GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION/ *VOORBEREIDENDE EKSAMEN*

2021

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:

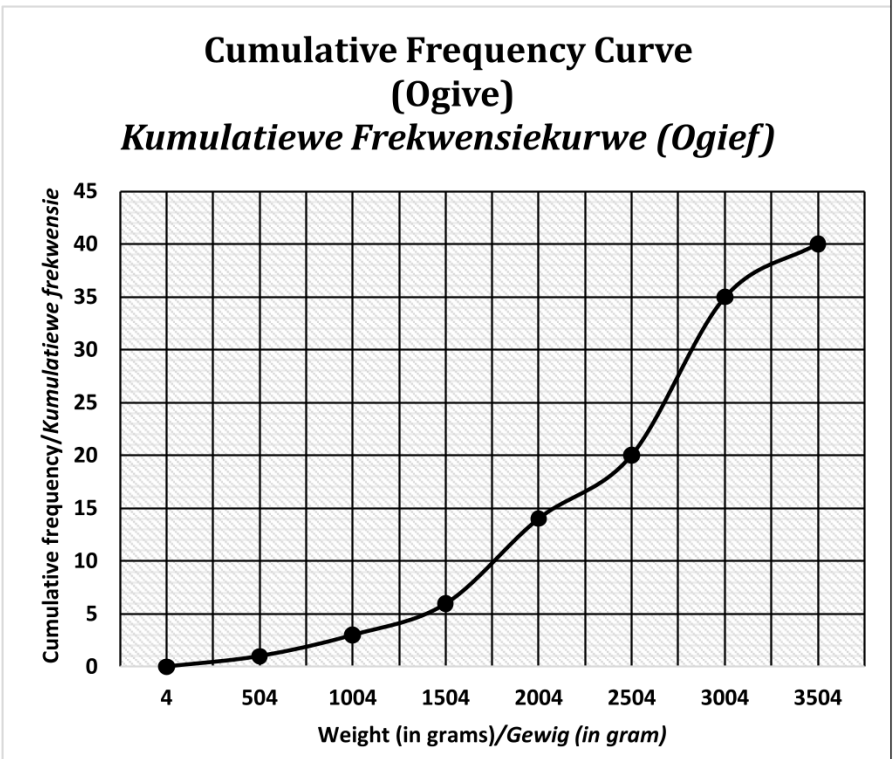
- As *'n* kandidaat *'n* vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.
- As *'n* kandidaat *'n* antwoord van *'n* vraag doodtrek en nie oordoen nie, sien die doodgetrekte poging na.
- Volgehoue akkuraatheid word in ALLE aspekte van die nasienriglyne toegepas. Hou op nasien by die tweede 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.)
	'n Punt vir *'n* korrekte bewering (*'n* Punt vir *'n* bewering is onafhanklik van die 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 the reason are both correct.
	(Ken *'n* punt toe as beide die bewering EN die rede korrek is.)

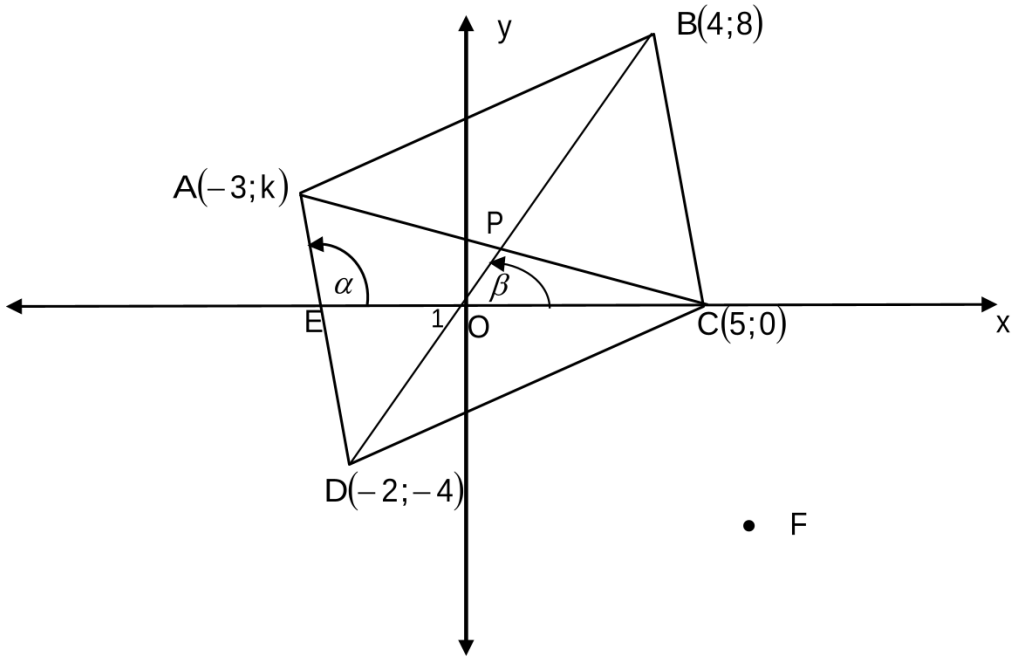
QUESTION/VRAAG 1

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/ Baie sterk positiewe korrelasie	✓ srong positive/ sterk positief	(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/Die verskil is 6,77%	✓ $\bar{x} = 7,57$ ✓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/Gebrek aan bywoning van aanlyn leerling **OR/OF** Section taught may have been difficult to grasp online/Afdeling wat onderrig was, was moeilik om te verstaan met aanlynklas **OR/OF** Poor connectivity/Slegte verbinding **OR/OF** Lack of resources/Gebrek aan hulpbronne **OR/OF** Insufficient ICT skills/Onvoldoende Rekenaarvaardighede	✓any valid answer/enige geldige antwoord	(1)
			[10]

QUESTION/VRAAG 2

2.1.1	$2500 \leq w < 3000$	✓ answer/antwoord	(1)
2.1.2	$\frac{250(1)+750(2)+1\,250(3)+1\,750(8)+2\,250(6)+2\,750(15)+3\,250(5)}{40}$ estimated/geskatte $\bar{x} = \frac{90\,500}{40}$ $= 2\,262,5$ grams/gram If numerator is correct and denominator is incorrect 1/3 If numerator is incorrect and denominator is correct 2/3 (CA) Indien teller korrek is en noemer is verkeerd 1/3 Indien teller verkeerd is en noemer is korrek 2/3 (CA)	✓ 90 500 ✓40 ✓ answer/antwoord	(3)
2.2.1		✓grounding point/ gegronde punt (4 ; 0) and/en (3 504 ; 40) ✓shape/vorm (if ruler is used to connect points, NO mark for shape/indien liniaal gebruik word om punte te verbind GEEN punt vir vorm ✓✓ (1 mistake - 1 mark; 2 mistakes - no mark/1 fout – 1 punt; 2 foute – geen punte)	(4)
2.2.2	It will not deviate./it will remain the same. Dit sal nie afwyk nie./dit sal dieselfde bly.	✓answer/antwoord	(1)
2.2.3 CA from /van 2.1.2	2 262,5 + 4 = 2 266,5 grams/gram	✓addition of 4/4 bygetel ✓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	$AB = \sqrt{65} = \sqrt{(-3-4)^2 + (k-8)^2}$ $65 = 49 + k^2 - 16k + 64$ $k^2 - 16k + 48 = 0$ $(k-4)(k-12) = 0$ $k = 4$ or/of $k = 12$ $\therefore k = 4$ **OR/OF** $AB = \sqrt{65} = \sqrt{(-3-4)^2 + (k-8)^2}$ $65 = 49 + (k-8)^2$ $(k-8)^2 = 16$ $k - 8 = \pm 4$ $k = 4$ or/of $k = 12$ $\therefore k = 4$	✓ substitute A and B into distance formula/ vervang A en B in die afstandsformule ✓ standard form/ standaardvorm ✓ factors/faktore ✓ $k = 4$ ✓ substitute A and B into distance formula/ vervang A en B in die afstandsformule ✓ isolate square/isoleer kwadraat ✓ square root both sides/vierkantswortel weerskante ✓ $k = 4$	(4)

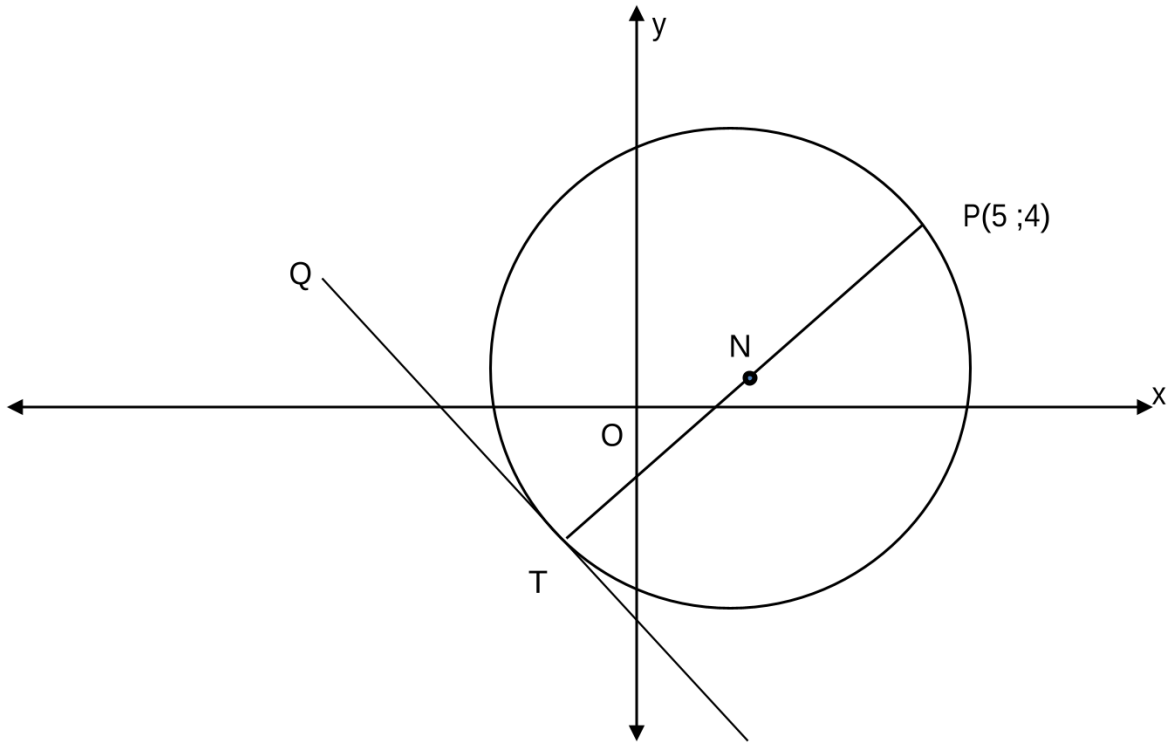
3.3	$m_{BD} = \frac{8-(-4)}{4-(-2)} = 2$ $m_{AC} = \frac{4-0}{-3-5} = -\frac{1}{2}$ $\therefore m_{BD} \times m_{AC} = 2 \times -\frac{1}{2} = -1$ $\therefore BP \perp AC$ **OR/OF** Coordinates of P = Midpoint of AC = Midpoint of BD/ Koördinate van P=Middelpunt van AC = Middelpunt van BD $= \left(\frac{-3+5}{2};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

3.5	**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**		
	$m_{AD} = m_{BC} = -8$	✓ $m_{AD} = -8$	
	$\tan\alpha = m_{AD}$		
	$\tan\alpha = -8$	✓ $\tan\alpha = -8$	
	$\alpha = 180° - \tan^{-1}(8)$ **OR/OF** $\alpha = \tan^{-1}(-8) + 180°$ $= 180° - 82{,}87°$ **OR/OF** $= -82{,}87° + 180°$ $= 97{,}13°$ $= 97{,}13°$	✓ $\alpha = 97{,}13°$	
	$\tan\beta = m_{BD} = 2$	✓ $\beta = 63{,}43°$	
	$\beta = 63{,}43°$		
	$\hat{O}_1 = 63{,}43°$ (vert.opp. ∠s/regoorst.∠e)		
	$E\hat{D}O = \alpha - \beta$ (ext. ∠ of Δ/buite ∠ van Δ) $= 97{,}13° - 63{,}43°$ $= 33{,}7°$	✓ $\alpha - \beta$ ✓ answer/antwoord	
	OR/OF		
	In ΔAPD , $A\hat{P}D = 90°$ AP = $2\sqrt{5}$ PD = $3\sqrt{5}$	✓ $A\hat{P}D = 90°$ ✓ AP = $2\sqrt{5}$ ✓ PD = $3\sqrt{5}$	
	$\tan E\hat{D}O = \frac{AP}{PD}$	✓ trig ratio/ trig verhouding	
	$\tan E\hat{D}O = \frac{2\sqrt{5}}{3\sqrt{5}}$	✓ substitution/ vervanging	
	$E\hat{D}O = 33{,}69 \approx 33{,}7°$ (rounded off to ONE decimal place/rond af tot EEN desimale plek)	✓ answer/antwoord	
	OR/OF		
	In ΔAPD , $A\hat{P}D = 90°$ AP = $2\sqrt{5}$ **&** AD = $\sqrt{65}$	✓ $A\hat{P}D = 90°$ ✓ AP = $2\sqrt{5}$ ✓ AD = $\sqrt{65}$	
	$\sin E\hat{D}O = \frac{AP}{AD}$	✓ trig ratio/ trig verhouding	
	$\sin E\hat{D}O = \frac{2\sqrt{5}}{\sqrt{65}}$	✓ substitution/ vervanging	
	$E\hat{D}O = 33{,}69 \approx 33{,}7°$ (rounded off to ONE decimal place/rond af tot EEN desimale plek)	✓ answer/antwoord	
	OR/OF		

	In ΔAPD $A\hat{P}D = 90°$ PD = $3\sqrt{5}$ AD = $\sqrt{65}$ $\cos E\hat{D}O = \frac{PD}{AD}$ $\cos E\hat{D}O = \frac{3\sqrt{5}}{\sqrt{65}}$ $E\hat{D}O = 33,69 \approx 33,7°$ (rounded off to ONE decimal place/rond af tot EEN desimale plek) **OR/OF** In ΔABD BD = $6\sqrt{5}$ AD = $\sqrt{65}$ $\cos E\hat{D}O = \frac{AD^2 + BD^2 - AB^2}{2(AD)(BD)}$ $\cos E\hat{D}O = \frac{\left(\sqrt{65}\right)^2 + \left(6\sqrt{5}\right)^2 - \left(\sqrt{65}\right)^2}{2\left(\sqrt{65}\right)\left(6\sqrt{5}\right)} = \frac{3}{\sqrt{13}}$ $E\hat{D}O = 33,69 \approx 33,7°$ (rounded off to ONE decimal place/rond af tot EEN desimale plek)	✓ $A\hat{P}D = 90°$ ✓ PD = $3\sqrt{5}$ ✓ AD = $\sqrt{65}$ ✓ trig ratio/trig verhouding ✓ substitution/ vervanging ✓ answer/antwoord ✓ BD = $6\sqrt{5}$ ✓ AD = $\sqrt{65}$ ✓ cosine rule/ kosinusreël ✓ substitution/ vervanging ✓ $\frac{3}{\sqrt{13}}$ ✓ answer/antwoord	(6)

3.6	$AC = \sqrt{(5-(-3))^2 + (0-4)^2} = \sqrt{80} = 4\sqrt{5}$ $DP = \sqrt{(-2-1)^2 + (-4-2)^2} = \sqrt{45} = 3\sqrt{5}$ Area of/van $\Delta ADC = \frac{1}{2} AC \times DP$ $\therefore$ Area of/van $\Delta ADC = \frac{1}{2}(4\sqrt{5}) \times (3\sqrt{5})$ = 30 square units/vierkante eehede **OR/OF** ABCD is a rhombus, because the diagonals bisect perpendicularly and all sides are equal. *ABCD is 'n ruit, want die hoeklyne halveer mekaar reghoekig en al die sye is ewe lank.* $\therefore C\hat{D}O = E\hat{D}O$ (diags of rhombus bisect $\angle$s of rhombus/diag van ruit halveer die $\angle$e van die ruit) $\therefore A\hat{D}C = 2 \times 33,7° = 67,4°$ Area of/van $\Delta ADC = \frac{1}{2} \times AD \times DC \times \sin A\hat{D}C$ $\therefore$ Area of/van $\Delta ADC = \frac{1}{2} \times (\sqrt{65}) \times (\sqrt{65}) \times \sin(67,4°)$ = 30 square units/vierkante eenhede	✓ length of AC/ lengte van AC ✓ length of DP/ lengte van DP ✓ correct substitution into formula/ korrekte vervanging in formule ✓ answer/antwoord ✓ $C\hat{D}O = E\hat{D}O$ ✓ $A\hat{D}C = 67,4°$ ✓ substitution into formula/ vervanging in formule ✓ answer/antwoord	(4)
			[21]

QUESTION/VRAAG 4



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

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

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

$(a+1)^2+(b+2)^2=72.....(2)$

Substitute (1) into (2) /

vervang (1) in (2)

$(a+1)^2+(a-1+2)^2=72$

$2a^2+4a-70=0$

$a^2+2a-35=0$

$(a+7)(a-5)=0$

$a=-7$ or/of $a=5$

$a=-7$ and/en $b=(-7)-1=-8$

$S(-7;-8)$

OR/OF

$2(a+1)^2=72$

$(a+1)^2=36$

$a+1=-6$ or/of $a+1=6$

$a=-7$ or/of $a=5$

$a=-7$

$b=-7-1=-8$

$S(-7;-8)$

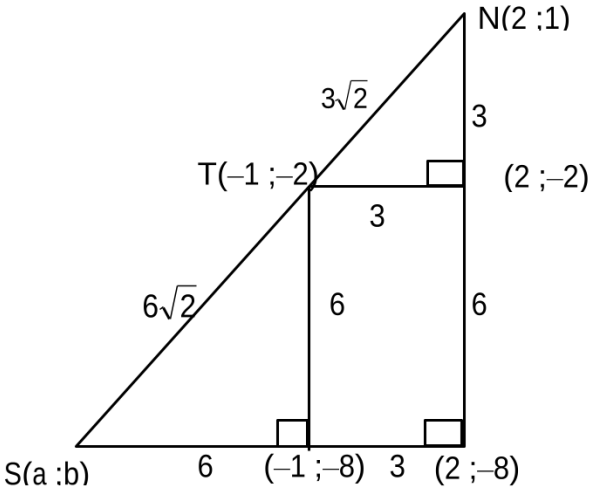
Answer only: 2/7/
Antwoord alleenlik: 2/7

✓equation/ (2)
vergelyking (2)

✓substitution/
vervanging

✓✓coordinates/
koördinate

OR/OF



✓ diagram

✓✓$(2;-2)$

✓✓$(2;-8)$

✓✓$S(-7;-8)$

OR/OF

$\frac{x_T-x_N}{x_S-x_N}=\frac{y_T-y_N}{y_S-y_N}=\frac{1}{3}$

$\frac{-3}{a-2}=\frac{-3}{b-1}=\frac{1}{3}$



✓dividing of a line segment into a given ratio/verdeel lynsegment in gegewe verhouding

✓✓substitution/
vervanging

$a-2=-9$

$a=-7$

$b-1=-9$

$b=-8$

$S(-7;-8)$

✓equation/
vergelyking

✓ $a=-7$

✓equation/
vergelyking

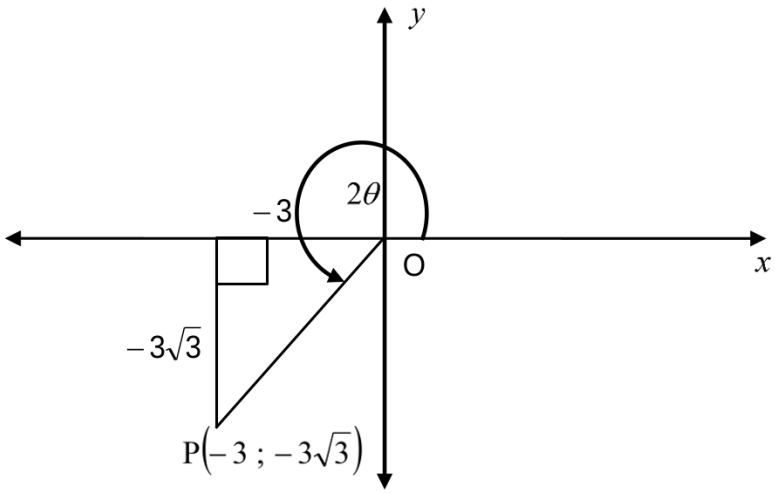
✓ $b=-8$

(7)

[18]

QUESTION/VRAAG 5

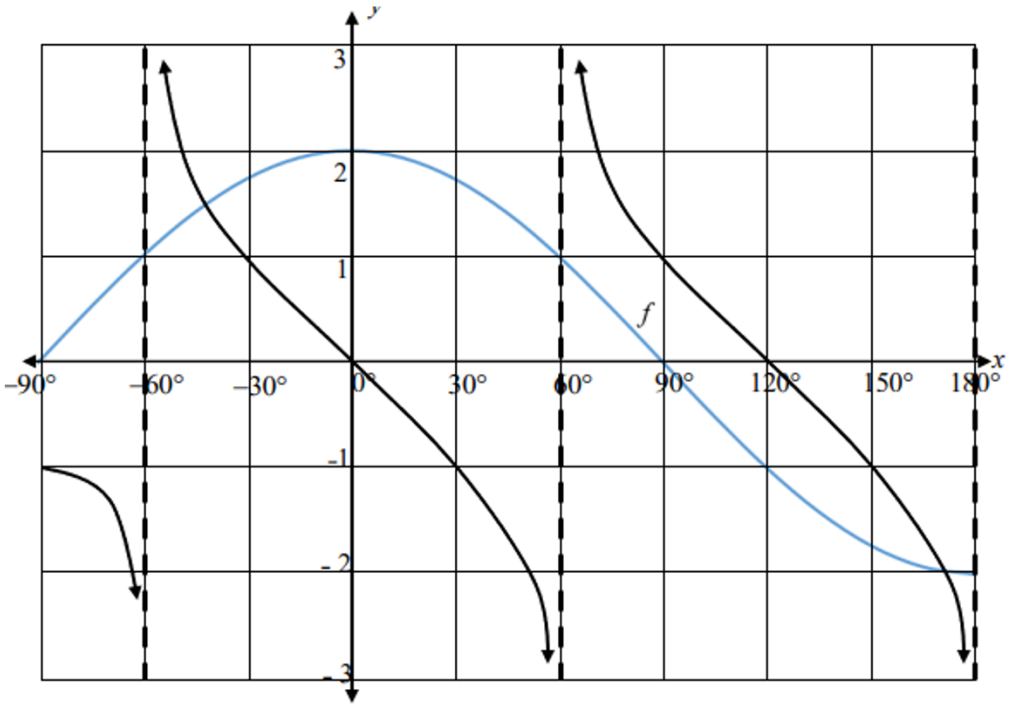
5.1



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	$\cos 2\theta = 1 - 2\sin^2\theta$ $\therefore 2\sin^2\theta = 1 - \cos 2\theta$ $\therefore \sin^2\theta = \frac{1-\cos 2\theta}{2}$ $= \frac{1-\left(-\frac{1}{2}\right)}{2}$ $= \frac{3}{4}$ $\therefore \sin\theta = \frac{\sqrt{3}}{2}$ **OR/OF** $-\frac{1}{2} = 1 - 2\sin^2\theta$ $\therefore -\frac{3}{2} = -2\sin^2\theta$ $\therefore \sin^2\theta = \frac{3}{4}$ $\therefore \sin\theta = \frac{\sqrt{3}}{2}$	✓ double angle identity/ dubbelhoekidentiteit ✓correct substitution/ korrekte vervanging ✓answer/antwoord ✓ $-\frac{1}{2} = 1 - 2\sin^2\theta$ ✓simplification/ vereenvoudiging ✓ answer/antwoord	(3)

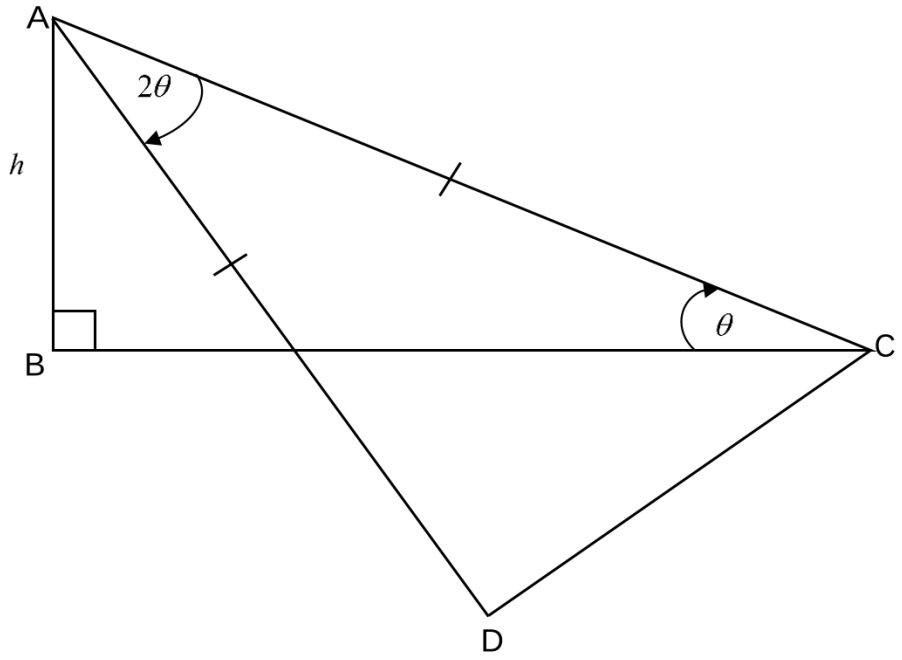
5.2	$\cos^2(180°+x)+\cos(-x).\tan x.\cos(90°+x)$ $=\cos^2 x+\cos x.\tan x.(-\sin x)$ $=\cos^2 x+\cos x.\frac{\sin x}{\cos x}.(-\sin x)$ $=\cos^2 x-\sin^2 x$ $=\cos 2x$	✓ $\cos^2 x$ ✓ $\cos x$ ✓ $-\sin x$ ✓ $\frac{\sin x}{\cos x}$ ✓ $\cos^2 x-\sin^2 x$ ✓ $\cos 2x$	(6)
5.3.1	$5\tan\theta-6\cos\theta=0$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

QUESTION/VRAAG 6



6.1	See the graph above/ Sien bostaande grafiek	✓asymptotes/asimptote ✓ $x=0°$; $x=120°$ ✓shape/vorm ✓ $(-90° ; -1)$ or/of $(90° ; 1)$	(4)
6.2	Period of/Periode van $g = \frac{180°}{1,5} = 120°$ **Answer only: Full marks/ Antwoord alleenlik: Volpunte**	✓ method/metode ✓ answer/antwoord	(2)
6.3	$x \in (0°;180°)$ OR/OF $0° < x < 180°$ **If values are incorrect 0/2 Indien waardes verkeerd is 0/2**	✓ values/waardes ✓ notation/notasie	(2)
6.4 CA from graph/ vanaf grafiek	$x \in (-60°;-30°]$ OR/OF $-60° < x \leq -30°$ or / or $x \in (60°;90°]$ OR/OF $60° < x \leq 90°$ **If values are incorrect 0/4 Indien waardes verkeerd is 0/4**	✓both values/albei waardes $-60° ; -30°$ ✓notation/notasie ✓both values/albei waardes $60° ; 90°$ ✓notation/notasie	(4)
6.5	$h(x) = g(x-30°)$ $= -\tan\left[\frac{3}{2}(x-30°)\right]$ $= -\tan\left(\frac{3}{2}x-45°\right)$	✓✓ $\frac{3}{2}(x-30°)$	(2)
			[14]

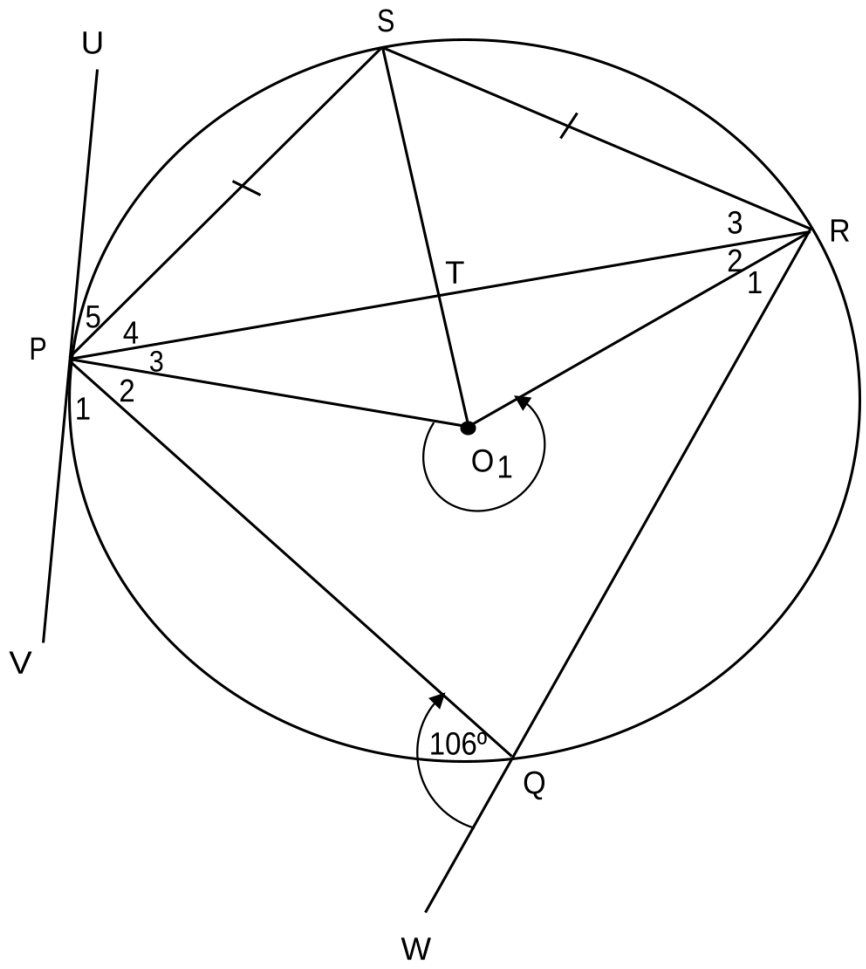
QUESTION/VRAAG 7



	$\text{In } \Delta ABC: \sin\theta = \frac{h}{AC}$ $\therefore AC = \frac{h}{\sin\theta}$ $\text{In } \Delta ACD: \quad AC = AD$ $A\hat{D}C = A\hat{C}D = \frac{180° - 2\theta}{2}$ [∠s opp.=sides; ∠s of Δ = 180°] [∠e teenoor = sye; som vd ∠ van Δ = 180°] $\therefore A\hat{D}C = 90° - \theta$ $\frac{CD}{\sin 2\theta} = \frac{AC}{\sin(90° - \theta)}$ $CD = \frac{AC.\sin 2\theta}{\sin(90° - \theta)}$ $= \frac{h}{\sin\theta} \times \frac{2\sin\theta.\cos\theta}{\cos\theta}$ $= 2h$ **OR/OF**	✓AC in terms of h and θ / AC in terme van h en θ ✓ $A\hat{D}C = 90° - \theta$ ✓correct subst. into sine rule/ korrekte vervanging in sinusreël ✓CD as subject/CD as onderwerp ✓ $\sin 2\theta = 2\sin\theta\cos\theta$ ✓ $\sin(90° - \theta) = \cos\theta$ ✓answer/antwoord	

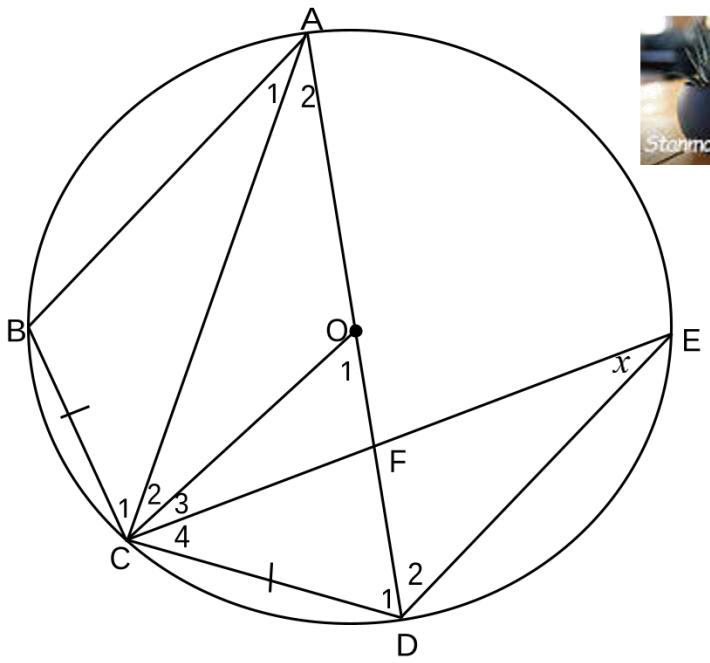
	In ΔABC: $\sin\theta = \frac{h}{AC}$ $\therefore AC = \frac{h}{\sin\theta}$  In ΔACD: $AC = AD$ $CD^2 = AC^2 + AD^2 - 2AC.AD\cos 2\theta$ $CD^2 = \left(\frac{h}{\sin\theta}\right)^2 + \left(\frac{h}{\sin\theta}\right)^2 - 2\left(\frac{h}{\sin\theta}\right)^2 \cos 2\theta$ $CD^2 = \frac{h^2}{\sin^2\theta}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

QUESTION/VRAAG 8



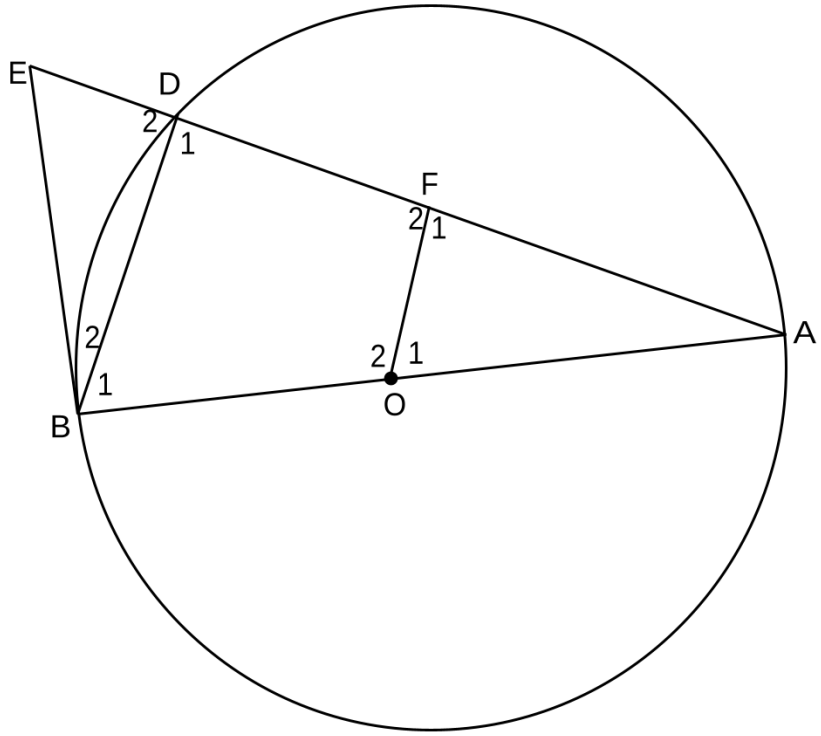
8.1.1	$P\hat{S}R = 106°$	ext. ∠ of cyclic quad/buite ∠ van kvh.	✓S ✓R	(2)
8.1.2	$\hat{P}_4 = \hat{R}_3$ $\hat{R}_3 = \frac{180° - 106°}{2}$ $\hat{R}_3 = 37°$	∠^{s} opposite = sides/∠^{e} teenoor = sye OR/OF equal chords; equal ∠^{s}/gelyke koorde; gelyke ∠^{e} sum of ∠^{s} in a triangle/som vd ∠^{e}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

8.1.5	$\hat{P}_3 + \hat{P}_4 + \hat{P}_5 = 90°$ $\hat{P}_3 = 90° - 37° - 37° = 16°$	radius $\perp$ tangent/radius $\perp$ raaklyn	✓R ✓$\hat{P}_3 = 16°$	
		OR/OF		
	$P\hat{O}R = 148°$ $\hat{P}_3 = \hat{R}_2 = 16°$	$\angle$'s around a point/$\angle$*'e om 'n punt* $\angle$'s opposite radii/$\angle$*'e teenoor radiusse*	✓R ✓$\hat{P}_3 = 16°$	(2)

8.2				
8.2.1	$\hat{A}_2 = \hat{E} = x$ $\hat{E} = \hat{A}_1 = \hat{A}_2 = x$ **OR/OF** $\hat{C}_2 = \hat{A}_2 = x$	$\angle^s$ 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*	✓S/R ✓S/R ✓S/R	(2)
	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**			
8.2.2	$\hat{C}_2 + \hat{C}_3 + \hat{C}_4 = 90°$ $\hat{D}_1 = 90° - x$ $A\hat{B}C = 90° + x$ **OR/OF** $\hat{O}_1 = 2x$ $\hat{D}_1 = 90° - x$ $A\hat{B}C = 90° + x$	$\angle^s$ 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 $\angle$ centre = 2× $\angle$ at circumference/ middelpunts $\angle$ = 2× 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	✓S/R ✓S ✓S/R ✓S/R ✓S ✓S/R	(3)
8.2.3	$\hat{C}_3 + \hat{C}_4 = 90° - x$ $\hat{A}_2 = \hat{C}_2 = x$ $\therefore \hat{A}_1 = \hat{C}_2 = x$ $\therefore AB \parallel CO$	$\angle^s$ opposite radii/$\angle$ *'e* teenoor radiusse $\angle^s$ opposite radii/$\angle$ *'e teenoor radiusse* alternate $\angle^s$ =/verwis. $\angle^e$ gelyk **OR/OF**	✓S/R ✓S/R ✓R	(3)

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

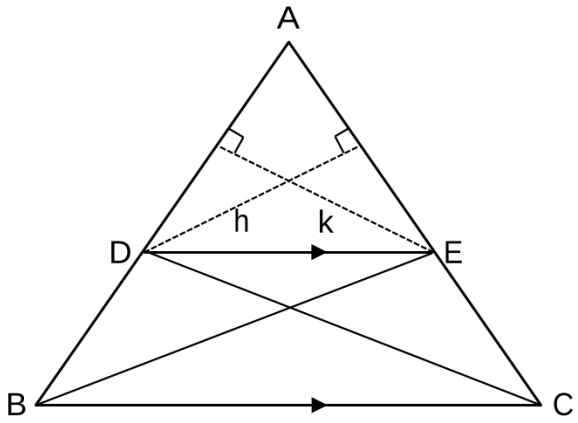
QUESTION/VRAAG 9

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

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

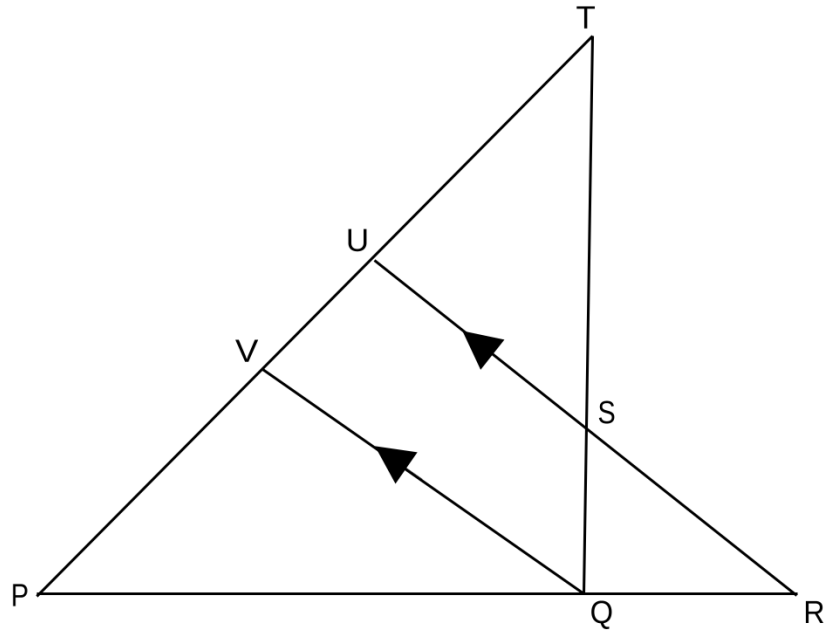
Stanmorephysics.com

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		✓construction/ konstruksie
	$\frac{\text{Area } \Delta ADE}{\text{Area } \Delta DEB} = \frac{\frac{1}{2}.AD.k}{\frac{1}{2}.DB.k} = \frac{AD}{DB}$		✓S
	$\frac{\text{Area } \Delta ADE}{\text{Area } \Delta DEC} = \frac{\frac{1}{2}.AE.h}{\frac{1}{2}.EC.h} = \frac{AE}{EC}$		✓S
	$\text{Area } \Delta DEB = \text{Area } \Delta DEC$ $\therefore \frac{\text{Area } \Delta ADE}{\text{Area } \Delta DEB} = \frac{\text{Area } \Delta ADE}{\text{Area } \Delta DEC}$	same base, same height/ dies. basis, dies. hoogte	✓S/R
	$\therefore \frac{AD}{DB} = \frac{AE}{EC}$		✓S
			(5)

				
10.2	$\frac{QS}{ST} = \frac{VU}{UT}$ $\frac{2}{3} = \frac{VU}{2}$ $VU = \frac{4}{3}$ $PV = 5 - \frac{4}{3} = \frac{11}{3}$ $\frac{PV}{VU} = \frac{PQ}{QR}$ $\frac{PQ}{QR} = \frac{11}{3} \div \frac{4}{3}$ $\frac{PQ}{QR} = \frac{11}{4}$	Proportion theorem, RU || QV/ line || one side of Δ/eweredigheids stelling RU || QV/lyn || een sy van Δ Proportion theorem, RU || QV/ line || one side of Δ/eweredigheids stelling RU || QV/lyn || een sy van Δ	✓S/R ✓ $VU = \frac{4}{3}$ ✓ $PV = \frac{11}{3}$ ✓S ✓S	(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.*

