Western Cape Government

PLC

TRIAL EXAMINATION

SEPTEMBER 2025

MATHEMATICS PAPER 1

GRADE 12

TOTAL: 150

DURATION: 3 hours

This question paper consists of 11 pages and a formula page

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. Number the answers correctly according to the numbering system used in this question paper.
4. Clearly show ALL calculations, diagrams, graphs, etc. that you have used in determining your answers.
5. Answers only will NOT necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. If necessary, round off answers to TWO decimal places, unless stated otherwise.
8. Diagrams are NOT necessarily drawn to scale.
9. An information sheet with formulae is included at the end of the question paper.
10. Write neatly and legibly

QUESTION 1

1.1 Solve for x:

1.1.1 $3x^2 - 7x - 6 = 0$ (3)

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

1.1.3 $x^2 - 4x - 21 \leq 0$ (3)

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

1.2 Solve simultaneously for x and y in:

$2x + y = 7$
$x^2 + y^2 - 2xy = 9$ (5)

1.3 Given $9^x = 45^7.15^{-y}$. Determine $x + y$. (5)

[23]

QUESTION 2

2.1 The following arithmetic sequence is given: $-7 ; -1 ; 5 ; \ldots\ldots ; 167$

2.1.1 How many terms are there in this sequence? (2)

2.1.2 Calculate the value of n for which the sum of n terms will be 8208. (4)

2.2 Given the series: $(x) + \frac{(x)^2}{2} + \frac{(x)^3}{4} + \ldots$

2.2.1 Determine the n^{th} term in terms of x. (2)

2.2.2 Determine the value(s) of x for which the series will converge. (2)

2.2.3 If the sum of the first two terms is equal to $\frac{5}{8}$ and $x > 0$, determine S_∞. (6)

2.3 Given $\sum_{k=2}^{20}(2x-1)^k$

2.3.1 Calculate the first term of the series. (1)

2.3.2 For which values of x will $\sum_{k=2}^{20}(2x-1)^k$ exist? (3)

[20]

QUESTION 3

Tanya starts a fitness programme by going for a run on Saturday in the local park. On the first Saturday, she runs 1 km and plans to increase her distance by 0,75 km every Saturday. She further decides that once she reaches the distance of 10km she will continue to run 10km every week thereafter.

3.1 Calculate the distance that Tania will run on her 9^{th} run? (2)

3.2 Calculate the total distance that Tania will run over the first 24 Saturdays. (5)

[7]

QUESTION 4

Given: $h(x) = \frac{2}{x-3} - 4$

4.1 Determine the equation of the asymptotes. (2)

4.2 Determine the x −intercept. (2)

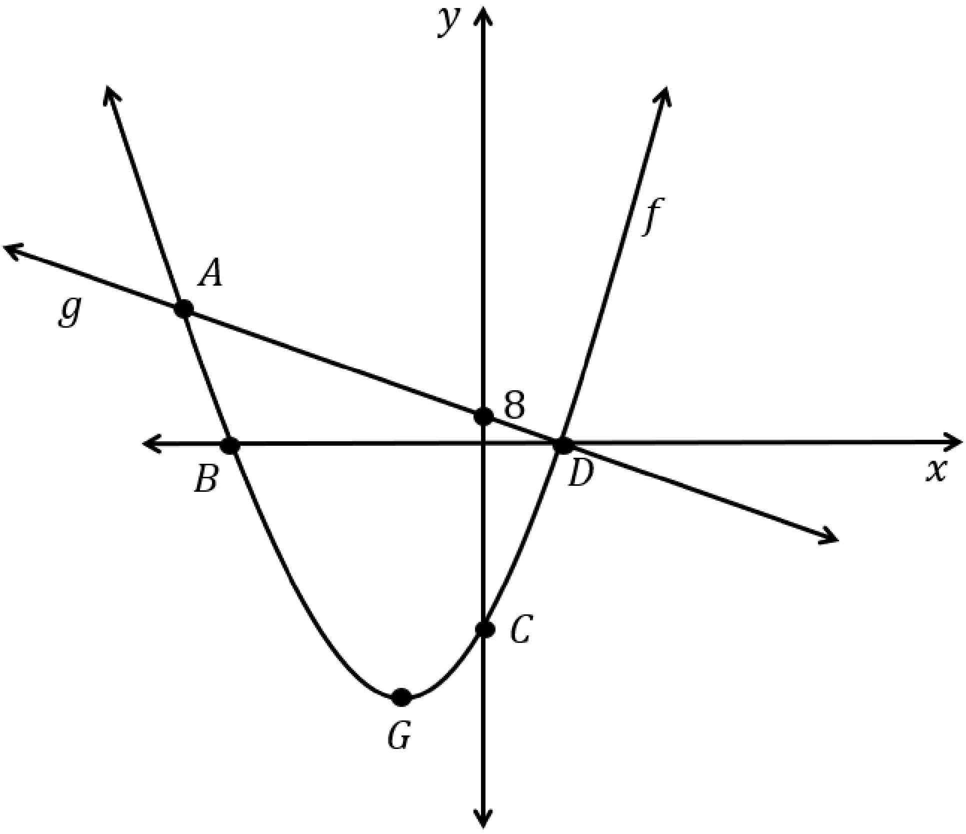
4.3 Sketch the graph of h. Clearly label ALL intercepts with the axes and any asymptotes. (4)

4.4 Determine the values of x for which $\frac{2}{x-3} \leq 4$ (2)

[10]

QUESTION 5

The graphs of $f(x) = (x - 4)(x + 6)$ and $g(x) = mx + c$ are shown below. The x-intercepts of f are points B and D, respectively. The graphs of f and g intersect at points A and D. Additionally, point C represents the y-intercept of f, and point G is the turning point of the graph of f.



5.1 Write down the coordinates of B and D. (2)

5.2 Determine the value of m and c. (3)

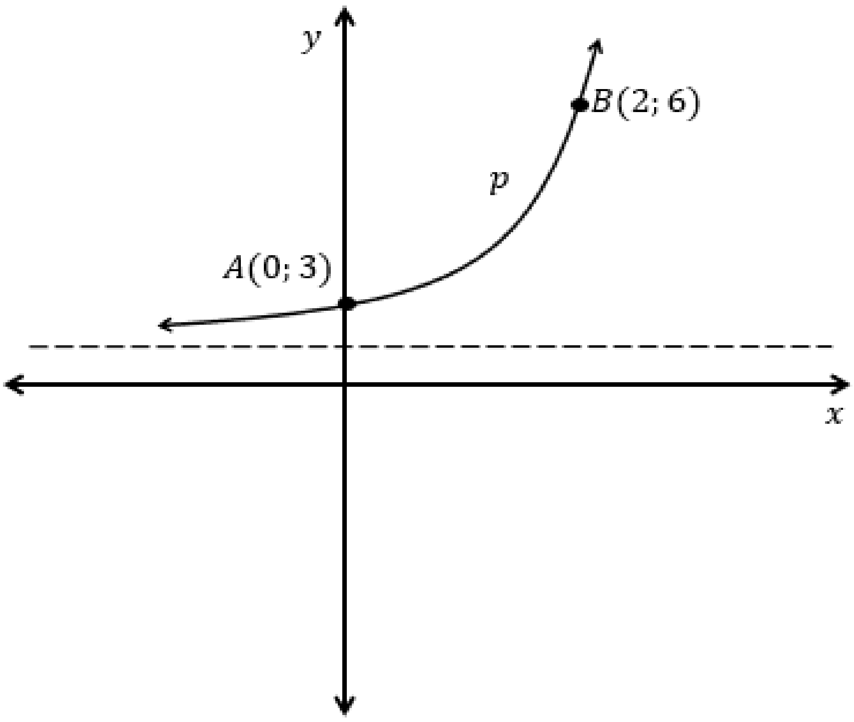
5.3 Determine the coordinate of A', the reflection of point A in the line $y = x$. (5)

5.4 Determine the value of k for which $g(x) = k$ will be a tangent to f. (5)

[15]

QUESTION 6

The graph of $p(x) = 2^x + q$ passes through the points $A(0; 3)$ and $B(2; 6)$.



6.1 Calculate the value of q. (2)

6.2 The graph of p is translated 2 units down to obtain $k(x)$. Determine the equation of $k^{-1}(x)$ in the form $y =$…….., (3)

6.3 For which values of x is:

6.3.1 $k^{-1}(x) \leq 0$ (2)

6.3.2 $p(x + 3). k^{-1}(x - 5) > 0$ (2)

6.4 If p is reflected about the horizontal asymptote and translated 3 units to the left to form $h(x)$, determine the equation of $h(x)$. (2)

[11]

QUESTON 7

7.1 Morne purchases a gaming computer for R85 000. The computer depreciates at 8,5% per annum, on the reduced balance method. Calculate the bookvalue of the gaming computer after 5 years. (2)

7.2 Brett wants to buy a car that costs R180 000. He decides to save for the car by depositing R4 494,35 at the end of each month into a savings account that earns interest at 7,2% p.a. compounded monthly.

Determine the number of months it will take Brett to save R180 000. (4)

7.3 Nabeel takes out a loan of R350,000 to renovate his house. The loan carries an interest rate of 11.5% per annum, compounded monthly, and is to be repaid over a period of 15 years. He makes regular monthly payments for the first 5 years. At the end of this 5-year period, he makes an additional lump sum payment of R40,000.

7.3.1 Calculate the outstanding balance of the loan immediately after the additional payment has been made. (6)

7.3.2 After 5 years, Nabeel misses the next 8 payments. Calculate his new monthly payment if he wants to settle the loan in the given period. (4)

[16]

QUESTION 8

8.1 Determine, from first principles, the derivative of $f(x) = 3 - x^2$ (5)

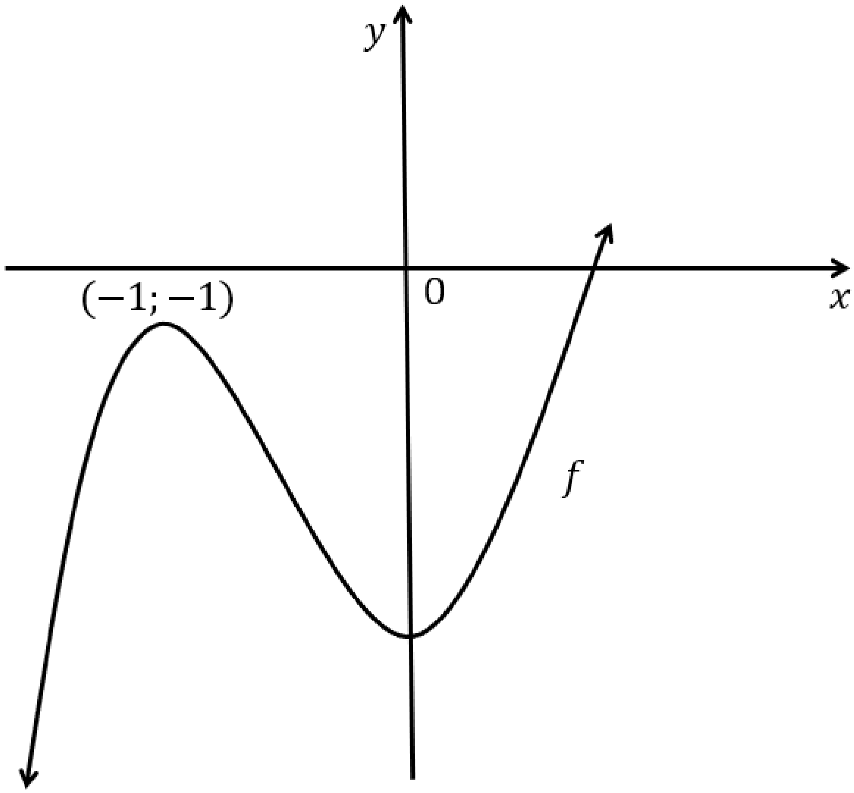
8.2 Determine the following:

8.2.1 $\frac{d}{dx}(3x^4 - 7x^{-2})$ (2)

8.2.2 $f'(x)$ if $f(x) = (2x^3 - 1)^2$ (3)

8.2.3 $Dx\left(\frac{x^4 - m}{x^2 - \sqrt{m}}\right)$ (3)

8.3 The graph of $f(x) = ax^3 + bx^2 - 2$ has a local maximum at $(-1; -1)$

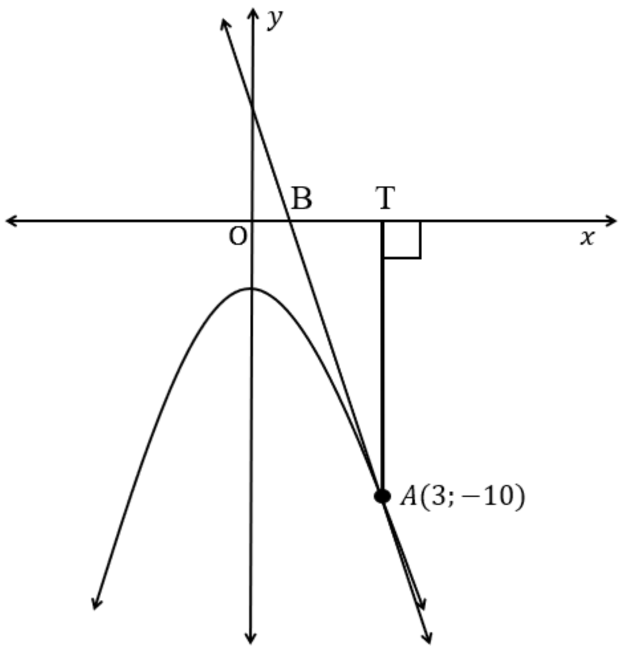


8.3.1 Show that $a = 2$ and $b = 3$. (4)

8.3.2 For which values of x will the graph be concave up? (3)

8.3.3 For which values of x will $x.f'(x) > 0$? (2)

8.4 A tangent at $A(3;-10)$ to a curve $y = -x^2 - 1$, intersects the x-axis at B. AT is perpendicular to the x −axis with T on the x −axis.



Determine the length of AB. (6)

[28]

QUESTION 9

A ball is thrown vertically upwards. The height of the ball in meters, after t seconds is given by the equation $h(t) = 9t - 2t^2$.

9.1 Determine the height of the ball after 2 seconds. (1)

9.2 Determine the speed of the ball after 2 seconds. (3)

9.3 After how many seconds will the ball reach the ground again? (2)

[6]

QUESTION 10

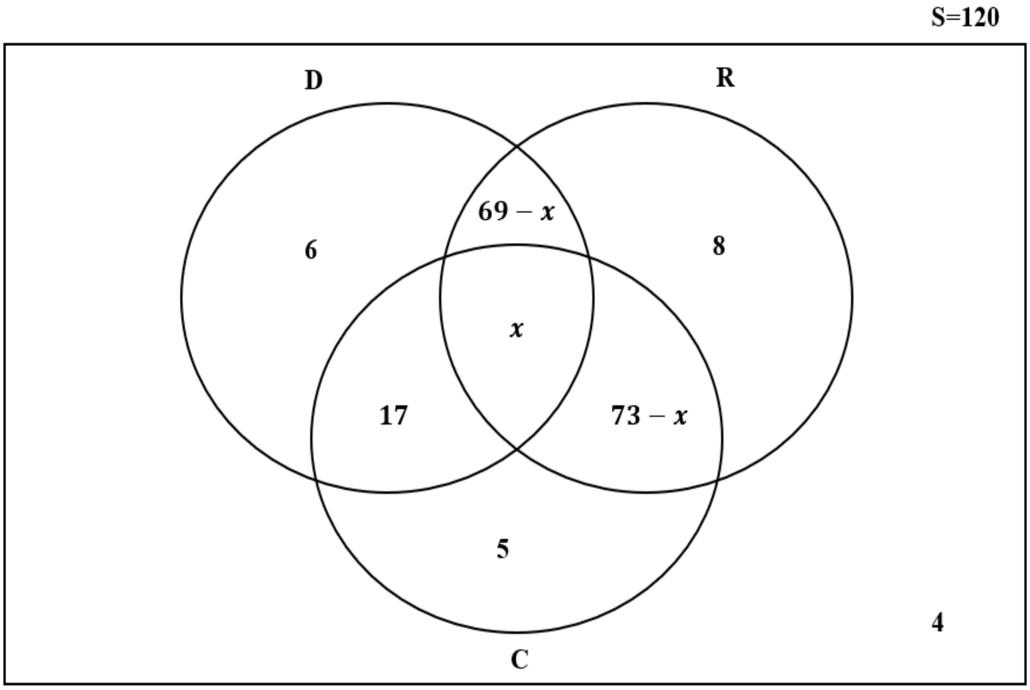
10.1 Two events A and B are given with P(A) $= 0{,}55$, P(B) $= 0{,}4$ and P(A or B) $= 0{,}73$.
Determine whether A and B are:

10.1.1 Mutually exclusive events. Justify your answer (2)

10.1.2 Independent events. Justify your answer. (3)

10.2 For an annual Grade 12 Sports Tour 120 learners were asked to indicate their choice of activity on the days they were not involved in tournaments. They could choose from the following three activity packages: a visit to Disneyland (D), visiting a local a Rugby Club (R) and attending a Cultural Programme (C) of the country they were visiting.

The results of the survey are represented in the Venn diagram below:



10.2.1 Calculate x. (2)

10.2.2 Calculate the probability that a learner chosen at random participates in the rugby club visit and cultural events. (2)

10.3 When creating an online profile with Titus Holdings, a unique login code is generated. The code is to be alphanumeric (include digits and letters) and to be 5 characters long. The first two characters are letters and the remaining characters are digits.

10.3.1 If letters may be repeated, but the digits may not, determine how many unique login codes can be created. (2)

10.3.2 A security alert is that the codes are not safe enough and implements new restrictions on the codes. If Titus Holdings project they will have 1600 people create profiles, determine if they will have enough unique codes considering they need to meet the updated restrictions below:

- No repetition allowed (letters and digits)
- All codes to begin with the letter "T"
- All digits to be $\epsilon \{0;\ 2;\ 3;\ 5;\ 6;\ 8;\ 9\}$
- The 3-digit numeric portion to be divisible by 5. (3)

[14]

TOTAL 150

INFORMATION SHEET

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

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

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

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

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

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

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

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

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

In ΔABC: $\frac{a}{sin A} = \frac{b}{sin B} = \frac{c}{sin C}$ $\quad a^2 = b^2 + c^2 - 2bc.cos A$

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

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

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

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

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

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

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