KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

GRADE 12 – TOPIC TEST 1

TOPIC :	**PATTERNS, SEQUENCES & SERIES**
DATE :	**3 FEBRUARY 2026**
TOTAL :	**25 MARKS**
TIME :	**30 MINUTES**

This question paper consists of 3 pages including the cover page and an information sheet.

INSTRUCTIONS AND INFORMATION

1. Answer **ALL** the questions.
2. Answers only will NOT necessarily be awarded full marks.
3. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.
4. Number your answers correctly according to the numbering system used in this question paper.

QUESTION 1

1.1 Consider the sequence: 298 ; 259 ; 222 ; 187 ; 154 ; 123 ; …

The nth term of the sequence is given by $T_n = an^2 + bn + 339$

1.1.1 Determine the values of a and b (4)

1.1.2 Write down the nth term of the sequence:

198 ; 159 ; 122 ; 87 ; 54 ; 23 ; … (1)

1.2 Given the arithmetic series: 1 + 4 + 7 + …

1.2.1 Determine the 65th term of the series (1)

1.2.2 Derive the formula for the nth term of this series (2)

1.2.3 Calculate k if 1 + 4 + 7 + …(to k terms) = 590 (4)

[12]

QUESTION 2

2.1 The first term of a geometric series is 2 and the common ratio is $\frac{3}{2}$

2.1.1 Determine the value of the third term (1)

2.1.2 Calculate n for which $S_n = 16\frac{1}{4}$ (4)

2.2 Determine the value of n if $\sum_{i=1}^{n}(2i-1) = 1089$ (3)

2.3 Consider the series $\sum_{n=1}^{\infty} 2\left(\frac{1}{2}x\right)^n$

2.3.1 For which value(s) of x will the series converge? (3)

2.3.2 Determine sum to infinity if $x = 1$ (2)

[13]

TOTAL: 25 MARKS

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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PATTERNS, SEQUENCES & SERIES
MARKING GUIDELINE
3rd FEBRUARY 2026

This marking guideline consists of 3 pages including the cover page .

25 MARKS

		QUESTION 1	
1.1			
	1.1.1	$298 = a + b + 339$ $a + b = -41 \ldots eqn(1)$ $259 = 4a + 2b + 339$ $4a + 2b = -80$ $2a + b = -40 \ldots eqn(2)$ $eqn(2) - eqn(1) : a = 1$ $eqn(1) : b = -42$ **OR** $2a = 2$ $\quad 3a + b = -39$ $a = 1$ $\quad b = -42$	✓ eqn1 ✓ eqn. 2 ✓ a ✓ b (4)
	1.1.2	$T_n = n^2 - 42n + 339$	✓ answer (1)
1.2			
	1.2.1	$T_{65} = 1 + 64(3)$ $T_{65} = 193$	✓ answer (1)
	1.2.2	$T_n = a + (n-1)d$ $T_n = 1 + (n-1)3$ $T_n = 3n - 2$	✓ substitute ✓ answer (2)
	1.2.3	$590 = \frac{k}{2}[2(1) + (k-1)3]$ $k(3k-1) = 1180$ $3k^2 - k - 1180 = 0$ $(3k + 59)(k - 20) = 0$ $k = 20$	✓ substitute ✓ standard form ✓Factors ✓ answer (4)
			[12]

		QUESTION 2	
2.1			
	2.1.1	$T_3 = 2\left(\frac{3}{2}\right)^2 = \frac{9}{2}$	✓ answer (1)
	2.1.2	$\frac{65}{4} = \frac{2\left[\left(\frac{3}{2}\right)^n - 1\right]}{\frac{3}{2} - 1}$ $\frac{65}{16} = \left(\frac{3}{2}\right)^n - 1$ $\left(\frac{3}{2}\right)^n = \frac{81}{16} = \left(\frac{3}{2}\right)^4$ $n = 4$	✓ substitute ✓ simplify ✓ exponent ✓ answer (4)
2.2		$\sum_{i=1}^{n}(2i-1) = 1+3+5+7+\ldots = 1089$ $S_n = \frac{n}{2}\left[[2(1)+(n-1)2]\right] = 1089$ $n^2 = 1089$ $n = 33$	✓ Substitute ✓ Quadratic eqn. ✓ answer (3)
2.3		$\sum_{n=1}^{\infty} 2\left(\frac{1}{2}x\right)^n = x + \frac{1}{2}x^2 + \frac{1}{4}x^3\ldots$	
	2.3.1	$a = x \qquad r = \frac{1}{2}x$ $-1 < \frac{1}{2}x < 1$ $-2 < x < 2$	✓ value of r ✓ Substitute ✓ answer (3)
	2.3.2	$S_\infty = \frac{1}{1-\frac{1}{2}} = 2$	✓ substitute ✓ answer (2)
			[13]

TOTAL: 25 MARKS