BERGVLIET HIGH SCHOOL

MATHEMATICS DEPARTMENT

NOVEMBER EXAMINATION

GRADE 10

MATHEMATICS PAPER 2
22 NOVEMBER 2023

MARKS: 100

TIME: 2 HOURS

SET BY: D. Viljoen

MODERATOR: K. Grebe

NAME: _____

MATHEMATICS TEACHER: EB / GR / JO / LY / VN / ST

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 questions and 16 pages.

2. Answer ALL the questions on the QUESTION PAPER.

3. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.

4. Answers only will not necessarily be awarded full marks.

5. You may use an approved scientific calculator (non-programmable and non-graphical), for all questions EXCEPT if otherwise instructed.

6. If necessary, round off answers to TWO decimal places, unless stated otherwise.

7. Diagrams are NOT necessarily drawn to scale.

9. Write neatly and legibly.

The following formulas are provided:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$y = mx + c$$

QUESTION 1

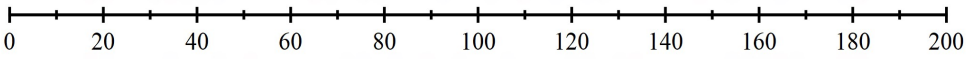
A school tuckshop has recorded the amounts (in Rands) spent by a selected group of students during a particular week:

15 ; 20 ; 35 ; 45 ; 50 ; 55 ; 80 ; 100 ; 120 ; 130 ; 180

1.1. Calculate the mean of the data. (2)

1.2. Determine the interquartile range (IQR), showing all your working. (3)

1.3. Using the number line below, draw a box-and-whisker diagram for the given data: (3)



1.4. The tuckshop did not include the data for students who spent no money at the tuckshop during the week. Determine the number of students who were originally excluded from the data if the mean of the entire group is known to be R41,50. (3)

[11]

QUESTION 2

The tuckshop decides to expand their study to 120 students. The results are partially summarised in the table below:

Class Interval	Frequency	Midpoint	F × Midpoint
$0 \leq x < 40$	**45**		
$40 \leq x < 80$	**18**		
$80 \leq x < 120$	**29**		
$120 \leq x < 160$	**22**		
$160 \leq x < 200$	**5**		
$200 \leq x < 240$	**1**		
TOTAL:			

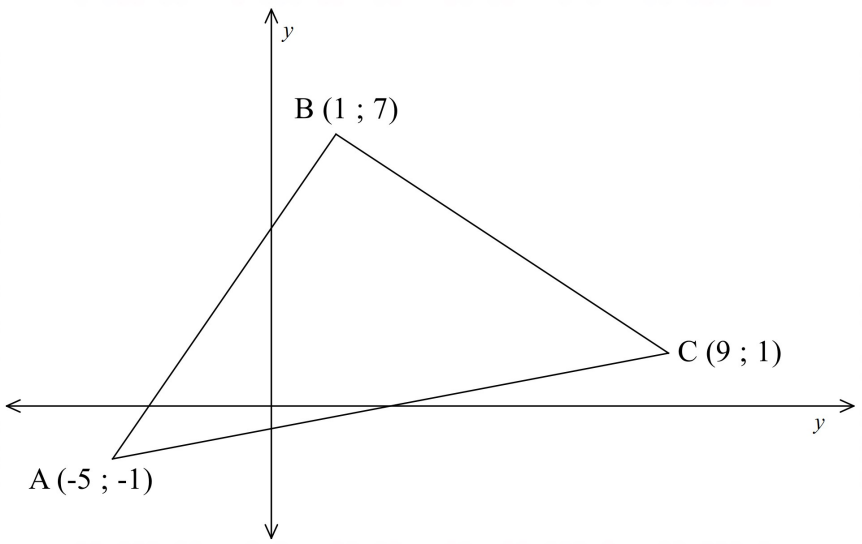
2.1. State the modal class. (1)

2.2. Use the table above to fill in the required values to assist you in calculating the estimated mean of the grouped data. (4)

[5]

QUESTION 3

In the figure below, M is the midpoint of AC with $AC \perp MB$ and $AM = MC$.



3.1. Calculate the coordinates of M, if M is the midpoint of AC. (2)

3.2. If $AB = 10$, show through appropriate calculations that ΔABC forms an isosceles triangle. (3)

3.3. Determine the coordinates of D if $ABCD$ forms a parallelogram. (2)

3.4. Calculate the area of $ABCD$. (3)

[10]

QUESTION 4

Consider the points $P(-1 ; -2)$, $Q(3 ; 10)$, and $R(a ; 3a+1)$.

4.1. Determine the equation of the straight-line passing through points P and Q. (3)

4.2. Show that $a \in \mathbb{R}$, if it is given that R lies on PQ. (3)

[6]

QUESTION 5

5.1. Given $\hat{A} = 23°$ and $\hat{B} = 40°$, calculate the value of the following:

5.1.1. $\tan(2\hat{A} - \hat{B})$ (1)

5.1.2. $\sec \hat{A} + \sin^2 \hat{B}$ (2)

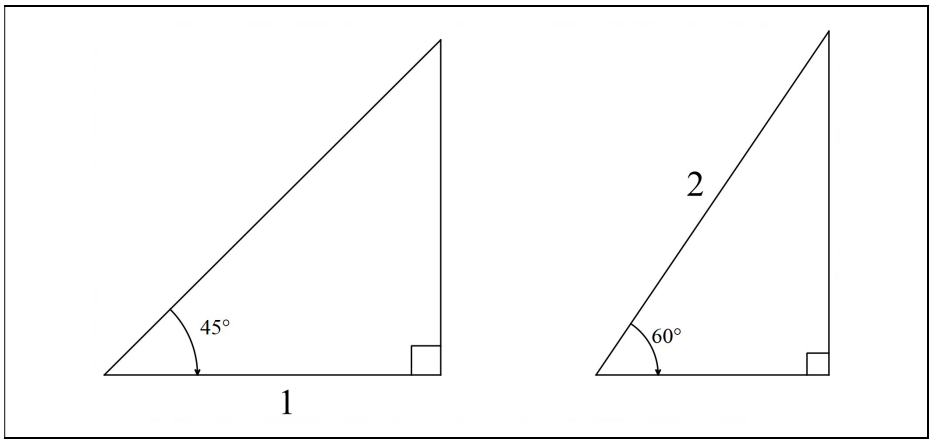
5.2. Solve for θ in the following equations, given that θ is an acute angle, rounding off your answer to two decimal places where necessary.

5.2.1. $\sin 2\theta = \frac{1}{3}$ (2)

5.2.2. $2\tan(\theta + 45°) = 4$ (3)

5.3. Use the special-angle triangles to assist you in the following questions.

5.3.1 Complete the values for all missing sides and angles in the triangles below: (2)



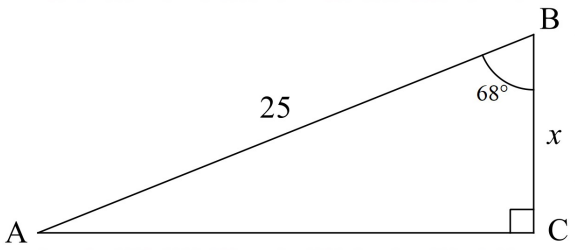
5.3.2. Using the above triangles, simplify the value of the following expression **without the use of a calculator**, showing all working out. (4)

$$\frac{\tan^2 45° + \cos 60°}{\sin 60°}$$

[14]

QUESTION 6

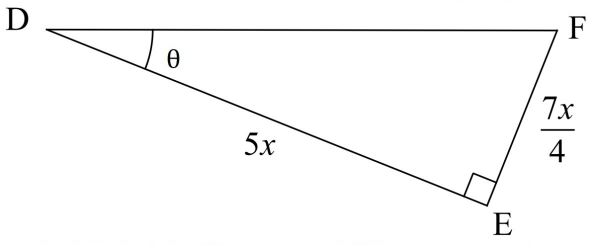
6.1. Given the right-angled triangle, ΔABC with $AB = 25$ and $A\hat{B}C = 68°$.



6.1.1. Determine the value of x. (2)

6.1.2. Hence, or otherwise, determine the value of AC. (2)

6.2. Solve for θ in the following: (4)



6.3. Given that $10\sin\theta - 6 = 0$ and $0 < \theta < 90°$:

6.3.1. Represent the given information through an appropriate diagram in the correct quadrant on the Cartesian Plane. (2)

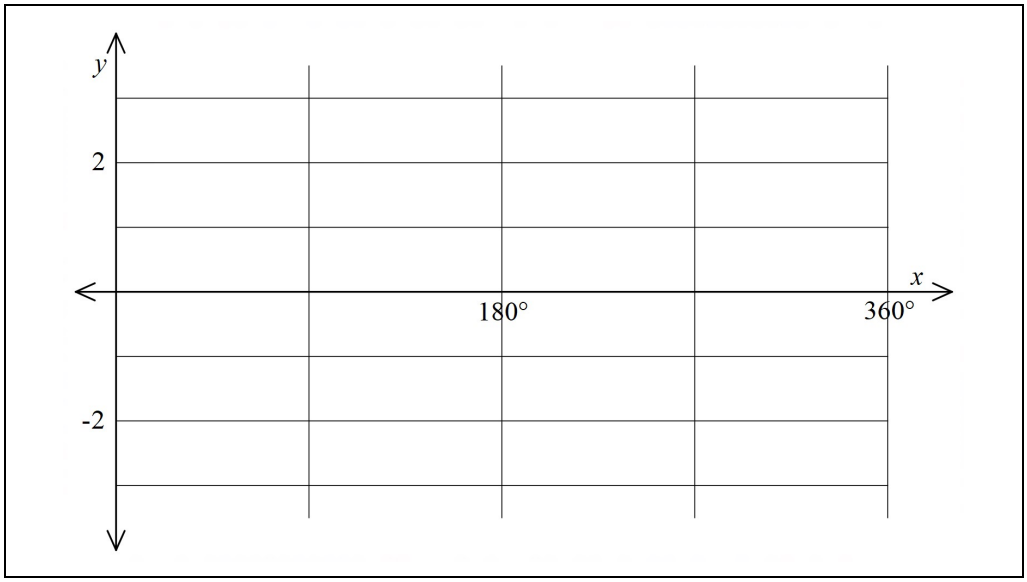
6.3.2 Using the diagram above, and WITHOUT THE USE OF A CALCULATOR, determine the value of $\tan\theta - 2\cos^2\theta$. (4)

[14]

QUESTION 7

Given: $f(x) = 2\cos x$

7.1. Sketch the graph of f on the interval $0° \le x \le 360°$. Clearly write down the coordinates of the turning points as well as the intercepts with the axes. (3)



7.2. Write down the period of f. (1)

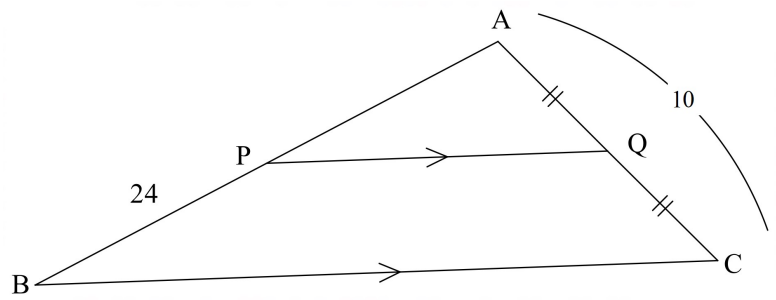
7.3. For which values of x is $f(x) > 0$? (3)

7.4. Write down the equation of *g*, if it is formed by shifting the graph up by 1 unit and then reflecting it about the *y*-axis. (2)

[9]

QUESTION 8

In the following figure, Q is the midpoint of AC, where BP = 24 units, AC = 10 units, and PQ||BC. (5)



Determine, with reasons, the value of PQ in the above diagram.

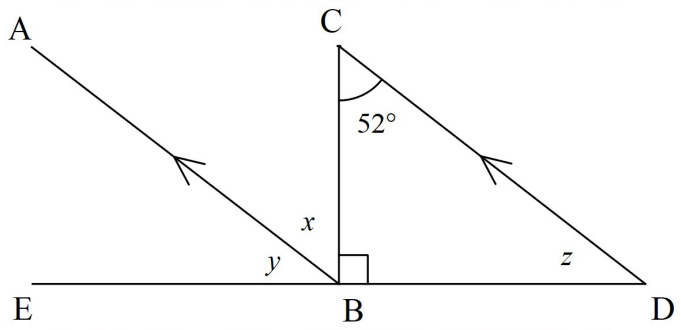
STATEMENT	REASON

[5]

QUESTION 9

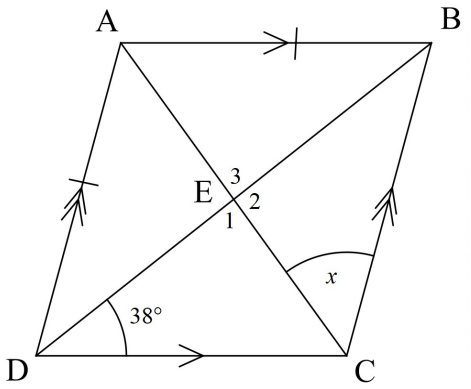
9.1. Given $AB \parallel CD$ and $CB \perp BD$ with $B\hat{C}D = 52°$.

Determine, with reasons, the values of x, y, and z in the diagram below. (3)



STATEMENT	REASON

9.2. Given the quadrilateral ABCD, where $AB \parallel CD$, $AD \parallel BC$ and $AB = AD$ with $E\hat{C}B = x$.



9.2.1. Identify the quadrilateral by fully classifying ABCD. (2)

STATEMENT	REASON

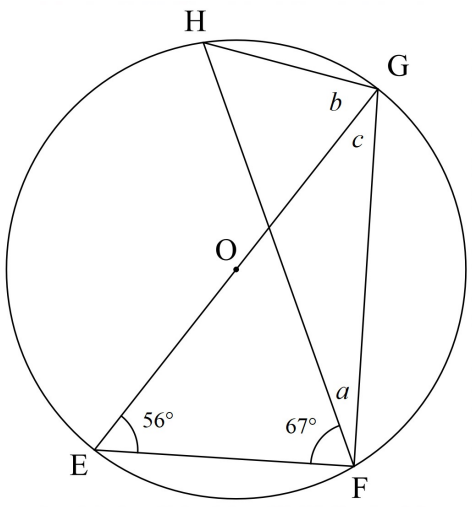
9.2.2. Determine the size of $\hat{E}_1$. (1)

STATEMENT	REASON

9.2.3. Hence, or otherwise, calculate the value of x. (4)

STATEMENT	REASON

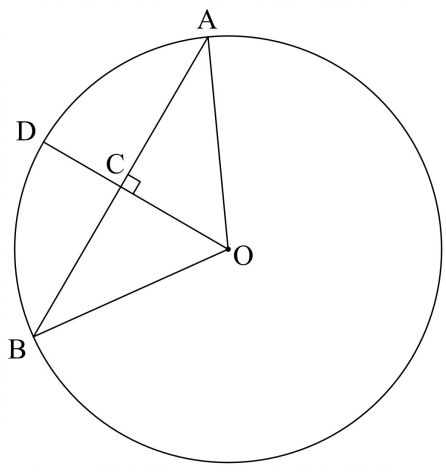
9.3 Determine, with reasons, the magnitude of the angles marked by lowercase letters *a*, *b* and *c* in the following, where O is the centre of the circle. (6)



STATEMENT	REASON

9.4. A communications tower, at O, has a range of 20km. Two testing stations, A and B, are installed 20km away from the tower and joined by an 8km straight road, AB.

During maintenance, technicians meet half-way between the two testing stations and begin to walk in the opposite direction from the communications tower.



Through providing relevant geometric statements and reasons, determine how far the technicians will walk before they begin to lose signal from the tower. (5)

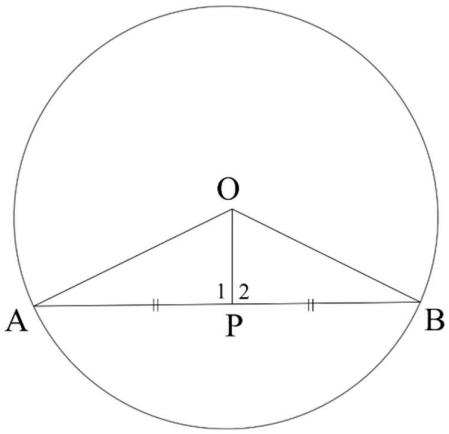
STATEMENT	REASON

[21]

QUESTION 10

Complete the proof which states that a *line from the centre of the circle to the midpoint of the chord is perpendicular to the chord.* In other words, prove that $AB \perp OP$. (5)

Given a circle, centre O, with chord AB bisected at P:



[5]

TOTAL: 100 marks