KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 11

MATHEMATICS

COMMON TEST

SEPTEMBER 2024

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MARKS: 75

TIME: 1½ hours

This question paper consists of 8 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 6 questions.
2. Answer ALL the questions.
3. Number the answers correctly 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. Diagrams are NOT necessarily drawn to scale.
9. TWO DIAGRAM SHEETS for QUESTION 2.1, QUESTION 2.2, QUESTION 6.1, and QUESTION 6.2 are attached at the end of this question paper. Detach the DIAGRAM SHEETS and hand it in together with your ANSWER BOOK.
10. Write neatly and legibly.

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QUESTION 1

The table below shows the marks, as a percentage, scored by 10 learners in a Maths Olympiad.

MARKS OBTAINED (AS A PERCENTAGE)	65	59	79	86	48	94	77	51	66	80

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

1.2 Write down the standard deviation for the above data. (1)

1.3 Calculate the number of marks that lie within one standard deviation of the mean. (2)

1.4 Two learners were omitted from the original set of data. Their scores were x and 58. When the scores of these two learners are included with the original set of data, then the new mean is now 67,5. Calculate the value of x. (2)

[7]

QUESTION 2

The ages of people who attended a musical concert was recorded. The information was summarised in the frequency table below.

Age group (x)	Number of people
$18 < x \leq 22$	2
$22 < x \leq 26$	6
$26 < x \leq 30$	12
$30 < x \leq 34$	24
$34 < x \leq 38$	36
$38 < x \leq 42$	24
$42 < x \leq 46$	16
$46 < x \leq 50$	10

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2.1 Complete the cumulative frequency column in the table provided on DIAGRAM SHEET 1. (2)

2.2 Use the grid provided on DIAGRAM SHEET 1 to draw an ogive (cumulative frequency graph) to represent the data. (3)

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

2.4 Youth are regarded as people below the age of 35. What percentage of youth attended the concert? (2)

[8]

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QUESTION 3

3.1 A and B are two events such that:

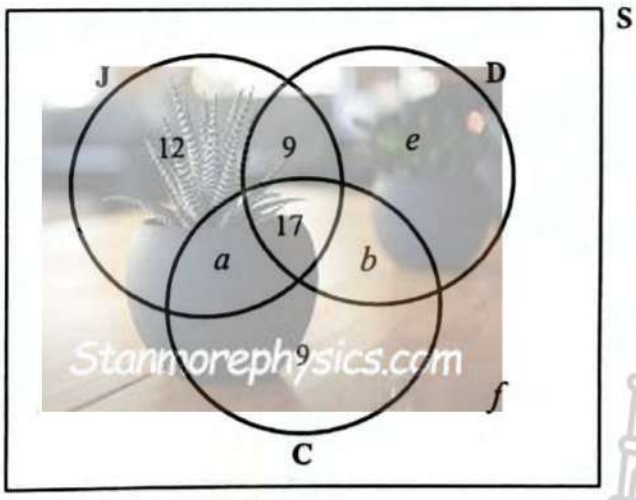
- P (not A) = 0,55
- P(B) = 0,4
- P(A or B) = 0,67

Are events A and B independent events? Justify your answer with relevant calculations. (5)

3.2 A survey was done among a group of 100 tourists to find out which city in South Africa they loved during their visit. They chose from Johannesburg (J), Durban (D) and Cape Town (C). The results of the survey are listed below:

- 17 said they loved all three cities
- 30 said they loved Durban and Cape Town
- 27 said they loved Johannesburg and Cape Town
- 52 said they loved Durban
- 9 said they loved only Johannesburg and Durban
- 12 said they loved Johannesburg only
- 9 said they loved Cape Town only

The above information is represented in the partially completed Venn Diagram below:



3.2.1 Write down the values of a, b, e and f. (4)

3.2.2 Calculate the probability that a tourist selected at random loved Cape Town or both Johannesburg and Durban. (3)

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3.3 Nelisiwe had a small box of 80 Smarties sweets.

40% of the Smarties are green, $\frac{3}{20}$ of them are blue and the remainder are red.

Nelisiwe picks a Smartie out of the box, takes note of the colour and then eats it. She then picks out a second Smartie and notes the colour before eating it.

3.3.1 How many red Smarties were in the box at the beginning? (2)

3.3.2 Represent the above situation by means of a tree diagram. Indicate the probabilities associated with each branch and the possible outcomes. (3)

3.3.3 Calculate the probability that Nelisiwe will pick two Smarties of the same colour. (3)

[20]

QUESTION 4

4.1 The population of fish in a tank was 5591 at the end of 2014. At the end of 2022, the population of fish grew to 6423. Calculate the average annual rate at which the population of fish grew over these 8 years. (3)

4.2 Convert the nominal interest rate of 9% p.a. compounded half-yearly to an effective interest rate. (3)

4.3 Mr Kheswa owns a business that makes built-in cupboards. Today, he bought a board-cutting machine for R250 000. The machine is expected to last for 6 years.

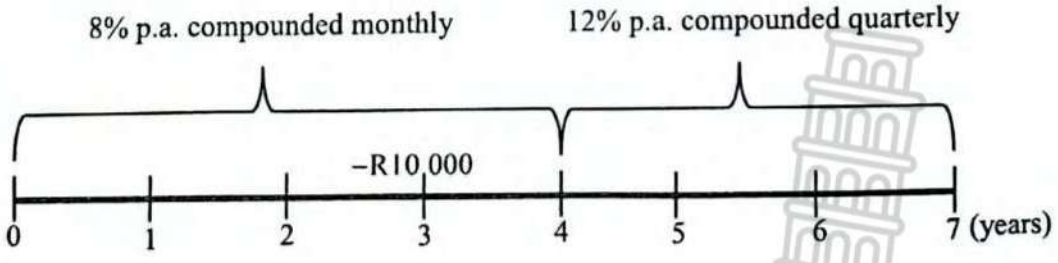
4.3.1 Calculate the scrap value of the machine in 6 years' time if it depreciates annually at 12% p.a. on a reducing-balance method. (2)

4.3.2 The cost of a new similar machine increases at the rate of 11% p.a. compounded quarterly. Calculate the cost price of a new board-cutting machine in 6 years' time. (3)

4.3.3 Mr Kheswa will trade-in the old machine and replace it with a new similar machine in 6 years' time. Calculate how much more will Mr Kheswa have to pay if he bought the new machine for cash. (1)

4.3.4 Mr Kheswa opened an investment account that pays interest at the rate of 12,25% p.a., compounded monthly. How much should he invest in this account today so that it will accumulate to the cash amount required to buy the new machine in 6 years' time? (3)

4.4 Exactly seven years ago, Krish deposited R25 000 in a bank account. The bank paid interest at the rate of 8% p.a., compounded monthly for the first 4 years and then changed to 12% p.a., compounded quarterly for the next 3 years. Krish withdrew R10 000 three years after making the initial deposit. This is illustrated in the time-line below.



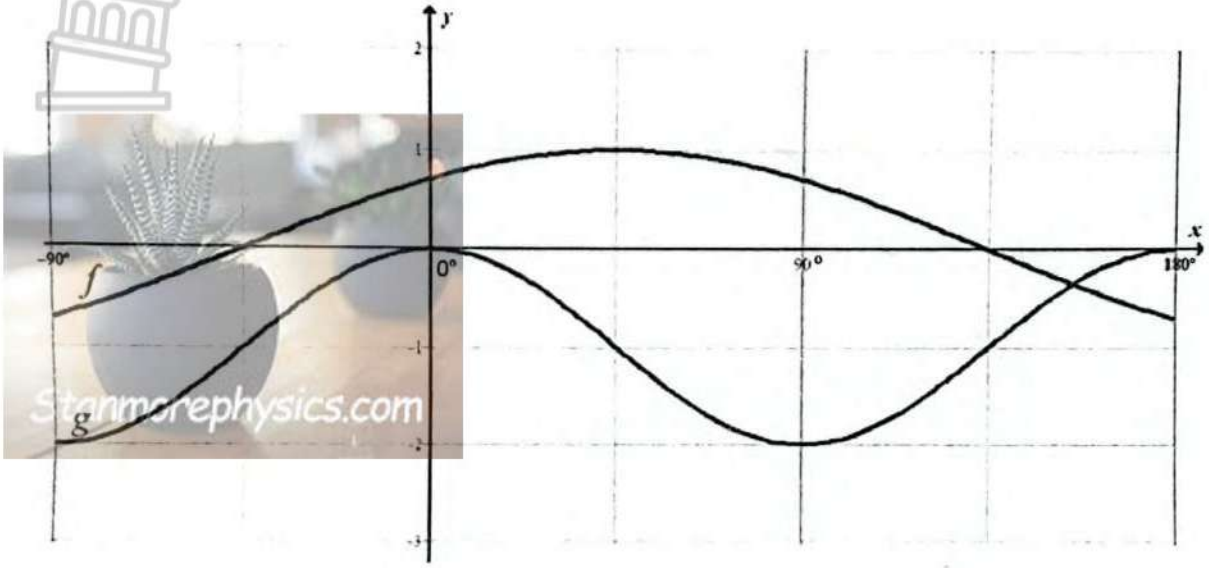
Calculate how much Krish has in the account today. (5)

[20]

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QUESTION 5

The sketch below shows the graphs of $f(x)=\sin(x+45°)$ and $g(x)=\cos bx+q$ for $x\in[-90°;180°]$.



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5.1 Write down the values of b and q. (2)

5.2 Write down the period of g. (1)

5.3 Write down the equation of h, if $h(x)=g(x)+1$. (1)

5.4 Calculate the values of x for which $f(x)-h(x)=0$ if $0°\le x\le 180°$. (5)

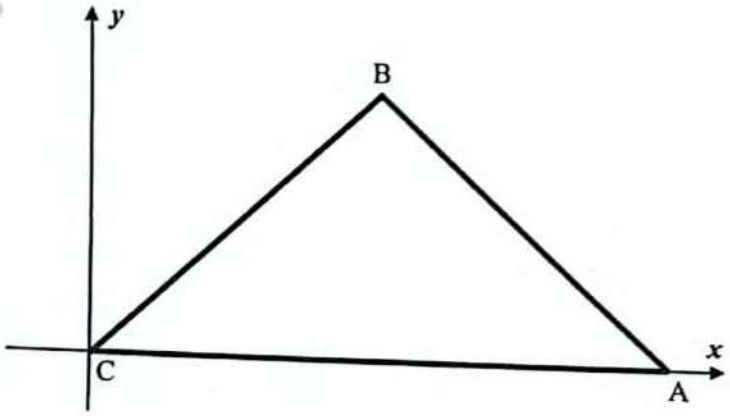
5.5 Use the sketch to write down the value(s) of x for which $\frac{1}{2}f(x)\times 4g(x)=-2$. (2)

[11]

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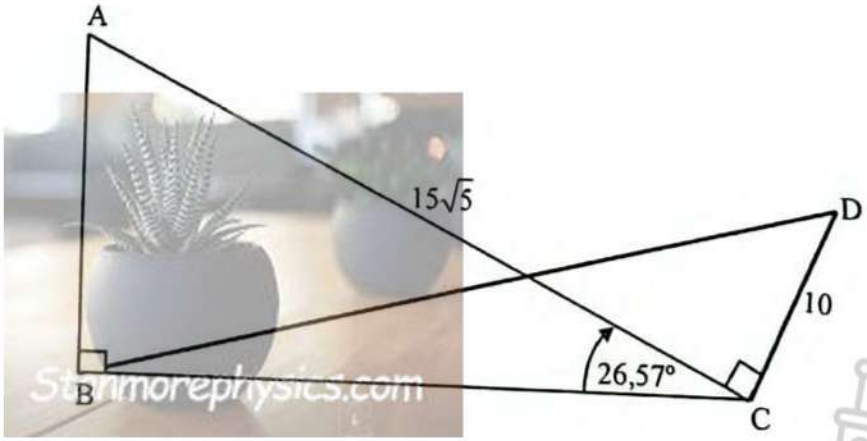
QUESTION 6

6.1 In the diagram below, ΔABC is drawn with C at the origin.



Use the diagram on **DIAGRAM SHEET 2** to prove that $c^2 = a^2 + b^2 - 2ab\cos C$. (4)

6.2 In the diagram below, ΔABC is right-angled at B. $AC \perp CD$. $AC = 15\sqrt{5}$, $CD = 10$ and $B\hat{C}A = 26{,}57°$.



Calculate the length of BD. (5)

[9]

TOTAL MARKS: 75

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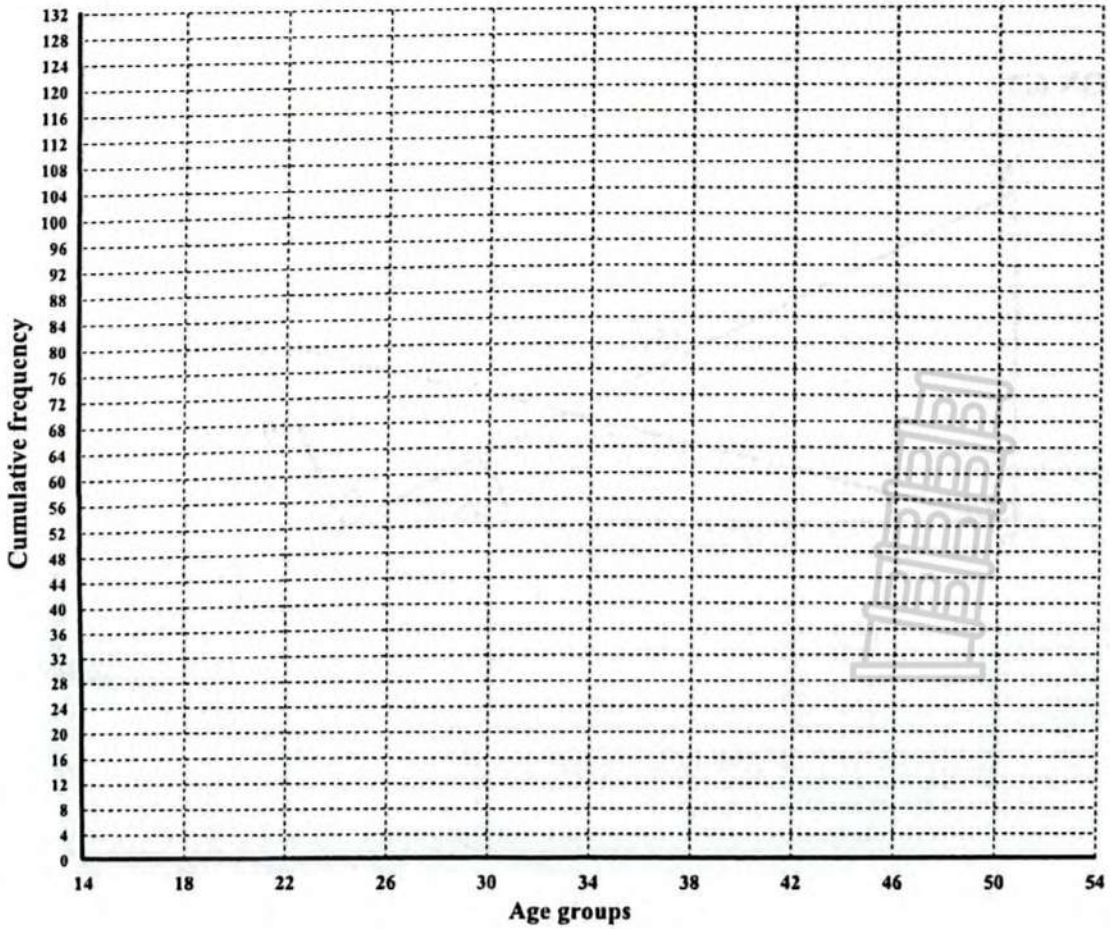
DIAGRAM SHEET 1

QUESTION 2.1

Age group (x)	Number of people	Cumulative frequency
$18 < x \leq 22$	2	
$22 < x \leq 26$	6	
$26 < x \leq 30$	12	
$30 < x \leq 34$	24	
$34 < x \leq 38$	36	
$38 < x \leq 42$	24	
$42 < x \leq 46$	16	
$46 < x \leq 50$	10	

QUESTION 2.2

OGIVE



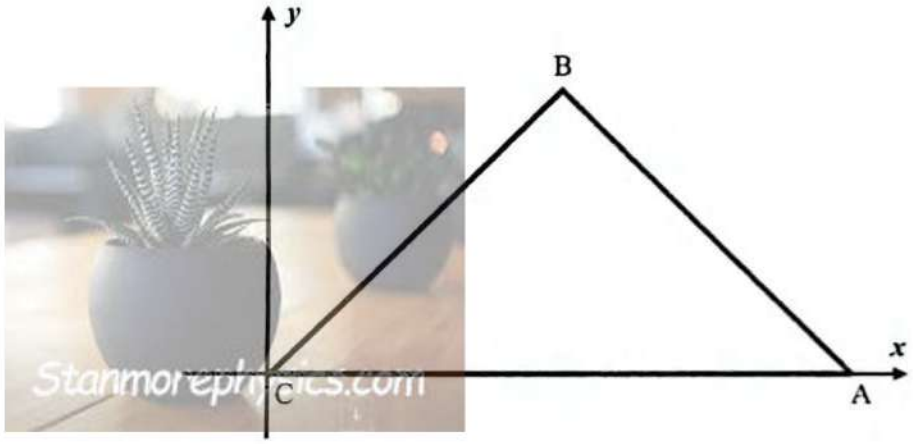
TEAR OFF

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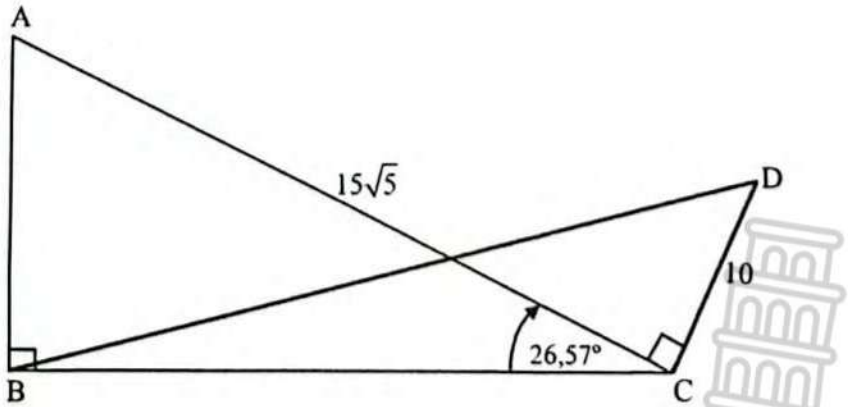
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DIAGRAM SHEET 2

QUESTION 6.1



QUESTION 6.2



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