education
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P1

JUNE 2026

MARKS: 150

TIME: 3 HOURS

This question paper consists of 7 pages and an information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. The question paper consists of 9 questions and information sheet.
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams, graphs, etc. which you have used in determining the 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. Write neatly and legibly.

QUESTION 1			
1.1	Solve for x:		
	1.1.1	$\left(\frac{3x}{2}+5\right)(x^2-7)=0$ a) if x is a rational number b) if x is an irrational number	 (1) (1)
	1.1.2	$-4x^2+6x=1$ (Correct to 2 decimal places)	(4)
	1.1.3	$x-\sqrt{x+8}=-2$	(4)
	1.1.4	$x^2+5x\leq 0$	(3)
	1.1.5	$3.2^{x+1}+2^{2x}=40$	(4)
1.2	Solve the following system of simultaneous equations:		
	$3^{x+2y}=\frac{9^{3y}}{27}$ and $x^2-10y^2+6y+3=0$		(6)
1.3	Given the equation: $x=-p\pm\sqrt{2p+1}$ Write down two positive values of p for which the roots are rational and real.		(3)
1.4	A circle has a circumference of 10π cm. A solid cylinder with the same circular base has a surface area of 90π cm^2. Calculate the radius of the base and the height of the cylinder.		(3)
			[29]

QUESTION 2			
2.1	The **first three differences** of a quadratic sequence are $-12; -10; -8$. The first term of the quadratic sequence is 39.		
	2.1.1	Determine the nth term of the **quadratic** sequence.	(3)
	2.1.2	Will this quadratic sequence have one minimum term? Explain your answer with the necessary calculations.	(2)
2.2	Given: $\sum_{n=0}^{\infty}\left(\frac{3+x}{3}\right)^n$		
	2.2.1	Present the sum to infinity in terms of x.	(2)
	2.2.2	For which values of x will the sum to infinity converge?	(3)
	2.2.3	If $x=-2$, calculate the sum to infinity.	(1)
			[11]

QUESTION 3

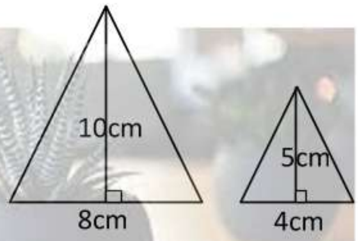
3.1 Given the arithmetic sequence given: 25; 28; 31; … ; 265

3.1.1 Determine the number of terms in this sequence. (2)

3.1.2 Write the sequence in sigma-notation. (2)

3.1.3 If this sequence continues, calculate the smallest number of terms that must be added to the sequence so that the sum of all the terms will be more than 15 000. (4)

3.2 A series of isosceles triangles are given. The first triangle has a base of 8cm and a perpendicular height of 10 cm. A second, smaller triangle is drawn where the base and the height is halved. This process continues and forms a geometric pattern.



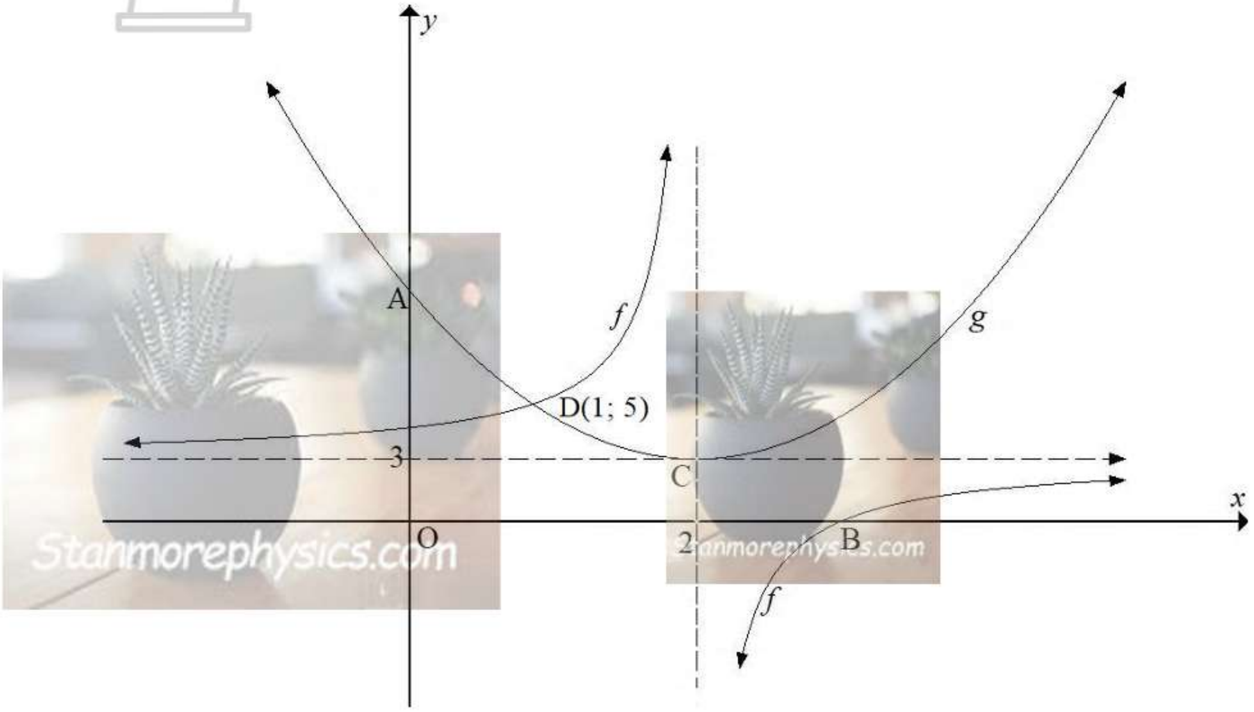
Calculate the sum of the areas of the first 8 triangles, correct to three decimal places. (3)

[11]

QUESTION 4		
Given: $f(x)=a^x-1$ for $a>0$. $(2\,;\frac{4}{9})$ is a point on f.		
4.1	Calculate the value of a.	(2)
4.2	Write down the range of f.	(1)
4.3	It is further given that $C(x\,;\frac{5}{4})$ is a point on f. Determine the coordinates of C', the image of C, when C is reflected about the line $y=x$.	(3)
4.4	Is C' a point on f? Explain your answer.	(2)
4.5	Give the equation of g if $g(x)=f(x)+1$.	(1)
4.6	Give the equation of $g^{-1}(x)$ in the form $y=...$	(2)
4.7	On the same set of axes, draw the graphs of g, g^{-1} as well as the symmetry axis. Clearly show the intercepts with the axes and asymptotes, if any, as well as **one other point** on each graph.	(5)
4.8	For which values of x is $g^{-1}(x)<0$?	(1)
		[17]

QUESTION 5

Given: The graphs of $f(x)=\dfrac{k}{x-2}+3$ and $g(x)=a(x-p)^2+q$ are sketched.
A and B are the *y* and *x*-intercepts of *g* and *f* respectively.
C is the turning point of *g* and lies on both asymptotes of *f*.
D(1 ; 5) is a point of intersection of *f* and *g*.



5.1 Determine the equation of *g* in the form $g(x)=a(x-p)^2+q$. (3)

5.2 Prove that the value of $k=-2$. (1)

5.3 Determine the length of AB if $g(x)=2x^2-8x+11$. (4)

5.4 Determine the equation of the symmetry-axis of f with a negative gradient. (2)

5.5 Determine the value(s) of x so that $f(x)-g(x)\le 0$. (2)

5.6 Determine the value(s) of m so that $g(x)+m=0$ has two distinct roots. (2)

5.7 The graph of g is translated 2 units to the right and 2 units down to form *h*. Give the equation of *h* in the form $h(x)=a(x+p)^2+q$. (2)

[16]

QUESTION 6		
6.1	An amount of money was invested at a rate of 7% p.a, compounded quarterly. Calculate the effective interest rate.	(3)
6.2	Githa bought a car for R790 000 five years ago. The car depreciated on the reducing balance method to R453 672, 30. Calculate the rate of depreciation.	(3)
6.3	Dino deposits R15 000 in a bank account at an interest rate of 9,1% p.a., compounded monthly. Two years later he withdraws R3 000. Three years after the initial deposit, the interest rate changed to 8,5% p.a. compounded half-yearly. Determine the value of the interest he received at the end of the seven years.	(6)
6.4	How long must an amount of money be invested to double in value at an interest rate of 7,95% p.a. on the straight line method? Give your answer in years and months.	(3)
		[15]

QUESTION 7			
7.1	Use first principles to find the derivative of f: $f(x) = -4x^2 - 3$		(5)
7.2	Determine:		
	7.2.1	$D_x\left[-(2x-1)^2\right]$	(3)
	7.2.2	$\frac{d}{dx}\left[\frac{1-\sqrt[3]{x^2}+\pi x}{6x}\right]$	(6)
	7.2.3	$g'(x)$ if $g(x) = \frac{x^3-8}{x-2}$	(2)
7.3	Given: $p(x) = -4x^3 + x^2 - 3x + 5$ Determine the interval for which p is concave up.		(3)
			[19]

QUESTION 8

The equation of the cubic function f is given as $f(x) = x^3 - 5x^2 + 8x - 4$
$= (x-1)(x^2 - 4x + 4)$

8.1	Calculate the coordinates of the stationary points of f.	(4)
8.2	Give the x-intercepts of f in coordinate form.	(2)
8.3	Sketch the graph of f, clearly indicating the intercepts with the axes and the turning points.	(3)
8.4	For which values of x is $f(x) \leq 0$?	(2)
8.5	Determine the equation of the tangent to the curve at the point $x = 3$.	(3)
8.6	If $f(x) - k = 0$ has three distinct real roots, determine the value(s) of k.	(2)
		[16]

QUESTION 9

9.1 Given : $P(A) = 0,5$ $P(\text{not } B) = 0,45$ $P(A \text{ or } B) = 0,9$

Draw a Venn-diagram and complete all the relevant information. (4)

9.2

	Gender		
Color of hair	Men	Women	Total
Brown	40	60	100
Red	8	7	15
	48	67	115

Is the red hair colour dependent of gender? (4)

9.3 In a factory, three machines, A, B and C, are used to manufacture plastic bottles. They produce 22%, 33% and 45% respectively of the total production. 2%, 3% and 7% respectively of the plastic bottles produced by machines A, B and C are defective.

9.3.1 Represent the information by means of a tree diagram. Clearly indicate the probability associated with each branch of the tree diagram and write down all the outcomes. (4)

9.3.2 A plastic bottle is selected at random from the total production.

(a)	What is the probability that it was produced by machine B and it is not defective?	(2)
(b)	What is the probability that the bottle is defective?	(2)
		[16]

TOTAL MARKS: 150

INFORMATION SHEET

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$\sin 2A = 2\sin A.\cos A$

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

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

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