Province of the
EASTERN CAPE
EDUCATION

Iphondo leMpuma Kapa: Isebe leMfundo
Provinsie van die Oos Kaap: Department van Onderwys
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NATIONAL SENIOR CERTIFICATE
NASIONALE SENIORSERTIFIKAAT

GRADE/*GRAAD* 11

NOVEMBER 2024

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

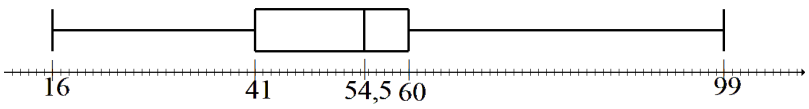
MARKS/*PUNTE*: 150

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

QUESTION 1 / *VRAAG 1*

Data Set / *Datastel*:

16	28	41	41	42	52	54
55	58	59	60	62	64	99

1.1	Mode / *Modus* $= 41$	✓ mode / *modus*	(1)
1.2	Outlier / *Uitskieter* $= 99$	✓ outlier / *uitskieter*	(1)
1.3	Median / *Mediaan* $= \frac{54+55}{2}$ $\therefore$ Median / *Mediaan* $= 54,5$ (Answer only full marks) (*Slegs antwoord – volpunte*)	✓ dividing a sum by 2 *deel 'n som deur 2* ✓ answer / *antwoord*	(2)
1.4	$Q_1 = 41$ $Q_3 = 60$ IQR / *IKW* $= Q_3 - Q_1 = 60 - 41$ $= 19$	✓ Q_1 ✓ Q_3 ✓ answer / *antwoord*	(3)
1.5		✓correct min and max *korrekte min en maks* ✓ correct box and whisker diagram. *korrekte mond-en-snordiagram*	(2)
1.6	The data is skewed to the left or negatively skewed. *Die data is skeef na links of negatief skeef.*	✓ for the correct comment *vir korrekte opmerking*	(1)
			[10]

QUESTION 2 / *VRAAG 2*

2.1

Weight of players *Gewig van boksers*	Frequency *Frekwensie*	Cumulative frequency *Kumulatiewe frekwensie*
$35 \le x < 55$	1	1
$55 \le x < 75$	3	4
$75 \le x < 95$	9	13
$95 \le x < 115$	6	19
$115 \le x < 135$	3	22
$135 \le x < 155$	1	23

✓ 4 and/*en* 13

✓ 19 and/*en* 22 (2)

2.2

The total number of boxers is 23
Die totale aantal boksers is 23

✓ for answer/ *vir antwoord* (1)

2.3

$$\bar{x} = \frac{1\times 45 + 3\times 65 + 9\times 85 + 6\times 105 + 3\times 125 + 1\times 145}{23}$$

$$= \frac{2155}{23}$$

$$\bar{x} = 93,70$$

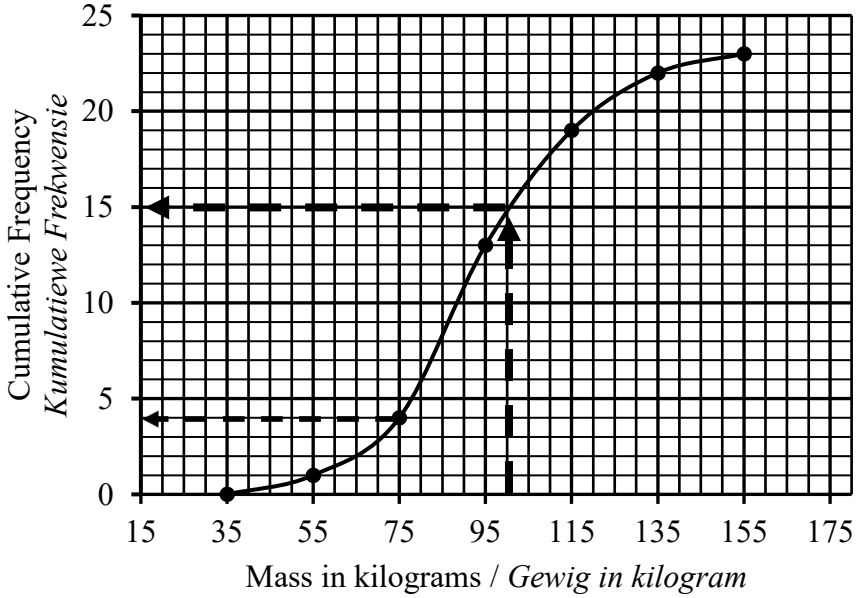
✓ f x xi

✓ 2 155

✓ answer/ *antwoord* (3)

2.4

Cumulative frequency graph (ogive)
Kumulatiewefrekwensiegrafiek (ogief)



✓ correct grounding/ *korrekte anker*

✓ plotting against the upper limits/ *afsteek by boonste limiete*

✓ correct shape/ *korrekte vorm* (3)

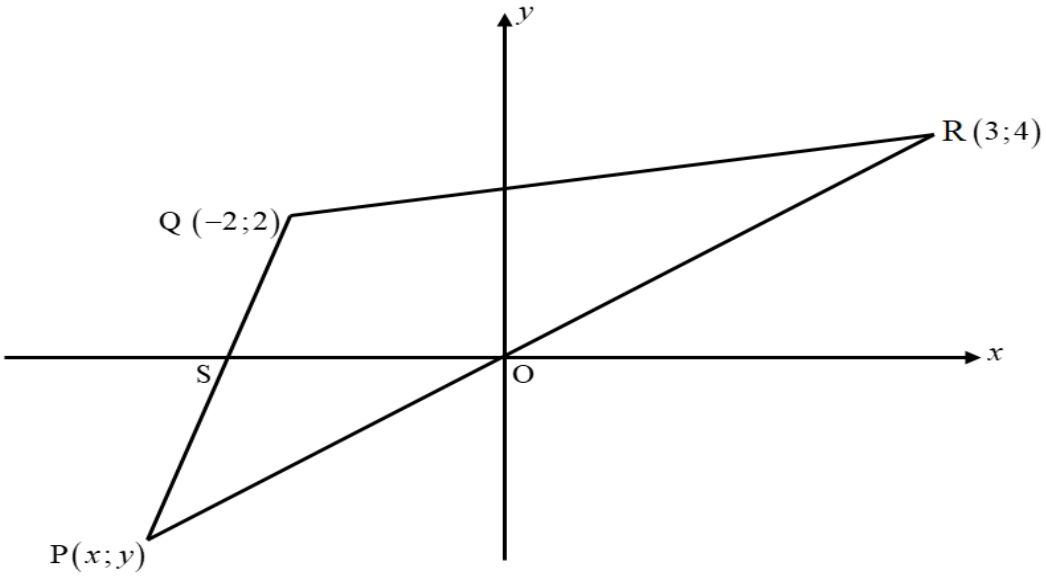
2.5

No. of boxers in the interval of $75 \le x < 100$ will be $15 - 4 = 11$
Aantal boksers in die interval $75 \le x < 100$ *sal* $15 - 4 = 11$ *wees*

✓ 15 or/*of* reading from the graph / *lees vanaf die grafiek*
✓ answer / *antwoord* (2)

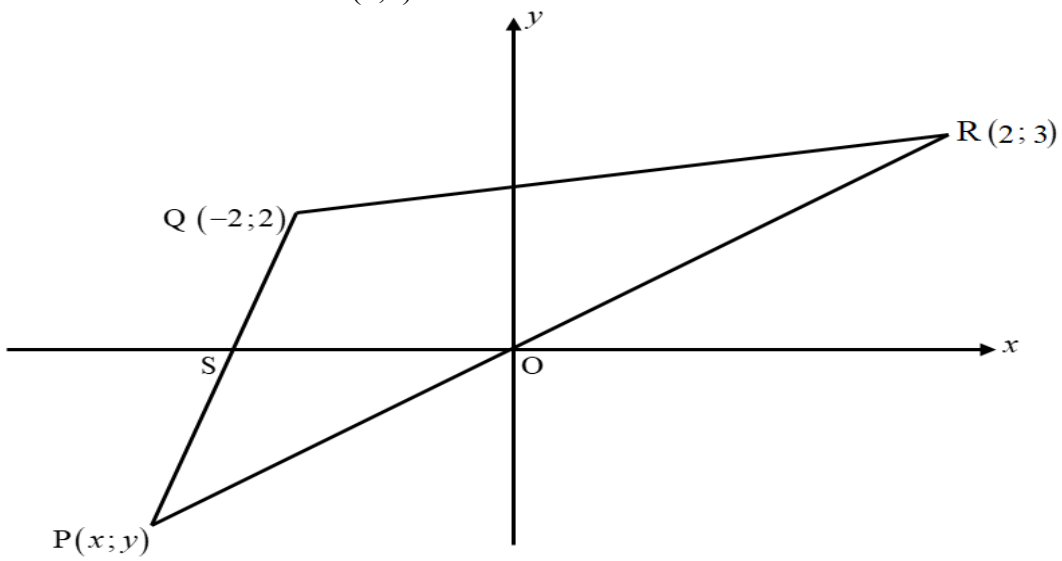
[11]

QUESTION 3 / *VRAAG 3*
MARKING GUIDELINE FOR: R(3;4)



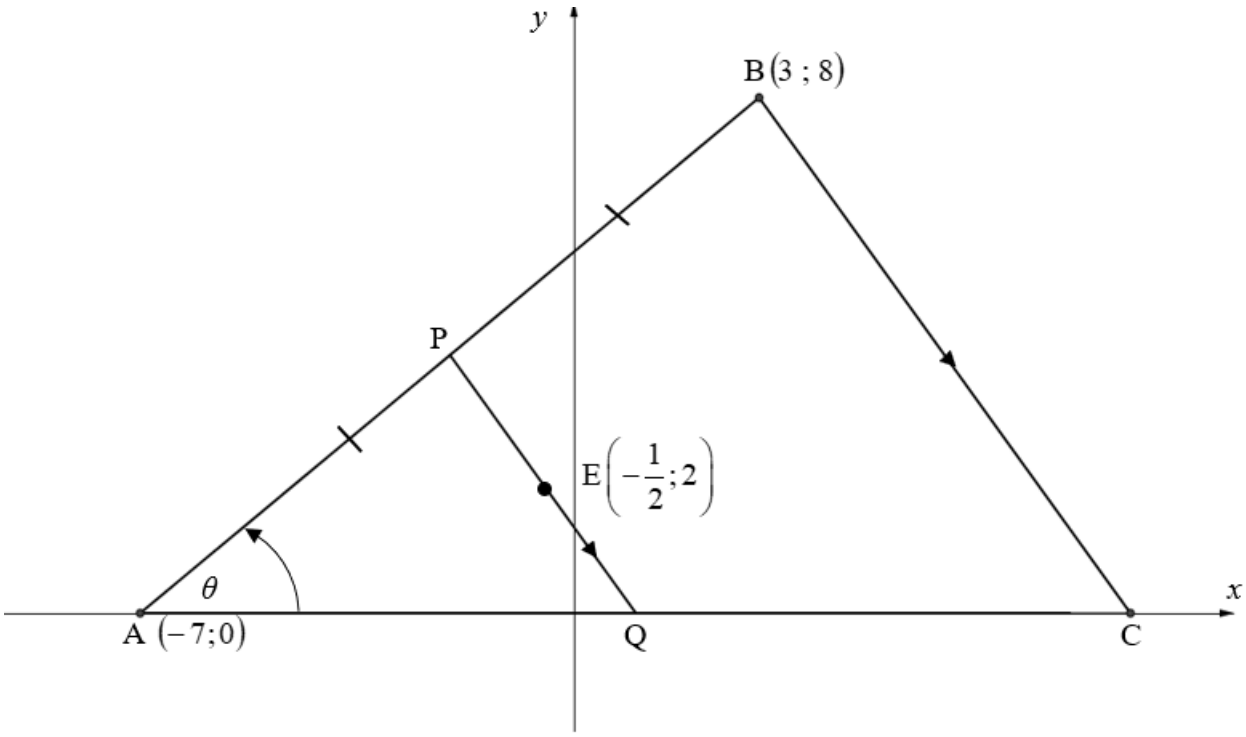
3.1	$m_{PR}=\frac{4-0}{3-0}$ $=\frac{4}{3}$	✓ correct substitution/ *korrekte vervanging* ✓ answer / *antwoord*	(2)
3.2	$m_{PR}=\frac{4}{3}$ (P, O and R are collinear points) (P, O *en* R *is saamlynige punte*) $y-4=\frac{4}{3}(x-3)$ $=\frac{4}{3}x$	✓ gradient of/ *gradiënt van* PR ✓ substitution by R or O/ *vervanging met* R *of* O ✓ equation of PR/ *vergelyking van* PR	(3)
3.3	$6x+14=\frac{4}{3}x$ $6x-\frac{4}{3}x=-14$ $\frac{14}{3}x=-14$ $x=-3$ $y=6(-3)+14$ $y=-4$ $P(-3;-4)$	✓ for equating the equations/ *vir gelykstelling van vergelykings* ✓ simplification/ *vereenvoudiging* ✓ *x*–value/*waarde* ✓ *y*–value/*waarde*	(4)
3.4	$0=6(x)+14$ $x=-\frac{7}{3}$ $\therefore S\left(-\frac{7}{3};0\right)$	✓ $y=0$ ✓ *x*-coordinate/ *x*-koördinaat	(1)
			[10]

MARKING GUIDELINE FOR: R(2;3)



3.1	$m_{PR} = \frac{3-0}{2-0}$ $= \frac{3}{2}$	✓ correct substitution/ *korrekte vervanging* ✓ answer / *antwoord*	(2)
3.2	$m_{PR} = \frac{3}{2}$ (P, O and R are collinear points) (P, O *en* R *is saamlynige punte*) $y - 3 = \frac{3}{2}(x-2)$ $= \frac{3}{2}x$	✓ gradient of/ *gradiënt van* PR ✓ substitution by R or O/ *vervanging met* R *of* O ✓ equation of PR/ *vergelyking van* PR	(3)
3.3	$6x + 14 = \frac{3}{2}x$ $6x - \frac{3}{2}x = -14$ $\frac{9}{2}x = -14$ $x = -\frac{28}{9}$ $y = 6\left(-\frac{28}{9}\right) + 14$ $y = -\frac{14}{3}$ $P\left(-\frac{28}{9}; -\frac{14}{3}\right)$	✓ for equating the equations/ *vir gelykstelling van vergelykings* ✓ simplification/ *vereenvoudiging* ✓ *x*–value/*waarde* ✓ *y*–value/*waarde*	(4)
3.4	$0 = 6(x) + 14$ $x = -\frac{7}{3}$ $\therefore S\left(-\frac{7}{3}; 0\right)$	✓ $y = 0$ ✓ *x*-coordinate/ *x*-koördinaat	(1)
			[10]

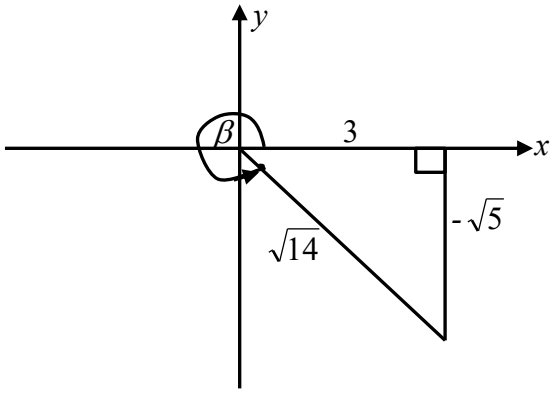
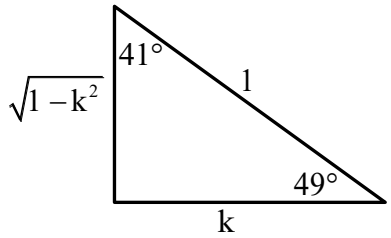
QUESTION 4 / *VRAAG 4*



4.1.1	$M = \frac{-7+3}{2} ; \frac{0+8}{2}$ $= -2 \ ; \ 4$ $P(-2 ; 4)$	✓ *x*-value/*waarde* ✓ *y*-value/*waarde*	(2)
4.1.2	$\boldsymbol{m} = \frac{8-0}{3+7}$ $= \frac{4}{5}$	✓ substitution / *vervanging* ✓ answer / *antwoord*	(2)
4.1.3	$\tan\theta = \frac{4}{5}$ $\theta = 38{,}66^0$	✓ $\tan\theta = \frac{4}{5}$ ✓ answer / *antwoord*	(2)
4.2	$m_{PQ} = \frac{4-2}{-2+\frac{1}{2}}$ $= -\frac{4}{3}$ $m_{BC} = m_{PQ} = -\frac{4}{3}$ gradients||lines = *gradiënte||lyne* = $y - 8 = -\frac{4}{3}(x-3)$ $y = -\frac{4}{3}x + 12$	✓ correct substitution/ *korrekte vervanging* ✓ answer / *antwoord* ✓ gradient of BC/ *gradiënt van* BC ✓ substitute B(3 ; 8) and *m* *vervang* B(3 ; 8) *en m* ✓ equation / *vergelyking*	(5)

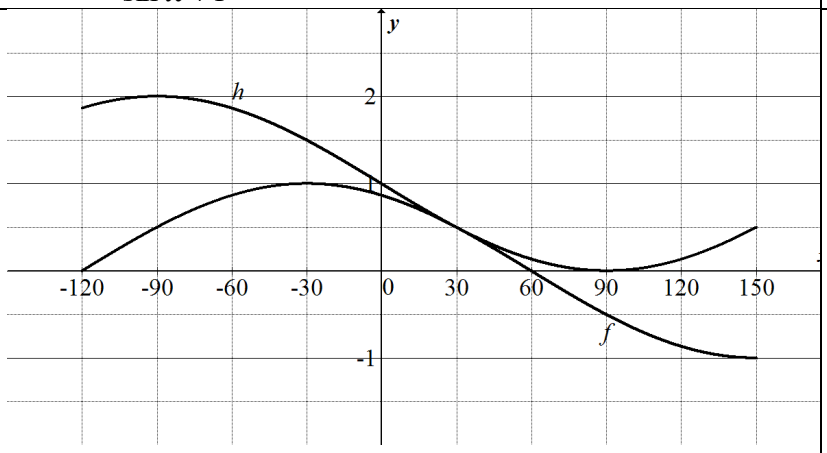
4.3.1	$-\frac{4}{3}x+12=0$ $x=9$ $AC=16$	✓ $y=0$ ✓ $x=9$ ✓ AC = 16	(3)
4.3.2	$AB=\sqrt{(3+7)^2+(8-0)^2}$ $=\sqrt{164}$ A. of/*van* $\Delta ABC=\frac{1}{2}\times\sqrt{164}\times 16\sin 38,65^0$ $=63,99$ A. of/*van* $\Delta APQ=\frac{1}{2}\times\frac{\sqrt{164}}{2}\times 8\sin 38,65^0$ $=16,00$ A. of/*van* PBCQ = 47,99	✓ $AB=\sqrt{164}$ ✓ correct substitution in A of ΔABC / *korrekte vervanging in* A *van* ΔABC ✓ 63,99 ✓ correct substitution in A of ΔAPQ *korrekte vervanging in* A *van* ΔAPQ ✓ 16,00 ✓ answer / *antwoord*	(6)
			[20]

QUESTION 5 / *VRAAG 5*

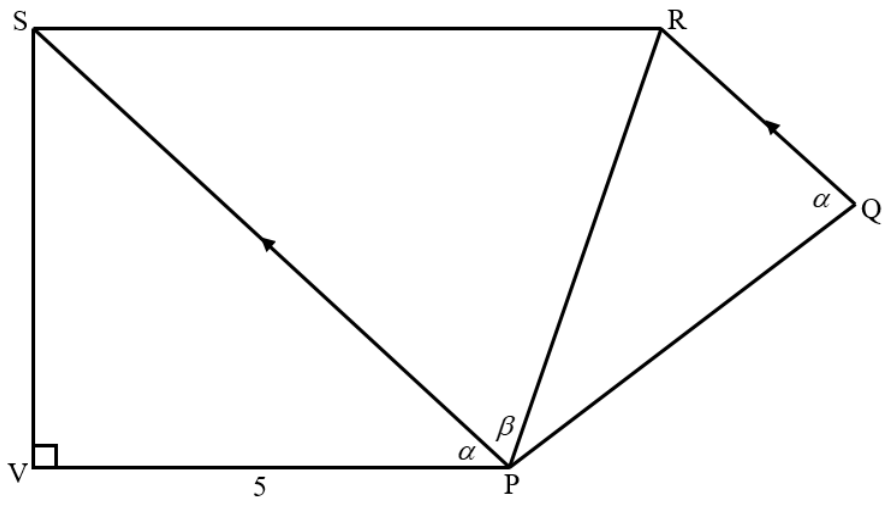
5.1	$-3\tan\beta = 5$ $\tan\beta = \frac{-\sqrt{5}}{3}$  $r = \sqrt{(3)^2 + (-\sqrt{5})^2}$ (*Pyth*) $= \sqrt{14}$ $\sin^2\beta - \cos^2\beta$ $= \left(\frac{-\sqrt{5}}{\sqrt{14}}\right)^2 - \left(\frac{3}{\sqrt{14}}\right)^2$ $= -\frac{2}{7}$	✓ $\tan\beta = \frac{-\sqrt{5}}{3}$ ✓ diagram in the correct quadrant *diagram in die korrekte kwadrant* ✓ for / *vir* $r = \sqrt{14}$ ✓ substitution / *vervanging* ✓ answer / *antwoord*	(5)
5.2	$r^2 = x^2 + y^2$ (*Pyth*) $(1)^2 = (k)^2 + (y)^2$ $y^2 = 1 - k^2$ $y = \sqrt{1-k^2}$  		
5.2.1	$\sin 131° = \sin(180° - 49°)$ $= \sin 49°$ $= \sqrt{1-k^2}$	✓ $\sin 49°$ ✓ answer / *antwoord*	(2)

5.2.2	$1-\cos^2 41^0 = \sin^2 41^0$ $= k^2$ **OR/*OF*** $1-\cos^2 41^0 = 1-\left(\sqrt{1-k^2}\right)^2$ $= 1-1+k^2$ $= k^2$	✓ for $\sin^2 41°$ ✓ answer / *antwoord* **OR/*OF*** ✓ substitution in terms of k/ *vervanging in terme van k* ✓ answer / *antwoord*	(2)
5.3	$\frac{\tan(180^0-x).\cos(-x)+\sin^2(360^0-x)\cos(90°-x)}{\sin(180°-x)}$ $= \frac{-\tan x.\cos x+\sin^2 x.\sin x}{\sin x}$ $= \frac{-\frac{\sin x}{\cos x}.\cos x+\sin^3 x}{\sin x}$ $= \frac{-\sin x+\sin^3 x}{\sin x}$ $= \frac{-\sin x(1-\sin^2 x)}{\sin x}$ $= -\cos^2 x$	✓ $-\tan x$ ✓ $\cos \boldsymbol{x}$ ✓ $\sin^2 \boldsymbol{x}$ ✓ $\sin \boldsymbol{x}$ ✓ $\frac{\sin \boldsymbol{x}}{\cos \boldsymbol{x}}$ ✓ simplification/ *vereenvoudiging* ✓ answer / *antwoord*	(7)
5.4	$\sin(-15^0)\cos 75^0 + \tan 75^0.\cos 75^0.\cos 165^0$ $= (-\cos 75^0)\cos 75^0 + \frac{\sin 75^0}{\cos 75^0}.\cos 75^0(-\sin 75^0)$ $= -\cos^2 75^0 - \sin^2 75^0$ $= -(\cos^2 75^0 + \sin^2 75^0)$ $= -1$ **OR/*OF*** $\sin(-15^0)\cos 75^0 + \tan 75^0.\cos 75^0.\cos 165^0$ $= (-\sin 15^0)\sin 15^0 + \frac{\cos 15^0}{\sin 15^0}.\sin 15^0(-\cos 15^0)$ $= -\sin^2 15^0 - \cos^2 15^0$ $= -(\sin^2 15 + \cos^2 15)$ $= -1$	✓ $-\cos 75°$ ✓ $\frac{\sin 75^0}{\cos 75^0}$ ✓ $-\sin 75^0$ ✓ common factor/ *gemene faktor* ✓ identity / *identitieit* $\cos^2 75^0 + \sin^2 75^0 = 1$ **OR/*OF*** ✓ $-\sin 15°$ and/*en* $\sin 15°$ ✓ $\frac{\cos 15^0}{\sin 15^0}$, [$\sin 15°$ and/ en$(-\cos 15^0)$] ✓ ✓ common factor/ *gemene faktor* ✓ identity / *identiteit* $\cos^2 15^0 + \sin^2 15^0 = 1$	(5)

5.5	$\frac{3\cos x}{1+\sin x}+3\tan x=\frac{3}{\cos x}$ $\text{LHS / } LK=\frac{3\cos x}{1+\sin x}+3\tan x$ $=\frac{3\cos x}{1+\sin x}+\frac{3\sin x}{\cos x}$ $=\frac{3\cos^2 x+3\sin x+3\sin^2 x}{\cos x(1+\sin x)}$ $=\frac{3(\cos^2 x+\sin^2 x)+3\sin x}{\cos x(1+\sin x)}$ $=\frac{3(1+\sin x)}{\cos x(1+\sin x)}$ $=\frac{3}{\cos x}$	✓ identity / *identiteit* $\frac{\sin x}{\cos x}$ ✓ simplification / *vereenvoudiging* ✓ square identity / *vierkantsidentiteit* ✓ common factor / *gemene faktor*	(4)
5.6	$\sin^2 x-3\cos^2 x=0$ $\sin^2 x=3\cos^2 x$ $\frac{\sin^2 x}{\cos^2 x}=3$ $\tan^2 x=3$ $\tan x=\pm\sqrt{3}$ $x=\pm 60°$ $x=60°+k.180$ or/*of* $x=-60°+k.180°, k\in \text{Z}$ or/*of* $x=120°+180°\ k, k\in \text{Z}$ **OR/*OF*** $\sin^2 x-3\cos^2 x=0$ $\sin^2 x-3(1-\sin^2 x)=0$ $\sin^2 x-3+3\sin^2 x=0$ $4\sin^2 x-3=0$ $\sin^2 x=\frac{3}{4}$ $\sin x=\pm\frac{\sqrt{3}}{2}$ $x=60°+360.k$ or/*of* $120°+360°.k, k\in \text{Z}$ or/*of* $x=240°+k.360°$ or/*of* $x=300°+k.360°$	✓ isolating trig ratios/ *isoleer trig. verhoudings* ✓ $\tan^2 x=3$ ✓ correct equations/ *korrekte vergelykings* ✓ $x=60°+180°.k$ ✓ $x=-60°+180°.k, k\in Z$ or /*of* $x=12\ +180°.k, k\in Z$ **OR/*OF*** ✓ $\cos^2 x=1-\sin^2 x$ ✓standard form/ *standaardvorm* ✓ correct equations/ *korrekte vergelykings* ✓ $x=60°+360.k$ $x=120°+360°.k$ both quads/*beide kwadrante* ✓ $x=240°+k.360°$ $x=300°+k.360°, k\in Z$ both quads / *beide kwadrante*	(5)
			[30]

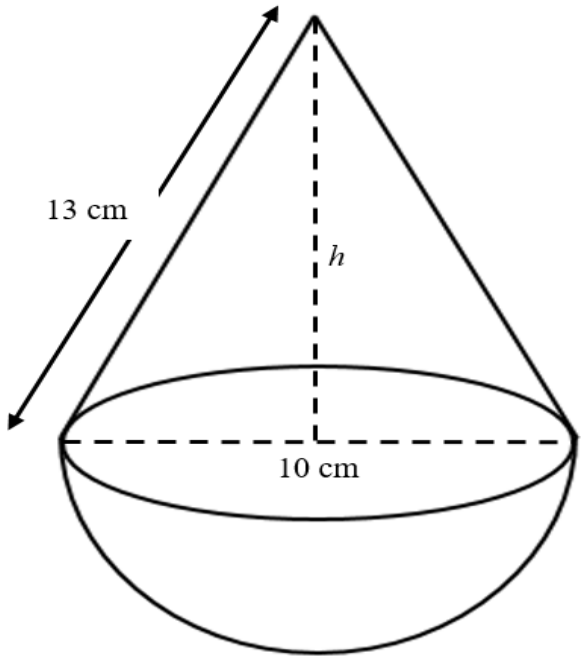
QUESTION 6 / *VRAAG 6*			
6.1	Period is / *Periode is* 360°	✓ answer/ *antwoord*	(1)
6.2	$y \in [0\,;\,2]$ or/*of* $0 \leq y \leq 2$	✓ correct interval/ *korrekte interval* ✓ correct notation/ *korrekte notasie*	(2)
6.3	$h(x) = \cos(60^0 + x + 30^0) + 1$ $= \cos(90^0 + x) + 1$ $= -\sin x + 1$	✓ $\cos(90° + x)$ ✓ $-\sin x$	(2)
6.4		$h(x)$ ✓ x-intercept/ *afsnit* ✓ y-intercept/ *y-afsnit* ✓ correct shape/ *korrekte vorm*	(3)
6.5.1	$x = 150°$	✓ answer/ *antwoord*	(1)
6.5.2	$60° \leq x \leq 150°$	✓ correct interval/ *korrekte interval* ✓ correct notation/ *korrekte notasie*	(2)
6.5.3	$x = 30°$	✓ answer/ *antwoord*	(1)
			[12]

QUESTION 7 / *VRAAG 7*



7.1	$\cos\alpha = \frac{5}{SP}$ $SP = \frac{5}{\cos\alpha}$	✓ $SP = \frac{5}{\cos\alpha}$	(1)
7.2	$P\hat{R}Q = \beta$ $(\textit{alt } \angle s; RQ \parallel SP)$ $\frac{\sin\alpha}{RP} = \frac{\sin\beta}{5}$ $RP = \frac{5\sin\alpha}{\sin\beta}$	✓ $P\hat{R}Q = \beta$ ✓ application of sine rule/ *toepassing van sinusreël* ✓answer / *antwoord*	(3)
7.3	$\text{area of/}\textit{van}\ \Delta RPS = \frac{1}{2}(RP)(PS)\sin\beta$ $= \frac{1}{2}\left(\frac{5\sin\alpha}{\sin\beta}\right)\left(\frac{5}{\cos\alpha}\right)\sin\beta$ $= \frac{25\sin\alpha}{2\cos\alpha}$ $\therefore \text{area of/}\textit{van}\ \Delta RPS = \frac{25\tan\alpha}{2}$	✓ correct formula for area rule/ *korrekte formule vir oppervlaktereël* ✓ substitution / *vervanging* ✓ simplification / *vereenvoudiging*	(3)
			[7]

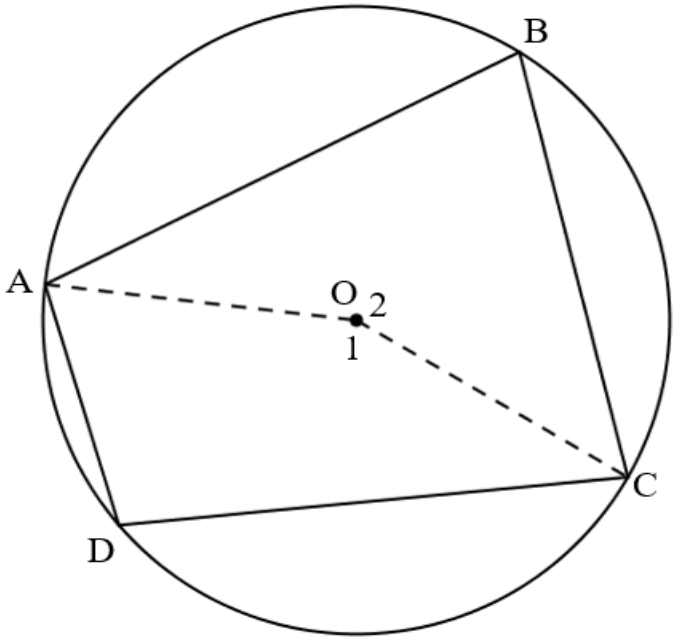
QUESTION 8 / *VRAAG 8*



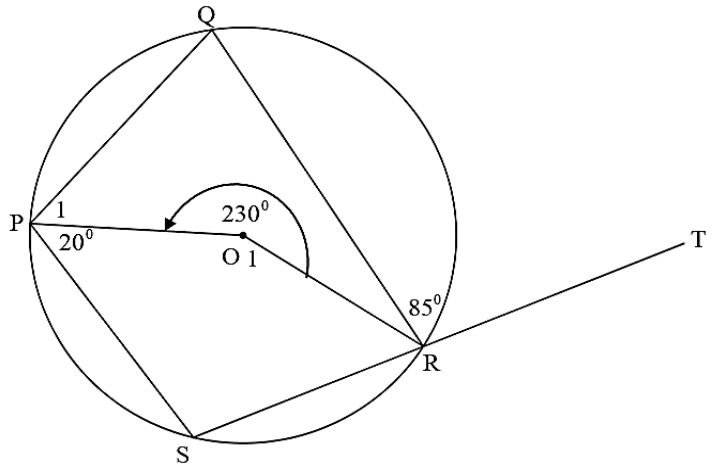
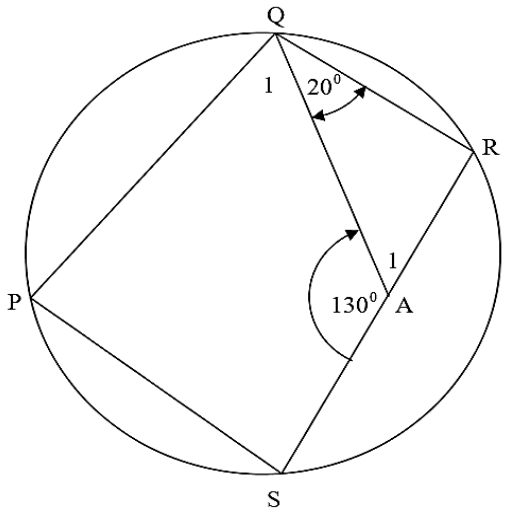
8.1	$(h_s)^2 = r^2 + h^2$ $(13)^2 = (5)^2 + h^2$ $h^2 = 169 - 25$ $h^2 = 144$ $h = 12$ cm	✓ correct formula/ *korrekte formule* ✓ substitution/ *vervanging* ✓ answer / *antwoord*	(3)
8.2	height of the whole shape / *hoogte van die hele vorm* $= r + h$ $= 5 + 12$ $= 17$cm	✓ answer / *antwoord*	(1)
8.3	volume of the whole shape / *volume van die hele vorm* $= \frac{2}{3}\pi r^3 + \frac{1}{3}\pi r^2 h$ $= \frac{2}{3}\pi(5)^3 + \frac{1}{3}\pi(5)^2(12)$ $= \frac{550}{3}\pi$ $= 575{,}96$ cm^3	✓ correct formula/ *korrekte formule* ✓ substitution/ *vervanging* ✓ answer / *antwoord*	(3)
8.4	outer surface area of the whole shape/ *buite – oppervlakte van die hele vorm* $= 2\pi r^2 + \pi r h_s$ $= 2\pi(5)^2 + \pi(5)(13)$ $= 115\pi$ $= 361{,}28$ cm^2	✓ correct formula/ *korrekte formule* ✓ substitution/ *vervanging* ✓ answer / *antwoord*	(3)
			[10]

QUESTION 9 / *VRAAG 9*

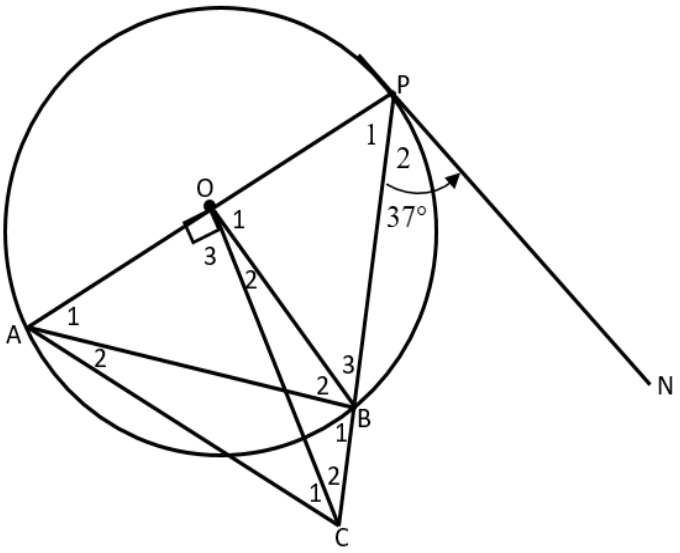
9.1.1

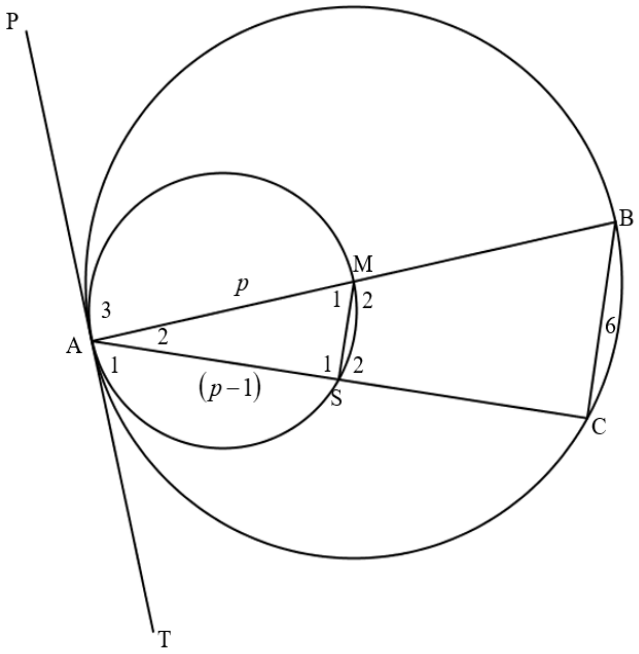


	Construction: Draw AO and OC $\hat{O}_1 = 2\hat{B}$[∠at centre = 2 × ∠at circumf] $\hat{O}_2 = 2\hat{D}$[∠at centre = 2 × ∠at circumf] $\therefore \hat{O}_1 + \hat{O}_2 = 360^0$[∠*s* around a point] $\therefore 2\hat{B} + 2\hat{D} = 360^0$ $\therefore \hat{B} + \hat{D} = 180^0$	✓ constructions ✓ S/R ✓ S ✓ S/R ✓ S	
	Konstruksie: *Teken* AO *en* OC $\hat{O}_1 = 2\hat{B}[Middelpunts\angle = 2 \times Omtreks\angle]$ $\hat{O}_2 = 2\hat{D}[Middelpunts\angle = 2 \times Omtreks\angle]$ $\therefore \hat{O}_1 + \hat{O}_2 = 360^0$[∠*e rondom 'n* punt] $\therefore 2\hat{B} + 2\hat{D} = 360^0$ $\therefore \hat{B} + \hat{D} = 180^0$	✓ *konstruksies* ✓ S/R ✓ S ✓ S/R ✓ S	(5)

9.2			
9.2.1	$\hat{S} = 115^0$ [∠ at the centre = 2 × ∠ at the circumference] [*Middelpunts* ∠ = 2 × *Omtreks* ∠]	✓ S ✓ R	(2)
9.2.2	$\hat{Q} = 65^0$ [opposite ∠s of cyclic quad] [*teenoorst.∠e van 'n koordevierhoek*]	✓ S ✓ R	(2)
9.2.3	$\hat{P}_1 + 20^0 = 85^0$ [ext.∠ of cyclic quad] [*buite.∠ van 'n koordevierhoek*] $\hat{P}_1 = 65^0$	✓ S ✓ R	(2)
9.3			
9.3.1	$\hat{A}_1 = 50^0$ [∠s in a str. line] / [*∠e op 'n reguitlyn*] $\hat{R} = 110^0$ [∠s in a Δ] / [*∠e in 'n driehoek*] $\hat{P} = 70^0$ [opp ∠s of a cyclic quad] [*teenoorst.∠e van 'n koordevierhoek*] **OR/*OF*** $\hat{R} = 130^0 - 20^0 = 110^0$ [ext ∠ of a Δ] / [*buite ∠ van Δ*] $\hat{P} = 70^0$ [opp.∠s of a cyclic quad] / [*teenoorst.∠e van 'n kv*]	✓ S ✓ S ✓ S ✓ R **OR/*OF*** ✓ S ✓ R ✓ S ✓ R	(4)
			[15]

QUESTION 10 / *VRAAG 10*

10.1			
10.1.1	$\hat{A}_1 = 37^0$ [tan chord]/[*raaklyn – koord stelling*] $\hat{O}_1 = 2\hat{A}_1 = 74^0$ [∠ at centre = 2 × ∠ at circumf] [*Middelpunts ∠ = 2 × Omtreks ∠*]	✓ S ✓ R ✓ S ✓ R	(4)
10.1.2 (a)	$A\hat{B}P = 90^0$ [∠ in a semi-circle]/[*∠ in 'n semi – sirkel*] $\therefore \hat{B}_1 = 90^0$ [∠s in a str. line]/[*∠e op 'n reguitlyn*] $\hat{O}_3 = 90^0$ [given]/[*gegee*] OACB is a cyclic quadrilateral OACB *is 'n koordevierhoek* [converse ∠s same seg]/[*Omgekeerde ∠e in dies segment*]	✓ S ✓ R ✓ S ✓ R	(4)
10.1.2 (b)	$\hat{C}_2 = \hat{A}_1 = 37^0$ [∠s same seg]/[*∠e in dies segment*] $\therefore$ OC ∥ PN [alt. ∠s =]/[*verw. ∠e =*] **OR/*OF*** $A\hat{P}N = 90^0$ [diameter ⊥ tan]/[*middellyn ⊥ raaklyn*] $\hat{O}_3 = 90^0$ [given]/[*gegee*] $\therefore$ OC ∥ PN [corresp. ∠s =]/[*ooreenk. ∠e =*]	✓ S ✓ R ✓ R **OR/*OF*** ✓ S ✓ R ✓ R	(3)

10.2			
10.2.1	$\hat{A}_3 = 90^0$ [tan ⊥ rad] / [*raaklyn ⊥ radius*] $\hat{S}_1 = 90^0$ [tan-chord theorem] / [*raaklyn – koord stelling*] $\hat{C} = 90^0$ [∠ in semi-circle] / [*∠ in 'n semi – sirkel*]	✓ S ✓ R ✓ S ✓ R ✓ S ✓ R	(6)
10.2.2	$\hat{S}_1 = \hat{C}$ [both / *beide* $= 90^0$] $\therefore MS \parallel BC$ [correspo. ∠s = / *ooreenkomst. ∠e =*]	✓ R	(1)
10.2.3	AS:SC = 1:1 [line drawn from the centre] [*lyn getrek vanaf middelpunt*]	✓ S ✓ R	(2)
10.2.4	MS = 3 [midpoint theorem] / [*middelpunt stelling*]	✓ S ✓ R	(2)
10.2.5	$p^2 = (p-1)^2 + 3^2$ Pyth. theorem / *stelling* $p^2 = p^2 - 2p + 1 + 9$ $2p = 10$ $p = 5$	✓ apply Pyth theo *toepassing van Pyth stelling* ✓ simplification/ *vereenvoudiging* ✓ answer / *antwoord*	(3)
			[25]

TOTAL / *TOTAAL*: 150