IB MATHS AA HL · UNIT 1

Sequences and Series: exam practice

10 questions · 45 marks · worked solutions and markschemes

Name _____ Date _____ Score / 45

- 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/hlaa/sequences-and-series-exam-practice

1. **3 marks · Paper 1 style · no calculator**

Find the value of $\sum_{r=1}^{8} 5 \times 2^{r-1}$.

Find the sum. **[3]**

2. **3 marks · Paper 1 style · no calculator**

Write the recurring decimal $0.\dot{3}\dot{6}$ as a fraction in its lowest terms, using an infinite geometric series.

Find the fraction. **[3]**

3. **4 marks · Paper 1 style · no calculator**

Find the sum of all integers between 100 and 400 that are multiples of 7.

Find the sum. **[4]**

4. **5 marks · Paper 1 style · no calculator**

The fifth term of an arithmetic sequence is 23 and the sum of the first ten terms is 255.

Find the first term and the common difference. **[5]**

5. **4 marks · Paper 1 style · no calculator**

Given that $\sum_{r=1}^{n}(4r+1)=1034$, find n.

Find n. **[4]**

6. **4 marks · Paper 2 style · calculator**

A theatre has 30 rows. The first row has 18 seats and each row has 2 more seats than the row in front.

(a) Find the number of seats in the last row. **[2]**

(b) Find the total number of seats. **[2]**

7. **5 marks · Paper 1 style · no calculator**

The second term of a geometric sequence is -12 and the fifth term is 96.

(a) Find the common ratio and the first term. **[3]**

(b) Find the sum of the first 10 terms. **[2]**

8. **6 marks · Paper 2 style · calculator**

A ball is dropped from 10 m. After each bounce it rises to 70% of the height of the previous bounce.

(a) Find the height of the ball after the 5th bounce. **[2]**

(b) Find the total distance travelled by the ball before it comes to rest. **[4]**

9. **5 marks · Paper 2 style · calculator**

An arithmetic sequence has first term 2 and common difference d, with $d \neq 0$. Its first, third and seventh terms are the first three terms of a geometric sequence.

(a) Find d. **[4]**

(b) Find the common ratio of the geometric sequence. **[1]**

10. **6 marks · Paper 1 style · no calculator**

The infinite geometric series $1 + (2x - 1) + (2x - 1)^2 + \ldots$ has a sum to infinity.

(a) Find the set of values of x for which the sum to infinity exists. **[3]**

(b) Given that the sum to infinity is $\frac{5}{4}$, find x. **[3]**

Answers and worked solutions

Question 1 — 3 marks

Answer: 1275

geometric, $u_1 = 5$, $r = 2$, $n = 8$ **M1**

$5(2^8 - 1)$ **A1**

1275 **A1**

Question 2 — 3 marks

Answer: $\frac{4}{11}$

$\frac{36}{100} + \frac{36}{100^2} + \ldots$ **M1**

$\frac{0.36}{1 - 0.01}$ **A1**

$\frac{4}{11}$ **A1**

Question 3 — 4 marks

Answer: 10836

first 105, last 399 **A1**

$n = 43$ **A1**

$\frac{43}{2}(105 + 399)$ **M1**

10836 **A1**

Question 4 — 5 marks

Answer: $u_1 = 3$, $d = 5$

$u_1 + 4d = 23$ **A1**

$5(2u_1 + 9d) = 255$ **A1**

attempt to solve **M1**

$d = 5$, $u_1 = 3$ **A1A1**

Question 5 — 4 marks

Answer: 22

$\frac{n}{2}(5 + 4n + 1) = 1034$ $M1$ **A1**

$2n^2 + 3n - 1034 = 0$ **A1**

$n = 22$ **A1**

Question 6 — 4 marks

Answer: (a) 76; (b) 1410

(a)

$18 + 29 \times 2$ **M1**

76 **A1**

(b)

$\frac{30}{2}(18 + 76)$ **M1**

1410 **A1**

Question 7 — 5 marks

Answer: (a) $r = -2$, $u_1 = 6$; (b) -2046

(a)

$r^3 = -8$ **M1**

$r = -2$ **A1**

$u_1 = 6$ **A1**

(b)

$\frac{6\left(1 - (-2)^{10}\right)}{1 - (-2)}$ **M1**

-2046 **A1**

Question 8 — 6 marks

Answer: (a) $1.68\,m$; (b) $56.7\,m$

(a)

$10(0.7)^5$ **M1**

$1.68\,m$ **A1**

(b)

down 10, then up and down each bounce **M1**

$10 + 2 \times \frac{7}{1 - 0.7}$ $M1$**A1**

$56.7\,m$ **A1**

Question 9 — 5 marks

Answer: (a) 1; (b) 2

(a)

$(2 + 2d)^2 = 2(2 + 6d)$ $M1$**A1**

$4d^2 - 4d = 0$ **A1**

$d = 1$ **A1**

(b)

$r = \frac{4}{2} = 2$ **A1**

Question 10 — 6 marks

Answer: (a) $0 < x < 1$; (b) $\frac{3}{5}$

(a)

$|2x - 1| < 1$ **M1**

$0 < x < 1$ **A2**

(b)

$\frac{1}{1 - (2x - 1)} = \frac{5}{4}$ **M1**

$2 - 2x = \frac{4}{5}$ **A1**

$x = \frac{3}{5}$ **A1**

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