basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMNATIONS
SENIORSERTIFIKAAT-EKSAMEN

MATHEMATICS P2/*WISKUNDE V2*

2017

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS: 150
PUNTE: 150

These marking guidelines consist of 22 pages.
Hierdie nasienriglyne bestaan uit 22 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 the question, mark the crossed out version.
- Consistent accuracy applies in ALL aspects of the marking memorandum. 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 a correct reason (a reason mark may only be awarded if the statement is correct)
  S/R = award a mark if statement and reason are both correct

NOTA:

- *As 'n kandidaat 'n vraag TWEEKEER beantwoord, merk slegs die EERSTE poging.*
- *As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, merk die doodgetrekte poging.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die memorandum toegepas. Hou op nasien by die tweede berekeningsfout.*
- *Aanvaar van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat nie.*
- *Euklidiese Meetkunde:*
  S = ‘n punt vir ‘n korrekte bewering (‘n beweringspunt is onafhanklik van die rede)
  R = ‘n punt vir ‘n korrekte rede (‘n punt kan slegs vir ‘n rede toegeken word, indien die bewering korrek is
  S/R = ‘n punt word toegeken indien beide die bewering en rede korrek is

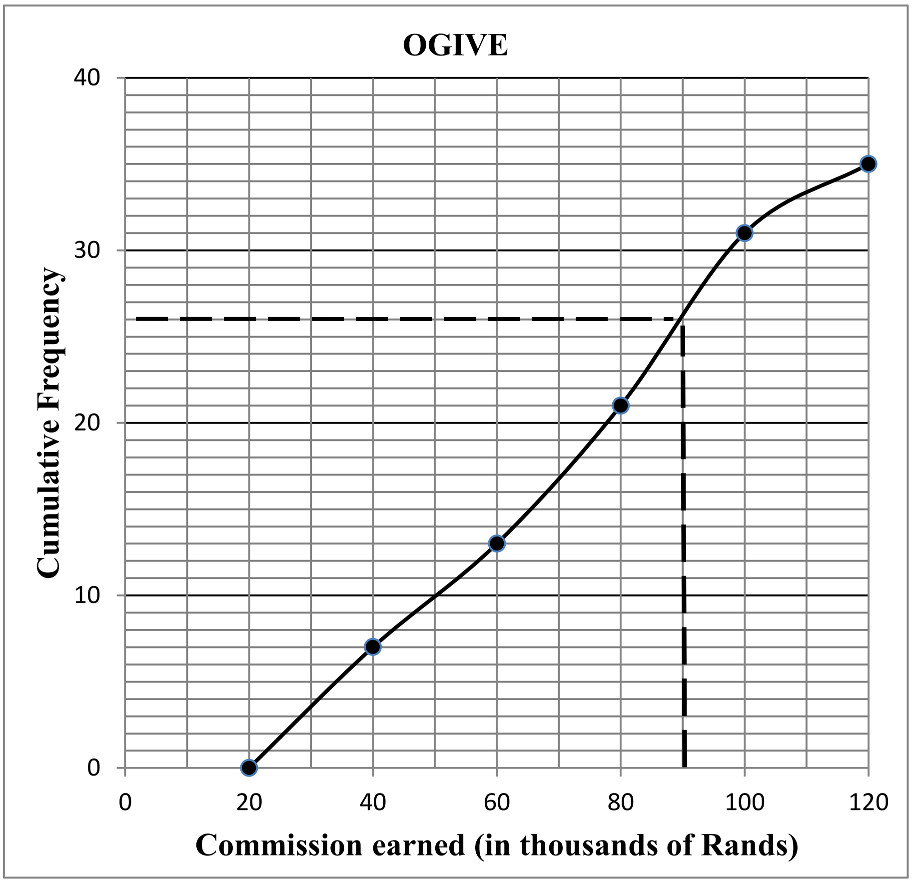
QUESTION/VRAAG/VRAAG 1

TIME TAKEN (IN HOURS)	5	7	5	8	10	13	15	20	18	25	23
COST (IN THOUSANDS OF RANDS)	10	10	15	12	20	25	28	32	28	40	30

1.1	$a = 4{,}806... = 4{,}81$ $b = 1{,}323... = 1{,}32$ $y = 4{,}81 + 1{,}32x$	✓ $a = 4{,}81$ ✓ $b = 1{,}32$ ✓ equation (3)
1.2	Cost = 25,974… = 25,97 thousand rand (calculator) = R25 970 **OR/*OF*** $y = 4{,}81 + 1{,}32(16)$ $y = 25{,}93$ Cost = R25 930	✓ 25,97 ✓ answer (in Rands) (2) ✓ substitution ✓ answer (in Rands) (2)
1.3	r = 0,949…= 0,95	✓ answer (1)
1.4	$x = 0$ $y = 4{,}81$ **OR** (4,80647) $\therefore$ R4 810 **OR** R4806,47	✓ $x = 0$ ✓ answer (2) **[8]**

QUESTION/VRAAG 2

<table>
<tr><td>2.1</td><td>modal class: $80 < x \leq 100$</td><td>✓ correct class (1)</td></tr>
<tr><td>2.2</td><td>
<table>
<tr><th>Commission earned (in thousands of Rands)</th><th>Frequency</th><th>Cumulative Frequency</th></tr>
<tr><td>$20 < x \leq 40$</td><td>7</td><td>7</td></tr>
<tr><td>$40 < x \leq 60$</td><td>6</td><td>13</td></tr>
<tr><td>$60 < x \leq 80$</td><td>8</td><td>21</td></tr>
<tr><td>$80 < x \leq 100$</td><td>10</td><td>31</td></tr>
<tr><td>$100 < x \leq 120$</td><td>4</td><td>35</td></tr>
</table>
</td><td>✓ 13 ; 21

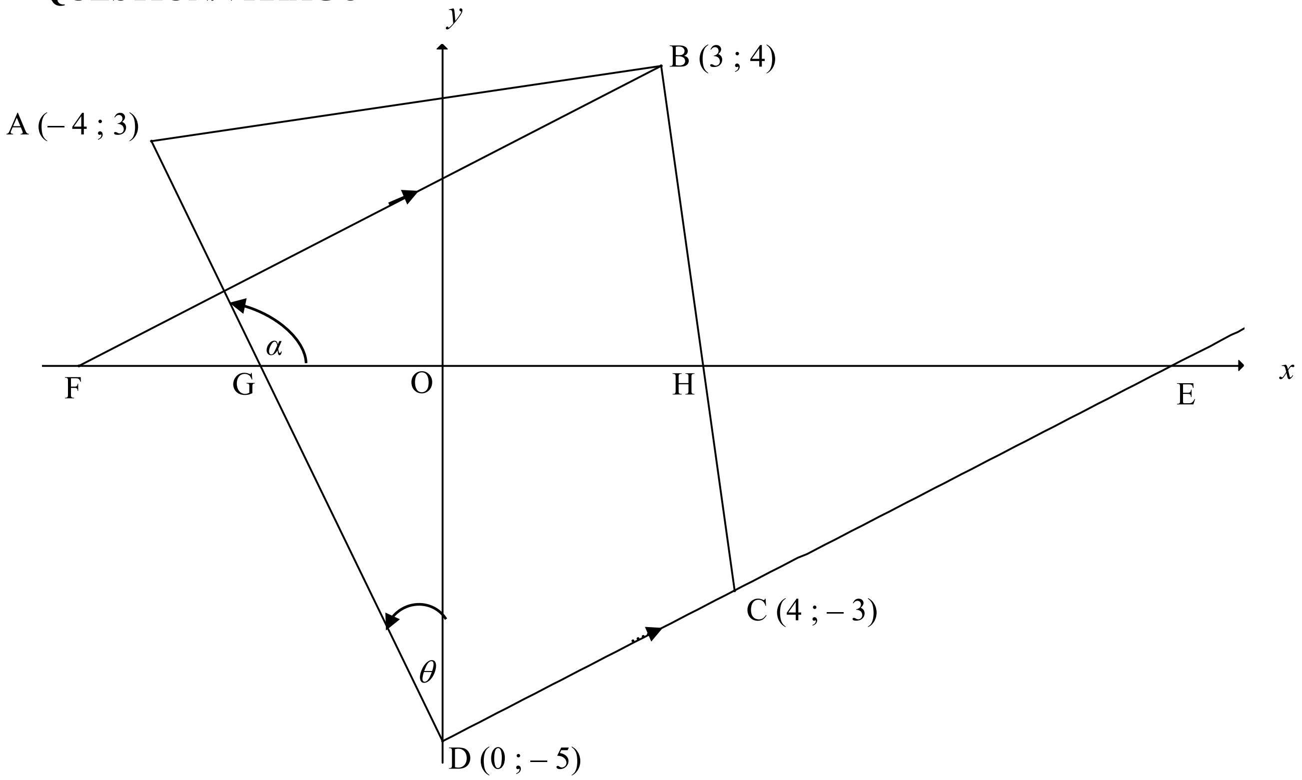
✓ 31 ; 35 (2)</td></tr>
<tr><td>2.3</td><td>


</td><td>✓ grounded/*geanker*
✓ upper limits/ *boonste limiet*
✓ cum frequency / Kum frekwensie
✓ shape/*vorm*

(4)</td></tr>
<tr><td>2.4</td><td>No. of salesmen awarded bonuses: 35 – 26
= 9 salesmen</td><td>✓ accept (25 – 27)
✓ accept (8 – 10)
(2)</td></tr>
<tr><td>2.5</td><td>Estimated mean $= \frac{(30\times 7)+(50\times 6)+(70\times 8)+(90\times 10)+(110\times 4)}{35}$
$= \frac{2410}{35}$
= 68,86 thousand rand or R68 857,14
= R69 000 or 69 thousand rand</td><td>✓ top line using midpts & freq
✓ 2410

✓ answer (nearest)
(3)
[12]</td></tr>
</table>

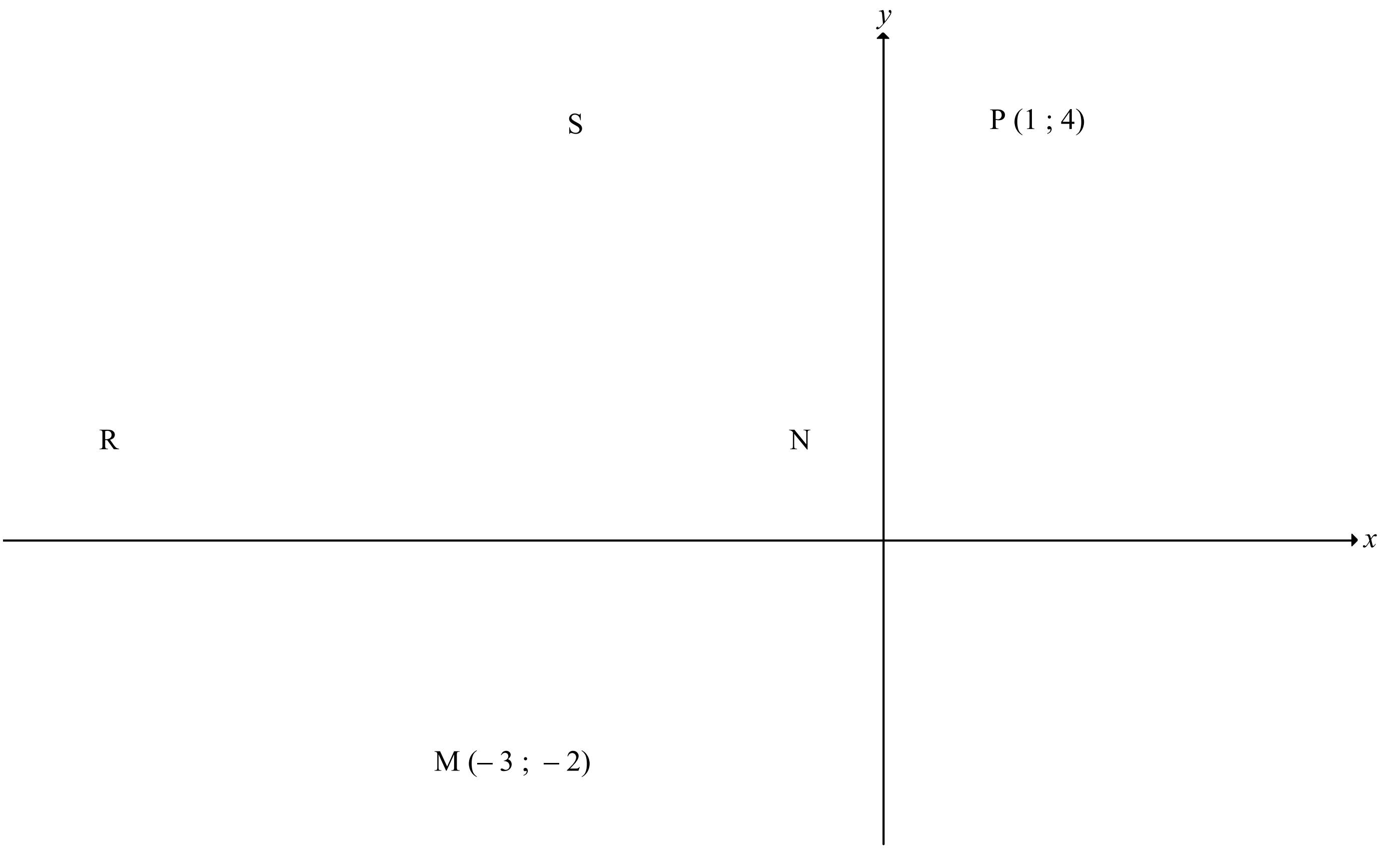
QUESTION/VRAAG 3



3.1	$m_{CD} = \frac{-3-(-5)}{4-0}$ $= \frac{-3+5}{4-0}$ $= \frac{1}{2}$	✓ substitution of C & D ✓answer (2)
3.2	$m_{AD} = \frac{-5-3}{0-(-4)}$ $= -2$ $m_{CD} \times m_{AD} = \frac{1}{2} \times -2$ $= -1$ $\therefore$ AD ⊥ DC	✓ substitution of A & D ✓ $m_{AD} = -2$ ✓ product = –1 (3)
3.3	$AB = \sqrt{(3+4)^2 + (4-3)^2} = \sqrt{50} = 5\sqrt{2}$ $BC = \sqrt{(4-3)^2 + (-3-4)^2} = 5\sqrt{2}$ AB = BC $\therefore$ ΔABC is an iscosceles triangle/'*n gelykbenige driehoek*	✓ correct substitution ✓ length of AB ✓ correct substitution ✓ length of BC (4)

3 .4	$m_{CD} = m_{BF} = \frac{1}{2}$ [BF ‖ DC] $4 = \frac{1}{2}(3) + c$ $c = \frac{5}{2}$ $y = \frac{1}{2}x + \frac{5}{2}$ **OR/*OF*** $y - 4 = \frac{1}{2}(x - 3)$ $y - 4 = \frac{1}{2}x - 1\frac{1}{2}$ $y = \frac{1}{2}x + 2\frac{1}{2}$	✓ $m_{BF} = \frac{1}{2}$ ✓ substitution of B(3 ; 4) ✓equation (3)
3.5	$\tan\alpha = -2$ $\therefore \alpha = 116.57°$ $\alpha = 90° + \theta$ [ext ∠Δ] $\therefore \theta = 26{,}57°$ **OR/*OF*** $\tan\alpha = -2$ OR $m_{AD} = -2$ $\therefore \tan\theta = \frac{1}{2}$ $\therefore \theta = 26{,}57°$ **OR/*OF*** Inclination of DE is β: $\tan\beta = \frac{1}{2}$ $\therefore \beta = 26{,}57°$ $\therefore O\hat{D}E = 63{,}43°$ $\therefore \theta = 90° - 63{,}43°$ $= 26{,}57°$	✓ $\tan\alpha = -2$ ✓ $\alpha = 116.57°$ ✓ $\theta = 26{,}57°$ (3) ✓ $\tan\alpha = -2$ ✓ $\tan\theta = \frac{1}{2}$ ✓ $\theta = 26{,}57°$ (3) ✓ $\beta = 26{,}57°$ ✓ $O\hat{D}E = 63{,}43°$ ✓ $\theta = 26{,}57°$ (3)
3.6	$x^2 + y^2 = r^2$ $(4)^2 + (-3)^2 = 25$ $x^2 + y^2 = 25$	✓ $r^2 = 25$ ✓ equation (2) **[17]**

QUESTION/VRAAG 4



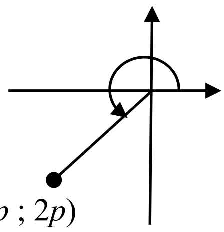
4.1	$N\left(\frac{1+(-3)}{2}\ ;\ \frac{4+(-2)}{2}\right)$ $N(-1\ ;\ 1)$ is the centre of the circle	✓ substitution M & P ✓ x-value of N ✓ y-value of N (3)
4.2	$r=\sqrt{(1-(-1))^2+(4-1)^2}$ $r=\sqrt{13}$ = radius $(x+1)^2+(y-1)^2=13$ **OR/*OR*** $r=\sqrt{(-3-(-1))^2+(-2-1)^2}$ $r=\sqrt{13}$ = radius $(x+1)^2+(y-1)^2=13$	✓ substitution N & P ✓ $r=\sqrt{13}$ ✓ LHS of eq ✓ RHS of eq (4) ✓ substitution N & M ✓ $r=\sqrt{13}$ ✓ LHS of eq ✓ RHS of eq (4)

4.3	$m_{NM} \times m_{MR} = -1$ [radius$\perp$ tangent/*raakklyn*] $m_{NM} = \dfrac{1-(-2)}{-1-(-3)}$ *OR* $m_{PM} = \dfrac{4-(-2)}{1-(-3)}$ $= \dfrac{3}{2}$ $= \dfrac{3}{2}$ $m_{MR} = -\dfrac{2}{3}$ $y - y_1 = -\dfrac{2}{3}(x - x_1)$ **OR/*OF*** $y = -\dfrac{2}{3}x + c$ $y + 2 = -\dfrac{2}{3}(x+3)$ **OR/*OF*** $-2 = -\dfrac{2}{3}(-3) + c$ $y = -\dfrac{2}{3}x - 4$	✓ correct substitution ✓ m_{NM} ✓ m_{MR} ✓substitution of m_{MR} &(–3 ;–2) ✓ equation (5)
4.4	Symmetry of a kite: S(–3 ; 4) **OR/*OF*** $P\hat{S}M = 90°$ [$\angle$ in semi circle] PS $\perp$ SM $\therefore$ S(–3 ; 4) **OR/*OF*** $(NS)^2 = (\text{radius})^2$ $(-3+1)^2 + (y-1)^2 = 13$ $(y-1)^2 = 9$ $y - 1 = \pm 3$ $y = 4$ *OR* $y \neq -2$ $\therefore$ S(–3 ; 4)	✓ *x*-value of S ✓ *y*-value of S (2) ✓ *x*-value of S ✓ *y*-value of S (2) ✓ *x*-value of S ✓ *y*-value of S (2)
4.5	$(SR)^2 = (RM)^2$...Tangents from common pt/*rklyne v dies punt* $(x+3)^2 + (y-4)^2 = (x+3)^2 + (y+2)^2$ $y^2 - 8y + 16 = y^2 + 4y + 4$ $-12y = -12$ $y = 1$ $\dfrac{2}{3}x = -4 - 1$ or $1 = -\dfrac{2}{3}x - 4$ $x = -\dfrac{15}{2}$ $x = -7\dfrac{1}{2}$ $\therefore$ $R\left(-7\dfrac{1}{2};1\right)$ **OR/*OF***	✓ equating lengths ✓ simplification ✓ *y*-value of R ✓ *x*-value of R (4)

	R$(x;1)$ [RN is a horizontal line] $\therefore 1=-\frac{2}{3}x-4$ $5=-\frac{2}{3}x$ $x=-\frac{15}{2}$ $\therefore \text{R}\left(-\frac{15}{2};1\right)$	✓ $y_{\text{R}}=1$ ✓ horizontal line OR R lies on $y = 1$ ✓ equating ✓ x-value of R ($x<-4{,}6$) (4)
	OR/*OF* $m_{\text{NS}}=\frac{1-4}{-1+3}=-\frac{3}{2}$ $\therefore\ m_{\text{RS}}=\frac{2}{3}$ $y-4=\frac{2}{3}(x+3)$ $y=\frac{2}{3}x+6$ $-\frac{2}{3}x-4=\frac{2}{3}x+6$ $x=-7\frac{1}{2}$ $y=\frac{2}{3}(-\frac{15}{2})+6=1$ $\therefore \text{R}\left(-\frac{15}{2};1\right)$	✓ $y=\frac{2}{3}x+6$ ✓ equating ✓ x-value of R ($x<-4{,}6$) ✓ y-value of R (4)
4.6	$\text{RS}=\sqrt{(-3+7{,}5)^2+(4-1)^2}$ OR/OF $\text{RM}=\sqrt{(-3+7{,}5)^2+(-2-1)^2}$ $\text{RS}=\frac{3\sqrt{13}}{2}=5{,}41$ area of RSNM = 2area of ΔRSN $=2\left(\frac{1}{2}\right)(\sqrt{13})\left(\frac{3\sqrt{13}}{2}\right)$ $=\frac{39}{2}$ **OR/*OF*** 19,5 square units	✓ RS **OR** RM ✓ method ✓ $\sqrt{13}$ and $\left(\frac{3\sqrt{13}}{2}\right)$ ✓ answer (4)
	OR/*OF*	✓ method ✓ MS = 6 ✓ RN = 6,5 ✓ answer

		(4)
	area RSNM $= \frac{1}{2}(\text{MS} \times \text{RN})$ (area of a kite/*opp v vlieër*) $= \frac{1}{2}(6)(6,5)$ $= \frac{39}{2}$ OR 19,5 square units **OR/*OF*** $\text{RS} = \sqrt{(-3+7,5)^2 + (4-1)^2}$ OR/OF $\text{RM} = \sqrt{(-3+7,5)^2 + (-2-1)^2}$ $\text{RS} = \frac{3\sqrt{13}}{2} \, or \, 5,41$ area of ΔRSN $= \left(\frac{1}{2}\right)(\sqrt{13})\left(\frac{3\sqrt{13}}{2}\right)$ $= \frac{39}{4}$ **OR/*OF*** 9,75 square units area of RSNM = 2area of ΔRSN $= \frac{39}{2}$ **OR/*OF*** 19,5 square units	✓ RS **OR** RM ✓ $\left(\frac{1}{2}\right)\sqrt{13}\left(\frac{3\sqrt{13}}{2}\right)$ ✓ method ✓ answer (4)
	OR/*OF* SM = 6 area of RSNM = Area of ΔSMN + Area of ΔRSM $= \frac{1}{2}(6)(1) + \frac{1}{2}(6)(5\frac{1}{2})$ $= 3 + 16\frac{1}{2}$ $= 19\frac{1}{2}$	✓ method ✓ MS = 6 ✓ $h = 1$ & $5\frac{1}{2}$ ✓ answer (4)
		[22]

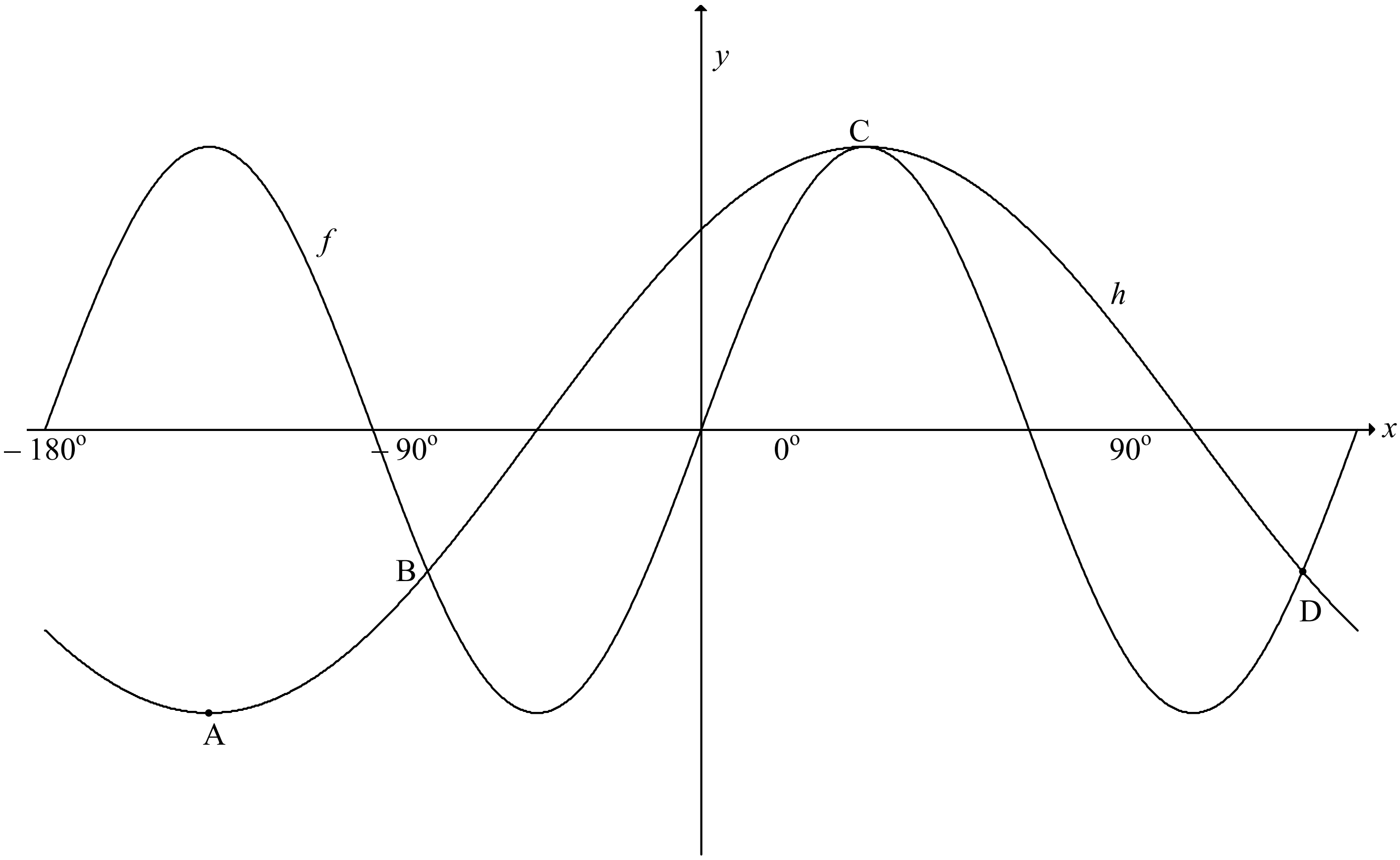
QUESTION/VRAAG 5

5.1.1	$\tan A = \frac{\sin A}{\cos A}$ $= \frac{2p}{p}$ $= 2$ **OR/*OF*** $\tan A = \frac{2p}{p}$ $= 2$  $(p\ ;\ 2p)$	✓identity ✓value of tan A (2) ✓ $\frac{y}{x}$ ✓value of tan A (2)
5.1.2	$\sin^2 A + \cos^2 A = 1$ $(2p)^2 + p^2 = 1$ $4p^2 + p^2 = 1$ $5p^2 = 1$ $p^2 = \frac{1}{5}$ $\therefore p = -\frac{1}{\sqrt{5}}$	✓ $(2p)^2 + p^2 = 1$ ✓ simplification of LHS ✓answer (3)
5.2	$2\sin^2 x - 5\sin x + 2 = 0$ $(2\sin x - 1)(\sin x - 2) = 0$ $\sin x = \frac{1}{2}$ or $\sin x = 2$(no solution) ref $\angle = 30°$ $\therefore x = 30° + k.360°$ or $x = 150° + k.360°\ ;\ k \in Z$	✓ factors or formula ✓ both equations ✓ no solution/*geen opl* ✓ $30° + k.360°$ ✓ $150° + k.360°$; ✓ $k \in Z$ (6)
5.3.1	$\sin(x + 300°) = \sin x \cos 300° + \cos x \sin 300°$	✓ expansion/*uitbreiding* (1)
5.3.2	$\sin(x + 300°) - \cos(x - 150°)$ $= \sin x \cos 300° + \cos x \sin 300° - (\cos x \cos 150° + \sin x \sin 150°)$ $= \sin x \cos 60° - \cos x \sin 60° - (-\cos x \cos 30° + \sin x \sin 30°)$ $= \sin x \cos 60° - \cos x \sin 60° + \cos x \cos 30° - \sin x \sin 30°$ $= \frac{1}{2}\sin x - \frac{\sqrt{3}}{2}\cos x + \frac{\sqrt{3}}{2}\cos x - \frac{1}{2}\sin x$ $= 0$ **OR/*OF***	✓2nd expansion/ *2de uitbreiding* ✓✓ reduction/*reduksie* ✓ special angle values/ *spesiale hoekwaardes* ✓ answer (5)

	$\sin(x+300°)-\cos(x-150°)$ $=\sin x\cos 300°+\cos x\sin 300°-(\cos x\cos 150°+\sin x\sin 150°)$ $=\sin x\cos 60°-\cos x\sin 60°-(-\cos x\cos 30°+\sin x\sin 30°)$ $=\sin x\cos 60°-\cos x\sin 60°+\cos x\cos 30°-\sin x\sin 30°$ $=\sin x\sin 30°-\cos x\sin 60°+\cos x\sin 60°-\sin x\sin 30°$ $=0$	✓2nd expansion/ *2de uitbreiding* ✓✓ reduction/*reduksie* ✓ co-ratios / *ko-verh* ✓ answer (5)
5.4	Consider: $\dfrac{\tan x+1}{\sin x\tan x+\cos x}=\sin x+\cos x$ $\text{LHS}=\dfrac{\left(\dfrac{\sin x}{\cos x}+1\right)}{\left(\sin x.\dfrac{\sin x}{\cos x}+\cos x\right)}=\dfrac{\left(\dfrac{\sin x+\cos x}{\cos x}\right)}{\left(\dfrac{\sin^2 x+\cos^2 x}{\cos x}\right)}$ $=\dfrac{\dfrac{\sin x+\cos x}{\cos x}}{\dfrac{1}{\cos x}}$ $=\dfrac{\sin x+\cos x}{\cos x}\times\dfrac{\cos x}{1}$ $=\sin x+\cos x$ $=\text{RHS}$ **OR/*OF*** $\text{LHS}=\dfrac{\left(\dfrac{\sin x}{\cos x}+1\right)}{\left(\sin x.\dfrac{\sin x}{\cos x}+\cos x\right)}=\dfrac{\left(\dfrac{\sin x}{\cos x}+1\right)}{\left(\dfrac{\sin^2 x+\cos^2 x}{\cos x}\right)}$ $=\dfrac{\left(\dfrac{\sin x}{\cos x}+1\right)}{\dfrac{1}{\cos x}}$ $=\left(\dfrac{\sin x}{\cos x}+1\right)\times\dfrac{\cos x}{1}$ $=\sin x+\cos x$ $=\text{RHS}$	✓ identity of $\tan x$ ✓ $\dfrac{\sin x+\cos x}{\cos x}$ ✓ $\dfrac{\sin^2 x+\cos^2 x}{\cos x}$ ✓ $\sin^2 x+\cos^2 x=1$ ✓ simplify (5) ✓ identity of $\tan x$ ✓ $\dfrac{\sin^2 x+\cos^2 x}{\cos x}$ ✓ $\sin^2 x+\cos^2 x=1$ ✓ simplify ✓ multiplication (5)
5.5.1	$\left(\sqrt{1+k}\right)^2=(\sin x+\cos x)^2$ $1+k=\sin^2 x+2\sin x\cos x+\cos^2 x$ $1+k=1+\sin 2x$ $k=\sin 2x$	✓ square both sides ✓ $\sin^2 x+\cos^2 x=1$ ✓ $\sin 2x$ (3)

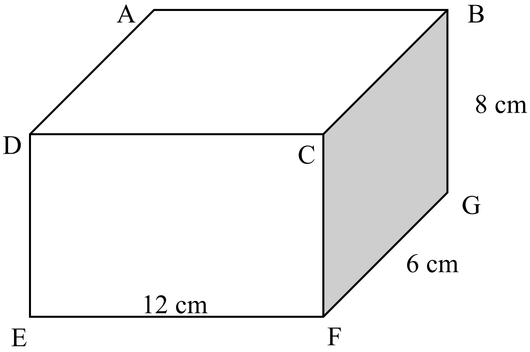
5.5.2	From 5.5.1 $\sin x + \cos x = \sqrt{1 + \sin 2x}$ $\therefore$ max value: $\sin x + \cos x = \sqrt{1+1}$ $= \sqrt{2}$ **OR/*OF*** Maximum value of $1 + \sin 2x = 1 + 1$ $= 2$ $\therefore$ maximum value of $\sin x + \cos x = \sqrt{2}$ **OR/*OF*** $(\sin x + \cos x)^2 = \sin^2 x + 2\sin x \cos x + \cos^2 x$ $= 1 + \sin 2x$ $\therefore$ max value $(\sin x + \cos x)^2 = 1 + 1 = 2$ $\therefore$ max value $\sin x + \cos x = \sqrt{2}$	✓ max of sin $2x$ =1 ✓ answer (2) ✓ max of sin $2x$ =1 ✓ answer (2) ✓ max of sin $2x$ =1 ✓ answer (2)
		[27]

QUESTION/VRAAG 6



6.1	Period = 180°	✓ answer (1)
6.2	$-75°$	✓ answer (1)
6.3	$\sin 2x \leq \frac{1}{\sqrt{2}}\cos x + \frac{1}{\sqrt{2}}\sin x$ $\sin 2x \leq \cos 45°.\cos x + \sin 45°.\sin x$ $\sin 2x \leq \cos(x - 45°)$ $x \in [-75°\ ;165°]$	✓ $\cos 45°.\cos x + \sin 45°.\sin x$ ✓ $\cos(x - 45°)$ ✓ ✓ answer (4)
		[6]

QUESTION/VRAAG 7



Figure/*Figuur* (i)

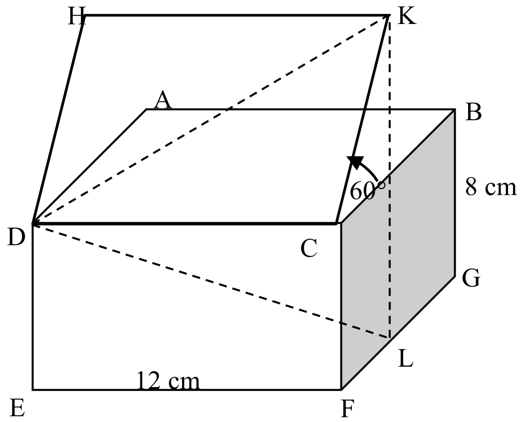
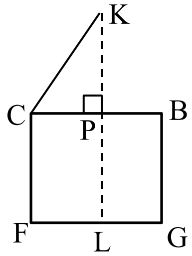
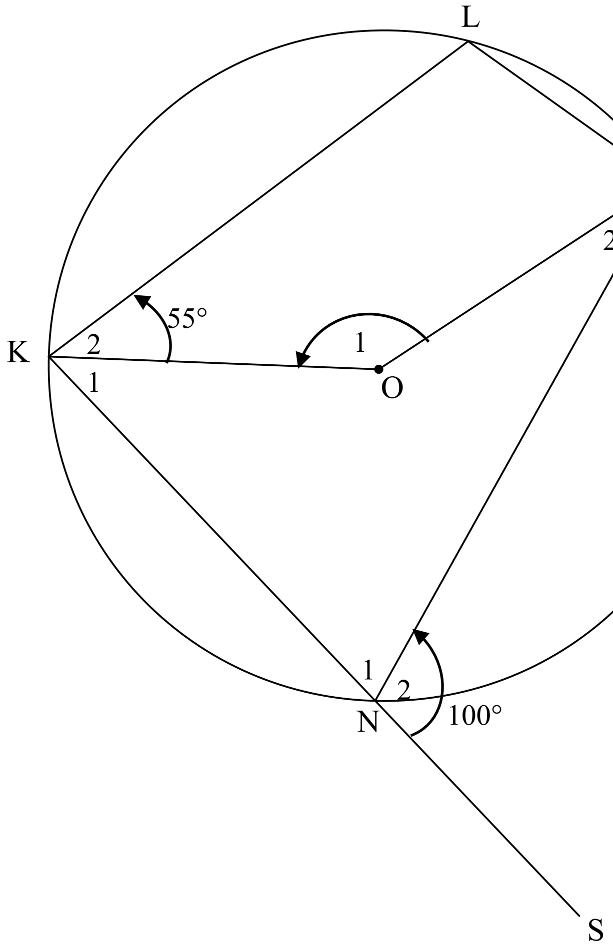


Figure / *Figuur* (ii)

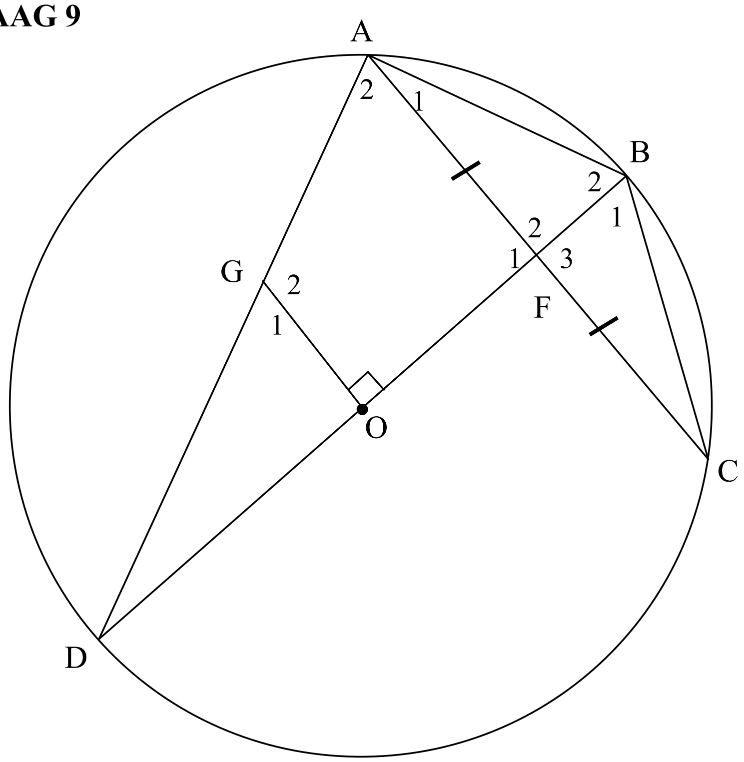
7.1	KC = 6 cm	✓ answer (1)
7.2	Let P be the point of intersection of KL and CB $\frac{KP}{KC} = \sin 60°$ $KP = 6\sin 60°$ $KP = 3\sqrt{3}$ or 5,20 $\therefore KL = 8 + 3\sqrt{3}$ or 13,20 cm 	✓ trig ratio ✓ length of KP ✓ answer (3)
7.3	$DK^2 = 6^2 + 12^2$ $DK = \sqrt{180}$ or $6\sqrt{5}$ or 13,42 cm $\frac{\sin K\hat{D}L}{KL} = \frac{\sin D\hat{L}K}{DK}$ $\frac{\sin K\hat{D}L}{\sin D\hat{L}K} = \frac{KL}{DK}$ $= \frac{8+3\sqrt{3}}{6\sqrt{5}}$ or $\frac{13,20}{13,42}$ or 0,98	✓ $DK = 6\sqrt{5}$ ✓ use of sine rule ✓ $\frac{\sin K\hat{D}L}{\sin D\hat{L}K} = \frac{KL}{DK}$ ✓ answer (4) **[8]**

QUESTION/VRAAG 8



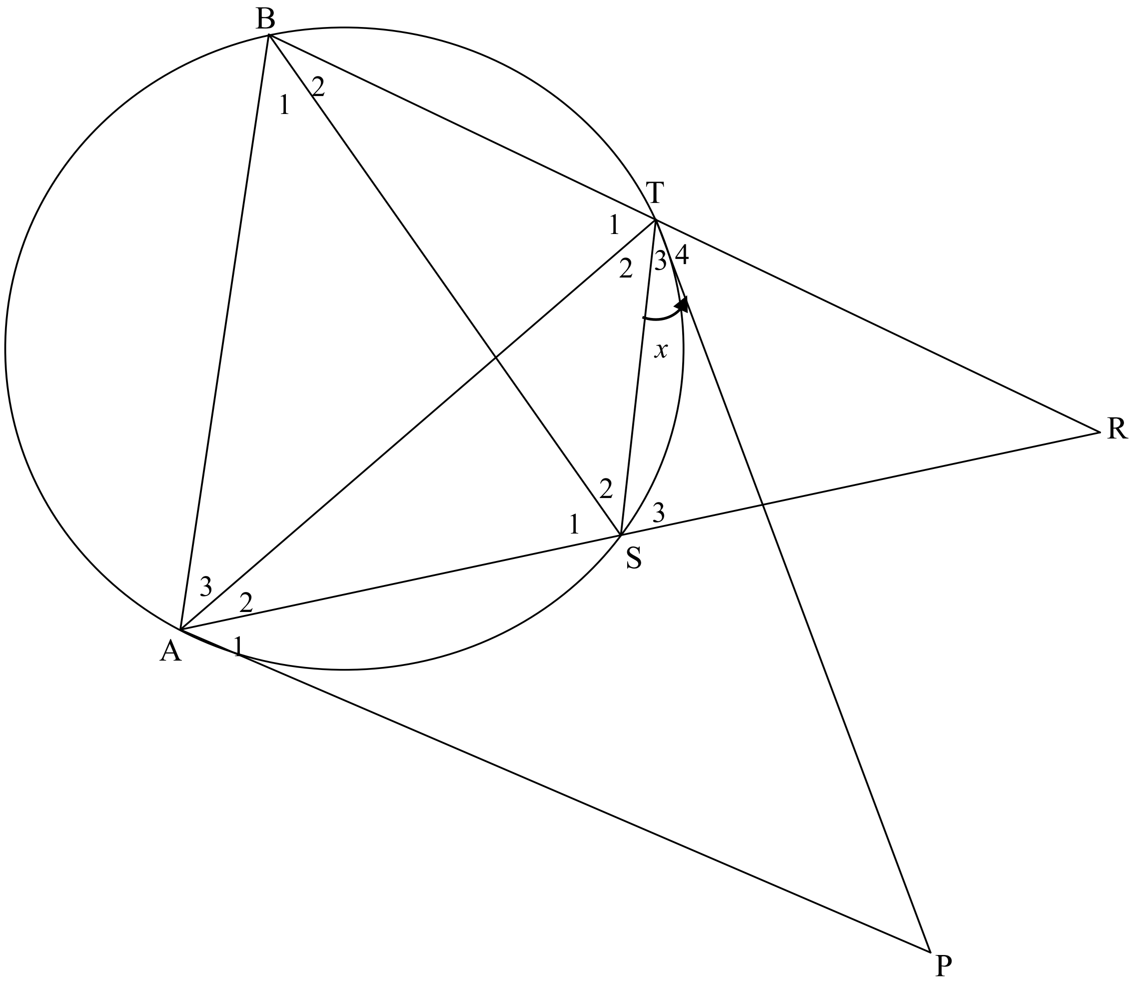
8.1	$\hat{L} = 100°$ [ext $\angle$ cyclic quad = int opp $\angle$ / *buite* $\angle$ *kdvh = tos* $\angle$] **OR/*OF*** $\hat{N}_1 = 80°$ [$\angle$s on straight line] $\hat{L} = 100°$ [opp $\angle$s of cyclic quad]	✓S ✓R (2) ✓S ✓R (2)
8.2	$\hat{N}_1 = 80°$ [$\angle$s on straight line/$\angle$e *op reguitlyn*] $\therefore \hat{O}_1 = 160°$ [$\angle$ at centre = $2\times\angle$ at circumference/midpts $\angle$ = 2 omtreks $\angle$] **OR/*OF*** reflex $K\hat{O}M = 200°$ [$\angle$ at centre=2 × $\angle$ at circumference/*midpts* $\angle$ = 2×*omtreks* $\angle$] $\therefore \hat{O}_1 = 160°$ [$\angle$s around a pt/ $\angle$e om 'n pt]	✓S ✓S ✓R (3) ✓S ✓R ✓S (3)
8.3	$\hat{M}_1 = 360° - (100° + 55° + 160°)$ [sum $\angle$s of quad/*som* $\angle$*e v vierhoek*] $\therefore \hat{M}_1 = 45°$	✓S ✓S (2) **[7]**

QUESTION/VRAAG 9



9.1.1	$\angle$ in semi-circle/$\angle$ *in halfsirkel*	✓answer (1)
9.1.2	**Opp $\angle$s** of quad **= 180°**/*Teenoorst $\angle$e v vierhoek=180°*	✓answer (1)
9.2.1	OF $\perp$ AC [line from centre bisects chord/*lyn v midpt halv kd*] $\therefore$ AC $\parallel$ GO [co-interior/*ko-binne* $\angle$s = 180° **OR/*OF*** corresp/*ooreenkomstige* $\angle$s =]	✓ S ✓ R ✓ R (3)
9.2.2	$\hat{G}_1 = \hat{A}_2$ [corresp/*ooreenk* $\angle$s; AC $\parallel$ GO] $\hat{A}_2 = \hat{B}_1$ [$\angle$s in same segment/$\angle$e *in dies segment*] $\therefore \hat{G}_1 = \hat{B}_1$ **OR/*OF*** $\hat{G}_1 = \hat{B}_2$ [ext $\angle$ cyclic quad/*buite* $\angle$ *koordevh*] but $\Delta ABF \equiv \Delta CBF$ [s, $\angle$, s] $\therefore \hat{B}_2 = \hat{B}_1$ $\therefore \hat{G}_1 = \hat{B}_1$	✓ S ✓ R ✓ S ✓ R (4) ✓ S ✓ R ✓ R ✓ S (4)
9.3	OF : FB = 3 : 2 DB = $2r$ $\therefore$ DO = $5k$ and DF = $8k$ **OR/*OF*** DF = $2r - \frac{2}{5}r = \frac{8}{5}r$ $\therefore \frac{DG}{DA} = \frac{DO}{DF} = \frac{r}{\frac{8}{5}r}$ [line $\parallel$ side of Δ/*lyn* $\parallel$ *sy v* Δ] $\therefore \frac{DG}{DA} = \frac{5}{8}$	✓ S ✓ R ✓ S (3)
		[12]

QUESTION/VRAAG 10

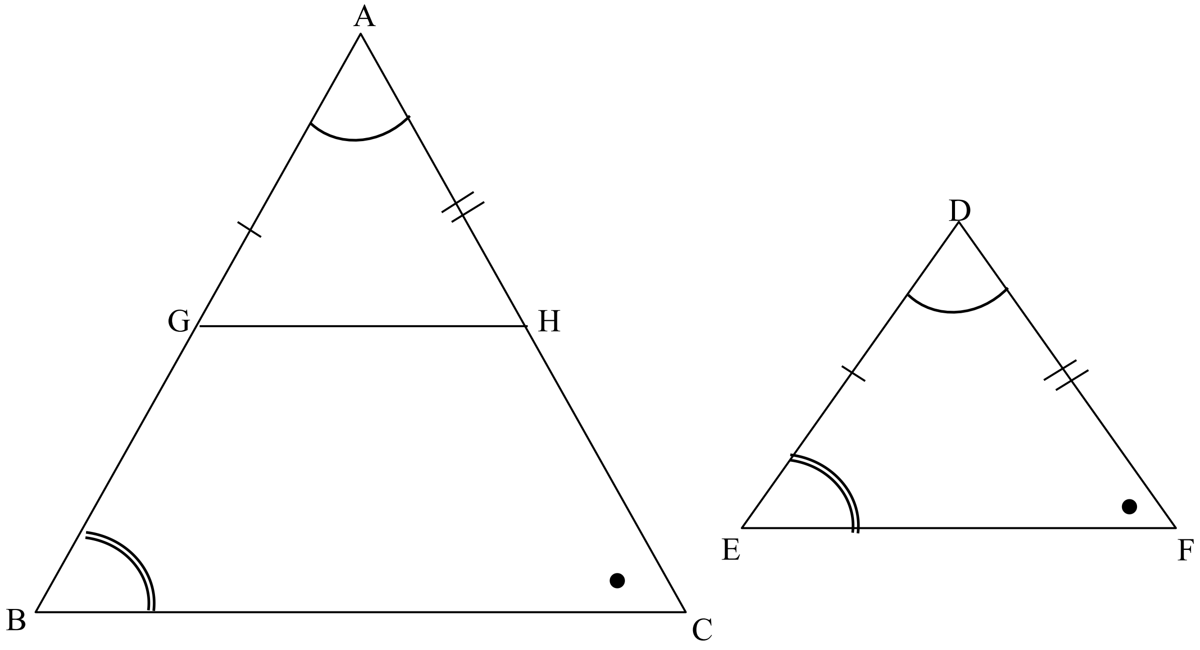


10.1	Tangent-chord theorem	✓ R (1)
10.2.1	$\hat{A}_2 + \hat{A}_3 = \hat{B}_1 + \hat{B}_2$ [$\angle^s$ opp = sides/$\angle e$ *teenoor* = *sye*] $\hat{S}_3 = \hat{B}_1 + \hat{B}_2$ [ext $\angle$ cyclic quad/*buite* $\angle$ *koordevh*] $\therefore \hat{S}_3 = \hat{A}_2 + \hat{A}_3$ $\therefore AB \parallel ST$ [corresp/*ooreenk* $\angle^s$ =] **OR/*OF*** $R\hat{T}S = B\hat{A}S$ [ext $\angle$ cyclic quad/*buite* $\angle$ *koordevh*] $B\hat{A}S = A\hat{B}T$ [$\angle^s$ opp = sides/$\angle e$ *teenoor* = *sye*] $\therefore R\hat{T}S = A\hat{B}T$ $\therefore AB \parallel ST$ [corresp/*ooreenk* $\angle^s$ =]	✓ S ✓ R ✓ S ✓ R ✓ R (5) ✓ S ✓ R ✓ S ✓ R ✓ R (5)

10.2.2	$\hat{B}_2 = x$ [tan chord theorem/*raakl – koordst*] $x + \hat{T}_4 = \hat{B}_1 + \hat{B}_2$ [corresp/*ooreenk* $\angle^s$; AB // ST] $\therefore \hat{T}_4 = \hat{B}_1$ $\hat{B}_1 = \hat{A}_1$ [tan chord theorem/*raakl – koordst*] $\therefore \hat{T}_4 = \hat{A}_1$	✓ S ✓ R ✓ S ✓ R ✓ R (5)
10.2.3	$\hat{T}_4 = \hat{A}_1$ [proven/*bewys in* 10.2.2] $\therefore$ RTAP is a cyclic quadrilateral [line subtends = $\angle^s$] *Is 'n koordevierhoek* [*lyn onderspan* = $\angle e$]	✓ S ✓ R (2)
		[13]

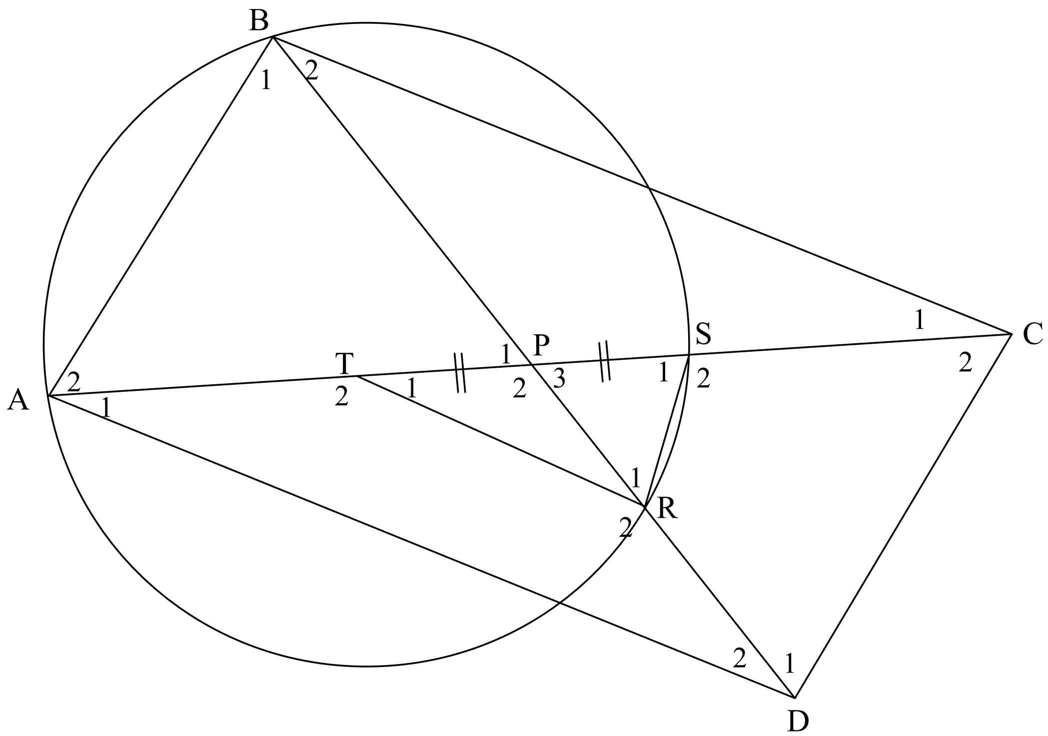
QUESTION/VRAAG 11

11.1



11.1	Constr: On sides AB and AC of ΔABC, mark points G and H respectively such that AG = DE and AH = DF. Draw GH/*Merk punt G en H op sy AB en AC van ΔABC onderskeidelik af sodanig dat AG = DE en AH = DF. Trek GH.*	✓ construction/ *konstruksie*
	Proof/*Bewys*:	
	$\Delta AGH \equiv \Delta DEF$ [s, ∠, s]	✓ S/R
	$\therefore A\hat{G}H = \hat{E}$	
	$= \hat{B}$ [$\hat{B} = \hat{E}$, given/*gegee*]	✓ S
	$\therefore GH \parallel BC$ [corresp/*ooreenk* $\angle^s =$]	✓ S /R
	$\therefore \frac{AG}{AB} = \frac{AH}{AC}$ [line ‖ side of Δ / *lyn* ‖ *sye v* Δ]	✓ S ✓ R
	$\therefore \frac{DE}{AB} = \frac{DF}{AC}$ [constr/*konstruksie*]	(6)

11.2



11.2.1(a)	$AP = PC$ [diag $\|\|^m$ bisect each other/*hoekl* $\|\|^m$ *halveer mekaar*] But $TP = PS$ [given/*gegee*] $AP - TP = PC - PS$ $\therefore AT = SC$	✓S ✓S OR S 2)
11.2.1(b)	In ΔPSR and ΔPBA : $\hat{P}_1 = \hat{P}_3$ [vertically opp $\angle^s$ / *regoorst* $\angle e$] $\hat{B}_1 = \hat{S}_1$ [$\angle^s$ in same segment/$\angle e$ *in dies segment*] $\therefore \Delta PSR \,\|\|\|\, \Delta PBA$ [$\angle, \angle, \angle$] **OR/*OF*** In ΔPSR and ΔPBA : $\hat{P}_1 = \hat{P}_3$ [vertically opp $\angle^s$ / *regoorst* $\angle e$] $\hat{B}_1 = \hat{S}_1$ [$\angle^s$ in same segment/$\angle e$ *in dies segment*] $\hat{A}_2 = \hat{R}_1$ [sum $\angle^s$ Δ / *som* $\angle e$ Δ] $\therefore \Delta PSR \,\|\|\|\, \Delta PBA$ [$\angle, \angle, \angle$]	✓S ✓R ✓S ✓R ✓R (5) ✓S ✓R ✓S ✓R ✓S (5)

11.2.2(a)	$\frac{PR}{PA}=\frac{PS}{PB}$ [$\parallel\mid\Delta$s] $\therefore \frac{PR}{PA}=\frac{TR}{AD}=\frac{PS}{PB}$ [given $\frac{PR}{PA}=\frac{TR}{AD}$] $\therefore \frac{PR}{PA}=\frac{TR}{AD}=\frac{TP}{PD}$ [PS = TP; PB = PD] $\therefore \Delta RPT \parallel\mid \Delta APD$ [sides of Δ in prop/*sye v* Δ *in dies verhouding*]	✓ S (all 3 ratios) ✓ S ✓ R (3)
11.2.2(b)	$\hat{T}_1=\hat{D}_2$ [$\parallel\mid\Delta$s] $\therefore$ ATRD is a cyclic quad [converse: ext $\angle$ of cyclic quad/ *Omgekeerde buite* $\angle$ v koordevh]	✓ S ✓ R (2)
		[18]

TOTAL/*TOTAAL*: 150