



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*

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

QUESTION/VRAAG 1				
1.1				
	1.1.1	$\text{mean/gemiddeld} = \frac{982}{16}$ $= 61,38$ Accept : 61 No penalty for rounding off	✓ 982 ✓ answer/antwoord	(2)
	1.1.2	$\sigma = 19,63$	✓ answer/antwoord	(1)
	1.1.3	$(\bar{x} - \sigma; \bar{x} + \sigma) = (61,38 - 19,63; 61,38 + 19,63)$ $= (41,75; 81,01)$ $\therefore 6 \text{ learners/leerders}$ 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 <i>Negatief skeef/skeef na links</i>	✓ 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%. <i>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.</i> OR/OF Test 2 , because the median mark is higher than that of test 1/ <i>Toets 2, omdat die mediaan hoër is as in toets 1</i> 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/ <i>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.</i>	✓ Test 2/ <i>Toets 2</i> ✓ reason/rede	(2)
	1.2.3	$\frac{25}{100} \times 16 = 4 \text{ learners/leerders}$ OR/OF $\frac{1}{4} \times 16 = 4 \text{ learners/leerders}$	$\checkmark \frac{25}{100} \times 16$ $\checkmark 4$ OR/OF $\checkmark \frac{1}{4} \times 16$ $\checkmark 4$	(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: $30 + 50 + 100 + 80 = 260$	✓ $280 - 20$ ✓ 260 OR ✓ Adding frequencies <i>Tel frekwensies op</i> ✓ Answer/antwoord	(2)
	2.1.4	The median will decrease./Die mediaan sal afneem.	✓ Decrease/afneem	(1)
2.2		$\frac{5 \times 13 + 15t + 25 \times 12 + 35 \times 4}{13 + t + 12 + 4} = 16,4$ $\frac{505 + 15t}{29 + t} = 16,4$ $475,6 + 16,4 t = 505 + 15t$ $1,4t = 29,4$ $t = 21$	✓ equating to 16,4/ <i>gelykstel aan 16,4</i> ✓ 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 <i>a</i>/korrekte substitusie in korrekte formule vir <i>a</i> ✓ correct substitution into formula for <i>b</i>/korrekte substitusie in formule vir <i>b</i> ✓ answer for both <i>a</i> and <i>b</i> in coordinate form/antwoord van beide <i>a</i> en <i>b</i> in koördinaat vorm	(3)
3.2	$m = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{4 - (-1)}{3 - 1} \quad \text{OR/OF} \quad m = \frac{4 - (-6)}{3 - (-1)}$ $= \frac{5}{2}$	✓ substitution into correct formula/Substitusie in korrekte formule ✓ answer/antwoord	(2)

3.3	$2y + x = 11$ $y = -\frac{1}{2}x + \frac{11}{2}$ OR $m = \frac{7-4}{-3-3}$ $\tan\alpha = -\frac{1}{2}$ $= -\frac{1}{2}$ $\alpha = 180^\circ - 26,56^\circ$ $\alpha = 153,43^\circ$ $\tan\beta = \frac{5}{2}$ $\beta = 68,198^\circ$ $\theta = 153,43^\circ - 68,198^\circ$ $\theta = 85,2^\circ$ (–1 Rounding/–1 Afronding)	$\checkmark \tan\alpha = -\frac{1}{2}$ $\checkmark$ answer α /antwoord α $\checkmark$ value of β /waarde van β $\checkmark$ value of θ /waarde van θ	(4)
3.4	$m_{BC} = \frac{5}{2}$ $y - y_1 = m(x - x_1)$ OR/OF $y = mx + c$ $y - 4 = \frac{5}{2}(x - 3)$ $4 = \frac{5}{2}(3) + c$ $y = \frac{5}{2}x - \frac{7}{2}$	$\checkmark$ Substitute gradiënt and point B or C or M/ <i>Sustitusie gradient en punt B of C of M</i> $\checkmark$ Equation/Vergelyking	(2)
3.5	$EF = \frac{11}{2} - \left(-\frac{7}{2}\right)$ $EF = 9$ $\text{Area}\Delta CEF = \frac{1}{2}EF \cdot \perp h$ $= \frac{1}{2}(9)(3)$ $= 13,5 \text{ units}^2/\text{eenhede}^2$ OR/OF	$\checkmark$ value of/waarde van y_F $\checkmark$ value of/waarde van EF $\checkmark$ value of/waarde van $\perp h$ $\checkmark$ answer/antwoord	

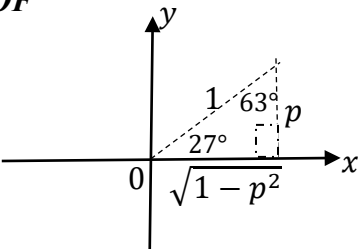
	$\widehat{ECF} = 180^\circ - 85,2^\circ = 94,8^\circ$ $F(0; -\frac{7}{2})$ $E(0; \frac{11}{2})$ $EC = \sqrt{(3-0)^2 + (4-\frac{11}{2})^2} = \frac{3\sqrt{5}}{2}$ $FC = \sqrt{(3-0)^2 + (4+\frac{7}{2})^2} = \frac{3\sqrt{29}}{2}$ $\text{Area}\Delta CEF = \frac{1}{2} FC \cdot EC \sin 94,8^\circ$ $= \frac{1}{2} (\frac{3\sqrt{5}}{2}) \cdot (\frac{3\sqrt{29}}{2}) \sin 94,8^\circ$ $= 13,50 \text{ unit}^2$	✓ size of/grootte van EC ✓ size of/grootte van FC ✓ substitution/subst ✓ answer/antwoord	(4) (4)
			[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 $(0)^2 + y^2 - 6(0) - 4y = 12 \checkmark$ $y^2 - 4y - 12 = 0$ $(y-6)(y+2) = 0 \checkmark$ $y = 6$ $y = -2$ $R(0; 6)$	✓ substitute $x = 0$/ vervang $x = 0$ ✓ factors/faktore ✓ substitute $x = 0$/ vervang $x = 0$ ✓ factors/faktore	(2)

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

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

QUESTION/VRAAG 5				
5.1		$\tan(-x) \cdot \sin(90^\circ + x) + \frac{\sin 2x}{2\cos(360^\circ + x)}$ $= -\tan x \cdot \cos x + \frac{2\sin x \cdot \cos x}{2\cos x}$ $= -\frac{\sin x}{\cos x} \cdot \cos x + \sin x$ $= -\sin x + \sin x$ $= 0$	$\checkmark -\tan x$ $\checkmark \cos x$ $\checkmark 2\sin x \cdot \cos x$ $\checkmark 2\cos x$ $\checkmark -\frac{\sin x}{\cos x}$ $\checkmark = 0$	(6)
5.2	5.2.1	$\cos 27^\circ = \sqrt{1 - \sin^2 27^\circ}$ $= \sqrt{1 - p^2}$ OR/OF  $\cos 27^\circ = \sqrt{1 - p^2}$	$\checkmark \sqrt{1 - \sin^2 27^\circ}$ $\checkmark \sqrt{1 - p^2}$ $\checkmark$ diagram $\checkmark$ answer/antwoord	(2)
	5.2.2	$\sin^2 63^\circ = \sin^2(90^\circ - 27^\circ)$ $= \cos^2(27^\circ)$ $= 1 - \sin^2 27^\circ$ $= 1 - p^2$ OR $\sin^2 63^\circ = 1 - p^2$	$\checkmark \cos^2(27^\circ)$ $\checkmark 1 - p^2$ OR $\checkmark \checkmark$ Answer only	(2)
	5.2.3	$\cos 27^\circ = 2\cos^2 13,5^\circ - 1$ $\sqrt{1 - p^2} + 1 = 2\cos^2 13,5^\circ$ $\therefore \cos 13,5^\circ = \sqrt{\frac{\sqrt{1 - p^2} + 1}{2}}$	$\checkmark$ double $\angle$ identity/dubbel $\angle$ identiteit $\checkmark$ substitution/substitusie $\checkmark$ answer/antwoord	(3)

5.3	$\cos(x - 45^\circ) = \cos x \cdot \cos 45^\circ + \sin x \cdot \sin 45^\circ$ $= \frac{\sqrt{2}}{2} \cos x + \frac{\sqrt{2}}{2} \sin x$ $= \frac{\sqrt{2}}{2} (\cos x + \sin x)$ $= \frac{\sqrt{2}}{2} k$	✓ expansion/uitbreiding ✓ special $\angle$s/spesiale $\angle$ e ✓ factorise/faktoriseer ✓ answer/antwoord	(4)
5.4	$\text{L. H. S/LK} = \frac{\cos 2\theta + 1}{\sin 2\theta} + \tan \theta$ $= \frac{\cos 2\theta + 1}{2\sin \theta \cdot \cos \theta} + \frac{\sin \theta}{\cos \theta}$ $= \frac{\cos 2\theta + 1 + 2\sin^2 \theta}{2\sin \theta \cdot \cos \theta}$ $= \frac{1 - 2\sin^2 \theta + 1 + 2\sin^2 \theta}{2\sin \theta \cdot \cos \theta}$ $= \frac{2}{2\sin \theta \cdot \cos \theta}$ $= \frac{1}{\sin \theta \cdot \cos \theta} = \text{R. H. S/RK}$	✓ $\frac{\sin \theta}{\cos \theta}$ ✓ $2\sin \theta \cdot \cos \theta$ ✓ L.C.D/ K.G.V. ✓ $1 - 2\sin^2 \theta$ ✓ $\frac{2}{2\sin \theta \cdot \cos \theta}$	(5)
5.5	$4\sin^2 \theta = \cos (90^\circ - 2\theta)$ $4\sin^2 \theta = \sin 2\theta$ $4\sin^2 \theta - 2\sin \theta \cdot \cos \theta = 0$ $2\sin \theta (2\sin \theta - \cos \theta) = 0$ $\sin \theta = 0 \text{ or/of } \tan \theta = \frac{1}{2}$ $\theta = 0^\circ + k \cdot 360^\circ; k \in \mathbb{Z} \text{ or/of}$ $\theta = 26,57^\circ + k \cdot 180^\circ; k \in \mathbb{Z}$ or/of $\theta = 180^\circ + k \cdot 360^\circ; k \in \mathbb{Z}$ OR/OF $\theta = k \cdot 180^\circ; k \in \mathbb{Z}$	Breakdown if divided by $\sin \theta$ (2/6) N.B: If/indien $k \in \mathbb{Z}$ is omitted/weggelaat – penalize/penaliseer. 1 mark/punt. ✓ $\sin 2\theta$ ✓ $2\sin \theta \cdot \cos \theta$ ✓ factors/faktore ✓ $\sin \theta = 0$ & $\tan \theta = \frac{1}{2}$ ✓ $0^\circ + k \cdot 360^\circ$ & $180^\circ + k \cdot 360^\circ / k \cdot 180^\circ; k \in \mathbb{Z}$ ✓ $\theta = 26,57^\circ + k \cdot 180^\circ; k \in \mathbb{Z}$	(6)

	OR $\frac{4\sin^2\theta}{\cos^2\theta} = \frac{2\sin\theta\cos\theta}{\cos^2\theta}$ $4\tan^2\theta - 2\tan\theta = 0$ $2\tan\theta(\tan\theta - 1) = 0$ $\tan\theta = 0 \text{ or } \tan\theta = \frac{1}{2}$ for $\tan\theta = 0$ $\theta = 0^\circ + k \cdot 180^\circ ; k \in \mathbb{Z}$ for $\tan\theta = \frac{1}{2}$ $\theta = 26.57^\circ + k \cdot 180^\circ ; k \in \mathbb{Z}$ N.B: If/indien $k \in \mathbb{Z}$ is omitted/weggelaat – penalize/penaliseer 1 mark/punt.	✓ $\sin 2\theta$ ✓ $2\sin\theta\cos\theta$ ✓ factors/faktore ✓ $\tan\theta = 0 \text{ or } \tan\theta = \frac{1}{2}$ ✓ $\theta = 0^\circ + k \cdot 180^\circ ; k \in \mathbb{Z}$ ✓ $\theta = 26.57^\circ + k \cdot 180^\circ ; k \in \mathbb{Z}$	(6)
			[28]

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

QUESTION/VRAAG 7			
7.1	$\theta = 180^\circ - 2\alpha$ $\therefore \sin\theta = \sin(180^\circ - 2\alpha)$ $\sin\theta = \sin 2\alpha$	✓ <i>sum of $\angle$'s in a Δ / som van $\angle$'e in 'n Δ</i> ✓ <i>Introducing sin both sides/gebruik sin beide kante</i>	(2)
7.2	$x = PR \cdot \cos\theta$ $\frac{x}{\sin\theta} = \frac{y}{\sin\alpha}$ $\therefore x = \frac{y \sin\theta}{\sin\alpha}$ $\therefore PR \cdot \cos\theta = \frac{y \sin\theta}{\sin\alpha} = \frac{y \sin 2\alpha}{\sin\alpha}$ $PR \cdot \cos\theta = \frac{2y \sin\alpha \cos\alpha}{\sin\alpha} = 2y \cos\alpha$ $\therefore PR = \frac{2y \cos\alpha}{\cos\theta}$	✓ $\cos\theta = \frac{x}{PR}$ ✓ <i>use of sine rule/gebruik van sin-reël</i> ✓ $2y \sin\alpha \cos\alpha$ ✓ <i>simplifying/vereenvoudiging</i>	(4)
7.3	$\text{Area} = \frac{1}{2} QT \cdot QR \sin\alpha$ $= \frac{1}{2} x y \sin\alpha$ $= \frac{1}{2} (20)(15) \sin 49^\circ$ $= 113,21 \text{ m}^2$	✓✓ <i>substitution into correct formula/vervanging van korrekte formule</i> ✓ <i>answer/antwoord</i>	(3)
			[9]

QUESTION 8/VRAAG 8				
8.1	8.1.1	$\hat{A}_1 = 22,5^\circ$ tan-chord theorem/ <i>raaklyn-koord stelling</i>	✓ S ✓ R	(2)
			✓	
	8.1.2	$\hat{C} = 22,5^\circ$ $\angle$'s opp equal sides/ $\angle$ 'e teenoor gelyke sye $\hat{D}_1 = 45^\circ$ ext $\angle$ of a Δ / <i>buite $\angle$ van 'n Δ</i>	✓ S/R ✓ S	(2)
	8.1.3	$O\hat{B}C = 90^\circ$ <i>tan $\perp$ rad/raaklyn $\perp$ radius</i> $\hat{B}_2 = 90^\circ - 22,5^\circ$ $= 67,5^\circ$	✓ R ✓ answer/antwoord	(2)
	8.1.4	$\hat{O}_1 = 2\hat{D}_1$ $\angle$ at centre = 2 x $\angle$ at circ/ <i>middelpunt $\angle$ = 2 x omtreks $\angle$</i> $\hat{O}_1 = 2 \times 45^\circ$ $\hat{O}_1 = 90^\circ$	✓ S/R ✓ answer/antwoord	(2)
8.2		$\hat{O}_1 = 90^\circ$ already proven/reeds bewys $O\hat{B}C = 90^\circ$ <i>tan $\perp$ rad/raaklyn $\perp$ radius or/of</i> already proven/reeds bewys $\therefore \hat{O}_1 = O\hat{B}C$ $CB \parallel OA$ <i>alt $\angle$s equal/verwisselende $\angle$e gelyk</i> OR/OF $\hat{A}_2 = 22,5^\circ$ $\angle$'s opp equal radii/ $\angle$ 'e teenoor gelyke radiusse $\hat{C} = 22,5^\circ$ $\therefore \hat{A}_2 = \hat{C}$ $CB \parallel OA$ <i>alt $\angle$s equal/verwisselende $\angle$e gelyk</i>	✓ $\hat{O}_1 = O\hat{B}C$ ✓ R OR/OF ✓ $\hat{A}_2 = 22,5^\circ$ ✓ R	(2)

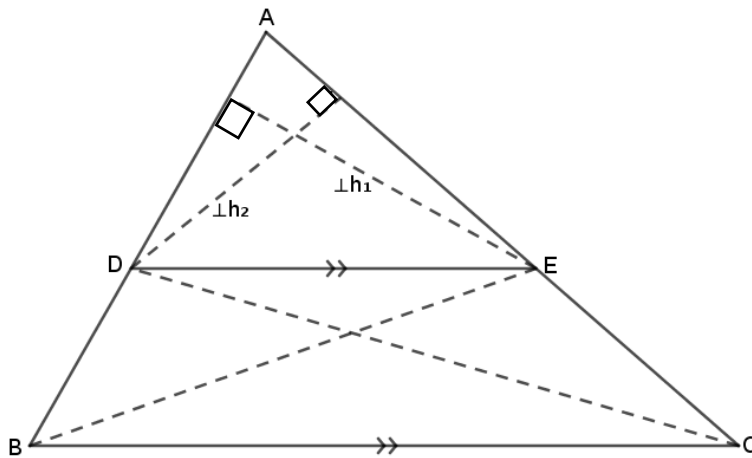
8.3	$AB^2 = OB^2 + OA^2$ $AB^2 = 12^2 + 12^2$ Pythagoras $AB = 12\sqrt{2} = 16,97$ units/eenhede But/Maar $\hat{C} = \hat{A}_1 = 22,5^\circ$ already proven/reeds bewys $\therefore BC = AB$ sides opp equal $\angle$ s/sye teenoor gelyke $\angle$ e $\therefore BC = 12\sqrt{2}$ $= 16,97$ units/eenhede OR/OF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

QUESTION/VRAAG 9			
9.1	$\hat{A}_2 = 90^\circ$ $\angle$ in a semi-circle/ $\angle$ in halwe sirkel $\hat{D}_2 = 90^\circ$ given/gegee $\therefore \hat{A}_2 = \hat{D}_2$ $\therefore ABCD$ is a cyclic quad/is 'n koordevierhoek converse angles in the same segment/omgekeerde hoeke in dieselfde 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 $\hat{A}_3 = \hat{B}_2$ $\angle$'s in the same segment/ $\angle$ 'e in dieselfde segment $\therefore \hat{B}_1 = \hat{B}_2$ $\therefore BD$ bisect $\hat{ABC}/BD$ halveer $\hat{ABC}$	✓S ✓R ✓ S	(3)

9.3	$\hat{O}_1 = 2\hat{B}_2$ $\angle$ at centre = $2 \times \angle$ at circ/middelpunt = $2 \times$ <i>omtreks $\angle$</i> $\hat{E}_3 = \hat{B}_1 + \hat{B}_2$ ext $\angle$ of cyclic quad/buite $\angle$ van <i>koordevierhoek</i> But/Maar $\hat{B}_1 = \hat{B}_2$ already proven/reeds bewys $\therefore \hat{E}_3 = 2\hat{B}_2$ $\therefore \hat{E}_3 = \hat{O}_1$ $\therefore$ EC is tangent to circle DEF/EC is 'n raaklyn aan sirkel <i>DEF/converse tan-chord th/omgekeerde rlyn-</i> <i>koordstelling or/of $\angle$ between line and chord/$\angle$ tussen</i> <i>lyn en koord</i>	$\checkmark$ S/R $\checkmark$ S $\checkmark \hat{E}_3 = \hat{O}_1$ $\checkmark$ 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

$$\frac{\text{area } \triangle ADE}{\text{area } \triangle DBE} / \frac{\text{opp } \triangle ADE}{\text{opp } \triangle DBE}$$

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

$$\frac{\text{area } \triangle ADE}{\text{area } \triangle EDC} / \frac{\text{opp } \triangle ADE}{\text{opp } \triangle EDC}$$

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

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

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

$$\text{But/Maar } \text{Area} \triangle ADE = \text{Area} \triangle ADE / \text{opp} \triangle ADE = \text{opp} \triangle ADE$$

$$\text{and/en } \text{Area} \triangle DBE = \text{Area} \triangle ECD$$

$$\text{same base, same height/dieselfde basis, dieselfde hoogte}$$

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

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

✓ Construction/
konstruksie

✓ S

✓ S/R

✓ S

✓ R

(5)

10.2	10.2.1	$DB = DG$ <i>In $\triangle ABC$:</i> $DF \parallel AB$ $\frac{AC}{FC} = \frac{BC}{DC} = \frac{3}{2}$ line $\parallel$ to one side of $\triangle$ (Prop theorem, $DF \parallel AB$) <i>aan een sy van $\triangle$/Eweredigheidsstelling ($DF \parallel AB$)</i>	$\checkmark$ radii/radiusse $\checkmark \frac{AC}{FC} = \frac{BC}{DC} = \frac{3}{2}$ $\checkmark$ R	(3)
	10.2.2	<i>In $\triangle ABC$ and/en $\triangle DEC$:</i> 1) $\hat{B} = 90^\circ$ $\tan \perp$ rad/rlyn $\perp$ radius $\hat{D}EC = 90^\circ$ $\tan \perp$ rad/rlyn $\perp$ radius $\therefore \hat{B} = \hat{D}EC$ 2) $\hat{C} = \hat{C}$ common $\angle$ /gemeenskaplike $\angle$ 3) $\hat{A} = \hat{E}DC$ $\angle$'s of a $\triangle$ / $\angle$ 'e van $\triangle$ $\therefore \triangle ABC \sim \triangle DEC$ $\angle\angle\angle$	$\checkmark \hat{B} = \hat{D}EC$ S/R $\checkmark \hat{C} = \hat{C}$ $\checkmark \hat{A} = \hat{E}DC$ OR $\checkmark \hat{B} = \hat{D}EC$ S/R $\checkmark \hat{C} = \hat{C}$ $\checkmark$ R $\angle\angle\angle$	(3)
	10.2.3	$\frac{AB}{DE} = \frac{BC}{EC} \triangle ABC \sim \triangle DEC$ <i>but/maar $AB = AE$ tans from same point/rlyne vanaf dies. punt and/en $BC = 3 \times \text{radius} = 3DE$</i> $\therefore \frac{AE}{DE} = \frac{3DE}{EC}$ $AE \cdot EC = 3DE \cdot DE$ $AE \cdot EC = 3DE^2$ $DE^2 = \frac{AE \cdot EC}{3}$	$\checkmark$ S/R $\checkmark$ S/R $\checkmark$ substitute AB with AE/vervang AB met AE $\checkmark$ substitute BC with 3DE/vervang BC met 3DE $\checkmark AE \cdot EC = 3DE^2$	(5)
	10.2.4	$\frac{\text{Area}\triangle FDC}{\text{Area}\triangle ABC} = \frac{\text{opp}\triangle FDC}{\text{opp}\triangle ABC}$ $= \frac{\frac{1}{2}FC \cdot DC \cdot \sin \hat{C}}{\frac{1}{2}AC \cdot BC \cdot \sin \hat{C}}$ $= \left(\frac{2}{3}\right) \left(\frac{2}{3}\right)$ $= \frac{4}{9}$	$\checkmark$ using area rule correctly/gebruik opp reël korrek $\checkmark \left(\frac{2}{3}\right) \left(\frac{2}{3}\right)$ $\checkmark$ answer/antwoord	(3)
				[19]
			TOTAL/TOTAAL	[150]