Province of the
EASTERN CAPE
EDUCATION

Iphondo leMpuma Kapa: Isebe leMfundo
Provinsie van die Oos Kaap: Department van Onderwys
Porafensie Ya Kapa Botjahabela: Lefapha la Thuto

NATIONAL SENIOR CERTIFICATE

GRADE 12

SEPTEMBER 2026

MATHEMATICS P1

MARKS: **150**

TIME: **3 hours**

This question paper consists of 12 pages, including an information sheet and a special answer book of 26 pages.

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of ELEVEN questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answer.
4. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
5. Answers only will not necessarily be awarded full marks.
6. If necessary, round off answers to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. Number the answers correctly according to the numbering system used in this question paper.
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 $2x(x-3)=0$ (2)

1.1.2 $5x=-2x^2-1$ (correct to TWO decimal places) (4)

1.1.3 $-x^2+2x+3>0$ (4)

1.1.4 $25^x - 26.5^x = -25$ (4)

1.2 Solve simultaneously for x and y, if:

$2x-y=1$ and $x^2-y^2=xy-11$ (6)

1.3 Given that $m(x)=\dfrac{3x-2}{4x}$ and $n(x)=\dfrac{x+2}{\sqrt{x+5}}$

Determine the value(s) of x if $m(n(x))=\dfrac{1}{2}$ (5)

[25]

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QUESTION 2

2.1 Given the arithmetic series: $7 + 16 + 25 + 34 + ...$

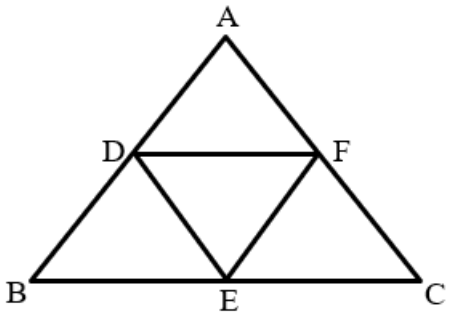
2.1.1 Determine the expression for the general term of the series. (2)

2.1.2 Calculate T_{35} (1)

2.1.3 Calculate S_{35}, i.e. the sum of the first 35 terms of the series. (2)

2.1.4 Determine the maximum number of terms for which the sum of this series will be less than 8 600. (4)

2.2 An equilateral triangle, ΔABC has each of its sides 1 unit long with an area of $\frac{\sqrt{3}}{4}$ units^2 . The midpoints of the sides are joined to form a new equilateral triangle, ΔDEF . This process of joining midpoints to form new equilateral triangles is continued indefinitely.



2.2.1 Determine the length of the sides of ΔDEF. (1)

2.2.2 Determine the area of ΔDEF. (2)

2.2.3 Calculate the sum of the areas of all the triangles if new triangles are formed indefinitely. (4)

2.3 Determine the value of T_4 if $\sum_{k=1}^{n} T_k = n(n+1)(2n+3)$ (4)

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QUESTION 3

Given the quadratic number pattern: $-3\ ;\ -6\ ;\ -11\ ;\ ...$

3.1 Write down the next TWO terms of the quadratic number pattern. (1)

3.2 Show that the general term of the quadratic number pattern is given as $T_n = -n^2 - 2$ (3)

3.3 Calculate the value of n if $T_n = -2\,603$ (2)

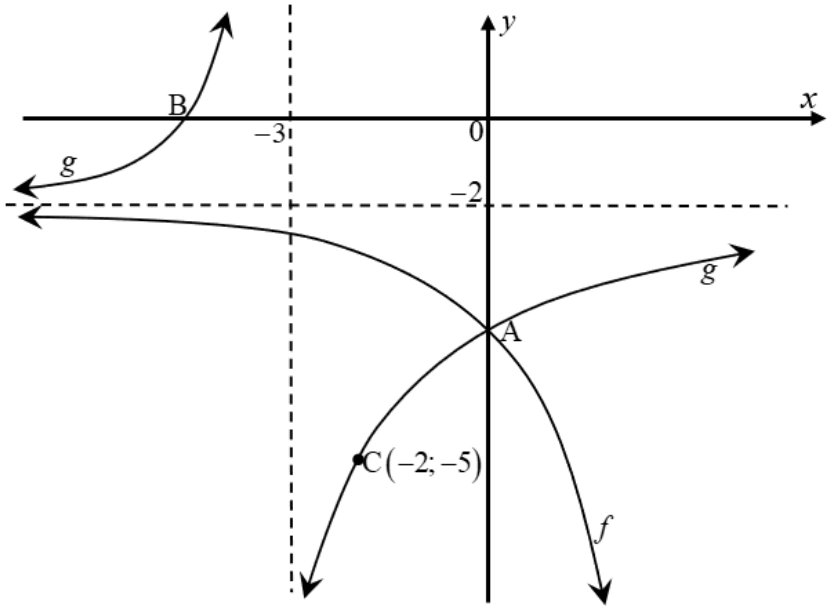
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QUESTION 4

The sketch below shows the graphs of $f(x) = -2^x + k$ and $g(x) = \frac{-3}{x+3} + q$

- A is the common y-intercept of f and g
- B is the x-intercept of g
- The graph of g passes through $C(-2;-5)$
- The graphs of f and g have a common horizontal asymptote of $y = -2$



4.1 Write down the value of q. (1)

4.2 Calculate the coordinates of B, the x-intercept of g. (3)

4.3 Determine the equation of h, the axes of symmetry of g with a positive gradient. (2)

4.4 Determine the coordinates of C', the reflection of C along the axes of symmetry with a positive gradient i.e. $y = h(x)$ (2)

4.5 Determine the equation of the inverse of p in the form $p^{-1}(x) = \ldots$, if the function of p is formed by shifting f, 2 units up and reflecting f about the x-axis. (3)

4.6 For which values of x will:

4.6.1 $g(x) \geq 0$ (2)

4.6.2 $p^{-1}(x) < 1$ (2)

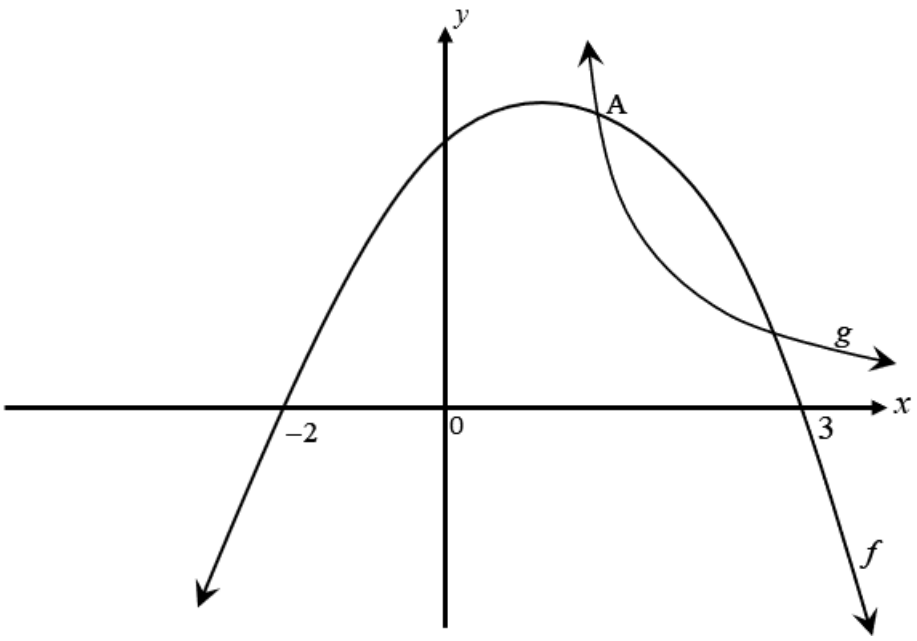
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QUESTION 5

5.1 The graphs of $f(x)=ax^2+bx+c$ and $g(x)=\frac{6}{x}$; $x>0$ are drawn below.
-2 and 3 are the x-intercepts of f. A is a point of intersection between f and g.



5.1.1 Write down the equation of the axis of symmetry of f. (1)

5.1.2 Given that $h(x)=-6x+12$ is the tangent to g at A, determine the equation of f in the form $f(x)=ax^2+bx+c$ (6)

5.1.3 If $f(x)=-x^2+x+6$, calculate the maximum value of f. (2)

5.1.4 A transformation is applied to f as follows, $f(x)=a(x+p+m)^2+q+n$ to obtain a new function defined as $t(x)=-\left(x-\frac{1}{4}\right)^2+\frac{29}{4}$
Determine the values of m and n. (2)

5.1.5 For which values of k will:

(a) $y=-6x+k$ cut g at two points. (2)

(b) $y=f(x)+k$ have no real roots. (2)

5.2 If $p(x)$ is a quadratic function of x such that $p(-2)=-6$, $p(0)=-4$ and $p(1)=0$, what is the value of $p(10)$? (5)
[20]

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QUESTION 6

6.1 A father invests money for his daughter on her fifth birthday. On her twenty-first birthday the daughter receives a sum of R85 000. If the money has been invested at an interest rate of 12% per annum, compounded half-yearly, what amount did her father invest initially? (3)

6.2 Mr Ntoa owns a business. He plans to expand his business after a period of four years. He decides to make equal quarterly payments of R55 000 into a savings account, starting in 3 months' time. He will make the last payment at the end of the four years. The interest paid on the savings is 6,75% p.a. compounded quarterly.

Calculate if he will have sufficient funds in four years' time, if the project will cost R1 million. (4)

6.3 Kim takes out a loan of R750 000 to buy a house. She plans to repay the loan over 20 years after the loan is granted by means of equal monthly instalments. The interest rate is 11,5% p.a. compounded monthly.

6.3.1 Calculate her monthly repayments, if the first payment starts six months after the loan was drawn. (4)

6.3.2 If the first payment (of monthly repayments) started one month after the loan is granted is R7 998,22. How much additional money did she pay, over the loan period, by deferring the repayment? (2)

[13]

QUESTION 7

7.1 Given the function: $f(x) = 3x^2 - 1$

7.1.1 Determine $f'(x)$ from first principles. (4)

7.1.2 Determine the equation of the tangent to f at point (1 ; 2). (3)

7.2 Determine:

7.2.1 $\frac{d}{dx}\left(x^2 + 5x\right)$ (2)

7.2.2 $\frac{dy}{dx}$ if $\frac{y}{\left(1-\sqrt{x}\right)} = \frac{2}{x}$ (4)

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QUESTION 8

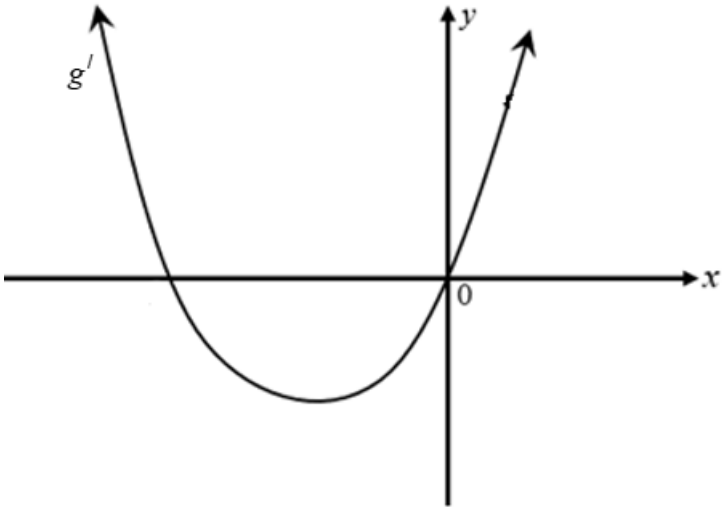
8.1 Given the function: $f(x) = -x^3 + 3x^2 + 9x + 5$

8.1.1 Determine the x-intercepts of the graph of f. (3)

8.1.2 Determine the coordinates of the turning points of f. (4)

8.1.3 Sketch the graph of f. Show clearly ALL the turning points as well as the intercepts on the axes. (3)

8.2 In the diagram, the graph of $g'(x) = 3x^2 + 6x$ is given, where $g(x) = ax^3 + bx^2$ represents a cubic function. The graph g' passes through the origin.



8.2.1 For which values of x is the graph of $g(x)$ decreasing? (2)

8.2.2 Determine the x-coordinate of the point of inflection of graph g. (2)

8.2.3 Solve for x, if $g'(x).g''(x) \geq 0$ (3)

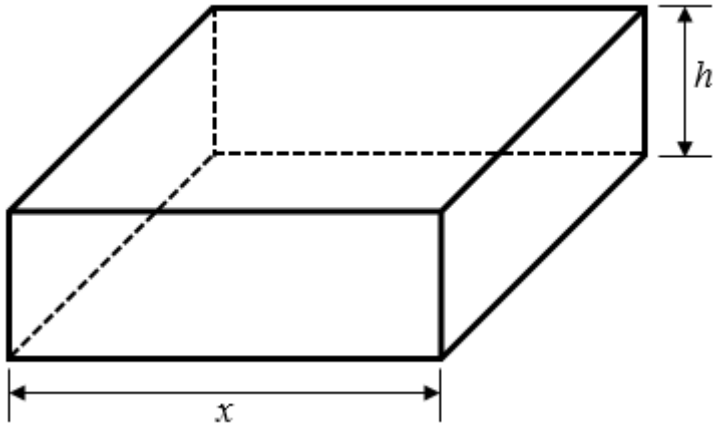
[17]

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QUESTION 9

A piece of wire, three metres (3 m) long, is bent into the frame work of a rectangular prism with a square base, as shown in the diagram. The sides of the square base are x units and the height of the prism is h units.



Calculate the values of x and h of the frame which will ensure the maximum volume of a solid block with the same dimensions. **[7]**

QUESTION 10

10.1 Given that:

- The probability that event A will occur is 0,3
- The probability that event B will occur is 0,5
- The probability that at least one of the events will occur is 0,65

10.1.1 Determine the probability that both events A and B will occur. (2)

10.1.2 Are the events A and B independent? Show your working to justify your conclusion. (3)

10.2 The two-way contingency table below shows the favourite sport activity of 80 students at a certain university in South Africa.

	Soccer	**Cycling**	**Tennis**	**Total**
Male	17	12	6	a
Female	19	11	b	45
Total	36	23	21	80

10.2.1 Write down that values of a and b. (2)

10.2.2 What is the probability of cycling being the favourite sport activity of a female student? (2)

[9]

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QUESTION 11

Three representatives from four different departments of a company will be featured on a photo board. The layout is shown in the diagram below, where one photo of each representative will be placed in a block labelled with a letter.

A		**B**		**C**
D		**E**		**F**
G		**H**		**I**
J		**K**		**L**

11.1 In how many different ways can these photos be arranged if the four team leaders' photos must be in the blocks labelled A, C, J and L? (2)

11.2 What is the probability that the photos of 3 representatives from the same department are grouped together in the same row? (i.e. each row represents a different department simultaneously) (3)
[5]

TOTAL: 150

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INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

In ΔABC: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$ $\qquad a^2 = b^2 + c^2 - 2bc.\cos A$ $\qquad area\,\Delta ABC = \dfrac{1}{2}ab.\sin C$

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

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

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

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

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

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

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