GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

JUNE EXAMINATION/
JUNIE EKSAMEN
GRADE/*GRAAD* 12

2025

MARKING GUIDELINES/
NASIENRIGLYNE

MATHEMATICS/
WISKUNDE

(PAPER/*VRAESTEL* 2)

24 pages/*bladsye*

AMENDMENT TO MARKING GUIDELINES

JUNE 2025 PROVINCIAL COMMON EXAMINATION

FOR ATTENTION: THE CHIEF INVIGILATOR

SUBJECT / *VAK*	**MATHEMATICS/*WISKUNDE***
PAPER / *VRAESTEL*	**2**
DATE OF EXAMINATION	**9 JUNE/*JUNIE* 2025**

The errata for the Marking Guidelines of **MATHEMATICS P2/*WISKUNDE* V2** has reference.

There was an error in **QUESTION 5 and QUESTION 8.2** which affected the possible candidate responses on BOTH the English AND Afrikaans versions of the question paper. This matter was addressed at the Marking Standardisation Meeting.

To ensure that candidates are not disadvantaged nor prejudiced in any way, you are advised to ask your Mathematics Educator to please **ignore QUESTION 5 and QUESTION 8.2** when marking. These questions carry 8 marks for QUESTION 5 and 7 marks for QUESTION 8.2, a total of 15 marks.

In other words, the paper must be marked out of a total of 135 instead of 150 and then the learners' marks must be converted to a mark out of 150. E.g. Should a learner attain $\frac{\mathbf{60}}{\mathbf{135}}$ then that mark is recalculated as $\frac{\mathbf{67}}{\mathbf{150}}$.

Use the formula: $\frac{a}{135} \times 100 = b$. *Then,* $\frac{b}{100} \times 150 = c$

***C** is the mark that is entered into SASAMS **out of 150**.*

pp _____
MR JONATHAN WILLIAMS

DIRECTOR: EXAMINATIONS MANAGEMENT
9 JUNE 2025

NOTE:

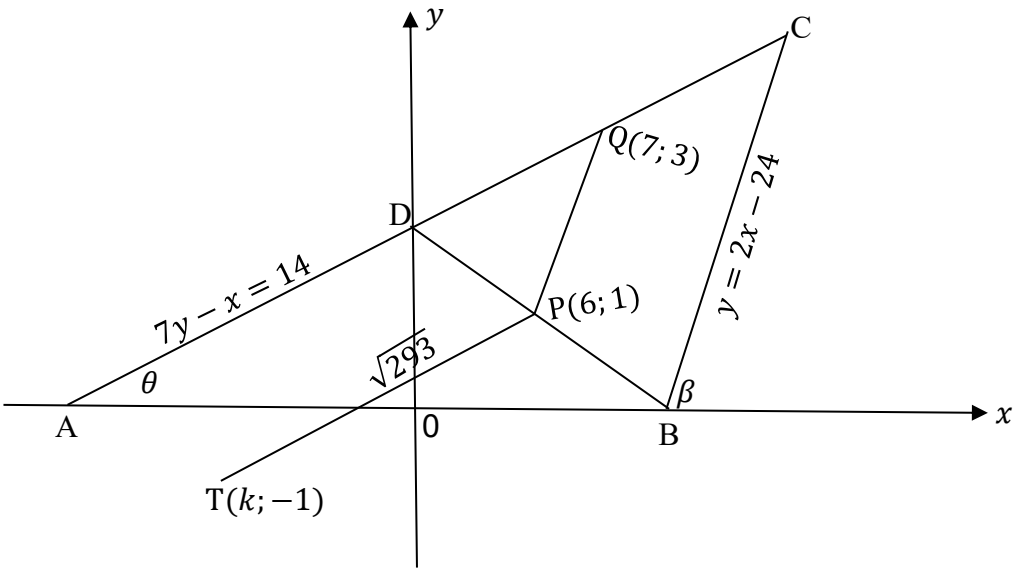
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed-out version.
- Consistent accuracy applies in ALL aspects of the marking guidelines. Stop marking at the second calculation error.
- Assuming answers/values 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 dit 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.*
- *Aannames 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 'n rede)*
R	A mark for a 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 the statement AND reason are both correct.
	Ken 'n punt toe as beide die bewering EN rede korrek is.

QUESTION/*VRAAG* 1



1.1	$m_{PQ} = \frac{3-1}{7-6}$ $= 2$ Answer only: Full marks *Antwoord alleen: Volpunte*	✓substitution into gradient formula/ *substitusie in die gradient formule* ✓answer/*antwoord* (2)
1.2	$m_{BC} = 2$ $m_{BC} = m_{PQ} = 2$ ∴ PQ||BC **OR/*OF*** Because gradient of/*Omdat die gradiënt van* PQ = gradient of/ *gradient van* BC **OR/*OF*** $7(2x - 24) - x = 14$ $13x = 182$ $x = 14$ $y = 4$ C(14; 4) ∴ Q is the midpoint of CD and P is the midpoint of BD/ *Q is die middelpunt van CD en P is die middelpunt van BD* ∴ PQ||BC (midpoint theorem/*middelpunt stelling*)	✓ $m_{BC} = 2$ ✓ $m_{BC} = m_{PQ}$ (2) **OR/*OF*** ✓✓ answer (2) **OR/*OF*** ✓ C(14; 4) ✓ midpoint theorem/ *middelpunt stelling* (2)

1.3	$D(0;2)$ $\frac{x_C+0}{2}=7$ $x_C=14$ $\frac{y_C+2}{2}=3$ $y_C=4$ $C(14;4)$ **OR/*OF*** $7(2x-24)-x=14$ $13x=182$ $x=14$ $y=4$ $C(14;4)$	✓$D(0;2)$ ✓substitution into midpoint formula (both)/ *substitusie in gradiënt formule vir beide* ✓x_C ✓y_C (4) **OR/*OF*** ✓correct use of a method of solving a pair of simultaneous equations/ *korrekte gebruik van 'n metode om gelyktydige vergelykings op te los* ✓simplifying/*vereenvoudiging* ✓x_C ✓y_C (4)
1.4	$m_{AC}=\frac{1}{7}$ $\theta=\tan^{-1}(\frac{1}{7})$ $\theta=8{,}13°$ $m_{BC}=2$ $\beta=\tan^{-1}(2)$ $\beta=63{,}43°$ $\therefore A\hat{C}B=55{,}30°$	✓$m_{AC}=\frac{1}{7}$ ✓$\theta=8{,}13°$ ✓$m_{BC}=2$ ✓$\beta=63{,}43°$ ✓answer/*antwoord* (5)

OR/*OF*

$A(-14;0)$

$B(12;0)$

$AB = 26$

$BC = \sqrt{(14-12)^2+(4-0)^2} = 2\sqrt{5}$

$AC = \sqrt{(14-(-14))^2+(4-0)^2} = 20\sqrt{2}$

$$A\hat{C}B = \cos^{-1}\left(\frac{(2\sqrt{5})^2+(20\sqrt{2})^2-26^2}{2(2\sqrt{5})(20\sqrt{2})}\right)$$

$\therefore A\hat{C}B = 55{,}30°$

OR/*OF*

✓$AB = 26$

✓$BC = 2\sqrt{5}$

✓$AC = 20\sqrt{2}$

✓substitution into cosine formula/ *substitusie in cos formule*

✓answer/*antwoord*

(5)

OR/*OF*

$m_{AC} = \frac{1}{7}$

$\theta = \tan^{-1}\left(\frac{1}{7}\right)$

$\theta = 8{,}13°$

$A(-14;0)$

$B(12;0)$

$AB = 26$

$BC = \sqrt{(14-12)^2+(4-0)^2} = 2\sqrt{5}$

$\frac{\sin A\hat{C}B}{26} = \frac{\sin 8{,}13°}{2\sqrt{5}}$

$A\hat{C}B = \sin^{-1}\left(\frac{26\times\sin 8{,}13°}{2\sqrt{5}}\right)$

$\therefore A\hat{C}B = 55{,}30°$

OR/*OF*

✓ $\theta = 8{,}13°$

✓ $AB = 26$

✓ $BC = 2\sqrt{5}$

✓ substitute into sine formula/ *substitusie in die sin formule*

✓answer/*antwoord*

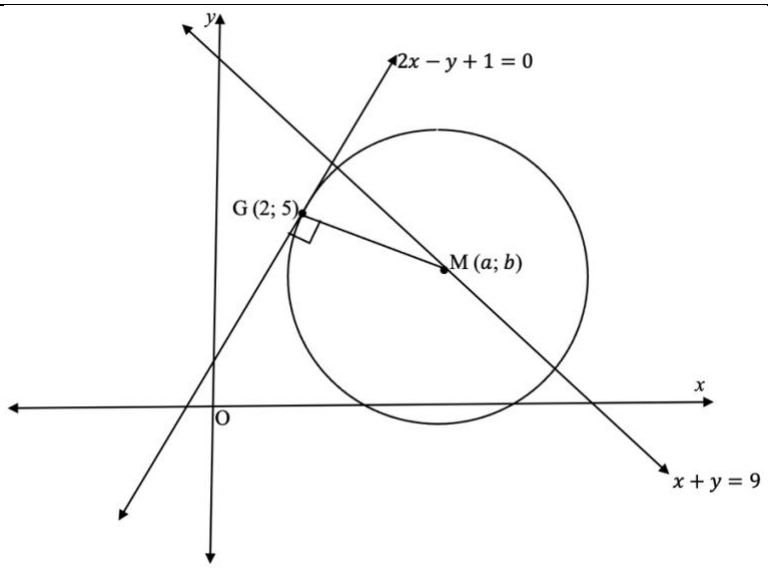
(5)

1.5	Area of/*oppervlak van* $\Delta ABC = \frac{1}{2} \times AB \times y_c$ $= \frac{1}{2} \times 26 \times 4$ $= 52$ Area of/ *oppervlak van* $\Delta AOD = \frac{1}{2} \times 14 \times 2$ $= 14$ $\therefore$ Area of /*oppervlak van* BODC $= 52 - 14$ $= 38$ units^2/*eenhede*^{2} **OR/*OF*** Area of/ *oppervlak van* $\Delta OBD = \frac{1}{2} \times OB \times OD$ $= \frac{1}{2} \times 12 \times 2$ $= 12$ Area of/ *oppervlak van* $\Delta BCD = \frac{1}{2} \times BC \times DC \sin\hat{C}$ $= \frac{1}{2} \times 2\sqrt{5} \times \sqrt{(14-0)^2 + (4-2)^2} \times \sin 55{,}3°$ $= 26{,}00$ $\therefore$ Area of /*oppervlak van* BODC $= 12 + 26$ $= 38$ units^2/*eenhede*^{2}	✓area of/*oppervlak van* ΔABC ✓area of/ *oppervlak van* ΔAOD ✓subtract/*verskil* ✓answer/ *antwoord* (4) **OR/*OF*** ✓ area of/ *oppervlak van* ΔOBD ✓ area of/ *oppervlak van* ΔBCD ✓adding/*som van* ✓answer/ *antwoord* (4)

1.6	$(k-6)^2 + (-1-1)^2 = 293$ $(k-6)^2 = 289$ $k - 6 = \pm\sqrt{289}$ $k = 6 + 17$ or /*of* $k = 6 - 17$ $k = 23$ *or* /*of* $k = -11$ $\therefore k = -11$	✓substitution into distance formula/*substitusie in afstandformule* ✓use of factors or quadratic formula/ *faktore of kwadratiese vergelyking* ✓correct value of k/*korrekte waarde van k* (3)

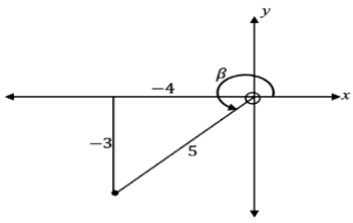
1.7	Midpoint of AC is (0;2) = midpoint of BE/ *Middelpunt van AC is (0;2) = middlepunt van BE* $\frac{x_E + 12}{2} = 0$ $\therefore x_E = -12$ $\frac{y_E + 0}{2} = 2$ $\therefore y_E = 4$ $a = -12$ and $b = 4$ Answer only: Full marks *Antwoord alleen: Volpunte*	✓ $a = -12$ ✓ $b = 4$ (2)
1.8	$m_{line} = -7$ $y = -7x + c$ $3 = -7(7) + c$ $c = 52$ $\therefore\ y = -7x + 52$	✓ $m = -7$ ✓ substitution/*substitusie* ✓ answer/*antwoord* (3)
		[25]

QUESTION/*VRAAG* 2

2.1				
	2.1.1	$m_{tan} = 2$ $\therefore m_{GM} = -\frac{1}{2}$ Answer only: Full marks *Antwoord alleen: Volpunte*	✓ gradient of tangent/ *gradiënt van raaklyn* ✓ gradient of GM/*gradiënt van GM*	(2)
	2.1.2	$y - y_1 = m(x - x_1)$ $y - 5 = -\frac{1}{2}(x - 2)$ $\therefore y = -\frac{1}{2}x + 6 \ / \ 2y = -x + 12$ **OR/*OF*** $y = -\frac{1}{2}x + c$ $5 = -\frac{1}{2}(2) + c$ $\therefore c = 6$ $\therefore y = -\frac{1}{2}x + 6 \ / \ 2y = -x + 12$	✓ substitution/*substitusie* (2;5) ✓ answer/*antwoord* **OR/*OF*** ✓ substitution/*substitusie* (2;5) ✓ answer/*antwoord*	(2)

	2.1.3	$y = -\frac{1}{2}x + 6$ $x + y = 9$ $\therefore\ x + -\frac{1}{2}x + 6 = 9$ $2x - x + 12 = 18$ $\therefore\ x = 6$ $\therefore y = 3$ $\therefore$ M(6; 3) **N.B: Penalize if not in coordinate form.** ***LW*: *Penaliseer as dit nie in koördinaatvorm is nie***	✓ equating/substitution *gelyk stel/substitusie* ✓ simplification */vereenvoudiging* ✓ both *x* and *y* value(s)/*beide x en y waardes* ✓ answer in coordinate form/ *antwoord in koördinaatvorm*	(4)
	2.1.4	GM $= r = \sqrt{(6-2)^2 + (3-5)^2}$ $= \sqrt{20} = 2\sqrt{5} = 4{,}47$	✓ substitution/*substitusie* ✓ answer/*antwoord*	(2)
	2.1.5	$(x-6)^2 + (y-3)^2 = \left(\sqrt{20}\right)^2$ $x^2 - 12x + 36 + y^2 - 6y + 9 - 20 = 0$ $\therefore x^2 + y^2 - 12x - 6y + 25 = 0$	✓ substitution/*substitusie* ✓ simplification */vereenvoudiging* ✓ answer/*antwoord*	(3)
2.2	$x^2 - 26x + y^2 + 12y = -105$ $x^2 - 26x + 169 + y^2 + 12y + 36 = -105 + 169 + 36$ $(x-13)^2 + (y+6)^2 = 100$ Centre/*middelpunt*: (13; −6) & Radius: 10 units/*eenhede* Point/*Punt* (7; 2) $m_{radius} = \frac{2-(-6)}{7-13}$ $= \frac{8}{-6} = -\frac{4}{3}$ $m_{tan} = \frac{3}{4}$ $y - y_1 = m(x - x_1)$ $y - 2 = \frac{3}{4}(x-7)$ $\therefore y = \frac{3}{4}x - \frac{13}{4}$ / $4y = 3x - 13$ $\therefore$ Inverse/*omgekeerde*: $y = \frac{4}{3}x + \frac{13}{3}$ / $3y = 4x + 13$	✓ completion of square */voltooi vierkant* ✓ equation of the circle/ *vergelyking van sirkel* ✓ gradient of the radius / *gradiënt van radius* ✓ gradient of tangent / *gradiënt van raaklyn* ✓ substitution/*substitusie* (7; 2) ✓ $y = \frac{3}{4}x - \frac{13}{4}$ / $4y = 3x - 13$ ✓ inverse/*omgekeerde*	(7)
				[20]

QUESTION/*VRAAG* 3

3.1	$\tan\beta = \frac{3}{4}$ 			
	3.1.1	$r^2 = x^2 + y^2$ $r^2 = (-4)^2 + (-3)^2$ $r^2 = 25$ $\therefore r = 5$ $\therefore \sin\beta = -\frac{3}{5}$	✓ correct quadrant /*korrekte kwadrant* ✓ value of *r/waarde van r* ✓ answer/*antwoord*	(3)
	3.1.2	$2 - \sin 2\beta$ $= 2 - 2\sin\beta\,.\cos\beta$ $= 2 - 2\left(-\frac{3}{5}\right).\left(-\frac{4}{5}\right)$ $= \frac{26}{25}$	✓ $2\sin\beta\,.\cos\beta$ ✓ correct substitution/*korrekte substitusie* ✓ answer/*antwoord*	(3)
	3.1.3	$\cos^2(90° - \beta) - 1$ $= \sin^2\beta - 1$ $= \left(-\frac{3}{5}\right)^2 - 1$ $= -\frac{16}{25}$	✓ $\sin^2\beta$ ✓ correct substitution/ *korrekte substitusie* ✓ answer /*antwoord*	(3)
3.2	$\frac{-1+\cos(180°-\theta).\sin(\theta-90°)}{\cos(-\theta).\sin(90°+\theta).\tan^2(540°+\theta)}$ $= \frac{-1+(-\cos\theta).-\cos\theta}{\cos\theta.\cos\theta\,.\tan^2\theta}$ $= \frac{-1+\cos^2\theta}{\cos^2\theta.\frac{\sin^2\theta}{\cos^2\theta}}$ $= \frac{-(1-\cos^2\theta)}{\sin^2\theta}$ $= \frac{-\sin^2\theta}{\sin^2\theta}$ $= -1$	✓ $-\cos\theta$ ✓ $-\cos\theta$ ✓$\cos\theta$ ✓$\cos\theta$ ✓$\tan^2\theta$ ✓ $-\sin^2\theta$ ✓ answer after simplification/ *antwoord na vereenvoudiging*	(7)	

3.3	$\frac{(\sin\theta-\cos\theta)^2}{1-\sin^2\theta} = \frac{1}{\cos^2\theta} - 2\tan\theta$ LHS $= \frac{(\sin\theta-\cos\theta)^2}{1-\sin^2\theta}$ $= \frac{\sin^2\theta-2\sin\theta\cos\theta+\cos^2\theta}{\cos^2\theta}$ $= \frac{\sin^2\theta+\cos^2\theta-2\sin\theta\cos\theta}{\cos^2\theta}$ $= \frac{1-2\sin\theta\cos\theta}{\cos^2\theta}$ $= \frac{1}{\cos^2\theta} - \frac{2\sin\theta\cos\theta}{\cos^2\theta}$ $= \frac{1}{\cos^2\theta} - \frac{2\sin\theta}{\cos\theta}$ $= \frac{1}{\cos^2\theta} - 2\tan\theta$ $\therefore$ LHS = RHS **OR/*OF*** $RHS = \frac{1}{\cos^2\theta} - 2\tan\theta$ $= \frac{1}{cos^2} - \frac{2sin\theta}{cos\theta}$ $= \frac{1-2sin\theta.cos\theta}{\cos^2\theta}$ $= \frac{sin^2\theta-2sin\theta.cos\theta+cos^2\theta}{\cos^2\theta}$ $= \frac{(sin\theta-cos\theta)^2}{\cos^2\theta}$ $= \frac{(sin\theta-cos\theta)^2}{1-sin^2\theta} = LHS$	✓ expansion of/*uitbreiding van* $(\sin\theta-\cos\theta)^2$ ✓ $1-\sin^2\theta = cos^2\theta$ ✓ $\sin^2\theta+\cos^2\theta=1$ ✓ separating into two fractions/ *verdeel in twee breuke* ✓ $\frac{2\sin\theta}{\cos\theta}$ **OR/*OF*** ✓ $\frac{2\sin\theta}{\cos\theta}$ ✓ $\cos^2\theta$ (denominator /*noemer)* ✓ $1=\sin^2\theta+\cos^2\theta$ ✓ $(\sin\theta-\cos\theta)^2$ ✓ $cos^2\theta = 1-\sin^2\theta$	(5) (5)
			[21]

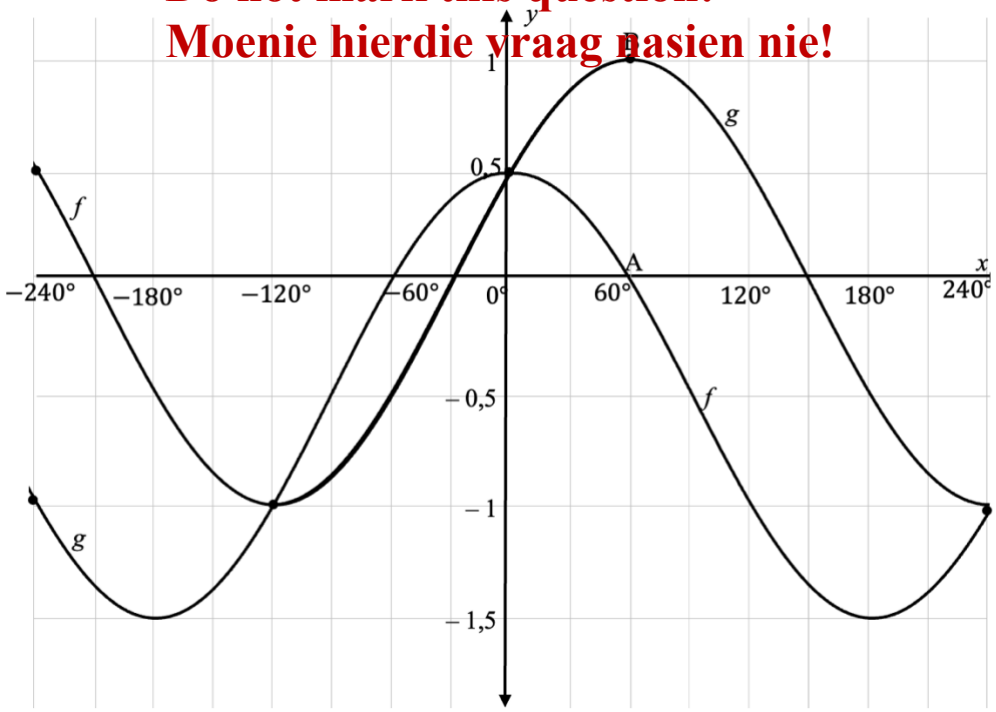
QUESTION/*VRAAG* 4

4.1	$\cos(A-B)=\cos A\cos B+\sin A\sin B$			
	4.1.1	$\sin(A+B)$ $=\cos[90°-(A+B)]$ $=\cos(90°-A-B)$ $=\cos[(90°-A)-B]$ $=\cos(90°-A).\cos B+\sin(90°-A).\sin B$ $=\sin A.\cos B+\cos A.\sin B$	✓ co-function/*ko-funksie* ✓ re-arrangement /*hergroepeer* ✓ expansion/*uitbreiding*	(3)
	4.1.2	$\sin(2x+50°)-\sin 15°\cos 48°=\sin 48°\cos 15°$ $\sin(2x+50°)=\sin 48°\cos 15°+\sin 15°\cos 48°$ $\sin(2x+50°)=\sin(48°+15°)$ $\sin(2x+50°)=\sin 63°$ $2x+50°=63°+k.360°$ $2x=13°+k.360°$ $\therefore x=6{,}5°+k.180°, k\in\mathbb{Z}$ or /*of* $2x+50°=180°-63°+k.360°$ $2x=67+k.360°$ $\therefore\ x=33{,}5°+k.180°, k\in\mathbb{Z}$	✓ using compound angle identity / *gebruik van saamgestelde hoeke identiteit* ✓ simplification of compound ∠ identity / *vereenvoudiging van saamgestelde ∠ identiteit* ✓ $x=6{,}5°+k.180°$ or/*of* ✓ $x=33{,}5°+k.180°$	(4)
4.2	$\cos(x+30°)=-2\sin x$ $\cos x.\cos 30°-\sin x.\sin 30°=-2\sin x$ $\frac{\sqrt{3}}{2}\cos x-\frac{1}{2}\sin x=-2\sin x$ $\sqrt{3}\cos x-\sin x=-4\sin x$ $\sqrt{3}\cos x=-3\sin x$ $\frac{\sin x}{\cos x}=-\frac{\sqrt{3}}{3}$ $\frac{\sin x}{\cos x}=-\frac{\sqrt{3}}{3}\times\frac{\sqrt{3}}{\sqrt{3}}$ $\frac{\sin x}{\cos x}=-\frac{3}{3\sqrt{3}}$ $\therefore\tan x=-\frac{1}{\sqrt{3}}$	✓ expanding/*uitbreiding* ✓ $\sin 30°=\frac{1}{2}$ ✓ $\cos 30°=\frac{\sqrt{3}}{2}$ ✓ simplification /*vereenvoudiging* ✓ $\frac{\sin x}{\cos x}=-\frac{\sqrt{3}}{3}\times\frac{\sqrt{3}}{\sqrt{3}}$	(5)

4.3	$\frac{4\sin x\cos x}{2\sin^2 x-1}$			
	4.3.1	$\frac{4\sin x\cos x}{2\sin^2 x-1}$ $=\frac{2(2\sin x\cos x)}{-(1-2\sin^2 x)}$ $=\frac{2\sin 2x}{-\cos 2x}$ $=-2\tan 2x$	✓ $\sin 2x$ ✓ $-\cos 2x$ ✓ answer/*antwoord*	(3)
	4.3.2	$2\sin^2 x-1=0$ $\sin x=\pm\frac{1}{\sqrt{2}}$ $\therefore x=-45°$ or $x=45°$ Answer only: Full marks *Antwoord alleen: Volpunte*	✓ $\pm\frac{1}{\sqrt{2}}$ ✓ $45°$ ✓ $-45°$	(3)
	4.3.3	$\frac{4\sin 15°\cos 15°}{2\sin^2(15°)-1}$ $=-2\tan 30°$ $=-2\left(\frac{1}{\sqrt{3}}\right)$ $=-\frac{2}{\sqrt{3}}=-\frac{2\sqrt{3}}{3}$	✓ $-2\tan 30°$ ✓ answer/*antwoord*	(2)
				[20]

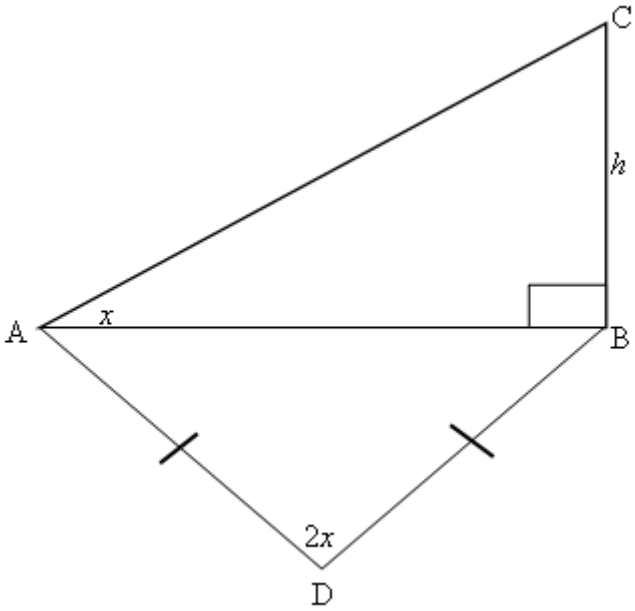
QUESTION/*VRAAG* 5

Do not mark this question!
Moenie hierdie vraag nasien nie!



5.1	$m = -\frac{1}{2}$ $n = 30°$	✓ value of *m/waarde van m* ✓ value of *n/waarde van n*	(2)
5.2	Amplitude of/*van* f =	✓ answer/*antwoord*	(1)
5.3	Period/*periode* of/*van* $h = 180°$	✓ answer/*antwoord*	(1)
5.4	$60° \leq x \leq 150°$	✓✓ answer/*antwoord*	(2)
5.5	Translation of 60 ° to the left and reflected about the *x*-axis./ *Translasie van* 60° *na links en refleksie om die x-as*	✓ translation of 60° to the left /*translasie van* 60° *na links* ✓ reflection in the *x*-axis /*refleksie om die x-as*	(2)
			[8]

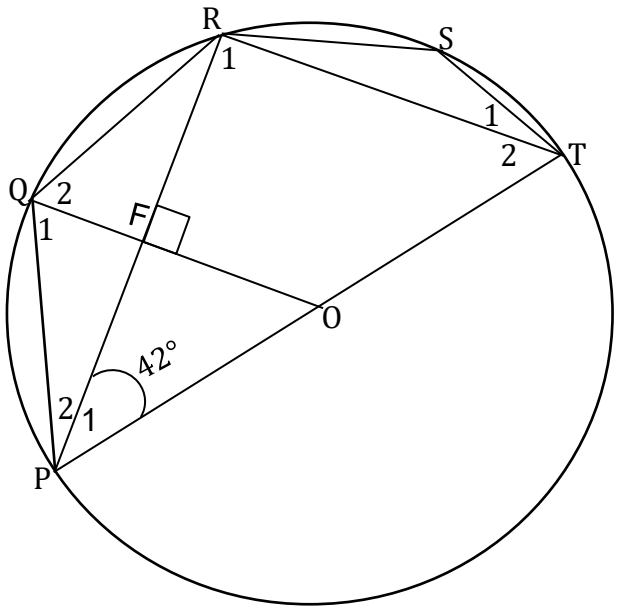
QUESTION/*VRAAG* 6



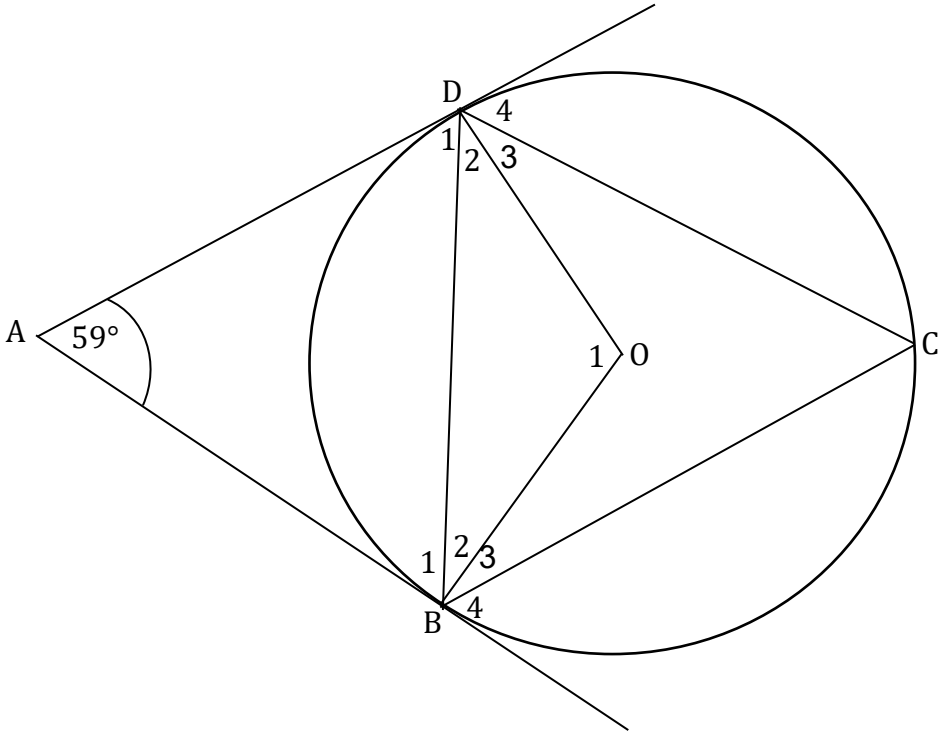
In Δ ABC $\frac{h}{AB} = \tan x$ $\therefore AB = \frac{h}{\tan x}$	✓ trig ratio/*trig verhouding* ✓ AB in terms of *x*/*AB in terme van x*	
In Δ ABD, BD = AD $A\hat{B}D = 90° - x$ (sum of/*som van ∠s in* Δ) $\frac{AD}{\sin \hat{B}} = \frac{AB}{\sin \hat{D}}$	✓ $A\hat{B}D = 90° - x$	
$\frac{AD}{\sin(90°-x)} = \frac{AB}{\sin 2x}$ $\frac{h}{\tan x}.\cos x = AD.2\sin x.\cos x$ $AD = \frac{h.\cos x}{2\sin x.\cos x.\tan x}$ $\therefore AD = \frac{h}{2\sin x.\tan x}$	✓ substitution into sine rule/ *substitusie in sin-reël* ✓ $\sin(90° - x) = \cos x$ ✓ $2\sin x.\cos x$	**[6]**

QUESTION/*VRAAG* 7

7.1

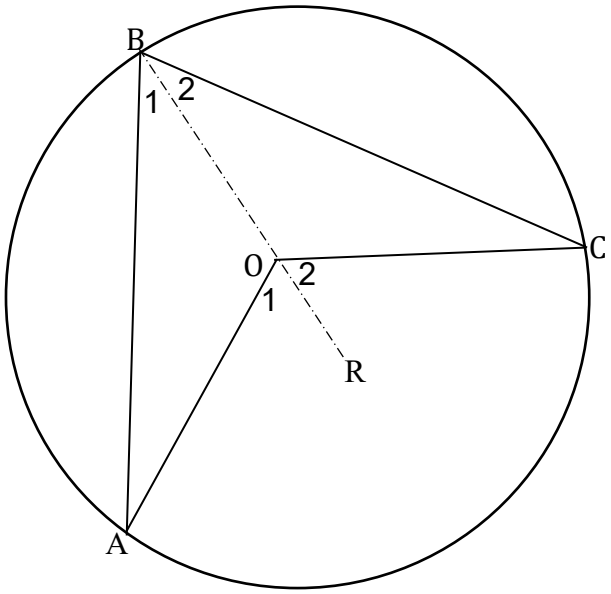


	7.1.1 (a)	$\hat{R}_1 = 90°$ (< in a semi-circle)*/(< in 'n halwe sirkel)*	✓S ✓R	(2)
	(b)	$\hat{S} = 138°$ (opp <s of a cyclic quad) / *(oorstaande ∠e van koordevierhoek)*	✓S ✓R	(2)
	(c)	$\hat{T}_2 = 48°$ (sum of <s in Δ)/ *(som van ∠e in Δ)* $P\hat{Q}R = 132°$ (opp <s of a cyclic quad) / *(oorstaande ∠e van koordevierhoek)*	✓S ✓R ✓S	(3)
	7.1.2	FR = 3,5 cm (line from centre⊥ chord) / *(lyn van middelpunt ⊥ op koord)* $O\hat{F}R = 90°$ (given) / *(gegee)* $QF = \sqrt{QR^2 + FR^2}$ (Pythagoras) $QF = \sqrt{4^2 + 3{,}5^2}$ QF = 1,94 cm	✓S/R ✓substitution into Pythagoras / *subst in Pythagoras* ✓ answer/*antwoord*	(3)

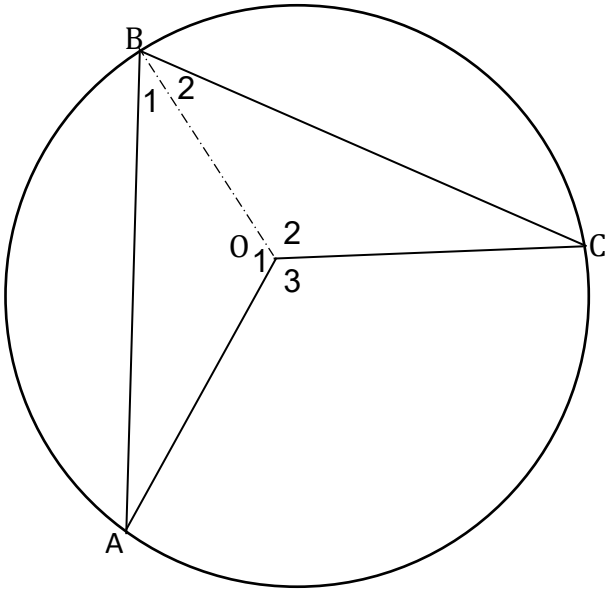
7.2				
	7.2.1	$\hat{B}_1 = \hat{D}_1$(<s opp equal sides)/(*∠e teenoor gelyke sye)* $\hat{B}_1 = 60{,}5°$ (sum of < s in Δ)/*(som van ∠e in* Δ)	✓R ✓S ✓R ✓S	(4)
	7.2.2	$\hat{C} = 60{,}5°$ (tan chord theorem)/*(∠tussen rlyn en koord)* $\therefore \hat{O}_1 = 121°$ (< at centre = 2 ×< at circumference)/ *(mid-punts ∠ =* 2 × omtreks ∠*)* **OR/*OF*** $\hat{B}_2 = 29{,}5°$ (tan⊥radius)/*(rlyn*⊥radius) $\hat{B}_2 = \hat{D}_2$ (<s opp equal radii)/*(∠e teenoor gelyke radiuse)* $\therefore \hat{O}_1 = 121°$ (sum of < s in Δ)/*(som van ∠e in* Δ) **OR/*OF*** $\hat{D}_1 + \hat{D}_2 = 90°$ $(tan. \perp radius)$ $\hat{B}_1 + \hat{B}_2 = 90°$ $(tan. \perp radius)$ $\therefore \hat{D}_1 + \hat{D}_2 + \hat{B}_1 + \hat{B}_2 = 180°$ $\therefore ADOB\ is\ a\ cyclic\ quadrilateral\ (opp. <' s\ supp.)$ $\therefore \hat{O}_1 + 59° = 180°$ $(opp. <' s\ of\ cyclic\ quad.)$ $\hat{O}_1 = 121°$	✓S ✓R ✓S ✓R **OR/*OF*** ✓S ✓R ✓S ✓S ✓S ✓R ✓S ✓S	(4) (4)
				[18]

QUESTION/*VRAAG* 8

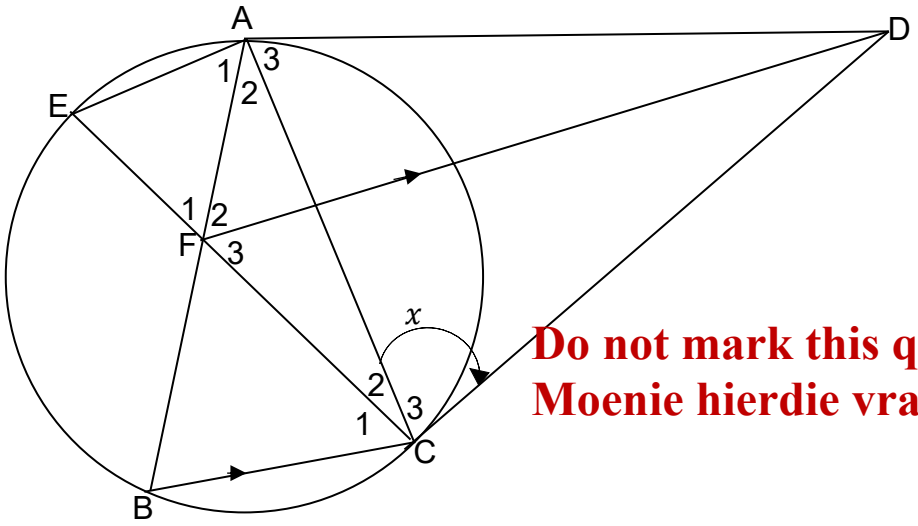
8.1



Construction: join BOR/*Konstruksie: verbind* BOR	✓construction/ *konstruksie*	
$\hat{B}_1 = \hat{A}$ (< s opp equal radii)/(*∠e teenoor gelyke radiuse)*	✓S	
$\hat{B}_1 + \hat{A} = \hat{O}_1$ (ext < of Δ)/*(buite∠ van* Δ)	✓S/R	
$\therefore 2\hat{B}_1 = \hat{O}_1$	✓S	
Similarly/*soortgelyk* , $2\hat{B}_2 = \hat{O}_2$		
$\hat{O}_1 + \hat{O}_2 = 2\hat{B}_1 + 2\hat{B}_2$	✓S	
$\therefore$ $A\hat{B}C = A\hat{O}C$		(5)

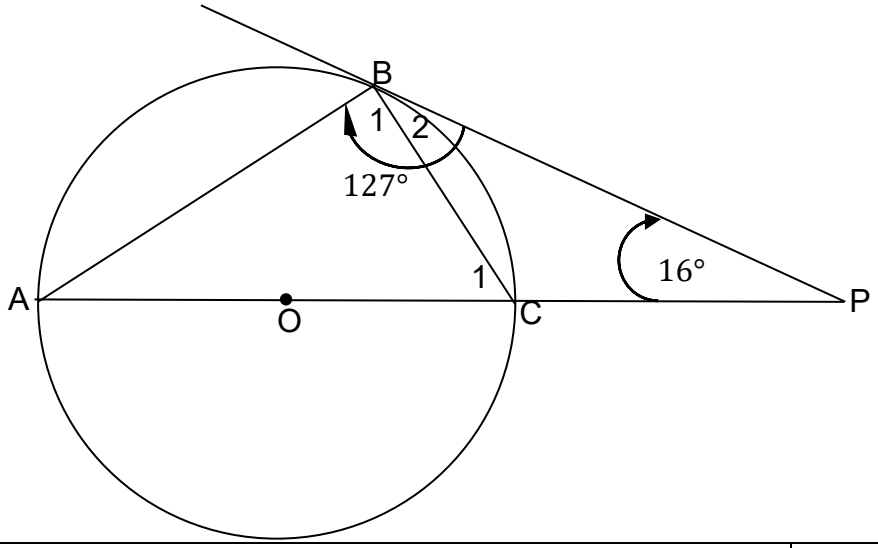
	OR/*OF*  	**OR/*OF***	
	Construction: join OB/*Konstruksie: verbind OB* $\hat{B}_1 = \hat{A}$ (< s opp equal radii)/(*∠e teenoor gelyke radiuse)* $\hat{B}_1 + \hat{A} + \hat{O}_1 = 180°$ (sum of < s in Δ)/(*som van ∠e in* Δ) $\therefore \hat{O}_1 = 180° - 2\hat{B}_1$ Similarly/*soortgelyk*, $\hat{O}_2 = 180° - 2\hat{B}_2$ $\hat{O}_1 + \hat{O}_2 + \hat{O}_3 = 360°$ (< s round a pt)/(*∠e om 'n punt/omwenteling)* $\hat{O}_3 = 360° - (180° - 2\hat{B}_1 + 180° - 2\hat{B}_2)$ $\hat{O}_3 = 2\hat{B}_1 + 2\hat{B}_2$ $\therefore A\hat{B}C = A\hat{O}C$	✓ construction /*konstruksie* ✓S ✓S ✓S/R ✓S	(5)

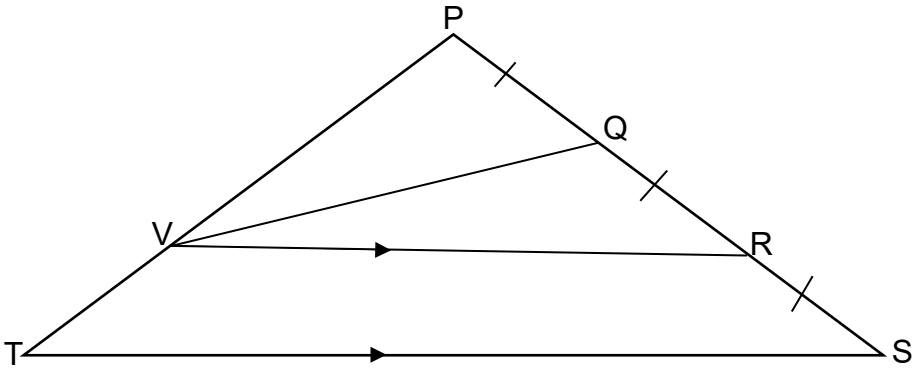
8.2

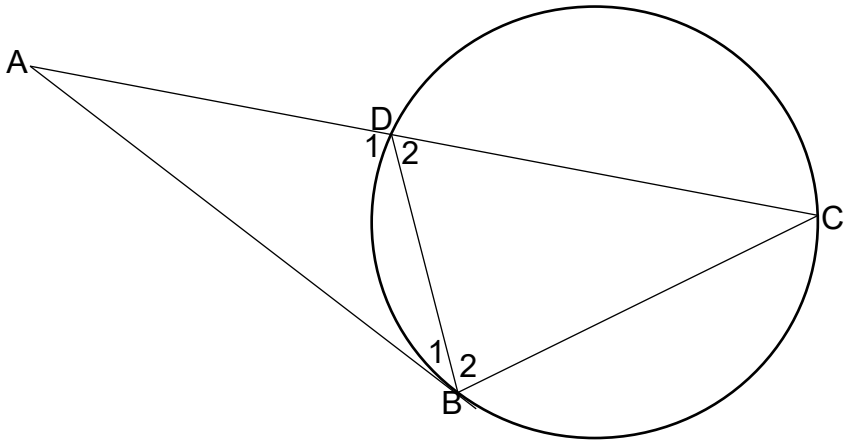


Do not mark this question!
Moenie hierdie vraag nasien nie!

	8.2.1	DA = DC (tans from same pt)/(*rlyne vanaf dies punt)* $\hat{A}_3 = x$ (equal sides)/(*∠e teenoor ke sye)* $\hat{B} = x$ (tan chord the m)/(*en rlyn en koord)* $\hat{E} = x$ (tan chord th em or < the same seg) / (*∠ sen rlyn en koord/ ∠e in dies kel segment*) $\hat{F}_2 = \hat{B} = x$ (corresp < s; BC||FD)/(*ooreenk ∠e*; BC||FD)	✓R ✓S ✓S/R ✓S/R	(5)
	8.2.2	$\hat{F}_2 = \hat{C}_3$ proved in 8.2.1)/(*proven in 8.2.1)* ∴ AFCD is a cyclic qua lateral (verse: ∠s in the same seg) *AFCD is 'n koorde hoek (ekeerde∠e in dieselfde el segment*)	✓S ✓R	(2)

8.3				
		$\widehat{B}_1 = 90°$ (< in a semi-circle)/*(< in ´n halwe sirkel)*	✓S ✓R	
		$\widehat{B}_2 = 37°$	✓S	
		$\widehat{A} = 37°$ (sum of < s in a Δ)/(*som van ∠e in* Δ)	✓S	
		∴ BP is tangent (converse: tan chord theorem)/	✓R	
		BP is ´n rlyn (*omgekeerde*: *∠tussen rlyn en koord*		(5)
				[10]

QUESTION/*VRAAG* 9				
9.1				
	9.1.1	$\frac{TV}{VP}=\frac{1}{2}$ (Line drawn||to one side of Δ *lyn* || *een sy van* Δ *or* (prop theorem, VR||TS)	✓S ✓R	(2)
	9.1.2	$\frac{\text{Area of }\Delta PQV}{\text{Area of }\Delta PST}=\frac{\frac{1}{2}\times PV\times PQ\sin\hat{P}}{\frac{1}{2}\times PT\times PS\sin\hat{P}}$ $=\frac{PV}{PT}\times\frac{PQ}{PS}$ $\frac{PQ}{PS}=\frac{1}{3}$ (given/*gegee*) $\frac{PV}{PT}=\frac{2}{3}$ (prop theorem/*lyn* || *een sy van* Δ; VR||TS) $\therefore \frac{\text{Area of }\Delta PQV}{\text{Area of }\Delta PST}=\frac{2}{3}\times\frac{1}{3}$ $=\frac{2}{9}$	✓$\frac{1}{2}\times PV\times PQ\sin\hat{P}$ ✓$\frac{1}{2}\times PT\times PS\sin\hat{P}$ ✓S ✓S ✓ answer/*antwoord*	(5)

9.2				
	9.2.1	In ΔCBA and *en* ΔBDA $\hat{C} = \hat{B}_1$ (tan chord theorem)/(∠*tussen rlyn en koord*) $\hat{A} = \hat{A}$ (common)/(*gemeenskaplike ∠*) $\hat{B}_1 + \hat{B}_2 = \hat{D}_1$ (sum of < s in Δ) / ((*som van ∠e in* Δ) ∴ ΔCBA|||ΔBDA (<<<) **OR/*OF*** In ΔCBA and/*en* ΔBDA $\hat{C} = \hat{B}_1$ (tan chord theorem)/(∠*tussen rlyn en koord*) $\hat{A} = \hat{A}$ (common)/(*gemeenskaplike ∠*) ∴ ΔCBA|||ΔBDA (<<<)	✓S ✓R ✓S ✓S **OR/*OF*** ✓S ✓R ✓S ✓R	(4)
	9.2.2	$\frac{BA}{DA} = \frac{CA}{BA}$ (ΔCBA|||ΔBDA) $BA^2 = DA \cdot CA$ $BA^2 = DA(DA + DC)$ $BA^2 = DA^2 + DA \cdot DC$ $BA^2 - DA^2 = DA \cdot DC$ ∴ $AB^2 - AD^2 = AD \cdot DC$	✓S ✓R ✓S ✓ CA = DA + DC	(4)
				[15]

			TOTAL/*TOTAAL:* 135