

SA's Leading Past Year

Exam Paper Portal



You have Downloaded, yet Another Great Resource to assist you with your Studies 😊

Thank You for Supporting SA Exam Papers

Your Leading Past Year Exam Paper Resource Portal

Visit us @ www.saexampapers.co.za



**SA EXAM
PAPERS**
SA EXAM
PAPERS



KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

MATHEMATICS P2

PRACTICE

JUNE 2024

MARKING GUIDELINE

MARKS: 150

TIME: 3 HOURS

This marking guideline consists of 9 pages.

QUESTION 1

1.1	$m_{AD} = m_{BC} = \frac{3+1}{2-6}$ $= -1$ <p>Sub A(-3; 3): $y = -x + c$ $3 = -(-3) + c$ $c = 0$</p> $\therefore y = -x$	✓ substitution ✓ m ✓ substitution ✓ equation (4)
1.2	$D(x; y) \rightarrow y = -x$ $BD = CD \rightarrow BD^2 = CD^2:$ $(2-x)^2 + (3-y)^2 = (6-x)^2 + (-1-y)^2$ $(2-x)^2 + (3-(-x))^2 = (6-x)^2 + (-1-(-x))^2$ $4 - 4x + x^2 + 9 + 6x + x^2 = 36 - 12x + x^2 + 1 - 2x + x^2$ $16x = 24$ $x = \frac{24}{16} = \frac{3}{2}$ $y = -\frac{3}{2}$ $\therefore D\left(\frac{3}{2}; -\frac{3}{2}\right)$	✓ $BD = CD$ ✓ substitution ✓ $y = -x$ ✓ simplification ✓ x -value ✓ y -value (6)
1.3	$m_{BC} = \frac{3 + \frac{3}{2}}{2 - \frac{3}{2}} = 9$	✓ substitution ✓ answer (2)
1.4	let \angle of inclination of BC be α and \angle of inclination of BD be β $\tan \alpha = m_{BC}$ $\tan \alpha = -1$ $\alpha = 135^\circ$ $\tan \beta = m_{BD}$ $\tan \beta = 9$ $\beta = 83,7^\circ$ $\theta = \alpha - \beta$ $= 135^\circ - 83,7^\circ$ $= 51,3^\circ$	✓ $\tan = m$ ✓ angles ✓ difference ✓ answer (4)
1.5	$BD^2 = CD^2 = \left(2 - \left(\frac{3}{2}\right)\right)^2 + \left(3 - \left(-\frac{3}{2}\right)\right)^2 = \frac{41}{2}$ $\therefore BD = CD = \frac{\sqrt{82}}{2}$ units $\widehat{BDC} = 180^\circ - (51,3^\circ \times 2) = 77,4^\circ$ $\text{Area}_{\Delta ABC} = \frac{1}{2} \left(\frac{41}{2}\right) \sin 77,4^\circ = 10$ square units	✓ substitution ✓ $BD=CD$ ✓ \widehat{BDC} ✓ sub in Area Rule ✓ answer (5)

[21]

QUESTION 3

3.1	$\sin \alpha = \frac{8}{17}$ $x = \sqrt{(17)^2 - (8)^2}$ $x = -15$		✓ diagram
3.1.1	$= 3 \left(\frac{8}{-15} \right) = -\frac{8}{5}$		✓ x-val ✓ answer (3)
3.1.2	$= \cos \alpha$ $= -\frac{15}{17}$		✓ cos α ✓ answer (2)
3.1.3	$= \cos^2 \alpha - \sin^2 \alpha$ $= \left(-\frac{15}{17} \right)^2 - \left(\frac{8}{17} \right)^2$ $= \frac{161}{289}$		✓ expansion ✓ substitution ✓ answer (3)
3.2	$\sin \theta \cos \theta = \frac{k}{4}$ $(\times 2): 2 \sin \theta \cos \theta = \frac{k}{2}$ $\sin 2\theta = \frac{k}{2}$ $\therefore \tan 2\theta = \frac{k}{\sqrt{4 - k^2}}$		✓ $\times 2$ ✓ sin 2θ ✓ diagram ✓ x-val / adj ✓ answer (5)

[13]

QUESTION 4

4.1	$= \frac{2 \cos(90^\circ + 15^\circ) \cos 15^\circ}{\cos(45^\circ - x + x)}$ $= \frac{2 \sin 15^\circ \cos 15^\circ}{\cos 45^\circ}$ $= \frac{\sin 30^\circ}{\cos 45^\circ} = \frac{\frac{1}{2}}{\frac{1}{\sqrt{2}}}$ $= \frac{1}{\sqrt{2}} \text{ OR } \frac{\sqrt{2}}{2}$	$\checkmark \cos(45^\circ - x + x)$ $\checkmark \sin 15^\circ$ $\checkmark \cos 45^\circ$ $\checkmark \cos 30^\circ$ $\checkmark \frac{\frac{1}{2}}{\frac{1}{\sqrt{2}}}$ $\checkmark \text{answer} \quad (6)$
4.2.1	$\text{RHS} = \frac{\cos \theta + \sin \theta}{\cos \theta - \sin \theta} \times \frac{\cos \theta + \sin \theta}{\cos \theta + \sin \theta}$ $= \frac{(\cos \theta + \sin \theta)^2}{\cos^2 \theta - \sin^2 \theta}$ $= \frac{\cos^2 \theta + 2 \sin \theta \cos \theta + \sin^2 \theta}{\cos 2\theta}$ $= \frac{1 + \sin 2\theta}{\cos 2\theta} = \text{LHS}$ <p style="text-align: center;">OR</p>	$\checkmark \times \text{conjugate}$ $\checkmark \cos^2 \theta - \sin^2 \theta$ $\checkmark \text{expansion}$ $\checkmark \cos 2\theta$ $\checkmark 1 \quad (5)$
	$\text{LHS} = \frac{\cos^2 \theta + 2 \sin \theta \cos \theta + \sin^2 \theta}{\cos^2 \theta - \sin^2 \theta}$ $= \frac{(\cos \theta + \sin \theta)^2}{(\cos \theta + \sin \theta)(\cos \theta - \sin \theta)}$ $= \frac{\cos \theta + \sin \theta}{\cos \theta - \sin \theta} = \text{RHS}$	$\checkmark \text{expansion}$ $\checkmark 2 \sin \theta \cos \theta$ $\checkmark \cos^2 \theta - \sin^2 \theta$ $\checkmark \text{square}$ $\checkmark \text{factors} \quad (5)$
4.2.2	$\cos 2\theta = 0 \quad \text{ref } \angle = 90^\circ$ $2\theta = 90^\circ + k \cdot 360^\circ$ $\theta = 45^\circ + k \cdot 180^\circ; k \in \mathbb{Z}$	$\checkmark \cos 2\theta = 0$ $\checkmark 45^\circ + k \cdot 180^\circ$ $\checkmark k \in \mathbb{Z} \quad (3)$
4.2.3	$= \frac{1 + \sin 30^\circ}{\cos 30^\circ}$ $= \frac{1 + \frac{1}{2}}{\frac{\sqrt{3}}{2}}$ $= \sqrt{3}$	\checkmark $\checkmark \text{substitution}$ $\checkmark \text{answer} \quad (3)$
4.3	$7 \cos x - 2(1 - \cos^2 x) + 5 = 0$ $7 \cos x - 2 + 2 \cos^2 x + 5 = 0$ $2 \cos^2 x + 7 \cos x + 3 = 0$ $(2 \cos x + 1)(\cos x + 3) = 0$ $\cos x = -\frac{1}{2} \quad \text{or} \quad \underline{\cos x = -3}$ $x = 120^\circ + k \cdot 360^\circ \quad \therefore \text{n/a}$ $x = 240^\circ + k \cdot 360^\circ; k \in \mathbb{Z}$	$\checkmark \text{expansion}$ $\checkmark \text{std form}$ $\checkmark \text{factors}$ $\checkmark \cos x = -\frac{1}{2}$ $\checkmark \cos x = -3$ $\checkmark \checkmark \text{answers} \quad (7)$

[24]

QUESTION 5

5.1	$a = 2$ $b = 2$	✓ ✓ (2)
5.2	$f: 180^\circ$ $g: 360^\circ$	✓ ✓ (2)
5.3	amplitude: 1	✓ (1)
5.4	$y \in [2; 4]$	✓ end points ✓ notation (2)
5.5	$-180^\circ < x < 0^\circ$; $x \neq -90^\circ$	✓ end points ✓ notation ✓ $x \neq -90^\circ$ (3)
	OR	
	$x \in (-180^\circ; 90^\circ) \cup (90^\circ; 0^\circ)$	✓✓ end points ✓ notation (3)
5.6	$h(x) = \sin(2x + 45^\circ)$	✓✓ (2)
5.7	$k(x) = -2 \cos x$	✓✓ (2)

[14]

QUESTION 6

6.1	$AC^2 = AB^2 + BC^2 - 2 \cdot AB \cdot BC \cdot \cos \widehat{ABC}$ $= a^2 + 4a^2 - 2(a)(2a) \cdot \cos 2\beta$ $\therefore AC = \sqrt{5a^2 - 4a^2 \cos 2\beta}$ $= \sqrt{a^2(5 - 4 \cos 2\beta)}$ $= a\sqrt{5 - 4 \cos 2\beta}$	✓ cosine rule ✓ substitution ✓ answer (3)
6.2	In $\triangle ADC$: $\tan \beta = \frac{AD}{a\sqrt{5 - 4 \cos 2\beta}}$ $AD = \tan \beta \cdot a\sqrt{5 - 4 \cos 2\beta}$ $= a \tan \beta \sqrt{5 - 4(1 - 2 \sin^2 \beta)}$ $= a \tan \beta \sqrt{5 - 4 + 8 \sin^2 \beta}$ $= a \tan \beta \sqrt{1 + 8 \sin^2 \beta}$	✓ trig ratio ✓ substitution ✓ $1 - 2 \sin^2 \beta$ ✓ simplification (4)

[7]

QUESTION 7

7.1.1	100°	ext \angle of Δ	\checkmark S \checkmark R (2)
7.1.2	50°	\angle at cent = $2\angle$ at CFCE	\checkmark S \checkmark R (2)
7.1.3	130°	opp \angle s of cyclic quad = 180°	\checkmark S \checkmark R (2)
7.1.4	$78^\circ - 50^\circ = 28^\circ$	corres \angle s ; AOF EH	\checkmark S \checkmark R (2)
7.2	Let $\hat{C} = x$ $\therefore \hat{ADB} = x$ & $\hat{AOB} = 2x$ $\hat{A}_1 = \hat{ADB} = x$ $\therefore \hat{E}_1 = 180^\circ - 2x$ $\therefore \hat{E}_2 = 2x$ $\hat{E}_2 = \hat{AOB} = 2x$ \Rightarrow AEOB is a cyclic quadrilateral	\angle s in same segment \angle at cent = $2\angle$ at CFCE alt \angle s; AC BD sum of \angle s in Δ \angle s on a str. line converse \angle s in same segment	\checkmark S/R \checkmark S/R \checkmark S/R \checkmark S/R \checkmark S/R \checkmark R (6)

[14]

QUESTION 8

8.1	Construction: Draw KS = PQ and KT = PR. Join ST In Δ KST and Δ PQR: 1. KS = PQ (constr) 2. $\hat{K} = \hat{P}$ (given) 3. KT = PR (constr) $\therefore \Delta$ KST \equiv Δ PQR (S; A; S) $\Rightarrow \hat{S}_1 = \hat{Q}$ (Δ KST \equiv Δ PQR) & $\hat{Q} = \hat{L}$ $\therefore \hat{S}_1 = \hat{L}$ \therefore ST LM (corres \angle s =) $\therefore \frac{KL}{KS} = \frac{KM}{KT}$ (Prop. Int. Theorem; ST LM) but KS = PQ & KT = PR $\therefore \frac{KL}{PQ} = \frac{KM}{PR}$	\checkmark construction \checkmark S/R \checkmark S/R \checkmark R \checkmark S/R \checkmark S (6)
-----	--	---

9.3	$WV^2 = RW^2 - RV^2$ $= \left(\frac{60}{7} + 6\right)^2 - (10)^2$ $WV = 10,598211$ $\frac{PN}{WV} = \frac{RN}{RW}$ $\frac{PN}{10,598211} = \frac{\frac{60}{7}}{\frac{60}{7} + 6}$ $PN = 6,23 \text{ units}$	(Pythag) (ΔRPN ΔRVW)	✓R ✓substitution ✓WV ✓S/R ✓substitution ✓PN (6)
	OR		
	$\frac{RP}{RV} = \frac{RS}{RT}$ $\frac{RP}{10} = \frac{10}{17}$ $RP = \frac{100}{17}$ $PN^2 = RN^2 - RP^2$ $= \left(\frac{60}{7}\right)^2 - \left(\frac{100}{17}\right)^2$ $= 6,23 \text{ units}$	(Prop. Int. Th; TW SN) (Pythag)	✓S ✓R ✓RP ✓R ✓substitution ✓PN (6)

[15]

TOTAL MARKS: 150