Western Cape Government
Education
FOR YOU

CAPE WINELANDS EDUCATION DISTRICT

MATHEMATICS PAPER 2

GRADE 12

COMMON MID-YEAR EXAMINATION

MAY/JUNE 2026

MARKS: 150

TIME: 3 hours

This question paper consists of 14 pages and 1 information sheet and an answer book of 25 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 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 monthly electricity usage (in kW) of 15 households is recorded below:

Household	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Monthly electricity usage (in kW)	120	150	180	200	220	250	275	300	330	360	400	450	520	600	750

1.1 Calculate the mean of the data. (2)

1.2 Calculate the standard deviation of the data. (1)

1.3 Determine the number of values within one standard deviation of the mean. (2)

1.4 The municipality introduces a penalty: any usage above 500 kW is increased by p%.
After adjustment, the new mean becomes 360 kW.
Calculate the value of p. (4)
[9]

QUESTION 2

The table below shows the distance (in km) travelled to work by 80 employees.

Distance (km)	Number of employees
$0 \leq x < 5$	8
$5 \leq x < 10$	14
$10 \leq x < 15$	22
$15 \leq x < 20$	18
$20 \leq x < 25$	12
$25 \leq x < 30$	6

2.1 Write down the modal class. (1)

2.2 Complete the cumulative frequency column. (2)

2.3 Draw an ogive on the grid provided. (4)

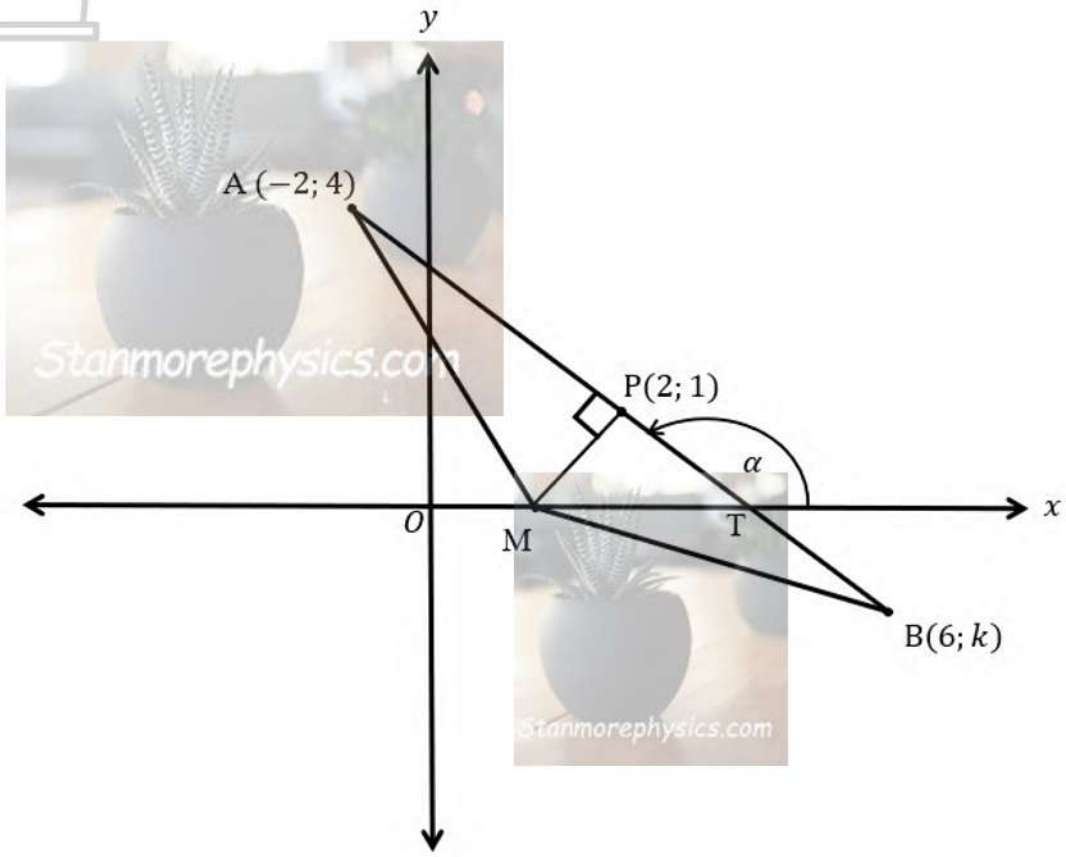
2.4 Use the ogive to estimate the upper quartile. (1)

2.5 The company relocates 8 employees from the $20 \leq x < 25$ class interval to 10 km closer to work. Calculate the new estimated mean distance. Show ALL working. (3)

[11]

QUESTION 3

In the diagram below, A$(-2\ ;\ 4)$ and B$(6\ ;\ k)$ are the endpoints of line AB. Line AB intersects the x $-$axis at point T. MP is the perpendicular bisector of line AB, with coordinate P$(2;1)$ on AB, and M on the x-axis. The inclination angle of line AB is α.



3.1 Calculate the gradient of AB. (2)

3.2 Calculate the value of k. (2)

3.3 Hence determine the length of AB. (2)

3.4 Show that the equation of MP is $y = \frac{4}{3}x - \frac{5}{3}$ (3)

3.5 Hence, determine the coordinates of M. (2)

3.6 AMBS is a parallelogram. Determine the coordinates of S. (2)

3.7 Determine the size of α. (2)

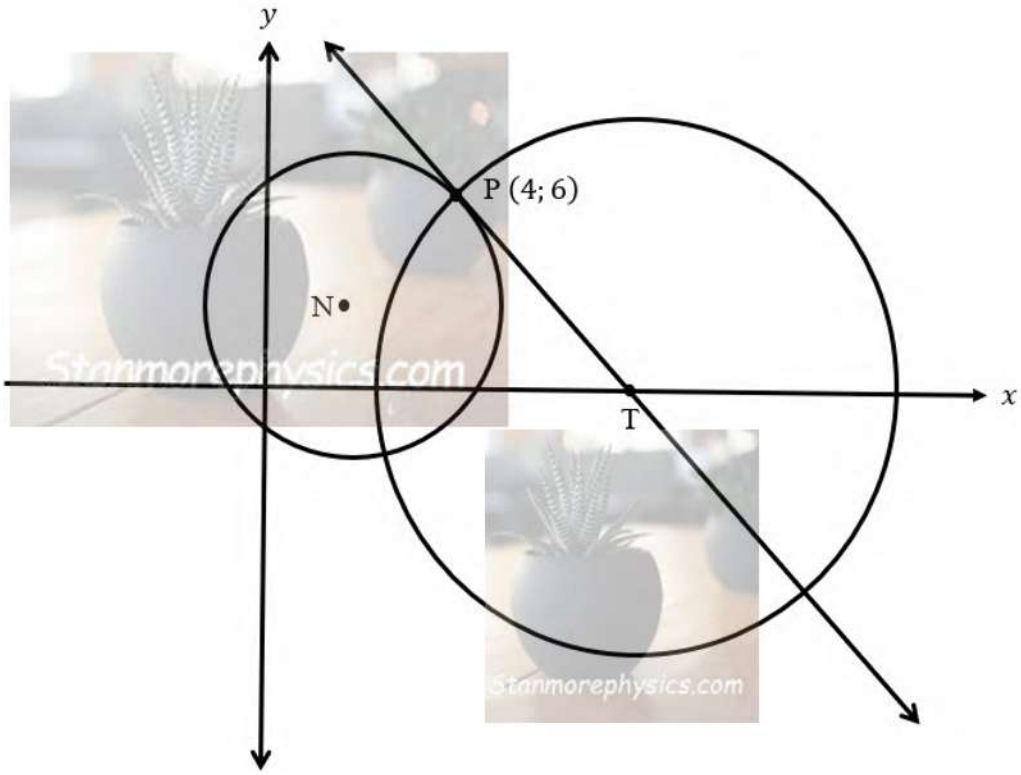
3.8 Hence, determine the size of M$\widehat{A}$B. (4)

3.9 Calculate the area of $\triangle MAB$. (3)

[22]

QUESTION 4

In the diagram, N is the centre of the smaller circle with the equation $(x-1)^2+(y-2)^2=25$. Point T lies on the x- axis and is the centre of a second larger circle. The two circles intersect at P$(4;6)$. Line PT is a tangent to the smaller circle at P.



4.1 Write down the coordinate of N, the centre of the smaller circle. (2)

4.2 Write down the radius of the smaller circle. (1)

4.3 Determine the y −intercepts of the smaller circle N. (4)

4.4 Determine the equation of the circle with midpoint T in the form $(x-a)^2+(y-b)^2=r^2$ (7)

4.5 The radius of the smaller circle is reduced so that the circles only touch once. Determine the new radius of the smaller circle. (4)

[18]

QUESTION 5

5.1 If $\sin 19° = t$, express the following in terms of t:

5.1.1 $\cos 19°$ (2)

5.1.2 $\sin 38°$ (2)

5.1.3 $\sin 101°$ (4)

5.2 Simplify the following:

$$\frac{\tan(180° - x)\cos(90° - 2x)}{\tan 225°.\sin(x - 360°)}$$ (8)

5.3 Find the general solution of the equation:

$$\frac{\tan^2 x + 1}{4} = 1$$ (5)

5.4 Prove the identity:

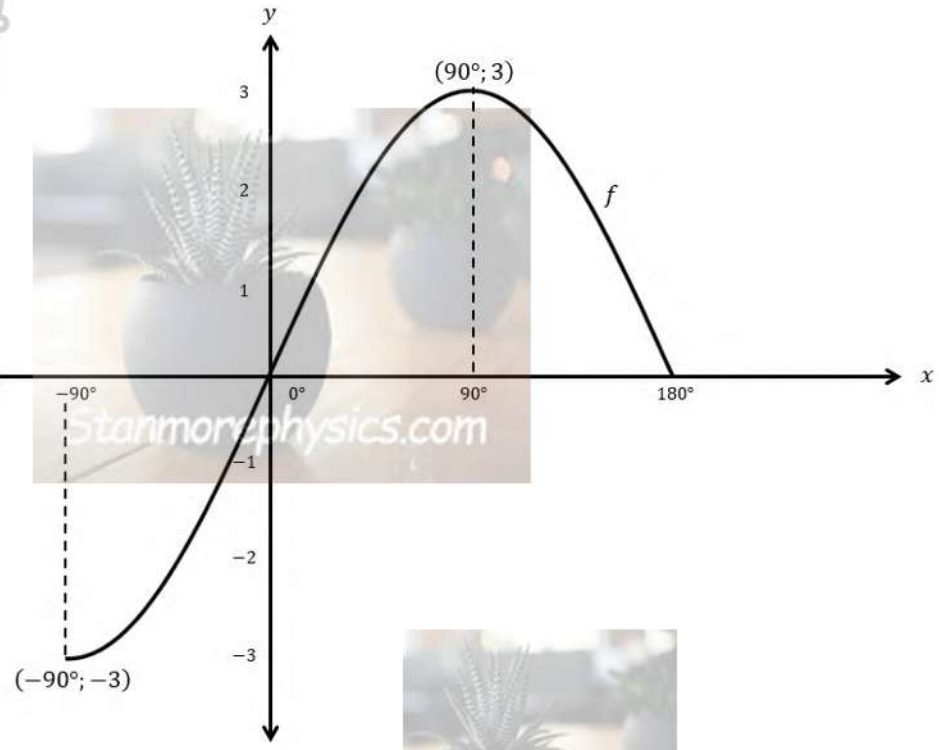
$$\frac{\sin 2A + \sin A}{\cos 2A + \cos A + 1} = \tan A$$ (5)

5.5 Show that if $\sin\theta = 2p$ and $\cos\theta = p$, then $p = \pm\frac{\sqrt{5}}{5}$. (4)

[30]

QUESTION 6

In the diagram the graph of $f(x) = a \sin x$ is drawn for the interval $x \in [-90° ; 180°]$.



6.1 Write down the value of a. (1)

6.2 For which values of x for which $f(x) > 0$. (2)

6.3 Draw the graph of $g(x) = 3 \sin x - 1$ for the interval $x \in [-90° ; 180°]$ on the axes provided in the ANSWER BOOK. Clearly show the y-intercepts and turning points of the graph. (2)

6.4 Write down the period of $g(2x)$. (1)

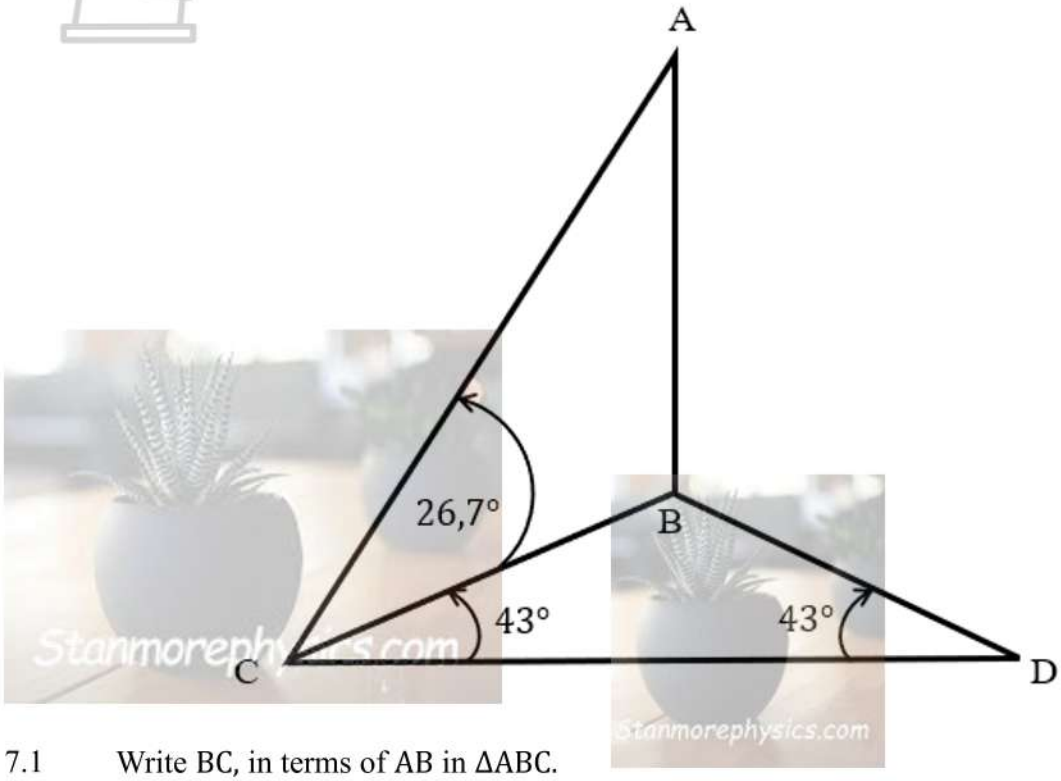
6.5 Calculate the values of x for which $g(x) \geq 1$ in the interval $x \in [-90° ; 180°]$. (3)

6.6 The graph of h is obtained by reflecting g about the x-axis and translated $90°$ to the left. Write down the equation of h in its simplest form. (3)

[12]

QUESTION 7

In the diagram, a vertical tower AB is observed from two points, C and D, in the same horizontal plane as point B, the foot of the tower. From C, the angle of elevation of A is $26{,}7°$ and $B\hat{C}D = B\hat{D}C = 43°$.



7.1 Write BC, in terms of AB in ΔABC. (2)

7.2 Hence, prove that the height of the tower is given by:

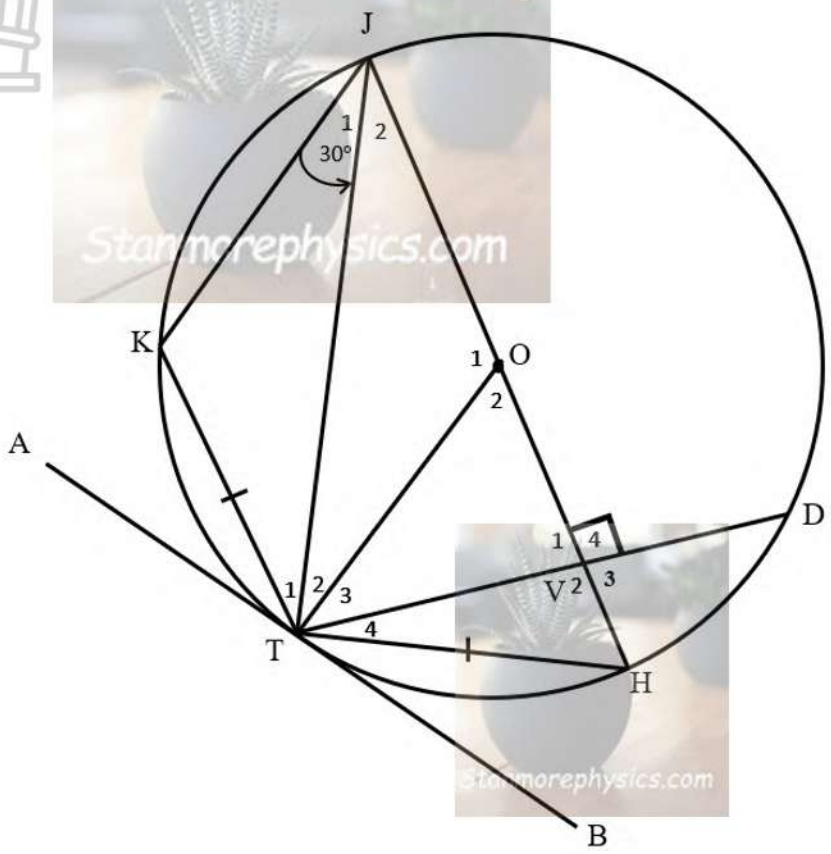
$$AB = \frac{CD.\sin 43°.\tan 26{,}7°}{\sin 94°}$$ (4)

7.3 If it is further given that C and D are 120 metres apart, calculate the length of AB. (2)

[8]

QUESTION 8

In the diagram, O is the centre of the circle JDHTK. The diameter JH is perpendicular to chord TD at V. AB is a tangent to the circle at T. JK, JT and HT are chords of the circle. KT = HT and $\hat{J}_1 = 30°$.



8.1 Provide a reason why $\hat{J}_2 = 30°$ (1)

8.2 Determine, with reasons, the size of:

8.2.1 $\hat{O}_2$ (2)

8.2.2 $\hat{K}$ (5)

8.2.3 $\hat{T}_2$ (1)

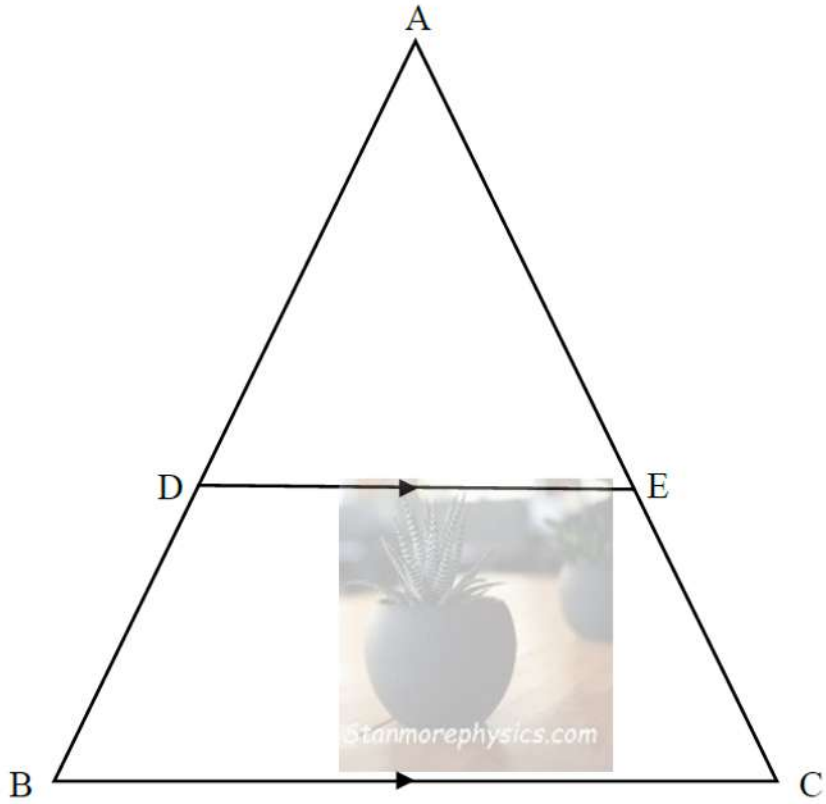
8.3 Determine the length of JT, if it is given that DT $=10\sqrt{3}$ and OT = 10. (3)

[12]

QUESTION 9

9.1 In the diagram below, ΔABC is drawn. D is a point on AB and E is a point on AC such that DE||BC.

Use the diagram to prove the theorem which states that $\frac{AD}{DB} = \frac{AE}{EC}$

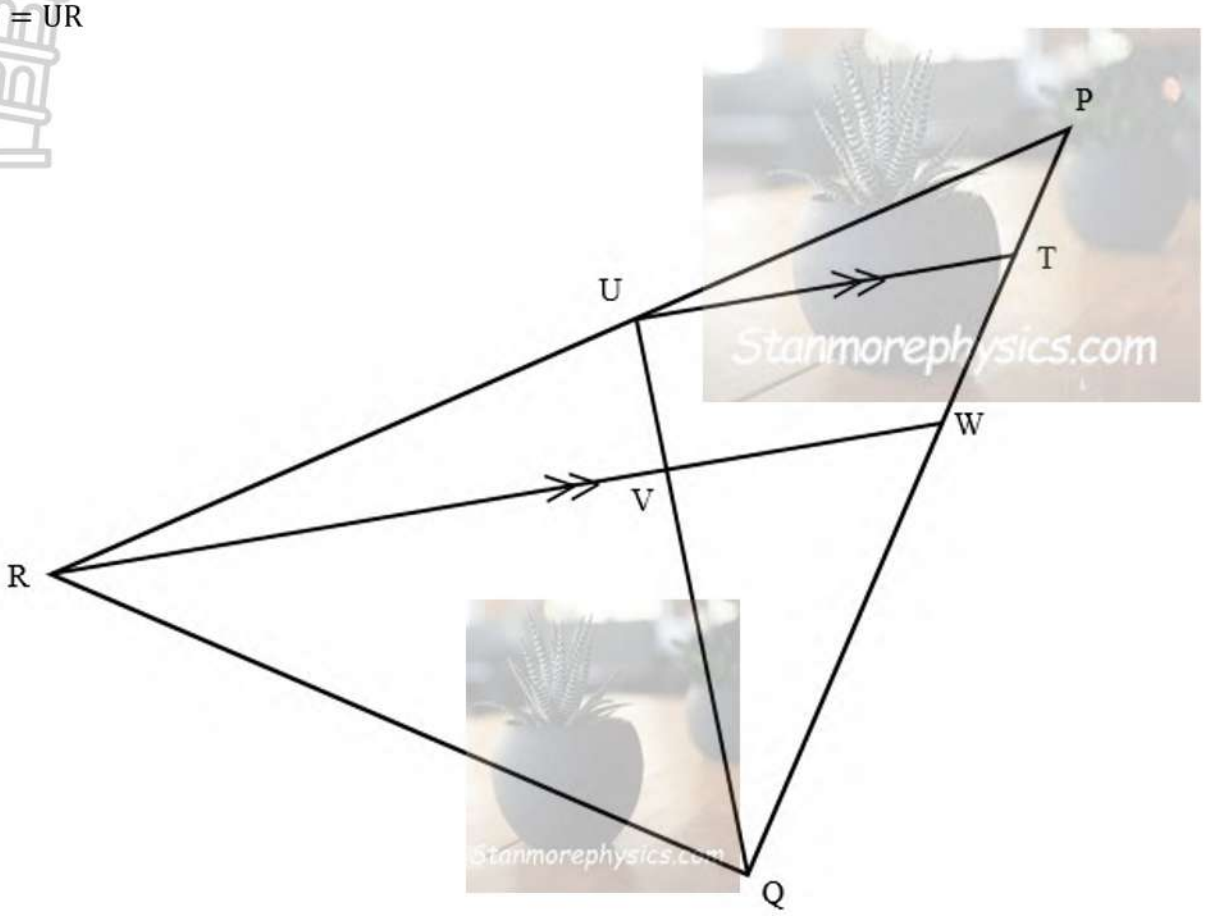


(5)

9.2 In the diagram T, U and W are points on ΔPQR. TU ∥ RW and UVQ is a straight line with V on QU and RW.

PW : PQ = 3 : 8

2PU = UR



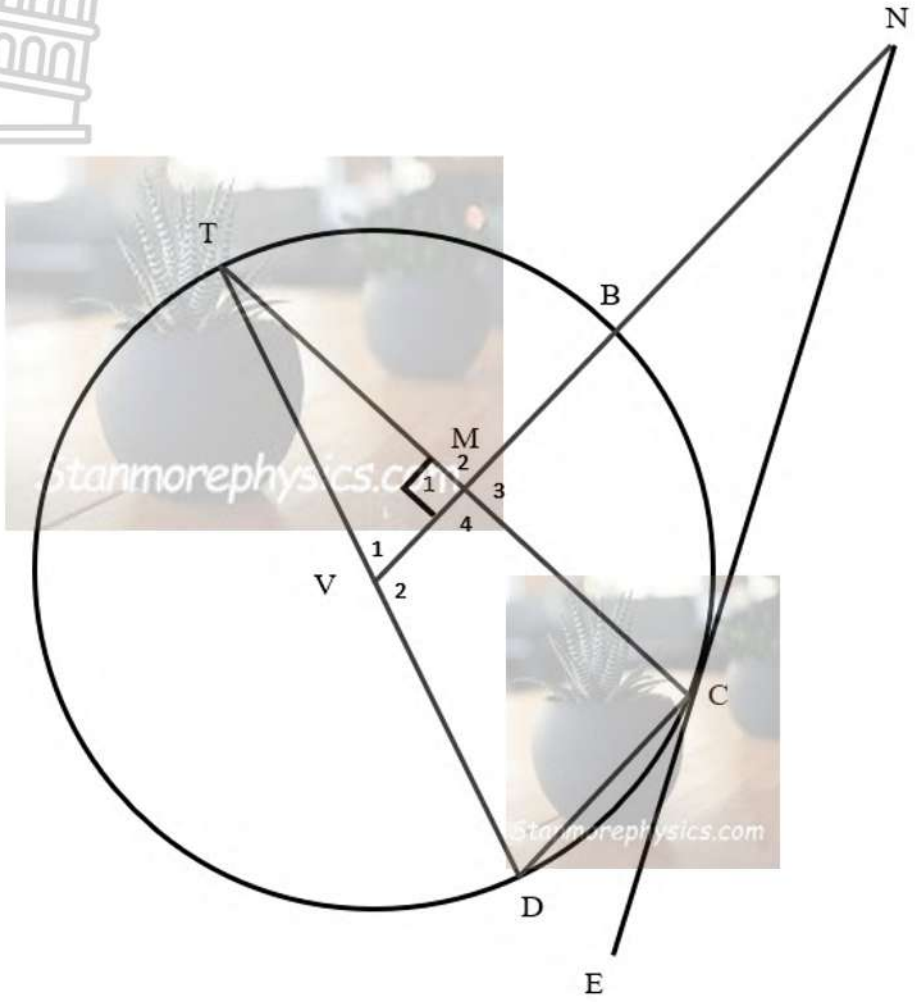
9.2.1 Calculate the ratio of $\frac{VQ}{VU}$ (4)

9.2.2 Calculate the ratio of $\frac{\text{Area } \Delta UPQ}{\text{Area } \Delta RPW}$ (3)

[12]

QUESTION 10

In the diagram TD is a diameter of circle TBCD. Chord TC meets tangent NE at C. Straight line NB is produced to V and intersects TC at M with V on TD. TC ⊥ NV at M.



10.1 Prove that NV ∥ CD. (3)

10.2 Prove that TNCV is a cyclic quadrilateral. (4)

10.3 Prove that $\Delta TMV \;|||\; \Delta NMC$ (3)

10.4 If it is further given that $NM = 2TM$ and $TM = MC$, prove that:

$$MV = \frac{NC^2}{4NM} - \frac{MC^2}{4NM}$$ (6)

[16]

TOTAL: 150 MARKS

INFORMATION SHEET

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

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

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

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

$$-1 < r < 1$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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MATHEMATICS PAPER 2

GRADE 12 MARKING GUIDELINE

COMMON MID-YEAR EXAMINATION

MAY/JUNE 2026

MARKS: 150

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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 Guidelines. 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 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 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 1		
1.1	$\Sigma x = 5105$ $= \frac{5105}{15}$ $= 340{,}33$ (AO full marks)	✓ 15 ✓ answer (2)
1.2	Standard deviation = 171,72	✓ answer (1)
1.3	Upper limit: $\bar{x} + \sigma = 512{,}05$ Lower limit: $\bar{x} - \sigma = 168{,}61$ $\therefore 10$	✓ upper and lower limits ✓ answer (2)
1.4	Values above 500: 520, 600, 750 Sum of affected values = 1 870 Let increase be p%. New total = $5\,105 + \left(\frac{p}{100}\right)(1\,870)$ New mean = 360 $360 \times 15 = 5\,400$ $5\,400 = 5\,105 + \left(\frac{p}{100}\right)(1\,870)$ $295 = \left(\frac{p}{100}\right)(1\,870)$ $p = 15{,}78\%$ **OR**	✓ $5\,105 + \left(\frac{p}{100}\right)(1\,870)$ ✓ 5400 ✓ equation ✓ answer

	$360 \times 15 = 5400$ Sum of values under R500 $= 3235$ Sum of values over R500 $= 1870$ $3235 + \left(1870 \times \frac{100 + p}{100}\right) = 5400$ $1870 \times \frac{100 + p}{100} = 2165$ $1870 + 18{,}7p = 2165$ $18{,}7p = 295$ $p = 15{,}78\%$	✓ 5400 ✓ 3235 and 1870 ✓ equation ✓ answer (4)
		[9]

QUESTION 2

2.1 $10 \leq x < 15$

✓ answer (1)

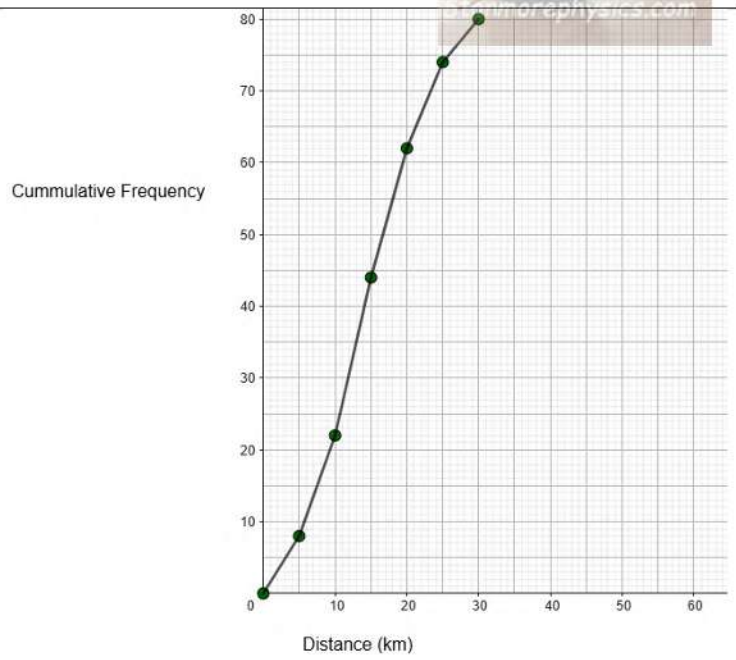
2.2

Distance (km)	Number of employees	Cumulative Frequency
$0 \leq x < 5$	8	8
$5 \leq x < 10$	14	22
$10 \leq x < 15$	22	44
$15 \leq x < 20$	18	62
$20 \leq x < 25$	12	74
$25 \leq x < 30$	6	80

✓ first three values

✓ second three values (2)

2.3



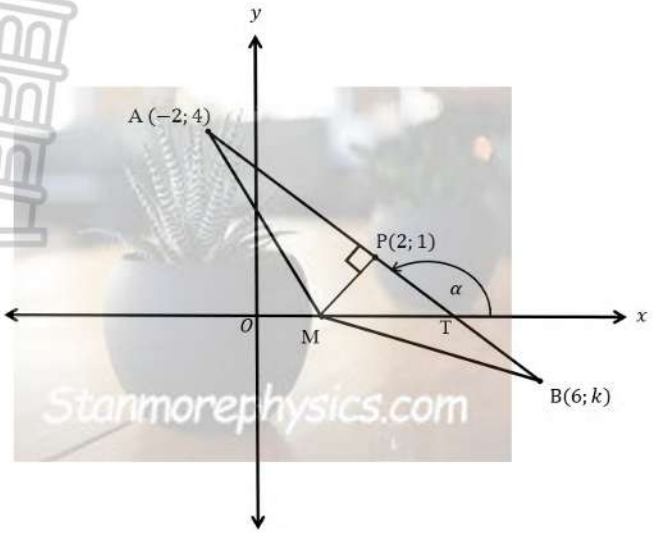
✓ correct plotting of first 3 points
✓ correct plotting of points last 3 points
✓ grounding
✓ smooth curve (4)

2.4. Upper quartile $= 19km$ (accept $18 - 20km$)

✓ answer (1)

2.5	Class interval shift: Distance (km) | Number of employees $0 \leq x < 5$ | 8 $5 \leq x < 10$ | 14 $10 \leq x < 15$ | 30 $15 \leq x < 20$ | 18 $20 \leq x < 25$ | 4 $25 \leq x < 30$ | 6 Original estimated mean $= \frac{8(2,5) + 14(7,5) + 30(12,5) + 18(17,5) + 4(22,5) + 6(27,5)}{80}$ $= 13,38$	✓ class interval shift ✓ equation ✓ answer (3)
		[11]

QUESTION 3



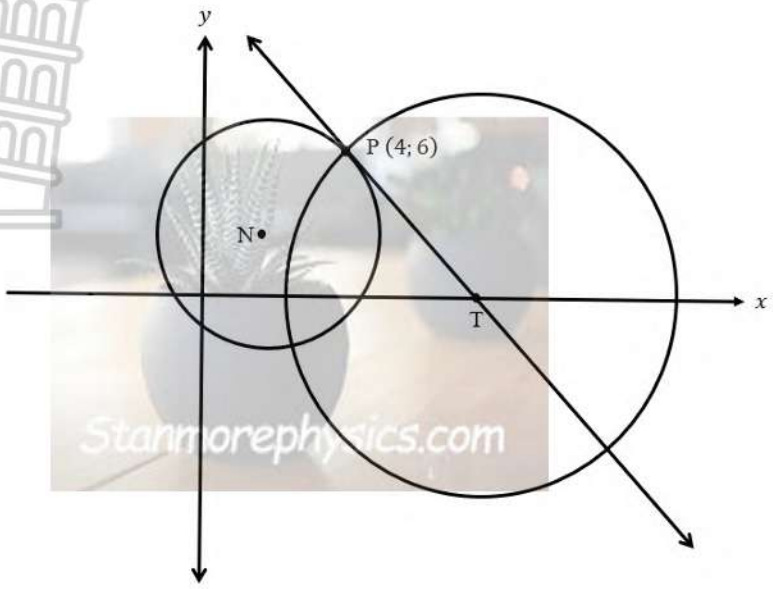
3.1	$m_{AB} = \frac{4-1}{-2-2}$ $= -\frac{3}{4}$	✓ sub ✓ answer (2)
3.2	$1 = \frac{k+4}{2}$ $k = -2$	✓ sub ✓ answer (2)
3.3	$AB = \sqrt{(-2-6)^2 + (4-(-2))^2}$ $= 10$ **OR** $AP = \sqrt{(-2-2)^2 + (4-(-1))^2}$ $= 5$ $AB = AP \times 2$ $= 10$	✓ sub ✓ answer ✓ sub ✓ answer (2)

$(m_1 \times m_2 = -1)$

3.4	$m_{MP} = \frac{4}{3}$ $y = \frac{4}{3}x + c$ $(2;1)$: $1 = \frac{4}{3}(2) + c$ $c = -\frac{5}{3}$ $y = \frac{4}{3}x - \frac{5}{3}$	✓ $m_{MP} = \frac{4}{3}$ ✓ sub of coordinate ✓ $c = -\frac{5}{3}$ (3)
3.5	$0 = \frac{4}{3}x - \frac{5}{3}$ $x = \frac{5}{4}$ $\quad$ $M\left(\frac{5}{4};0\right)$	✓ $0 = \frac{4}{3}x - \frac{5}{3}$ ✓ $x = \frac{5}{4}$ (2)
3.6	$S(2{,}75;2)$	✓ x- value ✓ y- value (2)
3.7	$\tan\alpha = -\frac{3}{4}$ $\alpha = 143{,}13°$	✓ sub ✓ answer (2)
3.8	$m_{AM} = \frac{4-0}{-2-\frac{5}{4}}$ $= -\frac{16}{13}$ $\tan A\hat{M}T = -\frac{16}{13}$ $A\hat{M}T = 129{,}09°$ $\therefore M\hat{A}B = 143{,}13° - 129{,}09°$ $= 14{,}04°$	✓ m_{AM} ✓ $\tan A\hat{M}T = m_{AM}$ ✓ $A\hat{M}T$ ✓ $M\hat{A}B$ (4)

3.9	Distance from M to AB MN= $\sqrt{\left(2-\frac{5}{4}\right)^2+(0-1)^2}$ $=\frac{5}{4}$ Area $\Delta MAB=\frac{1}{2}(10)(\frac{5}{4})$ $=6{,}25\ \text{units}^2$	✓ MN $=\frac{5}{4}$ ✓ sub ✓ answer (3)
		[22]

QUESTION 4

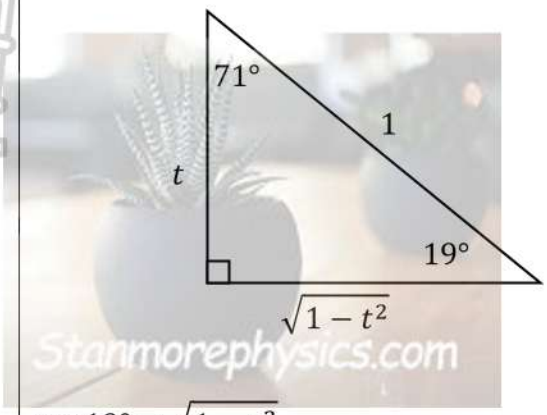


4.1	N(1 ; 2)	✓ x- value ✓ y- value (2)
4.2	$r = 5$	✓ answer (1)
4.3	$(0-1)^2 + (y-2)^2 = 25$ $1 + y^2 - 4y + 4 = 25$ $y^2 - 4y - 20 = 0$ $y = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-20)}}{2(1)}$ $y = 6{,}90$ or $y = -2{,}90$	✓ sub $x = 0$ ✓ standard form ✓ answer ✓ answer (4)

4.4	$m_{NP} = \frac{2-6}{1-4}$	✓ sub
	$= \frac{4}{3}$	✓ $m_{NP} = \frac{4}{3}$
	$\therefore m_{PT} = -\frac{3}{4}$ tan ⊥ radius	✓m_{PT}
	T$(x;0)$	
	$m_{PT} = \frac{0-6}{x-4}$	
	$-\frac{3}{4} = \frac{0-6}{x-4}$	✓ sub
	$-3x + 12 = -24$	
	$x = 12$ T$(12;0)$	✓ x-value of T
	PT $= \sqrt{(4-12)^2 + (6-0)^2}$	
	$= 10$	✓ distance of PT
	$\therefore (x-12)^2 + y^2 = 100$	✓ answer
	OR	
	$m_{NP} = \frac{2-6}{1-4}$	✓ sub
	$= \frac{4}{3}$	✓ $m_{NP} = \frac{4}{3}$
	$\therefore m_{PT} = -\frac{3}{4}$ tan ⊥ radius	✓m_{PT}
	T$(x;0)$	
	$m_{PT} = \frac{0-6}{x-4}$	
	$-\frac{3}{4} = \frac{0-6}{x-4}$	✓ sub

	$-3x + 12 = -24$	
	$x = 12 \qquad T(12; 0)$	✓ x-value of T
	$\therefore (x-12)^2 + y^2 = r^2$	
	Sub $(4; 6)$: $(4-12)^2 + (6)^2 = r^2$	
	$100 = r^2$	✓ r^2
	$\therefore (x-12)^2 + y^2 = 100$	✓ answer
	OR	
	$m_{NP} = \dfrac{2-6}{1-4}$	✓ sub
	$= \dfrac{4}{3}$	✓ $m_{NP} = \frac{4}{3}$
	$\therefore m_{PT} = -\dfrac{3}{4}$ tan ⊥ radius	✓m_{PT}
	PT: $y = -\frac{3}{4}x + c$	
	$(4; 6)$: $6 = -\dfrac{3}{4}(4) + c$	✓ sub
	$c = 9$	
	$y = -\frac{3}{4}x + 9$	
	$0 = -\frac{3}{4}x + 9$	
	$x = 12 \qquad T(12; 0)$	✓ x-value of T
	$\therefore (x-12)^2 + y^2 = r^2$	
	Sub $(4; 6)$: $(4-12)^2 + (6)^2 = r^2$	
	$100 = r^2$	✓ r^2
	$\therefore (x-12)^2 + y^2 = 100$	✓ answer

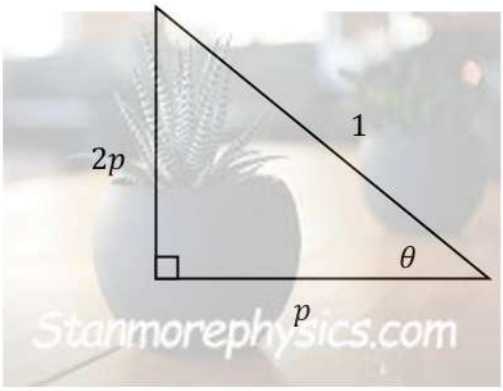
	OR $\widehat{NPT} = 90°$ (tan ⊥ radius) $T(x; 0)$ $PT^2 + NP^2 = NT^2$ (Pyth) $(4 - x)^2 + (6 - 0)^2 + (1 - 4)^2 + (2 - 6)^2$ $= (x - 1)^2 + (0 - 2)^2$ $16 - 8x + x^2 + 36 + 9 + 16 = x^2 - 2x + 1 + 4$ $-6x = -72$ $x = 12$ $T(12; 0)$ $\therefore (x - 12)^2 + y^2 = r^2$ Sub $(4; 6)$: $(4 - 12)^2 + (6)^2 = r^2$ $100 = r^2$ $\therefore (x - 12)^2 + y^2 = 100$	✓ sub distance PT^2 ✓ sub distance NP^2 ✓ sub distance NT^2 ✓ x-value of T ✓ sub ✓ r^2 ✓ answer (7)
4.5	$r + R = 5 + 10$ $= 15$ $NT = \sqrt{(12 - 1)^2 + (0 - 2)^2}$ $= 5\sqrt{5}$ / 11,18 Distance reduced $= 15 - 11,18$ $= 3,82$ New radius $= 1,18$	✓ $r + R$ ✓ NT ✓ distance reduced ✓ new radius (4)
		[18]

QUESTION 5		
5.1.1	$\sin 19° = t$  $\cos 19° = \sqrt{1-t^2}$	✓ $\sqrt{1-t^2}$ (3rd side) ✓ answer (2)
5.1.2	$\sin 38°$ $= \sin 2(19°)$ $= 2\sin 19° \cos 19°$ $= 2t\sqrt{1-t^2}$	✓ double angle ✓answer (2)

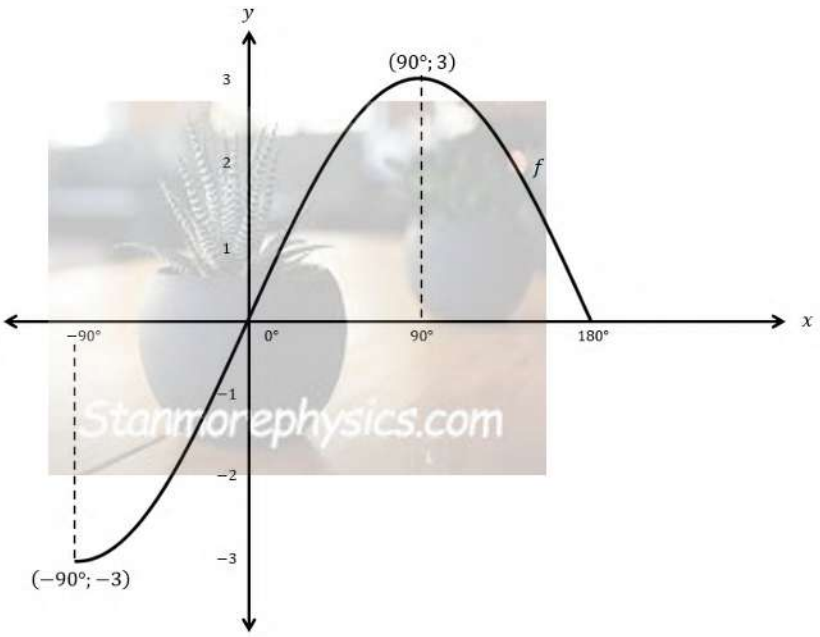
5.1.3	$\sin 101°$ $= \sin(30° + 71°)$ $= \sin 30° \cos 71° + \cos 30° \sin 71°$ $= \frac{1}{2}.t + \frac{\sqrt{3}}{2}.\sqrt{1-t^2}$ $= \frac{t}{2} + \frac{\sqrt{3}.\sqrt{1-t^2}}{2}$ $= \frac{t+\sqrt{3}.\sqrt{1-t^2}}{2}$ **OR** $\sin 101°$ $= \sin 79°$ $= \sin(60° + 19°)$ $= \sin 60° \cos 19° + \cos 60° \sin 19°$ $= \left(\frac{\sqrt{3}}{2}\right)\left(\sqrt{1-t^2}\right) + \left(\frac{1}{2}\right)(t)$ $= \frac{\sqrt{3}.\sqrt{1-t^2}}{2} + \frac{t}{2}$ $= \frac{\sqrt{3}.\sqrt{1-t^2}+t}{2}$	✓compound angle ✓expansion ✓$\frac{1}{2}.t$ ✓$\frac{\sqrt{3}}{2}.\sqrt{1-t^2}$ ✓compound angle ✓expansion ✓$\left(\frac{\sqrt{3}}{2}\right)\left(\sqrt{1-t^2}\right)$ ✓$\left(\frac{1}{2}\right)(t)$ (4)

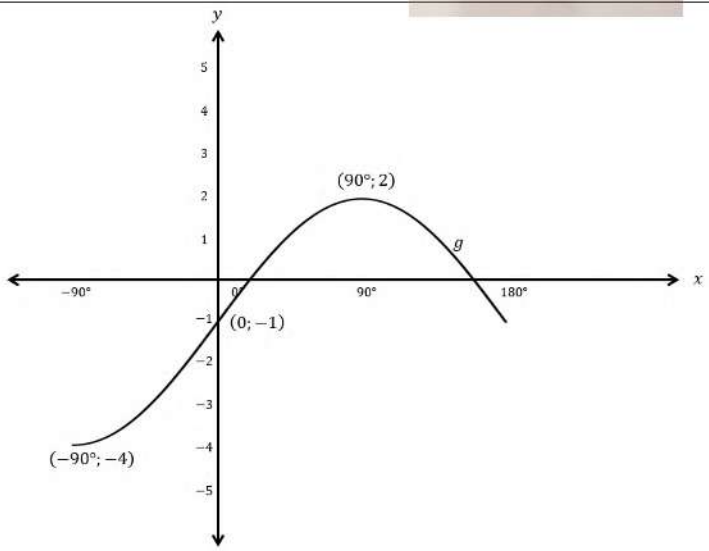
5.2	$\frac{\tan(180° - x)\cos(90° - 2x)}{\tan 225°.\sin(x - 360°)}$ $= \frac{-\tan x\,.\sin 2x}{\tan 45°\sin x}$ $= \frac{-\frac{\sin x}{\cos x}.2\sin x\cos x}{1.\sin x}$ $= -2\sin x$	✓ $-\tan x$ ✓ $\sin 2x$ ✓ $\tan 45°$ ✓ $\sin x$ ✓ $-\frac{\sin x}{\cos x}$ ✓ $2\sin x\cos x$ ✓ 1 ✓Answers (8)
5.3	$\frac{\tan^2 x + 1}{4} = 1$ $\tan^2 x = 3$ $\tan x = \pm\sqrt{3}$ RA= 60° $x = 60° + 180.k$ or $x = 120° + 180.k$ **OR** $\frac{\tan^2 x + 1}{4} = 1$ $\tan^2 x = 3$	✓ $\tan^2 x = 3$ ✓ $\tan x = \pm\sqrt{3}$ ✓ RA = 60° ✓ $60° + 180.k$ and $120° + 180.k$ ✓ $k\epsilon Z$ ✓ $\tan^2 x = 3$ ✓ $\tan x = \pm\sqrt{3}$

	$\tan x = \pm\sqrt{3}$ RA$= 60°$ $x = 60° + 360.k$ or $x = 120° + 360.k$ $x = 240° + 360.k$ or $x = 300° + 360.k$ $k\epsilon$Z	✓ RA $= 60°$ ✓ all 4 answers ✓ $k\epsilon$Z (5)
5.4	$\dfrac{\sin 2A + \sin A}{\cos 2A + \cos A + 1} = \tan A$ $LHS = \dfrac{\sin 2A + \sin A}{\cos 2A + \cos A + 1}$ $= \dfrac{2\sin A\cos A + \sin A}{2\cos^2 A - 1 + \cos A + 1}$ $= \dfrac{\sin A(2\cos A + 1)}{2\cos^2 A + \cos A}$ $= \dfrac{\sin A(2\cos A + 1)}{\cos A(2\cos A + 1)}$ $= \tan A$	✓2 sin A cos A ✓2 cos^2 $A - 1$ ✓ Common factor ✓ Simplify denominator ✓ Common factor (5)

5.5	Given: $\sin\theta = 2p$ and $\cos\theta = p$,  $1 = (2p)^2 + (p)^2$ (Pyth) $1 = 4p^2 + p^2$ $1 = 5p^2$ $\frac{1}{5} = p^2$ $p = \pm\sqrt{\frac{1}{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$ $p = \pm\frac{\sqrt{5}}{5}$	✓1 ✓Use of Pythagoras ✓ Value of p^2 ✓rationalisation (4)
		[30]

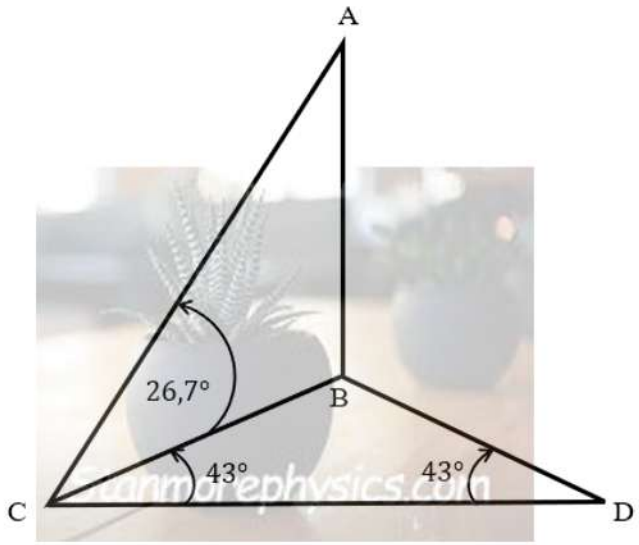
QUESTION 6



6.1	3	✓answer (1)
6.2	$0° < x < 180°$ / $x \in (0°; 180°)$	✓ cv ✓ inequality (2)
6.3		✓(90 ; 2) and y-intercept ✓shape of sine curve (2)
6.4	180°	✓answer (1)

6.5	$g(x) \geq 1$ $3\sin x - 1 \geq 1$ $3\sin x \geq 2$ $\sin x \geq \frac{2}{3}$ Reference Angle: $x = 41{,}81°$ $180° - 41.81° = 138.19°$ $\therefore 41{,}81° \leq x \leq 138{,}19° \quad / x \in [41{,}81°; 138{,}19°]$	✓ inequality ✓ $41{,}81°$ and $138{,}19°$ ✓answer (3)
6.6	$h(x) = -3\sin x + 1$ $= -3\sin(x + 90°) + 1$ $= -3\cos x + 1$	✓$-3\sin x + 1$ ✓ $-3\sin(x + 90°) + 1$ ✓$-3\cos x + 1$ (3)
		[12]

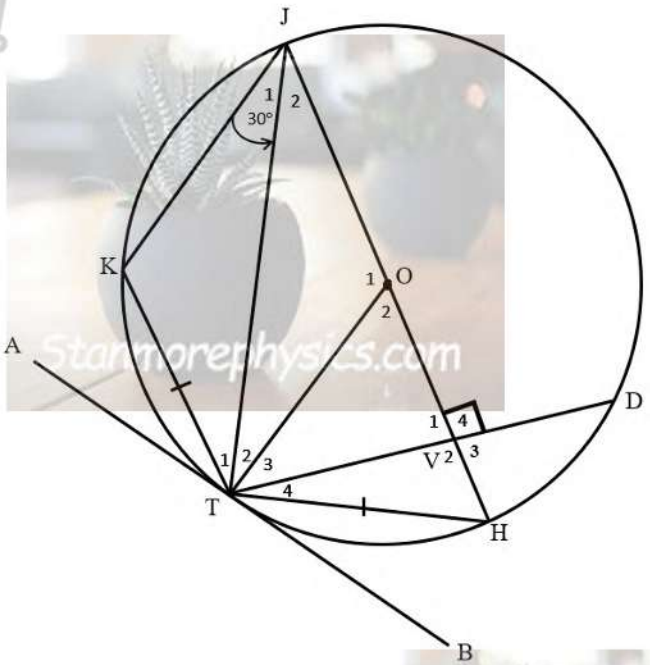
QUESTION 7



7.1	In ΔABD: $\tan 26{,}7° = \frac{AB}{BC}$ $BC = \frac{AB}{\tan 26{,}7°}$	✓$\tan 26{,}7° = \frac{AB}{BC}$ ✓BC (2)
7.2	In ΔBCD: $C\hat{B}D = 94°$ $\frac{CD}{\sin 94°} = \frac{BC}{\sin 43°}$ $BC = \frac{CD.\sin 43°}{\sin 94°}$ $\frac{AB}{\tan 26{,}7°} = \frac{CD.\sin 43°}{\sin 94°}$ $AB = \frac{CD.\sin 43°\tan 26{,}7°}{\sin 94°}$	✓94° ✓Subs into sin-formula ✓BC ✓Equating

	OR	
	In ΔABD:	
	$\tan 26{,}7° = \frac{AB}{BC}$	
	$AB = BC.\tan 26{,}7°$	
	In ΔBCD:	
	$C\hat{B}D = 94°$	✓94°
	$\frac{CD}{\sin 94°} = \frac{BC}{\sin 43°}$	✓Subs into sin-formula
	$BC = \frac{CD.\sin 43°}{\sin 94°}$	✓BC
	$\therefore AB = \frac{CD.\sin 43°}{\sin 94°}.\tan 26{,}7°$	✓sub
	$AB = \frac{CD.\sin 43°\tan 26{,}7°}{\sin 94°}$	(4)
7.3	$AB = \frac{120.\sin 43°\tan 26{,}7°}{\sin 94°}$	✓Subs 120
	$AB = 41{,}3$ m	✓Answer
		(2)
		[8]

QUESTION 8

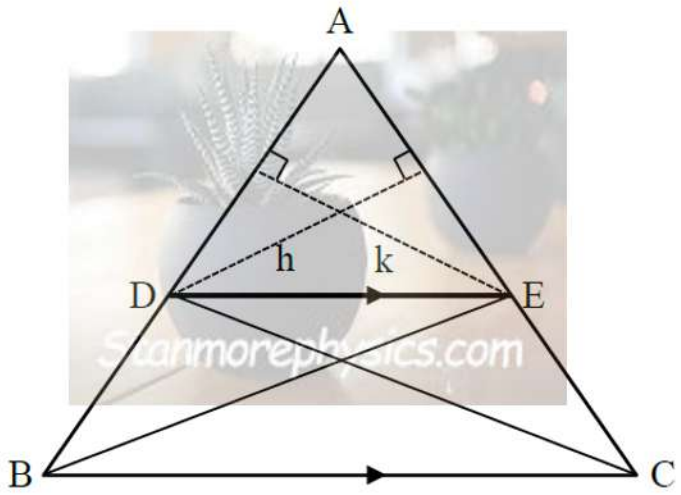


8.1	equal chords ; equal $\angle s$ /*gelyke koorde, gelyke* $\angle^e$	✓ R (1)
8.2.1	$\hat{O}_2 = 60°$ ($\angle$ at centre $= 2 \times \angle$ at circumference) (*Midpts*$\angle = 2 \times$ *Omtreks*$\angle$)	✓ S✓ R (2)
8.2.2	$J\hat{T}H = 90°$ ($\angle s$ in semi-circle) / ($\angle$ *in halwe sirkel*) $\hat{H} = 60°$ (sum of $\angle s$ in Δ) / *(som van* $\angle^e$ *in* Δ) $\hat{K} = 120°$ (opp $\angle s$ of cyclic quad) / *(teenoorst.* $\angle^e$ *van kvh)*	✓ S ✓ R ✓ S/R ✓ S ✓ R (5)
8.2.3	$\hat{T}_2 = 30°$ ($\angle$'s opp = sides) / ($\angle^e$ *teenoor gelyke sye)*	✓ S/R (1)

8.3	TV= $5\sqrt{3}$ (line from centre ⊥ to chord) *(lyn vanuit midpt ⊥ op koord)*	✓ S/R
	OV = 5 (Pyth ΔOVT)	✓ OV
	In ΔJTV	
	$JT^2 = \left(5\sqrt{3}\right)^2 + (15)^2$	
	$JT = 10\sqrt{3}$ / $\sqrt{300}$	✓ answer
	OR	
	$O\hat{H}T = 60°$ (sum of $\angle s$ in Δ) / *(som van $\angle^e$ in Δ)*	✓ S/R
	∴ OT = OH = TH = 10 (sides opp = $\angle$'s) *(sye teenoor gelyke $\angle^e$)*	
	In ΔJTH	✓TH
	$JT^2 = (10)^2 + (20)^2$	
	$JT = 10\sqrt{3}$ / $\sqrt{300}$	✓ answer
		(3)
		[12]

QUESTION 9

9.1



Construction must be in words or indicated on sketch. No construction – 0/5 for question.
90° must be mentioned or indicated – if not 4/5

Konstruksie moet op skets aangedui wees, of in woorde. Geen konstruksie – 0/5 vir vraag.
90° moet genoem word of aangedui wees – indien nie 4/5

Construction: Join DC and BE and perpendicular heights *k* and *h*

Konstruksie: Verbind DC en BE en loodregte hoogtes *k* en *h*

✓ construction / kontruksie

$$\frac{\text{Area } \triangle ADE}{\text{Area } \triangle DEB} = \frac{\frac{1}{2} \cdot AD \cdot k}{\frac{1}{2} \cdot DB \cdot k} = \frac{AD}{DB}$$

✓ statement

$$\frac{\text{Area } \triangle ADE}{\text{Area } \triangle DEC} = \frac{\frac{1}{2} \cdot AE \cdot h}{\frac{1}{2} \cdot EC \cdot h} = \frac{AE}{EC}$$

✓ statement

$\text{Area } \triangle DEB = \text{Area } \triangle DEC$

(same base, same height / *dies. basis, dies. hoogte)*

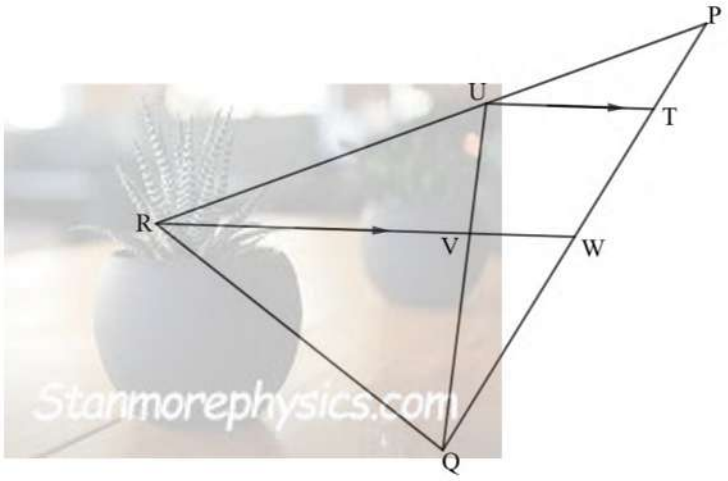
✓ statement / reason

$$\therefore \frac{\text{Area } \triangle ADE}{\text{Area } \triangle DEB} = \frac{\text{Area } \triangle ADE}{\text{Area } \triangle DEC}$$

$$\therefore \frac{AD}{DB} = \frac{AE}{EC}$$

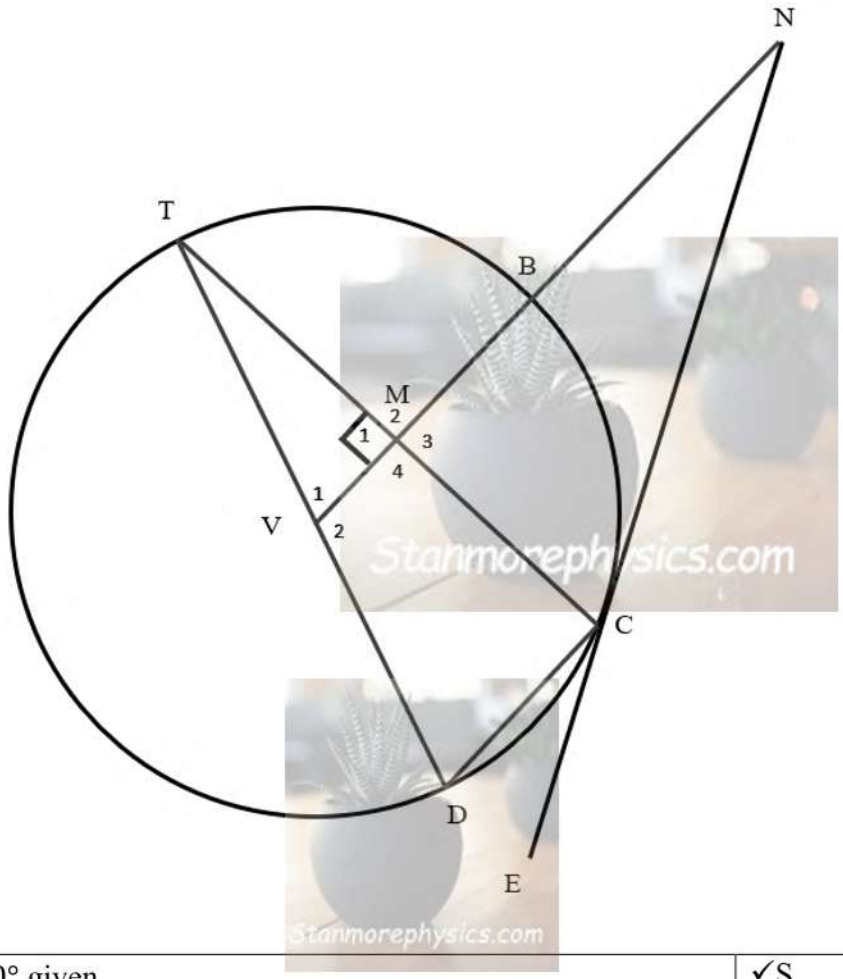
✓ statement

(5)



9.2.1	$\frac{WT}{TP}=\frac{RU}{UP}=\frac{2p}{1p}$ Line ∥ to one side of a Δ / *(lyn ∥een sy van Δ)* **OR** prop theorem; $UT \parallel RW$ *(eweredige stelling $UT \parallel RW$)* $\frac{VQ}{VU}=\frac{QW}{WT}$ Line ∥ to one side of a Δ/ *(lyn ∥een sy van Δ)* **OR** prop theorem; $UT \parallel RW$ *(eweredige stelling $UT \parallel RW$)* $\therefore \frac{VQ}{VU}=\frac{5}{2}$	✓S ✓R ✓ S/R ✓ answer (4)
9.2.2	$\frac{\text{Area } \Delta UPQ}{\text{Area } \Delta RPW}=\frac{\frac{1}{2}UP.PQ.\sin\hat{P}}{\frac{1}{2}RP.PW.\sin\hat{P}}$ $=\frac{1k.8p}{3k.3p}$ $=\frac{8}{9}$	✓ areas ✓ simplification / sub ✓ answer (3)
		[12]

QUESTION 10



10.1	$\widehat{M}_1 = 90°$ given $T\widehat{C}D = 90°$ (angles in semi-circle) / *(∠ in halwe sirkel)* NV ∥ CD (corr $\angle s$ =) / *(ooreenk.* $\angle^e$ =)	✓S ✓S/R ✓R (3)
10.2	$\widehat{V}_1 = T\widehat{D}C$ (corresp $\angle s$; VN ∥ DC) / *(ooreenk.* $\angle^e$; $VN \parallel DC$) $N\widehat{C}T = T\widehat{D}C$ (tan chord theorem) / *(rraklyn koord stelling)* $\widehat{V}_1 = N\widehat{C}T$ TNCV is a cylcic quad (converse $\angle s$ in same seg) *(omgekeerde* $\angle^e$ *in dieselfde segment)*	✓ S ✓ S/R ✓ S ✓ R (4)

10.3	In ΔTMV & ΔNMC 1. $V\hat{T}C = N$ ($\angle s$ in same seg) / *($\angle^e$ in dieselfde segment)* 2. $\hat{M}_1 = \hat{M}_3$ (vert opp $\angle s$ =) / *(regoorst. $\angle^e$)* 3. $\hat{V}_1 = T\hat{C}N$ (sum of $\angle s$ in Δ) / *(som van $\angle^e$ in Δ)* ΔTMV ||| ΔNMC ($\angle, \angle, \angle$)	✓S/R ✓S/R ✓R / 3rd angle (3)
10.4	$\frac{TM}{NM} = \frac{MV}{MC}$ $TM^2 = NM.MV$ (TM= MC) $\left(\frac{NM}{2}\right)^2 = NM.MV$ $MN^2 + MC^2 = NC^2$ (Pyth) $MN^2 = NC^2 - MC^2$ $\frac{NC^2 - MC^2}{4} = NM.MV$ $MV = \frac{NC^2}{4NM} - \frac{MC^2}{4NM}$	✓S ✓S/R ✓substitution ✓S ✓substitution ✓substitution (6)
		[16]
TOTAL 150		