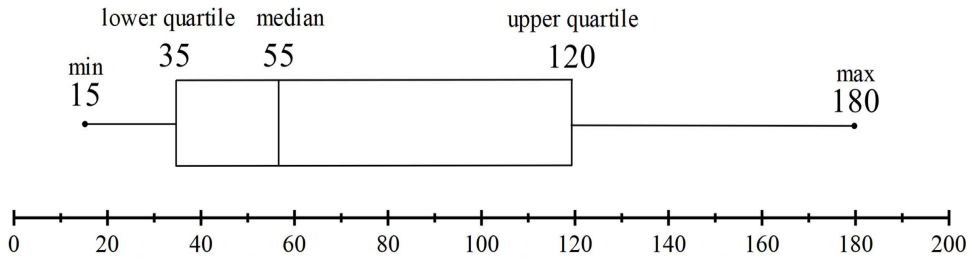
BERGVLIET HIGH SCHOOL

MATHEMATICS DEPARTMENT

GRADE 10 MATHEMATICS PAPER 2
MEMORANDUM
22 NOVEMBER 2023

QUESTION 1

15 ; 20 ; 35 ; 45 ; 50 ; 55 ; 80 ; 100 ; 120 ; 130 ; 180			
1.1.	$\bar{x} = \frac{830}{11}$ $= 75.46$	• n = 11 • 75.46 *(CA)* *(**note**: -1 for rounding error)*	(2)
1.2.	$Q_3 = 120$ $Q_1 = 35$ $IQR = 120 - 35$ $= 85$	• Q_3 • Q_1 • 85 *(CA)*	(3)
1.3.		• median = 55 • box • whiskers *(**note**: -1 for no values)*	(3)
1.4.	$\bar{x} = \frac{830}{n}$ $41.50 = \frac{830}{n}$ $n = \frac{830}{41.50}$ $= 20$ Therefore, **9 students** were originally excluded.	• $\bar{x} = 41.50$ (substitution) • $n = 20$ • 9 students	(3)
			[11]

QUESTION 2

2.1.	$80 \leq x < 120$				• accurate domain	(1)
2.2.	**Class Interval**	**Freq.**	**Mid.**	**F × M**	• Midpoints • 9080 • 120 • 75.67 *(CA)*	(4)
	$0 \leq x < 40$	45	**20**	**900**		
	$40 \leq x < 80$	18	**60**	**1080**		
	$80 \leq x < 120$	29	**100**	**2900**		
	$120 \leq x < 160$	22	**140**	**3080**		
	$160 \leq x < 200$	5	**180**	**900**		
	$200 \leq x < 240$	1	**220**	**220**		
	TOTAL:	**120**		**9080**		
	$\text{Est. mean} = \frac{9080}{120}$ ≈ 75.67					
						[5]

QUESTION 3

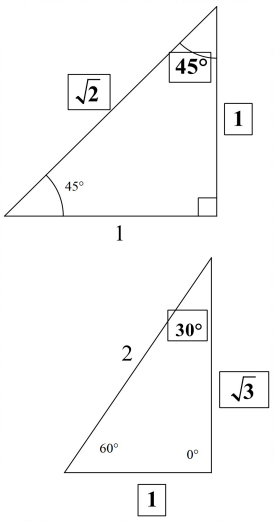
3.1.	$M\left(\frac{9+(-5)}{2};\frac{1+(-1)}{2}\right)$ $= M\left(2;0\right)$	• $x = 2$ • $y = 0$ *(**note**: state the coordinates)*	(2)
3.2.	$BC = \sqrt{(9-1)^2+(1-7)^2}$ $= \sqrt{100}$ $= 10$ $= AB$ $\therefore \Delta ABC$ is an isosceles triangle (AB = BC)	• Substitution • BC = 10 • AB = BC	(3)
3.3.	D(3;−7)	• $x = 3$ • $y = -7$ *(**note**: state the coordinates)*	(2)
3.4.	Area ABCD $= 2 \times$ Area ΔABC $= 2 \times \left(\frac{1}{2}\right)(AB)(BC)$ $= 2 \times \left(\frac{1}{2}\right)(10)(10)$ $= 100\text{cm}^2$	• $2 \times$ Area ΔABC • BC = 10 *(CA)* • 100cm^2	(3)
			[10]

QUESTION 4

4.1.	$m_{PQ} = \frac{10-(-2)}{3-(-1)}$ $= \frac{12}{4}$ $= 3$ $\therefore y = 3x + c$ P (-1; -2) Q (3; 10) $-2 = 3(-1) + c$ **(OR)** $10 = 3(3) + c$ $c = 1$ $c = 1$ $\therefore y = 3x + 1$	• $m_{PQ} = 3$ • subst. P or Q • $y = 3x + 1$	(3)
4.2.	$m_{PR} = \frac{(3a+1)-(-2)}{a-(-1)}$ $3 = \frac{3a+3}{a+1}$ $3(a+1) = 3a+3$ $3a+3 = 3a+3$ $\therefore a \in \mathbb{R}$	• collinear points • subst. gradient • algebraic identity *(**note**: "Show that $a \in \mathbb{R}$")*	(3)
	[OR]		
	$y = 3x + 1$ Q $(a;\ 3a+1)$ LHS: $3a+1$ RHS: $3(a)+1$ $= 3a+1$ $= 3a+1$ $\therefore$ LHS = RHS	• state linear function • domain of linear function • subst. point on the line *(**note**: "Show that $a \in \mathbb{R}$")*	(3)
			[6]

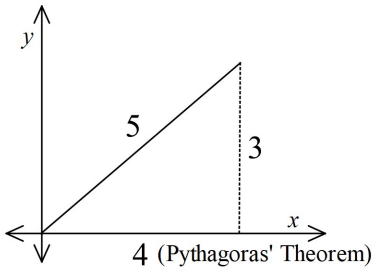
QUESTION 5

5.1.	5.1.1.	$\tan(2\hat{A} - \hat{B})$ $= \tan\left(2(23°) - 40°\right)$ $= 0.11$	• 0.11	(1)
	5.1.2.	$\sec \hat{A} + \sin^2 \hat{B}$ $= \sec(23°) + \sin^2(40°)$ $= \frac{1}{\cos(23°)} + \sin^2(40°)$ $= 1.50$	• reciprocal function • 1.50 *(**note**: full marks answer only)*	(2)
5.2.	5.2.1.	$\sin 2\theta = \frac{1}{3}$ $2\theta = \sin^{-1}\left(\frac{1}{3}\right)$ $= 19.47°$ $\theta = 9.74°$	• inverse function • $\theta = 9.74°$	(2)
	5.2.2.	$2\tan(\theta + 45°) = 4$ $\tan(\theta + 45°) = 2$ $(\theta + 45°) = \tan^{-1}(2)$ $= 63.43°$ $\theta = 63.43° - 45°$ $= 18.43°$	• division • inverse function • $\theta = 18.43°$	(3)

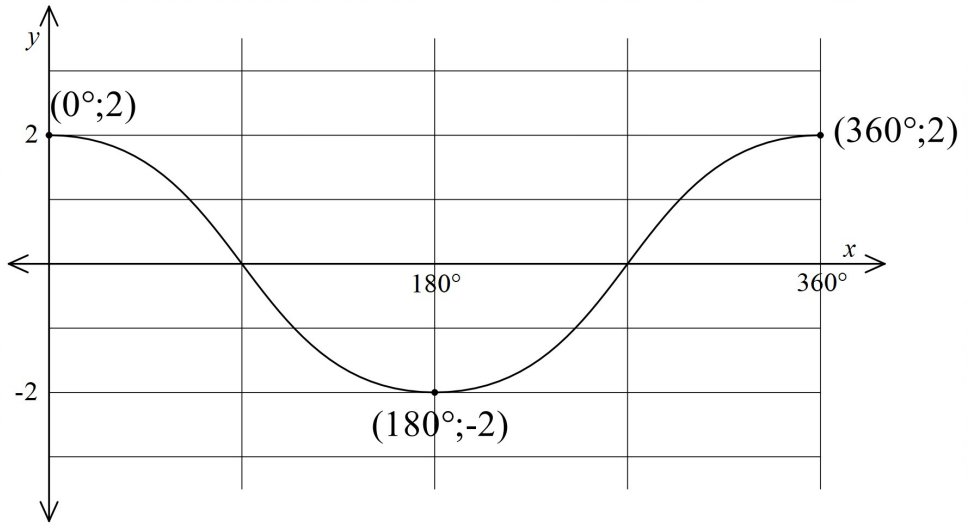
5.3.	5.3.1		• all sides • all angles	(2)
	5.3.2.	$\frac{\tan^2 45° + \cos 60°}{\sin 60°}$ $= \frac{\left(\frac{1}{1}\right)^2 + \frac{1}{2}}{\frac{\sqrt{3}}{2}}$ $= \frac{\left(\frac{3}{2}\right)}{\left(\frac{\sqrt{3}}{2}\right)}$ $= \frac{3}{\sqrt{3}}$	• tan subst. (CA) • cos subst. (CA) • sin subst. (CA) • $\frac{3}{\sqrt{3}}$ *(**note**: calculator results in $\sqrt{3}$)*	(4)
				[14]

QUESTION 6

6.1.	6.1.1.	$\cos 68° = \frac{x}{25}$ $x = 25\cos 68°$ $= 9.37$	• trig. ratio • 9.37	(2)
	6.1.2.	$\sin 68° = \frac{AC}{25}$ $AC = 25\cos 68°$ $= 23.18$	• trig. ratio • 23.18	(2)
		[OR]		
		$AC^2 = AB^2 - BC^2$ (Pythagoras' Theorem) $= \sqrt{25^2 - (9.37)^2}$ $= 23.17$	• subst. BC (CA) • 23.17 *(**note**: -1 no reason)*	(2)
6.2.		$\tan\theta = \frac{\left(\frac{7x}{4}\right)}{(5x)}$ $= \frac{7x}{4} \times \frac{1}{5x}$ $\tan\theta = \frac{7}{20}$ $\theta = \tan^{-1}\left(\frac{7}{20}\right)$ $= 19.29°$	• trig. ratio • "tip-and-times" *or* multiplication by $5x$ • $\frac{7}{20}$ • 19.29°	(4)

6.3.	6.3.1.	$10\sin\theta - 6 = 0$ $\sin\theta = \frac{6}{10}$ $= \frac{3}{5}$  $x = \sqrt{5^2 - 4^2}$ $= \sqrt{9}$ $= 3$	• $\sin\theta = \frac{3}{5}$ • $x = 4$ *(**note**: -1 no reason)*	(2)
	6.3.2	$\tan\theta - 2\cos^2\theta$ $= \left(\frac{3}{4}\right) - 2\left(\frac{4}{5}\right)^2$ $= \left(\frac{3}{4}\right) - \left(\frac{32}{25}\right)$ $= \left(\frac{75}{100}\right) - \left(\frac{128}{100}\right)$ $= -\frac{53}{100}$	• tan subst. (CA) • cos subst. (CA) • $\frac{32}{25}$ • $-\frac{53}{100}$	(4)
				[14]

QUESTION 7

Given: $f(x) = 2\cos x$			
7.1.	Graph of: $f(x) = 2\cos x$ 	• shape • intercept accuracy • turning point coordinates	(3)
7.2.	360°	• period	(1)
7.3.	$x \in [0°;90°)$ or $x \in (270°;360°]$	• excluding 90° and 270° • first domain • second domain	(3)
7.4.	$y = -2\cos x + 1$	• $-2\cos x$ • $+1$	(2)
			[9]

QUESTION 8

	STATEMENT	REASON		
	$AQ = QC$ $= 5$ $\frac{AP}{BP} = \frac{AQ}{QC}$ $\frac{AP}{24} = \frac{5}{5}$ $AP = 24$ $PQ = \sqrt{AP^2 + AQ^2}$ $= \sqrt{24^2 + 5^2}$ $= \sqrt{601}$ ≈ 24.52	(given) (proportion theorem; PQ||BC) (Pythagoras' Theorem)	• AC = QC = 5 • AP = 24 • Prop. Theorem reason *(**note**: -1 for omitting the || lines)* • Pythagoras subst. • PQ = 24.52	(5)
				[5]

MODERATION: NOTE ABOUT QUESTION 8

The 90-degree sign in the triangle did not export in the final document (but appears in the moderation). For this reason, the final two marks would not follow as expected in the memo and we would have to discuss the possible suggestion of **reallocating 2 (or 5) of the marks to other possible questions:**

- 6.3.1. (+1 mark)
- 9.1. (+3 marks)
- 9.2.2. (+1 mark)

	STATEMENT	REASON		
	$AQ = QC = 5$ $\frac{AP}{BP} = \frac{AQ}{QC}$ $\frac{AP}{24} = \frac{5}{5}$ $AP = 24$ $PQ = \sqrt{AP^2 + AQ^2}$ $= \sqrt{24^2 + 5^2}$ $= \sqrt{601}$ ≈ 24.52	(given) (proportion theorem; PQ||BC) (Pythagoras' Theorem)	• AC = QC = 5 • AP = 24 • Prop. Theorem reason *(**note**: -1 for omitting the || lines)* • Pythagoras subst. • PQ = 24.52	(5)
				[5]

QUESTION 9

	STATEMENT	REASON		
9.1.	$x = 52°$ $y = 38°$ $z = 38°$	(alternate ∠'s; AB||CD) (∠'s on str. line) (sum ∠'s in Δ) **OR** (corresponding ∠'s; AB||CD)	• statement & reason • statement & reason • statement & reason	(3)
9.2.1.	ABCD is a rhombus	(parallelogram with adjacent sides equal)	• rhombus • reason	(2)
9.2.2.	$\hat{E}_1 = 90°$	(properties of a rhombus)	• statement & reason	(1)
9.2.3.	$E\hat{C}D = 52°$ $\therefore x = 52°$	(sum ∠'s in Δ) (properties of a rhombus) **OR** (diags. bisect corner angles)	• statement • reason • statement • reason	(4)
9.3	$E\hat{F}G = 90°$ $\therefore a = 23°$ $b = 67°$ $c = 34°$	(angles in a semicircle) (∠'s in the same segment) (sum ∠'s in Δ)	• $a = 23°$ • reason • $b = 67°$ • reason • $c = 34°$ • reason	(6)
9.4	$AC = CB = 4$ $OC = \sqrt{OA^2 - AC^2}$ $= \sqrt{20^2 - 4^2}$ $= \sqrt{384}$ ≈ 19.60 $CD = OD - OC$ $= 20 - 19.60$ $= 0.4\text{km}$	(line from centre ⊥ chord) (Pythagoras' Theorem)	• 4km *(or on diagram)* • (line from centre…) • Pythag. subst. • OC = 19.60 km • 0.4 km (or 400m)	(5)
				[21]

QUESTION 10

	In ΔOAP and ΔOBP: i) $OA = OB$ (radii) ii) $AP = BP$ (given) iii) $OP = OP$ (common) $\therefore \Delta OAP \equiv \Delta OBP$ (RHS) But, $P_1 + P_2 = 180°$ ($\angle$'s on str. line), and $P_1 = P_2$ ($\Delta OAP \equiv \Delta OBP$) $\therefore P_1 = P_2 = 90°$ $AB \perp OP$	• side and reason • side and reason • side and reason • straight line • congruent angles	(5)
			[5]

TOTAL: 100 marks