



**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

NOVEMBER 2023

**MATHEMATICS P1
(DEAF)**

MARKS: 150

TIME: 3 hours

This question paper has 10 pages with an information sheet.

INSTRUCTIONS AND INFORMATION

Read the instructions. Answer the questions.

1. This question paper has **TEN** questions.
Answer ALL the questions.
2. Clearly show **ALL** calculations, diagrams, graphs that you used in your answers.
3. You **may use** a prescribed calculator.
Some questions will tell you **NOT** to use a calculator.
4. You will **NOT** always get marks for answer only.
5. **Round off** answers to **TWO** decimal places.
Some questions will tell you how to round off.
6. **Diagrams** are **NOT** drawn to scale.
Some questions will tell you to use the scale.
7. **Number** the answers the **same** as the numbers on the **question paper**.
8. An **information sheet** with **formulae** is at the **end** of the question paper.
9. Write **neatly**.
Make sure your **work** is **easy to read**.

QUESTION 11.1 **Solve** for x :

1.1.1 $x^2 - 3x = 0$ (2)

1.1.2 $x(3x+1) = 5$ (4)

1.1.3 $2x^2 - 5x + 3 < 0$ (3)

1.1.4 $2\sqrt{x+2} = x-1$ (5)

1.2 Solve for x **and** y **simultaneously** (at the same time):

$x + 3y = 2$ and $x^2 - 3xy = 4$ (6)

1.3 **Given:** $(x-3)^2 = p^2 - 4$ **Determine** the value(s) of p for which the **roots** will be **non-real**. (5)**[25]****QUESTION 2**2.1 Do **NOT** use a calculator.
Simplify fully:

$$\frac{2^{n+1} - 8 \cdot 2^{n-3}}{2^{n-2}}$$
 (4)

2.2 **Solve** for x :

2.2.1 $\sqrt[x]{27} = 2187$ (4)

2.2.2 $4^x - 16 = 6 \cdot 2^x$ (5)

2.3 Do **NOT** use a calculator.
Simplify.

Given that $x = \sqrt{3} - 2$, simplify $\frac{x^2 + 1}{x^2 - 5}$

(Give your answer in simplest surd form.) (5)**[18]**

QUESTION 3

3.1 Given the **linear number pattern**: 17 ; 14 ; 11 ; ... ; -247

3.1.1 Write down the **fourth** and **fifth terms** of the **number pattern**. (2)

3.1.2 Determine the **general term** T_n , of the **number pattern**. (2)

3.1.3 Calculate the **value** of T_{17} . (2)

3.1.4 Determine the **number** of **terms** in the **number pattern**. (2)

3.2 In a **linear number pattern**, the **first term** is $2x + 11$.

The **second term** is 2.

The **fourth term** is $2x - 4$.

Calculate the **value** of x . (5)

[13]

QUESTION 4

4.1 Given the **quadratic number pattern**: 94 ; 90 ; 82 ; 70 ; ...

4.1.1 Determine the **next two terms** of the **number pattern**. (2)

4.1.2 Determine T_n , the **general term** of the **number pattern**. (4)

4.1.3 Calculate **TWO consecutive terms** whose **first difference** is -136. (4)

4.2 A **quadratic number pattern** has a **general term** $T_n = an^2 + bn - 15$.

$T_2 - T_1 = 3$ and $T_3 - T_2 = 7$.

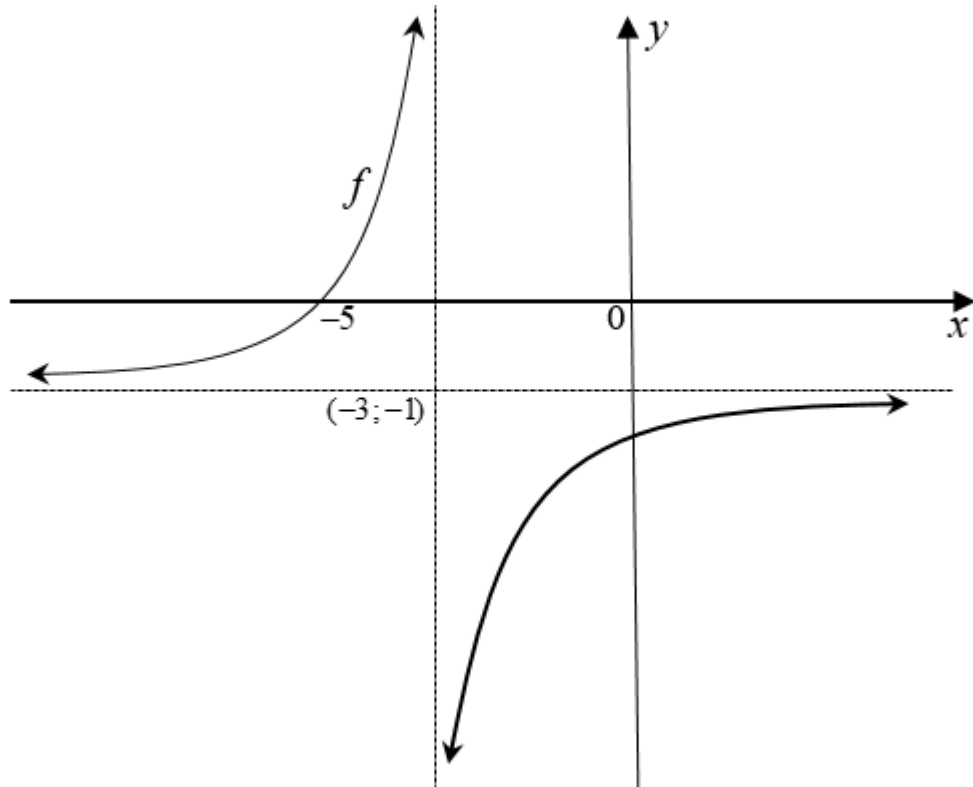
Determine the **values** of a and b . (5)

[15]

QUESTION 5

The **diagram below** shows the **graph** of $f(x) = \frac{a}{x+p} + q$.

The **asymptotes** of f **intersect** at $(-3; -1)$ and f **cuts** the x -axis at $x = -5$.



- 5.1 Write down the **values** of p and q . (2)
- 5.2 Determine the **value** of a . (3)
- 5.3 Calculate the y -intercept of f . (2)
- 5.4 Write down the **domain** of f . (2)
- 5.5 Determine the **line of symmetry** of f with a **negative gradient** in the form $y = mx + c$. (2)
- 5.6 For **which values** of x is $f(x) \geq 0$? (2)
- 5.7 Describe the **transformation** of f to g , given that $g(x) = \frac{2}{x-1} + 1$ (4)
- [17]

QUESTION 6**Given:** $f(x) = 2(3^x) + 1$

- 6.1 Write down the **coordinates** of the y -intercept of f . (1)
- 6.2 Write down the **equation** of **asymptote** of f . (2)
- 6.3 Draw a **sketch** of f .
Show clearly the **asymptote** and **intercept(s)** with the **axes**. (3)
- 6.4 Write down the **range** of h , if $h(x) = 2(3^{x+1}) - 5$. (2)

[8]

QUESTION 7

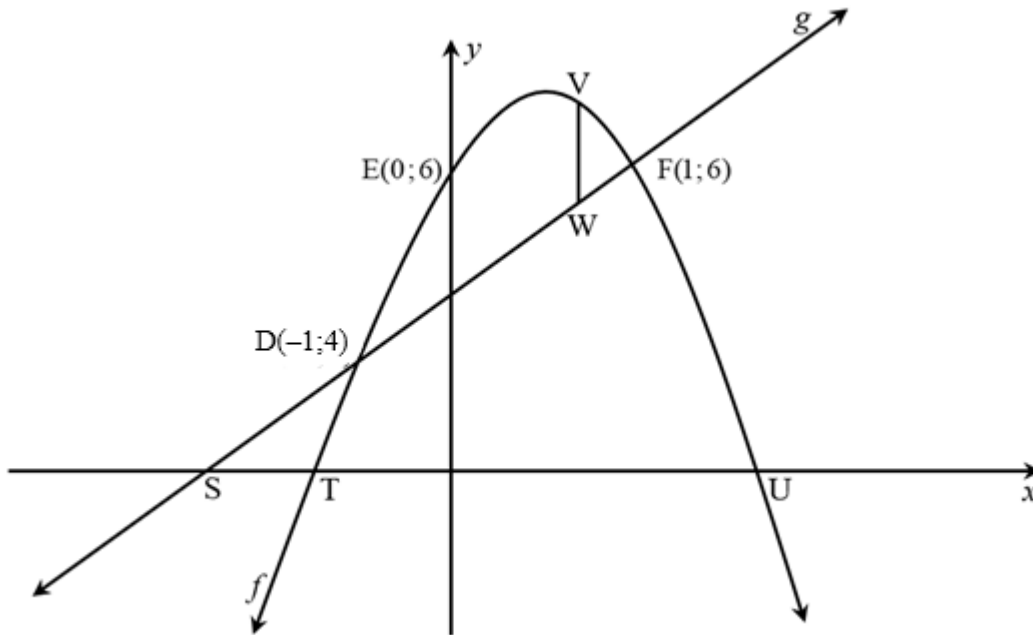
The **diagram** below shows the **graphs** of $f(x) = ax^2 + bx + c$ and $g(x) = mx + q$.

D(−1;4) and F(1;6) are **points of intersection** of f and g .

T and U are the x -intercepts of f . E(0;6) the y -intercept of f .

S is the x -intercept of g .

VW is a **straight line drawn parallel** to the y -axis.



- 7.1 Write the **equation** of the **axis of symmetry** of f . (1)
- 7.2 For **which values** of x is f **decreasing**? (1)
- 7.3 Calculate the **average gradient** of f between D and E. (2)
- 7.4 Determine the **equation** of g . (3)
- 7.5 Show that $f(x) = -x^2 + x + 6$. (4)
- 7.6 Calculate the **length** of SU. (5)
- 7.7 Determine the **values** of x for which $f(x) - g(x) \leq 0$. (2)
- 7.8 Calculate the **maximum length** of VW. (3)

[21]

QUESTION 8

- 8.1 Calculate the effective interest rate per annum_(yearly) if an investment earns interest at a rate of **9,3% p.a. compounded_(combined) monthly**. (3)
- 8.2 A school buys a bus that costs **R312 000** at the start of **2023**. The average inflation over the next **5 years** is **6,91%**. Calculate the cost of replacing the school bus at the end of **5 years**. (3)
- 8.3 Lwandi made an initial_(opening) deposit of **R23 000** into an investment account that paid an interest rate of **9,25% compounded quarterly**. After **3 years** since the start of his investment, he deposited **R13 500** and the interest rate changed to **8,2% p.a., compounded_(combined) monthly**. Exactly **5 years** after his initial_(opening) deposit, Lwandi withdrew **R9 000**.
- 8.3.1 Calculate the total value of the investment in Lwandi's account at the end of the **5th** year. (5)
- 8.3.2 At the end of **8 years** after the initial_(opening) deposit, Lwandi decided to withdraw and use the money. Calculate the annual_(yearly) interest rate of the investment in the final **3 years** if his final balance was **R64 487,24** and the interest was compounded_(combined) monthly. (4)

[15]

QUESTION 9

9.1 For any two events **A** and **B**, it is given that $P(A) = 0,35$ and $P(A \text{ or } B) = 0,61$.
Determine $P(B)$ if:

9.1.1 A and B are **mutually exclusive**. (3)

9.1.2 A and B are **independent**. (4)

9.2 A **cellphone distribution company** investigated the number of **defective**(faulty) **phones** that they **obtain**(get) from two suppliers, **Axis Phones** and **Direct Phones**. They recorded their findings in a contingency table.

	Axis Phones	Direct Phones	Total
Defective	58	a	b
Not Defective	326	188	514
Total	384	c	600

9.2.1 Determine the values of a , b and c . (3)

9.2.2 Calculate the probability that a cellphone chosen at random is supplied by **Direct Phones**. (1)

9.2.3 Calculate the probability that a cellphone chosen at random is **Not Defective** **OR** it is from **Axis Phones** and **Defective**. (3)
[14]

QUESTION 10

A bag contains(holds) x balls of which **5** are **red** and the **rest** are **green**.

One ball is **taken out** of the **bag** **randomly** and it is not **replaced**.

A **second ball** is **taken out** of the **bag**.

The probability of picking both green balls is $\frac{3}{11}$.

Show that the probability of picking both green balls can be represented by the equation:

$$4x^2 - 59x + 165 = 0. \quad [4]$$

TOTAL: 150

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$y = mx + c \quad y - y_1 = m(x - x_1)$$

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

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

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

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

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

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

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

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

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

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

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

$$\bar{x} = \frac{\sum x}{n}$$

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

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

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

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

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