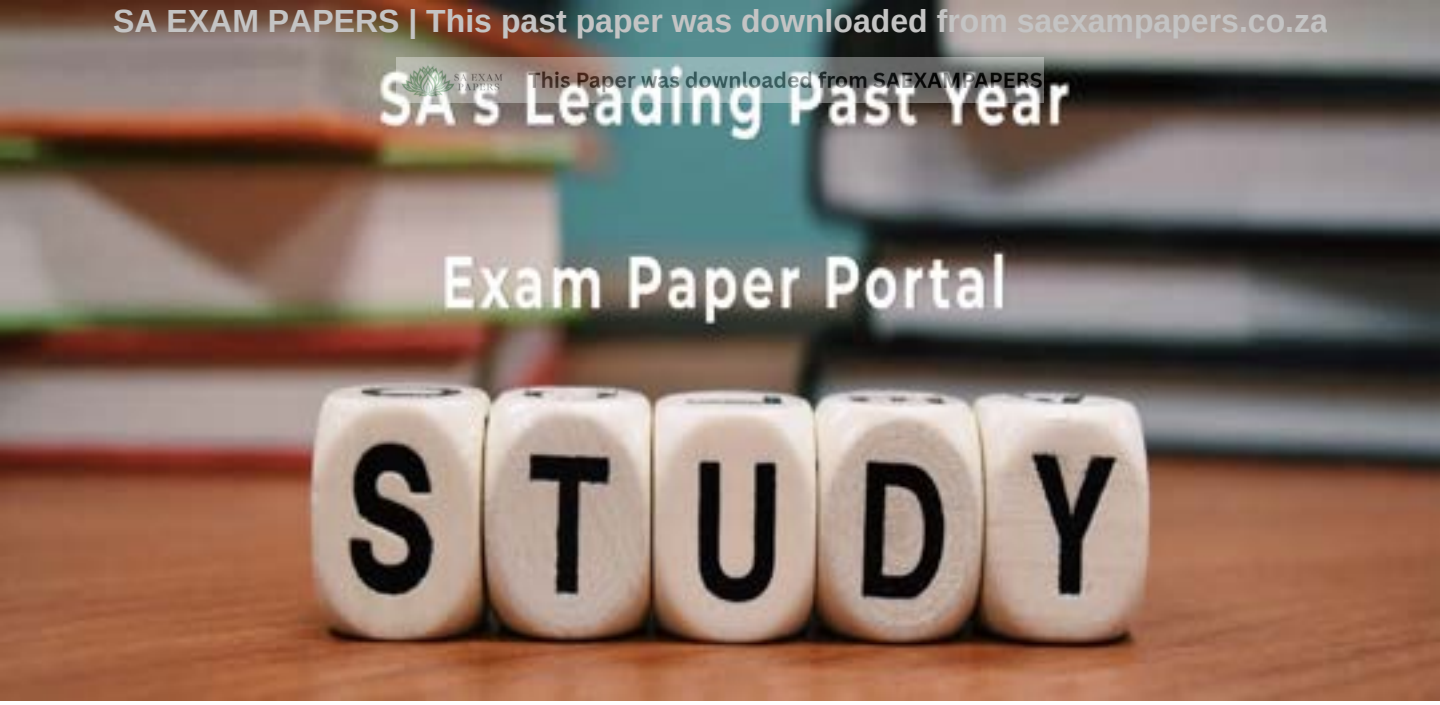


Province of the EASTERN CAPE EDUCATION

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

NATIONAL SENIOR CERTIFICATE

AMATHOLE EAST DISTRICT

GRADE 12

MARCH CONTROLLED TEST
TERM 1 2025

MATHEMATICS

MARKS : **100**

TIME : **2 HOUR**

This paper consists of 10 pages, including information sheet and diagram sheet

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

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

7 Write neatly and legibly.

QUESTION 1

1.1 Given the quadratic pattern $-80\ ;\ -63\ ; -48;$ ... ...

1.1.1 Write down the next two terms of the pattern. (1)

1.1.2 Determine the general term of the pattern in the form of $T_n = an^2 + bn + c$ (3)

1.1.3 Between which two consecutive terms of the quadratic pattern will the first difference be -103 ? (3)

1.2 Consider the following sequence :

$16(p-3)^3\ ; 8(p-3)^4\ ; 4(p-3)^5;$ ... . $p \neq 3$

1.2.1 For which values of p will the series converge? (3)

1.2.2 Calculate the sum to infinity if $p = 3{,}5$ (2)

[12]

QUESTION 2

2.1 The sum of the first n terms of a arithmetic series is given by: $S_n = 4n^2 + 6n$

2.1.1 Determine the first three terms of the series. (2)

2.1.2 The last term of the series is 58 , how many terms are in the series. (3)

2.1.3 Write down the series in sigma notation. (2)

2.2 The sum of the first 5 terms of a convergent geometric series is 62 and the sum to infinity of the series is 64. Determine the common ratio. (4)

2.3 KHANYA FM a community radio in Butterworth had a competition where the prize money is awarded over a period of 5 days. On the first day R5 000 is given to the winner. On the second day, 80% of that prize money was awarded to the winner and so on such the prize money continued to be 80% of the amount awarded on the previous day is given to the winner of the day.

2.3.1 How much money is given to the winner on the fourth day? (1)

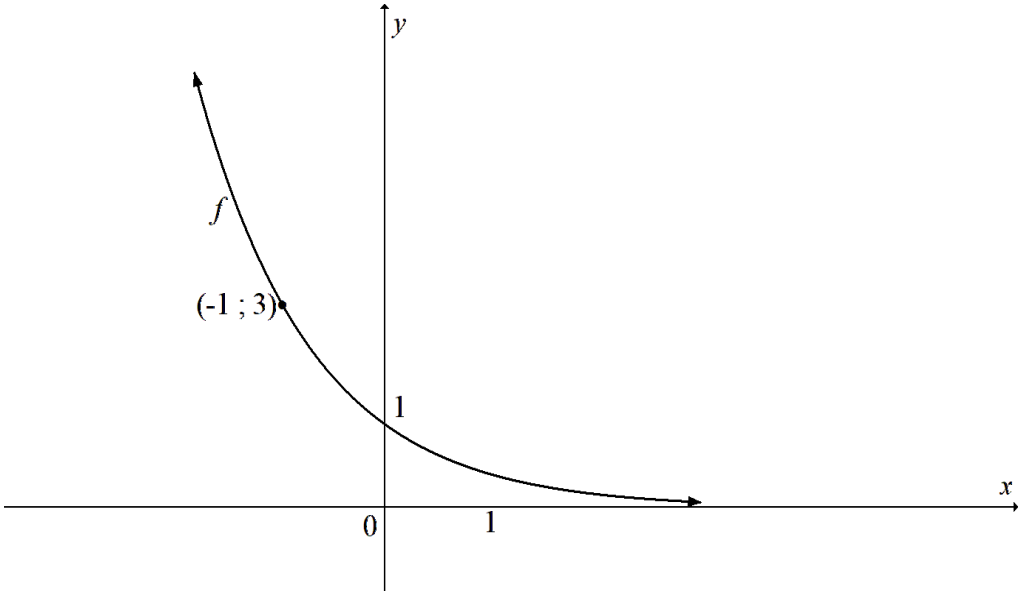
2.3.2 How much money is given out by the station over the 5 days? (3)

2.3.3 If Khanya FM has R22 000 to give out for this competition, over how many days could this competition last before there is no more money to be awarded? (3)

[18]

QUESTION 3

Given: $f(x) = \left(\frac{1}{3}\right)^x$



3.1 Write down the domain of f. (1)

3.2 Write down the range of f. (1)

3.3 Write down the equation of the f^{-1} in the form $y =$ …… (2)

3.4 Draw the graph of f^{-1} in your answer book. Show clearly, the intercepts with the axes as well as the coordinates of the other point. (3)

3.5 Write down the equation of the asymptote of $f^{-1}(x+2)$. (2)

[09]

QUESTION 4

Given $h(x)$: $(y+2)(x-3)=-2$ is a hyperbola.

4.1 Write down the equations of the asymptotes of h (2)

4.2 Calculate the x and y intercepts. (3)

4.3 Clearly sketch the graph of h showing the asymptotes and the intercepts with the axis. (3)

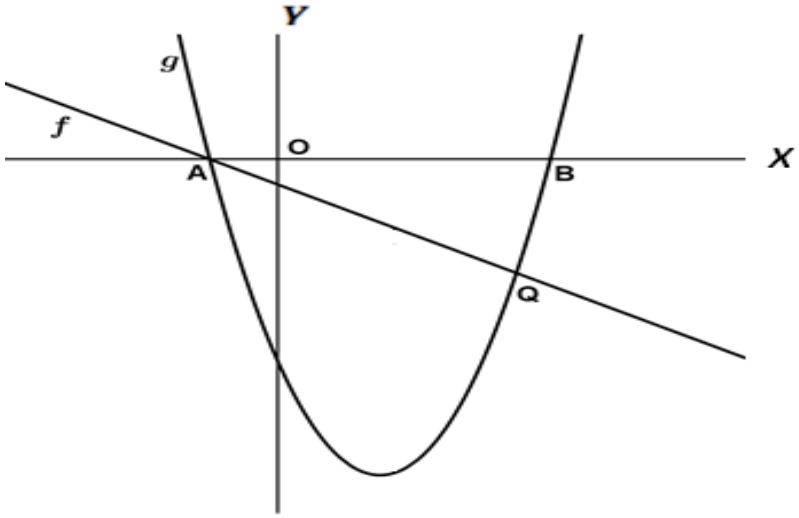
4.4 If $g(x)=h(x+2)$, write down the equation of the vertical asymptote of g (1)

4.5 If the graph of h is symmetrical about the line $y=-x+c$. Determine the value of c. (2)

[11]

QUESTION 5

The graphs of $f(x)=-x-2$ and $g(x)=x^2-6x-16$ are given. The graphs intersect at A and Q. A and B are the x-intercepts of g.



5.1 Determine the length of AB. (4)

5.2 Determine the coordinates of Q. (4)

5.3 Show that the coordinates of the turning point are $(3;-25)$ (2)

5.4 For which values of x is $f(x)>g(x)$? (2)

5.5 Determine for which value of k, will $x^2-6x+k+4=0$, have two equal roots? (2)

[14]

QUESTION 6

6.1 If $sin56° = q$, determine the value of the following in terms of q, **WITHOUT** the use of a calculator.

6.1.1 $\sin(-56°)$ (3)

6.1.2 $tan124°$ (3)

6.1.3 $\cos 4°$ (4)

6.2 Use the above identity $\cos(A-B) = \cos A\cos B + \sin A\sin B$ to prove that $\sin(A-B) = \sin A\cos B - \cos A\sin B$ (2)

6.3 Simplify to a single trigonometric ratio of A

$$\frac{\sin 2A.\cos(-A) + \cos(180+2A)\sin A}{\sin(A-90^0)}$$ (5)

6.4 Given the identity: $\frac{\cos 2x + \cos^2 x + 3\sin^2 x}{2-2\sin^2 x} = \frac{1}{\cos^2 x}$ (2)

6.4.1 Prove the above identity (5)

6.4.2 Hence, determine the value(s) of $x \in [0^0 ; 180^0]$ which will make the above identity is undefined. (2)

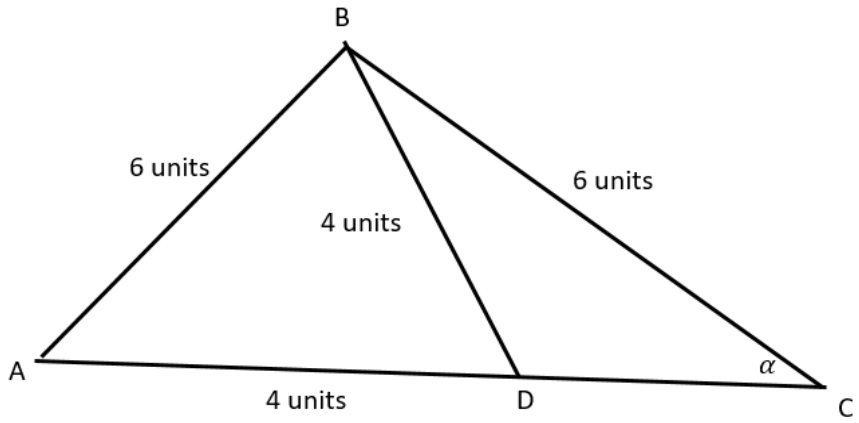
6.6 Determine the value of:

$tan1° \times tan2° \times tan3° \times tan4° \times \ldots\ldots\ldots \times tan87° \times tan88° \times tan89°$. (4)

[30]

QUESTION 7

7.1 In the diagram below ΔABC is an isosceles triangle with $AB = BC = 6\ units$ and $BD = AD = 4\ units$. $\hat{C} = \alpha$.



7.1.1 Show that $A\widehat{D}B = 180° - 2\alpha$. (3)

7.1.2 Hence, calculate the value of $cos2\alpha$. (3)

[6]

GRAND TOTAL[100]

NSC

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

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

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

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

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

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

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

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

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

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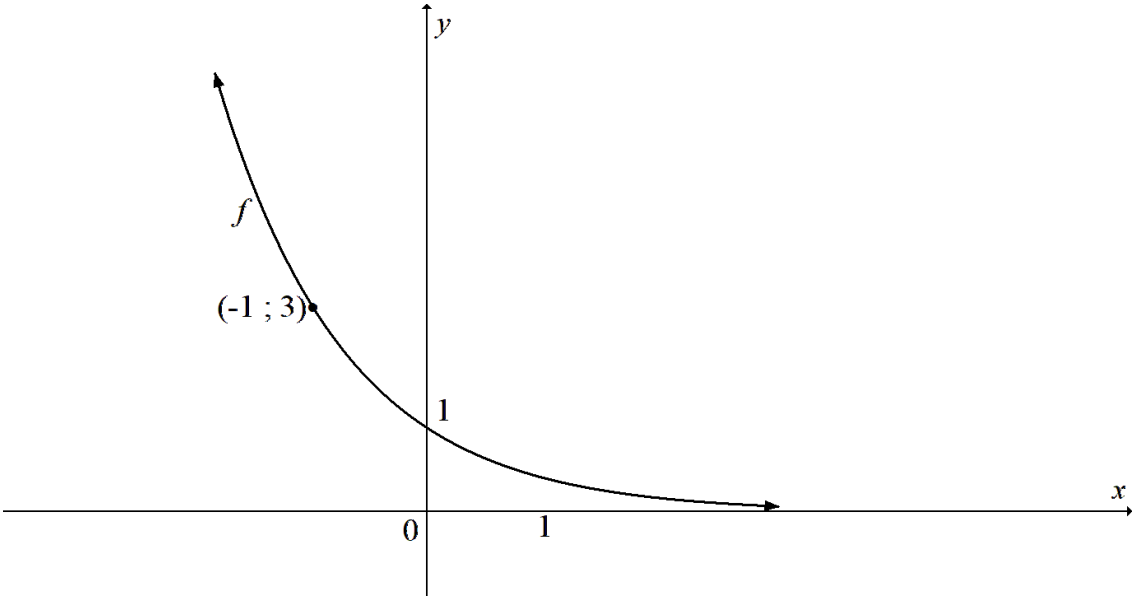
3.4



4.3