GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

JUNE EXAMINATION
JUNIE EKSAMEN
GRADE/*GRAAD* 12

2024

MARKING GUIDELINES/
NASIENRIGLYNE

MATHEMATICS/
WISKUNDE

(PAPER/*VRAESTEL* 2)

19 pages/*bladsye*

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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 guidelines. Stop marking at the second calculation error.
- Assuming answers/values to solve a problem is NOT acceptable.
- Breakdown implies stop marking.

LET WEL:
- *As 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord van 'n vraag doodtrek en dit nie oordoen nie, sien die doodgetrekte poging na.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die nasienriglyne toegepas. Hou op nasien by die tweede berekeningsfout.*
- *Aannames van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat NIE.*

GEOMETRY/*MEETKUNDE*	
S	A mark for a correct statement (A statement mark is independent of a reason.)
	'n Punt vir 'n korrekte bewering ('n Punt vir 'n bewering is onafhanklik van 'n rede)
R	A mark for a correct reason (A reason mark may only be awarded if the statement is correct.)
	'n Punt vir 'n korrekte rede ('n Punt word slegs vir die rede toegeken as die bewering korrek is.)
S/R	Award a mark if the statement AND reason are both correct.
	Ken 'n punt toe as beide die bewering EN rede korrek is.

QUESTION/VRAAG 1				
1.1				
	1.1.1	mean/gemiddeld= $\frac{982}{16}$ = 61,38 **Answer only: Full marks** *Slegs antwoord: Volpunte* Accept : 61 No penalty for rounding off	✓ 982 ✓ answer/antwoord	(2)
	1.1.2	$\sigma = 19{,}63$	✓ answer/antwoord	(1)
	1.1.3	$(\bar{x} - \sigma; \bar{x} + \sigma) = (61{,}38 - 19{,}63; 61{,}38 + 19{,}63)$ = (41,75; 81,01) ∴ 6 learners/leerders **ACCEPT/AANVAAR:** **(61 – 19,63 ; 61 + 19,63)** **= (41, 37; 80, 63)**	✓ (41,75; 81,01) ✓ 6	(2)
1.2	1.2.1	Negatively skewed/ skewed to the left *Negatief skeef/skeef na links*	✓ answer/antwoord	(1)
	1.2.2	**Test 2**, because 50% of the learners got a mark higher than 66, while in test 1,50 % of the learners got a mark less than 62%. *Toets 2, omdat 50% van die leerders 'n punt hoër as 66 behaal het, terwyl slegs 50 % van die leerders meer as 62% in toets 1 gekry het.* **OR/OF** **Test 2**, because the median mark is higher than that of test 1/**Toets 2**, *omdat die mediaan hoër is as in toets 1* **OR/OF** **Test 2**, because less than 75% of the learners got a mark less than 76, while in test 1 75% obtained a mark less than 76/**Toets 2**, *omdat minder as 75% van die leerders 'n punt minder as 76 behaal het, terwyl in toets 1 75% 'n laer punt as 76 behaal het.*	✓ Test 2/Toets 2 ✓ reason/rede	(2)
	1.2.3	$\frac{25}{100} \times 16 = 4$ learners/leerders **OR/OF** **Answer only: Full marks** *Slegs antwoord: Volpunte* $\frac{1}{4} \times 16 = 4$ learners/leerders	✓ $\frac{25}{100} \times 16$ ✓ 4 OR/OF ✓ $\frac{1}{4} \times 16$ ✓ 4	(2) (2)
				[10]

QUESTION 2/*VRAAG 2*

2.1	2.1.1	400	✓ 400	(1)
	2.1.2	A = 50 B = 100	✓ A ✓ B	(2)
	2.1.3	$280 - 20 = 260$ Ogive: Accept answer Btw (250 – 280) **OR** Table: $30 + 50 + 100 + 80 = 260$ ***[Answer only: Full marks / Slegs antwoord: Volpunte]***	✓ 280 – 20 ✓ 260 **OR** ✓ Adding frequencies *Tel frekwensies op* ✓ Answer/*antwoord*	(2)
	2.1.4	The median will decrease./*Die mediaan sal afneem.*	✓ Decrease/*afneem*	(1)
2.2		$\dfrac{5 \times 13 + 15t + 25 \times 12 + 35 \times 4}{13 + t + 12 + 4} = 16{,}4$ $\dfrac{505 + 15t}{29 + t} = 16{,}4$ $475{,}6 + 16{,}4\,t = 505 + 15t$ $1{,}4t = 29{,}4$ $t = 21$	✓ equating to 16,4/ *gelykstel aan 16,4* ✓ correct expressions for both numerator & denominator/*korrekte uitdrukking van beide teller en noemer* ✓ simplifying/*vereenvoudig* ✓ answer/*antwoord*	(4)
				[10]

QUESTION/*VRAAG* 3			
3.1	$x_m = \frac{x_1+x_2}{2}$ $\quad y_m = \frac{y_1+y_2}{2}$ $1 = \frac{a+3}{2}$ $\quad -1 = \frac{b+4}{2}$ $a = -1$ $\quad b = -6$ $B(-1; -6)$ Answer only: Full marks *Slegs antwoord: Volpunte.*	✓ correct substitution into correct formula for *a*/*korrekte substitusie in korrekte formule vir a* ✓ correct substitution into formula for *b*/*korrekte substitusie in formule vir b* ✓ answer for both *a* and *b* in coordinate form/*antwoord van beide a en b in koördinaat vorm*	(3)
3.2	$m = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{4-(-1)}{3-1}$ OR/*OF* $m = \frac{4-(-6)}{3-(-1)}$ $= \frac{5}{2}$	✓ substitution into correct formula/*Substitusie in korrekte formule* ✓ answer/*antwoord*	(2)

3.3	$2y + x = 11$ $y = -\dfrac{1}{2}x + \dfrac{11}{2}$ OR $m = \dfrac{7-4}{-3-3}$ $tan\alpha = -\dfrac{1}{2}$ $= -\dfrac{1}{2}$ $\alpha = 180° - 26,56°$ $\alpha = 153,43°$ $tan\beta = \dfrac{5}{2}$ $\beta = 68,198°$ $\theta = 153,43° - 68,198°$ $\theta = 85,2°$ (–1 Rounding/–1 Afronding)	✓ $tan\alpha = -\dfrac{1}{2}$ ✓ answer α/antwoord α ✓ value of β/waarde van β ✓ value of θ/waarde van θ	(4)
3.4	$m_{BC} = \dfrac{5}{2}$ $y - y_1 = m(x - x_1)$ **OR/OF** $y = mx + c$ $y - 4 = \dfrac{5}{2}(x - 3)$ $4 = \dfrac{5}{2}(3) + c$ $y = \dfrac{5}{2}x - \dfrac{7}{2}$	✓ Substitute gradiënt and point B or C or M/ Sustitusie gradient en punt B of C of M ✓ Equation/Vergelyking	(2)
3.5	$EF = \dfrac{11}{2} - \left(-\dfrac{7}{2}\right)$ $EF = 9$ $Area\Delta CEF = \dfrac{1}{2}EF.\perp h$ $= \dfrac{1}{2}(9)(3)$ $= 13,5$ units^2/eenhede^2 **OR/OF**	✓ value of/waarde van y_F ✓ value of/waarde van EF ✓ value of/waarde van $\perp h$ ✓ answer/antwoord	
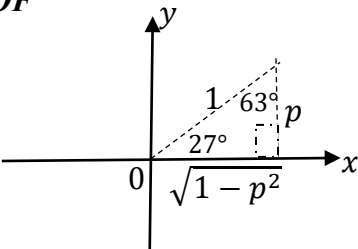
	$E\hat{C}F = 180° − 85,2° = 94,8°$		(4)
	$F(0; −\dfrac{7}{2})$		
	$E(0; \dfrac{11}{2})$		
	$EC = \sqrt{(3 − 0)^2 + (4 − \dfrac{11}{2})^2} = \dfrac{3\sqrt{5}}{2}$		
	$FC = \sqrt{(3 − 0)^2 + (4 + \dfrac{7}{2})^2} = \dfrac{3\sqrt{29}}{2}$	✓ size of/grootte van EC	
	$\text{Area}\Delta CEF = \dfrac{1}{2} FC \cdot EC \sin 94,8°$	✓ size of/grootte van FC	
	$= \dfrac{1}{2}(\dfrac{3\sqrt{5}}{2}) \cdot (\dfrac{3\sqrt{29}}{2})\sin 94,8°$	✓ substitution/subst	
		✓ answer/antwoord	(4)
	$= 13,50 \ unit^2$		
			[15]

QUESTION/VRAAG 4			
4.1	$x^2 + y^2 − 6x − 4y = 12$ $x^2 − 6x + 3^2 + y^2 − 4y + 2^2 = 12 + 3^2 + 2^2$ $(x − 3)^2 + (y − 2)^2 = 25$ $P(3;2)$ $r = 5$	✓ complete the square LHS/ voltooi die vierkant LK ✓ RHS ✓ P(3 ; 2) ✓ r = 5	(4)
4.2	$(0 + 3)^2 + (y − 2)^2 = 25$ $9 + y^2 − 4y + 4 = 25$ $y^2 − 4y − 12 = 0$ $(y − 6)(y + 2) = 0$ $y = 6$ $y = −2$ $R(0;6)$ **OR** $(0)^2 + y^2 − 6(0) − 4y = 12$ ✓ $y^2 − 4y − 12 = 0$ $(y − 6)(y + 2) = 0$ ✓ $y = 6$ $y = −2$ $R(0; 6)$	✓ substitute $x = 0$/ vervang $x = 0$ ✓ factors/faktore ✓ substitute $x = 0$/ vervang $x = 0$ ✓ factors/faktore	(2)

4.3	$m_{RP} = \dfrac{6-2}{0-3}$ $m_{RP} = \dfrac{-4}{3}$ $m_{RT} = \dfrac{3}{4} \left(Radius \perp \tan\right)/\, radius \perp raaklyn$ $y = \dfrac{3}{4}x + 6$	✓ $m_{RP} = \dfrac{-4}{3}$ ✓ $m_{RT} = \dfrac{3}{4}$ ✓ answer/*antwoord*	(3)
4.4	$tanR\hat{T}O = m_{RT} = \dfrac{3}{4}$ $R\hat{T}O = 36{,}86°$ $\theta = 90° + 36{,}86°$ $\theta = 126{,}9°$	✓ $tanR\hat{T}O = \dfrac{3}{4}$ ✓ $R\hat{T}O = 36{,}86°$ ✓ answer/*antwoord*	(3)
4.5	$Q(8; 2)$	✓ x-coordinate/*x-koördinaat* ✓ y-coordinate/*y-koördinaat*	(2)
4.6	Point of contact of tangent with gradient $\dfrac{3}{4}$: *Kontakpunt van raaklyn met gradiënt $\dfrac{3}{4}$:* $3 = \dfrac{0+x}{2}$ $x = 6$ $2 = \dfrac{6+y}{2}$ $y = -2$ Pt of contact/*kontakpunt*:$(6; -2)$ Equation of the tangent at/*Vergelyking van raaklyn by* $(6; -2)$: $y - (-2) = \dfrac{3}{4}(x - 6)$ $y = \dfrac{3}{4}x - \dfrac{13}{2}$ y-intercept/*afsnit* $= -\dfrac{13}{2}$ $-6{,}5 < k < 6$	point of contact/*kontakpunt*: ✓ x-coordinate/*x-koördinaat* ✓ y-coordinate/*y-koördinaat* value of k/*waarde van k*: ✓ ✓ $-6{,}5 < k < 6$	(4)

	OR/*OF*	OR/*OF*	
	Equation of diameter/*vergelyking van middellyn*: $$y = -\frac{4}{3}x + 6$$ $$(x-3)^2 + (-\frac{4}{3}x + 6 - 2)^2 = 25$$ $$x^2 - 6x + 9 + \frac{16}{9}x^2 - \frac{32}{3}x + 16 = 25$$ $$\frac{25}{9}x^2 - \frac{50}{3}x = 0$$ $$x^2 - 6x = 0$$ $$x(x-6) = 0$$ ∴ point of contact/*kontakpunt*:$(6; -2)$ Equation of the tangent at/*Vergelyking van raaklyn by*: $(6; -2)$: $$-2 = \frac{3}{4}(6) + c$$ $$y = \frac{3}{4}x - \frac{13}{2}$$ $$-6,5 < k < 6$$	point of contact/*kontakpunt*: ✓ *x*-coordinate/*x-koördinaat* ✓ *y*-coordinate/*y-koördinaat* value of k/*waarde van k*: ✓ ✓ $$-6,5 < k < 6$$	(4)
4.7	Centre of circle/*Middelpunt van sirkel* $M(-3; -2)$ Distance/*Afstand* MP: $$MP = \sqrt{(3 - (-3))^2 + (2 - (-2))^2}$$ $$MP = 2\sqrt{13}$$ $$= 7,21$$ $(R - r < MP < R + r)$ $1 < MP < 11$ ∴ Circles will cut twice /*sirkels sal twee keer sny*	✓ $M(-3; -2)$ ✓ $MP = 2\sqrt{13}$ ✓ $R = 6 \ and \ r = 5$ ✓ conclusion/*gevolgtrekking*	(4)
			[22]

QUESTION/*VRAAG* 5

5.1	$\tan(-x) \cdot \sin(90° + x) + \dfrac{\sin 2x}{2\cos(360° + x)}$	✓ $-\tan x$ ✓ $\cos x$ ✓ $2\sin x \cdot \cos x$ ✓ $2\cos x$	
	$= -\tan x \cdot \cos x + \dfrac{2\sin x \cdot \cos x}{2\cos x}$		
	$= -\dfrac{\sin x}{\cos x} \cdot \cos x + \sin x$	✓ $-\dfrac{\sin x}{\cos x}$	
	$= -\sin x + \sin x$		(6)
	$= 0$	✓ $= 0$	

5.2	5.2.1	$\cos 27° = \sqrt{1 - \sin^2 27°}$	✓ $\sqrt{1 - \sin^2 27°}$	
		$= \sqrt{1 - p^2}$	✓ $\sqrt{1 - p^2}$	(2)
		OR/*OF*		
			✓ diagram	
		$\cos 27° = \sqrt{1 - p^2}$	✓ answer/*antwoord*	(2)

	5.2.2	$\sin^2 63° = \sin^2(90° - 27°)$		
		$= \cos^2(27°)$ $= 1 - \sin^2 27°$ $= 1 - p^2$	✓ $\cos^2(27°)$ ✓ $1 - p^2$	
		OR	**OR**	
		$\sin^2 63° = 1 - p^2$	✓✓ Answer only	(2)

	5.2.3	$\cos 27° = 2\cos^2 13{,}5° - 1$	✓ double $\angle$ identity/*dubbel $\angle$ identiteit*	
		$\sqrt{1 - p^2} + 1 = 2\cos^2 13{,}5°$	✓ substitution/*substitusie*	
		$\therefore \cos 13{,}5° = \sqrt{\dfrac{\sqrt{1 - p^2} + 1}{2}}$	✓ answer/*antwoord*	(3)

5.3	$\cos(x - 45°) = cosx \cdot cos45° + sinx \cdot sin45°$	✓ expansion/*uitbreiding*	
	$= \frac{\sqrt{2}}{2} cosx + \frac{\sqrt{2}}{2} sinx$	✓ special ∠s/*spesiale ∠ e*	
	$= \frac{\sqrt{2}}{2} (cosx + sinx)$	✓ factorise/*faktoriseer*	
	$= \frac{\sqrt{2}}{2} k$	✓ answer/*antwoord*	(4)

5.4	$L.H.S/LK = \frac{cos2\theta + 1}{sin2\theta} + tan\theta$		
	$= \frac{COS2\theta+1}{2sin\theta \cdot cos\theta} + \frac{sin\theta}{cos\theta}$	✓ $\frac{sin\theta}{cos\theta}$ ✓ $2sin\theta \cdot cos\theta$	
	$= \frac{COS2\theta+1+2sin^2\theta}{2sin\theta \cdot cos\theta}$	✓ L.C.D/ K.G.V.	
	$= \frac{1-2sin^2\theta+1+2sin^2\theta}{2sin\theta \cdot cos\theta}$	✓ $1 - 2sin^2\theta$	
	$= \frac{2}{2sin\theta \cdot cos\theta}$		
	$= \frac{1}{sin\theta \cdot cos\theta} = R.H.S/RK$	✓ $\frac{2}{2sin\theta \cdot cos\theta}$	(5)

5.5	$4sin^2\theta = \cos(90° - 2\theta)$		
	$4sin^2\theta = sin2\theta$	✓ $sin2\theta$	
	$4sin^2\theta - 2sin\theta \cdot cos\theta = 0$	✓ $2sin\theta \cdot cos\theta$	
	$2sin\theta(2sin\theta - cos\theta) = 0$ Breakdown if divided by $sin\theta$(2/6)	✓ factors/*faktore*	
	$sin\theta = 0 \ or/of \ tan\theta = \frac{1}{2}$	✓ $sin\theta = 0 \ \& \ tan\theta = \frac{1}{2}$	
	$\theta = 0° + k \cdot 360°; k\epsilon\mathbb{Z} \ or/of$ $\theta = 26,57° + k \cdot 180° ; k\epsilon\mathbb{Z}$ N.B: If/indien $k\epsilon\mathbb{Z}$ is omitted/weggelaat – penalize/*penaliseer*. 1mark/*punt*.	✓ $0° + k \cdot 360°$ $\& \ 180° + k \cdot 360°/k \cdot 180°; k\epsilon\mathbb{Z}$	
	or/*of*	✓ $\theta = 26,57° + k \cdot 180° ; k\epsilon\mathbb{Z}$	
	$\theta = 180° + k \cdot 360°; k\epsilon\mathbb{Z}$		
	OR/*OF*		
	$\theta = k \cdot 180°; k\epsilon\mathbb{Z}$		(6)

OR

$4\sin^2\theta = \sin 2\theta$

$\dfrac{4\sin^2\theta}{\cos^2\theta} = \dfrac{2\sin\theta\cos\theta}{\cos^2\theta}$

$4\tan^2\theta - 2\tan\theta = 0$

$2\tan\theta(\tan\theta - 1) = 0$

$\tan\theta = 0$ or $\tan\theta = \dfrac{1}{2}$

for $\tan\theta = 0$

$\theta = 0° + k.180°$; $k\epsilon\mathbb{Z}$

for $\tan\theta = \dfrac{1}{2}$

$\qquad \theta = 26.57° + k.180°$; $k\epsilon\mathbb{Z}$

N.B: If/indien $k\epsilon\mathbb{Z}$ is omitted/weggelaat – penalize/*penaliseer* 1 mark/*punt*.

- ✓ $\sin 2\theta$
- ✓ $2\sin\theta\cos\theta$

- ✓ factors/*faktore*

- ✓ $\tan\theta = 0$ or $\tan\theta = \dfrac{1}{2}$

- ✓ $\theta = 0° + k.180°$; $k\epsilon\mathbb{Z}$
- ✓ $\theta = 26.57° + k.180°$; $k\epsilon\mathbb{Z}$

(6)

[28]

QUESTION/VRAAG 6				
6.1	$a = 5$ $b = 1$	✓ $a = 5$ ✓ $b = 1$		(2)
6.2	$h(x) = 4\cos(x - 30°) - 2$	✓ $x - 30°$ ✓ -2		(2)
6.3	Minimum value/minimum waarde $= \frac{8}{4} = 2$	✓ answer/answer		(1)
6.4	$B(38,66°; 3,12)$ Accept 38,61° or 38,73°	✓ $38,66°$ ✓ $3,12$		(2)
6.5	$k < -5 \ or/of \ k > 5$	✓ $k < -5$ ✓ $k > 5$		(2)
6.6	6.6.1	$x \in (-141,34°; 38,66°)$ OR/OF $-141,34° < x < 38,66°$	✓ end points/eindpunte ✓ correct notation/korrekte notasie	(2)
	6.6.2	$x \in [-180°; 180°]$ OR/OF $-180° \le x \le 180°$	✓ end points/eindpunte ✓ correct notation/korrekte notasie	(2)
				[13]

QUESTION/*VRAAG* 7			
7.1	$\theta = 180^0 - 2\alpha$ $\therefore sin\theta = \sin(180^0 - 2\alpha)$ $sin\theta = sin2\alpha$	✓ *sum of ∠'s in a Δ / som van ∠' e in 'n Δ* ✓ Introducing sin both sides/*gebruik sin beide kante*	(2)
7.2	$x = PR.cos\theta$ $\dfrac{x}{sin\theta} = \dfrac{y}{sin\alpha}$ $\therefore x = \dfrac{ysin\theta}{sin\alpha}$ $\therefore PR.cos\theta = \dfrac{ysin\theta}{sin\alpha} = \dfrac{ysin2\alpha}{sin\alpha}$ $PR.cos\theta = \dfrac{2ysin\alpha cos\alpha}{sin\alpha} = 2ycos\alpha$ $\therefore PR = \dfrac{2ycos\alpha}{cos\theta}$	✓ $cos\theta = \dfrac{x}{PR}$ ✓ use of sine rule/*gebruik van sin-reël* ✓ $2ysin\alpha cos\alpha$ ✓ simplifying/*vereenvoudiging*	(4)
7.3	Area $= \dfrac{1}{2} QT \cdot QRsin\alpha$ $= \dfrac{1}{2} x\, y\, sin\alpha$ $= \dfrac{1}{2}(20)(15)sin49°$ $= 113{,}21$ m^2	✓✓ substitution into correct formula/*vervanging van korrekte formule* ✓ answer/*antwoord*	(3)
			[9]

QUESTION 8/*VRAAG 8*

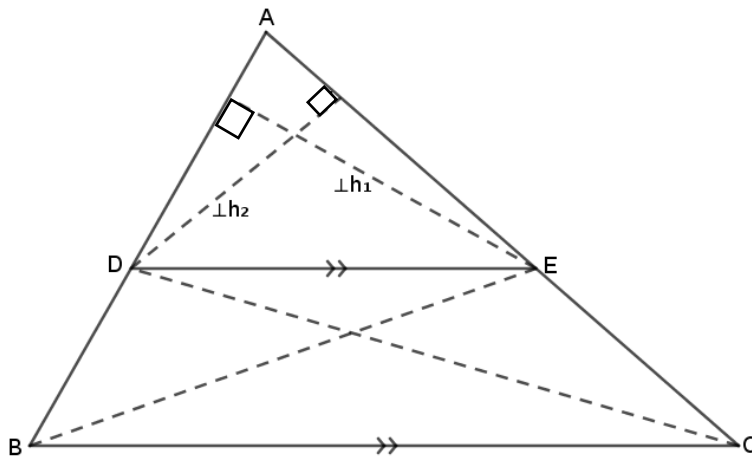| 8.1	8.1.1	$\hat{A}_1 = 22{,}5°$ tan-chord theorem/ *raaklyn-koord stelling*	✓ S ✓ R ✓	(2)
	8.1.2	$\hat{C} = 22{,}5°$ $\angle's$ opp equal sides/ $\angle'e$ *teenoor gelyke sye* $\widehat{D}_1 = 45°$ ext $\angle$ of a Δ/ *buite* $\angle$ *van 'n* Δ	✓ S/R ✓ S	(2)
	8.1.3	$O\hat{B}C = 90°$ tan $\perp$ rad/*raaklyn* $\perp$ *radius* $\hat{B}_2 = 90° - 22{,}5°$ $= 67{,}5°$	✓ R ✓ answer/*antwoord*	(2)
	8.1.4	$\hat{O}_1 = 2\widehat{D}_1$ $\angle$ at centre = 2 x $\angle$ at circ/ *middelpunt* $\angle = 2 \times$ *omtreks* $\angle$ $\hat{O}_1 = 2 \times 45^0$ $\hat{O}_1 = 90^0$	✓ S/R ✓ answer/*antwoord*	(2)
8.2		$\hat{O}_1 = 90^0$ already proven/*reeds bewys* $O\hat{B}C = 90°$ tan $\perp$ rad/*raaklyn* $\perp$ *radius* or/*of* already proven/*reeds bewys* $\therefore \hat{O}_1 = O\hat{B}C$ $CB \parallel OA$ alt $\angle s$ equal/*verwisselende* $\angle e$ *gelyk* **OR/*OF*** $\hat{A}_2 = 22{,}5°$ $\angle's$ opp equal radii/ $\angle'e$ *teenoor gelyke radiusse* $\hat{C} = 22{,}5°$ $\therefore \hat{A}_2 = \hat{C}$ $CB \parallel OA$ alt $\angle s$ equal/*verwisselende* $\angle e$ *gelyk*	✓ $\hat{O}_1 = O\hat{B}C$ ✓ R **OR/*OF*** ✓ $\hat{A}_2 = 22{,}5°$ ✓ R	(2)

8.3	$AB^2 = OB^2 + OA^2$ $AB^2 = 12^2 + 12^2$ Pythagoras $AB = 12\sqrt{2} = 16{,}97$ units/*eenhede* But/*Maar* $\hat{C} = \hat{A}_1 = 22{,}5°$ already proven/*reeds bewys* ∴ BC = AB sides opp equal ∠s/*sye teenoor gelyke ∠e* ∴ $BC = 12\sqrt{2}$ $= 16{,}97$ units/*eenhede* **OR/*OF***	✓ S/R ✓ answer/*antwoord* ✓ S/R ✓ answer/*antwoord* **OR/*OF***	(4)
	$AB = \sqrt{12^2 + 12^2} = 12\sqrt{2}$ Pythagoras $\dfrac{BC}{\text{sn}22{,}5°} = \dfrac{AB}{\text{sn}22{,}5°}$ ∴ $BC = AB = 12\sqrt{2}$ $= 16{,}97$ units/*eenhede*	✓ S/R ✓ formula/*formule* ✓ substitution/*substitusie* ✓ answer/*antwoord*	(4)
			[14]

QUESTION/*VRAAG* 9		
9.1	$\hat{A}_2 = 90^0$ ∠ in a semi-circle/∠ *in halwe sirkel* $\hat{D}_2 = 90^0$ given/*gegee* ∴ $\hat{A}_2 = \hat{D}_2$ ∴ ABCD is a cyclic quad/*is 'n koordevierhoek* converse angles in the same segment/*omgekeerde hoeke in dieslfde* segment line subtends equal angles/*lyn onderspan gelyke hoeke*	✓ S/R ✓ $\hat{A}_2 = \hat{D}_2$ ✓ reason/*rede*	(3)
9.2	$\hat{A}_3 = \hat{B}_1$ tan-chord theorem/*raaklyn-koord stelling* $\hat{A}_3 = \hat{B}_2$ ∠'s in the same segment/∠'*e in dieselfde segment* ∴ $\hat{B}_1 = \hat{B}_2$ ∴ BD bisect $A\hat{B}C$/*BD halveer $A\hat{B}C$*	✓S ✓R ✓ S	(3)

| 9.3 | $\hat{O}_1 = 2\hat{B}_2$ ∠ at centre = $2 \times$ ∠ at circ/*middelpunt*= $= 2 \times$ *omtreks* ∠

 $\hat{E}_3 = \hat{B}_1 + \hat{B}_2$ ext ∠ of cyclic quad/*buite ∠ van koordevierhoek*

 But/*Maar* $\hat{B}_1 = \hat{B}_2$ already proven/*reeds bewys*

 ∴ $\hat{E}_3 = 2\hat{B}_2$
 ∴ $\hat{E}_3 = \hat{O}_1$
 ∴ EC is tangent to circle DEF/*EC is 'n raaklyn aan sirkel DEF/converse tan-chord th/omgekeerde rlyn-koordstelling* or/*of* ∠ between line and chord/*∠ tussen lyn en koord* | ✓ S/R

 ✓ S

 ✓ $\hat{E}_3 = \hat{O}_1$
 ✓ reason/*rede* |

(4) |
| | | | **[10]** |

QUESTION 10/VRAAG 10

10.1

Construction/konstruksie:
$\perp h_1$ on AD and $\perp h_2$ on AE/
$\perp h_1$ op AD en $\perp h_2$ op AE
Join DC and BE/verbind DC en BE

✓ Construction/ konstruksie

No construction
No marks

$$\frac{area\ \Delta ADE}{area\ \Delta DBE} / \frac{opp\ \Delta ADE}{opp\ \Delta DBE}$$

✓ S

$$= \frac{\frac{1}{2}AD \perp h_1}{\frac{1}{2}DB \perp h_1} = \frac{AD}{DB} \quad \text{same height/dieselfde hoogte}$$

✓ S/R

$$\frac{area\ \Delta ADE}{area\ \Delta EDC} / \frac{opp\ \Delta ADE}{opp\ \Delta EDC}$$

$$= \frac{\frac{1}{2}AE \perp h_2}{\frac{1}{2}EC \perp h_2}$$

$$= \frac{AE}{EC} \quad \text{same height/dieselfde hoogte}$$

But/Maar $Area\Delta ADE = Area\Delta ADE$ /
$opp\Delta ADE = opp\Delta ADE$
and/en $Area\Delta DBE = Area\Delta ECD$
$opp\Delta DBE = opp\Delta ECD$
same base, same height/dieselfde basis, dieselfde hoogte

✓ S

✓ R

$$\therefore \frac{Area\Delta ADE}{Area\Delta DBE} = \frac{Area\Delta ADE}{Area\Delta ECD} / \therefore \frac{opp\Delta ADE}{opp\Delta DBE} = \frac{opp\Delta ADE}{opp\Delta ECD}$$

$$\therefore \frac{AD}{DB} = \frac{AE}{EC}$$

(5)

10.2	10.2.1	$DB = DG$ In ΔABC: $DF \parallel AB$ $\dfrac{AC}{FC} = \dfrac{BC}{DC} = \dfrac{3}{2}$ line $\parallel$ to one side of Δ/(Prop theorem,DF$\parallel$AB) *aan een sy van Δ/Eweredigheid stelling* (DF$\parallel$AB)	✓ radii/*radiusse* ✓ $\dfrac{AC}{FC} = \dfrac{BC}{DC} = \dfrac{3}{2}$ ✓ R	(3)

	10.2.2	In ΔABC and/*en* ΔDEC:
		1) $\hat{B} = 90°$ tan $\perp$ rad/*rlyn $\perp$ radius*
		   $D\hat{E}C = 90°$ tan $\perp$ rad/*rlyn $\perp$ radius*
		    $\therefore \hat{B} = D\hat{E}C$
		
		2) $\hat{C} = \hat{C}$ common $\angle$/*gemeenskaplike $\angle$*
		3) $\hat{A} = E\hat{D}C$ $\angle$'s of a Δ/$\angle'e$ *van* Δ
		
		$\therefore \Delta ABC /// \Delta DEC \angle\angle\angle$
			✓ $\hat{B} = D\hat{E}C$ S/R
			
			✓ $\hat{C} = \hat{C}$
			  ✓ $\hat{A} = E\hat{D}C$
			OR
			✓ $\hat{B} = D\hat{E}C$ S/R
			
			✓ $\hat{C} = \hat{C}$
			
			✓ R $\angle\angle\angle$
				(3)

	10.2.3	$\dfrac{AB}{DE} = \dfrac{BC}{EC}$ $\Delta ABC /// \Delta DEC$ but/*maar* $AB = AE$ tans from same point/*rlyne vanaf dies. punt* and/*en* $BC = 3 \times$ radius $= 3DE$ $\therefore \dfrac{AE}{DE} = \dfrac{3DE}{EC}$ $AE.EC = 3DE.DE$ $AE.EC = 3\,DE^2$ $DE^2 = \dfrac{AE.EC}{3}$	✓ S/R ✓ S/R ✓ substitute AB with AE/*vervang AB met AE* ✓ substitute BC with 3DE/*vervang BC met 3DE* ✓ $AE.EC = 3\,DE^2$	(5)
	10.2.4	$\dfrac{Area\Delta FDC}{Area\Delta ABC} = \dfrac{opp\Delta FDC}{opp\Delta ABC}$ $= \dfrac{\frac{1}{2}FC.DC.\sin \hat{C}}{\frac{1}{2}AC.BC.\sin \hat{C}}$ $= \left(\dfrac{2}{3}\right)\left(\dfrac{2}{3}\right)$ $= \dfrac{4}{9}$	✓ using area rule correctly/*gebruik opp reël korrek* ✓ $\left(\dfrac{2}{3}\right)\left(\dfrac{2}{3}\right)$ ✓ answer/*antwoord*	(3)
				[19]
			TOTAL/*TOTAAL*	**[150]**