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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</i> <i>('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</i> <i>('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>

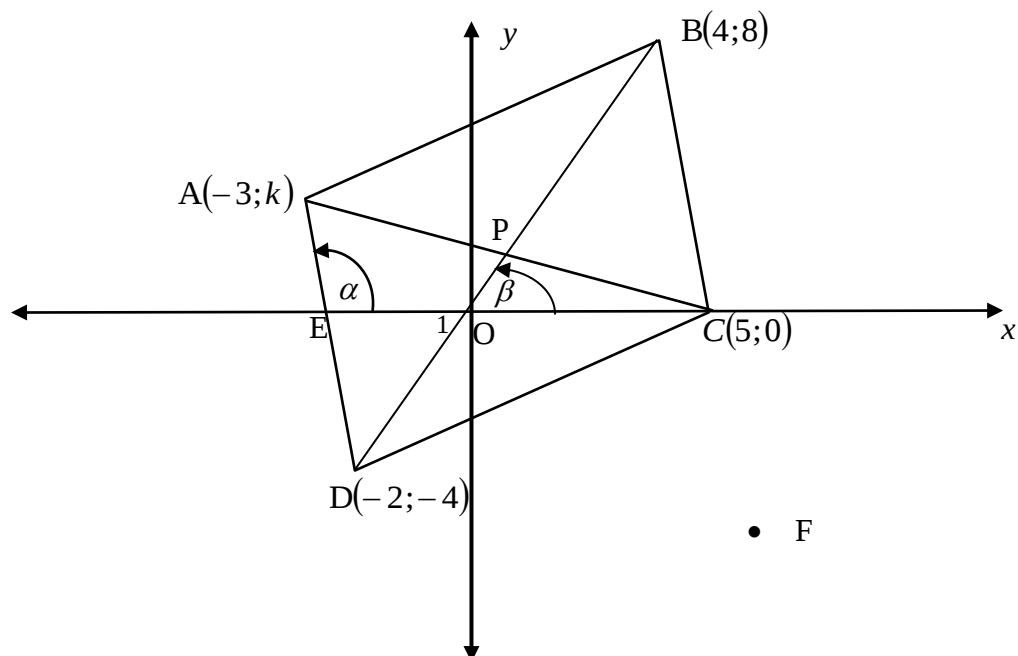
QUESTION/VRAAG 1

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</i> 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/ <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	$\frac{250(1)+750(2)+1\,250(3)+1\,750(8)+2\,250(6)+2\,750(15)+3\,250(5)}{40}$ estimated/geskatte $\bar{x} = \frac{90\,500}{40}$ $= 2\,262,5 \text{ grams/gram}$ 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>	✓ 90 500 ✓ 40 ✓ answer/antwoord	(3)
2.2.1	Cumulative Frequency Curve (Ogive) Kumulatiewe Frekwensiekurwe (Ogief)	✓ grounding point/ <i>gegronde punt</i> (4 ; 0) and/en (3 504 ; 40) ✓ shape/vorm (if ruler is used to connect points, NO mark for shape/ <i>indien liniaal</i> <i>gebruik word om</i> <i>punte te verbind</i> <i>GEEN punt vir</i> <i>vorm</i> ✓✓ (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. <i>Dit sal nie afwyk nie./dit sal dieselfde bly.</i>	✓ answer/antwoord	(1)
2.2.3 CA from /van 2.1.2	$2\,262,5 + 4$ $= 2\,266,5 \text{ grams/gram}$	✓ 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 afstandformule ✓ standard form/standaardvorm ✓ factors/faktore ✓ $k = 4$ ✓ substitute A and B into distance formula/vervang A en B in die afstandformule ✓ isolate square/isoleer kwadraat ✓ square root both sides/vierkantswortel weerskante ✓ $k = 4$	(4)

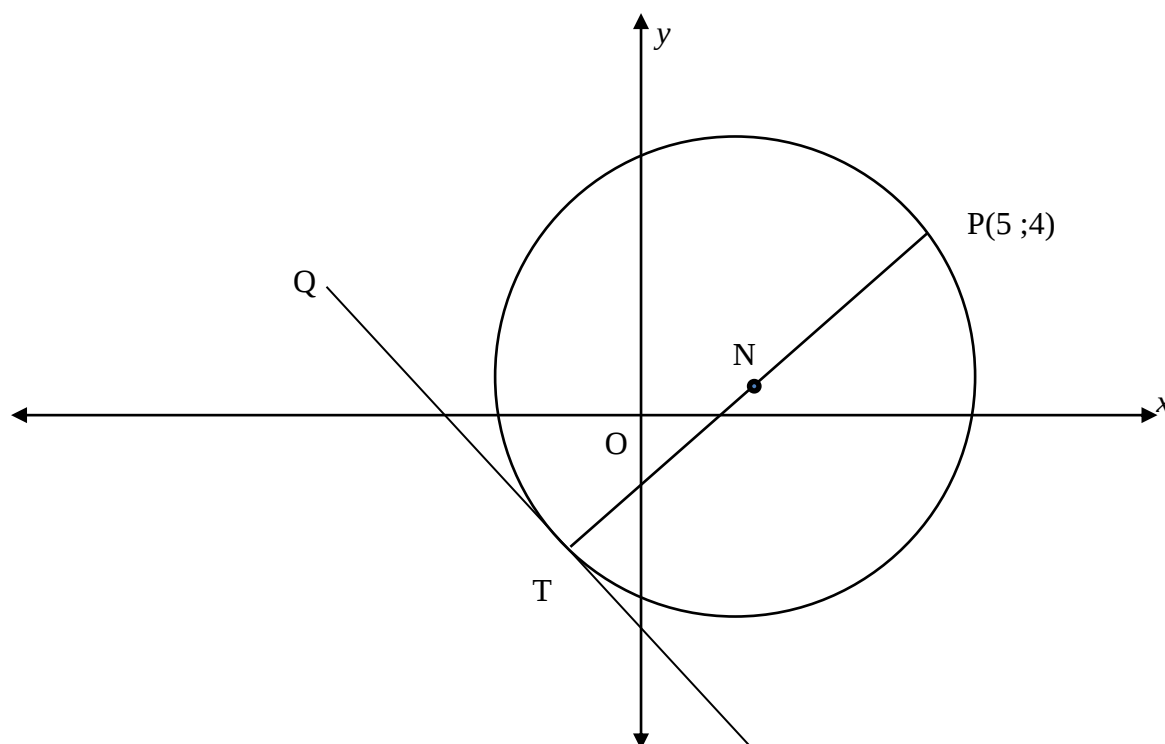
3.3	$m_{BD} = \frac{8 - (-4)}{4 - (-2)} = 2$ $m_{AC} = \frac{4 - 0}{-3 - 5} = -\frac{1}{2}$ $\therefore m_{BD} \times m_{AC} = 2 \times -\frac{1}{2} = -1$ $\therefore BP \perp AC$ OR/OF Coordinates of P = Midpoint of AC = Midpoint of BD/ <i>Koördinate van P = Middelpunt van AC = Middelpunt van BD</i> $= \left(\frac{-3+5}{2}; \frac{4+0}{2} \right) = \left(\frac{-2+4}{2}; \frac{-4+8}{2} \right)$ $= (1; 2)$ $m_{BP} = \frac{8-2}{4-1} = 2$ $m_{AC} = \frac{4-0}{-3-5} = -\frac{1}{2}$ $\therefore m_{BP} \times m_{AC} = 2 \times -\frac{1}{2} = -1$ $\therefore BP \perp AC$	$\checkmark m_{BD} = 2$ $\checkmark m_{AC} = -\frac{1}{2}$ $\checkmark m_{BD} \times m_{AC} = -1$ (must show the multiplication/ <i>moet die vermenigvuldiging aandui</i>)	(3)
3.4	Midpoint of AF = Midpoint of DC/ <i>Middelpunt van AF = Middelpunt van DC</i> $\frac{x+(-3)}{2} = \frac{-2+5}{2} \text{ and/en } \frac{y+4}{2} = \frac{-4+0}{2}$ $x = 6 \text{ and/en } y = -8$ $\therefore F(6; -8)$ Answer Only: Full Marks/Antwoord alleenlik: Volpunte OR/OF Method: Translation/Metode: Translasie <i>A → D:</i> $(x; y) \rightarrow (x+1; y-8)$ $\therefore$ 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	$\checkmark x - \text{coordinate/}$ $x - \text{koördinaat}$ $\checkmark y - \text{coordinate/}$ $y - \text{koördinaat}$	(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 $m_{AD} = m_{BC} = -8$ $\tan \alpha = m_{AD}$ $\tan \alpha = -8$ $\alpha = 180^\circ - \tan^{-1}(8)$ $= 180^\circ - 82,87^\circ$ $= 97,13^\circ$ $\tan \beta = m_{BD} = 2$ $\beta = 63,43^\circ$ $\hat{O}_1 = 63,43^\circ$ (vert.opp. $\angle$s/regoorst.$\angle$e) $\hat{E\hat{D}O} = \alpha - \beta$ (ext. $\angle$ of Δ/buite $\angle$ van Δ) $= 97,13^\circ - 63,43^\circ$ $= 33,7^\circ$ OR/OF In $\triangle APD$, $\hat{APD} = 90^\circ$ $AP = 2\sqrt{5}$ $PD = 3\sqrt{5}$ $\tan \hat{E\hat{D}O} = \frac{AP}{PD}$ $\tan \hat{E\hat{D}O} = \frac{2\sqrt{5}}{3\sqrt{5}}$ $\hat{E\hat{D}O} = 33,69 \approx 33,7^\circ$ (rounded off to ONE decimal place/rond af tot EEN desimale plek) OR/OF In $\triangle APD$, $\hat{APD} = 90^\circ$ $AP = 2\sqrt{5}$ & $AD = \sqrt{65}$ $\sin \hat{E\hat{D}O} = \frac{AP}{AD}$ $\sin \hat{E\hat{D}O} = \frac{2\sqrt{5}}{\sqrt{65}}$ $\hat{E\hat{D}O} = 33,69 \approx 33,7^\circ$ (rounded off to ONE decimal place/rond af tot EEN desimale plek) OR/OF	✓ $m_{AD} = -8$ ✓ $\tan \alpha = -8$ ✓ $\alpha = 97,13^\circ$ ✓ $\beta = 63,43^\circ$ ✓ $\alpha - \beta$ ✓ answer/antwoord ✓ $\hat{APD} = 90^\circ$ ✓ $AP = 2\sqrt{5}$ ✓ $PD = 3\sqrt{5}$ ✓ trig ratio/ trig verhouding ✓ substitution/ vervang ✓ answer/antwoord ✓ $\hat{APD} = 90^\circ$ ✓ $AP = 2\sqrt{5}$ ✓ $AD = \sqrt{65}$ ✓ trig ratio/ trig verhouding ✓ substitution/ vervang ✓ answer/antwoord	
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In $\triangle APD$ $\hat{APD} = 90^\circ$ $PD = 3\sqrt{5}$ $AD = \sqrt{65}$ $\cos \hat{EDO} = \frac{PD}{AD}$ $\cos \hat{EDO} = \frac{3\sqrt{5}}{\sqrt{65}}$ $\hat{EDO} = 33,69 \approx 33,7^\circ$ (rounded off to ONE decimal place/<i>rond af tot EEN desimale plek</i>) OR/OF In $\triangle ABD$ $BD = 6\sqrt{5}$ $AD = \sqrt{65}$ $\cos \hat{EDO} = \frac{AD^2 + BD^2 - AB^2}{2(AD)(BD)}$ $\cos \hat{EDO} = \frac{(\sqrt{65})^2 + (6\sqrt{5})^2 - (\sqrt{65})^2}{2(\sqrt{65})(6\sqrt{5})} = \frac{3}{\sqrt{13}}$ $\hat{EDO} = 33,69 \approx 33,7^\circ$ (rounded off to ONE decimal place/<i>rond af tot EEN desimale plek</i>)	✓ $\hat{APD} = 90^\circ$ ✓ $PD = 3\sqrt{5}$ ✓ $AD = \sqrt{65}$ ✓ 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	$AC = \sqrt{(5 - (-3))^2 + (0 - 4)^2} = \sqrt{80} = 4\sqrt{5}$ $DP = \sqrt{(-2 - 1)^2 + (-4 - 2)^2} = \sqrt{45} = 3\sqrt{5}$ $\text{Area of/van } \triangle ADC = \frac{1}{2} AC \times DP$ $\therefore \text{Area of/van } \triangle ADC = \frac{1}{2} (4\sqrt{5}) \times (3\sqrt{5})$ $= 30 \text{ square units/vierkante eehede}$ OR/OF 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> $\therefore \hat{CDO} = \hat{EDO}$ (diags of rhombus bisect $\angle$s of rhombus/<i>diag van ruit halveer die $\angle$e van die ruit</i>) $\therefore \hat{ADC} = 2 \times 33,7^\circ = 67,4^\circ$ $\text{Area of/van } \triangle ADC = \frac{1}{2} \times AD \times DC \times \sin \hat{ADC}$ $\therefore \text{Area of/van } \triangle ADC = \frac{1}{2} \times (\sqrt{65}) \times (\sqrt{65}) \times \sin(67,4^\circ)$ $= 30 \text{ square units/vierkante eenhede}$	✓ length of AC/ <i>lengte van AC</i> ✓ length of DP/ <i>lengte van DP</i> ✓ correct substitution into formula/ <i>korrekte</i> <i>vervanging in</i> <i>formule</i> ✓ answer/<i>antwoord</i> ✓ $\hat{CDO} = \hat{EDO}$ ✓ $\hat{ADC} = 67,4^\circ$ ✓ substitution into formula/ <i>vervanging in</i> <i>formule</i> ✓ answer/<i>antwoord</i>	(4) [21]
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QUESTION/VRAAG 4

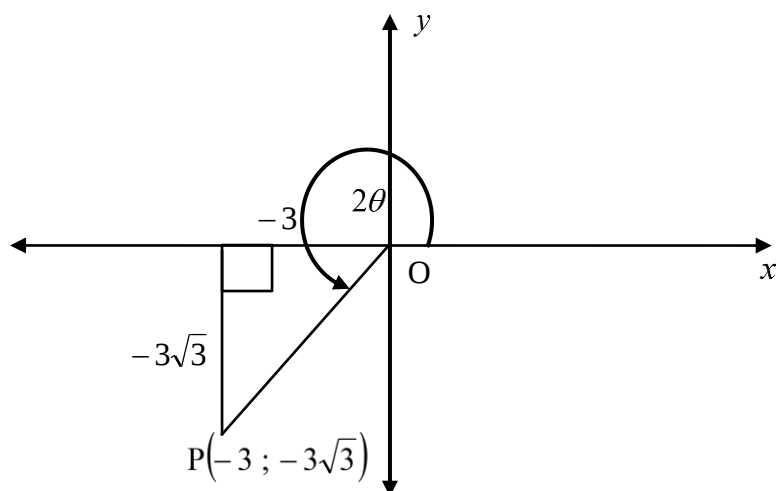


4.1	$x^2 + y^2 - 4x - 2y - 13 = 0$ $x^2 - 4x + 4 + y^2 - 2y + 1 = 13 + 4 + 1$ $(x-2)^2 + (y-1)^2 = 18$	Answer only: Full marks/ Antwoord alleenlik: Volpunte	✓ completing the square/vierkants-voltooiing ✓ $(x-2)^2 + (y-1)^2$ ✓ RHS/RK	(3)
4.2	N(2;1) $NT = \sqrt{18} = 3\sqrt{2}$ OR/OF 2,24		✓ both x and 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 → 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 $y = -x + c$ $-2 = -1(-1) + c$ $c = -3$ $y = -x - 3$ <i>radius $\perp$ tangent</i> <i>radius $\perp$ raaklyn</i>	$\checkmark m_{NT} = 1$ $\checkmark m_{QT} = -1$ $\checkmark$ substitute/vervang m and/en $T(-1; -2)$ CA from/van 4.3 $\checkmark y = -x - 3$	(6)
4.4	$NS = 3NT$ $NS^2 = 9NT^2$ $(a - 2)^2 + (b - 1)^2 = 9(\sqrt{18})^2 = 162 \dots\dots\dots (1)$ $NT \perp QT$ and/en $ST \perp QT \quad \therefore m_{ST} = m_{NT} = 1$ $\frac{b + 2}{a + 1} = 1$ $b + 2 = a + 1$ $b = a - 1 \dots\dots\dots (2)$ <i>Substitute (2) into (1)/vervang (2) in (1)</i> $(a - 2)^2 + (a - 1 - 1)^2 = 162$ $(a - 2)^2 + (a - 2)^2 = 162$ $2(a - 2)^2 = 162$ $(a - 2)^2 = 81$ $\therefore a - 2 = 9 \quad \text{or/of} \quad a - 2 = -9$ $a = 11 \quad \text{or/of} \quad a = -7$ But/maar $a < 0$ $\therefore a = -7$ $b = (-7) - 1 = -8$ $S(-7; -8)$ OR/OF	$\checkmark$ equation/vergelyking $\checkmark m_{ST} = m_{NT} = 1$ $\checkmark \frac{b + 2}{a + 1} = 1$ $\checkmark b = a - 1$ $\checkmark$ substitution/ vervang $\checkmark a = -7$ $\checkmark b = -8$	

QUESTION/VRAAG 5

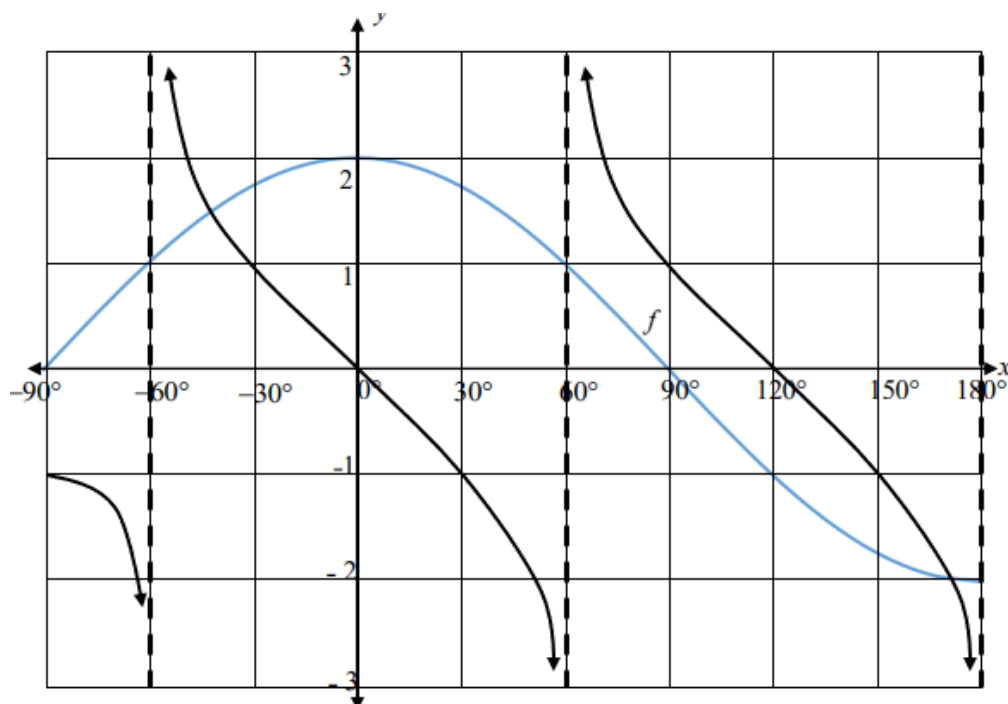
5.1



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/ <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)

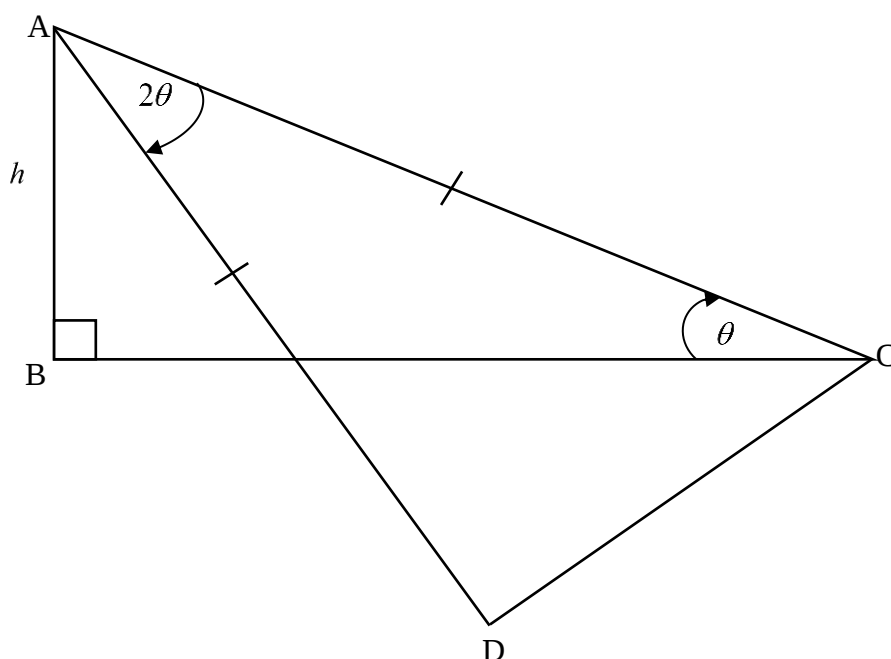
5.2	$\cos^2(180^\circ + x) + \cos(-x) \cdot \tan x \cdot \cos(90^\circ + x)$ $= \cos^2 x + \cos x \cdot \tan x \cdot (-\sin x)$ $= \cos^2 x + \cos x \cdot \frac{\sin x}{\cos x} \cdot (-\sin x)$ $= \cos^2 x - \sin^2 x$ $= \cos 2x$	$\checkmark \cos^2 x$ $\checkmark \cos x$ $\checkmark -\sin x$ $\checkmark \frac{\sin x}{\cos x}$ $\checkmark \cos^2 x - \sin^2 x$ $\checkmark \cos 2x$	(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 $\cos \theta$ / vermenigvuldiging met $\cos \theta$ $\checkmark \cos^2 \theta = 1 - \sin^2 \theta$	(3)
5.3.2	$6 \sin^2 \theta + 5 \sin \theta - 6 = 0$ $(3 \sin \theta - 2)(2 \sin \theta + 3) = 0$ $\sin \theta = \frac{2}{3}$ or/of $\sin \theta = -\frac{3}{2}$ no solution/ geen oplossing $\theta = 41,81^\circ + k \cdot 360^\circ; k \in \mathbb{Z}$ or/of $\theta = 138,19^\circ + k \cdot 360^\circ; k \in \mathbb{Z}$	$\checkmark$ factors (must indicate)/faktore (moet aandui) $\checkmark$ both values of $\sin \theta$ / albei waardes van $\sin \theta$ $\checkmark$ no solution/geen oplossing $\checkmark \theta = 41,81^\circ$ or/of $138,19^\circ$ $\checkmark + k \cdot 360^\circ; k \in \mathbb{Z}$	(5)
5.4	This question has been removed from the question paper. Do not mark this question. <i>Hierdie vraag is uit die vraestel verwyder. Moenie hierdie vraag merk nie.</i>		(0)
5.5	$\sin(3\alpha - \beta) = \frac{1}{\sqrt{2}}$ ref/verwys $\angle = 45^\circ$ $3\alpha - \beta = 180^\circ - 45^\circ$ $3\alpha - \beta = 135^\circ \dots\dots\dots(1)$ $\tan(2\alpha + \beta) = \frac{1}{\sqrt{3}}$ ref/verwys $\angle = 30^\circ$ $2\alpha + \beta = 180^\circ + 30^\circ$ $2\alpha + \beta = 210^\circ \dots\dots\dots(2)$ $5\alpha = 345^\circ$ (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/ Sien bostaande grafiek	✓ 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 $g = \frac{180^\circ}{1,5} = 120^\circ$ Answer only: Full marks/ Antwoord alleenlik: Volpunte	✓ method/metode ✓ answer/antwoord	(2)
6.3	$x \in (0^\circ; 180^\circ)$ OR/OF $0^\circ < x < 180^\circ$ If values are incorrect 0/2 Indien waardes verkeerd is 0/2	✓ values/waardes ✓ notation/notasie	(2)
6.4 CA from graph/ vanaf grafiek	$x \in (-60^\circ; -30^\circ]$ OR/OF $-60^\circ < x \leq -30^\circ$ or $x \in (60^\circ; 90^\circ]$ OR/OF $60^\circ < x \leq 90^\circ$ If values are incorrect 0/4 Indien waardes verkeerd is 0/4	✓ both values/albei waardes $-60^\circ; -30^\circ$ ✓ notation/notasie ✓ both values/albei waardes $60^\circ; 90^\circ$ ✓ notation/notasie	(4)
6.5	$h(x) = g(x - 30^\circ)$ $= -\tan\left[\frac{3}{2}(x - 30^\circ)\right]$ $= -\tan\left(\frac{3}{2}x - 45^\circ\right)$	✓ $\frac{3}{2}(x - 30^\circ)$	(2)
			[14]

QUESTION/VRAAG 7



In $\triangle ABC$: $\sin \theta = \frac{h}{AC}$ $\therefore AC = \frac{h}{\sin \theta}$ In $\triangle ACD$: $AC = AD$ $\hat{A}DC = \hat{A}CD = \frac{180^\circ - 2\theta}{2}$ [$\angle$s opp.=sides; $\angle$s of $\triangle = 180^\circ$] [$\angle$e teenoor = sye; som vd $\angle$ van $\triangle = 180^\circ$] $\therefore \hat{A}DC = 90^\circ - \theta$ $\frac{CD}{\sin 2\theta} = \frac{AC}{\sin(90^\circ - \theta)}$ $CD = \frac{AC \cdot \sin 2\theta}{\sin(90^\circ - \theta)}$ $= \frac{h}{\sin \theta} \times \frac{2 \sin \theta \cdot \cos \theta}{\cos \theta}$ $= 2h$ OR/OF	✓ AC in terms of h and θ / AC in terme van h en θ ✓ $\hat{A}DC = 90^\circ - \theta$ ✓ correct subst. into sine rule/ korrekte vervanging in sinusreël ✓ CD as subject/CD as onderwerp ✓ $\sin 2\theta = 2 \sin \theta \cos \theta$ ✓ $\sin(90^\circ - \theta) = \cos \theta$ ✓ answer/antwoord	
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In $\triangle ABC$: $\sin \theta = \frac{h}{AC}$ $\therefore AC = \frac{h}{\sin \theta}$ In $\triangle ACD$: $AC = AD$ $CD^2 = AC^2 + AD^2 - 2AC \cdot AD \cos 2\theta$ $CD^2 = \left(\frac{h}{\sin \theta}\right)^2 + \left(\frac{h}{\sin \theta}\right)^2 - 2\left(\frac{h}{\sin \theta}\right)^2 \cos 2\theta$ $CD^2 = \frac{h^2}{\sin^2 \theta} + \frac{h^2}{\sin^2 \theta} - 2\frac{h^2}{\sin^2 \theta} (1 - 2\sin^2 \theta)$ $CD^2 = 2\frac{h^2}{\sin^2 \theta} - 2\frac{h^2}{\sin^2 \theta} + 4h^2$ $CD^2 = 4h^2$ $CD = 2h$	✓ 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	$\hat{P}\hat{S}R = 106^\circ$	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	$\hat{P}_3 + \hat{P}_4 + \hat{P}_5 = 90^\circ$ $\hat{P}_3 = 90^\circ - 37^\circ - 37^\circ = 16^\circ$ OR/OF $\hat{P}\hat{O}R = 148^\circ$ $\hat{P}_3 = \hat{R}_2 = 16^\circ$	radius $\perp$ tangent/ <i>radius $\perp$ raaklyn</i> $\angle$'s around a point/ $\angle$ 'e om 'n punt $\angle$'s opposite radii/ $\angle$ 'e teenoor radiusse	$\checkmark R$ $\checkmark \hat{P}_3 = 16^\circ$ $\checkmark R$ $\checkmark \hat{P}_3 = 16^\circ$
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(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	
	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			(2)
8.2.2	$\hat{C}_2 + \hat{C}_3 + \hat{C}_4 = 90^\circ$ $\hat{D}_1 = 90^\circ - x$ $\hat{A}\hat{B}\hat{C} = 90^\circ + x$	$\angle^s$ 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	✓ S/R ✓ S ✓ S/R	
	$\hat{O}_1 = 2x$ $\hat{D}_1 = 90^\circ - x$ $\hat{A}\hat{B}\hat{C} = 90^\circ + x$	OR/OF $\angle$ 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	✓ S/R ✓ S ✓ S/R	(3)
8.2.3	$\hat{C}_3 + \hat{C}_4 = 90^\circ - x$ $\hat{A}_2 = \hat{C}_2 = x$ $\therefore \hat{A}_1 = \hat{C}_2 = x$ $\therefore AB \parallel CO$	$\angle^s$ opposite radii/ $\angle$ 'e teenoor radiusse $\angle^s$ opposite radii/ $\angle$ 'e teenoor radiusse alternate $\angle^s$ =/verwis. $\angle^e$ gelyk	✓ S/R ✓ S/R ✓ R	(3)

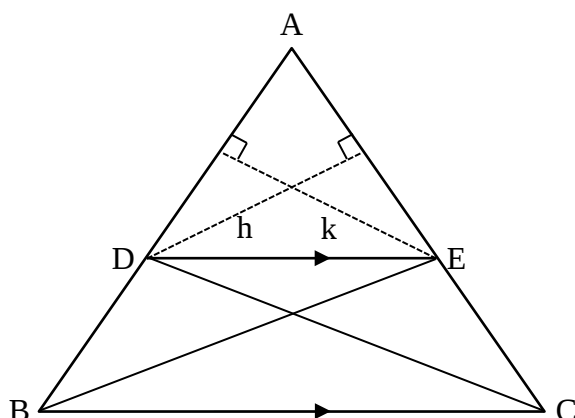
	$\hat{C}_3 + \hat{C}_4 = 90^\circ - x$ $\hat{A}_1 + \hat{A}_2 = \hat{O}_1 = 2x$ $\therefore AB \parallel CO$	$\angle^s$ opposite radii/ $\angle$ 'e teenoor radiusse $\angle$ centre = $2 \times \angle$ at circ./ <i>middelpunt</i> $\angle = 2 \times$ <i>omtrek</i> $\angle$ corresponding $\angle^s$ =/ooreenkomst.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

QUESTION/VRAAG 9

9.1.1	$\hat{F}_2 = 90^\circ$ $\hat{B}_1 + \hat{B}_2 = 90^\circ$ $\therefore \hat{F}_2 + \hat{B} = 180^\circ$ OBEF is a cyclic quad/ <i>OBEF is 'n</i> <i>koordevierhoek</i> $\hat{F}_1 = 90^\circ$ $\hat{B}_1 + \hat{B}_2 = 90^\circ$ $\therefore \hat{F}_1 = \hat{B}$	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> OR/OF 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>	$\checkmark$ S/R $\checkmark$ S/R $\checkmark$ R $\checkmark$ S/R $\checkmark$ S/R $\checkmark$ R	(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. $\angle^s$ /aangrensdde suppl. $\angle^e$ tan chord theorem/raaklyn koordstelling proved/reeds bewys sum of $\angle^s$ in $\triangle$ /som vd $\angle^e$ v $\triangle$ $\angle\angle\angle$	✓S/R	
		OR/OF		
	$\hat{D}_1 = 90^\circ$ $\hat{D}_2 = 90^\circ$ In $\triangle ADB$ and/en $\triangle BDE$ $\hat{A} = \hat{B}_2$ $\hat{D}_1 = \hat{D}_2$	$\angle$ in a semi circle/ $\angle$ in semisirkel Adj. sup. $\angle^s$ /aangrensdde suppl. $\angle^e$ tan chord theorem/raaklyn koordstelling proved/reeds bewys	✓S/R	
	$\triangle ADB \parallel \triangle BDE$	$\angle\angle\angle$	✓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	✓S ✓R	(2)
9.2	$\frac{AD}{BD} = \frac{BD}{DE}$ $BD^2 = AD \times DE$ but/maar $BD = 2OF$ $BD^2 = 4OF^2$ $4OF^2 = AD \times DE$ $OF^2 = \frac{AD \times DE}{4}$	$\triangle ADB \parallel \triangle BDE$ midpoint theorem/middelpuntstelling	✓S ✓S/R ✓S	(3)
				[11]

QUESTION/VRAAG 10



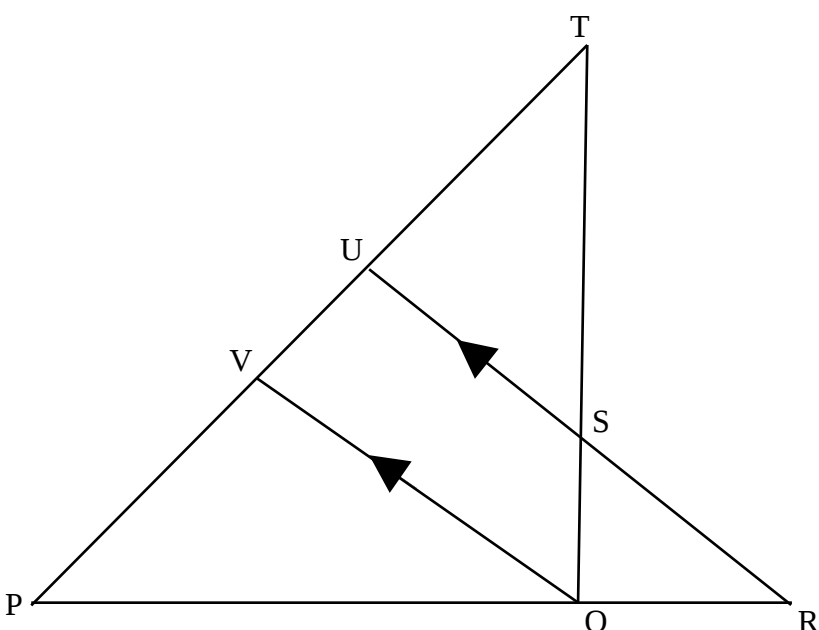
Construction must be in words or indicated on sketch. No construction – 0/5 for question.

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