basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/
SENIORSERTIFIKAAT-EKSAMEN

MATHEMATICS P2/*WISKUNDE V2*

JUNE 2016

MEMORANDUM

MARKS/*PUNTE*: 150

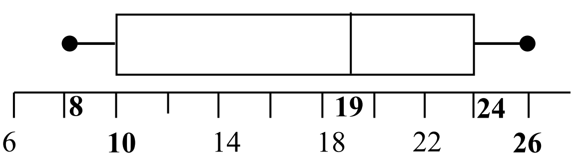
This memorandum consists of 21 pages./
Hierdie memorandum bestaan uit 21 bladsye.

NOTE:
- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate has crossed out an attempt to answer a question and did not redo it, 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.

LET WEL:
- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n poging om 'n vraag te beantwoord, doodgetrek en nie oorgedoen het nie, sien die doodgetrekte poging na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die memorandum van toepassing. Staak nasien by die tweede berekeningsfout.*
- *Om antwoorde/waardes om 'n probleem op te los, te veronderstel, word NIE toegelaat NIE.*

QUESTION/*VRAAG* 1

8	8	10	12	16	19	20	21	24	25	26

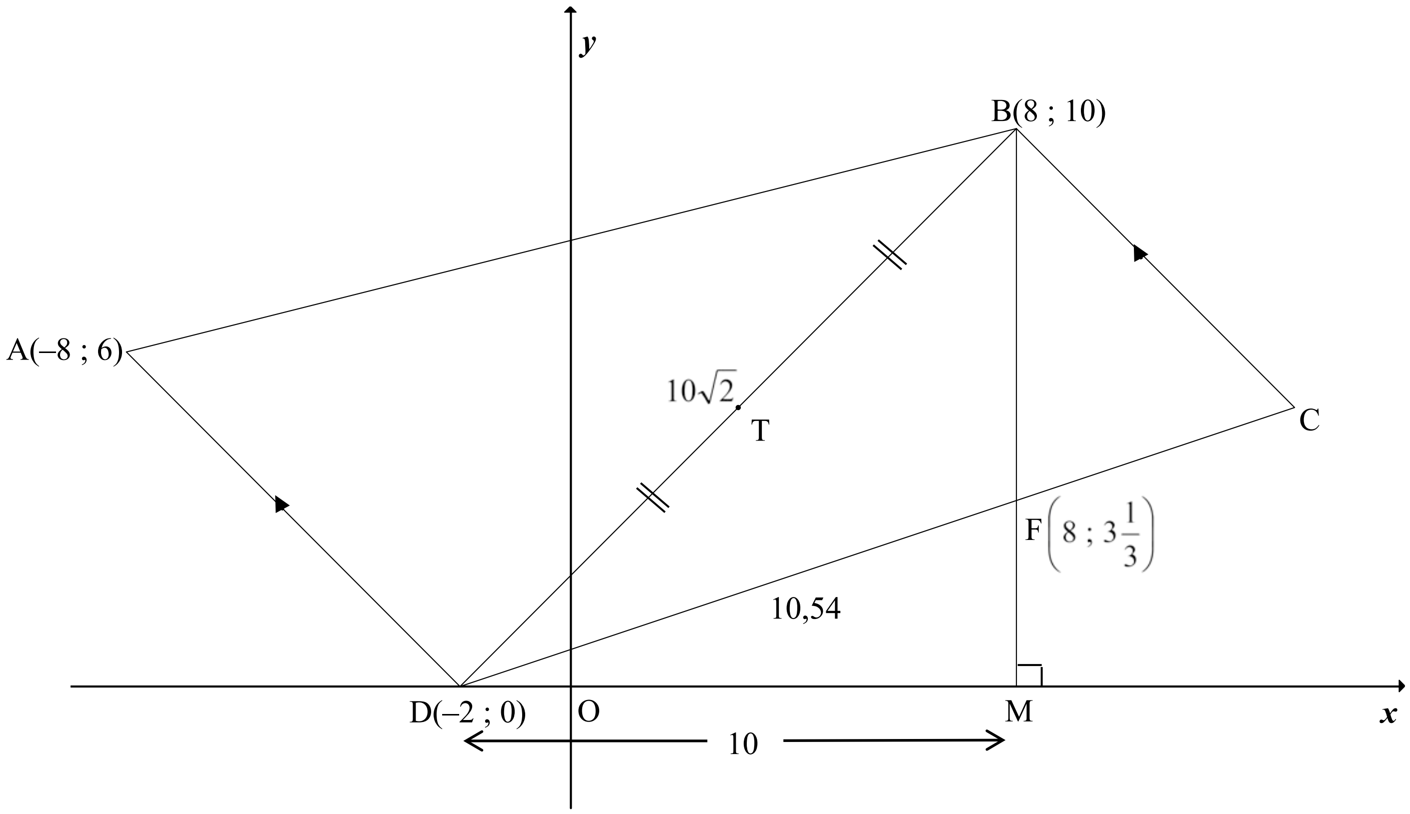
1.1	Mean/*Gemiddelde* $= \frac{189}{11}$ $= 17{,}18$ Answer only: Full marks *Slegs antwoord: Volpunte*	✓189 ✓ answer (2)
1.2	Min = 8, max = 26 Median/*Mediaan* = 19 $Q_1 = 10,\ Q_3 = 24$ $\therefore$ (8 ; 10 ; 19 ; 24 ; 26)	✓ min, max ✓ median ✓ Q_1 & Q_3 (3)
1.3		✓ box/*boks/mond* ✓ whiskers/*snor* (2)
1.4	The data is skewed to the left/*Die data is skeef na links.* **OR/*OF*** Negatively skewed/*Negatief skeef*	✓ answer (1) ✓ answer (1)
1.5	SD/*SA* = 6,46	✓✓ answer (2)
1.6	17,18 + 6,46 = 23,64 $\therefore$ 3 destinations/*bestemmings*	✓ interval ✓ answer (2) **[12]**

QUESTION/*VRAAG* 2

Temperature at midday (in °C) ***Middaguur-temperatuur (in °C)***	18	21	19	26	32	35	36	40	38	30	25
Number of bottles of water (500 mℓ) ***Getal bottels water (500 mℓ)***	12	15	13	31	46	51	57	70	63	53	23

2.1	(30 ; 53)	✓answer (1)
2.2	$a = -38{,}51$ $b = 2{,}68$ $\therefore\ \hat{y} = 2{,}68x - 38{,}51$	✓ value a ✓ value b ✓ equation (3)
2.3	$\therefore\ \hat{y} \approx 36{,}53$ bottles **OR/*OF*** $\hat{y} \approx 2{,}68(28) - 38{,}51$ $\approx 36{,}53$ bottles	✓✓ answer (2) ✓ substitution ✓ answer (2)
2.4	Strong/*Sterk* The majority of the points lie **close to** the regression line./*Die meerderheid punte lê naby die regressielyn.* **OR/*OF*** Strong/*Sterk* $r = 0{,}98$	✓ strong/*sterk* ✓ reason/*rede* (2) ✓ strong/*sterk* ✓ reason/*rede* (2)
2.5	Temperature cannot rise beyond a certain point as this would be life threatening **OR** there is only so much water one can consume before it becomes a risk to your health (hyponatremia)./*Temperatuur kan nie hoër as 'n sekere punt styg nie, anders raak dit lewensgevaarlik.* ***OF*** *'n persoon kan net 'n sekere hoeveelheid water inneem, anders raak dit 'n gesondheidsrisiko*	✓ reason/*rede* (1) **[9]**

QUESTION/*VRAAG* 3



3.1	$m_{\text{AD}} = \dfrac{y_2 - y_1}{x_2 - x_1}$ $= \dfrac{0-6}{-2+8}$ $= \dfrac{-6}{6} = -1$	✓substitution ✓–1 (2)
3.2	$m_{\text{BC}} = -1$ [BC || AD] $y = -x + c$ $10 = -8 + c$ $c = 18$ $y = -x + 18$ **OR/*OF*** $m_{\text{BC}} = -1$ [BC || AD] $y - y_1 = m(x - x_1)$ $y - 10 = -(x - 8)$ $y = -x + 18$	✓ gradient ✓substitute *m* and (8 ; 10) ✓ equation (3) ✓ gradient ✓substitute *m* and (8 ; 10) ✓ equation (3)

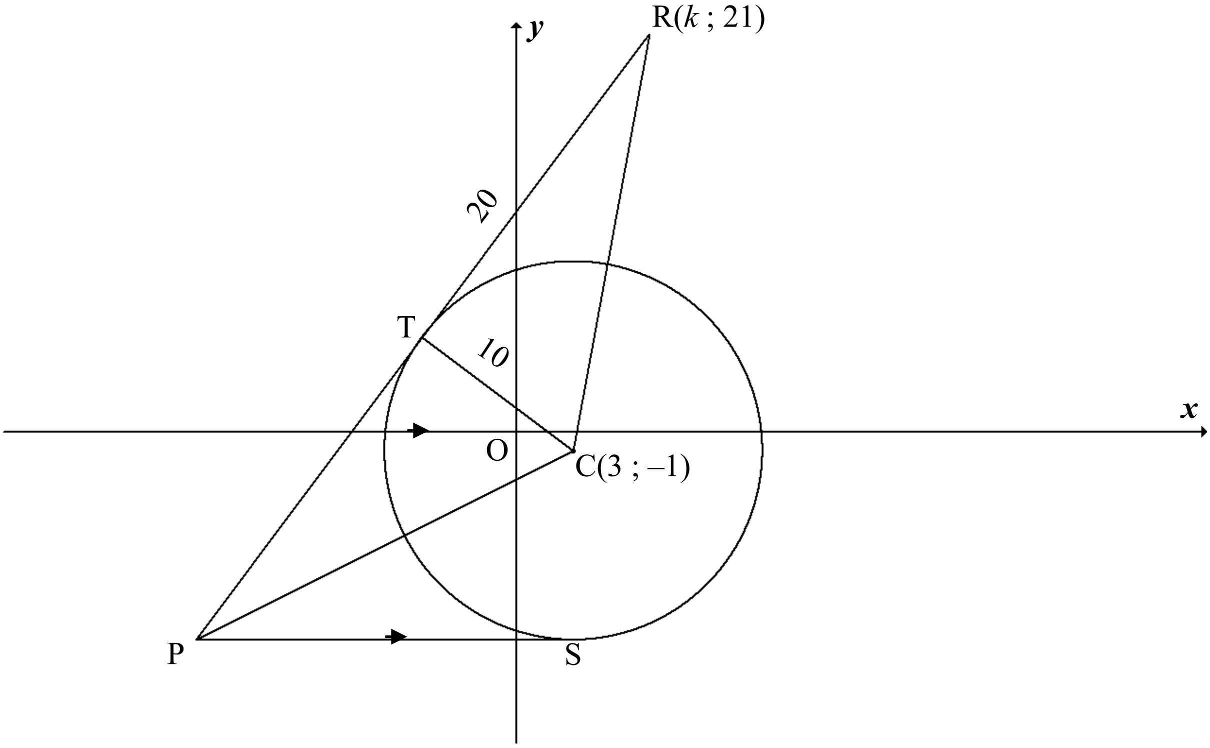
3.3	$m_{BD} = \dfrac{y_2 - y_1}{x_2 - x_1}$ $= \dfrac{10-0}{8+2} = 1$ $m_{BD} \times m_{AD} = 1 \times -1 = -1$ $\therefore DB \perp AD$	✓substitution ✓ answer ✓ $m_{BD} \times m_{AD} = -1$ (3)
	OR $AD^2 = 72$ *or* $AD = \sqrt{72}$ *or* $6\sqrt{2}$ $AB^2 = 272$ *or* $AB = \sqrt{272}$ *or* $4\sqrt{17}$ $BD^2 = 200$ *or* $BD = \sqrt{200}$ *or* $10\sqrt{2}$ $\therefore\ AB^2 = AD^2 + BD^2$ $\therefore\ A\hat{D}B = 90°$ [converse Pyth th/ *omgekeerde Pyth st*]	✓✓ calculating all 3 sides ✓ $AB^2 = AD^2 + BD^2$ (3)
3.4	$\tan B\hat{D}M = m_{BD} = 1$ $\therefore B\hat{D}M = 45°$	✓ $\tan B\hat{D}M = m_{BD}$ ✓ answer (2)
	OR $\sin\ B\hat{D}M = \dfrac{BM}{BD} = \dfrac{10}{10\sqrt{2}} = \dfrac{1}{\sqrt{2}}$ $\therefore B\hat{D}M = 45°$	✓ $\sin B\hat{D}M = \dfrac{1}{\sqrt{2}}$ ✓ answer (2)
3.5	$T(x\,;y) = \left(\dfrac{x_1+x_2}{2};\dfrac{y_1+y_2}{2}\right)$ $= \left(\dfrac{-2+8}{2};\dfrac{0+10}{2}\right)$ $= (3\ ;\ 5)$ T symmetrical about BM/*T is simmetries om BM* $\therefore$ distance of T to BM = 5 units = distance from BM to C $\therefore\ C(13\ ;\ 5)$ **OR/*OF***	✓T(3 ; 5) ✓value of x ✓ value of y (3)

	$m_{DF} = \dfrac{3\frac{1}{3} - 0}{8-(-2)} = \dfrac{1}{3}$ Equation of DF: $y - y_1 = m(x - x_1)$ $y - 0 = \dfrac{1}{3}(x+2)$ $y = \dfrac{1}{3}x + \dfrac{2}{3}$ Equation of BC: $y = -x + 18$ $\dfrac{1}{3}x + \dfrac{2}{3} = -x + 18$ $4x = 52$ $x = 13$ $\therefore y = -13 + 18 = 5$ $\therefore$ C(13 ; 5)	✓eq of DF ✓value of x ✓ value of y (3)
3.6	area/*opp* ΔBDF = area/*opp* ΔBDM – area/*opp* ΔDFM $= \dfrac{1}{2}(10)(10) - \dfrac{1}{2}(10)\left(\dfrac{10}{3}\right)$ $= \dfrac{100}{3}$ or $33\dfrac{1}{3}$ or 33,3 square units/*vk eenh* **OR/*OF*** area/*opp* ΔBDF $= \dfrac{1}{2}$.BF.DM $= \dfrac{1}{2}\left(\dfrac{20}{3}\right)(10)$ $= \dfrac{100}{3}$ or $33\dfrac{1}{3}$ or 33,3 square units/*vk eenh* **OR/*OF***	✓ formula/method ✓ 10 (DM) ✓ 10 (BM) ✓ $\dfrac{10}{3}$ or $3\dfrac{1}{3}$ ($\perp$h) ✓ answer (5) ✓ formula/method ✓ BF ✓✓ DM ✓ answer (5)

	$\tan F\hat{D}M = m_{DC} = \frac{5-0}{13+2} = \frac{1}{3}$ or $\tan F\hat{D}M = \frac{FM}{DM} = \frac{\frac{10}{3}}{10} = \frac{1}{3}$	✓ gradient/ratio
	$F\hat{D}M = 18{,}43°$	
	$\therefore B\hat{F}D = 108{,}43°$ [ext ∠ Δ]	✓ $B\hat{F}D$
	$BF = \frac{20}{3}$ or $6\frac{2}{3}$	
	$DF^2 = (10)^2 + \left(3\frac{1}{3}\right)^2$ [Pyth ΔDFM]	✓ DF
	$DF = 10{,}54$ or $\frac{\sqrt{1000}}{3}$ or $\frac{10\sqrt{10}}{3}$ $\boxed{BD = \sqrt{(10-0)^2+(8+2)^2} = \sqrt{200}\ or\ 10\sqrt{2}}$	
	$\therefore$ area/*opp* $\Delta BDF = \frac{1}{2}.BF.FD.\sin B\hat{F}D$	
	$= \frac{1}{2}\left(\frac{20}{3}\right)\left(\frac{10\sqrt{10}}{3}\right)(\sin 108{,}43)$	✓correct substitution into area rule
	$= \frac{100}{3}$ or $33\frac{1}{3}$ or 33,33 square units/*vk eenh*	✓ answer (5)
	OR/*OF*	
	$BF = \frac{20}{3}$ or $6\frac{2}{3}$	✓ BF
	$BD = \sqrt{(10-0)^2+(8+2)^2}$ $= \sqrt{200}\ or\ 10\sqrt{2}$	✓ BD
	area/*opp* $\Delta BDF = \frac{1}{2}.BF.BD.\sin D\hat{B}F$	✓ formula/method
	$= \frac{1}{2}\left(\frac{20}{3}\right)\left(\sqrt{200}\right)(\sin 45°)$	✓correct substitution into area rule
	$= \frac{100}{3}$ or $33\frac{1}{3}$ or 33,33 square units/*vk eenh*	✓ answer (5)
	OR/*OF*	
	area/*opp* ΔBDF = area/*opp* ΔBCD – area/*opp* ΔBCF	✓ formula/method
	$= \frac{1}{2}\left(10\sqrt{2}\right)\left(5\sqrt{2}\right) - \frac{1}{2}\left(\frac{20}{3}\right)(5)$	✓ $BD = 10\sqrt{2}$ ✓ $BC = 5\sqrt{2}$ ✓ $BF = \frac{20}{3}$
	$= \frac{100}{3}$ or $33\frac{1}{3}$ or 33,33 square units/*vk eenh*	✓ answer (5)
	OR/*OF*	

	$\tan F\hat{D}M = m_{DC} = \dfrac{5-0}{13+2} = \dfrac{1}{3}$ or $\tan F\hat{D}M = \dfrac{FM}{DM} = \dfrac{\frac{10}{3}}{10} = \dfrac{1}{3}$	✓ gradient/ratio
	$F\hat{D}M = 18{,}43°$	
	$B\hat{D}F = 26{,}56°$	✓ $B\hat{D}F$
	area / *opp* ΔBDF	
	$= \dfrac{1}{2}.BD.DF.\sin B\hat{D}F$	✓ DF **OR/*OF*** BD
	$= \dfrac{1}{2}.\left(10\sqrt{2}\right).\left(\dfrac{10\sqrt{10}}{3}\right).\sin 26{,}56°$	✓correct substitution into area rule
	$= \dfrac{100}{3}$ or $33\dfrac{1}{3}$ or 33,33 square units/*vk eenh*	✓ answer (5) **[18]**

QUESTION/*VRAAG* 4



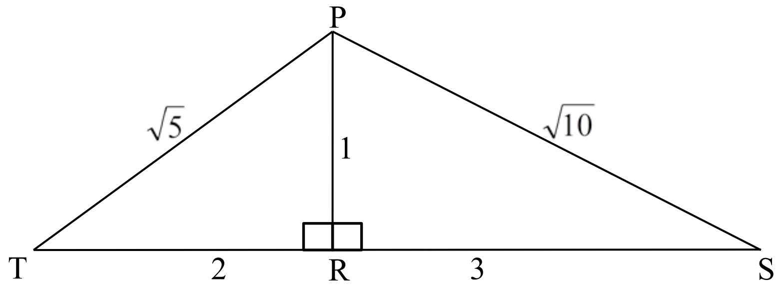
4.1	radius ⊥ tangent /*raaklyn*	✓ R (1)
4.2	$CR^2 = TR^2 + CT^2$ (Pyth) $CR^2 = 20^2 + 10^2 = 500$ $CR = \sqrt{500}$ or $10\sqrt{5}$	✓ substitution ✓ answer (2)
4.3	$CR^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$ $500 = (k-3)^2 + (21+1)^2$ $k^2 - 6k + 9 + 484 = 500$ $k^2 - 6k - 7 = 0$ $(k-7)(k+1) = 0$ $k = 7$ or $k \neq -1$ **OR/*OF*** $CR^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$ $500 = (k-3)^2 + (21+1)^2$ $(k-3)^2 = 16$ $k - 3 = 4$ or $k - 3 = -4$ $k = 7$ or $k \neq -1$	✓ substitution ✓ standard form ✓ factors ✓ $k = 7$ (4) ✓ substitution ✓ square form ✓ square root ✓ $k = 7$ (4)

4.4	$(x-3)^2+(y+1)^2=100$	✓✓ answer (2)
4.5	CS = 10 and CS $\perp$ PS $\therefore S(3;-11)$ $\therefore y=-11$	✓ $S(3;-11)$ ✓ answer (2)
4.6.1	S(3;–11) $\therefore 3(-11)-4x=35$ $x=-17$ $\therefore P(-17;-11)$ **OR/*OF*** $\frac{4}{3}x+\frac{35}{3}=-11$ $\frac{4}{3}x=\frac{-68}{3}$ $x=-17$ $P(-17;-11)$	✓ substituting ✓ answer (2) ✓ equating ✓ answer (2)
4.6.2	PT = PS [tangents from common point/*rklyne vanaf dies pt*] = 17 + 3 = 20 units **OR** $PC=\sqrt{(-17-3)^2+(-11+1)^2}$ $=\sqrt{500}$ *or* $10\sqrt{5}$ $PT^2=PC^2-TC^2$ [Pyth th] = 500 – 100 = 400 $\therefore$ PT = 20 **OR** $PC=\sqrt{(-17-3)^2+(-11+1)^2}$ $=\sqrt{500}$ *or* $10\sqrt{5}$ Δ PTC $\equiv$ ΔRTC [90°HS] $\therefore$ PT = TR $\therefore$ PT = 20	✓ S ✓R ✓ answer (3) ✓ value of PC ✓ using Pyth ✓ answer (3) ✓ value of PC ✓ S/R or proved ✓ answer (3)
4.7.1	$M(3;-16)$	✓answer (1)

4.7.2	Radius = 4	✓ answer (1)
4.7.3	$r_1 + r_2 = 10 + 4 = 14$ distance $\text{CM} = \sqrt{(3-3)^2 + (-1+16)^2}$ $= \sqrt{225}$ $= 15$ CM > $r_1 + r_2$ Therefore the two circles do not intersect or touch./*Daarom sny of raak die twee sirkels nie.*	✓ $r_1 + r_2$ ✓ 15 ✓explanation (3) **[21]**

QUESTION/*VRAAG* 5

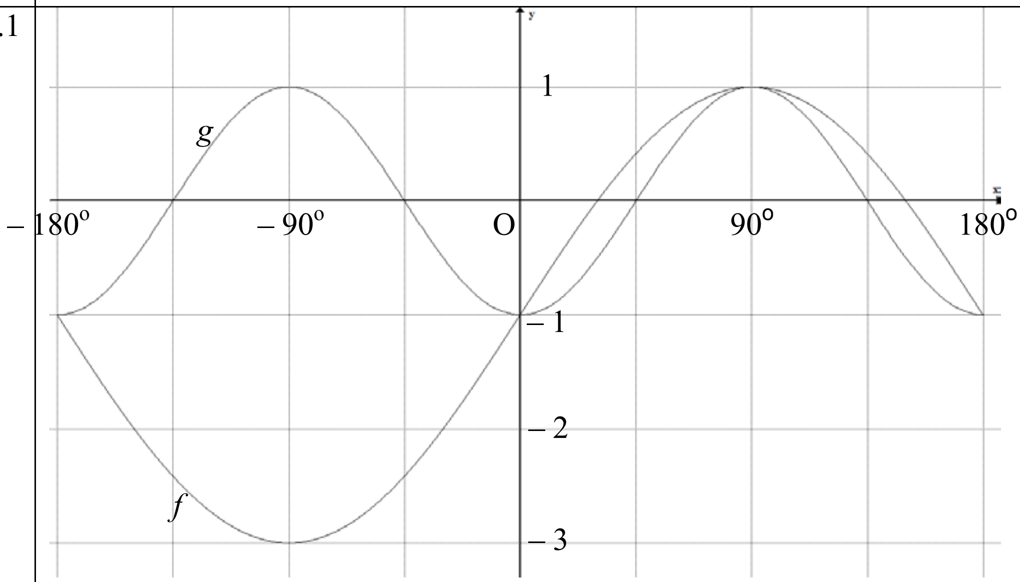
5.1



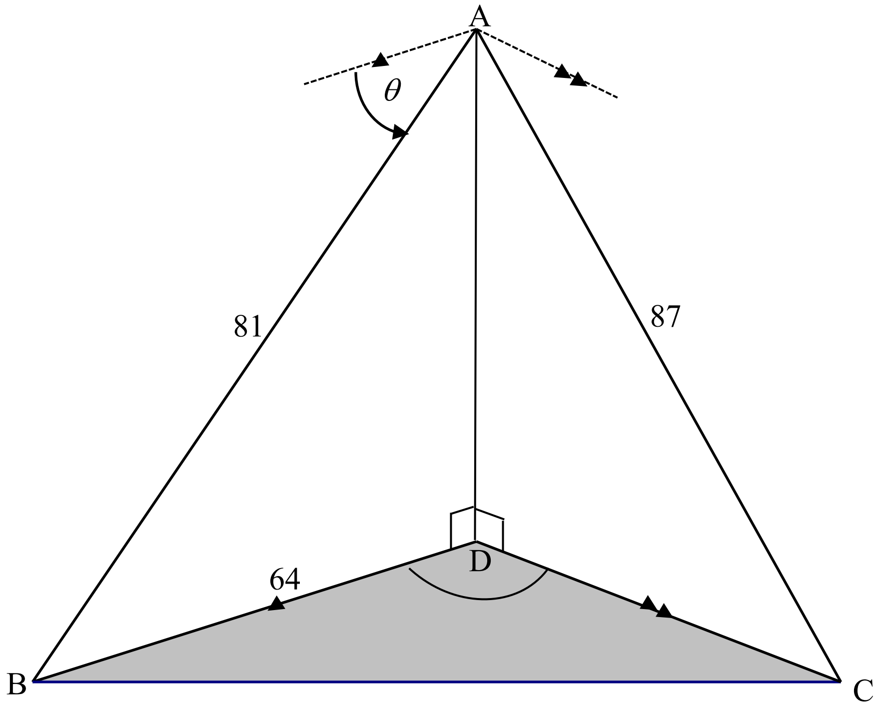
5.1.1(a)	$\sin T = \frac{1}{\sqrt{5}} = \frac{\sqrt{5}}{5} = 0{,}45$	✓value (1)
5.1.1(b)	$\cos S = \frac{3}{\sqrt{10}} = \frac{3\sqrt{10}}{10} = 0{,}95$	✓value (1)
5.1.2	$\cos(T+S) = \cos T\cos S - \sin T\sin S$ $= \left(\frac{2}{\sqrt{5}}\right)\left(\frac{3}{\sqrt{10}}\right) - \left(\frac{1}{\sqrt{5}}\right)\left(\frac{1}{\sqrt{10}}\right)$ $= \frac{6}{\sqrt{50}} - \frac{1}{\sqrt{50}}$ $= \frac{5}{\sqrt{50}}$ *or* $\frac{1}{\sqrt{2}}$ *or* $\frac{\sqrt{2}}{2}$	✓expansion ✓ $\frac{2}{\sqrt{5}}$ ✓ $\frac{1}{\sqrt{10}}$ ✓ simplification ✓ answer (5)
5.2	$\frac{1}{\cos(360° - \theta)\sin(90° - \theta)} - \tan^2(180° + \theta)$ $= \frac{1}{(\cos\theta)(\cos\theta)} - \tan^2\theta$ $= \frac{1}{\cos^2\theta} - \left(\frac{\sin^2\theta}{\cos^2\theta}\right)$ $= \frac{1 - \sin^2\theta}{\cos^2\theta}$ $= \frac{\cos^2\theta}{\cos^2\theta}$ *OR* $\frac{1 - \sin^2\theta}{1 - \sin^2\theta}$ $= 1$	✓ $\cos\theta$ ✓ $\cos\theta$ ✓ $\tan^2\theta$ ✓ $\frac{\sin^2\theta}{\cos^2\theta}$ ✓identity ✓ answer (6)

5.3	$(\sin x - \cos x)^2 = \left(\frac{3}{4}\right)^2$ $\sin^2 x - 2\sin x \cos x + \cos^2 x = \frac{9}{16}$ $1 - 2\sin x \cos x = \frac{9}{16}$ $2\sin x \cos x = \frac{7}{16}$ $\therefore \sin 2x = \frac{7}{16}$	✓ squaring both sides ✓expanding LHS ✓ using identity ✓ simplifying ✓answer (5) **[18]**

QUESTION/*VRAAG* 6

6.1	$4\sin x + 2\cos 2x = 2$ $2\sin x + \cos 2x - 1 = 0$ $2\sin x + (1 - 2\sin^2 x) - 1 = 0$ $2\sin^2 x - 2\sin x = 0$ $2\sin x(\sin x - 1) = 0$ $2\sin x = 0$ or $\sin x - 1 = 0$ $\sin x = 0$ $\sin x = 1$ $x = k.180°$ or $x = 90° + k.360, k \in Z$	✓using identity ✓ standard form ✓ factors ✓ $\sin x = 0$ or $\sin x = 1$ ✓ $k.180°$ ✓ $90° + k.360, k \in Z$ (6)
6.2.1		✓ turning point (–90° ; –3) ✓ turning point (90° ; 1) ✓ (–180° ; –1) & (0° ; –1) (3)
6.2.2	$(-90°; 0°)$ **OR/*OF*** $-90° < x < 0°$	✓ ✓ answer (2) ✓ ✓ answer (2)
6.2.3	$f(x) = g(x)$ $\therefore -180°; 0°; 90°; 180°$ $f(x + 30°) = g(x + 30°)$ $\therefore x = -30°; 60°; 150°$	✓ any ONE correct ✓ other 2 correct (2) **[13]**

QUESTION/*VRAAG* 7

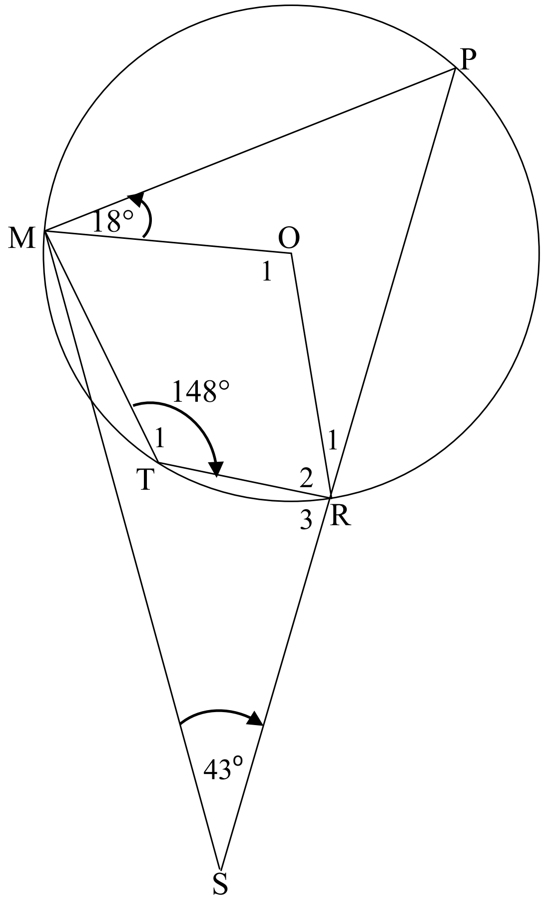


7.1	$\hat{ABD} = \theta$ [alternate $\angle$ s; $\parallel$ lines] $\cos\theta = \frac{BD}{AB} = \frac{64}{81}$ $\theta = 38°$ OR/***OF*** $\sin B\hat{A}D = \frac{64}{81}$ $B\hat{A}D = 52{,}18°$ $\theta = 38°$	✓correct trig ratio ✓substitution into correct ratio ✓ answer (to the nearest degree) (3) ✓correct trig ratio ✓substitution into correct ratio ✓ answer (to the nearest degree) (3)
7.2	$BC^2 = AB^2 + AC^2 - 2(AB)(AC)\cos B\hat{A}C$ $= 81^2 + 87^2 - 2(81)(87)\cos 82{,}6°$ $= 12314{,}754...$ $BC = 110{,}97\text{ m}$	✓use cosine rule ✓correct substitution into cosine rule ✓answer (3)

7.3	$\frac{\sin D\hat{C}B}{BD}=\frac{\sin B\hat{D}C}{BC}$ $\sin D\hat{C}B=\frac{BD.\sin B\hat{D}C}{BC}$ $\sin D\hat{C}B=\frac{64.\sin 110°}{110,97}$ $\therefore D\hat{C}B=32,82°$	✓ use sine rule ✓ substitution ✓ answer (3) **[9]**

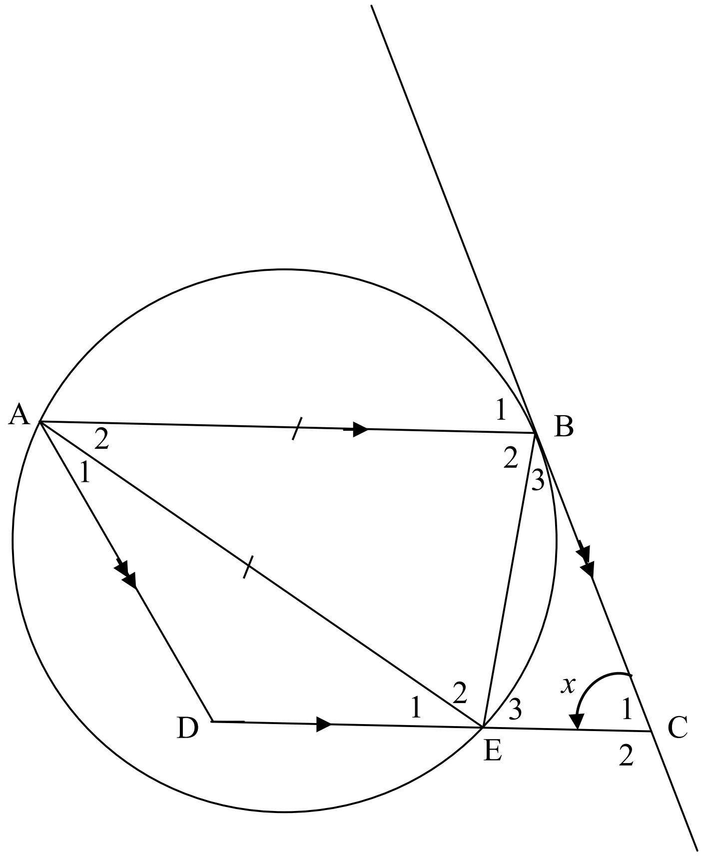
QUESTION/*VRAAG* 8

8.1



8.1.1	$\hat{P} = 32°$ [opp $\angle$s of cyclic quad/*teenoorst∠e v koordevh*]	✓ S ✓ R (2)
8.1.2	$\hat{O}_1 = 2(32°) = 64°$ [$\angle$ centre = 2 $\angle$ at circum/*midpts∠ = 2 omtreks∠*] **OR/*OF*** reflex $\hat{O} = 296°$ [$\angle$ centre = 2 $\angle$ at circum/*midpts∠ = 2 omtreks∠*] $\hat{O}_1 = 64°$ [$\angle$s around a point/*∠e om 'n punt*]	✓ S ✓R (2) ✓ S and R ✓ S (2)
8.1.3	$O\hat{M}S = 180° - (32° + 18° + 43°)$ [sum $\angle$s Δ / *som ∠e* Δ] $= 87°$	✓ S ✓ S (2)
8.1.4	$\hat{R}_3 = T\hat{M}P$ [ext $\angle$ cyclic quad/*buite ∠ koordevh*] $= 87° + 18° - 6°$ $= 99°$	✓ R ✓ S (2)

8.2

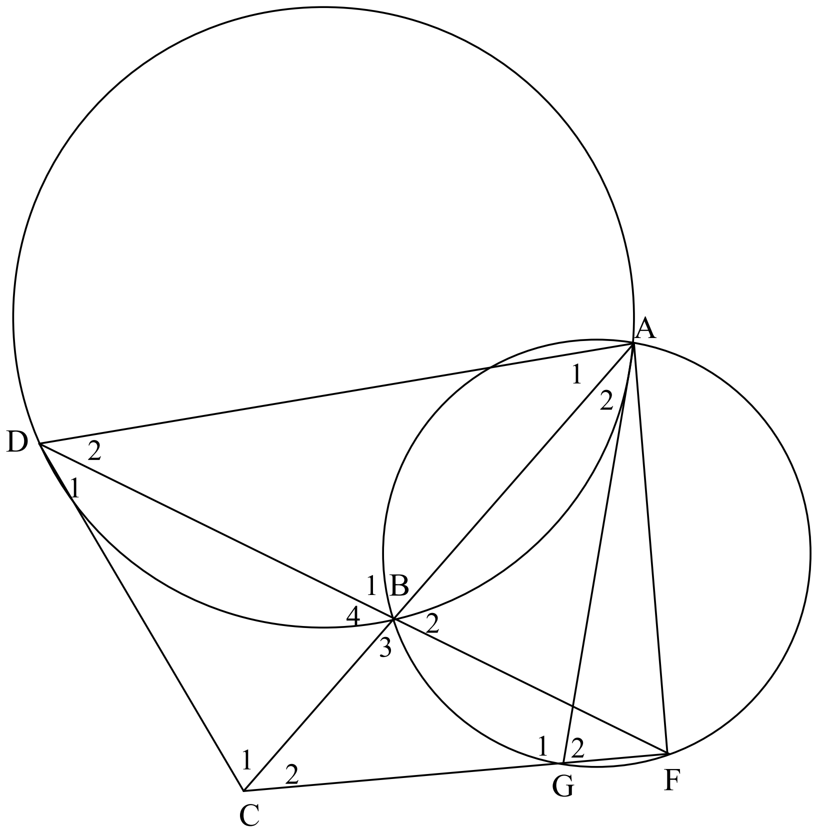


8.2.1	corres $\angle$s/*ooreenk* $\angle e$; AB | | DC	✓ R (1)
8.2.2	$\hat{E}_2 = x$ [tan - chord theorem/*raakl – koordst*] $\hat{B}_2 = x$ [$\angle$s opp = sides/$\angle e$ *teenoor* = *sye*] $\hat{E}_3 = x$ [alt $\angle$s/*verwiss* $\angle e$; AB || DC] $D\hat{A}B = x$ [opp $\angle$s $\|^m$ /*teenoor* $\angle e$ $\|^m$ **OR/*OF*** alternate/*verwiss* $\angle$s/*e*; BC ||AD] Any 3 $\angle$s correct	✓S ✓R ✓ S ✓ R ✓ S ✓ R (6)
8.2.3	$\hat{D} = 180° - x$ [co - int $\angle$s suppl/*ko – binne*$\angle e$ suppl; AD || BC] $\therefore \hat{B}_2 + \hat{D} = 180°$ $\therefore$ ABED a cyc quad/*kdvh* [converse opp $\angle$s of cyclic quad/ *omgek teenoorst* $\angle e$ *koordevh*] **OR/*OF*** $D\hat{A}B = x$ [opp $\angle$s/*teenoor* $\angle e$ | |^m] OR/*OF* [alt$\angle$s/*verwiss* $\angle e$;BC | | AD] $\hat{E}_3 = D\hat{A}B = x$ $\therefore$ ABED a cyc quad/*kdvh* [converse ext $\angle$ of cyc quad/*omgek buite*$\angle$ *v koordevh*]	✓S ✓ R ✓ R (3) ✓S ✓ R ✓ R (3) **[18]**

QUESTION/*VRAAG* 9

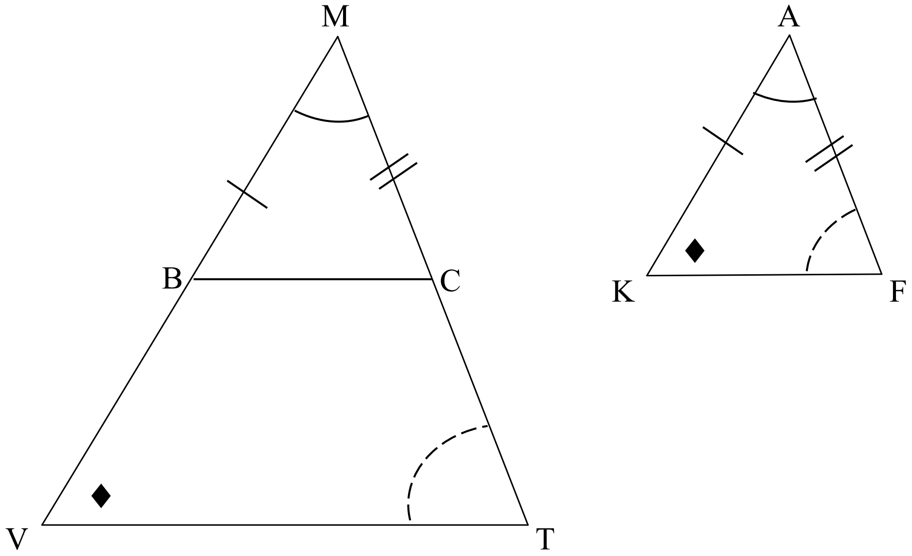
9.1	… in the alternate segment/…*in die(teen)oorstaande segment*	✓ answer (1)

9.2



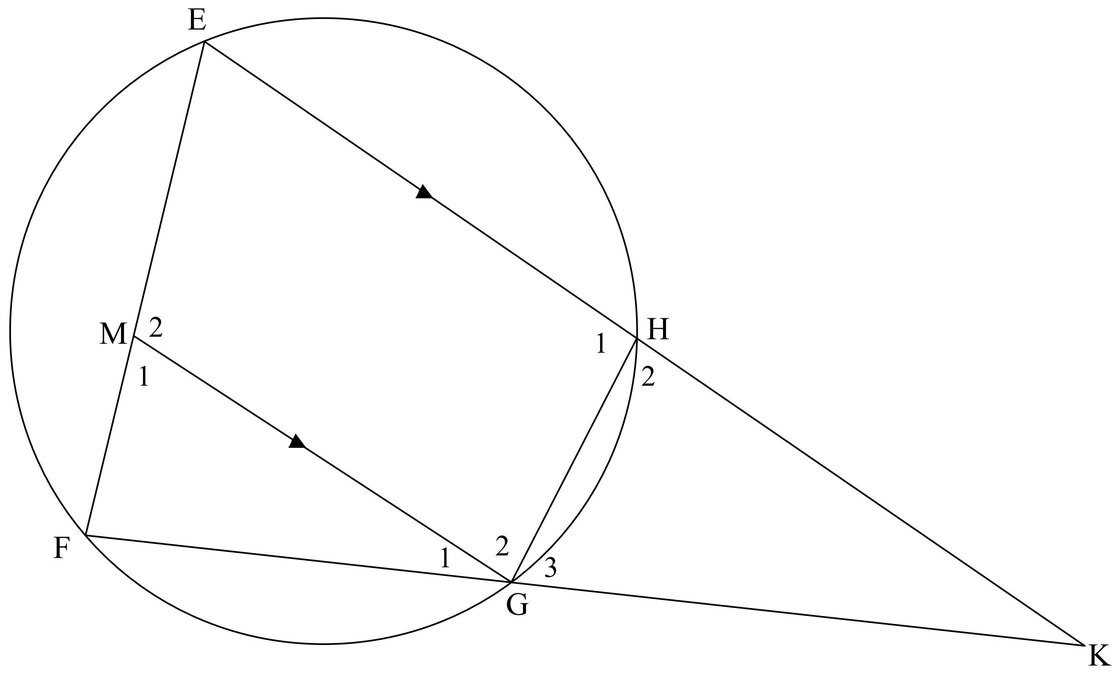
9.2.1	$\hat{A}_1 = \hat{D}_1$ [tan chord theorem/*raakl – koordst*] $\hat{B}_4 = \hat{A}_1 + \hat{D}_2$ [ext ∠ Δ/*buite*∠ Δ] $= \hat{D}_1 + \hat{D}_2$	✓S ✓ R ✓ S ✓ R (4)
9.2.2	$\hat{B}_4 = \hat{B}_2$ [vert opp ∠s/*regoorst* ∠*e*] $\hat{D}_1 + \hat{D}_2 = \hat{B}_2$ [proven/*bewys*] $= \hat{G}_2$ [∠s in same segment/∠e *in dies segment*] ∴ AGCD is cyc quad/*kvh* [converse ext∠ cyc quad/*omgek buite*∠ *kvh*]	✓ S ✓ S ✓ R ✓ R (4)
9.2.3	$\hat{D}_1 = \hat{A}_2$ [∠s in same segment/∠*e in dies segment*] $\hat{A}_2 = \hat{F}$ [∠s in same segment/∠*e in dies segment*] $\therefore \hat{D}_1 = \hat{F}$ ∴ DC = CF [sides opp = ∠s/*sye teenoor* = ∠*e*]	✓ S ✓ R ✓ S ✓ R (4) **[13]**

QUESTION/*VRAAG* 10



10.1	Constr/*Konstr* : Draw line BC such that MB = AK and MC = AF *Trek lyn BC sodat MB = AK en MC = AF* Proof/*Bewys* : In ΔBMC and/*en* ΔKAF MB = AK [constr/*konstr*] $\hat{M} = \hat{A}$ [given/*gegee*] MC = AF [constr/*konstr*] $\Delta BMC \equiv \Delta KAF$ [s $\angle$ s] $\therefore M\hat{B}C = A\hat{K}F$ or $M\hat{C}B = A\hat{F}K$ [$\equiv \Delta$] but /*maar* $\hat{V} = \hat{K}$ or $\hat{T} = \hat{F}$ [given/*gegee*] $\therefore M\hat{B}C = \hat{V}$ or $M\hat{C}B = \hat{T}$ But these are corresponding $\angle$s/*maar hulle is ooreenk* $\angle$*e* $\therefore BC \parallel VT$ [corr $\angle$s = /*ooreenk*$\angle$*e* =] $\therefore \frac{MV}{MB} = \frac{MT}{MC}$ [prop theorem/*eweredighst*; BC | | VT] but /*maar* MB = AK and MC = AF [constr/*konstr*] $\therefore \frac{MV}{AK} = \frac{MT}{AF}$	✓ constr/*konstr* ✓ S / R ✓ S ✓ S ✓ S / R ✓S ✓R (7)

10.2



10.2.1(a)	In ΔKGH and ΔKEF $\hat{K}$ is common/*gemeen* $\hat{H}_2 = \hat{F}$ [ext $\angle$ cyclic quad/*buite* $\angle$ *koordevh*] $\hat{G}_3 = \hat{E}$ [sum$\angle$s Δ OR ext $\angle$ cyclic quad/*som*$\angle$*e*Δ *OR buite*$\angle$*koordevh*] $\therefore \Delta KGH \mid\mid\mid \Delta KEF$ [$\angle\angle\angle$]	✓ S ✓S ✓R ✓ naming third angle OR $\angle\angle\angle$ (4)
10.2.1(b)	$\frac{EF}{GH} = \frac{KE}{KG}$ [$\mid\mid\mid$ Δs] $\therefore \frac{EF}{GH} = \frac{KE}{EF}$ [KG = EF] $\therefore EF^2 = KE.GH$	✓ S ✓ S (2)
10.2.1(c)	$\frac{KG}{KF} = \frac{EM}{EF}$ [prop theorem/*eweredighst*; MG | | EK] but EF = KG [given/*gegee*] $\frac{KG}{KF} = \frac{EM}{KG}$ $KG^2 = EM.KF$	✓ S ✓ R ✓ S (3)
10.2.2	KE.GH = EM.KF $EM = \frac{20 \times 4}{16}$ = 5 units	✓ KE.GH = EM.KF ✓ substitution ✓ answer (3) **[19]**

TOTAL/*TOTAAL*: 150