

SA's Leading Past Year

Exam Paper Portal

STUDY

You have Downloaded, yet Another Great Resource to assist you with your Studies 😊

Thank You for Supporting SA Exam Papers

Your Leading Past Year Exam Paper Resource Portal

Visit us @ www.saexampapers.co.za



SA EXAM
PAPERS



GAUTENG PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION/ VOORBEREIDENDE EKSAMEN

2022

MARKING GUIDELINES/ NASIENRIGLYNE

(10612)

MATHEMATICS (PAPER 2)/WISKUNDE (VRAESTEL 2)

26 pages/bladsye

NOTE:

- If a candidate answers a question TWICE, mark only the FIRST attempt.
- If a candidate has crossed-out an attempt of a question and has 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.*
- *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.)
	<i>'n Punt vir 'n korrekte bewering ('n Punt vir 'n bewering is onafhanklik van die rede.)</i>
R	A mark for a 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 the statement AND the reason are both correct.
	<i>(Ken 'n punt toe as beide die bewering EN die rede korrek is.)</i>

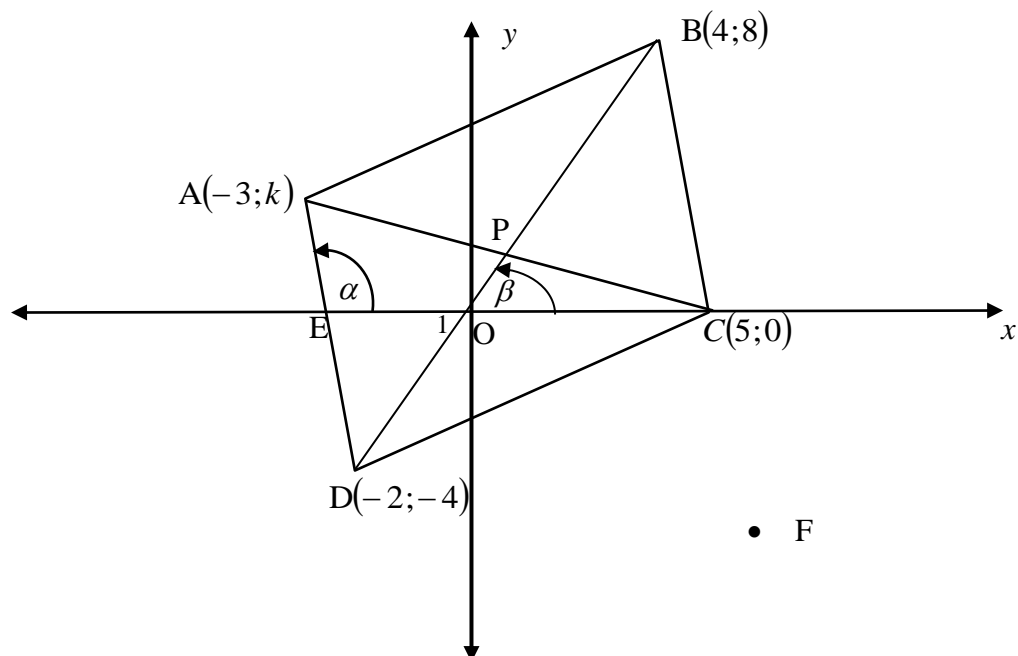
QUESTION/VRAAG 1

1.1	$a = 38,26$ $b = 2,46$ $\hat{y} = 38,26 + 2,46x$ NOT allowed to round to Units , but may round off to 3 decimal or 1 decimal place Mag NIE afrond tot Ene nie, maar mag afrond tot 3 desimale of 1 desimale plek	✓ $a = 38,26$ ✓ $b = 2,46$ ✓ $\hat{y} = 38,26 + 2,46x$ answer only full marks/ antwoord alleenlik volpunte	(3)
1.2	$r = 0,97$	✓ answer/antwoord	(1)
1.3	Very strong positive correlation/ <i>Baie sterk positiewe korrelasie</i>	✓ srong positive/ <i>sterk positief</i>	(1)
1.4	$\bar{x} = (2+8+4+6+12+10+11) \div 7 = 7,57$ $y = [38,26 + 2,46(7,57)] - [15,74 + 4,54 (7,57)]$ $y = 6,77$ The difference is/ <i>Die verskil is 6,77%</i>	✓ $\bar{x} = 7,57$ ✓ substitute/vervang 7,57 ✓ answer/antwoord (% not necessary to indicate/ % nie nodig om aan te dui)	(3)
1.5	(2;9) OR/OF $x = 2; y = 9$	✓ answer/antwoord ✓ answer/antwoord	(1)
1.6	Lack of attendance by online learner/ <i>Gebrek aan bywoning van aanlyn leerling</i> OR/OF Section taught may have been difficult to grasp online/ <i>Afdeling wat onderrig was, was moeilik om te verstaan met aanlynklas</i> OR/OF Poor connectivity/ <i>Slegte verbinding</i> OR/OF Lack of resources/ <i>Gebrek aan hulpbronne</i> OR/OF Insufficient ICT skills/ <i>Onvoldoende Rekenaarvaardighede</i>	✓ any valid answer/enige geldige antwoord	(1)
			[10]

QUESTION/VRAAG 2

2.1.1	$2500 \leq w < 3000$	✓ answer/antwoord	(1)
2.1.2	$\frac{250(1)+750(2)+1250(3)+1750(8)+2250(6)+2750(15)+3250(5)}{40}$ <p>estimated/geskatte $\bar{x} = \frac{90500}{40}$ $= 2262,5$ grams/gram</p> <p>If numerator is correct and denominator is incorrect 1/3 If numerator is incorrect and denominator is correct 2/3 (CA) <i>Indien teller korrek is en noemer is verkeerd 1/3</i> <i>Indien teller verkeerd is en noemer is korrek 2/3 (CA)</i></p>	✓ 90 500 ✓ 40 ✓ answer/antwoord	(3)
2.2.1	<p style="text-align: center;">Cumulative Frequency Curve (Ogive) Kumulatiewe Frekwensiekurve (Ogief)</p>	✓ grounding point/ <i>gegronde punt (4 ; 0)</i> and/en (3 504 ; 40) ✓ shape/vorm (if ruler is used to connect points, NO mark for shape/ <i>indien linaal</i> <i>gebruik word om</i> <i>punte te verbind</i> GEEN punt vir vorm ✓✓ (1 mistake - 1 mark; 2 mistakes - no mark/ <i>1 fout – 1</i> <i>punt; 2 foute – geen</i> <i>punte</i>)	(4)
2.2.2	It will not deviate./it will remain the same. <i>Dit sal nie afwyk nie./dit sal dieselfde bly.</i>	✓ answer/antwoord	(1)
2.2.3 CA from /van 2.1.2	$2262,5 + 4$ $= 2266,5$ grams/gram	✓ addition of 4/4 <i>bygetel</i> ✓ answer/antwoord	(2)
			[11]

QUESTION/VRAAG 3



3.1	$m_{BC} = \frac{8-0}{4-5}$ $m_{BC} = -8$	✓ correct substitution into gradient formula (swop x and y around $0/2$)/korrekte vervanging in gradiënt formule (ruil x en y om $0/2$)/ ✓ answer/antwoord	(2)
3.2	$AB = \sqrt{65} = \sqrt{(-3-4)^2 + (k-8)^2}$ $65 = 49 + k^2 - 16k + 64$ $k^2 - 16k + 48 = 0$ $(k-4)(k-12) = 0$ $k = 4 \text{ or/of } k = 12$ $\therefore k = 4$ OR/OF $AB = \sqrt{65} = \sqrt{(-3-4)^2 + (k-8)^2}$ $65 = 49 + (k-8)^2$ $(k-8)^2 = 16$ $k-8 = \pm 4$ $k = 4 \text{ or/of } k = 12$ $\therefore k = 4$	✓ substitute A and B into distance formula/vervang A en B in die afstandsvormule ✓ standard form/standaardvorm ✓ factors/faktore ✓ $k = 4$ ✓ substitute A and B into distance formula/vervang A en B in die afstandsvormule ✓ isolate square/soleer kwadraat ✓ square root both sides/vierkantswortel weerskante ✓ $k = 4$	(4)

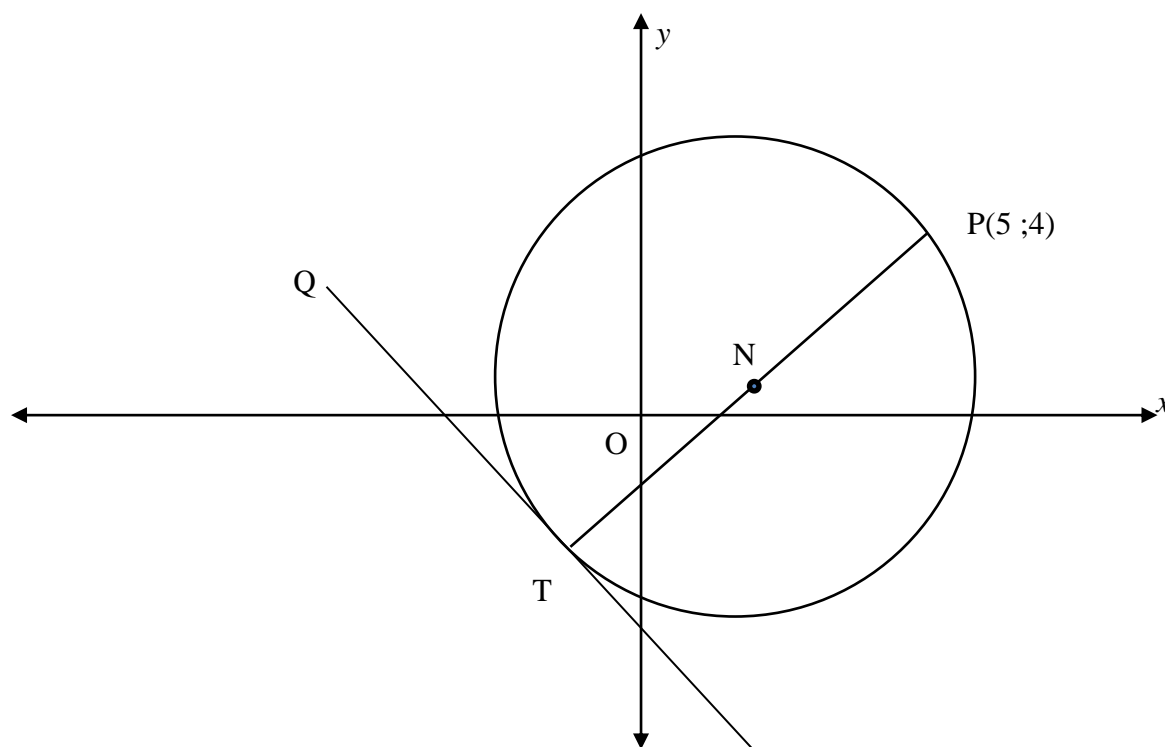
3.3	$m_{BD} = \frac{8 - (-4)}{4 - (-2)} = 2$ $m_{AC} = \frac{4 - 0}{-3 - 5} = -\frac{1}{2}$ $\therefore m_{BD} \times m_{AC} = 2 \times -\frac{1}{2} = -1$ $\therefore BP \perp AC$ <p>OR/OF</p> <p>Coordinates of P = Midpoint of AC = Midpoint of BD/ <i>Koördinate van P = Middelpunt van AC = Middelpunt van BD</i></p> $= \left(\frac{-3 + 5}{2}; \frac{4 + 0}{2} \right) = \left(\frac{-2 + 4}{2}; \frac{-4 + 8}{2} \right)$ $= (1; 2)$ $m_{BP} = \frac{8 - 2}{4 - 1} = 2$ $m_{AC} = \frac{4 - 0}{-3 - 5} = -\frac{1}{2}$ $\therefore m_{BP} \times m_{AC} = 2 \times -\frac{1}{2} = -1$ $\therefore BP \perp AC$	$\checkmark m_{BD} = 2$ $\checkmark m_{AC} = -\frac{1}{2}$ $\checkmark m_{BD} \times m_{AC} = -1$ (must show the multiplication/ <i>moet die vermenigvuldiging aandui</i>)	
3.4	<p>Midpoint of AF = Midpoint of DC/ <i>Middelpunt van AF = Middelpunt van DC</i></p> $\frac{x + (-3)}{2} = \frac{-2 + 5}{2} \text{ and/en } \frac{y + 4}{2} = \frac{-4 + 0}{2}$ $x = 6 \text{ and/en } y = -8$ $\therefore F(6; -8)$ <p>Answer Only: Full Marks/Antwoord alleenlik: Volpunte</p> <p>OR/OF</p> <p>Method: Translation/Metode: <i>Translasie</i> A → D: $(x; y) \rightarrow (x + 1; y - 8)$ \therefore by symmetry/as <i>simmetrie</i>: C → F: C(5; 0) → F(5 + 1; 0 - 8) $\therefore F(6; -8)$</p> <p>Answer Only: Full Marks/Antwoord alleenlik: Volpunte</p>	$\checkmark x$ - coordinate/ <i>x - koördinaat</i> $\checkmark y$ - coordinate/ <i>y - koördinaat</i>	(3)
		$\checkmark x$ - coordinate/ <i>x - koördinaat</i> $\checkmark y$ - coordinate/ <i>y - koördinaat</i>	(2)

3.5	<p>ONLY QUESTION (3.5) IN PAPER WHERE LEARNER WILL BE PENALISED FOR INCORRECT ROUNDING ENIGSTE VRAAG (3.5) IN VRAESTEL WAAR LEERLING GEPENALISEER WORD VIR VERKEERDE AFRONDING</p> <p>$m_{AD} = m_{BC} = -8$ $\tan \alpha = m_{AD}$ $\tan \alpha = -8$ $\alpha = 180^\circ - \tan^{-1}(8)$ $= 180^\circ - 82,87^\circ$ $= 97,13^\circ$</p> <p>OR/OF</p> <p>$\alpha = \tan^{-1}(-8) + 180^\circ$ $= -82,87^\circ + 180^\circ$ $= 97,13^\circ$</p> <p>$\tan \beta = m_{BD} = 2$ $\beta = 63,43^\circ$ $\hat{O}_1 = 63,43^\circ$ (vert.opp. \angles/regoorst.\anglee) $\hat{E\hat{D}O} = \alpha - \beta$ (ext. \angle of Δ/buite \angle van Δ) $= 97,13^\circ - 63,43^\circ$ $= 33,7^\circ$</p> <p>OR/OF</p> <p>In $\triangle APD$, $\hat{A\hat{P}D} = 90^\circ$ $AP = 2\sqrt{5}$ $PD = 3\sqrt{5}$ $\tan \hat{E\hat{D}O} = \frac{AP}{PD}$ $\tan \hat{E\hat{D}O} = \frac{2\sqrt{5}}{3\sqrt{5}}$ $\hat{E\hat{D}O} = 33,69 \approx 33,7^\circ$ (rounded off to ONE decimal place/<i>rond af tot EEN desimale plek</i>)</p> <p>OR/OF</p> <p>In $\triangle APD$, $\hat{A\hat{P}D} = 90^\circ$ $AP = 2\sqrt{5}$ & $AD = \sqrt{65}$ $\sin \hat{E\hat{D}O} = \frac{AP}{AD}$ $\sin \hat{E\hat{D}O} = \frac{2\sqrt{5}}{\sqrt{65}}$ $\hat{E\hat{D}O} = 33,69 \approx 33,7^\circ$ (rounded off to ONE decimal place/<i>rond af tot EEN desimale plek</i>)</p> <p>OR/OF</p>	<p>✓ $m_{AD} = -8$</p> <p>✓ $\tan \alpha = -8$</p> <p>✓ $\alpha = 97,13^\circ$</p> <p>✓ $\beta = 63,43^\circ$</p> <p>✓ $\alpha - \beta$ ✓ answer/antwoord</p> <p>✓ $\hat{A\hat{P}D} = 90^\circ$ ✓ $AP = 2\sqrt{5}$ ✓ $PD = 3\sqrt{5}$</p> <p>✓ trig ratio/ <i>trig verhouding</i></p> <p>✓ substitution/ <i>vervang</i></p> <p>✓ answer/antwoord</p> <p>✓ $\hat{A\hat{P}D} = 90^\circ$ ✓ $AP = 2\sqrt{5}$ ✓ $AD = \sqrt{65}$</p> <p>✓ trig ratio/ <i>trig verhouding</i></p> <p>✓ substitution/ <i>vervang</i></p> <p>✓ answer/antwoord</p>	
-----	--	---	--

	<p>In $\triangle APD$ $\hat{A}PD = 90^\circ$ $PD = 3\sqrt{5}$ $AD = \sqrt{65}$ $\cos \hat{E}DO = \frac{PD}{AD}$ $\cos \hat{E}DO = \frac{3\sqrt{5}}{\sqrt{65}}$ $\hat{E}DO = 33,69 \approx 33,7^\circ$ (rounded off to ONE decimal place/<i>rond af tot EEN desimale plek</i>)</p> <p>OR/OF</p> <p>In $\triangle ABD$ $BD = 6\sqrt{5}$ $AD = \sqrt{65}$ $\cos \hat{E}DO = \frac{AD^2 + BD^2 - AB^2}{2(AD)(BD)}$ $\cos \hat{E}DO = \frac{(\sqrt{65})^2 + (6\sqrt{5})^2 - (\sqrt{65})^2}{2(\sqrt{65})(6\sqrt{5})} = \frac{3}{\sqrt{13}}$ $\hat{E}DO = 33,69 \approx 33,7^\circ$ (rounded off to ONE decimal place/<i>rond af tot EEN desimale plek</i>)</p>	<p>✓ $\hat{A}PD = 90^\circ$ ✓ $PD = 3\sqrt{5}$ ✓ $AD = \sqrt{65}$ ✓ trig ratio/<i>trig verhouding</i> ✓ substitution/<i>vervang</i> ✓ answer/<i>antwoord</i></p> <p>✓ $BD = 6\sqrt{5}$ ✓ $AD = \sqrt{65}$ ✓ cosine rule/<i>kosinusreël</i> ✓ substitution/<i>vervang</i> ✓ $\frac{3}{\sqrt{13}}$ ✓ answer/<i>antwoord</i></p>	(6)
--	---	---	-----

3.6	$AC = \sqrt{(5 - (-3))^2 + (0 - 4)^2} = \sqrt{80} = 4\sqrt{5}$ $DP = \sqrt{(-2 - 1)^2 + (-4 - 2)^2} = \sqrt{45} = 3\sqrt{5}$ $\text{Area of/van } \triangle ADC = \frac{1}{2} AC \times DP$ $\therefore \text{Area of/van } \triangle ADC = \frac{1}{2} (4\sqrt{5}) \times (3\sqrt{5})$ $= 30 \text{ square units/vierkante eenhede}$ <p>OR/OF</p> <p>ABCD is a rhombus, because the diagonals bisect perpendicularly and all sides are equal. <i>ABCD is 'n ruit, want die hoeklyne halveer mekaar reghoekig en al die sye is ewe lank.</i></p> $\therefore \hat{CDO} = \hat{EDO} \quad (\text{diags of rhombus bisect } \angle\text{s of rhombus/diag van ruit halveer die } \angle\text{e van die ruit})$ $\therefore \hat{ADC} = 2 \times 33,7^\circ = 67,4^\circ$ $\text{Area of/van } \triangle ADC = \frac{1}{2} \times AD \times DC \times \sin \hat{ADC}$ $\therefore \text{Area of/van } \triangle ADC = \frac{1}{2} \times (\sqrt{65}) \times (\sqrt{65}) \times \sin(67,4^\circ)$ $= 30 \text{ square units/vierkante eenhede}$	<ul style="list-style-type: none"> ✓ length of AC/ lengte van AC ✓ length of DP/ lengte van DP ✓ correct substitution into formula/ korrekte vervanging in formule ✓ answer/antwoord ✓ $\hat{CDO} = \hat{EDO}$ ✓ $\hat{ADC} = 67,4^\circ$ ✓ substitution into formula/ vervanging in formule ✓ answer/antwoord 	(4)
			[21]

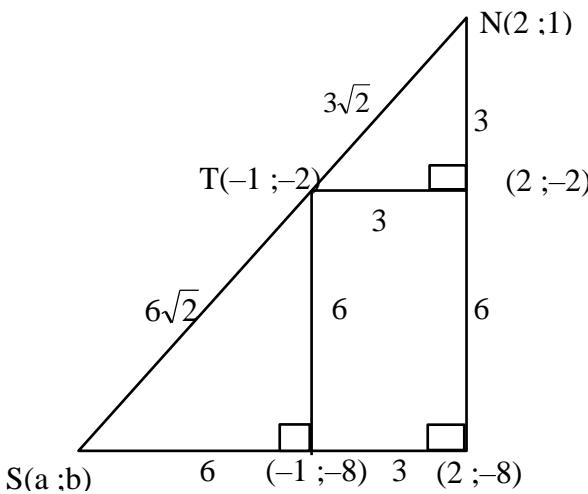
QUESTION/VRAAG 4



4.1	$x^2 + y^2 - 4x - 2y - 13 = 0$ $x^2 - 4x + 4 + y^2 - 2y + 1 = 13 + 4 + 1$ $(x - 2)^2 + (y - 1)^2 = 18$	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> Answer only: Full marks/ Antwoord alleenlik: Volpunte </div>	✓ completing the square/vierkants-voltooiing ✓ $(x - 2)^2 + (y - 1)^2$ ✓ RHS/RK	(3)
4.2	$N(2;1)$ $NT = \sqrt{18} = 3\sqrt{2} \text{ OR/OF } 2,24$		✓ both x and y correct/ <i>albei x en y korrek</i> CA from/van 4.1 ✓ length of NT/ <i>lengte van NT</i>	(2)
4.3	Midpoint of TNP/ <i>Middelpunt van TNP</i> , $N(2;1)$ $\frac{x_T + 5}{2} = 2 \text{ and/en } \frac{y_T + 4}{2} = 1$ $T(-1; -2)$ <p>OR/OF</p> Method: Translation/ <i>Metode: Translasie</i> $P \rightarrow N:$ $(x; y) \rightarrow (x - 3; y - 3)$ $\therefore N \rightarrow T:$ $N(2;1) \rightarrow T(2 - 3; 1 - 3)$ $\therefore T(-1; -2)$		✓ x - value/ <i>waarde</i> ✓ y - value/ <i>waarde</i>	

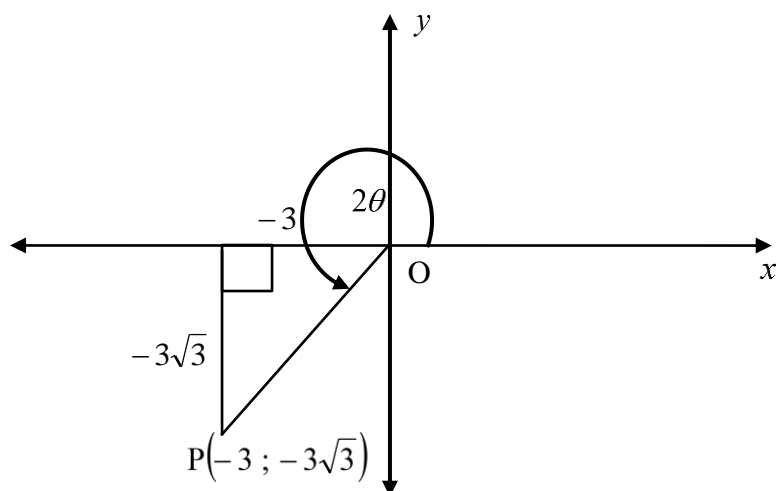
	$m_{NT} = \frac{1 - (-2)}{2 - (-1)} = \frac{3}{3} = 1$ $m_{NT} \times m_{QT} = -1$ $\therefore m_{QT} = -1$ $y - (-2) = -1[x - (-1)]$ $y + 2 = -1(x + 1)$ $y = -x - 3$	<p>radius \perp tangent <i>radius \perp raaklyn</i></p> <p>OR/OF</p> $y = -x + c$ $-2 = -1(-1) + c$ $c = -3$ $y = -x - 3$	<p>$\checkmark m_{NT} = 1$</p> <p>$\checkmark m_{QT} = -1$</p> <p>\checkmark substitute/vervang m and/en $T(-1; -2)$ CA from/van 4.3</p> <p>$\checkmark y = -x - 3$</p>	(6)
4.4	$NS = 3NT$ $NS^2 = 9NT^2$ $(a - 2)^2 + (b - 1)^2 = 9(\sqrt{18})^2 = 162 \dots\dots\dots (1)$ $NT \perp QT \text{ and/en } ST \perp QT \quad \therefore m_{ST} = m_{NT} = 1$ $\frac{b + 2}{a + 1} = 1$ $b + 2 = a + 1$ $b = a - 1 \dots\dots\dots (2)$ <p><i>Substitute (2) into (1)/vervang (2) in (1)</i></p> $(a - 2)^2 + (a - 1 - 1)^2 = 162$ $(a - 2)^2 + (a - 2)^2 = 162$ $2(a - 2)^2 = 162$ $(a - 2)^2 = 81$ $\therefore a - 2 = 9 \quad \text{or/of} \quad a - 2 = -9$ $a = 11 \quad \text{or/of} \quad a = -7$ <p>But/maar $a < 0$</p> $\therefore a = -7$ $b = (-7) - 1 = -8$ $S(-7; -8)$ <p>OR/OF</p>	<p>\checkmark equation/vergelyking</p> <p>$\checkmark m_{ST} = m_{NT} = 1$</p> <p>$\checkmark \frac{b + 2}{a + 1} = 1$</p> <p>$\checkmark b = a - 1$</p> <p>$\checkmark$ substitution/ vervang</p> <p>$\checkmark a = -7$</p> <p>$\checkmark b = -8$</p>		

<p> $NS = 3NT$ $NS^2 = 9NT^2$ $(a-2)^2 + (b-1)^2 = 9(\sqrt{18})^2 = 162 \dots\dots\dots (1)$ $NT \perp QT$ and/en $ST \perp QT \quad \therefore m_{ST} = m_{NT} = 1$ $\frac{b+2}{a+1} = 1$ $b+2 = a+1$ $b = a-1 \dots\dots\dots (2)$ Substitute (2) into (1)/<i>vervang (2) in (1)</i> $(a-2)^2 + (a-1-1)^2 = 162$ $(a-2)^2 + (a-2)^2 = 162$ $a^2 - 4a + 4 + a^2 - 4a + 4 = 162$ $2a^2 - 8a - 154 = 0$ $a^2 - 4a - 77 = 0$ $(a-11)(a+7) = 0$ $a = 11 \quad \text{or/of} \quad a = -7$ But/<i>Maar</i> $a < 0$ $\therefore a = -7$ $b = (-7) - 1 = -8$ $S(-7 ; -8)$ OR/OF NTS is a straight line/<i>NTS is 'n reguitlyn</i> $m_{SN} = 1$ $\frac{b-1}{a-2} = 1$ $b-1 = a-2$ $b = a-1 \dots\dots\dots (1)$ $ST = 2NT = 2\sqrt{18}$ $ST^2 = 4(18) = 72$ </p>	<p> \checkmark equation/ (1) <i>vergelyking</i> (1) $\checkmark m_{ST} = m_{NT} = 1$ $\checkmark \frac{b+2}{a+1} = 1$ $\checkmark b = a - 1$ \checkmark substitution/ <i>vervanging</i> $\checkmark a = -7$ $\checkmark b = -8$ $\checkmark m_{SN} = 1$ $\checkmark \frac{b-1}{a-2}$ \checkmark equation/ (1) <i>vergelyking</i> (1) </p>	
---	---	--

$(a+1)^2 + (b+2)^2 = 72 \dots\dots (2)$ Substitute (1) into (2)/ <i>vervang (1) in (2)</i> $(a+1)^2 + (a-1+2)^2 = 72$ $2a^2 + 4a - 70 = 0$ $a^2 + 2a - 35 = 0$ $(a+7)(a-5) = 0$ $a = -7$ or/of $a = 5$ $a = -7$ and/en $b = (-7) - 1 = -8$ $S(-7; -8)$	$2(a+1)^2 = 72$ $(a+1)^2 = 36$ $a + 1 = -6$ or/of $a + 1 = 6$ $a = -7$ or/of $a = 5$ $a = -7$ $b = -7 - 1 = -8$ $S(-7; -8)$ <div style="border: 1px solid black; padding: 5px; display: inline-block;"> Answer only: 2/7/ Antwoord alleenlik: 2/7 </div>	✓ equation/ (2) <i>vergelyking (2)</i> ✓ substitution/ <i>vervanging</i> ✓ ✓ coordinates/ <i>koördinate</i>	
<p>OR/OF</p>  <p>OR/OF</p> $\frac{x_T - x_N}{x_S - x_N} = \frac{y_T - y_N}{y_S - y_N} = \frac{1}{3}$ $\frac{-3}{a-2} = \frac{-3}{b-1} = \frac{1}{3}$ $a - 2 = -9$ $a = -7$ $b - 1 = -9$ $b = -8$ $S(-7; -8)$		✓ diagram ✓ ✓ (2; -2) ✓ ✓ (2; -8) - ✓ ✓ S(-7; -8) ✓ dividing of a line segment into a given ratio/ <i>verdeel</i> <i>lynsegment in</i> <i>gegewe verhouding</i> ✓ ✓ substitution/ <i>vervanging</i> ✓ equation/ <i>vergelyking</i> ✓ $a = -7$ ✓ equation/ <i>vergelyking</i> ✓ $b = -8$	(7)
			[18]

QUESTION/VRAAG 5

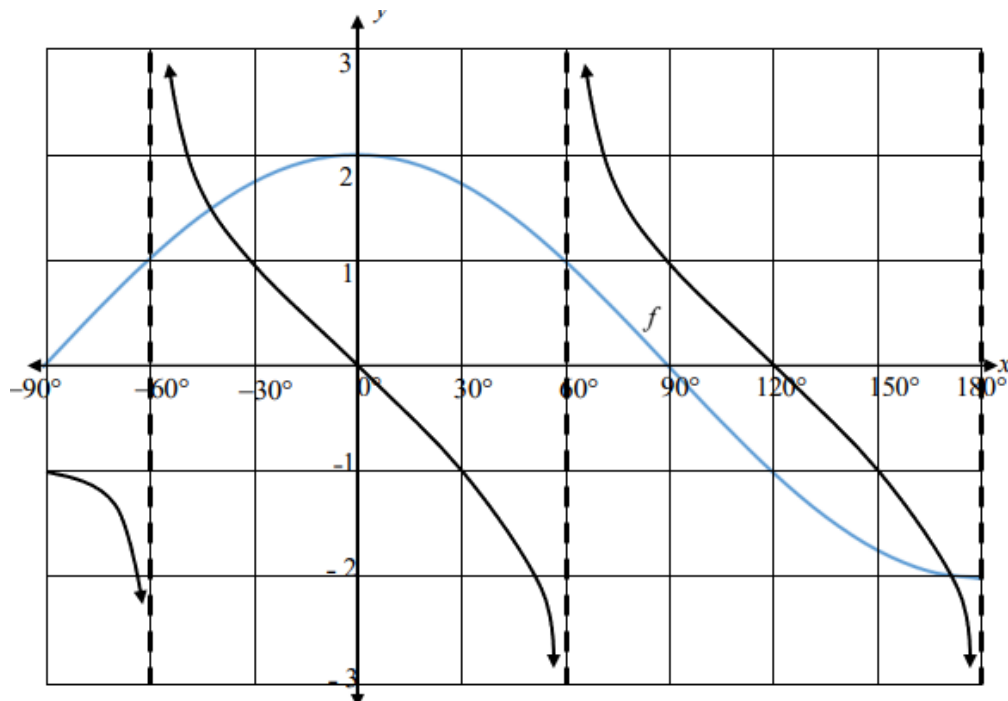
5.1



5.1.1	$OP^2 = (-3)^2 + (-3\sqrt{3})^2$ $OP = 6$ $\cos 2\theta = \frac{-3}{6} = -\frac{1}{2}$	✓ Pythagoras ✓ $OP = 6$ ✓ $\cos 2\theta = -\frac{1}{2}$	(3)
5.1.2	$\cos 2\theta = 1 - 2\sin^2 \theta$ $\therefore 2\sin^2 \theta = 1 - \cos 2\theta$ $\therefore \sin^2 \theta = \frac{1 - \cos 2\theta}{2}$ $= \frac{1 - \left(-\frac{1}{2}\right)}{2}$ $= \frac{3}{4}$ $\therefore \sin \theta = \frac{\sqrt{3}}{2}$ <p>OR/OF</p> $-\frac{1}{2} = 1 - 2\sin^2 \theta$ $\therefore -\frac{3}{2} = -2\sin^2 \theta$ $\therefore \sin^2 \theta = \frac{3}{4}$ $\therefore \sin \theta = \frac{\sqrt{3}}{2}$	✓ double angle identity/ <i>dubbelhoekidentiteit</i> ✓ correct substitution/ <i>korrekte vervanging</i> ✓ answer/antwoord ✓ $-\frac{1}{2} = 1 - 2\sin^2 \theta$ ✓ simplification/ <i>vereenvoudiging</i> ✓ answer/antwoord	(3)

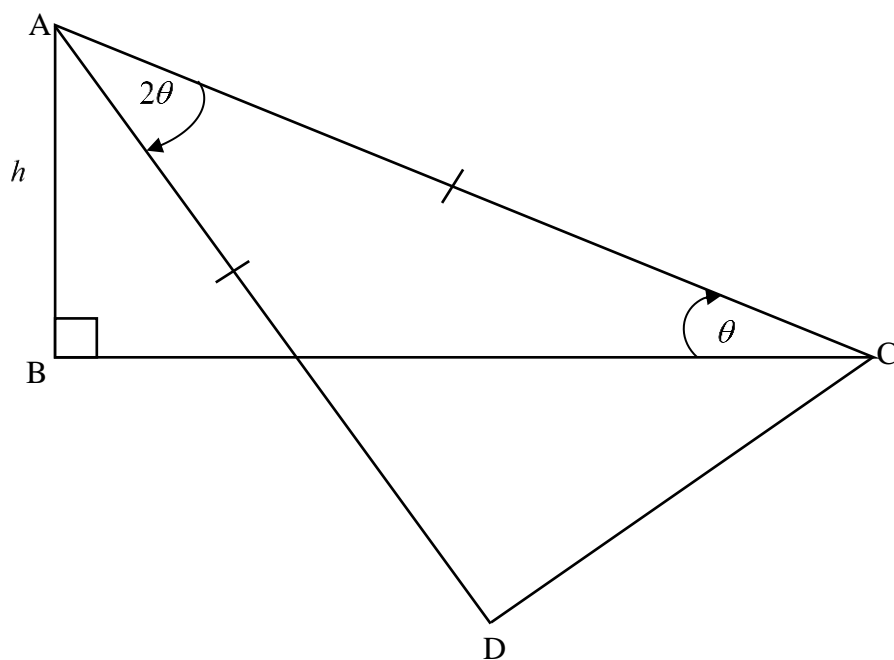
5.2	$\cos^2(180^\circ + x) + \cos(-x) \cdot \tan x \cdot \cos(90^\circ + x)$ $= \cos^2 x + \cos x \cdot \tan x \cdot (-\sin x)$ $= \cos^2 x + \cos x \cdot \frac{\sin x}{\cos x} \cdot (-\sin x)$ $= \cos^2 x - \sin^2 x$ $= \cos 2x$	$\checkmark \cos^2 x$ $\checkmark \cos x$ $\checkmark -\sin x$ $\checkmark \frac{\sin x}{\cos x}$ $\checkmark \cos^2 x - \sin^2 x$ $\checkmark \cos 2x$	(6)
5.3.1	$5 \tan \theta - 6 \cos \theta = 0$ $5 \left(\frac{\sin \theta}{\cos \theta} \right) - 6 \cos \theta = 0$ $5 \sin \theta - 6 \cos^2 \theta = 0$ $5 \sin \theta - 6(1 - \sin^2 \theta) = 0$ $5 \sin \theta - 6 + 6 \sin^2 \theta = 0$ $6 \sin^2 \theta + 5 \sin \theta - 6 = 0$	$\checkmark \tan \theta = \frac{\sin \theta}{\cos \theta}$ \checkmark multiplying by $\cos \theta$ / <i>vermenigvuldiging met $\cos \theta$</i> $\checkmark \cos^2 \theta = 1 - \sin^2 \theta$	(3)
5.3.2	$6 \sin^2 \theta + 5 \sin \theta - 6 = 0$ $(3 \sin \theta - 2)(2 \sin \theta + 3) = 0$ $\sin \theta = \frac{2}{3} \text{ or/of } \sin \theta = -\frac{3}{2}$ <p style="text-align: center;">no solution/ <i>geen oplossing</i></p> $\theta = 41,81^\circ + k \cdot 360^\circ; k \in \mathbb{Z} \text{ or/of } \theta = 138,19^\circ + k \cdot 360^\circ; k \in \mathbb{Z}$	\checkmark factors (must indicate)/ <i>faktore (moet aandui)</i> \checkmark both values of $\sin \theta$ / <i>albei waardes van $\sin \theta$</i> \checkmark no solution/ <i>geen oplossing</i> $\checkmark \theta = 41,81^\circ$ or/of $138,19^\circ$ $\checkmark + k \cdot 360^\circ; k \in \mathbb{Z}$	(5)
5.4	<p>This question has been removed from the question paper. Do not mark this question.</p> <p><i>Hierdie vraag is uit die vraestel verwyder. Moenie hierdie vraag merk nie.</i></p>		(0)
5.5	$\sin(3\alpha - \beta) = \frac{1}{\sqrt{2}} \quad \text{ref/verwys } \angle = 45^\circ$ $3\alpha - \beta = 180^\circ - 45^\circ$ $3\alpha - \beta = 135^\circ \dots\dots\dots(1)$ $\tan(2\alpha + \beta) = \frac{1}{\sqrt{3}} \quad \text{ref/verwys } \angle = 30^\circ$ $2\alpha + \beta = 180^\circ + 30^\circ$ $2\alpha + \beta = 210^\circ \dots\dots\dots(2)$ $5\alpha = 345^\circ \quad (1)+(2)$ $\alpha = 69^\circ$ $\beta = 72^\circ$	$\checkmark 3\alpha - \beta = 135^\circ$ $\checkmark 2\alpha + \beta = 210^\circ$ $\checkmark \alpha = 69^\circ$ $\checkmark \beta = 72^\circ$	(4)
			[24]

QUESTION/VRAAG 6



6.1	See the graph above/ <i>Sien bostaande grafiek</i>	<ul style="list-style-type: none"> ✓ asymptotes/asimptote ✓ $x=0^\circ$; $x=120^\circ$ ✓ shape/vorm ✓ $(-90^\circ; -1)$ or/of $(90^\circ; 1)$ 	(4)
6.2	Period of/Periode van $g = \frac{180^\circ}{1,5} = 120^\circ$	<ul style="list-style-type: none"> ✓ method/metode ✓ answer/antwoord 	(2)
Answer only: Full marks/ Antwoord alleenlik: Volpunte			
6.3	$x \in (0^\circ; 180^\circ)$ OR/OF $0^\circ < x < 180^\circ$	<ul style="list-style-type: none"> ✓ values/waardes ✓ notation/notasie 	(2)
If values are incorrect 0/2 Indien waardes verkeerd is 0/2			
6.4 CA from graph/ vanaf grafiek	$x \in (-60^\circ; -30^\circ]$ OR/OF $-60^\circ < x \leq -30^\circ$ or $x \in (60^\circ; 90^\circ]$ OR/OF $60^\circ < x \leq 90^\circ$	<ul style="list-style-type: none"> ✓ both values/albei waardes $-60^\circ; -30^\circ$ ✓ notation/notasie ✓ both values/albei waardes $60^\circ; 90^\circ$ ✓ notation/notasie 	(4)
If values are incorrect 0/4 Indien waardes verkeerd is 0/4			
6.5	$h(x) = g(x - 30^\circ)$ $= -\tan\left[\frac{3}{2}(x - 30^\circ)\right]$ $= -\tan\left(\frac{3}{2}x - 45^\circ\right)$	<ul style="list-style-type: none"> ✓ ✓ $\frac{3}{2}(x - 30^\circ)$ 	(2)
			[14]

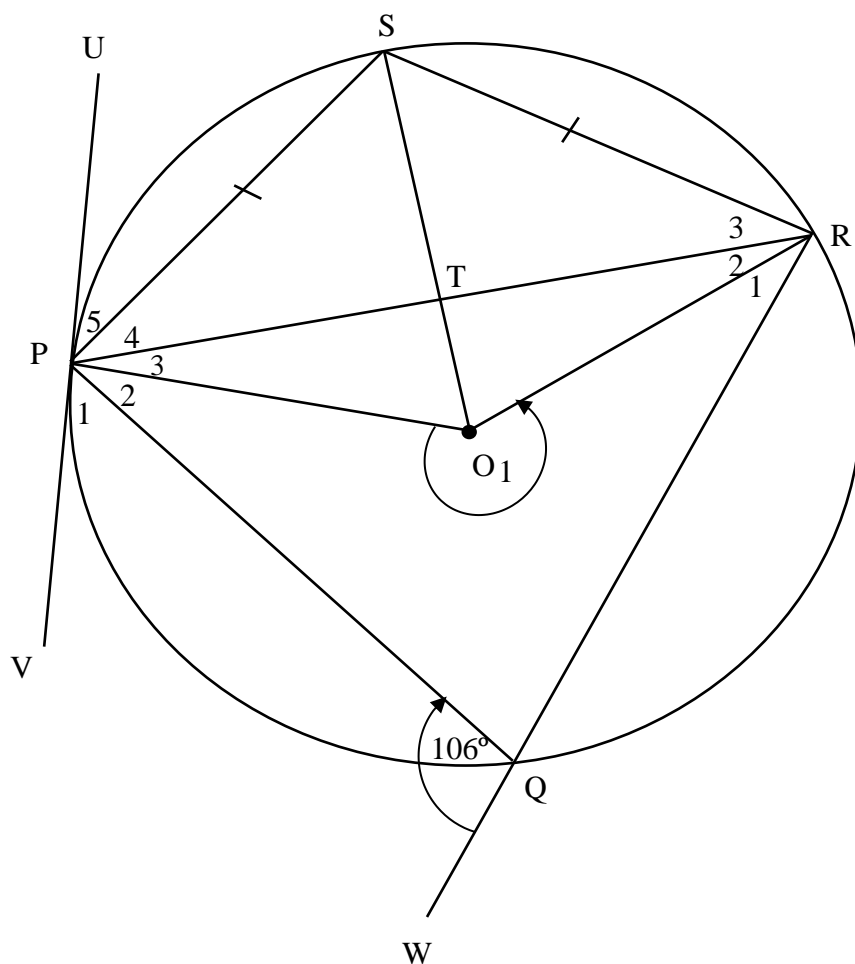
QUESTION/VRAAG 7



<p>In $\triangle ABC$: $\sin \theta = \frac{h}{AC}$</p> <p>$\therefore AC = \frac{h}{\sin \theta}$</p> <p>In $\triangle ACD$: $AC = AD$</p> <p>$\hat{A}DC = \hat{A}CD = \frac{180^\circ - 2\theta}{2}$ [\angles opp.=sides; \angles of $\Delta = 180^\circ$]</p> <p>[\anglee teenoor = sye; som vd \angle van $\Delta = 180^\circ$]</p> <p>$\therefore \hat{A}DC = 90^\circ - \theta$</p> <p>$\frac{CD}{\sin 2\theta} = \frac{AC}{\sin(90^\circ - \theta)}$</p> <p>$CD = \frac{AC \cdot \sin 2\theta}{\sin(90^\circ - \theta)}$</p> <p>$= \frac{h}{\sin \theta} \times \frac{2 \sin \theta \cdot \cos \theta}{\cos \theta}$</p> <p>$= 2h$</p> <p>OR/OF</p>	<p>✓ AC in terms of h and θ/ AC in terme van h en θ</p> <p>✓ $\hat{A}DC = 90^\circ - \theta$</p> <p>✓ correct subst. into sine rule/ korrekte vervanging in sinusreël</p> <p>✓ CD as subject/CD as onderwerp</p> <p>✓ $\sin 2\theta = 2 \sin \theta \cos \theta$</p> <p>✓ $\sin(90^\circ - \theta) = \cos \theta$</p> <p>✓ answer/antwoord</p>	
--	---	--

	<p>In $\triangle ABC$: $\sin\theta = \frac{h}{AC}$ $\therefore AC = \frac{h}{\sin\theta}$</p> <p>In $\triangle ACD$: $AC = AD$ $CD^2 = AC^2 + AD^2 - 2AC \cdot AD \cos 2\theta$ $CD^2 = \left(\frac{h}{\sin\theta}\right)^2 + \left(\frac{h}{\sin\theta}\right)^2 - 2\left(\frac{h}{\sin\theta}\right)^2 \cos 2\theta$ $CD^2 = \frac{h^2}{\sin^2\theta} + \frac{h^2}{\sin^2\theta} - 2\frac{h^2}{\sin^2\theta}(1 - 2\sin^2\theta)$ $CD^2 = 2\frac{h^2}{\sin^2\theta} - 2\frac{h^2}{\sin^2\theta} + 4h^2$ $CD^2 = 4h^2$ $CD = 2h$</p>	<p>✓ AC in terms of h and θ/ <i>AC in terme van h en θ</i></p> <p>✓ $AC = CD$</p> <p>✓ correct subst. into cosine rule/ <i>korrekte vervanging in kosinusreël</i></p> <p>✓ $\cos 2\theta = 1 - 2\sin^2\theta$</p> <p>✓ multiplication/ <i>vermenigvuldiging</i></p> <p>✓ simplification/ <i>vereenvoudiging</i></p> <p>✓ answer/antwoord</p>	(7)
			[7]

QUESTION/VRAAG 8



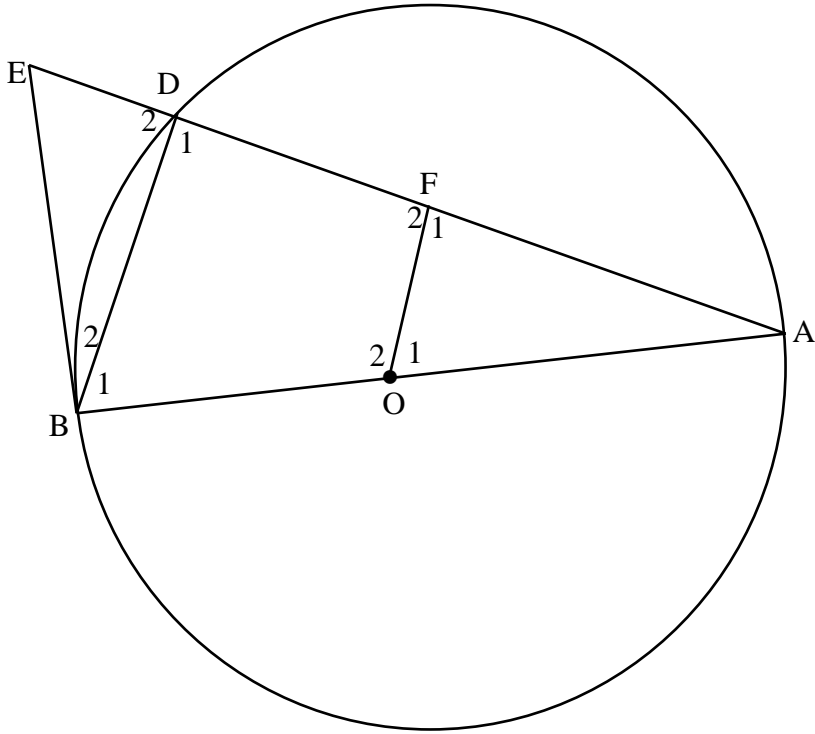
8.1.1	$\hat{P}SR = 106^\circ$	ext. \angle of cyclic quad/buite \angle van kvh.	✓S ✓R	(2)
8.1.2	$\hat{P}_4 = \hat{R}_3$ $\hat{R}_3 = \frac{180^\circ - 106^\circ}{2}$ $\hat{R}_3 = 37^\circ$	\angle^s opposite = sides/ \angle^e teenoor = sye OR/OF equal chords; equal \angle^s /gelyke koorde; gelyke \angle^e sum of \angle^s in a triangle/som vd \angle^e v driehoek	✓S/R ✓S ✓S	(3)
8.1.3	$\hat{P}_5 = \hat{R}_3 = 37^\circ$	tan chord theorem/raaklyn koordstelling	✓S ✓R	(2)
8.1.4	$\hat{O}_1 = 212^\circ$	\angle centre = $2 \times \angle$ at circumference/ middelpunts $\angle = 2 \times$ omtreks \angle	✓R ✓S	(2)

8.1.5	$\hat{P}_3 + \hat{P}_4 + \hat{P}_5 = 90^\circ$ $\hat{P}_3 = 90^\circ - 37^\circ - 37^\circ = 16^\circ$	radius \perp tangent/ <i>radius \perp raaklyn</i> OR/OF \angle 's around a point/ <i>\angle'e om 'n punt</i> \angle 's opposite radii/ <i>\angle'e teenoor radiusse</i>	\checkmark R $\checkmark \hat{P}_3 = 16^\circ$ \checkmark R $\checkmark \hat{P}_3 = 16^\circ$	(2)
-------	---	--	--	-----

<p>8.2</p>			
<p>8.2.1</p>	<p> $\hat{A}_2 = \hat{E} = x$ $\hat{E} = \hat{A}_1 = \hat{A}_2 = x$ OR/OF $\hat{C}_2 = \hat{A}_2 = x$ </p> <p> \angle^s in the same segment/ \angle^e in dies. segment = chords subtend = \angle^s / gelyke koorde onderspan gelyke \angle^e \angle^s opposite radii/ \angle 'e teenoor radiusse </p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p> Learner MUST first determine \hat{A}_2 in order to get the mark for \hat{C}_2 Leerling MOET eers \hat{A}_2 bepaal, om die punt vir \hat{C}_2 te verdien </p> </div>	<p>✓S/R</p> <p>✓S/R</p> <p>✓S/R</p>	<p>(2)</p>
<p>8.2.2</p>	<p> $\hat{C}_2 + \hat{C}_3 + \hat{C}_4 = 90^\circ$ $\hat{D}_1 = 90^\circ - x$ $\hat{A}\hat{B}\hat{C} = 90^\circ + x$ </p> <p> \angle^s in a semi circle/ \angle^e in semi sirkel sum of \angle^s in a triangle/som vd \angle^e v driehoek opposite \angle^s of cyclic quad/oorst \angle^e v kvh </p> <p>OR/OF</p> <p> $\hat{O}_1 = 2x$ $\hat{D}_1 = 90^\circ - x$ $\hat{A}\hat{B}\hat{C} = 90^\circ + x$ </p> <p> \angle centre = $2 \times \angle$ at circumference/ middelpunts $\angle = 2 \times$ omtreks \angle sum of \angle^s in a triangle/som vd \angle^e v driehoek opposite \angle^s of cyclic quad/oorst \angle^e v kvh </p>	<p>✓S/R</p> <p>✓S</p> <p>✓S/R</p> <p>✓S/R</p> <p>✓S</p> <p>✓S/R</p>	<p>(3)</p>
<p>8.2.3</p>	<p> $\hat{C}_3 + \hat{C}_4 = 90^\circ - x$ $\hat{A}_2 = \hat{C}_2 = x$ $\therefore \hat{A}_1 = \hat{C}_2 = x$ $\therefore AB \parallel CO$ </p> <p> \angle^s opposite radii/ \angle 'e teenoor radiusse \angle^s opposite radii/ \angle 'e teenoor radiusse alternate \angle^s =/verwis. \angle^e gelyk </p> <p>OR/OF</p>	<p>✓S/R</p> <p>✓S/R</p> <p>✓R</p>	<p>(3)</p>

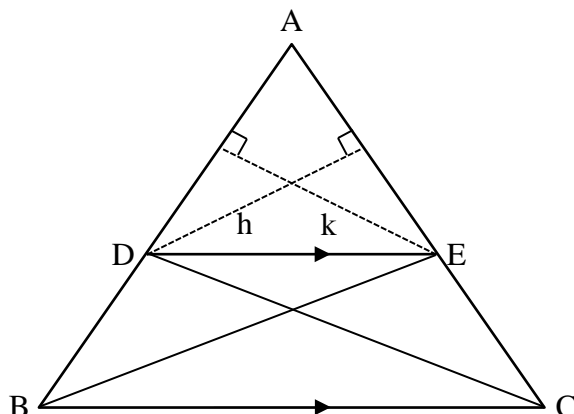
	$\hat{C}_3 + \hat{C}_4 = 90^\circ - x$	\angle^s opposite radii/ \angle 'e teenoor radiusse	✓S/R	
	$\hat{A}_1 + \hat{A}_2 = \hat{O}_1 = 2x$	\angle centre = $2 \times \angle$ at circ./ middelpunt $\angle = 2 \times$ omtrek \angle	✓S/R	
	$\therefore AB \parallel CO$	corresponding $\angle^s =$ ooreenkomst. \angle^e gelyk	✓R	
				[19]

QUESTION/VRAAG 9

				
9.1.1	<p> $\hat{F}_2 = 90^\circ$ $\hat{B}_1 + \hat{B}_2 = 90^\circ$ $\therefore \hat{F}_2 + \hat{B} = 180^\circ$ OBEF is a cyclic quad/ <i>OBEF is 'n</i> <i>koordevierhoek</i> </p> <p> $\hat{F}_1 = 90^\circ$ $\hat{B}_1 + \hat{B}_2 = 90^\circ$ $\therefore \hat{F}_1 = \hat{B}$ </p>	<p> line from centre to midpoint of chord/ <i>lyn v middelpunt na middelpunt v koord</i> radius \perp tangent/radius \perp raaklyn opp. \angle^s are supplementary/ converse of opp. \angle^s of a cyclic quad/ <i>oorst. \angle^e is supplementêr/omgekeerde v</i> <i>oorst \angle^e v kvh</i> </p> <p>OR/OF</p> <p> line from centre to midpoint of chord/ <i>lyn v middelpunt na middelpunt v koord</i> radius \perp tangent/radius \perp raaklyn ext. $\angle =$ interior opposite \angle/ converse of exterior. \angle of a cyclic quad/ <i>$\angle =$ oorst binne \angle^e/omgekeerde van buite</i> <i>\angle van kvh</i> </p>	<p> \checkmarkS/R \checkmarkS/R \checkmarkR \checkmarkS/R \checkmarkS/R \checkmarkR </p>	(3)

9.1.2	$\hat{D}_1 = 90^\circ$ $\hat{D}_2 = 90^\circ$ In $\triangle ADB$ and/en $\triangle BDE$ $\hat{A} = \hat{B}_2$ $\hat{D}_1 = \hat{D}_2$ $\hat{B}_1 = \hat{E}$ $\triangle ADB \parallel \triangle BDE$	\angle in a semi circle/ \angle in semisirkel Adj. sup. \angle^s /aangrensde suppl. \angle^e tan chord theorem/raaklyn koordstelling proved/reeds bewys sum of \angle^s in \triangle /som vd \angle^e v \triangle $\angle\angle\angle$ OR/OF $\hat{D}_1 = 90^\circ$ $\hat{D}_2 = 90^\circ$ In $\triangle ADB$ and/en $\triangle BDE$ $\hat{A} = \hat{B}_2$ $\hat{D}_1 = \hat{D}_2$ $\triangle ADB \parallel \triangle BDE$	\checkmark S/R \checkmark S \checkmark R \checkmark S/R \checkmark S \checkmark R	(3)
9.1.3	$\hat{B}_1 = \hat{E}$ $\therefore OB$ is a tangent/ $\therefore OB$ is 'n raaklyn	3rd \angle in \triangle , $\triangle ADB \parallel \triangle BDE$ converse of tan chord theorem/ omgekeerde raaklyn koordstelling	\checkmark S \checkmark R	(2)
9.2	$\frac{AD}{BD} = \frac{BD}{DE}$ $BD^2 = AD \times DE$ but/maar $BD = 2OF$ $BD^2 = 4OF^2$ $4OF^2 = AD \times DE$ $OF^2 = \frac{AD \times DE}{4}$	$\triangle ADB \parallel \triangle BDE$ midpoint theorem/middelpuntstelling	\checkmark S \checkmark S/R \checkmark S	(3)
				[11]

QUESTION/VRAAG 10



**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**

10.1

Construction: Join DC and BE and
 perpendicular heights k and h
 Konstruksie: Verbind DC en BE en
 loodregte hoogtes k en h

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

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

$$\begin{aligned} \text{Area } \triangle DEB &= \text{Area } \triangle DEC \\ \therefore \frac{\text{Area } \triangle ADE}{\text{Area } \triangle DEB} &= \frac{\text{Area } \triangle ADE}{\text{Area } \triangle DEC} \end{aligned}$$

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

same base, same height/
 dies. basis, dies. hoogte

✓ construction/
 konstruksie

✓S

✓S

✓S/R

✓S

(5)

10.2	$\frac{QS}{ST} = \frac{VU}{UT}$ $\frac{2}{3} = \frac{VU}{2}$ $VU = \frac{4}{3}$ $PV = 5 - \frac{4}{3} = \frac{11}{3}$ $\frac{PV}{VU} = \frac{PQ}{QR}$ $\frac{PQ}{QR} = \frac{11}{3} \div \frac{4}{3}$ $\frac{PQ}{QR} = \frac{11}{4}$	<p>Proportion theorem, $RU \parallel QV$/ line \parallel one side of Δ/eweredigheids stelling $RU \parallel QV$/lyn \parallel een sy van Δ</p> <p>Proportion theorem, $RU \parallel QV$/ line \parallel one side of Δ/eweredigheids stelling $RU \parallel QV$/lyn \parallel een sy van Δ</p>	<p>\checkmark S/R</p> <p>\checkmark</p> <p>$VU = \frac{4}{3}$</p> <p>\checkmark $PV = \frac{11}{3}$</p> <p>\checkmark S</p> <p>\checkmark S</p>	(5)
				[10]

TOTAL/TOTAAL: 145

The mark out of 145 must be converted to a mark out of 150.
Die punt uit 145 moet herlei word na 'n punt uit 150.