

# 1.4 Proof & Reasoning

## Question Paper

Course	DPIB Maths
Section	1. Number & Algebra
Topic	1.4 Proof & Reasoning
Difficulty	Medium

**Time allowed:** 40  
**Score:** /27  
**Percentage:** /100

**Question 1**

Prove that  $(4x - 1)(2x + 3) - (2x + 1)^2 = 2(2x - 1)(x + 2)$ .

[3 marks]

**Question 2**

Prove that  $x^2 - 3x + 3$  is positive for all values of  $x$ .

[3 marks]

**Question 3**

Prove that  $(a - b)^2 - (a + b)^2 = -4ab$ .

[3 marks]

**Question 4**

Prove that the sum of any three consecutive integers is a multiple of 3.

[3 marks]

**Question 5**

Prove that  $x^2 + 2 \geq 2$  for all values of  $x$ .

[2 marks]

**Question 6**

Prove that the square of an even number is a multiple of 4.

[3 marks]

**Question 7a**

(a) Factorise  $n^2 + 3n + 2$ .

[1 mark]

**Question 7b**

(b) Hence show that  $n^3 + 3n^2 + 2n = n(n + 1)(n + 2)$ .

[1 mark]

**Question 7c**

(c) Given that  $n$  is even, write down whether  $(n + 1)$  and  $(n + 2)$  are odd or even.

[2 marks]

**Question 7d**

(d) Hence deduce whether  $n^3 + 3n^2 + 2n$  is odd or even. Justify your answer.

[2 marks]

**Question 8a**

(a) Show that  $(3n + 2)^2 - (n + 2)^2 = 8n^2 + 8n$ , where  $n \in \mathbb{Z}$ .

[2 marks]

**Question 8b**

(b) Hence, or otherwise, prove that  $(3n + 2)^2 - (n + 2)^2$  is a multiple of 8.

[2 marks]