# Sequences and Series: exam practice

10 questions · 33 marks · worked solutions and markschemes

Name _____ Date _____ Score / 33

- Answer every question before you look at the solutions. They start after the last question, with the marks for each line: M for method, A for accuracy, R for reasoning.
- Online, with more practice: ibmathrevision.com/hlai/sequences-and-series-exam-practice

**1.** **2 marks · Paper 2 style · calculator allowed**

A gym charges $\$40$ in the first month of membership and increases the fee by $\$1.50$ each month.

Find the total paid in the first $2$ years. **[2]**

**2.** **2 marks · Paper 1 style · calculator allowed**

Find the number of terms in the arithmetic sequence $17, 23, 29, \ldots, 401$.

Find the number of terms. **[2]**

**3.** **3 marks · Paper 1 style · calculator allowed**

The sum of the first $n$ terms of an arithmetic sequence with $u_1 = 5$ and $d = 3$ is $1105$.

Find $n$. **[3]**

**4.** **3 marks · Paper 2 style · calculator allowed**

A pile of logs has $30$ logs in the bottom row, $29$ in the next, and so on, with $1$ fewer in each row up to the top row of $8$ logs.

Find the number of rows and the total number of logs. **[3]**

**5.** **4 marks · Paper 1 style · calculator allowed**

A geometric sequence has $u_3 = 18$ and $u_6 = 486$.

Find $r$, $u_1$ and $S_8$. **[4]**

**6.** **4 marks · Paper 1 style · calculator allowed**

The first three terms of a geometric sequence are $k + 2$, $2k$ and $k + 12$, with $k > 0$.

Find $k$ and the common ratio. **[4]**

**7.** **4 marks · Paper 2 style · calculator allowed**

Option A pays $\$1000$ in year 1 rising by $\$100$ each year. Option B pays $\$1000$ in year 1 rising by $8\%$ each year.

Find the total paid over $10$ years by each option and state which pays more. **[4]**

**8.** **3 marks · Paper 2 style · calculator allowed**

A geometric series has first term $5$ and ratio $1.2$.

Find the least $n$ for which $S_n > 1000$. **[3]**

**9.** **4 marks · Paper 1 style · calculator allowed**

An arithmetic sequence has $u_1 = 7$ and $u_{12} = 51$.

**(a)** Find the common difference. **[2]**

**(b)** Find $S_{20}$. **[2]**

**10.** **4 marks · Paper 2 style · calculator allowed**

The number of visitors to a museum was $52\,000$ in 2020 and falls by $4\%$ each year.

**(a)** Find the number of visitors in 2026. **[2]**

**(b)** Find the total number of visitors from 2020 to 2029 inclusive. **[2]**

## Answers and worked solutions

### Question 1 — 2 marks

**Answer:** $1374$

$\frac{24}{2}(80 + 23 \times 1.5)$ **M1**

$\$1374$ **A1**

### Question 2 — 2 marks

**Answer:** $65$

$17 + 6(n-1) = 401$ **M1**

$n = 65$ **A1**

### Question 3 — 3 marks

**Answer:** $26$

$\frac{n}{2}(10 + 3(n-1)) = 1105$ **M1**

$3n^2 + 7n - 2210 = 0$ **A1**

$n = 26$ **A1**

### Question 4 — 3 marks

**Answer:** $23$ rows; $437$ logs

$30 - (n-1) = 8$, $n = 23$ **A1**

$\frac{23}{2}(30 + 8)$ **M1**

$437$ **A1**

### Question 5 — 4 marks

**Answer:** $r = 3$, $u_1 = 2$, $S_8 = 6560$

$r^3 = 27$, $r = 3$ **A1**

$u_1 = 2$ **A1**

$\frac{2(3^8 - 1)}{2}$ **M1**

$6560$ **A1**

### Question 6 — 4 marks

**Answer:** $k = 6$, $r = 1.5$

$(2k)^2 = (k+2)(k+12)$ **M1**

$3k^2 - 14k - 24 = 0$ **A1**

$k = 6$ **A1**

$r = \frac{12}{8} = 1.5$ **A1**

### Question 7 — 4 marks

**Answer:** A $\$14\,500$, $B$ $\$14\,486.56$; A

A:

$\frac{10}{2}(2000 + 900) = \$14\,500$ **A1**

$B$: $\frac{1000(1.08^{10} - 1)}{0.08}$ **M1**

$\$14\,486.56$ **A1**

Option $A$ **A1**

### Question 8 — 3 marks

**Answer:** $21$

$\frac{5(1.2^n - 1)}{0.2} > 1000$ **M1**

$n > 20.4$ **A1**

$n = 21$ **A1**

### Question 9 — 4 marks

**Answer:** (a) $4$; (b) $900$

**(a)**

$7 + 11d = 51$ **M1**

$d = 4$ **A1**

**(b)**

$\frac{20}{2}(14 + 19 \times 4)$ **M1**

$900$ **A1**

### Question 10 — 4 marks

**Answer:** (a) $40\,700$; (b) $436\,000$

**(a)**

$52000(0.96)^6$ **M1**

$40\,700$ **A1**

**(b)**

$\frac{52000(1 - 0.96^{10})}{0.04}$ **M1**

$436\,000$ **A1**

Every solution is also on ibmathrevision.com/hlai/sequences-and-series-exam-practice
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