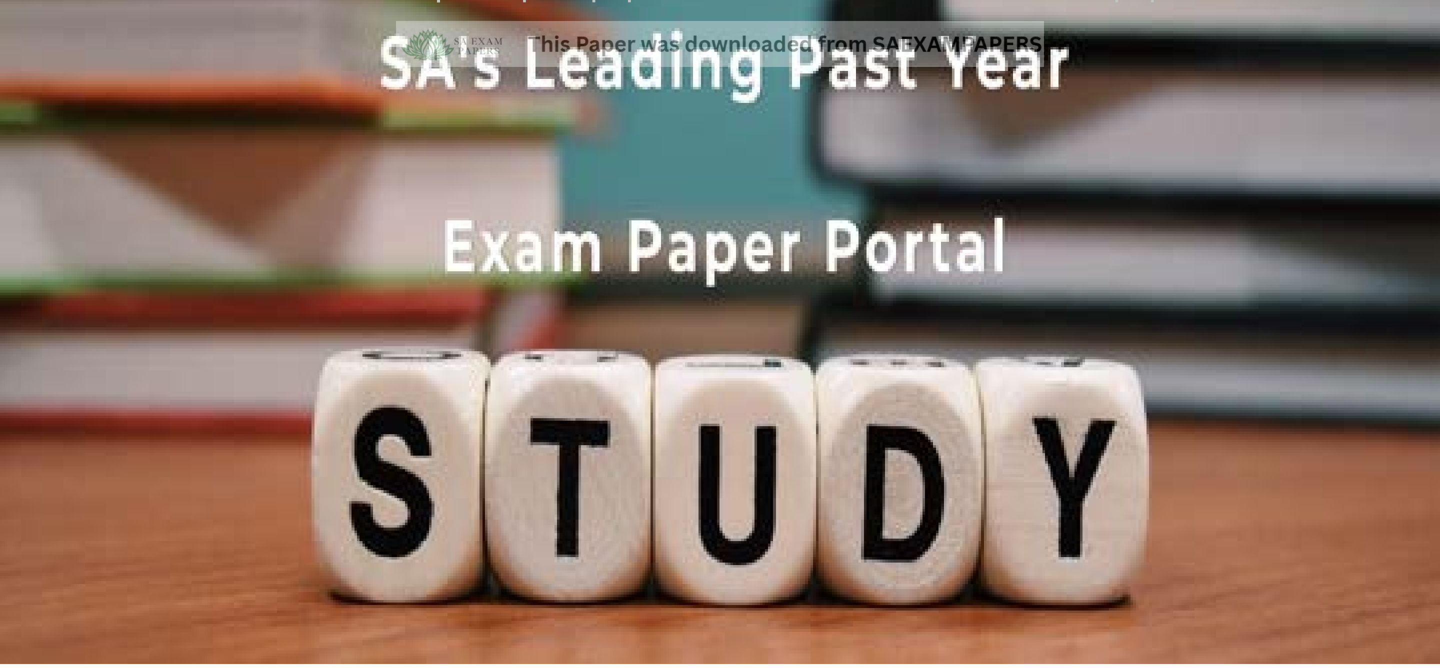
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NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P1

JUNE 2026

MARKS: 150

TIME: 3 hours

This question paper consists of 8 pages and 1 information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 8 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.

QUESTION 1

1.1 Solve for x:

1.1.1 $x^2 - x = 12$ (3)

1.1.2 $4x^2 - 12x - 6 = 0$ (correct to **TWO** decimal digits) (3)

1.1.3 $2x - \sqrt{x+4} = 7$ (4)

1.1.4 $(3x-2)^2 > 3x$ (4)

1.1.5 $2^{\frac{2x}{3}} + 2^{\frac{x}{3}} - 6 = 0$ (3)

1.2 Solve for x and y simultaneously, where:

$6y = x^2 - 2x - 6$ and $\sum_{n=3}^{4} x(n-2)^2 = 10y$ (6)

1.3 Without the use of a calculator, prove that $(x + x^{-1})^2 - (x - x^{-1})^2 = 4$ (4)

[27]

QUESTION 2

Given an arithmetic sequence $x+4$; $2x$; $x+8$;...............

2.1 Calculate the value of x. (2)

2.2 Write down the first three terms of the sequence. (1)

2.3 Calculate the 100th term. (2)

2.4 Determine the term of the sequence which is equal to 48. (3)

2.5 Calculate the sum of the first 21 terms. (2)

[10]

QUESTION 3

3.1 The distance an object travelled (in meters) from a starting point at a particular time (in seconds) is recorded in the table below:

Time in seconds (t)	1	2	3	4	5	6
Distance from starting point (d)	4	10	18			

3.1.1 Complete the table for the next three seconds. (3)

3.1.2 The relationship between the distance (d) travelled by the object in a particular time (t) is modelled by the equation $d = mt^2 + nt$
Determine the values of m and n. (2)

3.1.3 Determine the distance travelled by the object after 10 seconds. (2)

3.2 A rubber ball dropped from a height of 30m loses 20% of its previous height on each rebound.

3.2.1 Calculate the height the ball will reach after the second bounce. (2)

3.2.2 Show that the series converges. (2)

3.2.3 Calculate the sum to infinity. (2)

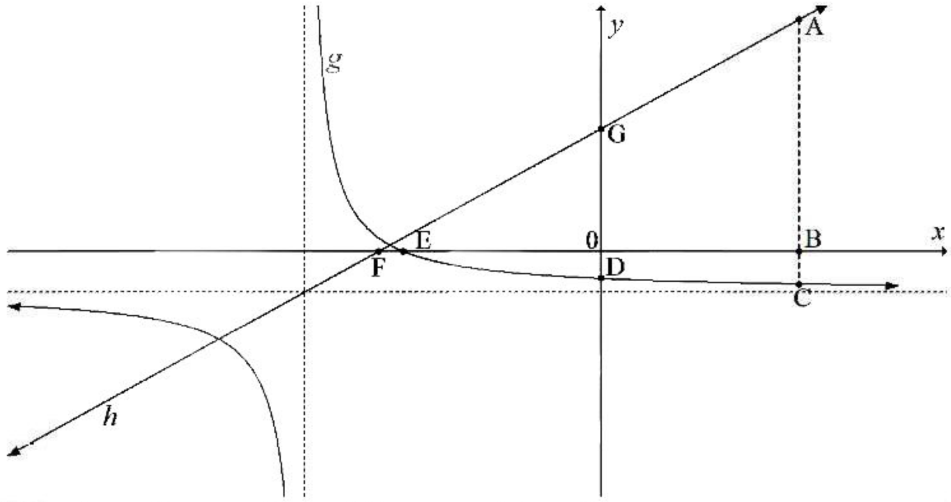
3.2.4 Determine the number of times the ball will rise to a height of more than 4m. (6)

3.2.5 Calculate the total distance the ball will travel before it comes to rest. (3)

[22]

QUESTION 4

4.1 The sketch below shows the hyperbola $g(x)=\frac{1}{x+3}-1$.The y – intercept of the straight line h is 3 and the line passes through the point of intersection of the asymptotes of g. Line h cuts the x – axis at F and the y –axis at G respectively.



4.1.1 Write down the equations of the asymptotes of g. (2)

4.1.2 Determine the domain of g. (1)

4.1.3 Determine the equation of h. (3)

4.1.4 Write down the equation of the axis of symmetry of g with the negative gradient . (2)

4.1.5 Determine the equations of the asymptotes of $f(x)=g(x-2)+4$. (2)

4.1.6 If ABC // y – axis and $AC=6\frac{7}{15}$ units . calculate the length of OB. (4)

4.1.7 Calculate the area of ABOG (4)

4.2 Given: $f(x)=x^2-2x-3$

4.2.1 Calculate the coordinates of the x-intercepts of the graph of f. (2)

4.2.2 Calculate the coordinates of the turning point of the graph of f. (2)

4.2.3 Draw a sketch graph of f. Indicate the turning point and the intercepts with the axes on the sketch. (4)

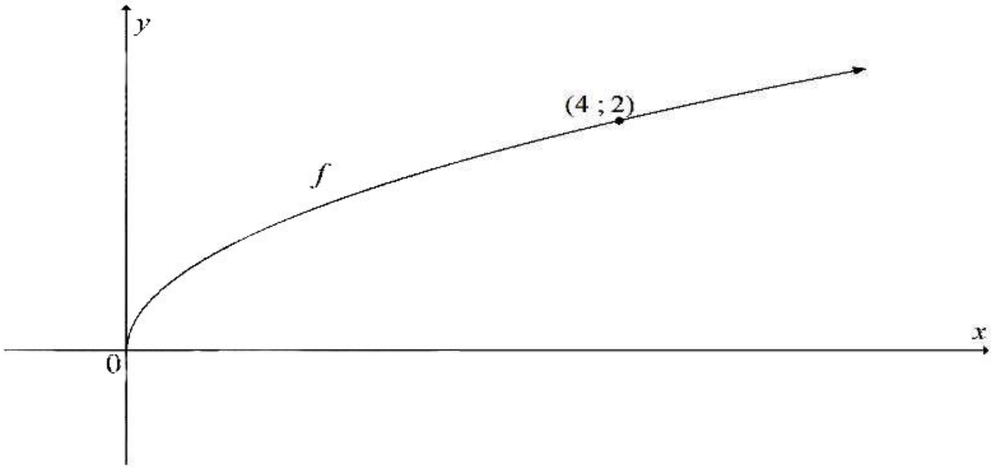
4.2.4 Write down the equation of the tangent that passes through the turning point of the graph of f. (1)

4.2.5 Use the graph of f to determine value(s) for x if $2x^2-4x-6<0$. (2)

[29]

QUESTION 5

The graph of $f(x) = a\sqrt{x}$, $x \geq 0$ and is sketched below. The point $P(4;2)$ lies on the graph of f.



5.1 Calculate the value of a. (2)

5.2 Determine the equation of f^{-1}, in the form $y = ...$ (2)

5.3 Write down the range of f^{-1}. (1)

5.4 Draw the graph of f^{-1} for $x \geq 0$ and clearly indicates the coordinates of the reflecting point. (3)

5.5 The graph of f is reflected across the line $y = x$ and thereafter it is reflected across the x-axis. Determine the equation of the new function in the form $y = ...$ (3)

[11]

QUESTION 6

6.1 Given: $f(x) = x - x^2$

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

6.1.2 Hence, calculate $f'(2)$. (1)

6.2 Differentiate the following with respect to x:

6.2.1 $y = \dfrac{2x^2 - 11x + 15}{3 - x}$ $(x \neq 3)$ (3)

6.2.2 $y = \left(x^2 - \sqrt{x}\right)^2$ (4)

6.3 The equation of a tangent to the curve of $f(x) = ax^3 + bx$ is $y = x + 4$. If the point of contact is $(-1;3)$, calculate the values of a and b. (6)

[18]

QUESTION 7

7.1 Given: $f(x) = x^3 - 6x^2 + 9x - 4$

7.1.1 Show that $(x-1)$ is a factor of $f(x)$. (2)

7.1.2 Determine the coordinates of the x-intercepts of f. (4)

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

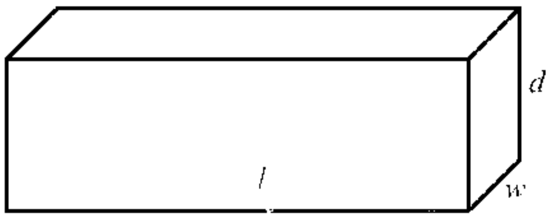
7.1.4 Draw a neat sketch graph of f indicating the coordinates of the turning points as well as the x-intercepts. (4)

7.1.5 Hence, or otherwise, solve: $(x-2)^3 - 6(x-2)^2 + 9(x-2) = 4$ (2)

7.1.6 Determine the coordinates of the point of inflection of $f(x)$. (3)

7.2 The measurements of a rectangular dam are as follows:

length $(l) = 60 - 2x$, width $(w) = 2x$ and depth $(d) = \frac{x}{2}$.



7.2.1 Determine the volume of the dam in terms of x. (2)

7.2.2 Determine the value of x for which the volume of the dam is a maximum. (3)

7.2.3 Calculate the maximum volume of the dam. (2)

[26]

QUESTION 8

Just after birth the weight of a baby drops for a few days and then starts to increase again.

The average weight of a baby in its first 30 days of life can be approximated by the following equation:

$$m(t)=0,02t^3-0,2t^2+3200, \qquad 0\leq t\leq 30$$

where t is the time in days and $m(t)$ is the weight in grams.

8.1 Calculate the weight of the baby at birth. (1)

8.2 Calculate on what day the weight reaches a minimum. (4)

8.3 Calculate the maximum weight of the baby in the 30-day period. (2)

[7]

TOTAL: 150

INFORMATION SHEET

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

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

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

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

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

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

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

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

In ΔABC:

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

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

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

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

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

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

$\sin 2\alpha = 2\sin\alpha.\cos\alpha$

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

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

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