FS/VS/September 2022

Grade/Graad 12 Prep. Exam./Voorb. Eksam.   Marking Guidelines/Nasienriglyne

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.

NOTA:

- As 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.
- As 'n kandidaat 'n antwoord van 'n vraag doodtrek en 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.
- Om antwoorde/waardes te aanvaar 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 die rede)**
R	**A mark for the 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 statement AND reason are both correct**
	Ken 'n punt toe as die bewering EN die rede beide korrek is

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QUESTION/VRAAG 1

1.1.1	Range= max$-$min $\quad$ =685$-$287 $\quad$ = 398	✓ 398 (1)
1.1.2	$x = \frac{287+328+374+\cdots+619+685}{11}$ x$=\frac{5478}{11}$ $= 498$	sum & ✓div by 11 ✓ 498 (2)
1.1.3	$\sigma = 119{,}4708028 \approx 119.47$	✓ 119.47 (1)
1.2	$(x - \sigma; x + \sigma)$ $= (498 - 119.47; 498 + 119{,}47)$ $= (378{,}53; 617{,}47)$ $287; 328; 374; 619; 685$ $\therefore$ 5 distances/$afstande$	✓ $(x - \sigma; x + \sigma)$ ✓ $(378{,}53; 617{,}47)$ ✓ 5 distances (3)
1.3.1	119,47	✓ 119,47 (1)
1.3.2	$11y + 5478 = 5555$ $11y = 77$ $\therefore y = 7$ $\therefore Q_2 = 508$	✓ $11y = 77$ ✓✓ $Q_2 = 508$ (3)
		[11]

QUESTION/VRAAG 2

2.1	$y = a + bx$ $a = 57{,}86698281 \approx 57{,}87$ $b = 0{,}04935388263 \approx 0{,}05$ $\therefore y = 57{,}87 + 0{,}05x$	✓ value of a ✓ value of b ✓ correct equation (3)
2.2	$r = 0{,}9332540794$ $\approx 0{,}93$	✓ value of r (1)
2.3	$y = 57{,}87 + 0{,}05x$ $\quad = 57{,}87 + 0{,}05(465)$ $\quad = 81{,}12\%$ $\therefore$ 81% succeful average in the next tournament/ $\quad$ suksesvolle gemiddelde in die volgende toernooi	✓ subst ✓ 81,12% (2)
2.4	Very strong positive correlation/Sterk positiewe korrelasie	✓✓very strong positive (2)
		[8]

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QUESTION/VRAAG 3

3.1.1	$=G\left(\frac{X_E+X_D}{2}; \frac{Y_E+Y_D}{2}\right)$ $=G\left(\frac{-11+(-8)}{2}; \frac{0+5}{2}\right)$ $= G\left(-9\frac{1}{2}; 2\frac{1}{2}\right)$	✓ x value ✓ y value (2)
3.1.2	$M_{FHG} = \dfrac{2\frac{1}{2}-1}{-9\frac{1}{2}-(-8)}$ G, H and F are collinear/ G, H en F is kolloneêr $= \dfrac{1\frac{1}{2}}{1\frac{1}{2}}$ $= -1$ $\therefore m_{FG} = -1$	✓ Substitute ✓ $m_{FG} = -1$ (2)
3.2	$y - y_1 = m(x - x_1)$ $y - 5 = -1(x + 8)$ $y = -x - 3$	✓ grad ✓ sub ✓ answer (3)
3.3.1	At A $y = 0$ $A(-3; 0)$ $OA = 3$ units/eenhede $AE = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $AE = \sqrt{(-11 + 3)^2 + (0)^2}$ $= \sqrt{64}$ $= 8$	✓ sub dist formulae ✓ answer (2)

3.3.2	$EF = 4$ line drawn from midpoint / to 3rd side/lyn getrek van
	                            middelpunt tot die 3de sy
	 DA$= 5\sqrt{2}$
	
	 GF$= \frac{5\sqrt{2}}{2}$ midpoint theorem/middelpunt stelling
	
	 $m_{AD} = -1$
	
	 D$\hat{A}E = 45°$
	 Area of/Oppvl van $\triangle AED = \frac{1}{2} AD.AE \sin 45°$
	             $= \frac{5\sqrt{2}}{2} .8 \sin 45°$
	             $= 20$
		✓ DA
		
		 ✓ Area $\triangle AED = 20$

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	Area of/ Oppvl van $\Delta GFE = \frac{1}{2} . GF . EF . \sin 45°$ $= \frac{1}{2} . \frac{5\sqrt{2}}{2} . 4 \sin 45°$ $= 5$ Area of trapezium ADGF $=$ Area $\Delta AED -$ Area ΔGFE Oppvl van trapesium ADGF $=$ Oppvl $\Delta AED -$ Oppvl ΔGFE $= 20 - 5$ $= 15$ square units/vierkante	✓ Area $\Delta AED = 5$ ✓ answer (4)

3.3.3	$\hat{C} + D\hat{A}B = 180°$ opp angles of cyclic quad/
	                     teenoorgest hoeke van 'n
	                     koordevierhoek
	        $D\hat{A}B = 180° - 71,57°$
	              $= 108,43°$
	
	 $M_{DA} = -1$
	 $\therefore DAF = 45°$
	
	    $B\hat{A}O + D\hat{A}E + 108,43 = 180°$ adj angles on str line/
	                                  aangr hoeke op 'n reguitlyn
	 $B\hat{A}O + 45° + 108,43° = 180°$
	 $B\hat{A}O = 26,57°$
	
	 $M_{AB} = \tan B\hat{A}O$
	       $= \tan 26,57°$
	       $= 0,5$
		✓ S
		
		 ✓ S
		
		 ✓ S
		
		 ✓ S
		
		 ✓ S
		
		 ✓ answer
		
		(6)

		[19]

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QUESTION/VRAAG 4

4.1	M(3,4)	✓ x value ✓ y value (2)
4.2.1	$(x-3)^2 + (y-4)^2 = 25$ x-interepts/x-afsnitte: y=0 $(x-3)^2 + (0-4)^2 = 25$ $(x-3)^2 + 16 = 25$ $(x-3)^2 = 9$ $x-3 = \pm 3$ $\therefore x = 6$ or $x = o$ K(6;0)	 ✓ $sub\ y = 0$ ✓ simplification ✓ x value s ✓ choose $x = 6$ (4)
4.2.2	$M_{KM} = \dfrac{0-4}{6-3}$ $= \dfrac{-4}{3}$	✓subst ✓ $M_{KM} = \dfrac{-4}{3}$ (2)
4.3	Equation of/Vergelyking van PR MK perpendicular/loodreg op PR tan-rad $y = \dfrac{3}{4}x + c$ $0 = \dfrac{3}{4}(6) + c$ $\therefore c = \dfrac{-9}{2}$ $y = \dfrac{3}{4}x - \dfrac{9}{2}$	 ✓ sub point K (6;0) ✓ $c = \dfrac{-9}{2}$ ✓ answer (3)

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4.4	$R\left(0; \dfrac{-9}{2}\right)$ RT = RK (6,0) tangents from same point/ raaklyne van dieselfde punt $RT = \sqrt{(6-0)^2 + (0+\dfrac{9}{2})^2}$ $RT = \sqrt{36 + \dfrac{81}{4}}$ $RT = \dfrac{15}{2}$	✓ sub coordinates R ✓ simplification ✓ length of RT (3)
4.5.1	MN= 10 MN= $R_M + r_n$ 10 = 5 +r_n $r_n = 5$ ∴K is the midpoint of/is die middelpunt van MN $N(9; -4)$	✓ MN ✓ K is the midpoint ✓ N $(9; -4)$ (3)
4.5.2	$(x-a)^2 + (y-b)^2 = r^2$ $(6-9)^2 + (0+4)^2 = r^2$ 9+16 $= r^2$ $r^2 = 25$ $(x-9)^2 + (y+4)^2 = 25$ $x^2 - 18x + 81 + y^2 + 8y + 16 - 25 = 0$ $x^2 + y^2 - 18x + 8y + 72 = 0$	✓ sub K(6;0) ✓ 25 ✓ sub ✓ answer (4)
		[21]

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QUESTION/VRAAG 5

5.1	$\dfrac{-\cos x.(-\tan x)Cos^2x}{\sin x} - 4Cos^2x$ $\dfrac{-\cos x\dfrac{\sin x}{\cos x}}{\sin x}.Cos^2x - 4Cos^2x$ $Cos^2x - 4Cos^2x$ $-3Cos^2x$	$\checkmark -\cos x$ $\checkmark -\tan x$ $\checkmark \cos^2x$ $\checkmark \sin x$ $\checkmark \dfrac{\sin x}{\cos x}$ $\quad\checkmark$ simplification $\checkmark -3Cos^2x$ (7)
5.2.1	LHS$= \cos(A-B) - \cos(A+B)$ $= \cos A \cos B + \sin A \sin B - [\cos A \cos B - \sin A \sin B]$ $= \cos A \cos B + \sin A \sin B - \cos A \cos B + \sin A \sin B$ $= 2\sin A \sin B$	$\checkmark$ correct exp $\checkmark$ simplification (2)
5.2.2	$\cos 15° - \cos 75°$ $= \cos(45° - 30°) - \cos(45 + 30°)$ $= 2\sin 45°.\sin 30°$ $= 2.\dfrac{2}{\sqrt{2}}.\dfrac{1}{2}$ $= \dfrac{\sqrt{2}}{2}$	$\checkmark \cos(45° - 30°)$ $\checkmark \cos(45 + 30°)$ $\checkmark$ simplification $\checkmark \dfrac{\sqrt{2}}{2}$ (4)
5.3	$\dfrac{cos36°}{cos12°} - \dfrac{sin36°}{sin12°} = \dfrac{cos36°sin12° - sin36°cos12°}{cos12°sin12°}$ $\dfrac{-\sin(36°-12°)}{cos12° \, sin12°}$ $\dfrac{-sin24}{sin24}$ but/maar $\sin 24° = \sin 2(12)$ $\dfrac{-2\sin 12 \cos 12}{\sin 12 \cos 12}$ -2	$\checkmark$ One fraction with common denominator $\checkmark \sin(36° - 12°)$ $\checkmark \sin 24° = \sin 2(12)$ $\checkmark$ Answer: -2 (4)

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5.4.1	L.H.S$= \dfrac{2sin^2x + \sin 2x}{\cos 2x}$	✓ double angle sin
	$= \dfrac{2sin^2x + 2sinxcosx}{cos^2x - sin^2x}$	✓ common factor
	$= \dfrac{2\sin x(sinx + \cos x)}{(\cos x - \sin x)(\cos x + \sin x)}$	✓ factor denominator
	$= \dfrac{2\sin x}{(\cos x - \sin x)}$	✓ double angle cos
	$\therefore L.H.S = R.H.S$	(4)
5.4.2	Invalid for/Ongeldig vir: $\cos 2x = 0$ and/en $\cos x = \sin x$ $2x = \pm \cos^{-1} 0 + 360°.k, k\epsilon z$ $2x = 90° + 360.k$ or/of $2x = -90° + 360.k$ $x = 45° + 180.k$ or of $x = -45° + 180.k$ $x\epsilon\{-45°; 45\}$	✓ $x = 45°$ ✓ $x = -45°$ (2)
5.5	$AB^2 = (x_B - x_A)^2 + (y_B - y_A)^2$ $\left(\sqrt{86}\right)^2 = (6 - \cos\theta)^2 + (7 - \sin\theta)^2$ $86 = 36 - 12\cos\theta + cos^2\theta + 49 - 14\sin\theta + sin^2\theta$ $1 = -12\cos\theta - 14\sin\theta + sin^2\theta + cos^2\theta$ $1 = -12\cos\theta - 14\sin\theta + 1$ $14\sin\theta = -12\cos\theta$ $\therefore \dfrac{\sin\theta}{\cos\theta} = \dfrac{-12}{14}$ $\therefore \tan\theta = \dfrac{-12}{14} = \dfrac{-6}{7}$	✓ sub into corr formulae ✓ equating ✓ simplification ✓ $\dfrac{\sin\theta}{\cos\theta} = \dfrac{-12}{14}$ ✓ $\tan\theta = \dfrac{-12}{14}$ (5)
		[28]

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QUESTION/VRAAG 6

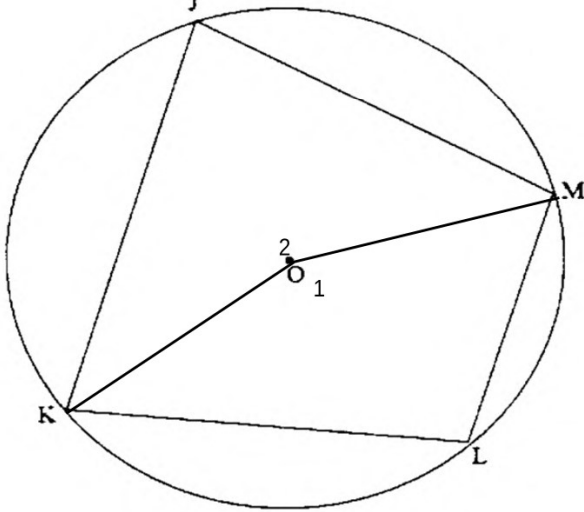| 6.1	$P\hat{S}Q = 90°$ semi-circle/semi-sirkel $Q\hat{S}R = \alpha$ tan-chord/tankoord $P\hat{S}R = 90° + \alpha$ $R = 90° - 2\alpha$ sum of angles of triangle som van hoeke van driehoek	✓ answer (1)
6.2	In $\Delta\,QSR$ $\dfrac{QS}{\sin R} = \dfrac{QR}{\sin S}$ $QS = \dfrac{k\sin(90° - 2\alpha)}{\sin\alpha}$ $= \dfrac{k\cos 2\alpha}{\sin\alpha}$	✓ sine rule ✓ $\dfrac{k\cos 2\alpha}{\sin\alpha}$ (2)
6.3	In Δ PRS $\dfrac{RS}{\sin\alpha} = \dfrac{4k}{\sin(90°+\alpha)}$ $\dfrac{PS}{\sin(90°-2\alpha)} = \dfrac{4k}{\sin(90°+\alpha)}$ $PS = \dfrac{4k\cos 2\alpha}{\cos\alpha}$	✓ sine rule ✓ $\cos\alpha$ ✓ $\cos 2\alpha$ (3)
6.4	$\tan\alpha = \dfrac{QS}{PS}$ $\sin\alpha = \dfrac{QS}{3k}$ $QS = 3k\sin\alpha$ $\tan\alpha = \dfrac{QS}{PS}$ $\quad = \dfrac{3k\sin\alpha}{1} \,X\, \dfrac{\cos\alpha}{4k\cos 2\alpha}$ $\quad = 3.\dfrac{1}{2}\sin 2\alpha \div 4\cos 2\alpha$ $\quad = \dfrac{3\sin 2\alpha}{8\cos 2\alpha}$ $\quad = \dfrac{3}{8}\tan 2\alpha$	✓ $QS = 3k\sin\alpha$ ✓ $\dfrac{1}{2}\sin 2\alpha$ ✓ $\dfrac{3\sin 2\alpha}{8\cos 2\alpha}$ (3)
		[9]

QUESTION/VRAAG 7

7.1.1	$A(-30°; 0)$	✓ answer	(1)
7.1.2	$f(180°) = -\sin(210°)$ $\qquad = 0{,}5$ $g(180°) = 2\cos(180°)$ $\qquad = -2$ $\therefore CD = \dfrac{5}{2}$	✓✓ answer	(2)
7.2	$360°$	✓ $360°$	(1)
7.3	$2\cos x + \sin(x + 30°) = 0$ $-[\sin x \cos 30° + \cos x \sin 30°] = 2\cos x$ $-\dfrac{\sqrt{3}}{2}\sin x - \dfrac{1}{2}\cos x = 2\cos x$ $-\dfrac{\sqrt{3}}{2}\sin x = \dfrac{5}{2}\cos x$ $\div -\dfrac{\sqrt{3}}{2}\cos x$ $\tan x = \dfrac{-5}{\sqrt{3}}$ $\therefore x = 109{,}11° + 180.k \ (k \in z)$	✓ expansion ✓ simplification ✓ equate ✓ $\div -\dfrac{\sqrt{3}}{2}\cos x$ ✓ $\tan x = \dfrac{-5}{\sqrt{3}}$ ✓ correct answer $\quad k \in z$	(6)
7.4	For/Vir $g(x) > f(x)$: $-70{,}89° < x < 109{,}11°$ $-90{,}89° < x < 89{,}11°$	✓ ✓ $-90{,}89°$ ✓ $89{,}11°$	(3)
			[13]

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QUESTION/VRAAG 8

8.1	$\hat{C}_1 = 48°$ $\hat{C}_1 = G = 48°$	given/gegee tan chord/tankoord	✓ S ✓ R (2)
8.2	$\hat{C}_2 = 90° - 48°$ $\hat{C}_2 = 42°$	∠ between tan and diameter/ tussen tan en middellyn	✓ R ✓ S (3)
8.3	$C\hat{E}F = 90°$ ∠ in $\frac{1}{2}$ $\therefore \hat{D} = 90° - 48° = 42°$ Ext/*Verlengde* ∠ of/*van* Δ		✓S ✓ R ✓ S/R (3)
			[8]

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QUESTION/VRAAG 9

9.1	 Construction/Konstruksie: Join KO and/en OM. $\hat{O}_1 = 2\hat{J}$ $\qquad$ $\angle$ at centre $= 2 \times \angle$ on circumference $\qquad\qquad\qquad$ $\angle$ by middelp $= 2 \times \angle$ op omtrek $\hat{O}_2 = 2\hat{L}$ $\qquad$ $\angle$ at centre $= 2 \times \angle$ on circumference $\qquad\qquad\qquad$ $\angle$ middelp $= 2 \times \angle$op omtrek but/maar $\hat{O}_1 + \hat{O}_2 = 360°$ revolution /revolusie $\therefore \hat{J} + \hat{L} = 180°$	construction ✓ S✓ R ✓ S✓ S✓ (5)
9.2.1	$A\hat{S}B = A\hat{T}B$ $\qquad$ angle sub by AB/hoek verv by AB $A\hat{T}B = B\hat{D}R$ $\qquad$ ext angle of cyclic quad/buitehoek van $\qquad\qquad\qquad\qquad\qquad$ koordevierkant $\therefore SCDB$ $\qquad$ is a cyclic quad ext angle of quad =opp angle/ $\qquad\qquad$ is 'n koordevierhoek, buitehoek van $\qquad\qquad$ koordevierhoek = teenoorg hoek	✓✓ S/R ✓✓ S/R ✓ R (5)
9.2.2	$\hat{A} = \hat{B}_1$ $\qquad\qquad$ angle in same segment/hoek in dieselfde $\qquad\qquad\qquad\qquad\qquad\qquad$ segment $\hat{R}_1 = \hat{B}_2$ $\qquad$ ext of cyclic quad/verl van koordevierkant $\therefore S\hat{B}D = \hat{B}_1 + \hat{B}_2$ $\qquad = A + \hat{R}_1$	S✓ S✓ (2)
		[12]

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QUESTION/VRAAG 10

10.1.1	$\hat{S}_1 = \hat{V}_1$ alt angles/*hoeke* SP// TV	✓ S/R
	But/Maar $\hat{V}_1 = \hat{R}_1$ ext angle of cyclic quad/	✓S✓R
	buitehoek van koordevierkant	
	$\therefore \hat{S}_1 = \hat{R}_1$	(3)
10.1.2	In $\triangle$PQR and/en $\triangle$PWQ	
	$\hat{P}_2 = \hat{P}_2$ common/algeneem	✓ S/R
	$\hat{Q}_1 = \hat{R}_2$ tan chord/tankoord	✓ S/R
	$\hat{W}_3 = \hat{Q}_1 + \hat{Q}_2$ 3rd angle/hoek	
	$\therefore \triangle$PQW/// $\triangle$PRQ angle, angle, angle/hoek, hoek,	✓ R
	hoek	✓ S
	$\therefore \frac{PQ}{PR} = \frac{QW}{RQ} = \frac{PW}{PQ}$ $\therefore PQ^2 = PW.PR$	(4)
10.2	$\triangle$PSR/// $\triangle$PWS $\hat{S}_1 = \hat{R}_1$ proven/bewys in 10.1.1	✓ S
	$\hat{P}_1$ common/algemeen	(1)
10.3	$\frac{PS}{PW} = \frac{PR}{PS}$ $\triangle$PSR/// $\triangle$PWS	✓ S
	$PS^2 = PW.PR$	
	$PQ^2 = PW.PR$ proven/bewys in 10.12	✓ S/R
	$PS^2 = PQ^2$ both equals to/beide gelyk aan $PW.PR$	✓ S
	PS = PQ	
		(3)
		[11]

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QUESTION/VRAAG 11

11.1	Let/Laat $BP = 4x$ and/en $PC = 3x$ KMCP is a/'n 11^m 2 pairs of opp sides 11/ 2 pare van teenoorg kante 11 $\therefore KM = PC = 3x$ $\dfrac{KM}{BC} = \dfrac{3x}{7x} = \dfrac{3}{7}$	✔ S ✔ S answer ✔ (3)
11.2	$\dfrac{AC}{AM} = \dfrac{AB}{AK}$ prop theorem/bewys, KM//BC $\dfrac{AB}{AK} = \dfrac{CB}{CP} = \dfrac{7}{3}$ prop theorem/bewys, KP//AC $\dfrac{AC}{AM} = \dfrac{7}{3}$	S ✔ ✔ S ✔$\dfrac{7}{3}$ (3)
11.3	$\dfrac{\text{Area of}/Oppvl\ van\ \Delta KBP}{\text{Area of}/Oppvl\ van\ \Delta ABC} = \dfrac{\frac{1}{2}KB.BP.\sin B}{\frac{1}{2}AB.BC.\sin B}$ $= \dfrac{4}{7}\cdot\dfrac{4}{7}$ $= \dfrac{16}{49}$	✔ areas ✔ ratio ✔$\dfrac{4}{7}\cdot\dfrac{4}{7}$ ✔ answer (4)
		[10]

TOTAL/TOTAAL: 150