

where students come first!



Year 11- Mathematics Advanced Sequence and Series

A collage of various mathematical and scientific diagrams and formulas. It includes:

- Physics: $F = qv \times B$, $V_f = V_i + at$, $\Delta W = d$, $\int t^n dt = \frac{t^{n+1}}{n+1} + C$, $s_a = \frac{1}{6}k(\frac{\Delta t}{2})^3 + v_0 \frac{\Delta t}{2}$, $\theta \sin u = \theta \sin' u$
- Mathematics: $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$, $y = f(x)$, $\frac{dy}{dx} = f(x)$, $\frac{d}{dx}(u^n) = n u^{n-1} \frac{du}{dx}$, $\frac{d}{dt}(u/v) = \frac{v \frac{du}{dt} - u \frac{dv}{dt}}{v^2}$, $\frac{d}{dt}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dt} - u \frac{dv}{dt}}{v^2}$
- Chemistry: Molecular structures of $CH_3-CH_2-CH_2-C(=O)-O-CH_3$, $CH_3-CH_2-CH_2-C(=O)-O-CH_2-CH_2-CH_2-C(=O)-O-CH_3$, $CH_3-CH_2-CH_2-C(=O)-O-CH_2-CH_2-CH_2-C(=O)-O-CH_2-CH_2-CH_2-C(=O)-O-CH_3$, and a diagram of a cobalt atom with 'ON' and 'OFF' labels.
- Geometry: A circular diagram with angles and a central point, and a flowchart with diamond-shaped decision boxes.
- Other: A Bohr-style atomic model with a central nucleus and three elliptical orbits.

Sequences and series Exam

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1. (3 marks)

The n th term in an arithmetic series is given by $T_n = 4n + 7$. Find the 12th term of this series and find the sum of the first 20 terms of this series.

2. (3 marks)

The geometric series $a+ar+ar^2 + \dots$ has a second term $1/4$ and a limiting sum of 1. Find 'a' in terms of 'r' and solve a pair of simultaneous equations to find 'r'.

3. (3 marks)

Simplify $n=0.08\bar{2}$ into fraction form.

4. (3 marks)

The second term of a G.P is 120 and the fifth term is 15. Find the common ratio and first term of the series and find the limiting sum.

5. (5 marks)

Karam and Girgis decided to borrow \$150000 to buy a small centre for their new tutoring business. Interest is compounded monthly at 6% p.a. The loan is to be repaid at the end of 15 years with equal monthly repayments of \$M.

i) find an expression for A_n

ii) Find value for M

iii) hence calculate the amount still owing after 5 years of payment.

6. (5 marks)

For the arithmetic sequence: 56, 53, 50, ...

i) find an expression for the n th term in simplest form

ii) find the value of the first negative term of the sequence.

7. (3 marks)

Evaluate $\sum_{k=10}^{k=50} (3k + 1)$

8. (3 marks)

Consider the series: $\sin^2 x + \sin^4 x + \sin^6 x + \dots$

Show that a limiting sum exists for $0 < x < \frac{\pi}{2}$

9. (5 marks)

The attendance at a speed reading course has an average increase of 20 people per month. The original attendance was 100 people.

- i) how many people attended after 2 years
- ii) how long before the attended classes reach 1500?
- iii) if the cost of classes is \$50 per month per person, find the takings for the first 5 months.

10. (2 marks)

Find the sum of the first 50 terms of the series: $10+7+4+\dots$