KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 11

MATHEMATICS P1

NOVEMBER 2025

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MARKS: 150

TIME: 3 hours

This question paper consists of 9 pages and 1 information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show numbering if additional space has been used to answer some question. If NOT, cross out all rough work done in the additional space.
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. An information sheet with formulae is included at the end of the question paper.
10. Write neatly and legibly.

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QUESTION 1

1.1 Solve for x:

1.1.1 $4x^2 - 9 = 0$ (3)

1.1.2 $-2x^2 + 6x - 3 = 0$ (answers correct to TWO decimal places) (3)

1.1.3 $x - 3 = \dfrac{2x^2 + x - 6}{x + 2}$ (4)

1.1.4 $x^2 - 2x - 15 \geq 9$ (4)

1.2 Two equations are given below:

$\dfrac{1}{2^y} = 4^{1-x}$ and $x + 6 = x^2 - y$

1.2.1 Show that $\dfrac{1}{2^y} = 4^{1-x}$ can be written as $y = 2x - 2$. (2)

1.2.2 Hence, or otherwise, solve for both x and y. (4)

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1.3 The roots of a quadratic equation are given as: $x = \sqrt{2-k}$, where $k \in (-9 : 0)$.
Determine the integral values of k for which the roots are rational. (2)

1.4 The roots of the equation $ax^2 + bx + c = 0$ are $\dfrac{-b \pm \sqrt{72}}{6}$ where $b < 0$ and $c = b + 18$. Calculate the values of a, b and c. (5)

[27]

QUESTION 2

2.1 Simplify fully, **WITHOUT** using a calculator:

2.1.1 $2x.\left(27x^3\right)^{\frac{2}{3}}.\left(\frac{2x}{27x^3}\right)^0$ (3)

2.1.2 $\frac{\left(6-2\sqrt{3}\right)^2}{\sqrt{3}}$ (4)

2.2 It is given that $\frac{2^{m+4}-4.2^{m+1}}{5.2^{m+3}}$

2.2.1 Simplify the above expression. (3)

2.2.2 Hence, solve for x if $\frac{5.2^{m+3}}{2^{m+4}-4.2^{m+1}}=\frac{1}{125^x}$ (3)

2.3 Solve for x: $\sqrt{x^2-53}-2\sqrt{2x-5}=0$ (5)

[18]

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QUESTION 3

WhatsApp messages were sent using face emojis with two popping hearts per face (shown below).

MESSAGE 1	MESSAGE 2	MESSAGE 3
😍	😍😍😍	😍😍😍😍😍

These faces and popping hearts in the different messages forms a linear number pattern.

3.1 How many popping hearts will appear in message 4?. (1)

3.2 Determine the n^{th} term (general term) of the popping hearts in the messages. (2)

3.3 Calculate the number of popping hearts in the tenth (T_{10}) message. (2)

3.4 In which message will there be 710 popping hearts? (2)

3.5 A new series of messages using the same emojis was created by:

- keeping the number of faces in message 1 and message 2 the same as the original messages.
- adding 2 more faces to the original message 3.
- adding 6 more faces to the original message 4.

The new series of messages forms a quadratic number pattern.
Which message in the NEW PATTERN will have 266 popping hearts ? (6)

[13]

QUESTION 4

The first four terms of a quadratic number pattern are -7 ; m ; 5 ; n. The constant second difference is 4.

4.1 Prove, by calculations, that $m = -3$ and $n = 17$. (3)

4.2 Which two consecutive terms of the quadratic number pattern has a first difference of 292? (3)

4.3 It is given that the general term of a quadratic number pattern is $T_n = 2n^2 - 2n - 7$. Calculate the value of n if $T_n = 1\,005$. (4)

[10]

QUESTION 5

Consider the function f defined by $f(x) = \frac{-3}{x+2} + \frac{1}{2}$. Graph f passes through (4 ; 0).

5.1 Write down the y-intercept of f. (1)

5.2 Write down the equations of the asymptotes of f. (2)

5.3 Calculate the x-intercept of f. (2)

5.4 Draw a neat sketch of f. Clearly label all the intercepts with the axes and asymptotes. (3)

5.5 Determine the values of y for which f lies $x < -2$ or $0 \leq x \leq 4$. (2)

5.6 Graph f is reflected about the y-axis and shifted $\frac{3}{2}$ units up to form p.
Write down the equation of p in the form of $p(x) = \ldots$. (2)

[12]

QUESTION 6

6.1 The function $h(x) = ax^2 + bx + c$ has the following properties:

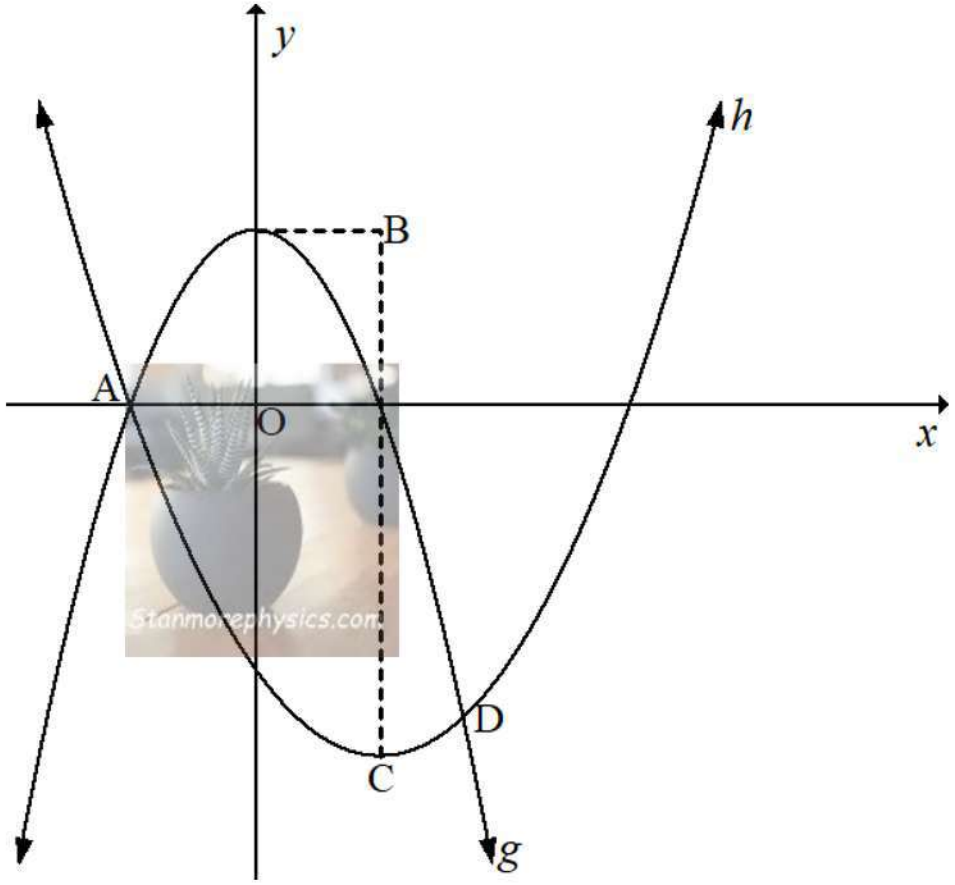
- $h(2) = 0$
- the value of $\frac{-b}{2a}$ is 5
- the range of h is $y \leq 10 ; y \in \mathrm{R}$.

Draw a neat sketch of h. Clearly label the x-intercepts and turning point. (3)

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6.2 The graphs of $g(x) = -x^2 + 9$ and $h(x) = ax^2 + bx - \frac{27}{4}$ are sketched below.

- A is an x-intercept of g and h and lies on the negative x-axis.
- A and D are the points of intersection of graphs g and h.
- C is the turning point of h.
- B lies on the horizontal line that passes through the turning point of g such that BC is parallel to the y-axis and passes through the other intercept of g.
- BC = 18 units



6.2.1 Calculate the coordinates of A. (3)

6.2.2 Show that $a = \frac{1}{4}$ and $b = -\frac{3}{2}$. (4)

6.2.3 Write down the range of h. (2)

6.2.4 It is given that $m(x) = x^2 - 4$. Explain, in words, the transformation from the graphs of g to m. (2)

6.2.5 Calculate the coordinates of D. (5)

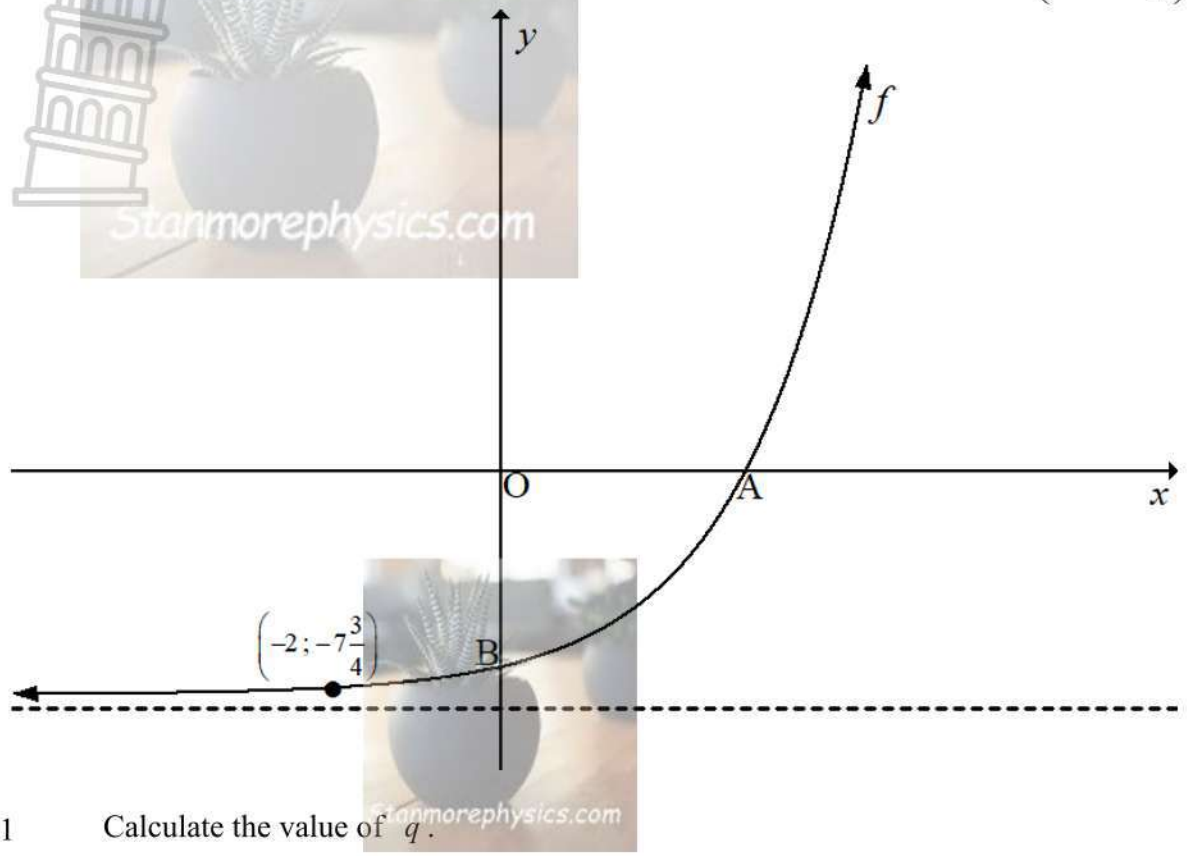
6.2.6 It is given that $p(x) = k$. Determine the integral value of k such that the distance between the points of intersection of h and p is 8 units. (2)

[21]

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QUESTION 7

The graph of $f(x) = 2^x + q$ is drawn below. . Graph f passes through the point $\left(-2\,;-7\frac{3}{4}\right)$.



7.1 Calculate the value of q. (2)

7.2 If $q = -8$, calculate the coordinates of A. (3)

7.3 Determine the average gradient between A and B. (3)

7.4 Determine the values of x where $\frac{x}{f(x)} \leq 0$ (2)

7.5 Determine the values of k for which $8 - 2^x - k = 0$ will have negative roots. (2)

[12]

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QUESTION 8

8.1 Dr Krishnanair invests R15 000 for a period of 6 years in an account that pays simple interest at the rate of 10% per annum.
Calculate the interest his investment earned at the end of 6 years. (3)

8.2 Miss Coetzee bought a brand new car. The value of the car depreciates annually at the rate of 8,25% p.a. on the reducing balance method. If the book value of the car was R277 216 after 3 years, calculate the purchase price of the car. (2)

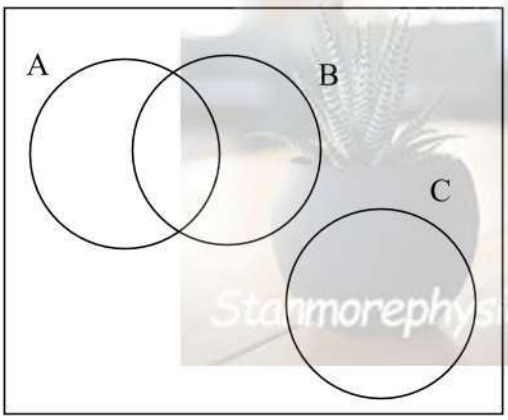
8.3 An advertisement reads "XY Bank offers loans at an effective interest rate of 12% per annum". Calculate the nominal rate of interest if interest on the loan is compounded quarterly. (4)

8.4 Mr Dlezi invested R25 000 in an account that offers 9,25% per annum compounded half-yearly. Calculate the accumulated amount in this account at the end of nineteen half-years. (3)

8.5 Mr Masango invested R6 500 in a savings account that paid interest at the rate of 13% p.a., compounded monthly for the first two years. Thereafter, the interest rate changed to 10,5% p.a., compounded quarterly. Three years after making the initial deposit, Mr Masango withdrew Rx from the account. At the end of 5 years, he had R928,30 more in the account than his initial deposit. Calculate the value of x, to the nearest rand (5)
[17]

QUESTION 9

In the Venn diagram below, events A, B and C are shown.



9.1 It is given that $P(A) = 0,47$ and $P(C) = \frac{3}{7}$

9.1.1 Write down the $P(A \text{ and } C)$. (1)

9.1.2 Calculate the $P(A \text{ or } C)$. (2)

9.2 It is given that events A and B are independent and $P(A) = \frac{2}{5}P(B)$.

9.2.1 Determine the $P(A \text{ and } B)$ in terms of $P(B)$. (2)

9.2.2 It also given that $P(A \text{ or } B) = 70\%$. Calculate $P(B)$. (5)

[10]

QUESTION 10

A survey was conducted amongst 45 males and 85 females who were randomly selected. This survey was about the brand of clothes they would love to buy between Gucci (G) and Louis Vuitton (LV). The results are summarised below.

- $3y$ females said they would love to buy Louis Vuitton.
- y males said they would love to buy Gucci.
- The total number of males who said they would love to buy Louis Vuitton is double the total number of females who said they would love to buy Gucci.

10.1 Calculate the total number of females who said they would love to buy Gucci. (6)

10.2 Are the events of being a 'male' and having said that they would love to buy one of the brands **independent**? Justify your answer with calculations. (4)

[10]

TOTAL MARKS: 150

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INFORMATION SHEET

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1+ni) \qquad A = P(1-ni) \qquad A = P(1-i)^n \qquad A = P(1+i)^n$$

$$T_n = a + (n-1)d \qquad S_n = \frac{n}{2}[2a + (n-1)d]$$

$$T_n = ar^{n-1} \qquad S_n = \frac{a(r^n - 1)}{r-1} \; ; r \neq 1 \qquad S_\infty = \frac{a}{1-r} \; ; -1 < r < 1$$

$$F = \frac{x[(1+i)^n - 1]}{i} \qquad P = \frac{x[1-(1+i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta$$

$$(x-a)^2 + (y-b)^2 = r^2$$

In ΔABC: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

$$a^2 = b^2 + c^2 - 2bc.\cos A$$

$$area\ \Delta ABC = \frac{1}{2}ab.\sin C$$

$$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta \qquad \sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$$

$$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta \qquad \cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases} \qquad \sin 2\alpha = 2\sin\alpha.\cos\alpha$$

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)} \qquad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx \qquad b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

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