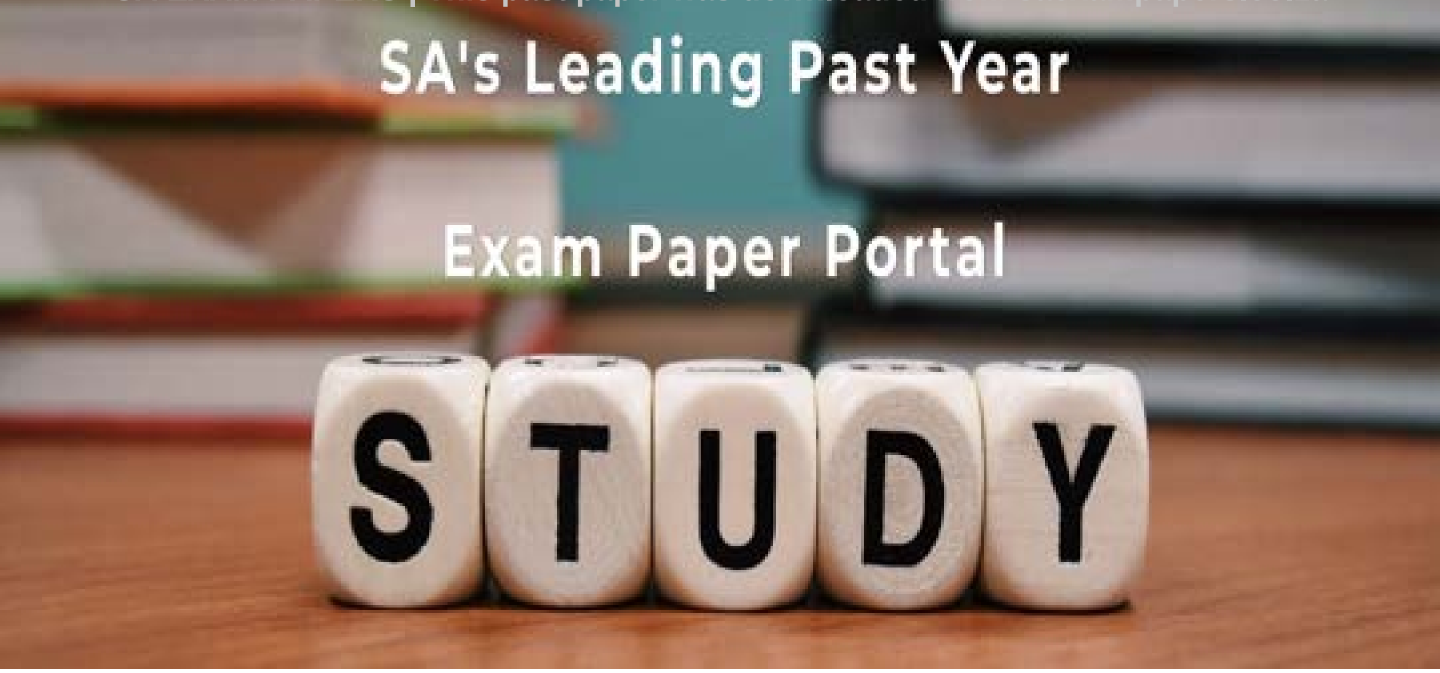
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Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 12

MATHEMATICS P1

JUNE 2025

MARKS: 150

TIME: 3 hours

This question paper consists of 9 pages and 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. 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 $x^2 - x - 12 = 0$ (3)

1.1.2 $5x^2 + 2x = 9$ (correct to TWO decimal places) (4)

1.1.3 $18 - 3x - x^2 \geq 0$ (4)

1.1.4 $6 - \sqrt{x+4} = x + 4$ (6)

1.2 Solve for x and y simultaneously:

$2y - x = 3$ and $y^2 + 3x - 2xy = 0$ (6)

1.3 If $x^3 - y^3 = (x-y)(x^2 + xy + y^2)$, show that $\left(3 - \frac{1}{\sqrt{5}}\right)\left(9 + \frac{3}{\sqrt{5}} + \frac{1}{5}\right)$ can be expressed as $a - \frac{1}{25}\sqrt{b}$ where $a, b \in \mathbb{Q}$. (4)

[27]

QUESTION 2

Given the quadratic number pattern: 2; 7; 16; . . . . . . ; 862

2.1 Write down the 4th term of this quadratic number pattern. (1)

2.2 Determine the general term (T_n) for the quadratic number pattern. (4)

2.3 Calculate the number of terms in the number pattern. (3)

[8]

QUESTION 3

3.1 Given the geometric series: $2 + 6 + 18 + 54 + \ldots$

3.1.1 Write down the general term of this series. (1)

3.1.2 Calculate the value of m such that: $\sum_{n=1}^{m} \frac{2}{3} \cdot 3^n = 59\,048$ (4)

3.2 The first term of an infinite geometric sequence is 3 and the common ratio of the sequence is $\frac{1}{2}$.

3.2.1 Determine the value of the third term of the sequence. (1)

3.2.2 Determine the value of S_∞. (2)

3.3 If the powers of 6 is removed from the sequence $1;\ 2;\ 3;\ 4;\ \ldots;\ 8\,000$, determine the sum of the remaining terms. (4)

[12]

QUESTION 4

4.1 Michael notices the following about the number of black tiles and number of white tiles:

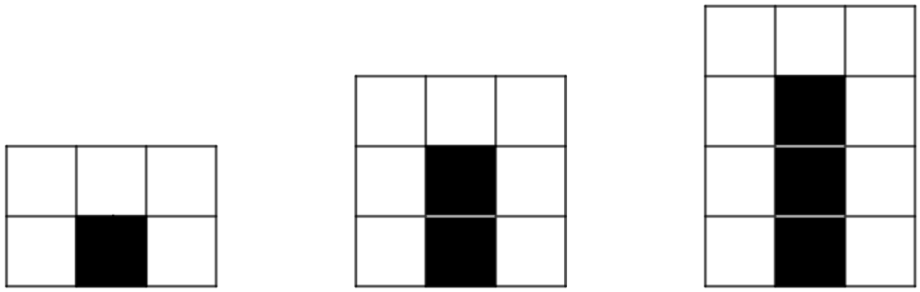


Figure 1:	1 black tile	White tiles:	$T_1 = 3 \times 1 + 2$
Figure 2:	2 black tiles		$T_2 = 3 \times 2 + 1$
Figure 3:	3 black tiles		$T_3 = 3 \times 3 + 0$
Figure 4:	4 black tiles		$T_4 = 3 \times 4 - 1$
Figure 5:	5 black tiles		$T_5 = 3 \times 5 - 2$
Figure 6:	6 black tiles		$T_6 = 3 \times 6 - 3$

4.1.1 If this pattern continues as above, write down the rule for the number of white tiles if the figure has 17 black tiles. (2)

4.1.2 Write down the n^{th} term for the number of white tiles around n black tiles. (2)

4.1.3 How many black and white tiles will Michael have in total up to the 25^{th} pattern? (5)

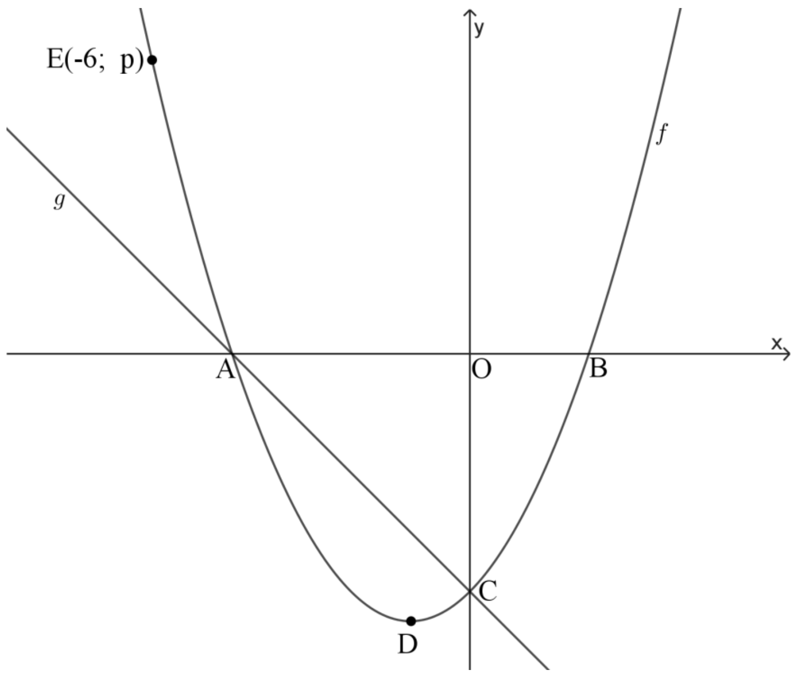
4.2 Which term of the series $19 + 18\frac{1}{5} + 17\frac{2}{5} + \ldots$ is the first negative term? (5)

[14]

QUESTION 5

The graphs of $f(x) = x^2 + 2x - 8$ and $g(x) = mx + c$ are sketched below.

- A and B are the x-intercepts of f
- C is the y-intercept for f and g
- D is the turning point of f
- $E(-6; p)$ is a point on f



5.1	Write down the value of p.	(1)
5.2	Determine the coordinates of A and B.	(4)
5.3	Determine the coordinates of D.	(2)
5.4	Determine the values of m and c.	(2)
5.5	Determine the equation of the tangent to f at point C.	(3)
5.6	Write down the range for $-f(x)$.	(2)
5.7	For which values of x will $f(x) - g(x) > 0$?	(2)
5.8	For which values of k will $x^2 + 2x + k = 0$ have no real roots?	(2)
		[18]

QUESTION 6

Given: $h(x)=\dfrac{6}{x-2}-1$

6.1 Write down the equations of the asymptotes of h. (2)

6.2 Determine the coordinates of the x- and y-intercepts of $h(x)$. (3)

6.3 Sketch the graph of $h(x)$. Clearly show the intercepts with the axes and asymptotes, if any. (3)

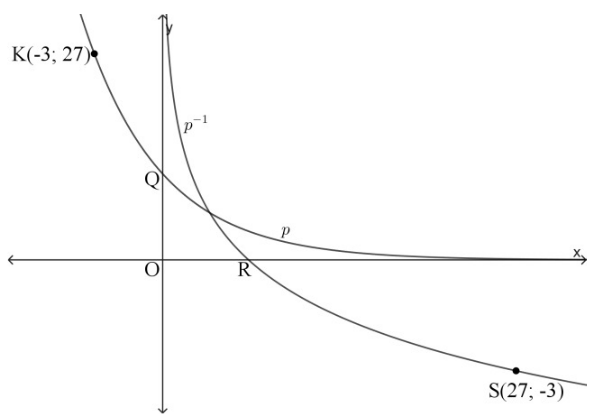
6.4 Determine the values of x for which $h(x)<0$ for $x\in[0;\infty)$. (2)

[10]

QUESTION 7

The graphs of $p(x)=b^x$ and $p^{-1}(x)$ are sketched below.

- $K(-3;27)$ lies on the graph of p and $S(27;-3)$ lies on the graph of p^{-1}.
- Q is the y-intercept of p and R is the x-intercept of p^{-1}.



7.1 Determine the value of b. (2)

7.2 Determine the equation of p^{-1} in the form $y = \ldots$ (2)

7.3 Write down the coordinates of Q and R. (2)

7.4 For which value(s) of x will:

7.4.1 $0<p(x)\le 1$ (1)

7.4.2 $\log_{\frac{1}{3}} x<-3$ (1)

7.5 T is a point in the first quadrant where TQ is parallel to the x-axis and TS is parallel to the y-axis. Calculate the area of ΔQTS. (4)
[12]

QUESTION 8

8.1 Determine $f^{/}(x)$ from first principles if $f(x)=3x^2-2$. (5)

8.2 Determine:

8.2.1 $f^{/}(x)$ if $f(x)=3x^4-\frac{1}{2}x^2+5$ (2)

8.2.2 $\frac{dy}{dx}$ if $y=\frac{\sqrt{x}}{2}-\frac{1}{9x^3}$ (4)

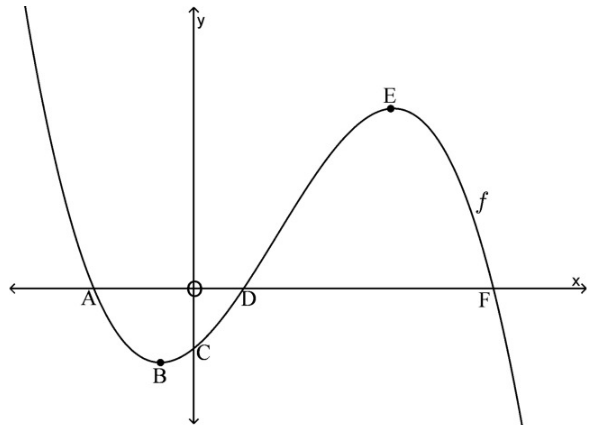
8.2.3 $f^{/}(x)$ if $f(x)=\frac{2x^2-3x-5}{x+1}$ (3)

8.3 The tangent to the curve of $y=-x^2+4x$ is perpendicular to the line $y=\frac{1}{2}x-4$.

Determine the equation of the tangent. (7)
[21]

QUESTION 9

Given: $f(x) = -2x^3 + 5x^2 + 4x - 3$



9.1 Solve for x if $f(x) = 0$. (4)

9.2 Calculate the coordinates of B and E, the turning points of f. (5)

9.3 For which values of x is the graph concave down? (3)

9.4 For which values of x will $x \cdot f'(x) > 0$? (3)

9.5 For which values of k will $2x^3 - 5x^2 - 4x + 3 = k$ have THREE roots. (3)

[18]

QUESTION 10

Given: $f(x) = px^3 + qx^2 + rx$; $p > 0$; $p, q, r \in \mathbb{R}$ and the turning points of f are given by $\text{P}(a; f(a))$ and $\text{Q}(b; f(b))$ where $a > b$.

10.1 Which of points P and Q represent the minimum and maximum turning point? (2)

10.2 Is $f(x)$ increasing or decreasing for $x > a$? (2)

10.3 Write down the coordinates of the y - intercept of $f'(x)$. (2)

10.4 Write down, giving a reason, the value of $f'(x)$ if $x = b$. (2)

10.5 Write down the coordinates of the x-intercept of $y = 6px + 2q$ in terms of a and b. (2)

[10]

TOTAL: 150

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

$f'(x) = \lim\limits_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$

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

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

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

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

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

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

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

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

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

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

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