LIMPOPO

PROVINCIAL GOVERNMENT

REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF

EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P1

SEPTEMBER 2026

MARKS: 150

TIME: 3 hours

This question paper consists of 10 pages and 1 information sheet.

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 11 Questions.

2. Answer **ALL** the questions.

3 Number your answers correctly according to the numbering system used in this question paper.

4. Clearly show **ALL** calculations, diagrams and graphs that you have used in determining your answers.

5. Answers only will NOT necessarily be awarded full marks.

6. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.

7. If necessary, answers should be rounded off to **TWO** decimal places, unless stated otherwise.

8. Diagrams are NOT necessarily drawn to scale.

9. 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 Given: $y+\frac{1}{y}=2$

1.1.1 Solve for y. (2)

1.1.2 Hence, solve for x (round off to TWO decimal places if necessary)

$$(2x^2+3x)+\frac{1}{(2x^2+3x)}=2$$ (4)

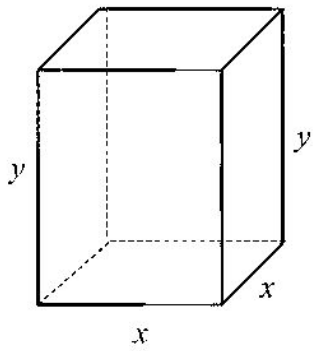
1.2 Solve for x:

1.2.1 $x^2+x-6<0$ (3)

1.2.2 $5+\sqrt{x+5}=\frac{14}{\sqrt{x+5}}$ (5)

1.2.3 $9^{x+1}-10.3^x+1=0$ (4)

1.3 A closed box has the shape of a rectangular prism with a square base. The sides of the base are x cm long. The height is y cm long. The surface area of the box is $288\,cm^2$. The height of the edges are such that $y=21-2x$.



1.3.1 Show that: $x^2+2xy-144=0$. (2)

1.3.2 Hence, calculate the values of x and y. (4)

[24]

QUESTION 2

2.1 Given the series: $(x-3)+(x-3)^2+(x-3)^3+.....$

2.1.1 If the series converges, calculate the value(s) of x. (3)

2.1.2 Calculate the sum to infinity in terms of x. (2)

2.1.3 Hence, calculate S_∞ for the following series:

$(2,5-3)+(2,5-3)^2+(2,5-3)^3+.....$ (2)

2.2 Given that: $\sum_{p=1}^{n}(2p+2)=990$

2.2.1 Determine the value of n. (4)

2.2.2 If $n=30$, show that $T_n=S_n-S_{n-1}$. (4)

[15]

QUESTION 3

The following sequence of numbers forms a quadratic pattern:

3 ; 2 ; 3 ; 6 ; 11 ; .....

3.1 Determine the 10^{th} term of the first difference. (3)

3.2 Calculate the difference between the 30^{th} and the 31^{st} terms of quadratic pattern. (2)

3.3 The general term of quadratic pattern is given by $T_n=an^2+bn+c$. Determine the values of a, b and c. (3)

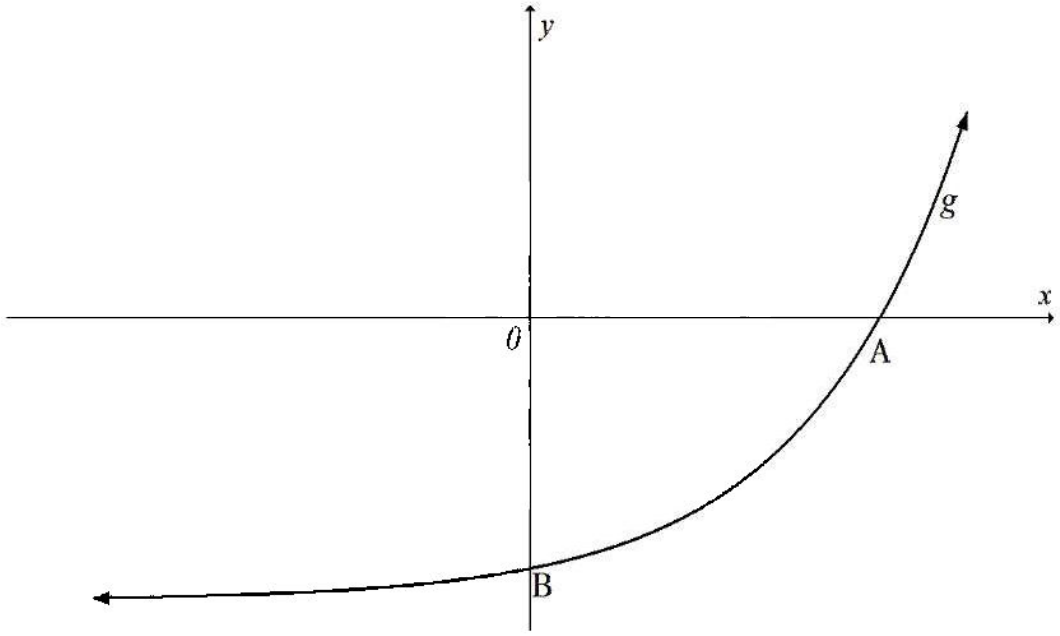
3.4 Explain why the given quadratic pattern will never contain a negative value. (1)

[9]

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QUESTION 4

The graph of $g(x) = 3^x - 9$ is sketched below. The graph cuts the x – axis and y – axis at A and B respectively.



4.1 Determine the coordinates of A and B. (3)

4.2. Determine the equation of k if $k(x) = g(2x) + 9$ (2)

4.3 Determine the equation of k^{-1} in the form $y = ...$ (2)

4.4 If k^{-1} is defined by $p(x)$, sketch the graph of p. (2)

4.5 Write down the domain of p. (1)

4.6 Determine the equation of h if h is the reflection of p about the x – axis. (2)

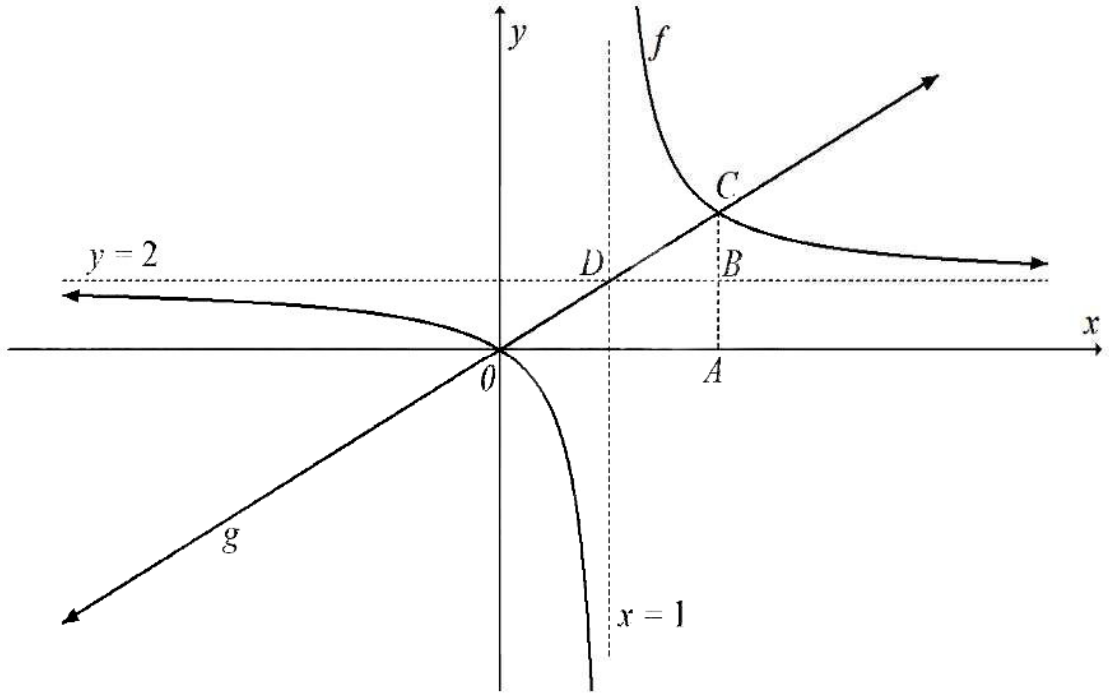
4.7 Calculate : $\sum_{x=0}^{2} 9^x - \sum_{x=3}^{4} g(x)$ (3)

[15]

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QUESTION 5

The sketch graphs of $f(x)=\frac{a}{x+p}+q$ and $g(x)=mx+c$ are drawn below:



5.1 Determine the equation of f. (3)

5.2 Determine the equation of g. (3)

5.3 Determine the coordinates of C. (4)

5.4 For which value(s) of x will $f(x)>g(x)$? (2)

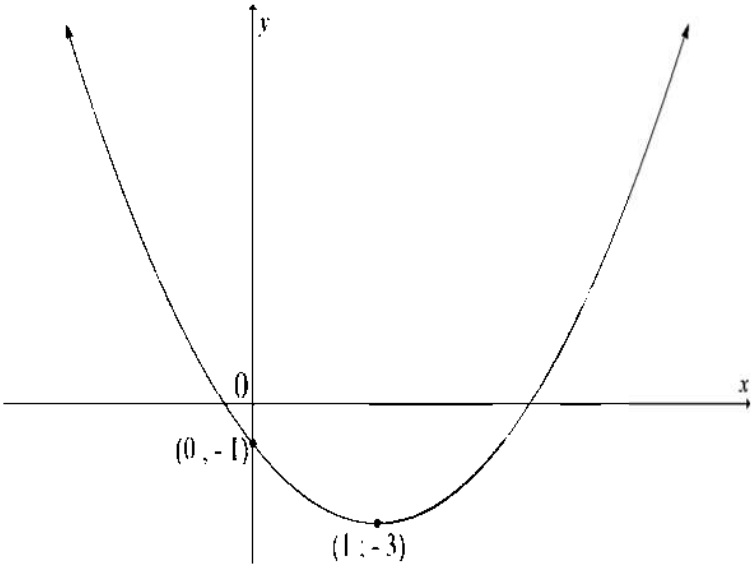
5.5 For which value(s) of x will $g(x).f(x)<0$? (2)

[14]

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QUESTION 6

The figure below shows the graph of $y = ax^2 + bx + c$. The turning point is at $(1\ ;-3)$ and the $y-$ intercept is at $(0\ ;-1)$.



6.1 Determine the values of a and b. (4)

6.2 Determine, with the aid of the graph, the values of k for which the product of the roots of $ax^2 + bx + c = k$ is negative. (2)

[6]

QUESTION 7

7.1 University fees for a student studying a bachelor's degree are on average, about R62 000 per year. Assuming an average inflation rate of 5% per annum, what will the fees be in twenty years' time? (3)

7.2 Tlou takes out a loan for R800 000 to buy an apartment. The bank offers him an interest rate at 11% p.a. compounded monthly. He pays back the loan over 20 years with equal payments (starting one month after receiving the loan)

7.2.1 Show that his monthly payments are R8 257,51. (3)

7.2.2 Immediately after the 180th repayment of R8 257,51 Tlou decides to pay off the balance of his loan. Calculate the lump sum payment he would need to pay off the loan. (4)

7.2.3 Tlou decides that instead of paying the fixed monthly repayments of R8 257,51, he will pay R12 000 per month. Calculate how long it will take Tlou to repay the loan. (5)

[15]

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QUESTION 8

8.1 Determine $f'(x)$ from first principles if it is given that $f(x) = -x^2 + 3x$. (5)

8.2 Determine:

8.2.1 $g'(x)$ if $g(x) = x^2 - 2\sqrt{x}$ (3)

8.2.2 $\frac{dy}{dx}$ if $y = \left[\frac{x^3 - 2x^2 - x + 2}{x - 1}\right]$ (3)

[11]

QUESTION 9

The graph of a cubic function f has turning points at $A(-1\ ;\ p)$ and $B(2\ ;\ q)$.
The function f has the following properties:

$f'(x) > 0$ for $x < -1$ or $x > 2$

$f'(x) < 0$ for $-1 < x < 2$

$f(2) > 0$

9.1 Draw a neat graph of f. Clearly label A and B on the sketch.
(It is not necessary to show the x and y – intercepts). (3)

9.2 Determine the number of roots for f. (1)

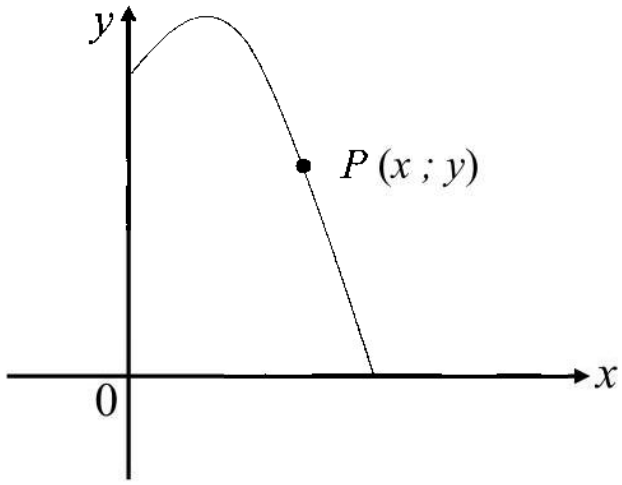
9.3 If $f(x) = x^3 + bx^2 + cx + d$, calculate the values of b and c. (6)

[10]

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QUESTION 10

10.1 The graph of $x^3 + y^2 = 8$, not drawn to scale, is represented alongside for the interval $0 \le x \le 2$, $P(x\ ;\ y)$ is any point on the graph.

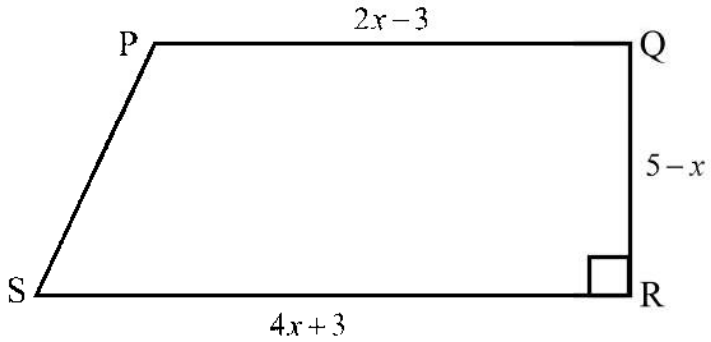


10.1.1 Determine the length of OP in terms of x. (2)

10.1.2 Determine the maximum value of OP^2. (5)

10.1.3 Calculate the shortest distance from the origin to the graph. (2)

10.2 PQRS is a trapezium with PQ parallel to RS and measurements $PQ = 2x - 3$, $QR = 5 - x$ and $RS = 4x + 3$ in meters, as indicated on the diagram.



10.2.1 Show that the area of the trapezium is $A = 15x - 3x^2$. (2)

10.2.2 Calculate the value of x if PQRS has a maximum area. (2)

10.2.3 Calculate the maximum area of PQRS. (2)

[15]

QUESTION 11

11.1 The marks of 720 learners who took both Mathematics and English were analysed and are summarised in the table below.

	Good Mathematics marks	Weak Mathematics marks	Total
Good English marks	360	b	480
Weak English marks	e	60	f
Total	d	c	a

11.1.1 Calculate the values of a , b , c, d , e and f in the table above. (3)

11.1.2 Is a learner's English mark independent of his/her Mathematics ability? Support your answer with appropriate calculations. (4)

11.2 Rugby players want to go to the beach after a game if the sun is shining. The chance that the sun will shine is $\frac{1}{3}$. If it is a sunny day, the chance that they will go to the beach is $\frac{5}{8}$. If it is not a sunny day, their chances are reduced to $\frac{2}{8}$. Determine the probability that the rugby players will go to the beach. (3)

11.3 Four boys and three girls are seated in a row.

11.3.1 Calculate the probability that the middle seat and both end seats are occupied by boys. (3)

11.3.2 Compare event in 11.3.1 with the event that girls will occupy both end seats and a boy occupies the middle seat. Which event is more likely? Show all calculations and reasons. (3)

[16]

TOTAL [150]

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INFORMATION SHEET

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

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

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

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

$$F = \frac{x\left[\left(1+i\right)^n - 1\right]}{i} \qquad P = \frac{x[1-(1+i)^{-n}]}{i} \qquad f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

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

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

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

In ΔABC:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

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

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

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

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

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

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

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