Province of the
EASTERN CAPE
EDUCATION

Iphondo leMpuma Kapa: Isebe leMfundo
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Porafensie Ya Kapa Botjahabela: Lefapha la Thuto

NATIONAL SENIOR CERTIFICATE

GRADE 12

JUNE 2025

MATHEMATICS P1

MARKS: 150

TIME: 3 hours

JMATHE1

This question paper consists of 12 pages, including 1 information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 questions.

2. Answer ALL the questions.

3. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.

4. Answers only will NOT necessarily be awarded full marks.

5. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.

6. If necessary, round off answers to TWO decimal places, unless stated otherwise.

7. Diagrams are NOT necessarily drawn to scale.

8. An information sheet, with formulae, is included at the end of the question paper.

9. Number the answers correctly according to the numbering system used in this question paper.

10. Write neatly and legibly.

QUESTION 1

1.1 Solve for x:

1.1.1 $x^2+2x+1=0$ (2)

1.1.2 $x(5x-3)=1$ (correct to TWO decimal places) (4)

1.1.3 $2x+3>x^2$ (4)

1.1.4 $\sqrt{7x-12}-x=0$ (4)

1.1.5 $\left(\frac{1}{6}\right)^{3x+2}.216^{3x}=\frac{1}{216}$ (4)

1.2 Solve simultaneously for x and y:

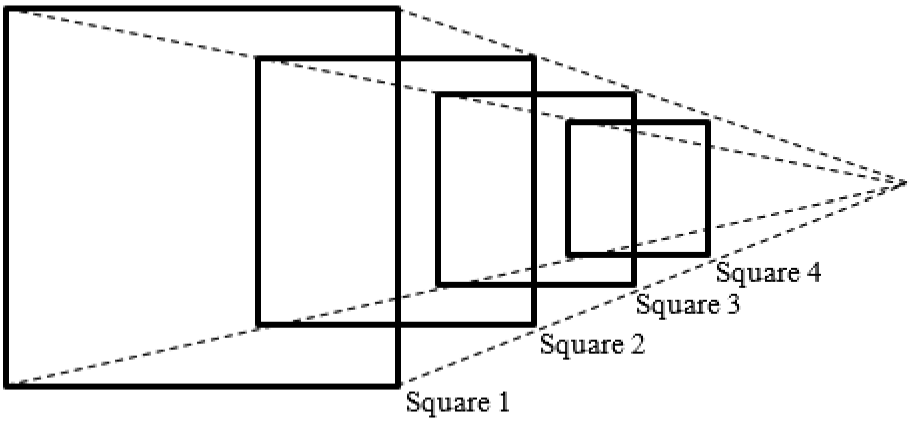
$x+y=3$
$x^2+2y^2=18$ (5)

1.3 Given: $\left(\sqrt{5}\right)^x-\left(\sqrt[3]{2}\right)^y=17$; where x and $y\in\mathbb{N}$, determine a value for $P=(x\times y)$. (4)

[27]

QUESTION 2

2.1 Given the following geometric series: $36 + 18 + 9 + \frac{9}{2} + \ldots$ representing the areas of the squares in cm^2, as drawn below.



2.1.1 Does the series converge? Justify your answer. (2)

2.1.2 Calculate S_∞. (2)

2.1.3 Which square will have a side length of $\frac{3}{8}$ cm? (3)

2.1.4 Calculate the sum of the diagonals of the first ten squares. (4)

2.2 The seventh term of an arithmetic sequence is 4 and the twelfth term is 14.

2.2.1 Determine the common difference and the first term of the sequence. (3)

2.2.2 Which term of the sequence will be the additive inverse of the first term? (2)

2.3 Given: $\sum_{p=k}^{100}(4p-1)=19995$, determine the value of k. (5)

[21]

QUESTION 3

3.1 Consider the quadratic number pattern: 3 ; 12 ; 33 ; 66 ; …

3.1.1 Write down the value of the next term of the quadratic number pattern. (2)

3.1.2 If the general term of the quadratic pattern is $T_n = 6n^2 - 9n + 6$, determine the value of $T_9 - T_5$. (2)

3.2 The following information of a quadratic pattern is given:

- $T_n = an^2 + bn + 1$
- $T_4 = 27$
- $T_3 - T_2 = 8$

Determine the values of a and b. (5)

[9]

QUESTION 4

4.1 Given the functions $f(x) = x^2 - 2x - 3$ and $g(x) = x - 3$, where $x \in \mathbb{R}$.

4.1.1 Sketch the graphs of the two functions $f(x)$ and $g(x)$ on the same system of axes. Clearly indicate the coordinates of the turning point of $f(x)$, the axis of symmetry of $f(x)$ and the x- and y-intercepts of both graphs. (6)

4.1.2 Determine the value(s) of x, for which:

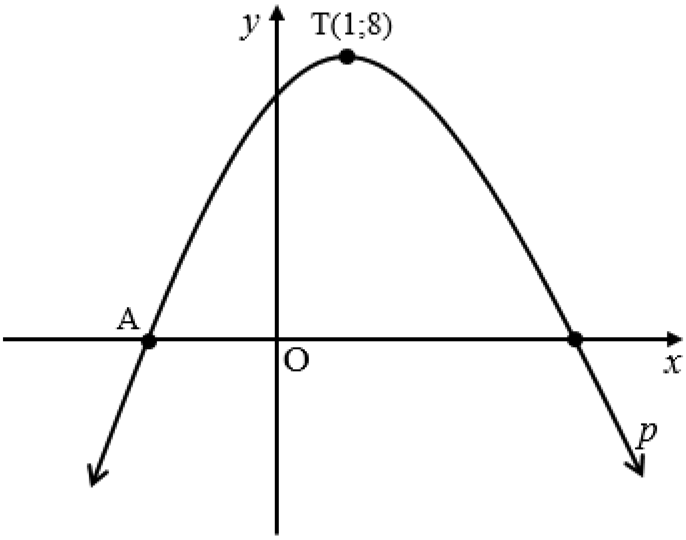
(a) $f(x) > g(x)$ (2)

(b) $f(x).g(x) \leq 0$ (2)

4.1.3 Determine the range of h, if $h(x) = -[f(x) + 4]$. (2)

4.2 The following information of a parabola, p sketched below, is given:

- Coordinates of the turning point are $\text{T}(1;8)$
- $p^{/}(x) = -x + 1$
- Gradient of the tangent at point A, an x-intercept of p, is 4

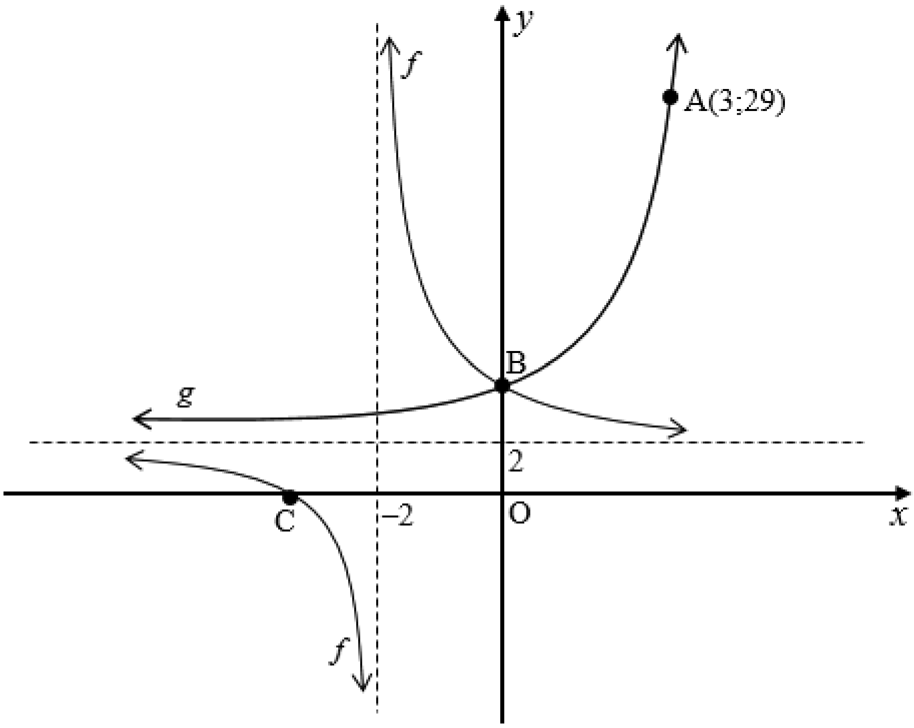


Determine the equation of the parabola, in the form $y = \ldots$ (4)

[16]

QUESTION 5

In the diagram below, the graphs of $f(x)=\dfrac{2}{x+p}+q$ and $g(x)=b^x+2$ are given, with point $A(3\,;\,29)$ on g.



5.1	Write down the coordinates of B.	(1)
5.2	Write down the range of $g(x)$.	(1)
5.3	Determine the value of b.	(2)
5.4	Determine the coordinates of C, the x-intercept of f.	(2)
5.5	If $h(x)=g(x)-2$, determine the equation of $h^{-1}(x)$, in the form $y=$ ...	(3)
5.6	Determine the equation of the axis of symmetry of f, which has a positive gradient.	(2)
5.7	For which values of x is $f(x)\times g'(x)\leq 0$?	(2)
5.8	Determine the area of ΔABC.	(4)

[17]

QUESTION 6

6.1 Siya invested R500 000 for 5 years at an interest rate of 6,5% p.a. compounded monthly.

6.1.1 Calculate the effective interest rate of the investment. (correct to 4 decimal places) (3)

6.1.2 Hence, or otherwise calculate how much money he will get at the end of the five years. (2)

6.2 A sports car is purchased for R800 000. After how many years will the value of the car be R250 000, if the annual rate of depreciation is 20,75% p.a. on the reducing-balance method. (3)

6.3 A school is planning to build a mini-school hall. The cost is calculated to be R2 000 000 in ten years' time. On 1 January 2025, an initial deposit of R650 197,00 is made into the school hall project savings account. Interest is earned at 6,1% p.a. compounded monthly for the first 5 years. On 1 January 2030, another amount, of R x, is deposited into the savings account . The interest rate for the last 5 years is 7,47% p.a. compounded quarterly.

Determine the amount that was deposited into the savings account on 1 January 2030, i.e. calculate the value of x. (6)

[14]

QUESTION 7

7.1 Determine $f'(x)$, from first principles, if $f(x) = x^2 + x$. (5)

7.2 Determine:

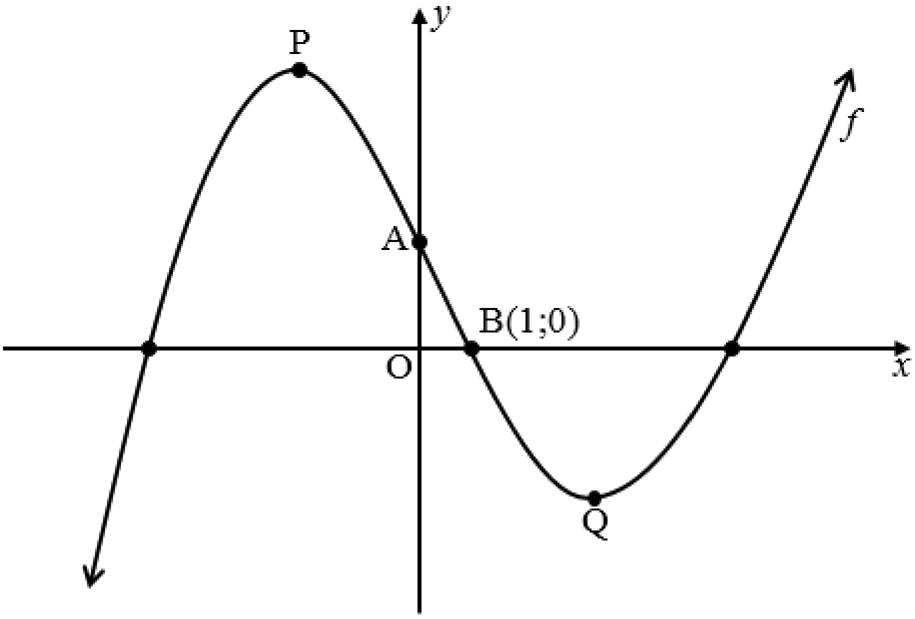
7.2.1 $f'(x)$, if $f(x) = 3x^4 - \frac{1}{2}x^{-2}$ (2)

7.2.2 $D_x\left[\frac{x+4}{\sqrt{x}}\right]$ (4)

[11]

QUESTION 8

The graph of $f(x)=2x^3-3x^2+cx+37$ is sketched below. B$(1\ ;\ 0)$ is an x-intercept of f. Answer the questions that follow.

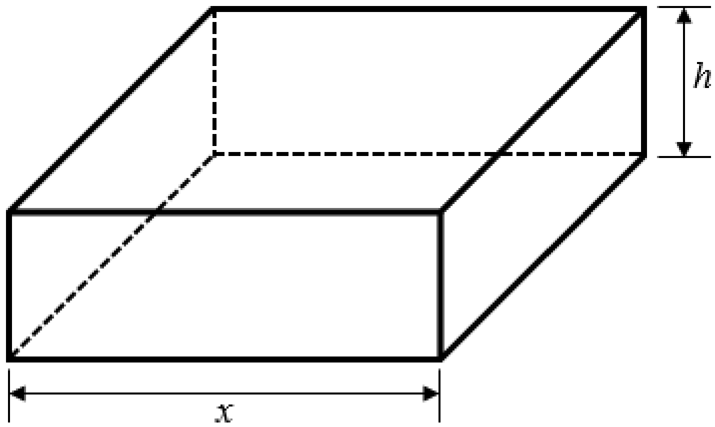


8.1	Write down the length of OA.	(1)
8.2	Show that the value of $c=-36$.	(2)
8.3	Determine the coordinates of P and Q, the turning points of f.	(4)
8.4	For which values of x is $f'(x)\geq 0$?	(2)
8.5	For which values of k, will $g(x)=f(x)+k$ have only one real root?	(2)
8.6	Determine whether f is concave up or concave down at the x-intercept, B$(1\ ;\ 0)$.	(3)

[14]

QUESTION 9

An open box with a square base is to be made out of a given quantity of pre-cut cardboard sheet. The total surface area of the outside of the box is 300 cm^2.



Determine the value of x for which the volume of the box will be a maximum, and hence the maximum volume of the box. **[7]**

QUESTION 10

10.1 Two events A and B are such that:

- P(A) = 0,4
- P(B) = x
- P(A or B) = 0,52

Determine the value of x for which the events are:

10.1.1 Mutually exclusive (2)

10.1.2 Independent (3)

10.2 A school organised a winter camp for 120 learners. The learners were asked which hot beverage they prefer. They could choose from coffee (**C**), milo (**M**) and tea (**T**).

The following information was collected:

- 5 learners do not drink coffee, milo or tea
- 10 learners drink only milo
- 8 learners drink only coffee
- 35 learners do not drink tea
- 6 learners drink only tea
- 66 leaners drink coffee and tea
- 75 learners drink milo and tea
- x learners drink coffee, milo and tea

10.2.1 Draw a Venn diagram to represent the above information. (3)

10.2.2 Determine the value of x. (2)

10.2.3 Determine the probability that a learner chosen at random drinks coffee and tea. (1)

10.2.4 Determine the probability that a learner chosen at random prefers at least TWO of the beverages. (1)

10.2.5 P(not C and not T) = … (2)

[14]

TOTAL: 150

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

$y = mx + c$ $\qquad y - y_1 = m(x - x_1)$ $\qquad m = \dfrac{y_2 - y_1}{x_2 - x_1}$ $\qquad m = \tan\theta$ $\qquad (x-a)^2 + (y-b)^2 = r^2$

In Δ ABC:

$\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$ $\qquad a^2 = b^2 + c^2 - 2bc.\cos A$

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

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

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

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

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

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

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