KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 11

MATHEMATICS

SEPTEMBER TEST

2025

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MARKS: 75

TIME: 1½ hours

This question paper consists of 7 pages and 2 DIAGRAM SHEETS.

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 5 questions.
2. Answer ALL the questions.
3. Number the answers correctly and according to the numbering system used in this question paper.
4. Clearly show ALL calculations, diagrams, graphs, etc. which you have used in determining your answers.
5. Answers only will NOT necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. If necessary, round off answers correct to TWO decimal places, unless stated otherwise.
8. TWO DIAGRAM SHEETS for QUESTION 3.2.2, QUESTION 3.2.4, QUESTION 5.1 and QUESTION 5.2, are attached at the end of this question paper. Detach the DIAGRAM SHEETS and hand them in together with your ANSWER BOOK.
9. Diagrams are NOT necessarily drawn to scale.
10. Write neatly and legibly.

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QUESTION 1

1.1 A school bought a brand-new data projector for R20 000. The value of the machine depreciated annually at the rate of 13% per annum, on a reducing balance.

1.1.1 Calculate the book value of the data projector 7 years after it was bought. (2)

1.1.2 The exchange rate between America ($) and South Africa (R) was $1 = R18,45$. Calculate the book value of the data projector 7 years after it was bought in American dollars. (2)

1.2 An investment earns interest at the rate of 9% p.a., compounded quarterly. Calculate the effective interest rate of this investment. (3)

1.3 The value of a flat increases annually at the rate of 12% per annum on a straight-line basis. Calculate the current price of the flat if it will be valued at R500 050 in 60 months' time. (2)

1.4 Three years ago, the selling price of a dozen of eggs was R16,25. The selling price of a dozen of eggs is currently R18,00. Calculate the average yearly inflation rate at which the price of eggs increased over the three years. (4)

1.5 Mr Mavundla invested R12 000 in an account that earned interest at the rate of 11,35% p.a.. He had forgotten what the compounding period of the investment was. After 20 unequal amounts of interest were added to the original investment, the accumulated amount was R36 193,15. How many years did it take for the original investment to accumulate to R36 193,15? (5)

[18]

QUESTION 2

2.1 It is given that for events A and B,

- $P(\text{not } B) = 0,67$
- $P(A \text{ or } B) = 0,57$

2.1.1 Calculate $P(B)$ (2)

2.1.2 Calculate $P(A)$ if it is given that events A and B are mutually exclusive. (3)

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2.2 A survey was conducted among 140 workers about the category of salary they earned and the environment under which they worked. The results are summarised in the table below.

Category of salary	Good environment	Moderate environment	Bad environment	Total
R5 000 < $x \leq$ R25 000	23	15	17	55
R25 000 < $x \leq$ R40 000	22	3	p	60
R40 000 < $x \leq$ R65 000	m	12	9	25
Total	49	30	61	140

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2.2.1 Write down the values of m and p. (2)

2.2.2 Calculate the probability of randomly selecting a worker from this group who worked in a good environment and whose salary was in the R25 000 < $x \leq$ R40 000 category. (1)

2.2.3 Are the events working in a moderate environment and earning a salary above R40 000 independent? Justify your answer with relevant calculations. (4)

2.3 Mr Van der Merwe rolls an ordinary fair dice in a game.
The rules are as follows:

- if number 1 is rolled, he wins;
- if number 2 or 3 is rolled, he loses;
- if number 4,5 or 6 is rolled, he rolls again.

If Mr Van der Merwe rolls again and:

- a number from 1 to 4 is rolled, he loses;
- number 5 or 6 is rolled, he wins.

The game stops when Mr Van der Merwe wins or loses.

2.3.1 Represent the above information in a tree diagram. Show the probabilities associated with each branch and the outcomes of this game. (4)

2.3.2 Write down the probability that Mr Van der Merwe wins on the first roll of the dice. (1)

2.3.3 Calculate the probability that Mr Van der Merwe will lose at this game. Write your answer as a percentage. (3)

[20]

QUESTION 3

3.1 The table below shows the number of learners who participated in a Maths Olympiad at a school over the past 9 years.

5	8	15	20	25	27	31	36	75

3.1.1 Calculate the mean of the data. (2)

3.1.2 Write down the standard deviation of the data. (1)

3.1.3 For how many years was the number of learners who participated in the Maths Olympiad less than ONE standard deviation below the mean? (2)

3.2 The amount of time, in minutes, that a group of learners waited one afternoon before they were helped by a school librarian was recorded. The information was summarised in the frequency table below.

Time waiting (in minutes)	Number of learners	Cumulative frequency
$0 < x \leq 4$	6	
$4 < x \leq 8$	12	
$8 < x \leq 12$	20	
$12 < x \leq 16$	16	
$16 < x \leq 20$	6	

3.2.1 Write down the modal class of the data. (1)

3.2.2 Complete the cumulative frequency column of the table provided in DIAGRAM SHEET 1. (2)

3.2.3 Write down the total number of learners who waited to be helped by the librarian that afternoon. (1)

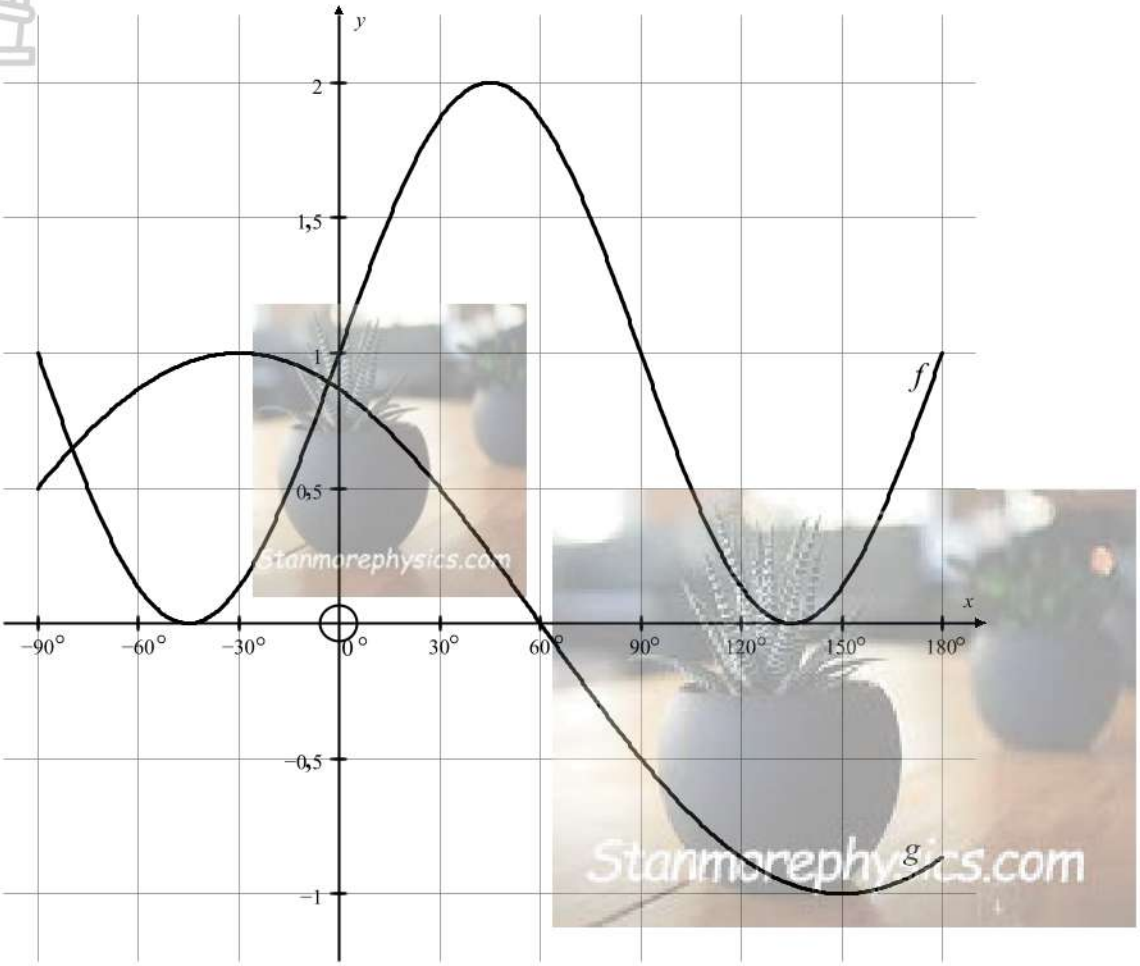
3.2.4 On the grid provided in DIAGRAM SHEET 1, draw the cumulative frequency graph (ogive) of the data. (3)

3.2.5 Use your graph to estimate the interquartile range of the data. (3)

[15]

QUESTION 4

In the diagram below, the graphs of $f(x) = \sin bx + q$ and $g(x) = \cos(x + p)$ are shown for the interval $-90° \le x \le 180°$.



4.1 Write down the amplitude of f. (1)

4.2 Write down the period of g. (1)

4.3 Write down the values of b, q and p. (3)

4.4 Determine the value(s) of x in the interval $-90° \le x \le 180°$ for which:

4.4.1 $x.g(x) \ge 0$. (2)

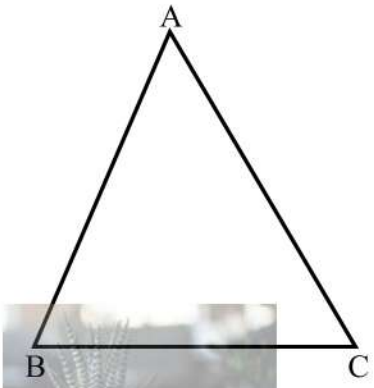
4.4.2 $f(x) - \sin 30° = g(x) + 1$ (3)

4.5 Given that $h(x) = g(x + k)$, determine the value(s) of k in the interval $-90° \le k \le 180°$ where $h(x) = \sin(-x)$. (2)

[12]

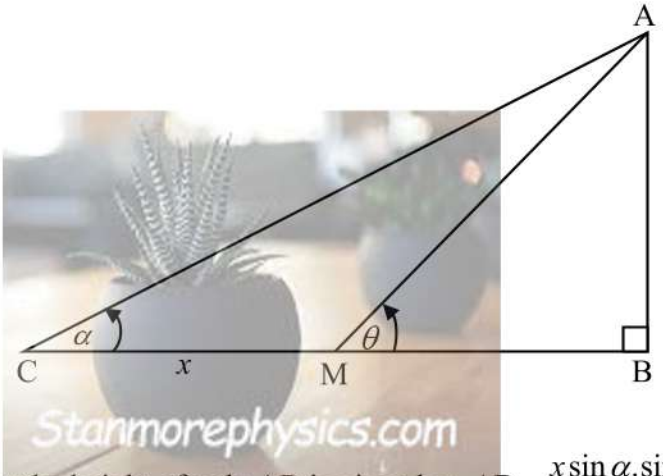
QUESTION 5

5.1 In the diagram below, ΔABC is sketched. $\hat{B}$ is an acute angle.



Use the sketch provided on DIAGRAM SHEET 2 to prove that $\frac{\sin B}{b} = \frac{\sin C}{c}$. (5)

5.2 In the diagram below, AB is a vertical pole. The angle of elevation from C to the top of the pole is α and the angle of elevation from M to the top of the pole is θ.
CM is x metres.



Show that the height of pole AB is given by: $AB = \frac{x \sin\alpha . \sin\theta}{\sin(\theta - \alpha)}$ (5)

[10]

TOTAL: 75 MARKS

NAME:

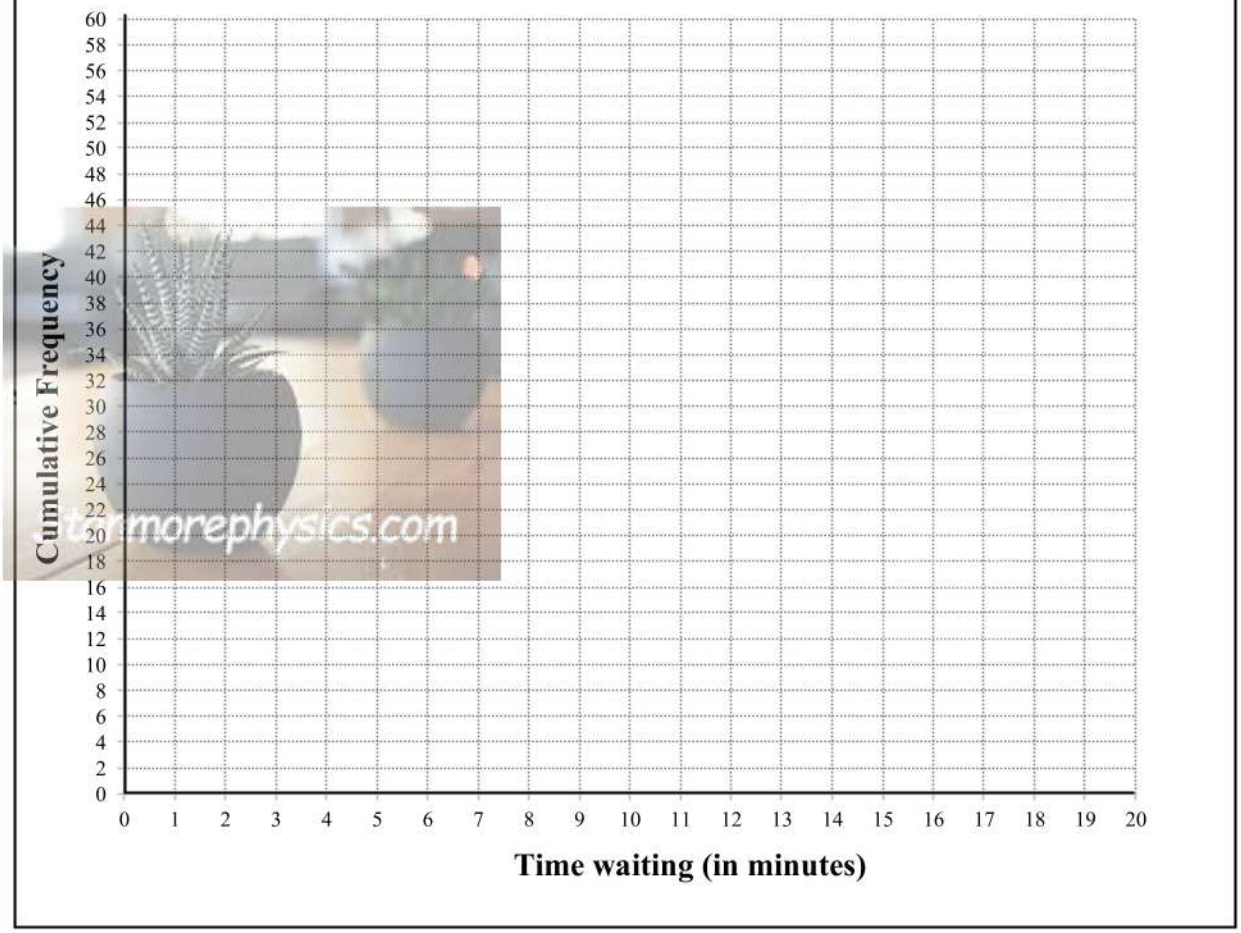
DIAGRAM SHEET 1

QUESTION 3.2.2

Time waiting (in minutes)	Number of learners	Cumulative frequency
$0 < x \leq 4$	6	
$4 < x \leq 8$	12	
$8 < x \leq 12$	20	
$12 < x \leq 16$	16	
$16 < x \leq 20$	6	

QUESTION 3.2.4

OGIVE



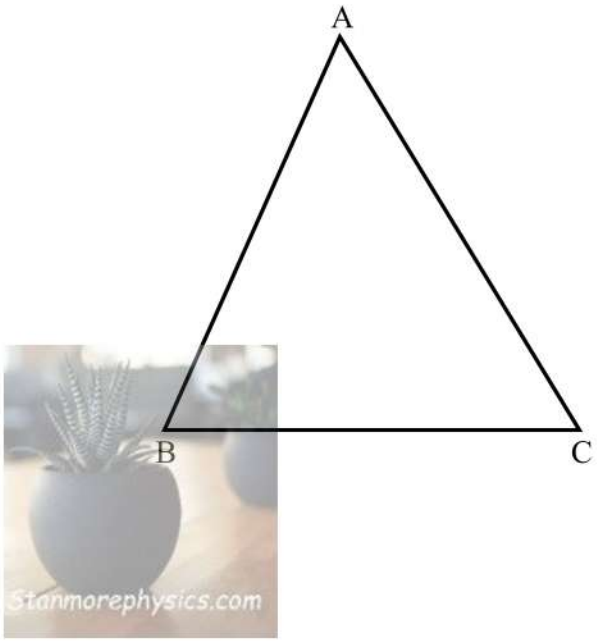
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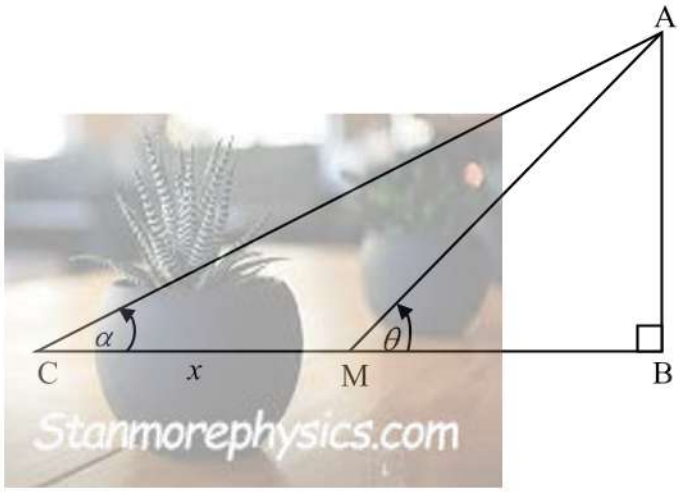
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DIAGRAM SHEET 2

QUESTION 5.1



QUESTION 5.2



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