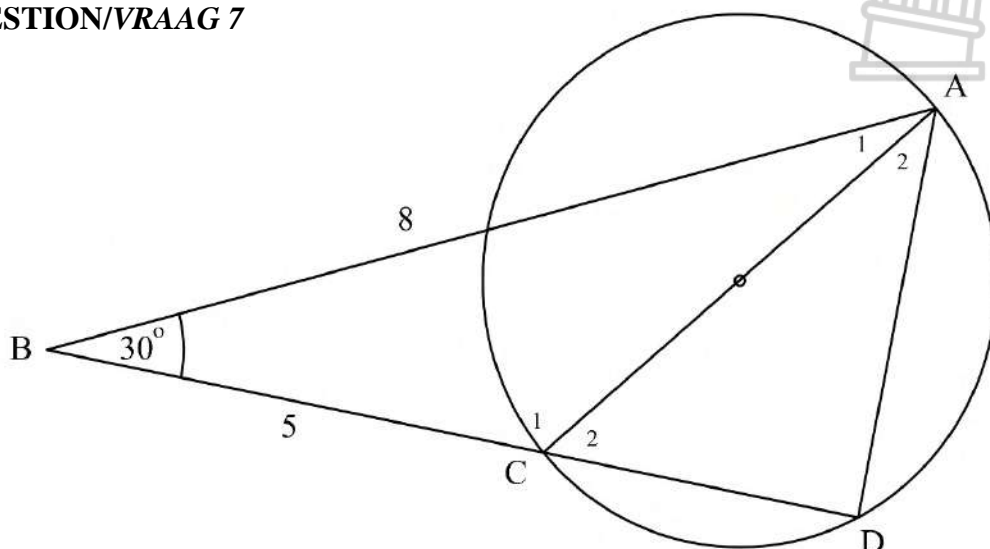
5.3.2	$3\sin 48^\circ$ $= 3p$	$\checkmark\checkmark 3p$ (2)
5.3.3	$\sin(-2202^\circ)$ $= \sin(-42^\circ)$ $= -\sin 42^\circ$ $= -\sqrt{1-p^2}$	$\checkmark \sin(-42^\circ)$ \checkmark diagram $\checkmark -\sqrt{1-p^2}$ (3)
5.4	$\frac{\sin x}{1+\cos x} + \frac{1}{\tan x} = \frac{1}{\sin x}$ LH: $\frac{\sin x}{1+\cos x} + 1 \div \left(\frac{\sin x}{\cos x}\right)$ $= \frac{\sin x}{1+\cos x} + 1 \times \left(\frac{\cos x}{\sin x}\right)$ $= \frac{\sin^2 x + \cos x(1+\cos x)}{\sin x(1+\cos x)}$ $= \frac{\sin^2 x + \cos x + \cos^2 x}{\sin x(1+\cos x)}$ $= \frac{1+\cos x}{\sin x(1+\cos x)}$ $= \frac{1}{\sin x}$ LH = RH	$\checkmark \tan x = \frac{\sin x}{\cos x}$ $\checkmark \frac{1}{\tan x} = \frac{\cos x}{\sin x}$ \checkmark numerator/ noemer $\sin x(1+\cos x)$ $\checkmark \sin^2 x + \cos x + \cos^2 x$ $\checkmark \sin^2 x + \cos^2 x = 1$ $\checkmark \frac{1+\cos x}{\sin x(1+\cos x)}$ (6)
5.5	$\tan^2 \theta = \frac{2ab}{a^2+b^2}$ $\therefore \tan \theta = \sqrt{\frac{2ab}{a^2+b^2}} \dots (0^\circ < \theta < 90^\circ)$ But/ maar $OA^2 = OB^2 + AB^2$ $= a^2 + b^2 + 2ab$ $= (a+b)^2$ $\therefore OA = a+b$ $\therefore \sin \theta = \frac{\sqrt{2ab}}{a+b}$	$\checkmark \tan^2 \theta = \frac{2ab}{a^2+b^2}$ $\checkmark \tan \theta = \sqrt{\frac{2ab}{a^2+b^2}}$ \checkmark Pythagoras $\checkmark OA = a+b$ $\checkmark \sin \theta = \frac{\sqrt{2ab}}{a+b}$ (5)
		[31]

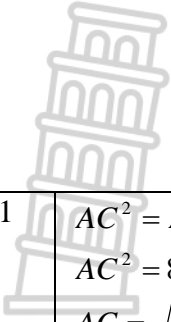
QUESTION/VRAAG 6

6.1	$\cos(x-30^\circ) = \sin x$ $\cos(x-30^\circ) = \cos(90^\circ-x)$ I $x-30^\circ = 90^\circ-x+k.360^\circ; k \in Z$ $2x = 120^\circ+k.360^\circ; k \in Z$ $x = 60^\circ+k.180^\circ, k \in Z$ $x \in \{-120^\circ; 60^\circ\}$	IV $x-30^\circ = 360-(90^\circ-x)+k.360^\circ; k \in Z$ No solution/ geen oplossing OR/OF	$\checkmark \sin x = \cos(90^\circ-x)$ $\checkmark x-30^\circ = 90^\circ-x+k.360^\circ$ $\checkmark x = 60^\circ+k.180^\circ$ $\checkmark k \in Z$ $\checkmark x \in \{-120^\circ; 60^\circ\}$ OR/OF $\checkmark \cos(x-30) = \sin(120^\circ-x)$
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	$\cos(x - 30^\circ) = \sin x$ $\sin(90^\circ - x + 30^\circ) = \sin x$ <p style="text-align: center;"><i>I</i></p> $120^\circ - x = x + k.360^\circ; k \in \mathbb{Z}$ $-2x = -120^\circ + k.360^\circ; k \in \mathbb{Z}$ $x = 60^\circ + k.180^\circ; k \in \mathbb{Z}$ <p style="text-align: center;"><i>II</i></p> $120^\circ - x = 180^\circ - x + k.360^\circ; k \in \mathbb{Z}$ <p style="text-align: center;">No solution/ geen oplossing</p> <p>$x \in \{-120^\circ; 60^\circ\}$</p>	<ul style="list-style-type: none"> ✓ $120^\circ - x = x + k.360^\circ$ ✓ $x = 60^\circ + k.180^\circ$ ✓ $k \in \mathbb{Z}$ ✓ $x \in \{-120^\circ; 60^\circ\}$ <p style="text-align: right;">(5)</p>
<p>6.2</p>		<p>for/vir $f(x)$:</p> <ul style="list-style-type: none"> ✓ Shape/vorm ✓ intercepts with axes/ afsnitte met asse ✓ Turning points/ draaipunte <p>for/vir $g(x)$</p> <ul style="list-style-type: none"> ✓ shape/vorm ✓ intercepts with axes/ afsnitte met asse and turning points/ draaipunte <p style="text-align: right;">(5)</p>
<p>6.3</p>	<p>$f(x) \leq g(x)$ $60^\circ \leq x \leq 180^\circ$ OR/OF $x \in [60^\circ; 180^\circ]$</p>	<ul style="list-style-type: none"> ✓ interval ✓ notation/ notasie <p style="text-align: right;">(2)</p>
		<p>[12]</p>

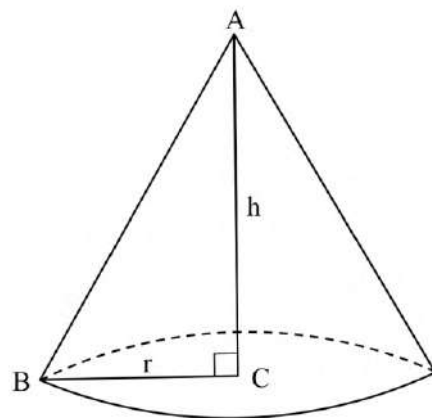
QUESTION/VRAAG 7





7.1	$AC^2 = AB^2 + BC^2 - 2(AB)(BC)\cos\hat{B}$ $AC^2 = 8^2 + 5^2 - 2(8)(5)\cos 30^\circ$ $AC = \sqrt{19,71796\dots}$ $AC = 4,44$	✓ subst. correctly into cos rule/ <i>vervang korrek in cos-reël.</i> ✓ $AC = \sqrt{19,71796}$ (2)
7.2.1	$\frac{\sin \hat{A}_1}{5} = \frac{\sin 30^\circ}{4,44}$ $\sin \hat{A}_1 = \frac{5 \sin 30^\circ}{4,44}$ $\hat{A}_1 = 34,27^\circ$	✓ subst. correctly into sin rule/ <i>vervang korrek in sin-reël.</i> ✓ $\hat{A}_1 = 34,27^\circ$ (2)
7.2.2	$\hat{C}_2 = 30^\circ + 34,27^\circ \dots \text{ext angle of } \Delta / \text{buite hoek van } \Delta$ $\hat{C}_2 = 64,27^\circ$	✓ $\hat{C}_2 = 64,27^\circ$ (1)
7.2.3	$\hat{D} = 90^\circ \text{ [} \angle \text{ in semi circle/ } \angle \text{ in halwe sirkel]}$ $\sin 64,27^\circ = \frac{AD}{4,44}$ $AD = 4$	✓ $\hat{D} = 90^\circ$ ✓ $\sin 64,27^\circ = \frac{AD}{4,44}$ ✓ $AD = 4$ (3)
		[8]

QUESTION/VRAAG 8

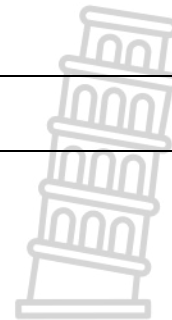


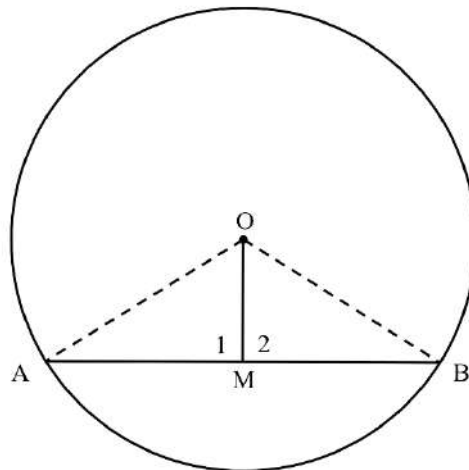


<p>8.1</p>	$2\pi r = 245$ $\therefore r = \frac{245}{2\pi}$ $r = 39 \text{ m}$ <p>In $\triangle ABC$: $\frac{h}{r} = \tan 50^\circ$</p> $\therefore h = 39 \cdot \tan 50^\circ$ $\therefore h = 46,5 \text{ m}$	<p>✓ $r = 39\text{m}$</p> <p>✓ $\frac{h}{r} = \tan 50^\circ$</p> <p>✓ $h = 46,5 \text{ m}$</p> <p>(3)</p>
<p>8.2</p>	$\text{Volume} = \frac{1}{3} \pi r^2 h$ $= \frac{1}{3} \pi (39)^2 \cdot 46,5$ $= 74065 \text{ m}^3$	<p>✓ $\frac{1}{3} \pi r^2 h$</p> <p>✓ $\frac{1}{3} \pi (39)^2 \cdot 46,5$</p> <p>✓ 74065 m^3</p> <p>(3)</p>
		<p>[6]</p>

QUESTION/VRAAG 9

<p>9.1</p>



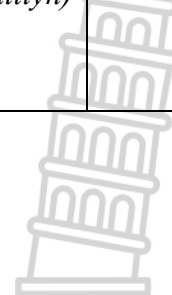


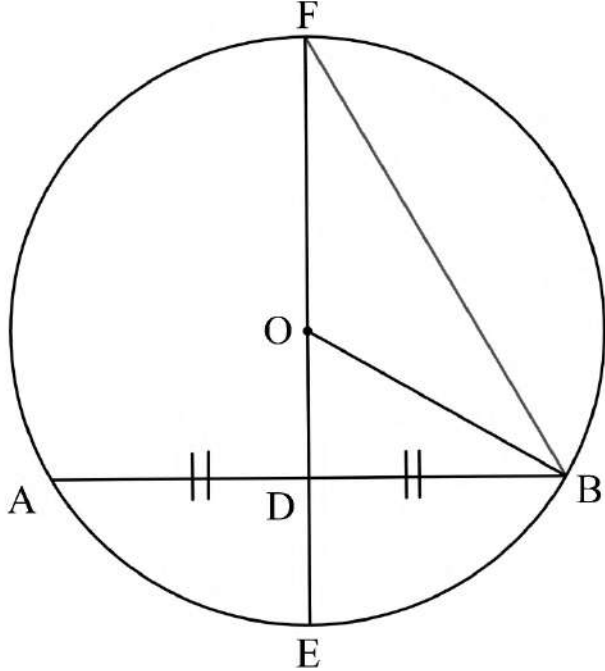
NOTE: If candidate fails to draw the construction or indicate the construction, it is an immediate BREAK DOWN. 0/5 marks.

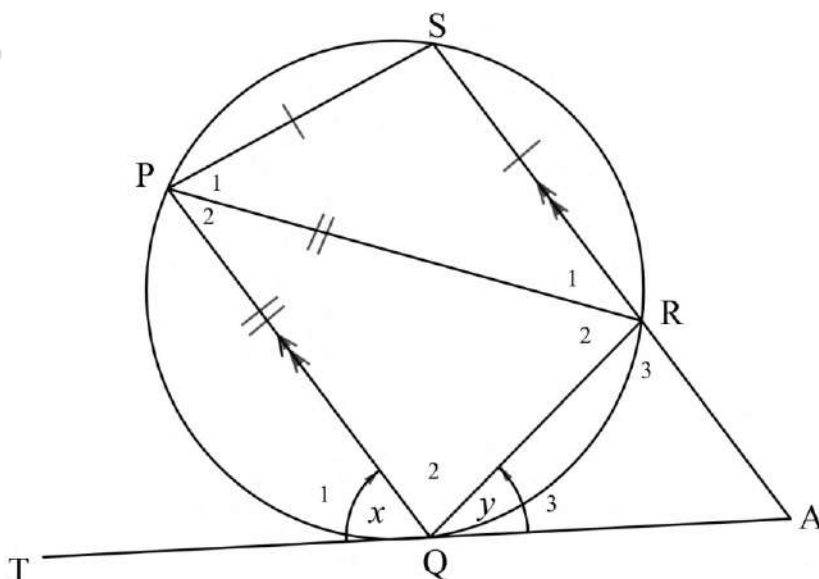
NOTA: Indien kandidaat nie die konstruksie teken of aandui dat 'n konstruksie plaasvind nie, is dit 'n onmiddellike "BREAK DOWN" en daar word nie verder gemerk nie. 0/5 punte.

<p>9.1</p>	<p>Construction: Connect AO and OB <i>Konstruksie: Verbind AO en OB</i></p> <p>In $\triangle AOM$ and $\triangle BOM$:</p> <ol style="list-style-type: none"> 1. $AO = BO$ (Radii) 2. $OM = OM$ (Common side/ <i>Gemeenskaplike sy</i>) 3. $AM = MB$ (Given/ <i>Gegee</i>) <p>$\therefore \triangle AOM \equiv \triangle BOM$ (S S S)</p> <p>$\therefore \hat{M}_1 = \hat{M}_2$</p> <p>But/ <i>maar</i> $\hat{M}_1 + \hat{M}_2 = 180^\circ$ (AMB is a straight line/ <i>'n reguitlyn</i>)</p> <p>$\therefore \hat{M}_1 = \hat{M}_2 = 90^\circ$</p> <p>$\therefore OM \perp AB$</p>	<p>✓ construction/ <i>konstruksie</i></p> <p>✓S ✓R</p> <p>✓S/R</p> <p>✓S/R</p> <p>✓S/R</p> <p>(5)</p>
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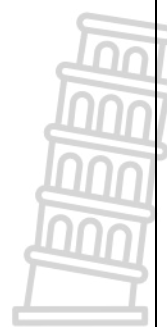
QUESTION/VRAAG 10



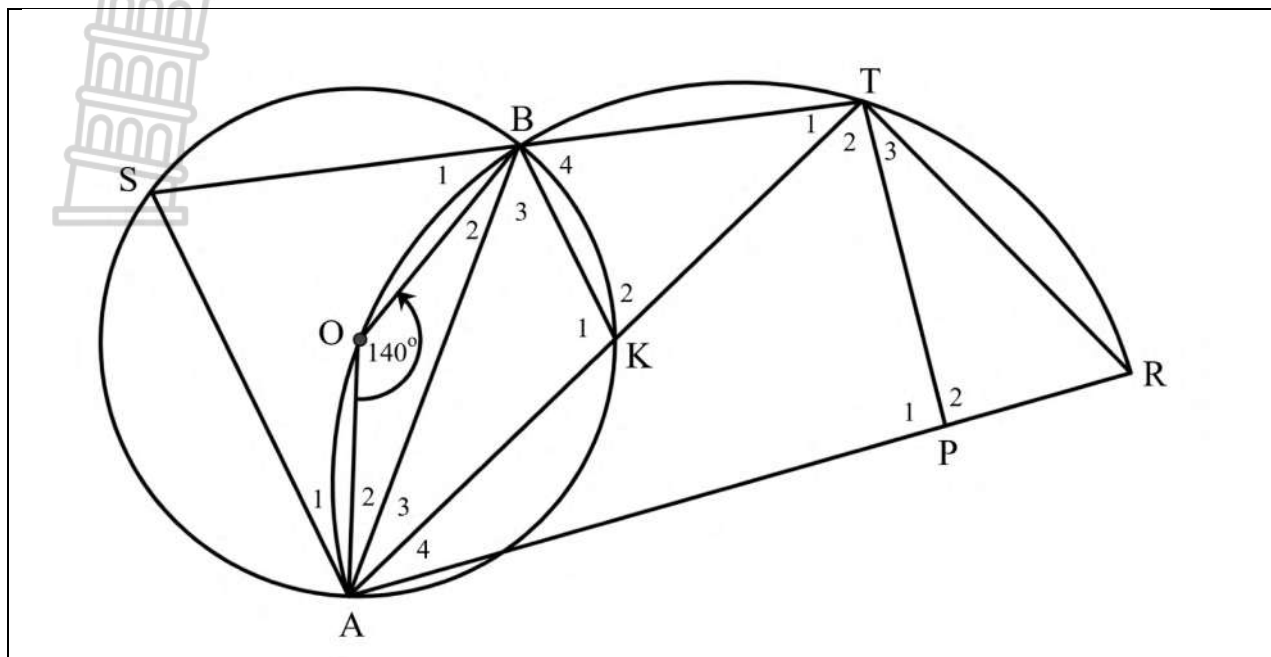
<p>9.2</p> 		
<p>9.2.1</p>	<p>$OD \perp AB$ [line from center to midpoint of chord/ lyn vanaf mid.punt van sirkel na middelpunt van koord.] $OD^2 = OB^2 - DB^2$ Pythagoras $OD^2 = 20^2 - 12^2$ $OD = \sqrt{256}$ $OD = 16$ $\therefore DE = 20 - 16$ $= 4 \text{ mm}$</p>	<p>✓ S&R ✓ $OD^2 = 20^2 - 12^2$ ✓ $OD = 16$ ✓ $DE = 4 \text{ mm}$ (4)</p>
<p>9.2.2</p>	<p>$FD = 20 + 16$ $FD = 36 \text{ mm}$ $FB^2 = 36^2 + 12^2$ Pythagoras $FB = \sqrt{1440}$ $FB = 37,95 \text{ mm}$</p>	<p>✓ $FD = 36 \text{ mm}$ ✓ $FB^2 = 36^2 + 12^2$ ✓ $FB = 37,95 \text{ mm}$ (3)</p>
		<p>[12]</p>



10.1	$\hat{P}_2 = y$ [tangent chord theorem / raaklyn-koordstelling] $\hat{R}_1 = y$ [alt \angle s / verw \angle e; $SR // PQ$] $\hat{P}_1 = y$ [\angle s opp equal sides/ \angle e teenoor gelyke sye]	\checkmark S \checkmark R \checkmark S \checkmark R \checkmark S \checkmark R (6)
10.2	$\hat{R}_2 = x$ [tangent chord theorem / raaklyn-koordstelling] $\hat{Q}_2 = x$ [\angle s opp equal sides/ \angle e teenoor gelyke sye] $\hat{R}_3 = x$ [alt \angle s / verw \angle e; $SR // PQ$]	\checkmark S \checkmark R \checkmark S/R \checkmark S/R (4)
10.3	$\hat{S} = 180^\circ - x$ [opp \angle s of cyclic quad/ t.o. \angle e van KVH]	\checkmark R (1)
10.4	$\hat{Q}_1 + \hat{Q}_2 + \hat{Q}_3 = 180^\circ$ [\angle s on a str line/ \angle e op reguitlyn] $x + x + y = 180^\circ$ $y = 180^\circ - 2x \dots\dots(1)$ $\hat{P}_1 + \hat{R}_1 + \hat{S} = 180^\circ$ [\angle s in a Δ] $y + y + 180^\circ - x = 180^\circ$ $2y = x \dots\dots(2)$ Subt (1) in (2) $2(180^\circ - 2x) = x$ $360^\circ - 4x = x$ $360^\circ = 5x$ $x = 72^\circ$ $\therefore y = 180^\circ - 2(72^\circ)$ $y = 36^\circ$	\checkmark S/R $\checkmark y = 180^\circ - 2x$ \checkmark S/R $\checkmark 2y = x$ $\checkmark x$ -value/ waarde $\checkmark y$ -value/ waarde (6)
		[17]



QUESTION/VRAAG 11



11.1	$\hat{S} = 70^\circ$ [angle at centre = $2 \times \angle$ at circumference/ <i>middelpunts $\angle = 2 \times$ omtreks \angle]</i>	\checkmark S \checkmark R (2)
11.2	$\hat{K}_2 = \hat{S} = 70^\circ$ [ext \angle of cyclic quad/ <i>buite \angle van KVH</i>] $\hat{T}_1 = 40^\circ$ [opp \angle s of cyclic quad = 180° / <i>t.o \angle e van KVH = 180°</i>] $\hat{B}_4 = 70^\circ$ [\angle s in a Δ] $\therefore \hat{B}_4 = \hat{S}$ But angles lie corresponding/ <i>hoeke lê ooreenkomstig</i> $\therefore AS \parallel KB$	\checkmark S \checkmark R \checkmark S/R \checkmark S \checkmark R (5)
11.3	$\hat{A}\hat{T}R = 90^\circ$ [\angle in semi circle/ <i>\angle in halwe sirkel</i>]	\checkmark S \checkmark R (2)
11.4	$\hat{P}_2 = 80^\circ$ [\angle s opp equal sides/ <i>\angle e teenoor gelyke sye</i>] $\hat{T}_3 = 20^\circ$ [\angle s in a Δ] $\therefore \hat{T}_2 = 70^\circ$ $\therefore \hat{T}_2 = \hat{B}_4 = 70^\circ$ $\therefore BK$ is a tangent/ <i>raaklyn... converse tan chord theorem/ omgekeerde raaklyn-koord stelling</i> OR/OF [\angle between line and chord/ <i>\angle tussen lyn en koord</i>]	\checkmark S \checkmark S \checkmark S \checkmark R (4)
		[13]
TOTAL/ TOTAAL:		150