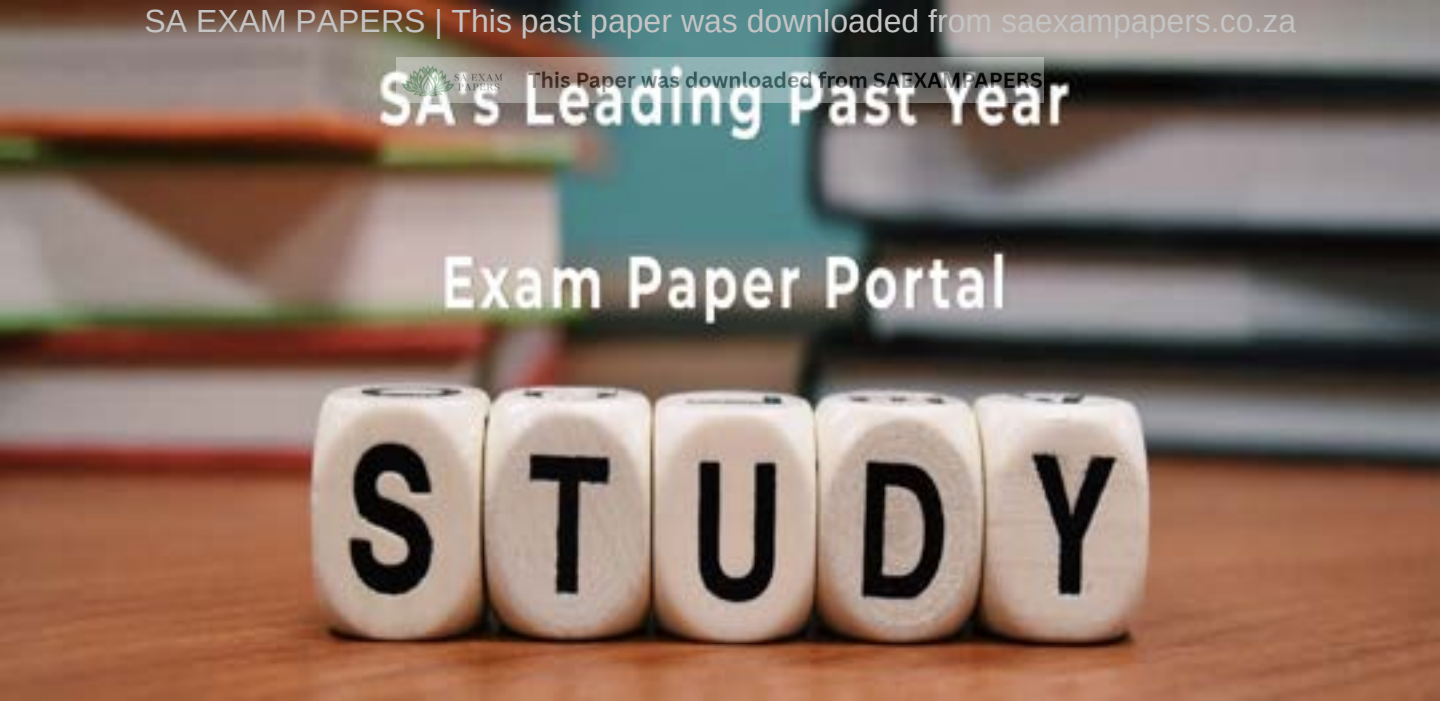


KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS

PROVINCIAL STANDARDISED ASSESSMENT

MARCH 2026

MARKS: 100

TIME: 2 hours

This question paper consists of 7 pages and an information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 9 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, 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. Write neatly and legibly.

QUESTION 1

Given: 26, 45 and 70 are the third, fourth and fifth terms of a quadratic number pattern.

1.1 Calculate the first term of the quadratic number pattern. (1)

1.2 Determine the expression for the n^{th} term of the pattern. (4)

1.3 Which two consecutive terms of the first differences sequence will have a product of 7 735? (5)

[10]

QUESTION 2

2.1 The 5^{th} term of a geometric sequence is $\frac{1}{48}$ and the 9^{th} term is $\frac{1}{768}$, where $r<0$.

Determine the first three terms of the sequence. (5)

2.2 Given: $\sum_{k=0}^{\infty} 2p^{1-k}$, where $p \neq 0$

Calculate the value(s) of p, if it is given that $S_{\infty} = 12,5$. (5)

[10]

QUESTION 3

After undergoing knee surgery, Patrick had to return to his running program gradually.

His physiotherapist advised him to do it in the following way:

- He has to run daily.
- In the first week he must run 6 minutes per day.
- Every week thereafter he must increase the time per day by 3 minutes.

3.1 During which week of his program will he be running 60 minutes per day? (3)

3.2 Calculate the total number of minutes he would have run by the end of the 19^{th} week. (3)

[6]

QUESTION 4

Given: $f(x)=\frac{2}{x}+1$ and $g(x)=k^x$. The point $(2\ ;\ 9)$ lies on g.

4.1 Determine the value of k. (1)

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

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

4.4 Draw sketch graphs of f and g^{-1} on the same set of axes, clearly indicating all asymptotes and intercepts with the axes. (5)

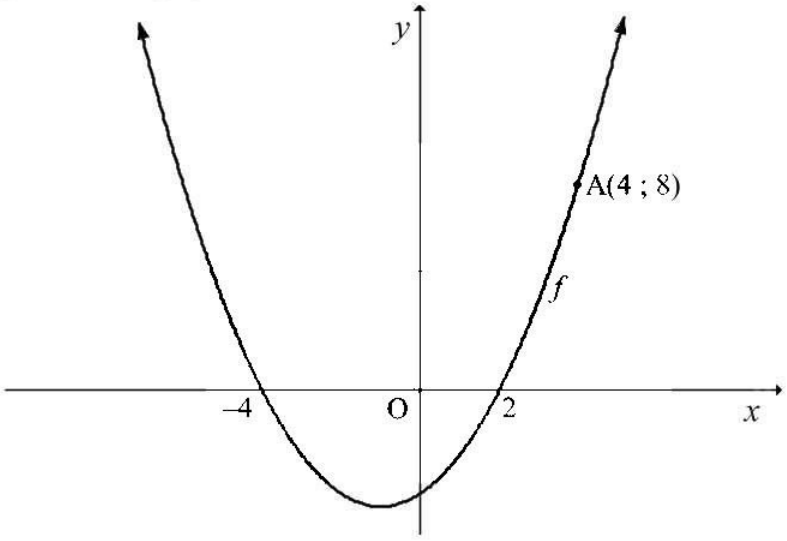
4.5 For which values of x will $f(x).g^{-1}(x)\leq 0$? (2)

4.6 Determine the x-coordinates of the points of intersection between f and its axis of symmetry that has a positive gradient. Stanmorephysics.com (3)

[15]

QUESTION 5

Sketched below is the graph of $f(x)=ax^2+bx+c$, with x-intercepts of -4 and 2.
$A(4\ ;\ 8)$ is a point on the graph.



5.1 Write down the coordinates of the image of A after reflection in the axis of symmetry of f. (2)

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

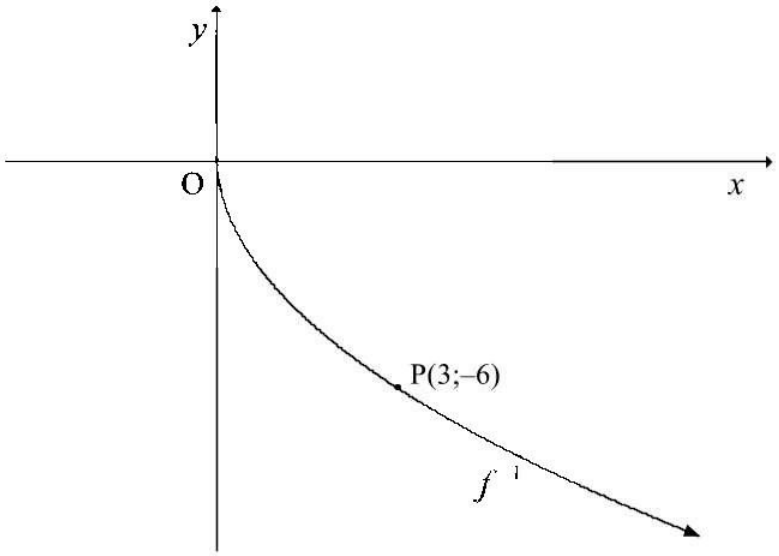
5.3 Determine the values of d such that $\frac{1}{2}(x+d)^2+x=4-d$ will have two positive real roots. (3)

[8]

QUESTION 6

The graph of $f^{-1}(x) = -\sqrt{12x}$ for $x \geq 0$ is sketched below.

The point $P(3;-6)$ lies on the graph of f^{-1}.



6.1 Determine the equation of f in the form $y = \ldots\ldots$ Indicate all restrictions. (3)

6.2 Sketch the graph of f in your answer book. Indicate any intercepts with the axes, as well as the coordinates of one other point. Stanmorephysics.com (3)

6.3 Describe the transformation from f^{-1} to g^{-1}, if $g^{-1}(x) = \sqrt{12x}$, where $x \geq 0$. (1)

[7]

QUESTION 7

7.1 It is given that $a\cos 28° = b$.
Express the following in terms of a and b, WITHOUT the use of a calculator:

7.1.1 $\cos(-28°)$ (2)

7.1.2 $\sin 118°$ (2)

7.1.3 $\sin 56°$ (3)

7.1.4 $\cos 14°$ (3)

7.2 Simply to a single trigonometric ratio, WITHOUT the use of a calculator.
Show ALL working details. Stanmorephysics.com

$$\frac{\left[2\cos^2(180° + x) - 1\right].\cos 67°}{\left(6\sin^2 x - 3\right).\tan 23°}$$ (6)

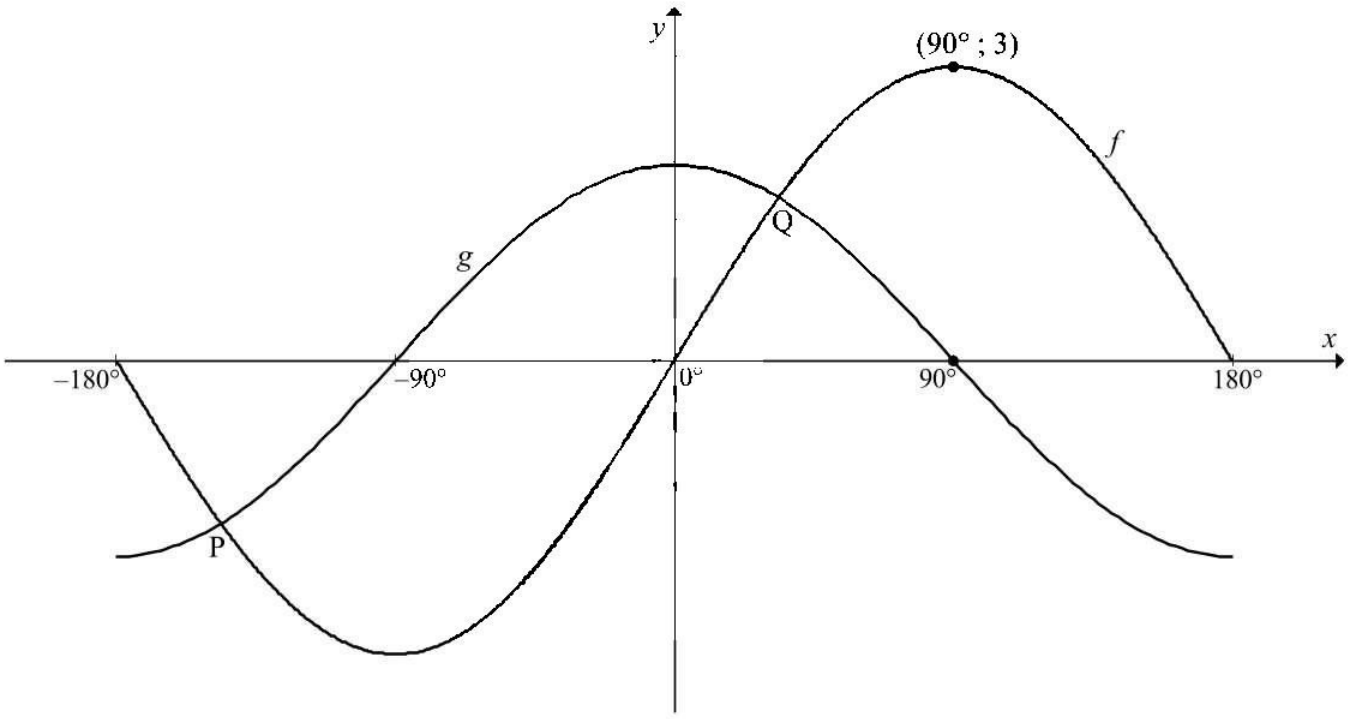
7.3 Prove the following identity, WITHOUT the use of a calculator:

$$\sin(45° + \theta) - \cos(45° + \theta) = \sqrt{2}\sin^3\theta + \sqrt{2}\sin\theta\cos^2\theta$$ (5)

[21]

QUESTION 8

In the diagram below, the graphs of $f(x) = a\sin x$ and $g(x) = 2\cos bx$ are drawn for the interval $x \in [-180° ; 180°]$. g passes through $(90° ; 0)$, and $(90° ; 3)$ is a turning point of f.



8.1 Determine the values of a and b. (2)

8.2 Determine the values of x, in the interval $x \in [-180° ; 0°]$, for which $f(2x) \leq 0$. (2)

8.3 P and Q are two points of intersection of f and g.

8.3.1 Calculate the x-coordinates of P and Q. (4)

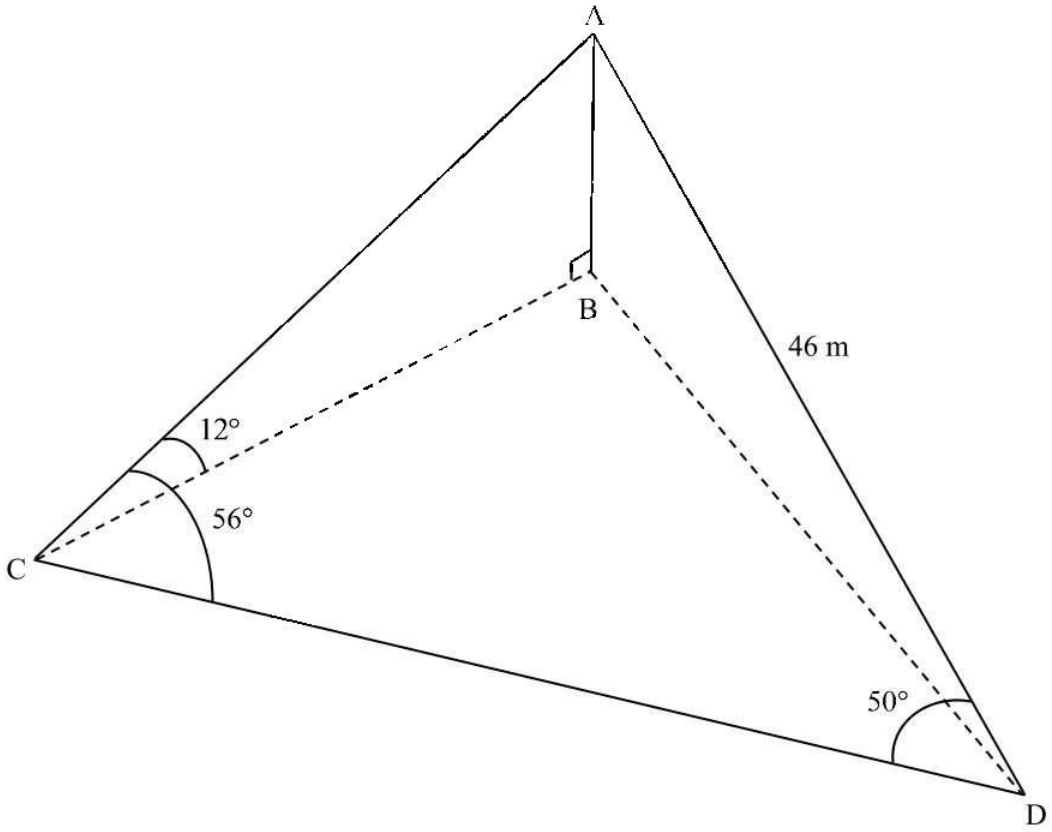
8.3.2 Hence, determine the values of x in the interval $x \in [-180° ; 180°]$, for which $\tan x > \frac{2}{3}$. (4)

8.4 What will the equation of g be after the y-axis has been shifted $45°$ to the left? (2)

[14]

QUESTION 9

A vertical steel pole AB is shown in the diagram below. AC and AD are steel cables, anchoring the pole to the ground at C and D. B, C and D are in the same horizontal plane. The length of AD is 46 m. The angle of elevation of A from C is 12°. $A\hat{C}D = 56°$ and $A\hat{D}C = 50°$.



9.1 Write down the size of $C\hat{A}D$. (1)

9.2 Calculate the length of AC. (3)

9.3 Calculate the height of the pole AB. (2)

9.4 Calculate the area of triangle ACD. (3)

[9]

TOTAL MARKS: 100

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

In ΔABC:

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

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

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

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

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

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

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

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

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