Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 12

SEPTEMBER 2022

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

MARKS/*PUNTE*: 150

This marking guideline consists of 16 pages./
Hierdie nasienriglyn bestaan uit 16 bladsye.

QUESTION 1/*VRAAG 1*

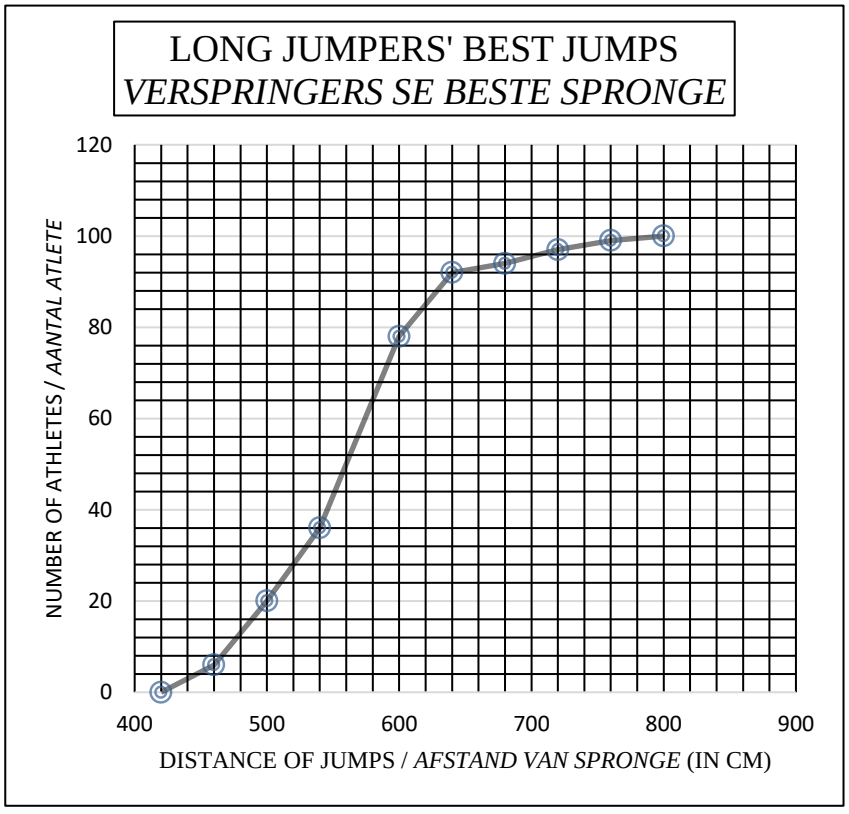
1.1

Distance of Jumps *Afstand van Sponge* **(in cm)**	**Number of athletes** *Aantal atlete*	**CF** *KF*
420 < d ≤ 460	6	6
460 < d ≤ 500	14	20
500 < d ≤ 540	16	36
540 < d ≤ 580	42	78
580 < d ≤ 620	14	92
620 < d ≤ 660	2	94
660 < d ≤ 700	3	97
700 < d ≤ 740	2	99
740 < d ≤ 780	1	100

✓ for cf [6 to 92] *vir kf* [6 *tot* 92]
✓ for cf [94 to 100] *vir kf* [94 *tot* 100]

(2)

1.2



✓ anchor point *ankerpunt*
✓ upper limits *boonste limiete*
✓ sf /
✓ smooth shape *egalige vorm*

(4)

1.3

The median jump is 553. Accept between (551 – 555)
Die mediaan sprong is 553. *Aanvaar tussen* (551 – 555)

✓✓ for answer *vir antwoord*

(2)

1.4

Number jumped over 560 cm = 100 – 57 = 43 athletes
Therefore, it is 43% of the athletes.
Aantal wat oor 560 cm *gespring het* = 100 – 57 = 43 *atlete*
Dit is daarom 43% *van die atlete*.

✓ for subtraction *vir aftrekking*
✓ for the answer *vir die antwoord*

(2)

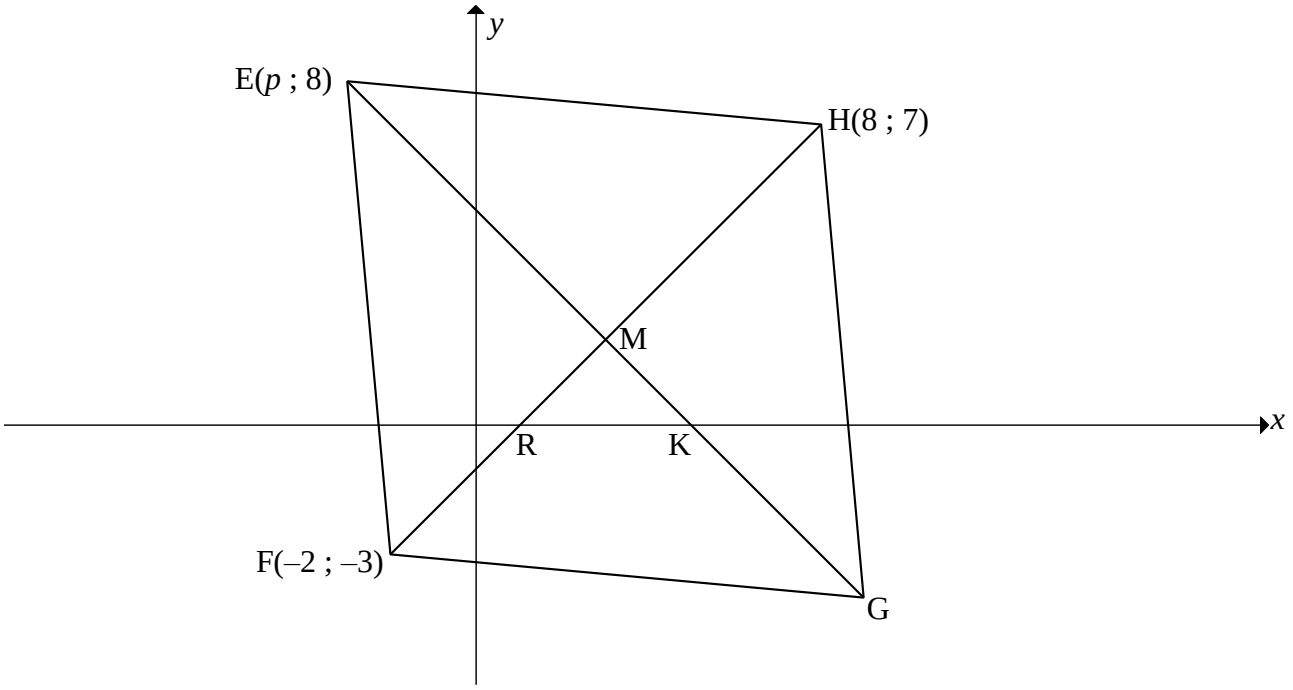
[10]

QUESTION 2/*VRAAG 2*

Long jumper / *Verspringer*	1	2	3	4	5	6
x*: Hours practised / *Ure geoefen	4,5	2	3,5	4	8	3
***y*: Distance jumped / *Afstand gespring* (cm)**	650	420	580	490	780	525

2.1	a = 336,699 b = 56,992 $\hat{y}$ = 336,699 + 56,992*x*	✓ for/*vir* a ✓ for/*vir* b ✓ for/*vir* a + b*x*	(3)
2.2	$\hat{y}$ = 336,699 + 56,992 (5.4) = 644, 46 cm	✓ for substitution *vir vervanging* ✓ for the answer *vir die antwoord*	(2)
2.3	The more they practiced, the further they jumped. Strong positive correlation. *Hoe meer hulle geoefen het, hoe verder het hulle gespring.* *Sterk positiewe korrelasie.*	✓✓ for the answer *vir die antwoord*	(2)
2.4.1	The mean will decrease by 13 cm. *Die gemiddelde sal met 13 cm verminder.*	✓ for the answer *vir die antwoord*	(1)
2.4.2	The range will remain the same / No influence on range. *Die omvang sal dieselfde bly / Geen invloed op die omvang.*	✓ for the answer *vir die antwoord*	(1)
2.4.3	The standard deviation remains the same. *Die standaardafwyking bly dieselfde.*	✓ for the answer *vir die antwoord*	(1)
			[10]

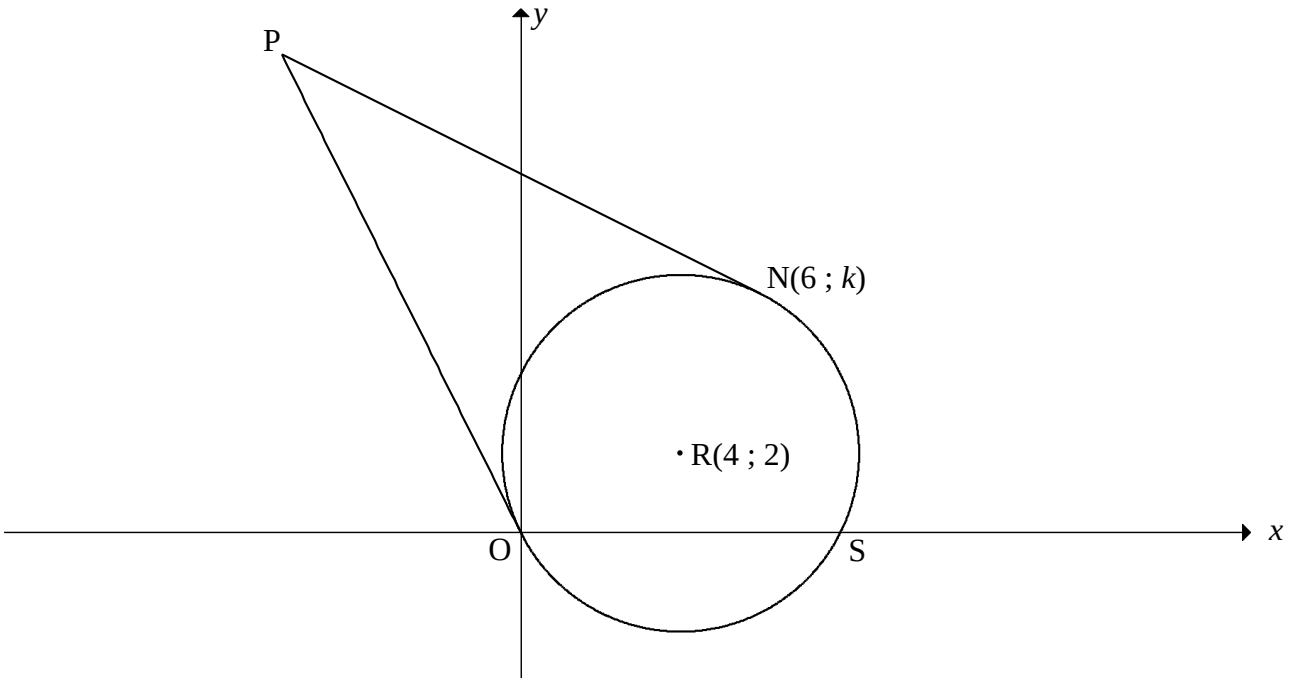
QUESTION 3/*VRAAG 3*



3.1.1	M (3; 2)	✓ for/*vir x* ✓for/*vir y*	(2)
3.1.2	$m_{FH} = \frac{7-(-3)}{8-(-2)} = 1$	✓ for subst. / *vir vervanging* ✓ for answer / *vir antwoord*	(2)
3.1.3	$m_{EG} = -1$ (diagonals bisect at 90°) (*hoeklyne halveer loodreg/by 90˚*) $\tan M\hat{K}X = -1$ $M\hat{K}X = 135^{\circ}$ $\therefore M\hat{K}R = 45^{\circ}$	✓ S ✓ S ✓ $M\hat{K}X = 135^{\circ}$ ✓ for answer / *vir antwoord*	(4)

3.2	FE = EH (sides of a rhombus =) (*sye van 'n rombus* =) $FE^2 = EH^2$ $(p+2)^2+(8+3)^2=(p-8)^2+(8-7)^2$ $p^2+4p+4+121=p^2-16p+64+1$ $20p=-120$ $p=-3$ **OR/*OF*** E(p; 8) and Midpoint of HF / *en Middelpunt van* HF = (3; 2) $m_{FH}=1$ gradient from E to midpoint of FH / *gradiënt vanaf* E *na middelpunt van* FH $=\frac{8-2}{p-3}=\frac{6}{p-3}$ FH is perpendicular to EG / FH *is loodreg op* EG $\therefore \frac{6}{p-3}\times 1=-1$ $\therefore p=-3$	✓ for equating / *gelykstel* $FE^2 = EH^2$ ✓ for squaring / *kwadrering* ✓ for simplification *vir vereenvoudiging* ✓ for the answer *vir die antwoord* **OR/*OF*** ✓ for gradient of E to FH *vir gradiënt van* E *na* FH ✓ statement / *stelling* ✓ for the product *vir die produk* ✓ for the answer *vir die antwoord*	(4)
3.3	G(9; – 4)	✓ for/*vir x* ✓for/*vir y*	(2)
3.4	M(3 ;2) N(-9 ;2) MN = 12 units/eenhede	✓ for coordinates of N *vir die koördinate van* N ✓✓ for answer / *vir antwoord*	(3)
			[17]

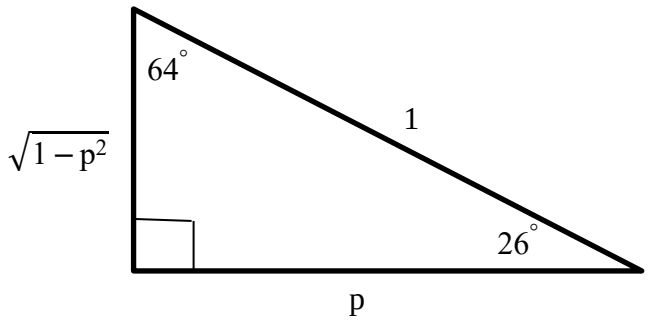
QUESTION/*VRAAG 4*



4.1	$r^2 = (4-0)^2 + (2-0)^2$ $r^2 = 20$ $\therefore (x-4)^2 + (y-2)^2 = 20$	✓ substitution / *vervanging* ✓ for/*vir* r^2 ✓ for the equation/*vir die* vergelyking	(3)
4.2	$(6-4)^2 + (k-2)^2 = 20$ $(k-2)^2 = 16$ $k - 2 = \pm 4$ $k = 6$ or/of $k = -2$ $k = 6$ **OR/*OF*** Sub: N(6; y) into the equation of the circle. *Verv.* N(6; *y*) *in die vergelyking van die sirkel*. $(6-4)^2 + (y-2)^2 = 20$ $4 + y^2 - 4y + 4 - 20 = 0$ $y^2 - 4y - 12 = 0$ $(y-6)(y+2) = 0$ $y = 6$ or/*of* $y = -2$ $\therefore y = 6$	✓ substitution of / *vervanging van* N ✓ simplification / *vereenvoudiging* ✓ both answers for k / *beide antwoorde vir k* ✓ selection of $k = 6$ *keuse van k* = 6 **OR/*OF*** ✓ for substitution / *vir vervanging* ✓ for standard form / *vir standaardvorm* ✓ for the factors / *vir die faktore* ✓ for the answer / *vir die antwoord*	(4)

4.3	$m_{RN} = \frac{6-2}{6-4} = 2$ $m_{NP} = -\frac{1}{2}$ Equation of NP / *Vergelyking van* NP: $y-6 = -\frac{1}{2}(x-6)$ $y = -\frac{1}{2}x+9$	✓ for gradient of RN *vir gradiënt van* RN ✓ for gradient of NP *vir gradiënt van* NP ✓ for substitution of N *vir vervanging van* N ✓ for/*vir* $c = 9$ ✓ for answer / *vir antwoord*	(5)
4.4.1	$-2x = -\frac{1}{2}x+9$ $-\frac{3}{2}x = 9$ $-3x = 18$ $\therefore x = -6$ and/*en* $y = 12$ $\therefore$ P$(-6; 12)$	✓ for equating / *vir gelykstelling* ✓ for the simplification *vir die vereenvoudiging* ✓ for the answer / *vir die antwoord*	(3)
4.4.2	RO = RN = $\sqrt{4^2+2^2} = 2\sqrt{5}$ (radii/*radiusse*) PO = PN = $\sqrt{(-6)^2+12^2} = 6\sqrt{5}$ (tangents from same pt) *(raaklyne vanaf dieselfde punt)* $\therefore$ Perimeter of /*Omtrek van* PNRO = $2(2\sqrt{5}) + 2(6\sqrt{5})$ $= 16\sqrt{5}$ or/*of* 35,78 units/*eenhede*	✓ use of distance formula *gebruik van afstand formule* ✓ for RO / RN answer *vir* RO / RN *antwoord* ✓ for PO / PN answer *vir* PO / PN *antwoord* ✓ for final answer *vir finale antwoord*	(4)
4.5	S$(8;0)$ T$(12;-2)$	✓✓ coordinates of S *koördinate van* S ✓✓ coordinates of T *koördinate van* T	(4)
			[23]

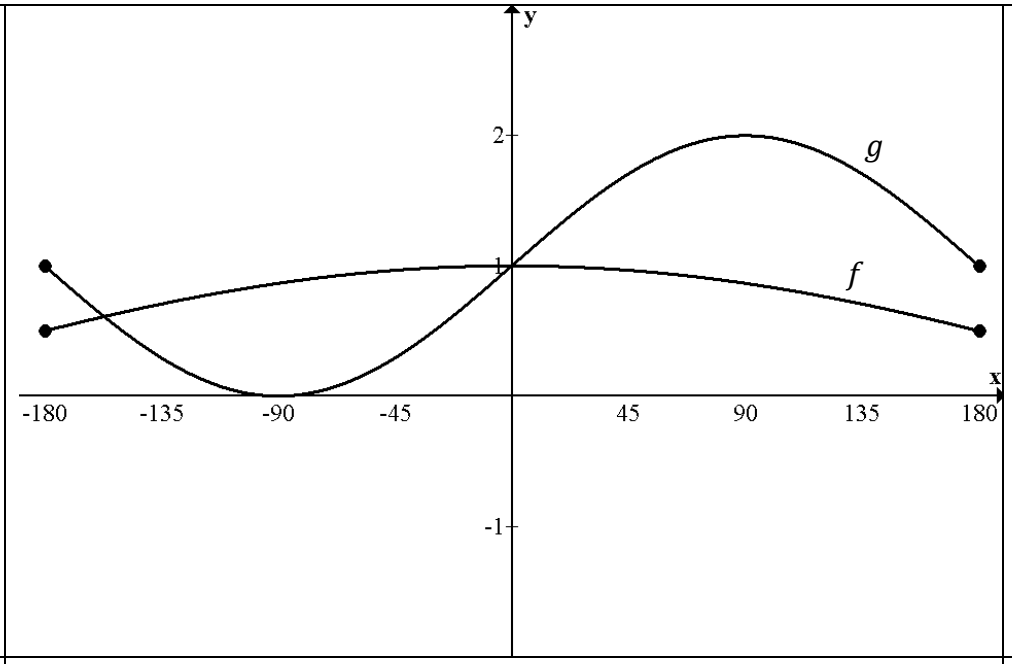
QUESTION 5/*VRAAG 5*



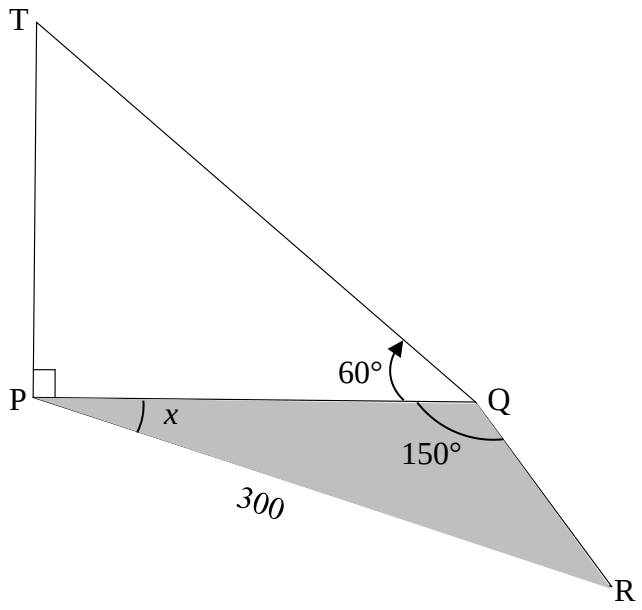
5.1.1	$\sin 26^\circ = \frac{\sqrt{1-p^2}}{1}$	✓✓ for the answer *vir die antwoord*	(2)
5.1.2	$\tan 154^\circ$ $= -\tan 26^\circ$ $= -\frac{\sqrt{1-p^2}}{p}$	✓✓ for the reduction *vir die reduksie* ✓ for the answer *vir die antwoord*	(3)
5.1.3	$\sin 13^\circ . \cos 13^\circ$ $\sin 26^\circ = 2\sin 13^\circ . \cos 13^\circ$ $\sin 13^\circ . \cos 13^\circ = \frac{\sin 26^\circ}{2}$ $\sin 13^\circ . \cos 13^\circ = \frac{\sqrt{1-p^2}}{2}$	✓ for the reduction *vir die reduksie* ✓ for the answer *vir die antwoord*	(2)
5.2.1	$\frac{\cos(-\theta) . \tan(180^\circ + \theta)}{2\cos(90^\circ + \theta)}$ $= \frac{\cos\theta . \tan\theta}{-2\sin\theta}$ $= \frac{\cos\theta . \frac{\sin\theta}{\cos\theta}}{-2\sin\theta}$ $= -\frac{1}{2}$	✓ $\cos\theta$ ✓ $\tan\theta$ ✓ $-2\sin\theta$ ✓ $\frac{\sin\theta}{\cos\theta}$ ✓ for the answer *vir die antwoord*	(5)
5.2.2	$1 + 2\cos 105^\circ \sin 15^\circ$ $= 1 + 2\cos 75^\circ \sin 15^\circ$ $= 1 + 2\sin 15^\circ \sin 15^\circ$ $= 1 - \sin 30^\circ$ $= 1 - \frac{1}{2}$ $= \frac{1}{2}$	✓ for reduction of $\cos 105^\circ$ *vir reduksie van* $\cos 105^\circ$ ✓ for reduction of $\cos 75^\circ$ *vir reduksie van* $\cos 75^\circ$ ✓ for $\sin 30^\circ$ *vir* $\sin 30^\circ$ ✓ for the answer *vir die antwoord*	(4)

5.3.1	$\frac{1-\cos 2x-\sin x}{\sin 2x-\cos x}=\tan x$ LHS: $\frac{1-(1-2\sin^2 x)-\sin x}{2\sin x\cos x-\cos x}$ $=\frac{2\sin^2 x-\sin x}{2\sin x\cos x-\cos x}$ $=\frac{\sin x(2\sin x-1)}{\cos x(2\sin x-1)}$ $=\tan x=$ RHS	✓ expansion of $\cos 2x$ *uitbreiding van* $\cos 2x$ ✓ expansion of $\sin 2x$ *uitbreiding van* $\sin 2x$ ✓ for the simplification *vir die vereenvoudiging* ✓ taking out HCF *uithaal van* GGD	(4)
5.3.2	$\sin 2x=\cos x$ $x=$ -90° ; 30° ; 90° and/en 150°	✓ for/*vir* $\sin 2x=\cos x$ ✓ for any 2 answers *vir enige* 2 *antwoorde* ✓ for any other 2 answers *vir enige* 2 *antwoorde*	(3)
5.4	$\sin^2 x+2\sin x\cos x=3\cos^2 x$ $\sin^2 x+2\sin x\cos x-3\cos^2 x=0$ Divide every term by/*Deel elke term deur* $\cos^2 x$ $\tan^2 x+2\tan x-3=0$ $(\tan+3)(\tan x-1)=0$ $\tan x=-3$ or/*of* $\tan x=1$ $x=108,43°+180°.k$ or/*of* $x=45°+180°.k$ where/*waar* $k\in Z$ **OR/*OF*** $\sin^2 x+2\sin x\cos x=3\cos^2 x$ $\sin^2 x+2\sin x\cos x-3\cos^2 x=0$ $(\sin x+3\cos x)(\sin x-\cos x)=0$ $\sin x=-3\cos x$ or/of $\sin x=\cos x$ $tan\,x=-3$ or/*of* $tan\,x=1$ $x=108{,}43°+180°.k$ or/*of* $x=45°+180°.k$ where/*waar*, $k\in Z$	✓ for standard form *vir standaardvorm* ✓ for dividing by $\cos^2 x$ *vir deling deur* $\cos^2 x$ ✓ for the factors *vir die faktore* ✓ for values of $\tan x$ vir waardes van $\tan x$ ✓✓ for the answers *vir die antwoorde* ✓ for standard form *vir standaardvorm* ✓ for the factors *vir die faktore* ✓ for isolating $\sin x$ *vir isolering van* $\sin x$ ✓ for values of $\tan x$ vir waardes van $\tan x$ ✓✓ for the answers *vir die antwoorde*	(7)
			[30]

QUESTION 6/*VRAAG 6*

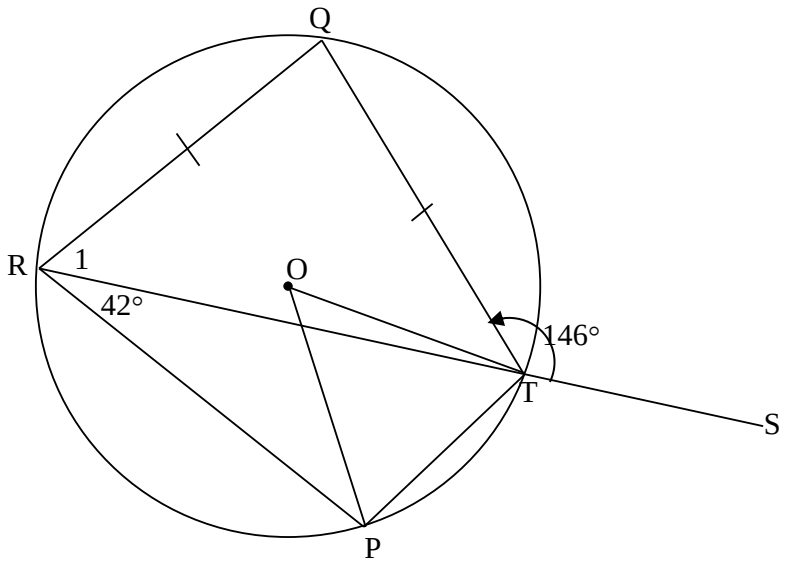
6.1			✓ shape *vorm* ✓ start / end points *begin / eind punte* ✓TP at / *DP by* 90°	(3)
6.2.1	Period / *Periode* = 180°		✓ answer	(1)
6.2.2	$-3 \leq y \leq -1$ **OR/*OF*** $y \in [-3\ ;-1]$	✓ for/*vir* -3 and/en -1 ✓ for the answer in correct notation *vir die antwoord in korrekte notasie*		(2)
6.3	$h(x) = -\sin x - 1$ Maximum distance/*Maksimum afstand* = 2 units/*eenhede*	✓ for/*vir* $h(x)$ ✓ answer / *antwoord*		(2)
6.4	$f(x).g'(x)>0$ $-90^\circ < x < 90^\circ$	✓✓ answer / *antwoord*		(2)
6.5	Graph shifted 1 unit down and 15° to the right. *Grafiek het* 1 *eenheid af en* 15° *na regs geskuif.*	✓ for 1 unit down / *vir* 1 *eenheid af* ✓ for 15° to the right / *vir* 15° *na regs*		(2)
				[12]

QUESTION 7/*VRAAG 7*



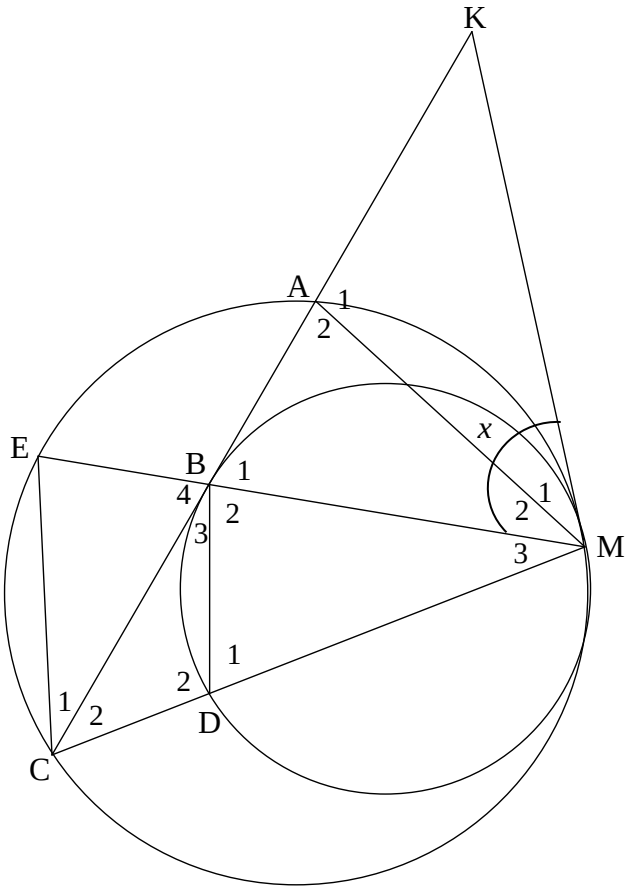
7.1	$\hat{R}(30^\circ - x)$	✓ for answer / *vir antwoord*	(1)
7.2	$\frac{PQ}{\sin(30^\circ - x)} = \frac{300}{\sin 150^\circ}$ $\frac{PQ}{\sin(30^\circ - x)} = 600$ $PQ = 600\sin(30^\circ - x)$	✓ for sine-rule *vir sinusreël* ✓ for/*vir* 600 ✓ for the answer *vir die antwoord*	(3)
7.3	$\tan 60^\circ = \frac{TP}{PQ}$ $TP = PQ\tan 60^\circ$ $TP = \sqrt{3}.600\sin(30^\circ - x)$ $TP = \sqrt{3}.600.(\sin 30^\circ \cos x - \cos 30^\circ \sin x)$ $TP = \sqrt{3}.600\left(\frac{1}{2}\cos x - \frac{\sqrt{3}}{2}\sin x\right)$ $TP = \sqrt{3}.300(\cos x - \sin x)$	✓ for/*vir* $\tan 60^\circ$ ✓ for/*vir* $\sqrt{3}.600\sin(30^\circ - x)$ ✓ for expansion *vir uitbreiding* ✓ for taking out common factor / *vir uithaal van gemene faktor*	(4)
			[8]

QUESTION 8/*VRAAG 8*



8.1	$P\hat{O}T = 84°$ ($\angle$ at centre) / (*Middelpunts* $\angle$)	✓ S ✓R	(2)
8.2	$Q\hat{T}R = 34°$ ($\angle$ s on a straight line) (*$\angle$e op 'n reguitlyn*) $\hat{R}_1 = 34°$ ($\angle$ s opp. = sides) / (*$\angle$e teenoor = sye*)	✓ S and/*en* R ✓ S and/*en* R	(2)
8.3	$R\hat{Q}T = 112^{\circ}$ $R\hat{P}T = 68°$ (opp. $\angle$s of cq) / (*teenoorst. $\angle$e van kv*)	✓ S and/*en* R ✓S ✓R	(3)
			[7]

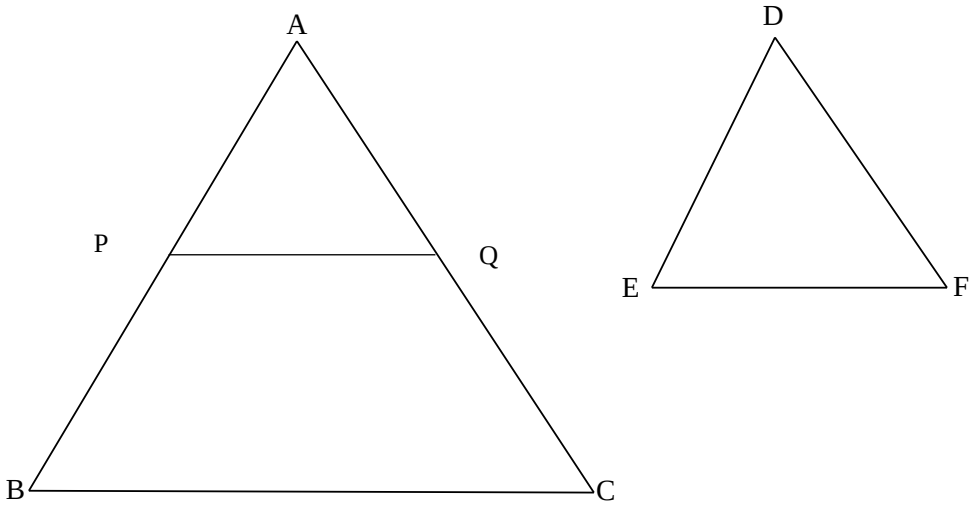
QUESTION 9/*VRAAG 9*



9.1	$\hat{B}_1 = x$ (tangents from common point) (*raaklyne van gemene punt*) $\hat{B}_4 = x$ (vertically opposite angles) (*regoorstaande hoeke*) $\hat{D}_1 = x$ (tan/chord theorem) (*raaklyn/koord stelling*) $E\hat{C}M = x$ (tan/chord theorem) (*raaklyn/koord stelling*)	✓ S and/en R ✓ S and/en R ✓ S ✓ R ✓ S and/en R	(5)
9.2.1	$B\hat{D}M = E\hat{C}D = x$ (proven / *bewys*) $\therefore BD \| \| EC$ (corresponding angles =) (*ooreenkomstige hoeke* =)	✓ S ✓ R	(2)
9.2.2	$\hat{A}_2 = \hat{E}$ (angles in the same segment) (*hoeke in dieselfde segment*) $\hat{B}_2 = \hat{E}$ (corresponding angles = , BD ||EC) (*ooreenkomstige hoeke* =, BD ||EC) $\hat{A}_2 = \hat{B}_2$	✓ S ✓ R ✓ S and/en R	(3)

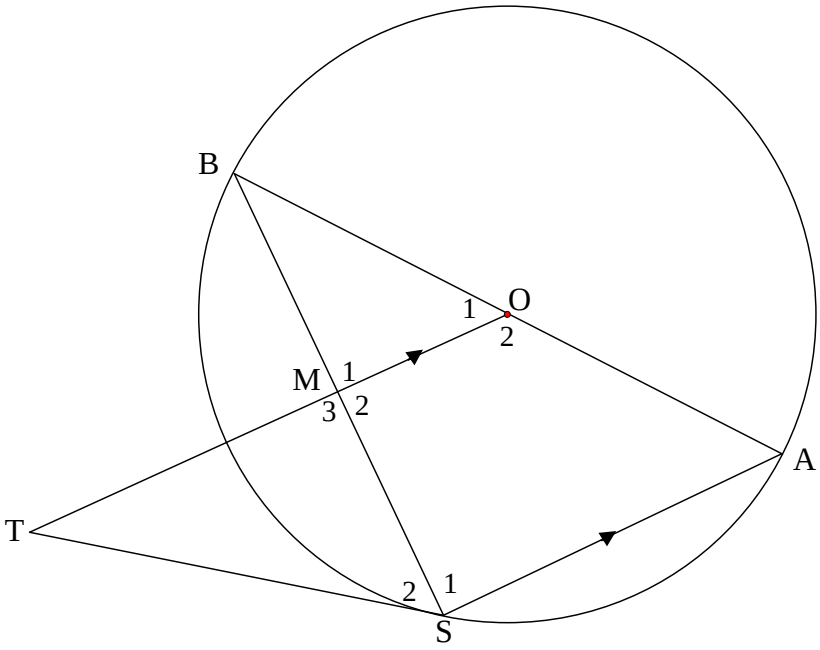
9.2.3	In ΔMEC: CE ∥ DB (proven / bewys) $\frac{ME}{MB} = \frac{MC}{MD}$ (prop. int. Thm, CE ∥ DB) (eweredigheid st, CE ∥ DB) $\therefore \frac{ME}{MC} = \frac{MB}{MD}$ $\therefore ME \times MD = MC \times MB$	✓ S and/en R ✓ S	(2)
			[12]

QUESTION 10/*VRAAG 10*



10.1	Construction: Mark off, on AB and AC, P and Q respectively such that AP = DE and AQ = DF. *Konstruksie: Merk* P *en* Q *onderskeidelik op* AB *en* AC *af sodat* AP = DE *en* AQ = DF. In ΔPAQ and/*en* ΔEDF: (1) PA = ED (construction / *konstruksie*) (2) $\hat{A} = \hat{D}$ (given / *gegee*) (3) QA = FD (construction / *konstruksie*) $\therefore \Delta PAQ \equiv \Delta EDF$ (SAS) $\therefore A\hat{P}Q = \hat{E}$ (congruency / *kongruensie*) But/*Maar* $\hat{B} = \hat{E}$ (given/*gegee*) $\therefore A\hat{P}Q = \hat{E}$ $\therefore$ PQ BC (corresponding $\angle$s = / *ooreenkomstige.* $\angle e$ =) $\therefore \frac{AP}{AB} = \frac{AQ}{AC}$ (prop. int. thm / *eweredigheid stelling*) But/*Maar* : AP = DE and/*en* AQ = DF (construction/*konstruksie*) $\therefore \frac{DE}{AB} = \frac{DF}{AC}$	✓ construction *konstruksie* ✓ S and/en R ✓ S ✓ S ✓ R ✓ S	(6)

10.2



10.2.1	$B\hat{O}M = \hat{S}_3$ (∠s in the same segment) / (*∠e in dies. segment*) $B\hat{O}M = \hat{A}$ (corresponding <s, AS ∥ OM) (*ooreenkomstige ∠e,* AS ∥ OM) $\therefore \hat{S}_3 = \hat{A}$ ∴ TS is a tangent (conv. tan - chord thrm) TS *is 'n raaklyn* (*omgekeerde raaklyn - koord stelling*)	✓ S ✓ R ✓ S and/en R ✓ R	(4)
10.2.2	$\hat{S}_2 = 90°$ (∠s in a semi - circle)/(*∠ in semi - sirkel*) $\hat{M}_3 = 90°$ (corr. ∠s / *ooreenk. ∠e,* AS ∥ OM) ∴ TS is diameter (conv. ∠s in a semi - circle) TS *is 'n middellyn* (*omgek. ∠e in semi – sirkel*)	✓ S ✓ R ✓ S ✓ R ✓ R	(5)
10.2.3	In ΔABS and/*en* ΔSTM (1) $\hat{A} = \hat{S}_3$ (proven / *bewys*) (2) $\hat{B} = S\hat{T}M$ (∠s in the same segment)/(*∠e in dies. segement*) (3) $\hat{S}_2 = \hat{M}_3$ (proven / *bewys*) ΔABS ||| ΔSTM (∠∠∠)	✓ S ✓ S ✓ R or/*of* 3rd angle/ 3*de hoek*	(3)
10.2.4	$\therefore \frac{AS}{SM} = \frac{SB}{MT}$ (similarity / *gelykvormigheid*) AS . MT = SM . SB But/*Maar* : SB = 2SM (Midpoint thrm / prop.int. , OM ∥ AS) (*Middelpunt stelling* / *Ewer.*, OM ∥ AS) $\therefore 2SM^2 = AS.MT$	✓ S ✓ S ✓ R	(3)
			[21]
		TOTAL/*TOTAAL*:	**150**