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**PROVINSIALE EKSAMEN
PROVINCIAL EXAMINATION**

GRAAD 12/GRADE 12

**WISKUNDE/MATHEMATICS
VRAESTEL 2/PAPER 2
JUNIE/JUNE 2025
NASIENRIGLYNE/MARKING GUIDELINES**

PUNTE/MARKS: 150

TYD/TIME: 3 uur/hours

**Hierdie nasienriglyne bestaan uit 17 bladsye./
These marking guidelines consist of 17 pages**



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.

**SA EXAM PAPERS**

QUESTION/VRAAG 1

1.1	$\tilde{x} = 48,45$	✓✓ Answer (2)
1.2	$\sigma = 25,97$	✓ Answer (1)
1.3	$[48,45 - 25,97 ; 48,45 + 25,97]$ $[22,48 ; 74,42]$ 8 learners	✓22.48 ✓74.42 ✓8 learners (3)
1.4	$IQR = 55 - 31$ $= 24$	✓55 ✓31 ✓ Answer (3)
1.5	112 $Q_3 + 1.5 \cdot IQR = 55 + 1.5(24) = 91$ $112 > 91$	✓ Answer (1)
		[10]



QUESTION/VRAAG2

2.1	$43 + 69 + 110 + 49 + 20 + 9 = 300$ cars				✓300 (1)
2.2	Speed/ <i>Spoe</i> d km/h	Frequency/ <i>Frekwensie</i>	F		✓43,112, 222 ✓271,291, 300 (2)
	$60 \leq x < 70$	43	43		
	$70 \leq x < 80$	69	112		
	$80 \leq x < 90$	110	222		
	$90 \leq x < 100$	49	271		
	$100 \leq x < 110$	20	291		
	$110 \leq x < 120$	9	300		
2.3	CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE				✓ grounding ✓Upper boundaries . ✓shape (3)
2.4	$Q_1 = 75$ $Q_3 = 90$ accept Q_1 from 72-75, accept Q_3 from 90-93 $SIQR = \frac{90 - 75}{2} = 7.5$ CA from Ogive				✓75 ✓90 ✓Answer (3)
2.5	$300 - 112 = 188$ cars (If read from ogive-accept from 187-189) 300- 112 Could also just add using the table. CA from learners' ogive all the way				✓✓188 (2)
					[11]



QUESTION/VRAAG 3

3.1	$m = \frac{6-0}{3-0}$ $= 2$	Not allowed to use the value of S in q 3.1 - 3.3	✓ Substitution ✓ Answer (2)
3.2	$\tan \theta = 2$ $\theta = \tan^{-1}(2)$ $= 63.43^\circ$		✓ Substitution ✓ Answer (2)
3.3.1	$\alpha = 63.43^\circ + 20.23^\circ$ (ext $\angle$ of Δ) $\alpha = 83.66^\circ$ $m = \tan 83.66^\circ$ $m = 9$		✓ $\alpha = 83.66^\circ$ ✓ substitution ✓ Answer (3)
3.3.2	$y = 9x + c$ $3 = 9(-2) + c$ $3 + 18 = c$ $c = 21$ $y = 9x + 21$		✓✓ substitution ✓ Answer (3)
3.4	$2x = 9x + 21$ $-7x = 21$ $x = -3$ $y = 2(-3)$ $y = -6$ $S(-3; -6)$	Mistake in question paper. S given in paper differs from S calculated in 3.4	✓ equating ✓ $x = -3$ ✓ substitution ✓ $y = -6$ (4)
3.5	$S(-21; -42)$ $M\left(\frac{-21+3}{2}; \frac{6+(-42)}{2}\right)$ $M(-9; -18)$	$S(-3; -6)$ $M\left(\frac{-3+3}{2}; \frac{-6+6}{2}\right)$ $M(0; 0)$	✓ x-value ✓ y-value (2)



3.6	$-9 = \frac{-2+x}{2}$ $-18+2=x$ $R(-16; -39)$	$-18 = \frac{3+y}{2}$ $-36-3=y$	$0 = \frac{-2+x}{2}$ $x = 2$ $0 = \frac{3+y}{2}$ $y = -3$ $R(2; -3)$	Answer only: full marks	✓ substitution ✓ x-value ✓ y-value (3)
					[19]



QUESTION/VRAAG 4

4.1.1	$0 = \frac{-5}{2}x - 4$ $4 = \frac{-5}{2}x$ $8 = -5x$ $x = -\frac{8}{5}$ $E\left(\frac{-8}{5}; 0\right)$	$\checkmark 0$ $\checkmark -\frac{8}{5}$ (2)
4.1.2	$x^2 + y^2 = r^2$ $(0)^2 + \left(-\frac{8}{5}\right)^2 = r^2$ $r^2 = \frac{64}{25}$ $x^2 + y^2 = \frac{64}{25}$ NB It was not given that AMB is a diameter. BUT the sketch is misleading. The option is therefor added to the memo, BUT it is actually INCORRECT to assume that AMB is a diameter.	$\checkmark$ substitution $\checkmark r^2 = \frac{64}{25}$ $\checkmark$ answer (3)
4.2	CORRECT $M_{AE} = -\frac{5}{2}$ $M_{AM} = \frac{2}{5} (\tan \perp radii)$ $y = \frac{2}{5}x + c$ $c = -4$ $y = \frac{2}{5}x - 4$ $M_{AM} = \frac{-2 - (-4)}{5 - 0}$ $= \frac{2}{5}$ $c = -4$ $y = \frac{2}{5}x - 4$ xx ASSUMED	$\checkmark$ gradient of AM $\checkmark y = \frac{2}{5}x + c$ $\checkmark$ Answer (3)
4.3	$-3 = \frac{2}{5}a - 4$ $1 = \frac{2}{5}a$ $a = \frac{5}{2}$ OR $a = \frac{5+0}{2}$ $a = \frac{5}{2}$ CORRECT xx ASSUMED	$\checkmark$ substitution $\checkmark$ simplification $\checkmark$ Answer (3) OR $\checkmark \checkmark$ substitution $\checkmark$ Answer (3)



4.4	$\left(x - \frac{5}{2}\right)^2 + (y - (-3))^2 = r^2$ $\left(x - \frac{5}{2}\right)^2 + (y + 3)^2 = r^2$ $\left(0 - \frac{5}{2}\right)^2 + (-4 + 3)^2 = r^2$ $r^2 = \frac{29}{4}$ $\left(x - \frac{5}{2}\right)^2 + (y + 3)^2 = \frac{29}{4}$	$\checkmark \left(x - \frac{5}{2}\right)^2 + (y + 3)^2 = r^2$ $\checkmark \text{ Substitution}$ $\checkmark r^2 = \frac{29}{4}$ $\checkmark \text{ Answer}$ (4)
4.5	$\hat{G} = 90^\circ (\angle \text{ in semi-circle})$ $G\left(0; \frac{8}{5}\right)$ $F\left(\frac{8}{5}; 0\right)$ $EG = \sqrt{\left(\frac{-8}{5} - 0\right)^2 + \left(\frac{8}{5} - 0\right)^2} = \frac{8\sqrt{2}}{5}$ $GF = \frac{8\sqrt{2}}{5}$ $\text{Area of } \triangle EFG = \frac{1}{2} \left(\frac{8\sqrt{2}}{5}\right) \left(\frac{8\sqrt{2}}{5}\right)$ $= \frac{64}{25} = 2.56 \text{ units}^2$ OR $\text{Area of } \triangle EFG = \frac{1}{2} \cdot EF \cdot OG$ $\text{Area of } \triangle EFG = \frac{1}{2} \left(2 \cdot \frac{8}{5}\right) \left(\frac{8}{5}\right)$ $= \frac{64}{25} = 2.56 \text{ units}^2$	$\checkmark \text{ Angle G.}$ $\checkmark \text{ length of EG}$ $\checkmark \text{ length of GF}$ $\checkmark \text{ Substitution}$ $\checkmark \text{ Answer}$ (5) OR $\checkmark \checkmark \text{ method}$ $\checkmark \checkmark \text{ substitution}$ $\checkmark \text{ Answer}$ (5)
		[20]



QUESTION/VRAAG 5

5.1.1	$(\sqrt{34})^2 = (3)^2 + p^2$ $34 - 9 = p^2$ $p = -5$	✓ substitution ✓ Answer (2)
5.1.2	$\cos(450^\circ - 2\theta)$ $= \sin 2\theta$ $= 2 \sin \theta \cdot \cos \theta$ First mark awarded here $= 2 \left(\frac{-5}{\sqrt{34}} \right) \left(\frac{3}{\sqrt{34}} \right)$ $= \frac{-30}{34}$ $= \frac{-15}{17}$	✓ $\sin 2\theta = 2 \sin \theta \cos \theta$ ✓ substitution ✓ Answer (3)
5.1.3	$\cos(30^\circ - \theta)$ $\cos 30^\circ \cdot \cos \theta + \sin 30^\circ \cdot \sin \theta$ $\left(\frac{\sqrt{3}}{2} \right) \left(\frac{3}{\sqrt{34}} \right) + \left(\frac{1}{2} \right) \left(\frac{-5}{\sqrt{34}} \right)$ $\frac{3\sqrt{3} - 5}{\sqrt{34}}$ Answer $\frac{3\sqrt{102} - 5\sqrt{34}}{34}$	✓ Expansion ✓ Substitution ✓ Answer (3)
5.2	$\frac{-2 \sin x - \cos x}{\sin(x + 60^\circ + x)}$ Question paper misleading...does not simplify to a single trigonometric function $\frac{2 \sin x \cdot \cos}{\sin(2x + 60^\circ)}$ $\frac{\sin 2x}{\sin 2x \cdot \cos 60^\circ + \cos 2x \cdot \sin 60^\circ}$ $\frac{\sin 2x}{\sin 2x + \frac{\sqrt{3}}{2} \cos 2x}$ $\frac{2 \sin 2x}{\sin 2x + \sqrt{3} \cos 2x}$ $\frac{2 \tan 2x}{\tan 2x + \sqrt{3}}$	✓ $-\sin x$ ✓ $-\cos x$ ✓ compound angle ✓ $\sin 2x$ ✓ $\sin 2x \cdot \cos 60^\circ + \cos 2x \cdot \sin 60^\circ$ ✓ Answer (6)



5.3.1	$f(x) = \cos(x + 45^\circ) \cdot \cos(45^\circ - x)$ $= [\cos x \cdot \cos 45^\circ - \sin x \cdot \sin 45^\circ] [\cos x \cdot \cos 45^\circ + \sin x \cdot \sin 45^\circ]$ $= \left[\frac{1}{\sqrt{2}} \cos x - \frac{1}{\sqrt{2}} \sin x \right] \left[\frac{1}{\sqrt{2}} \cos x + \frac{1}{\sqrt{2}} \sin x \right]$ $= \frac{1}{2} \cos^2 x - \frac{1}{2} \sin^2 x$ $= \frac{1}{2} (\cos^2 x - \sin^2 x)$ $= \frac{1}{2} \cos 2x$	✓ first expansion ✓ second expansion ✓ $\frac{1}{2} \cos^2 x - \frac{1}{2} \sin^2 x$ ✓ common factor (4)
5.3.2	$\frac{1}{2} \cos 2x = 1 - 2 \sin x$ $1 - 2 \sin^2 x = 2 - 4 \sin x$ $2 \sin^2 x - 4 \sin x + 1 = 0$ $\sin x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(2)(1)}}{2(2)}$ $\sin x = \frac{2 - \sqrt{2}}{2} = 0,29 \text{ or } \sin x = \frac{2 + \sqrt{2}}{2} = 1,71$ $x = 17.03^\circ + k.360^\circ \quad \text{no solution}$ $x = 162.97^\circ + k.360^\circ \quad k \in \mathbb{Z}$ CA is learner uses 0,293 etc	✓ formulae ✓ standard form ✓ $\sin x$ value(s) ✓ $x = 17.03^\circ + k.360^\circ$ ✓ $x = 162.97^\circ + k.360^\circ$ ✓ $k \in \mathbb{Z}$ (6)
5.4	$\cos \theta = 2m \text{ and } \cos 2\theta = 7m$ $2 \cos^2 \theta - 1 = 7m$ $2(2m)^2 - 1 = 7m$ $8m^2 - 7m - 1 = 0$ $(8m + 1)(m - 1) = 0$ $m = \frac{-1}{8} \text{ or } m = 1$ $\therefore m = -\frac{1}{8}$	✓ formulae ✓ substitution ✓ standard form ✓ factors ✓ Answer with selection (5)
		[29]



QUESTION/VRAAG 6

6.1	120°	✓ Answer (1)
6.2		g ✓ shape ✓ x-intercept ✓ turning point (3)
6.3.1	$x \in [-90^\circ; -60^\circ)$ or $-90^\circ \leq x < -60^\circ$	✓✓ Answer (2)
6.3.2	$-90^\circ < x < 0^\circ$ or $60^\circ < x < 90^\circ$, $x \neq -60^\circ$ Incorrect, some equal signs omitted	✓ $-90^\circ < x < 0^\circ$ ✓ $60^\circ < x < 90^\circ$ ✓ $x \neq -60^\circ$ (3)
6.3.3	$x = 30^\circ$ Question paper asked wrong way round - the only answer available is a -1. Therefore...actually no solution Note: Accept no solution	✓ Answer (1)
6.4	$h(x) = 2 \cos(x - 30^\circ - 60^\circ)$ $= 2 \cos(x - 90^\circ)$ $= 2 \sin x$	✓ $2 \cos(x - 90^\circ)$ ✓ Answer (2)
		[12]



QUESTION/VRAAG 7

7.1	in $\triangle PQS$ $\cos 30^\circ = \frac{x}{PS}$ $\frac{\sqrt{3}}{2} = \frac{x}{PS}$ $PS = \frac{2x}{\sqrt{3}}$ in $\triangle PQR$ $\sin 30^\circ = \frac{x}{PR}$ $\frac{1}{2} = \frac{x}{PR}$ $PR = 2x$ in $\triangle PSR$ $PR^2 = RS^2 + PS^2 - 2RS \cdot PS \cos \theta$ $(2x)^2 = \left(\frac{2x}{\sqrt{3}}\right)^2 + (\sqrt{3})^2 - 2\left(\frac{2x}{\sqrt{3}}\right)(\sqrt{3})\cos \theta$ $4x^2 = \frac{4}{3}x^2 + 3 - 4x \cos \theta \quad \times 3$ $12x^2 = 4x^2 + 9 - 12x \cos \theta$ $12x \cos \theta = 9 - 8x^2$ $\cos \theta = \frac{9 - 8x^2}{12x}$	$\checkmark \cos 30^\circ = \frac{x}{PS}$ $\checkmark PS = \frac{2x}{\sqrt{3}}$ $\checkmark \sin 30^\circ = \frac{x}{PR}$ $\checkmark PR = 2x$ $\checkmark \text{Substitution into Cosine rule}$ $\checkmark 4x^2 = \frac{4}{3}x^2 + 3 - 4x \cos \theta$ (6)
7.2	Area of $\triangle PSR = \frac{1}{2}(\sqrt{3})\left(\frac{2(1)}{\sqrt{3}}\right)\sin \theta$ $= \sin \theta \text{ units}^2$	$\checkmark \checkmark \text{Substitution into Area rule}$ (2)
		[8]



QUESTION/VRAAG 8

8.1	$\hat{QOR} = 228^\circ$ ($\angle$ around a point) $\hat{QTR} = 114^\circ$ ($\angle$ at center = $2\angle$ at circumference) OR $\hat{RPQ} = 66^\circ$ ($\angle$ at center = $2\angle$ at circumference) $\hat{QTR} = 114^\circ$ (opp $\angle$ s of cyclic quad)	$\checkmark$ S $\checkmark$ S $\checkmark$ R OR $\checkmark$ S $\checkmark$ R $\checkmark$ S (3)
8.2	$\hat{OQS} = 90^\circ$ (tan $\perp$ radii) $\hat{ORS} = 90^\circ$ (tan $\perp$ radii) $\therefore$ QORS is a cyclic quadrilateral (opp $\angle$ s are supplementary) OR (converse of opp $\angle$ s of cyclic quad)	$\checkmark$ S/R $\checkmark$ S/R $\checkmark$ R (3)
8.3	$\hat{QSR} = 48^\circ$ (Opp $\angle$ s of cyclic quad) OR (sum of $\angle$ s of quad)	$\checkmark$ S $\checkmark$ R (2)
		[8]



QUESTION/VRAAG 9

9.1	$c = x$ (tan-chord theorem) S R $E_1 = 180^\circ - (x + y)$ (sum of $\angle$ s in Δ) S/R $E_3 = y$ ($\angle$ s in str line) / ext $\angle$ of ΔDEC S/R $\hat{A}BE = y$ ($\angle$ s opp = sides) S/R $D_1 = \hat{A}BE = y$ R $\therefore$ ABED is a cyclic quad (converse of ext $\angle$ of cyclic quad)	✓S ✓R ✓S/R ✓S/R ✓S/R ✓R (6)
9.2	$\hat{B}_1 = x$ ($\angle$ s in same seg) S R $\hat{B}_1 = \hat{C} = x$ AB is a tangent to a circle B,C and D (converse of tan-chord theorem) or ($\angle$ between a line and chord) R	✓S ✓R ✓R (3)
		[9]



QUESTION/VRAAG 10

10.1	Construct height h and k perpendicular to AD and AE respectively. Join DC and BE. $\frac{\text{Area of } \triangle ADE}{\text{Area of } \triangle BDE} = \frac{\frac{1}{2} AD \cdot h}{\frac{1}{2} BD \cdot h} \quad (\text{Same height } h)$ $= \frac{AD}{BD}$ $\frac{\text{Area of } \triangle ADE}{\text{Area of } \triangle CED} = \frac{\frac{1}{2} AE \cdot k}{\frac{1}{2} EC \cdot k} \quad (\text{Same height } k)$ $= \frac{AE}{EC}$ But Area of $\triangle BDE$ = Area of $\triangle CED$ (same base DE, same height between $\parallel$ lines.) $\frac{\text{Area of } \triangle ADE}{\text{Area of } \triangle BDE} = \frac{\text{Area of } \triangle ADE}{\text{Area of } \triangle CED}$ $\therefore \frac{AD}{BD} = \frac{AE}{EC}$	✓ construction ✓ S ✓ S ✓ S ✓ R ✓ S (6)
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10.2	$\frac{AD}{DB} = \frac{AF}{FC} \text{ (Prop theorem } DF \parallel BC)$ $AF = \frac{AD \cdot FC}{DB}$ $\text{From } \frac{AF}{FE} = \frac{FC}{EB}$ $AF = \frac{FE \cdot FC}{EB}$ $\frac{FE \cdot FC}{EB} = \frac{AD \cdot FC}{DB}$ $\frac{FE}{EB} = \frac{AD}{DB}$ $\therefore DE \parallel AF \text{ (Converse of prop theorem)}$	✓S ✓R ✓ $AF = \frac{AD \cdot FC}{DB}$ ✓ $AF = \frac{FE \cdot FC}{EB}$ ✓Equating ✓R (6)
		[12]



QUESTION/VRAAG 11

The word "TANGENT" DE was omitted on ENGLISH side

11.1	$\hat{F}\hat{G}\hat{E} = \theta$ (Tan-chord theorem) $\hat{E}_2 = \theta$ ($\angle s$ opp = sides) $\hat{F}_2 = \theta$ (Alt $\angle s$, $DE \parallel FH$)	✓S ✓S ✓S (3)
11.2	In $\triangle DEF$ and $\triangle DGE$ ✓ $\hat{D} = \hat{D}$ common ✓ $\hat{E}_1 = \hat{G}$ tan chord theorem or (proved in 11.1) ✓ $\hat{F}_3 = \hat{E}_1 + \hat{E}_2$ (Sum of $\angle s$ in $\triangle$) $\triangle DEF \sim \triangle DGE$ (AAA) ✓ $\frac{DE}{DG} = \frac{EF}{GE} = \frac{DF}{DE}$ (from $\sim \triangle s$) $DE^2 = DF \cdot DG$	✓identifying triangles ✓S/R ✓S ✓R(AAA) ✓S (5)
11.3	$\frac{DF^2}{DE^2} + \frac{DF}{DE} = \frac{DF^2 + DF \cdot DE}{DE^2}$ $= \frac{DF(DF + DE)}{DE^2}$ $= \frac{DF(DF + FG)}{DF \cdot DG} \quad (DE = FG)$ $= \frac{DF + FG}{DG} \quad (DE^2 = DF \cdot DG)$ $= \frac{DG}{DG} \quad (DG = DF \cdot FG)$ $= 1$ OR $\frac{EF}{GE} = DE^2 = DF \cdot DG$ $= DF \cdot (DF + FG)$ $= DF^2 + DF \cdot FG$ $= DF^2 + DF \cdot DE$ $\frac{DE^2}{DE^2} = \frac{DF^2}{DE^2} + \frac{DF \cdot DE}{DE^2}$ $1 = \frac{DF^2}{DE^2} + \frac{DF}{DE}$	$\checkmark \frac{DF^2 + DF \cdot DE}{DE^2}$ ✓common factor ✓S ✓S (4) $\checkmark DF \cdot (DF + FG)$ $\checkmark DF^2 + DF \cdot FG$ $\checkmark DF^2 + DF \cdot DE$ ✓Dividing both sides by DE^2 (4) [12]
		TOTAL: 150

