

EXAMINATION		NATIONAL SENIOR CERTIFICATE
GRADE		12
DATE		MAY/JUNE 2026
SUBJECT		MATHEMATICS
PAPER		1
MARK TOTAL		150
DURATION (HOURS)		3
NUMBER OF PAGES		14



SOUTH AFRICAN COMPREHENSIVE ASSESSMENT INSTITUTE
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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 the answers correctly according to the numbering system used in this question paper.
4. Clearly show **ALL** calculations, diagrams, graphs, *et cetera* that 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 to **TWO** decimal places, unless stated otherwise. Diagrams are **NOT** necessarily drawn to scale.
8. An information sheet with formulae is included at the end of the question paper.
9. Write neatly and legibly, in **BLUE** ink only.



QUESTION 1

1.1 Solve for x :

1.1.1 $x^2 - 2x = 24$ (3)

1.1.2 $3x^2 - 7x = 3$ (correct to two decimal places) (4)

1.1.3 $7^{x+3} - 7^{x+2} + 7^0 = 100\,843$ (4)

1.1.4 $4x^2 - 5x < 0$ (3)

1.2 Solve for x and y simultaneously:

$x^2 + xy - y^2 = 16$ and $2x - y = 4$ (6)

1.3 If $4^{x+1} + 4^x = 5^{y+1} - 5^y$, calculate the values of x and y , where x and y are integers. (5)

[25]



QUESTION 2

2.1 Given the quadratic sequence: 100; 202; 310; 424; ...

2.1.1 Write down the next term of the sequence. (1)

2.1.2 Show that the n^{th} term of the sequence is $T_n = 3n^2 + 93n + 4$. (3)

2.1.3 Determine between which two consecutive terms the difference will be 2022. (3)

2.2 Calculate the value of n if:

$$\sum_{k=1}^n (-3k + 20) = -11\,780 \quad (5)$$

[12]



QUESTION 3

3.1 Given the geometric series: $20 + 5 + 1\frac{1}{4} + \frac{5}{16} + \dots$

3.1.1 Determine the value of the 5th term of this series. (2)

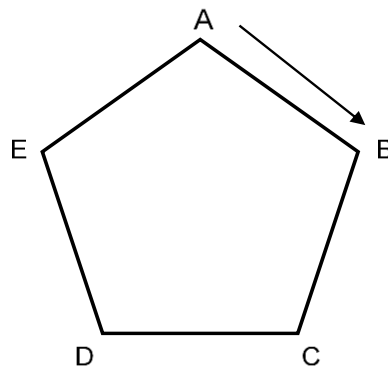
3.1.2 Show that the series converges. (1)

3.1.3 Determine the sum of the first 10 terms. (2)

3.2 The figure below represents the perimeter of a pentagonal building that needs to be patrolled by a security guard. Each side of the pentagon is 50m. The guard is to patrol the perimeter in a clockwise direction.

The following information represents a geometric sequence:

The guard covers 70 metres in his first minute, and thereafter covers 0,97 of the previous distance covered per minute.



3.2.1 Calculate the total distance the guard patrolled after 1 hour. (4)

3.2.2 If the guard continues to travel around the building, determine the total distance that he will travel. (2)

3.2.3 After patrolling 1230 metres, the guard had to take a toilet break. On which side of the pentagon should his reliever start patrolling? (3)

[14]



QUESTION 4

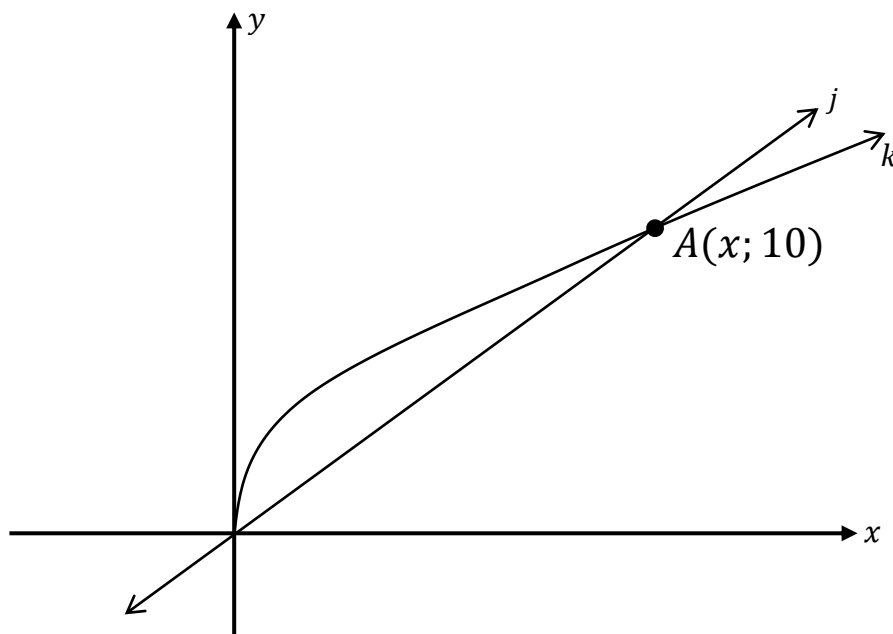
- 4.1 Determine the number of years it will take an investment to triple if the interest rate is 9% per annum compounded annually. (3)
- 4.2 Mr Shabangu wants to buy a new car at a value of R650 000. The bank offers him an effective interest rate of 11,27% per annum over a period of 5 years.
- 4.2.1 Show that the nominal monthly interest rate per annum is 10,73%. (2)
- 4.2.2 Calculate the monthly instalments that Mr Shabangu will have to make. (4)
- 4.2.3 The car dealer claims that the best time to trade in a car for a new model is when the outstanding balance of the loan is equal to the book value of the car. He predicts that this will happen after 3 years. Determine the annual depreciation rate, on the reducing balance method, for which the car dealers' claim will be valid. (6)

[15]



QUESTION 5

The graph of k is defined by the equation $k(x) = \sqrt{ax}$, $x \geq 0$ and is drawn. It is given that $k(x)$ and $j(x) = \frac{1}{2}x$ intersect at $A(x; 10)$.



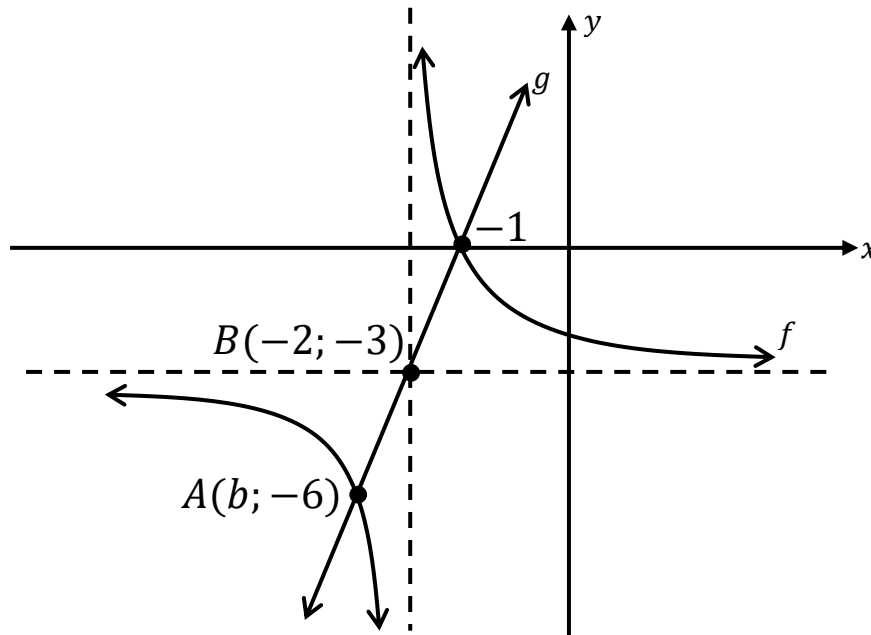
- 5.1 Find the x –coordinate of the point of intersection of k and j . (1)
- 5.2 Calculate the value of a . (2)
- 5.3 Write down the equation of k^{-1} , the inverse of k , in the form $y = \dots$ (2)
- 5.4 If $p(x) = -x + 10$, determine the point(s) of intersection of k and p . (5)
- 5.5 Hence, or otherwise, determine the value(s) of x for which $k^{-1}(x) < p(x)$. (2)

[12]



QUESTION 6

The graphs of $f(x) = \frac{a}{x-p} - 3$ and $g(x) = 3x + 3$ are drawn below. The graphs of f and g intersect at $A(b; -6)$ and share the same x -intercept at $x = -1$. $B(-2; -3)$ is the point of intersection of the asymptotes of f . Use the graph to answer the questions that follow:



- 6.1 Determine the equation of $f(x)$. (3)
- 6.2 Calculate the value of b . (2)
- 6.3 Determine the equation of the axis of symmetry of f with a positive gradient. (2)
- 6.4 For which values of x is $\frac{3}{x+2} > 3$. (2)
- 6.5 Describe the transformation of $f(x)$ that will result in $k(x) = \frac{3}{x} - 3$. (2)

[11]



QUESTION 7

Given that $f(x) = a^x$ and $f^{-1}(9) = 2$.

7.1 Determine the value of a . (3)

7.2 Find the equation of f^{-1} . (2)

7.3 A new function $g(x)$ is formed by translating f , 3 units to the right. Write down the equation of g in the form $y = ab^x$. (2)

7.4 Draw a neat sketch of g and f^{-1} on the same set of axes. Clearly indicate all intercepts with the axes and asymptotes. (3)

7.5 If P is the point of intersection of the line $y = 1$ and g , show that P is also a point on f^{-1} . (3)

[13]

**QUESTION 8**

8.1 Given $p(x) = x^2 - 3x$. Find $p'(x)$ using first principles. (5)

8.2 Determine:

8.2.1 $D_x \left[x^4 - 3 \sqrt[3]{x^2} + \frac{3}{4} \right]$ (3)

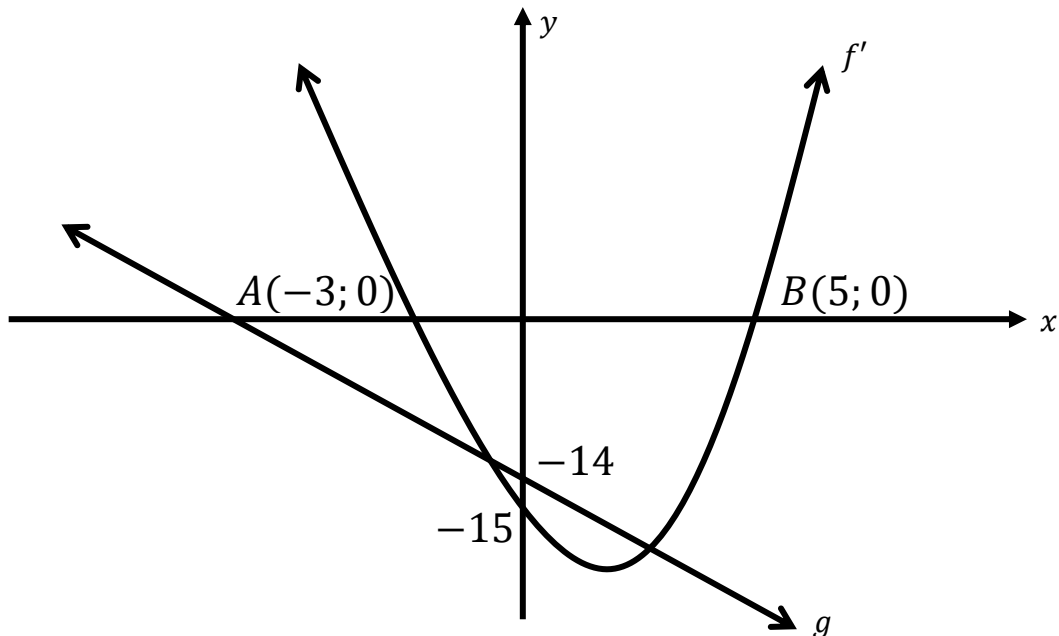
8.2.2 Determine the x –coordinate(s) of the points on the curve $f(x) = \frac{4}{x}$ where the gradient of the tangent to the curve is -1 . (3)

[11]



QUESTION 9

Sketched below are the graphs of $f'(x) = x^2 - 2x - 15$, the first derivative of $f(x) = px^3 + qx^2 + rx - 3$, and $g(x) = -\frac{1}{2}x - 14$. The x -intercepts of $f'(x)$ is given as $A(-3; 0)$ and $B(5; 0)$.



- 9.1 For which value(s) of x will:
- 9.1.1 $f(x)$ be decreasing? (1)
- 9.1.2 $f(x)$ have stationary points? (1)
- 9.2 Determine the values of p ; q and r . (4)
- 9.3 For which value(s) of x is $f(x)$ concave upwards? (2)
- 9.4 Show that the tangent of f' where $x = 2$ is perpendicular to g . (3)
- 9.5 Hence, or otherwise, prove that g and the tangent in question 9.4 intersect at the same point on the curve. (3)
- 9.6 The x -intercepts of $f(x)$ are given as $(-5,25; 0)$; $(-0,2; 0)$ and $(8,45; 0)$. Draw a neat sketch of $f(x)$. Clearly indicate the intercepts with the axes and the x -coordinates of the turning point(s). (2)

[16]



QUESTION 10

A cylindrical box with height (h) and radius (r), will be tied up with a ribbon as shown in the picture below. The longest piece of ribbon available is 200cm of which 40cm is required for the bow at the top.



10.1 Show that $h = 40 - 2r$. (2)

10.2 Calculate the maximum volume of the box. (4)

[6]



QUESTION 11

- 11.1 S and T are two events in a sample space where $P(S) = 0,5$, $P(S \cup T) = 0,8$ and $P(T) = y$. Determine the value of y if:

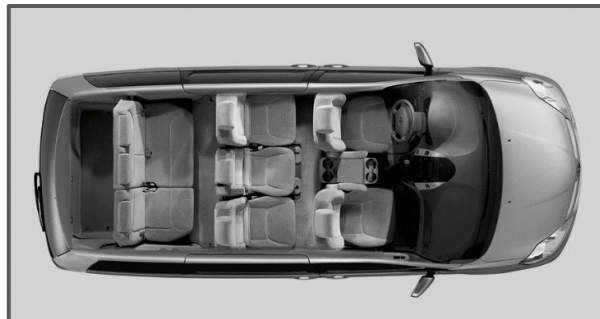
11.1.1 S and T are mutually exclusive. (2)

11.1.2 S and T are independent events. (2)

- 11.2 Susan has been recording the punctuality of the buses on a particular route for the past 80 days. It rained on 36 days and the buses were delayed on 28 of those days. The busses were also delayed on 9 days when there was no rain. The latest weather report predicts a 65% probability of rain this Friday when Susan is writing her Mathematics term test. Using this information, estimate the probability that the buses will be delayed this Friday. (5)

- 11.3 Susan is stressed that she is going to be late for her Mathematics term test and begs her mom to drive her to school this Friday. Her mom agrees and says that she would pick up 6 of her friends as well to ensure that they are all on time for the test.

The diagram below shows the inside of Susan's mom's minibus.



- 11.3.1 In how many different ways can the 7 friends be seated in the minibus? (1)
- 11.3.2 Susan insists on sitting in the front passenger seat. 2 of her friends, Lisa and Lizzy, must sit together. In how many different ways can they be seated now? (2)
- 11.3.3 John claims that he gets car sick very easily. Determine the probability that he gets a window seat in the middle row of the minibus if they are seated at random. (3)

[15]

GRAND TOTAL: [150]

INFORMATION SHEET: MATHEMATICS

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

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

$$A = P(1 - i)^n$$

$$A = P(1 + i)^n$$

$$T_n = a + (n - 1)d$$

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

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1}; r \neq 1$$

$$S_\infty = \frac{a}{1 - r}; -1 < r < 1$$

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

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

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

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

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

$$\text{In } \triangle ABC: \quad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

$$\text{Area } \triangle ABC = \frac{1}{2}ab \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$$

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

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

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

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

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$$

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

$$P(A) = \frac{n(A)}{n(S)}$$

$$P(A \text{ or/of } B) = P(A) + P(B) - P(A \text{ and/en } B)$$

$$\hat{y} = a + bx$$

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