

# IB Maths AA SL Unit 1 Number and Algebra Practice Exam: Mark Scheme

IB Mathematics: Analysis and Approaches SL · 10 questions · 53 marks

- M marks are for a correct method; A marks for an accurate answer that follows a correct method; R marks are for clear reasoning; AG means the answer is given in the question, so the working must be complete.
- Accept any correct method that reaches a correct answer, unless the question says which method to use.
- Practise these topics online with instant feedback: [ibmathrevision.com/SLAAUnit1](https://ibmathrevision.com/SLAAUnit1)

## Section A: no calculator

### Question 1

2 marks

$$4.5 \times 10^4 = 0.45 \times 10^5 \text{ (or } 3.2 \times 10^5 = 32 \times 10^4) \text{ (M1)}$$

$$3.2 \times 10^5 + 0.45 \times 10^5 = 3.65 \times 10^5 \text{ A1}$$

### Question 2

3 marks

a.  $r = -2$  A1

b.  $3(-2)^{n-1} = 3072 \implies (-2)^{n-1} = 1024 = (-2)^{10} \text{ (M1)}$

$n = 11$  A1

### Question 3

3 marks

a.  $9.5 \times 2.4 \times 10^{-13+10} = 22.8 \times 10^{-3} \text{ (M1)}$   
 $= 2.28 \times 10^{-2} \text{ g A1}$

b. 0.0228 g A1

### Question 4

6 marks

a.  $n^3 + 3n^2 + 3n + 1 - n^3 \text{ M1}$   
 $= 3n^2 + 3n + 1 \text{ AG}$

b.  $3n^2 + 3n = 3n(n+1) \text{ M1}$   
 $n(n+1)$  is a product of consecutive integers, so even R1  
 even  $+1$  is odd R1

c.  $\frac{x(x+1) - x(x-1)}{(x-1)(x+1)} \text{ M1}$   
 $= \frac{x^2 + x - x^2 + x}{x^2 - 1} \text{ A1}$   
 $= \frac{2x}{x^2 - 1} \text{ AG}$

### Question 5

4 marks

a.  $(2.5 \times 10^n)^3 = 2.5^3 \times 10^{3n} = 15.625 \times 10^{3n} \text{ M1A1}$   
 $= 1.5625 \times 10^1 \times 10^{3n} = 1.5625 \times 10^{3n+1} \text{ AG}$

b.  $3n + 1 = 22 \text{ (M1)}$   
 $n = 7 \text{ A1}$



**Question 6**

6 marks

- a.  $u_1 = 4, r = 2$  **A1A1**
- b.  $\frac{4(2^6 - 1)}{2 - 1}$  **(M1)**  
 $= 252$  **A1**
- c.  $4(2^n - 1) > 2000 \implies 2^n > 501$  **(M1)**  
 $2^8 = 256 < 501 < 512 = 2^9$ , so  $n = 9$  **A1**

**Question 7**

11 marks

- a.  $u_1 = S_1 = 8$  **A1**  
 $u_2 = S_2 - S_1 = 22 - 8 = 14$  **A1**
- b.  $u_n = S_n - S_{n-1} = 3n^2 + 5n - 3(n-1)^2 - 5(n-1)$  **M1**  
 $= 6n + 2$  **A1**  
 $u_{n+1} - u_n = 6$ , a constant **R1AG**
- c.  $3n^2 + 5n - 1000 > 0$  **(M1)**  
 $S_{17} = 952 < 1000$  and  $S_{18} = 1062 > 1000$  (or solving the quadratic:  $n > 17.4$ ) **(A1)**  
 $n = 18$  **A1**
- d.  $S_{2k} - S_{k-1}$  **M1**  
 $= 3(4k^2) + 10k - 3(k-1)^2 - 5(k-1)$  **(A1)**  
 $= 9k^2 + 11k + 2$  **A1**

**Question 8**

8 marks

- a. let  $u = 2^x$ :  $u^2 - 6u + 8 = 0$  **M1**  
 $u = 2$  or  $u = 4$  **A1**  
 $x = 1$  or  $x = 2$  **A1**
- b.  $(e^x - 2)(e^x - 3) = 0$  **M1**  
 $x = \ln 2$  or  $x = \ln 3$  **A1A1**
- c.  $\log_{10}\left(\frac{8}{100}\right) = 3 \log_{10} 2 - 2$  **M1**  
 $= 3a - 2$  **A1**

**Section B: calculator allowed****Question 9**

5 marks

- a.  $u_1 = 2, r = 3$  **A1**  
 $S_n = \frac{2(3^n - 1)}{3 - 1} = 3^n - 1$  **M1AG**
- b.  $3^n - 1 > 10^6$  **(M1)**  
 $n > \frac{\ln(10^6 + 1)}{\ln 3} = 12.57 \dots$  **(A1)**  
 $n = 13$  **A1**



### Question 10

5 marks

a.  $12\,000 \times 1.035^{10}$  **(M1)**  
 $= 16927$  **A1**

b.  $12\,000 \times 1.035^n > 24\,000$  **(M1)**  
 $n > 20.15$ , so  $n = 21$  **(A1)**  
start of 2046 **A1**

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