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**NATIONAL
SENIOR CERTIFICATE
NASIONALE
SENIORSERTIFIKAAT**

GRADE/GRAAD 12

SEPTEMBER 2024

**MATHEMATICS P2/WISKUNDE V2
MARKING GUIDELINE/NASIENRIGLYN**

MARKS/PUNTE: 150

This marking guideline consists of 17 pages.
Hierdie nasienriglyn bestaan uit 17 bladsye.

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 a question, mark the crossed out version.
- Consistency accuracy applies in ALL aspects of the Marking Guideline. Stop marking at the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

GEOMETRY	
S	A mark for a correct statement (A statement mark is independent of a reason)
R	A mark for the correct reason. (A reason mark may only be awarded only if the statement is correct)
S/R	Award a mark if a statement AND a reason are both correct

NOTA:

- *As 'n kandidaat 'n vraag TWEEKEER beantwoord, merk slegs die EERSTE poging.*
- *As 'n kandidaat 'n poging van 'n vraag doodtrek en dit nie oordoen nie, merk die doodgetrekte poging.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die Nasienriglyn toegepas. Hou op nasien by die tweede berekeningsfout.*
- *Aanvaar van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat nie.*

MEETKUNDE	
S	<i>'n Punt vir korrekte bewering ('n Punt vir 'n bewering is onafhanklik van die rede)</i>
R	<i>'n Punt vir 'n korrekte rede ('n Punt word slegs vir die rede toegeken as die bewering korrek is)</i>
S/R	<i>Ken 'n punt toe as die bewering EN rede beide korrek is</i>



QUESTION 1/VRAAG 1

1.1	82 64 55 50 41 71 78 88 98 96 63 66 80 84 88		
1.1.1	88	✓ answer / antwoord	(1)
1.1.2	Range / Omvang = $98 - 41 = 57$	✓ answer / antwoord	(1)
1.1.3	$\bar{x} = \frac{1104}{15}$ $= 73,60$	✓ 1104 ✓ answer / antwoord	(2)
1.1.4	$\sigma = 16,30$	✓ answer / antwoord	(1)
1.1.5	$\bar{x} - \sigma = 73,60 - 16,30$ $= 57,30$ \therefore There were 3 truck drivers. <i>Daar was 3 trokbestuurders</i>	✓ $73,60 - 16,30$ ✓ $57,30$ ✓ answer / antwoord	(3)
1.2	let total mass of 8 people be x : <i>laat die totale massa van 8 mense x wees :</i> number of people to be added be k : <i>aantal mense wat by moet kom k wees :</i> $\frac{x}{8} = 75$ $x = 600$ $75k + 600 = 1000$ $\therefore k = \frac{1000 - 600}{75}$ $k = 5,333$ It will be approximately equal to 5 people <i>Dit sal ongeveer gelyk aan 5 mense wees</i>	✓ $\frac{x}{8} = 75$ ✓ mass of 8 people (600) <i>massa van 8 mense (600)</i> ✓ equation / vergelyking <i>(75k + 600 = 1 000)</i> ✓ answer / antwoord	(4)
			[12]



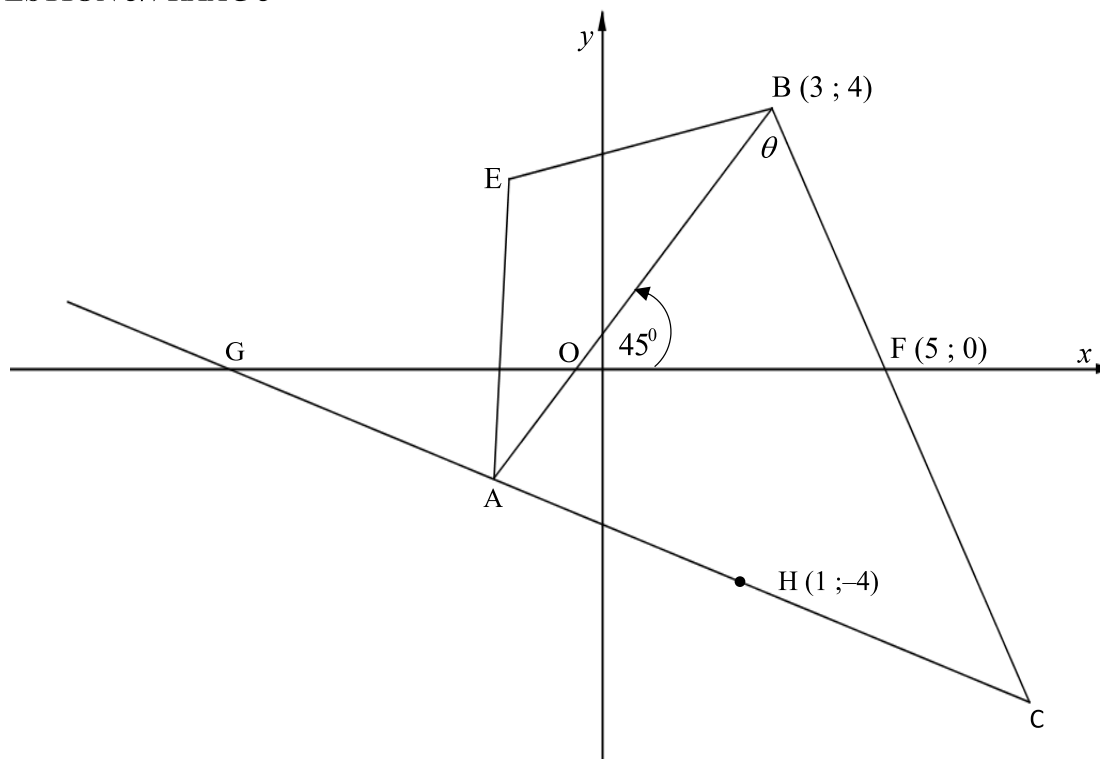
QUESTION 2/VRAAG 2

TEST A / TOETS A	39	33	35	44	37	40	24	31	30	5
TEST B / TOETS B	41	45	48	40	47	42	37	44	43	24

2.1	(44 ; 40)	✓ 44 in TEST A / TOETS A	(1)
2.2	$a = 25,48$ $b = 0,49$ $y = 25,48 + 0,49x$	✓ $a = 25,48$ ✓ $b = 0,49$ ✓ $y = 25,48 + 0,49x$	(3)
2.3	$y = 25,48 + 0,49(14)$ $= 32$	✓ correct substitution / korrekte vervanging ✓ answer / antwoord	(2)
2.4	$r = 0,79$ Strong positive correlation Sterk positiewe korrelasie	✓ $r = 0,79$ ✓ comment / kommentaar (opmerking)	(2)
			[8]



QUESTION 3/VRAAG 3

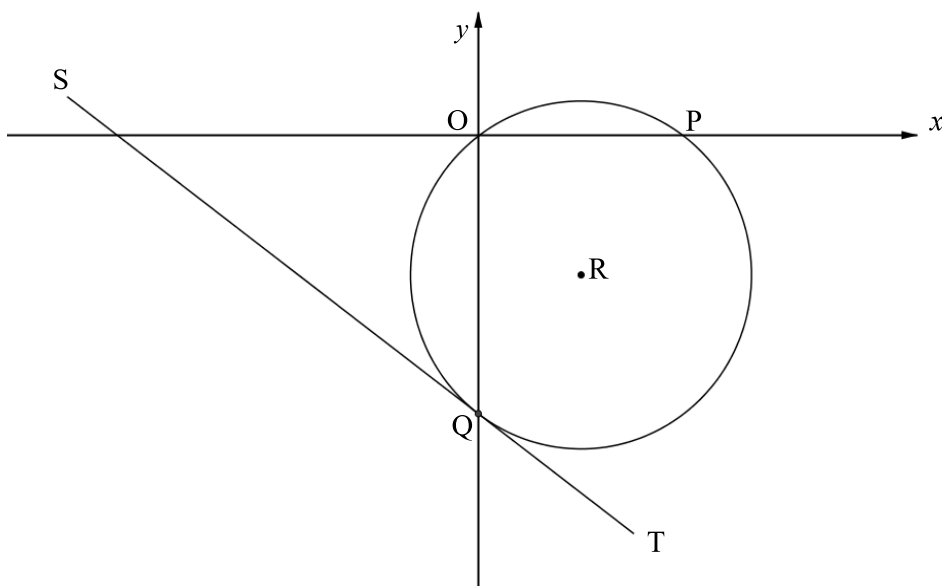


3.1	$BF = \sqrt{(3-5)^2 + (4-0)^2}$ $= \sqrt{20}$	✓ correct substitution korrekte vervanging ✓ answer / antwoord	(2)
3.2	$m_{BF} = \frac{4-0}{3-5}$ $= -2$	✓ correct substitution korrekte vervanging ✓ answer / antwoord	(2)
3.3	$\tan \alpha = -2$ $\alpha = 116,57^\circ$ $\theta = 116,57^\circ - 45^\circ = 71,57^\circ \quad [\text{ext } \angle \text{ of a } \Delta]$	✓ $\tan \alpha = m_{BF} = -2$ ✓ $\alpha = 116,57^\circ$ ✓ $\theta = 71,57^\circ$	(3)
3.4	$\tan 45^\circ = m_{AB} = 1$ $m_{HF} = \frac{1-5}{-4-0}$ $= 1$ $\therefore HF \parallel AB \quad [m_{AB} = m_{HF} = 1]$	✓ $m_{AB} = 1$ ✓ correct substitution/ korrekte vervanging ✓ $m_{HF} = 1$ ✓ Reason /Rede [$m_{AB} = m_{HF}$]	(4)



3.5	Kite / Vlieër	✓ answer / antwoord	(1)
3.6	$\frac{HC}{AH} = \frac{FC}{BF}$ [line/lyn to one side of a Δ / aan een sy van Δ] $\frac{2}{1} = \frac{FC}{2\sqrt{5}}$ $FC = 4\sqrt{5}$ $BC = 4\sqrt{5} + 2\sqrt{2} = 6\sqrt{5}$ $AC = 6\sqrt{5}$ [adj. sides of a kite / aangr. sye van vlieër]	✓ correct ratio / korrekte verhouding ✓ correct substitution korrekte vervanging ✓ FC ✓ AC = BC	(4)
3.7	$\hat{B} = \hat{A} = 71,57^\circ$ [\angle s opp = sides / \angle eteenoor = sye] $\therefore \hat{C} = 36,87^\circ$ Area of/van AOFC = Area of/van ΔABC – Area of/van ΔOBF $= \frac{1}{2} \times 6\sqrt{5} \times 6\sqrt{5} \times \sin 36,87^\circ - 12$ $= 42$	✓ $\hat{C} = 36,87^\circ$ ✓ Area of/van ΔABC ✓ answer / antwoord	(3)
			[19]

QUESTION 4/VRAAG 4



4.1.1	$y = -\frac{3}{4}(0) - 8$ $= -8$ $Q(0; -8)$	✓ $x = 0$ ✓ y- coordinate / y-koördinaat	(2)
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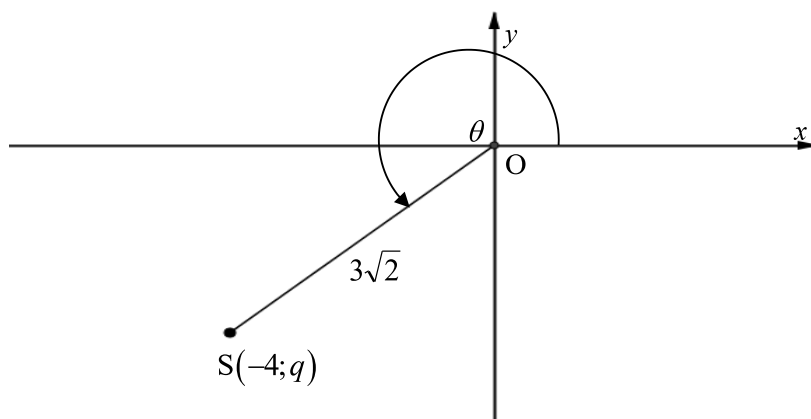


4.1.2	$m_{QR} = \frac{4}{3}$ [tan \perp rad / raakl \perp rad] $y + 8 = \frac{4}{3}(x - 0)$ $y = \frac{4}{3}x - 8$	✓ m_{QR} ✓ substituting m_{QR} and $Q(0; -8)$ vervanging m_{QR} en $Q(0; -8)$ ✓ equation / vergelyking	(3)
4.1.3	$\frac{4}{3}x - 8 = 0$ $x = 6$ $P(6; 0)$	✓ $y = 0$ ✓ $x = 6$	(2)
4.1.4	$x_R = \frac{0+6}{2}; y_R = \frac{-8+0}{2}$ $x_R = 3; y_R = -4$	✓ correct substitution korrekte vervanging ✓ $x_R = 3$ ✓ $y_R = -4$	(3)
4.1.5	$r^2 = (0-3)^2 + (-8+4)^2$ $= 25$ $(x-3)^2 + (y+4)^2 = 25$	✓ correct substitution korrekte vervanging ✓ $r^2 = 25$ ✓ equation / vergelyking	(3)
4.1.6	$k = -4 + 5$ or / of $k = -4 - 5$ $k = 1$ or / of $k = -9$	✓ method / metode ✓ $k = 1$ ✓ $k = -9$	(3)
4.2	$(x - \sin \theta)^2 + (y + 2 \sin \theta)^2 = -2 + \sin^2 \theta + 4 \sin^2 \theta$ $r^2 = -2 + 5 \sin^2 \theta$ For any value of θ maximum of $\sin^2 \theta = 1$ Vir enige waarde van θ is maksimum van $\sin^2 \theta = 1$ $\therefore r = \sqrt{-2 + 5(1)}$ $= \sqrt{3}$	✓ $(x - \sin \theta)^2 + (y + 2 \sin \theta)^2$ ✓ $r^2 = -2 + 5 \sin^2 \theta$ ✓ maximum of $\sin^2 \theta = 1$ maksimum van $\sin^2 \theta = 1$ ✓ $r = \sqrt{-2 + 5(1)}$ ✓ answer / antwoord	(5)
			[21]



QUESTION 5/VRAAG 5

5.1

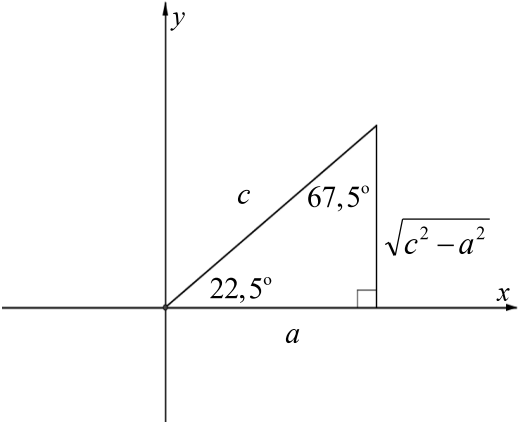


5.1.1	$q = -\sqrt{(3\sqrt{2})^2 - (-4)^2}$ <i>Pyth</i> $= -\sqrt{2}$	✓ correct substitution/ <i>korrekte vervanging</i> ✓ answer / <i>antwoord</i>	(2)
5.1.2	$\sin(\theta + 45^\circ) = \sin \theta \cdot \cos 45^\circ + \cos \theta \sin 45^\circ$ $= \frac{-\sqrt{2}}{3\sqrt{2}} \cdot \frac{\sqrt{2}}{2} + \left(\frac{-4}{3\sqrt{2}}\right) \cdot \frac{\sqrt{2}}{2}$ $= \frac{-1 - 2\sqrt{2}}{3\sqrt{2}}$	✓ expansion / <i>vergelyking</i> ✓ ratios of / <i>verhoudings van</i> $\sin \theta$ & $\cos \theta$ ✓ special angles / <i>spesiale hoeke</i> ✓ answer / <i>antwoord</i>	(4)
5.1.3	$\cos(2\theta - 360^\circ) = \cos 2\theta$ $= 2\cos^2 \theta - 1$ $= 2\left(\frac{-4}{3\sqrt{2}}\right)^2 - 1$ $= \frac{7}{9}$	✓ $\cos 2\theta$ ✓ identity / <i>identiteit</i> ✓ ratio of / <i>verhouding van</i> $\cos \theta$ ✓ answer / <i>antwoord</i>	(4)
5.2	$\frac{\sin(90^\circ - \theta) \cdot \cos 480^\circ + \cos(180^\circ - \theta) \cdot \tan 45^\circ}{\cos \theta \cdot \sin 390^\circ - \tan 180^\circ}$ $= \frac{\cos \theta \cdot (-\cos 60^\circ) + (-\cos \theta)(\tan 45^\circ)}{\cos \theta (\sin 30^\circ) - \tan 180^\circ}$ $= \frac{-\frac{1}{2} \cos \theta - \cos \theta(1)}{\cos \theta \left(\frac{1}{2}\right) - 0}$ $= \frac{-\frac{3}{2} \cos \theta}{\frac{1}{2} \cos \theta}$ $= -3$	✓ $\cos \theta$ ✓ $-\cos 60^\circ$ ✓ $\sin 30^\circ$ ✓ special angles / <i>spesiale hoeke</i> ✓ answer / <i>antwoord</i>	(5)



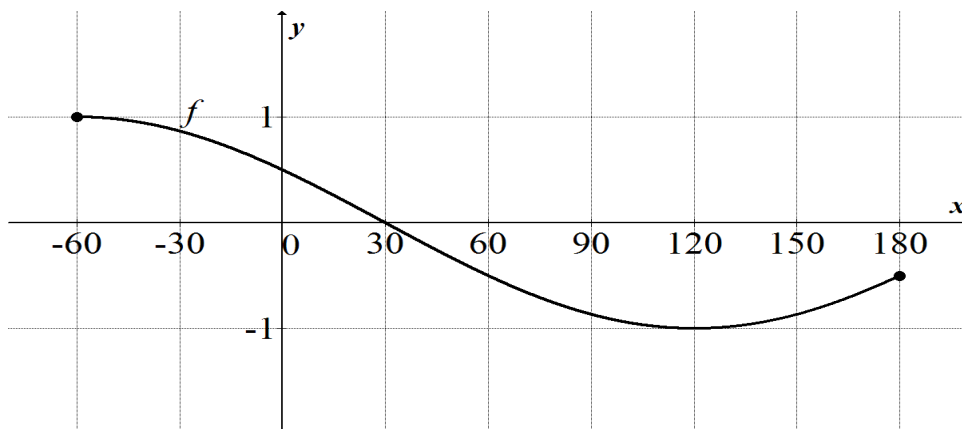
5.3	$\begin{aligned} \text{LHS} / \text{LK} &= \frac{\cos x}{\sin 2x} - \frac{\cos 2x}{2 \sin x} \\ &= \frac{2 \sin x \cos x - \cos 2x \sin 2x}{2 \sin 2x \sin x} \\ &= \frac{\sin 2x - \cos 2x \sin 2x}{2 \sin 2x \sin x} \\ &= \frac{\sin 2x(1 - \cos 2x)}{2 \sin 2x \sin x} \\ &= \frac{1 - (1 - 2 \sin^2 x)}{2 \sin x} \\ &= \frac{2 \sin^2 x}{2 \sin x} \\ &= \sin x \end{aligned}$	<ul style="list-style-type: none"> ✓ simplification / vereenvoudiging ✓ $\sin 2x$ ✓ common factor / gemene faktor ✓ identity / identiteit $1 - 2 \sin^2 x$ ✓ $\frac{2 \sin^2 x}{\sin x}$ 	(5)
5.4.1	$\begin{aligned} \frac{\cos 60^\circ}{\sin x} - \frac{\sin 60^\circ}{\cos x} &= 2 \\ \frac{\cos 60^\circ \cos x - \sin 60^\circ \sin x}{\sin x \cos x} &= 2 \\ \cos(x + 60^\circ) &= 2 \sin x \cos x \\ \cos(x + 60^\circ) &= \sin 2x \\ \cos(x + 60^\circ) &= \cos(90^\circ - x) \end{aligned}$	<ul style="list-style-type: none"> ✓ simplification / vereenvoudiging ✓ $\cos(x + 60^\circ)$ ✓ $\sin 2x$ 	(3)
5.4.2	$\begin{aligned} \cos(x + 60^\circ) &= \cos(90^\circ - 2x) \\ x + 60^\circ &= \pm(90^\circ - 2x) + 360^\circ.k \\ x + 60^\circ &= 90^\circ - 2x + 360^\circ.k \quad \text{or / of} \quad x + 60^\circ = -90^\circ + 2x + 360^\circ.k \\ 3x &= 30^\circ + 360^\circ.k \quad \text{or / of} \quad -x = -120^\circ + 360^\circ.k \\ x &= 10^\circ + 120^\circ.k \quad \text{or / of} \quad x = 120^\circ - 360^\circ.k, k \in \mathbb{Z} \\ \mathbf{OR / OF} \\ x + 60^\circ &= 90^\circ - 2x + 360^\circ.k \quad \text{or / of} \quad x + 60^\circ = 360^\circ - 90^\circ + 2x + 360^\circ.k \\ 3x &= 30^\circ + 360^\circ.k \quad \text{or / of} \quad -x = 240^\circ + 360^\circ.k \\ x &= 10^\circ + 120^\circ.k \quad \text{or / of} \quad x = -240^\circ - 360^\circ.k, k \in \mathbb{Z} \end{aligned}$	<ul style="list-style-type: none"> ✓ $x + 60^\circ = 90^\circ - 2x$ ✓ $\left[\begin{array}{l} 3x = 30^\circ + 360^\circ.k \\ \text{or / of} \\ -x = -120^\circ + 360^\circ.k \end{array} \right]$ ✓ $\left[\begin{array}{l} x = 10^\circ + 120^\circ.k \\ \text{or / of} \\ x = 120^\circ - 360^\circ.k \end{array} \right]$ ✓ $360^\circ.k, k \in \mathbb{Z}$ 	(4)



<p>5.5</p>	<p>$y = \sqrt{c^2 - a^2}$ Pyth Theorem / <i>Stelling</i></p>  <p>$\frac{\sqrt{2}}{2} = \sin 45^\circ$ $= 2 \sin 22,5^\circ \cos 22,5^\circ$ $= 2 \cdot \frac{\sqrt{c^2 - a^2}}{c} \cdot \frac{a}{c}$ $= 2 \cdot \frac{\sqrt{a^2 + b^2 - a^2}}{c} \cdot \frac{a}{c}$ $= \frac{2ab}{c^2}$</p>	<p>✓ $y = \sqrt{c^2 - a^2}$ Pyth Theorem / <i>Stelling</i></p> <p>OR/OF correct diagram/ <i>korrekte diagram</i></p> <p>✓ $\sin 45^\circ$ ✓ $2 \sin 22,5^\circ \cdot \cos 22,5^\circ$ ✓ substitution / <i>vervanging</i> ✓ c^2 i.t.o./ <i>i.t.v</i> a^2 & b^2</p>	<p>(5)</p>
			<p>[32]</p>

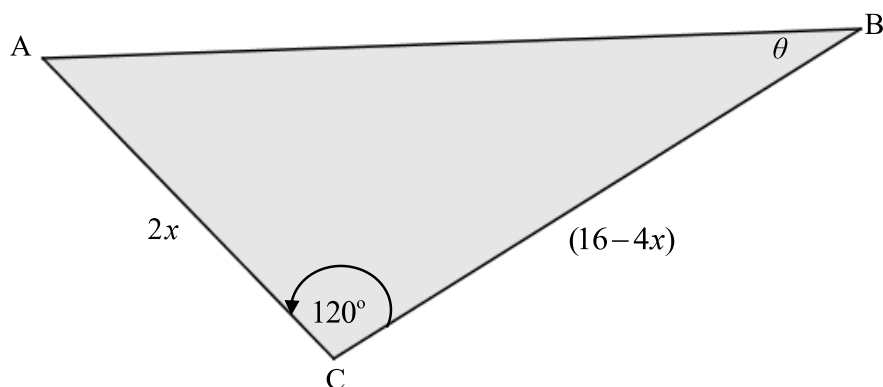


QUESTION 6/VRAAG 6



6.1	Period / Periode is 360°	✓ answer / antwoord	(1)
6.2	Min value / waarde = -1	✓ answer / antwoord	(1)
6.3	$-1 \leq y \leq 1$ $-1+1 \leq y \leq 1+1$ $0 \leq y \leq 2$	✓ correct critical values korrekte kritieke waardes ✓ correct notation / korrekte notasie	(2)
6.4	$120^\circ < x < 180^\circ$	✓ correct critical values korrekte kritieke waardes ✓ correct notation / korrekte notasie	(2)
6.5	$g(x) = -\sin(x - 30^\circ - 60^\circ)$ $= -\sin(x - 90^\circ)$ $= -\cos x$	✓ $(-\sin x - 30^\circ - 60^\circ)$ ✓ $\sin(x - 90^\circ)$ ✓ $-\cos x$	(3)
6.6		✓ intercepts with the axes afsnitte met die asse ✓ turning points / draaipunte ✓ shape / vorm	(3)
			[12]

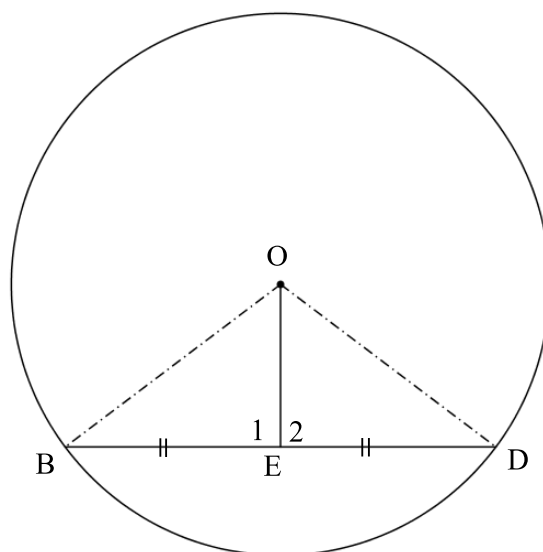
QUESTION 7 / VRAAG 7



7.1	$A \text{ of } \triangle ABC = \frac{1}{2} \times 2x \times (16-4x) \times \sin 120^\circ$ $= (16x - 4x^2) \times \sin 60^\circ$ $= 8\sqrt{3}x - 2\sqrt{3}x^2$	✓ correct substitution / <i>korrekte vervanging</i> ✓ $\sin 60^\circ$ ✓ answer / <i>antwoord</i>	(3)
7.2	$A' = 0$ $8\sqrt{3} - 4\sqrt{3}x = 0$ $x = 2$	✓ derivative / <i>afgeleide</i> = 0 ✓ $8\sqrt{3} - 4\sqrt{3}x$ ✓ answer / <i>antwoord</i>	(3)
			[6]



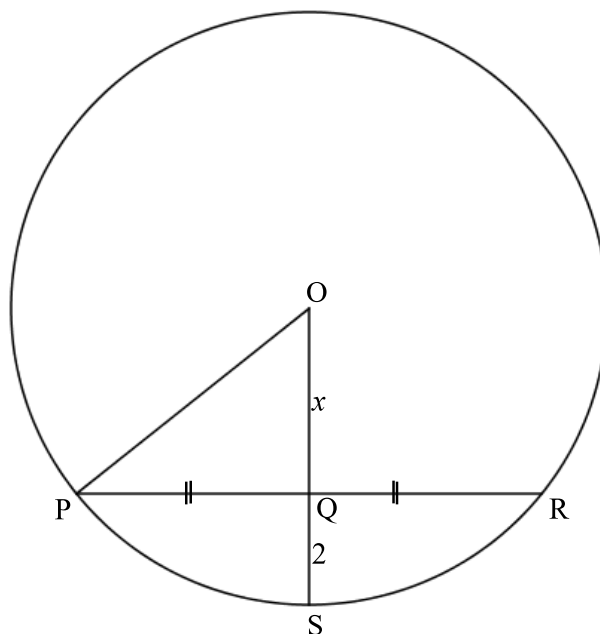
QUESTION 8/VRAAG 8



8.1	<p>Construction: Draw DO and OB Proof: In $\triangle ODE$ and $\triangle OEB$ $DE = EB$ [given] $OD = OB$ [radii] $OE = OE$ [common] $\therefore \triangle ODE \equiv \triangle OEB$ [SSS] $\hat{E}_1 + \hat{E}_2 = 180^\circ$ [\angles on str line] $\therefore \hat{E}_1 = \hat{E}_2 = 90^\circ$ [$\triangle ODE \equiv \triangle OEB$]</p> <p><i>Konstruksie:</i> Trek DO en OB <i>Bewys:</i> In $\triangle ODE$ en $\triangle OEB$ $DE = EB$ [gegee] $OD = OB$ [radiusse] $OE = OE$ [gemeen] $\therefore \triangle ODE \equiv \triangle OEB$ [SSS] $\hat{E}_1 + \hat{E}_2 = 180^\circ$ [\angle op reguitlyn] $\therefore \hat{E}_1 = \hat{E}_2 = 90^\circ$ [$\triangle ODE \equiv \triangle OEB$]</p>	<p>✓ construction</p> <p>✓ first statement (radii)</p> <p>✓ other 2 statements</p> <p>✓ reason for congruency</p> <p>✓ R</p> <p>✓ konstruksie</p> <p>✓ eerste stelling (radiusse)</p> <p>✓ ander 2 stellings</p> <p>✓ rede vir kongruensie</p> <p>✓ R</p>	(5)
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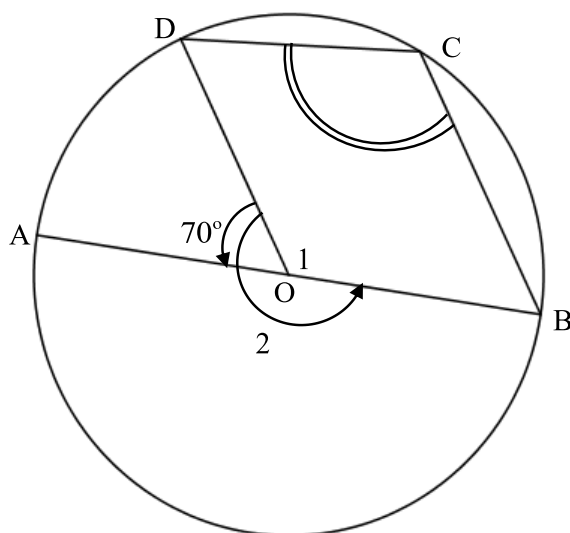
8.2



8.2.1	$\widehat{OQP} = 90^\circ$ [line from centre to the midpoint] [lyn vanaf middelpunt van sirkel na middelpunt van koord]	✓S ✓R	(2)
8.2.2	$PQ = 4$ $OP^2 = PQ^2 + OQ^2$ [Pyth] $(x+2)^2 = 4^2 + x^2$ $x^2 + 4x + 4 = 16 + x^2$ $4x = 12$ $x = 3$ $OP = OS = 5$ [radii / radiusse]	✓ PQ ✓ substitution into Pythagoras <i>vervanging in Pythagoras</i> ✓ simplification / <i>vereenvoudiging</i> ✓ x-value /x-waarde ✓ PO	(5)
			[12]

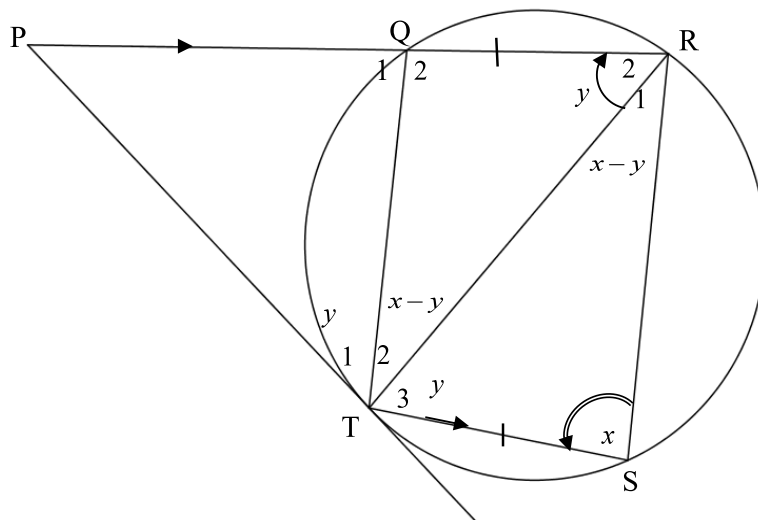


QUESTION 9/VRAAG 9



9.1	$\hat{O}_1 = 110^\circ$	[\angle s on a str. line / \angle e opreguitlyn]	\checkmark S/R	
	$\hat{O}_2 = 250^\circ$	[\angle s around a point / \angle e om 'n punt]	\checkmark S \checkmark R	
	$\therefore \hat{C} = 125^\circ$	[\angle at centre = $2 \times \angle$ at circumf] [Middelpunts $\angle = 2 \times$ Omtreks \angle]	\checkmark S \checkmark R	
				(5)

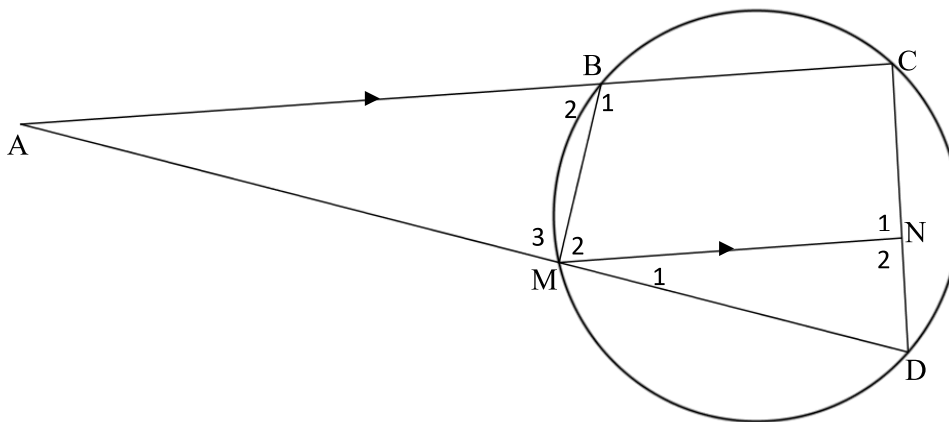
9.2



9.2.1	$\hat{T}_1 = y$ [tan chord theorem / raaklyn koord Stelling] $\hat{T}_3 = y$ [alt \angle s / verw. \angle e, $PR \parallel TS$]	✓ S ✓ R ✓ S ✓ R	(4)
9.2.2	$\hat{T}_2 = \hat{R}_1$ [\angle s subt by equal chords / \angle e onderspan deur gelyke koorde]	✓ S ✓ R	(2)
9.2.3	$\hat{T}_2 = x - y$ [ext. \angle of a Δ / buite \angle van 'n Δ] $\hat{R}_1 = \hat{T}_2 = x - y$ [proved / bewys] $y + x - y + x = 180^\circ$ [\angle s in ΔTRS / \angle e in ΔTRS] $2x = 180^\circ$ $x = 90^\circ$ $\therefore TR$ is the diameter of the circle [chord subt. 90°] <i>TR is die middellyn van die sirkel [koord onderspan 90°]</i>	✓ S ✓ S/R ✓ $x = 90^\circ$ ✓ R	(4)
			[15]

QUESTION 10 / VRAAG 10

AC = 36 units/eenhede, AD = 48 units/eenhede and/en BM = 24 units/eenhede



10.1	$\hat{A} = \hat{A}$ [common / <i>gemeen</i>] $\hat{B}_2 = \hat{D}$ [ext \angle of a cyclic quad / <i>buite \angle van koordev.</i>] $\hat{M}_3 = \hat{C}$ [ext \angle of a cyclic quad / <i>buite \angle van koordev.</i>] or / of [<i>3^{rd/de} \angle</i>] $\Delta ABM \parallel \Delta ADC$ [$\angle \angle \angle$]	\checkmark S \checkmark S \checkmark R \checkmark R 3 rd angle/ <i>3^{de} hoek</i> OR/OF \checkmark R $\angle \angle \angle$	(4)
10.2	$\frac{BM}{DC} = \frac{AM}{AC}$ [$\parallel \Delta$ s] but/ <i>maar</i> AM = DC [given / <i>gegee</i>] $\frac{BM}{DC} = \frac{DC}{AC}$ $CD^2 = BM \times AC$	\checkmark S \checkmark R \checkmark AM = DC	(3)
10.3	$CD^2 = 24 \times 36 = 864$ $\frac{CN}{CD} = \frac{AM}{AD}$ [line \parallel to one side of a Δ] [<i>lyn \square aan een sy van 'n Δ</i>] $AM = CD$ $CN = \frac{CD^2}{AD}$ $= \frac{864}{48}$ $= 18$	\checkmark length of CD^2 <i>lengte van CD^2</i> \checkmark S \checkmark R \checkmark CN in terms of CD^2 <i>CN in terme van CD^2</i> \checkmark correct substitution <i>korrekte vervanging</i> \checkmark length of CN <i>lengte van CN</i>	(6)
			[13]
TOTAL/TOTAAL:			150

