Northern Cape
Department of Education

PROVINSIALE VOORBEREIDENDE EKSAMEN/
PROVINCIAL PREPARATORY EXAMINATION

GRAAD/GRADE 12

WISKUNDE/MATHEMATICS

VRAESTEL/PAPER 1

SEPTEMBER 2026

PUNTE/MARKS: 150

TYD/TIME: 3 uur/hours

Hierdie vraestel bestaan uit 10 bladsye, 1 inligtingsblad en 'n antwoordeboek van 23 bladsye./
This question paper consists of 10 pages, 1 information sheet and an answer book of 23 pages.

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INSTRUCTIONS AND INFORMATION

Read the following instructions and information carefully before answering the questions.

1. This question paper consists of TEN questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, etc. which 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. Write neatly and legibly.

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QUESTION 1

1.1 Solve for x:

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

1.1.2 $-x^2+7x=-5$ (correct to TWO decimal places) (4)

1.1.3 $(x+1)(2-x)<0$ (3)

1.1.4 $\sqrt{x-3}+1=\frac{x}{2}$ (4)

1.2 Solve for x and y simultaneously:

$y-x^2=-3x+2$
$y=2x-4$ (5)

1.3 Given the quadratic equation $2x^2 - mx + 2 = 0$

The equation is known to have equal real roots.

Furthermore, the quadratic equation $x^2-(m-2)x+k=0$ also has equal roots that are reciprocals of the roots of the first equation.

Determine the possible value(s) of m and k. (7)
[25]

QUESTION 2

The first term of a quadratic number pattern is 5. The general term of the first differences of the pattern is $T_p=6p+2$.

2.1 Determine the next TWO terms of the quadratic number pattern. (2)

2.2 Hence, or otherwise, show that the general term of the quadratic number pattern is given by $T_n=3n^2-n+3$. (3)

2.3 What is the position of the next consecutive term greater than 2327? (4)

2.4 The quadratic number pattern has two consecutive terms of which the difference is 902. Determine the positions of these consecutive terms. (2)
[11]

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QUESTION 3

3.1 Given the geometric series $\frac{6}{10} + \frac{6}{20} + \frac{6}{40} + \ldots = S$

3.1.1 If the series has 18 terms, determine the value of S. (3)

3.1.2 Determine the largest value of n for which $T_n > \frac{6}{4096}$. (4)

3.2 Prove that the following sum is a convergent geometric series. Show ALL calculations.

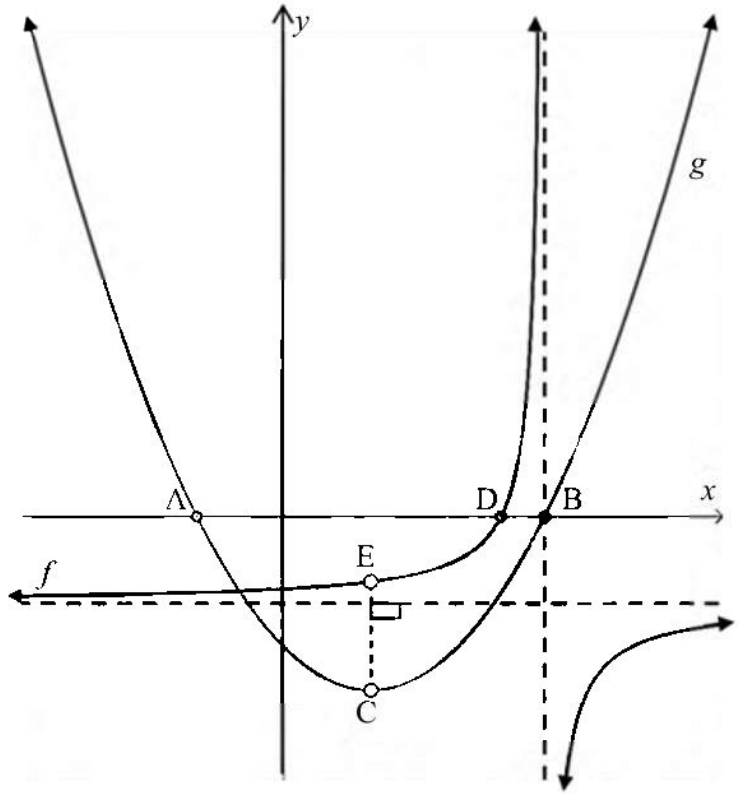
$T_n = 5\left(\frac{1}{3}\right)^n$ (2)

3.3 Given $\sum_{k=p}^{\infty} 5\left(\frac{1}{3}\right)^k = \frac{5}{18}$

Calculate the value of p. (5)
[14]

QUESTION 4

The graphs of $g(x) = (x+1)(x-3)$ and $f(x) = -\frac{1}{x-p} + q$ are drawn below.
A and B are the x-intercepts of g. C is the turning point of g.
D $\left(\frac{5}{2}; 0\right)$ is the x-intercept of f.
EC is perpendicular to the horizontal asymptote of f.



4.1 Write down the coordinates of A and B. (2)

4.2 Determine the coordinates of C, the turning point of g. (3)

4.3 Determine the equation of f. (3)

4.4 Write down the equation of the horizontal asymptote of f. (1)

4.5 Determine the positive x-values for which $g(x) > f(x)$. (2)

4.6 Determine the equation of h if $h(x) + 5 = g(x)$. (2)

4.7 Write down the range of $h(x)$. (2)

4.8 Calculate the length of EC. (3)

4.9 Determine the value of p for which $h(x) = p$ will have at least one real root. (3)
[21]

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QUESTION 5

Given $p(x) = 3^{-x}$

5.1 State whether $p(x)$ is an increasing or decreasing function. (1)

5.2 Determine p^{-1}, the inverse of p, in the form $y = \ldots$ (2)

5.3 If point $m\left(2\,;\,\frac{1}{9}\right)$ lies on p, then write down the coordinates of its image m' which is the reflection across the line $y = x$. (1)

5.4 Draw the graphs of p and p^{-1} on the set of axes provided in the ANSWER BOOK. Clearly indicate ALL the intercepts with the axes. (4)

5.5 Write down the domain of p^{-1}. (1)

5.6 Write down the equation for the asymptote of $p(x) - 2$. (1)

5.7 Describe the transformation from p to k if $k(x) = \log_3 x$. (2)

[12]

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QUESTION 6

6.1 A company bought a photocopier for R185 000 on 1 July 2026. They will use the old photocopier as a trade-in when they replace it with a similar new photocopier in 5 years' time, on 30 June 2031.

6.1.1 The average rate of inflation over the next 5 years will be 6,2% p.a. Determine the price of a similar new photocopier in 5 years' time. (2)

6.1.2 Calculate the trade-in value of the old photocopier after 5 years if it depreciates at a rate of 8,5% p.a. on a straight-line method. (2)

6.1.3 The company sets up a sinking fund to cover the replacement cost of the new photocopier. The fund earns interest at a rate of 8,1% p.a., compounded monthly. The company makes its first deposit on 31 July 2026 and continues to do so until 31 May 2031, one month prior to the new photocopier being bought. How much should be deposited at the end of each month so that the company will be able to buy the new photocopier? (4)

6.2 A bank granted Lerato a loan of R180 000 at an interest rate of 12% p.a., compounded monthly, to renovate her home. Lerato agreed to repay the loan over five years in equal monthly instalments.

6.2.1 Calculate the monthly instalment Lerato must pay the bank. (2)

6.2.2 However, Lerato was unable to make three consecutive monthly instalments immediately after the 12^{th} payment. If Lerato still needs to finish her payments in 5 years' time from the time the loan was granted, calculate her new monthly instalment after the three months she was unable to pay. (6)

[16]

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QUESTION 7

7.1 Determine $f'(x)$ from first principles if it is given that $f(x) = x^2 - 3x + 2$. (6)

7.2 Determine:

7.2.1 $D_x[(2x + 5)(x - 2)]$ (3)

7.2.2 $\frac{dy}{dx}$ if $y = \frac{\sqrt[3]{x^4} + 2\pi - x^{-3}}{x}$ (4)

7.3 Determine the x-coordinate of the point on the curve $y = 3(2 - x)^2$ where the tangent at this point is perpendicular to the line $y = \frac{1}{2}x - 5$. (4)

[17]

QUESTION 8

The equation of the cubic function f is given as
$f(x) = (x + 1)(x - 2)(x + k) = x^3 - 5x^2 + 2x + 8$

8.1 Calculate:

8.1.1 The value of k (2)

8.1.2 The coordinates of the turning points of f (3)

8.2 Draw the graph of f on the set of axes provided in the ANSWER BOOK. Clearly indicate the intercepts with the axes and the turning points. (3)

8.3 Determine the intervals in which the function is concave down. (2)

8.4 Determine the value(s) of x for which $x \cdot f'(x) > 0$. (2)

[12]

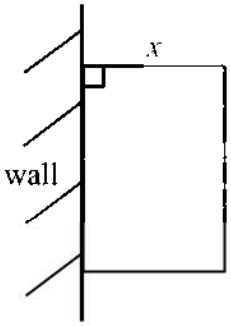
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QUESTION 9

The diagram below shows a rectangular enclosure designed so that one side is fixed against a wall and therefore does not require fencing.

Let the two equal sides perpendicular to the wall each be x metres long.

The total length of fencing available for the remaining three sides is 60 metres.



9.1 Show that the expression for the area is $A = -2x^2 + 60x$. (1)

9.2 Calculate the maximum possible area of the enclosure. (3)

9.3 The farmer is not restricted to 60 m of fencing but instead has a budget of R480 for the fencing.

- The two sides perpendicular to the wall cost R5 per metre each
- The side parallel to the wall costs R8 per metre

Let the length of each perpendicular side be x metres and the length of the side parallel to the wall be y metres.

Using differentiation, determine the value of x that will maximise the area of the enclosure. (5)

[9]

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QUESTION 10

10.1 A community youth centre surveyed 50 of its learners on the after-school activities they regularly participate in namely sports (S), music (M) and drama (D). The results of the survey are given in percentages:

- 8% of the learners participate in all three activities.
- 18% participate in sports and music.
- 10% only participate in music and drama.
- x% only participate in sports and drama.
- 64% participate in sports.
- 40% participate in music.
- 52% participate in drama.
- 10% participate in none of the three activities.

10.1.1 Draw a Venn diagram to represent ALL the learners who participated in the survey. (4)

10.1.2 Calculate the value of x. (1)

10.1.3 Determine whether participation in sports (S) and music (M) are independent events. (2)

10.2 Consider the letters of the word STATISTICS. The letters that are the same are treated as being identical. If the letters are arranged in any order without repetition, what is the probability that the word arrangement formed will end with the letter S? (4)

10.3 A school has 7 boys and 5 girls. A committee of 6 learners is selected and then seated in a row for a photograph. In how many ways can the 6-member committee be chosen if at least 3 girls must be included? (2)
[13]

TOTAL: 150

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INFORMATION SHEET

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$\sin 2\alpha = 2\sin\alpha\,.\cos\alpha$

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

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

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

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