Province of the
EASTERN CAPE
EDUCATION

Igoondo leMpuma Kapa: Isebe leMfundo
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Porofensi Ya Kapa Botjhabela: Lefapha la Thuto

NATIONAL SENIOR CERTIFICATE

GRADE 11

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MATHEMATICS P1

MARKS: **150**

TIME: **3 hours**

IMAT1

This question paper consists of 11 pages, including an information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of NINE questions. Answer ALL the questions.
2. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.
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. Diagrams are NOT necessarily drawn to scale.
7. Number the answers correctly according to the numbering system used in this question paper.
8. An information sheet with formulae is included at the end of the question paper.
9. Write neatly and legibly.

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QUESTION 1

1.1 Solve for x:

1.1.1 $x(2x+6)=0$ (2)

1.1.2 $4x^2=9-3x$ (correct to TWO decimal places) (4)

1.1.3 $x(x-4)+2(4-x)>0$ (4)

1.1.4 Given: $f(x)=\dfrac{\sqrt{x+14}}{x+2}$

(a) For which value(s) of x will $f(x)$ be real? (2)

(b) Solve for x, if $f(x)=1$ (4)

1.2 Solve simultaneously for x and y:

$$x-3y=1$$
$$x^2-2xy+9y^2=17$$ (6)

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1.3 Determine the value of x that will satisfy the equation ***(without the use of a calculator and show all your working)***

$$1+\cfrac{10}{1+\cfrac{1}{1+\cfrac{1}{x}}}=7$$ (5)

[27]

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QUESTION 2

2.1 Simplify the following expression:

$$\frac{125^x \cdot \sqrt{5^{4x-2}}}{\sqrt[3]{5^{12x+6}} \cdot 5^x}$$ (4)

2.2 Solve for x:

2.2.1 $6x^{\frac{3}{2}} = 48$ (3)

2.2.2 $x^{\frac{1}{2}} - 3x^{\frac{1}{4}} + 2 = 0$ (4)

2.3 Given: The area of a rectangle is $\left(16^x - 100\right) cm^2$ and the breadth is $\left(4^x + 10\right) cm$.
Determine the length of the rectangle in terms of x. (4)

2.4 The difference between the squares of two consecutive integers is 45. Determine the value of the square of the sum of these two consecutive integers.
Hint: Let the smaller integer be x. (4)
[19]

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QUESTION 3

3.1 Consider the following linear number pattern: 5,5 ; 5,0 ; 4,5 ; . . .

3.1.1 Write down the next TWO terms in the number pattern. (2)

3.1.2 Calculate the general term of the number pattern, in the form

$T_n = bn + c$ (2)

3.1.3 Which term in the number pattern is the first to be less than $-113,5$? (2)

3.2 The constant difference of a linear number pattern is 5 and the 38^{th} term is 192.

Determine the value of the first term. (3)
[9]

QUESTION 4

4.1 Given the n^{th} term of the quadratic number pattern: $T_n = n^2 - 12n + k$

4.1.1 If $T_{62} = 3132$, determine the value of k. (2)

4.1.2 Determine the first THREE terms of the first difference number pattern. (2)

4.1.3 Calculate the value of n for which the quadratic number pattern will have a minimum. (2)

4.1.4 Determine T_{n-1}, in terms of n. (2)

4.1.5 Between which two consecutive terms of the quadratic number pattern, will the difference be 149? (3)

4.2 In a quadratic number pattern, the second term is 4, the third term is three times the first term and the fourth term is 18.

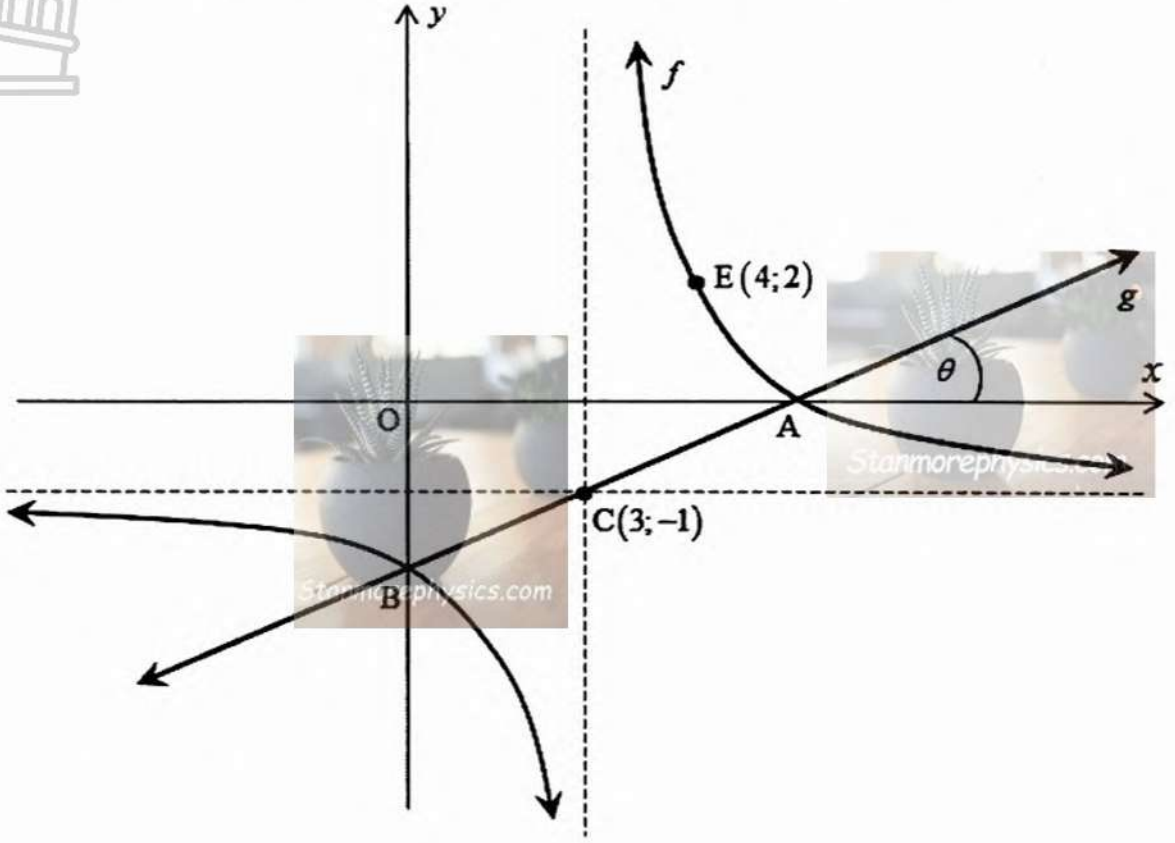
Determine the value of T_3 (3)
[14]

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QUESTION 5

The graphs of $f(x)=\frac{a}{x+p}+q$ and $g(x)=\frac{x}{3}+c$ are drawn below. $C(3;-1)$ is the point of intersection between the asymptotes of f. A and B are x- and y-intercepts of f and g respectively. E(4 ; 2) is a point on f in the first quadrant.



5.1 Write down the value of p. (1)

5.2 Determine the equation of f. (3)

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

5.4 Write down the domain of h, if $h(x)=f\left[-(x-4)\right]$ (3)

5.5 Determine the value of x, for which $f(x).g(x)<0$ (2)

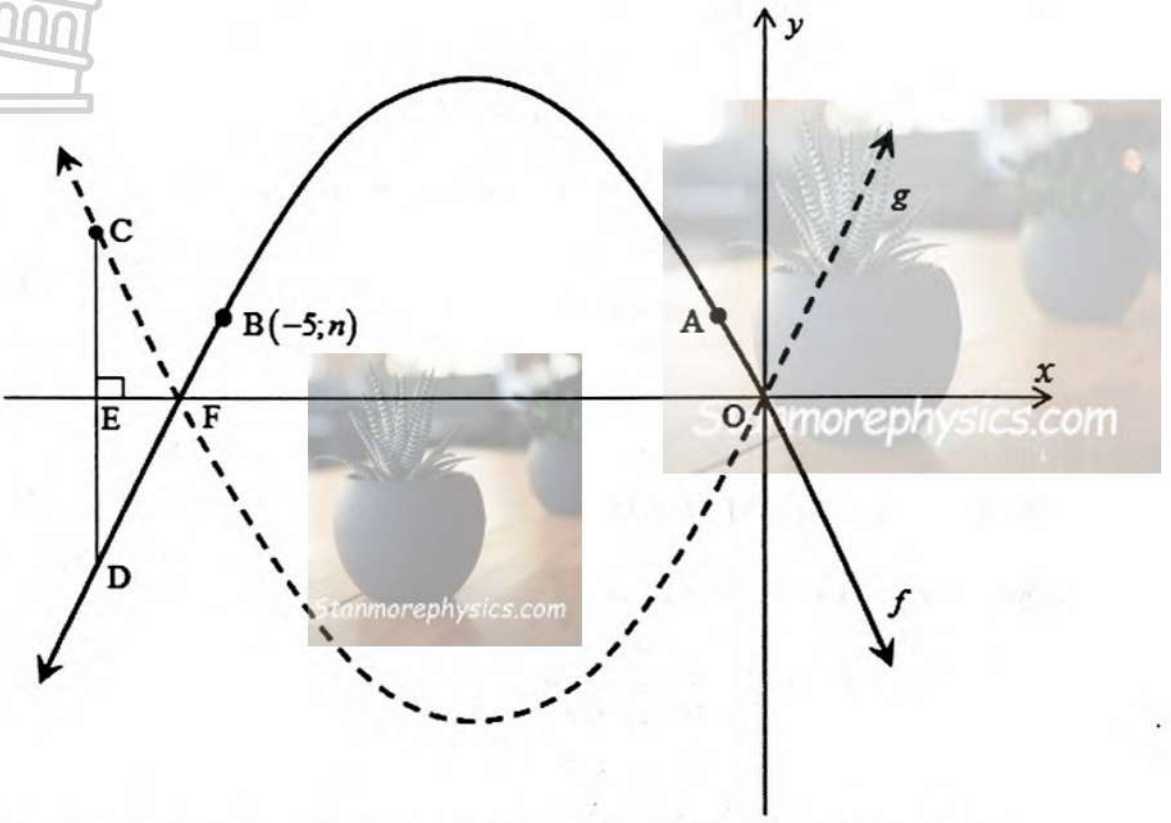
5.6 Calculate the area of ΔABE if the length $AB=2\sqrt{10}$ units. (5)

[17]

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QUESTION 6

The graphs of $f(x)=-x^2-6x$ and $g(x)=ax^2+bx$ are drawn below. g is the reflection of f along the x-axis. A and $B(-5;n)$ are symmetrical on f along $x=-p$, i.e. the axes of symmetry.



6.1 Write down the equation of f in the turning point form, i.e. $y=a(x+p)^2+q$ (3)

6.2 Determine the coordinates of A. (3)

6.3 Determine the length of OE if CD = 14 units. (5)

6.4 Determine the value(s) of k for which:

6.4.1 $f(x)=-x^2-6x+k$ will have non-real roots. (2)

6.4.2 $f(x+k)$ will have two real roots that have different signs. (3)

[16]

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QUESTION 7

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

7.1.1 Write down the equation of the asymptote of f (1)

7.1.2 Calculate the coordinates of the intercepts of f (3)

7.1.3 Sketch the graph of f. Indicate the horizontal asymptote as well as the intercepts with the axes. (3)

7.1.4 Determine the value of x for which $f(x)\geq 0$ (2)

7.2 An exponential function with equation $h(x)=a.k^x+r$ has the following properties:

- The range is $y\in(-2;\infty)$
- The points $(0;0)$ and $(2;6)$ lie on the graph

Determine the equation of h, in the form $y=\ldots$ (4)

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QUESTION 8

8.1 A motorbike costs R250 000 and depreciates by 13% p.a. annually, calculated on the reducing balance method.

Calculate what the motorbike will be worth after 6 years. (3)

8.2 Convert an annual effective rate of 7,5% per annum to a nominal rate per annum compounded quarterly. (3)

8.3 Rodney starts an investment with a deposit of R25 000. Two years later, he deposits another R10 000. Exactly four years after he started the investment, he withdraws R5 000. For the first two years, the interest is calculated at 4% per annum, compounded monthly and thereafter it is calculated at 7% per annum, compounded semi-annually.

What is the accumulated amount of the investment exactly five years after the initial deposit? (5)

8.4 Brian borrows R x at an annual interest rate of 12% p.a. He has two options to repay the loan.

OPTION 1: Pay R5 000, 2 years after the loan was granted and the remaining amount, 4 years after the loan was granted. The interest is compounded annually.

OPTION 2: Pay R3 000, 1 year after the loan was granted and the remaining amount, 3 years after the loan was granted. The interest is compounded semi-annually.

If the total amount paid in both options is the same, calculate the value of x. (6)

[17]

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QUESTION 9

9.1 A and B are independent events. It is further given that:

- P(A) = 0,3
- P(B) = 0,6

9.1.1 Are the events, A and B mutually exclusive? Motivate your answer. (2)

9.1.2 Represent the information on a Venn diagram. (3)

9.1.3 Calculate P (not A and not B). (2)

9.2 The contingency table below represents 106 athletes' responses regarding jogging on the sand.

	Male	**Female**	**Total**
Enjoy jogging on sand	26	30	56
Do not enjoy jogging on sand	16	34	50
Total	42	64	106

9.2.1 If an athlete from this group is chosen randomly, what is the probability that it is a male? (1)

9.2.2 Is the event "enjoy jogging on sand" independent of the gender? (4)

9.3 During the summer season in South Africa, the probability of sunny weather on any given day is 0,7. If it is sunny, the probability that a person uses sunscreen is x. If it is not sunny, the probability of using sunscreen is $0,2x$.

9.3.1 Draw a tree diagram, clearly labelling the branches and indicating the outcomes. (3)

9.3.2 If it is given that the overall probability of using sunscreen on a randomly selected day is $0,62$, determine the value of x. (3)

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TOTAL: 150

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INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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