Name: ______________________________

GCSE (1 – 9)

Proof

Instructions

• Use **black** ink or ball-point pen.
• Answer all questions.
• Answer the questions in the spaces provided
– *there may be more space than you need.*
• Diagrams are **NOT** accurately drawn, unless otherwise indicated.
• You must **show all your working out.**

Information

• The marks for each question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

• Read each question carefully before you start to answer it.
• Keep an eye on the time.
• Try to answer every question.
• Check your answers if you have time at the end

1 Prove algebraically that the sum of any two consecutive integers is always an odd number.

(Total for question 1 is 2 marks)

---

2 Prove algebraically that the sum of any three consecutive even integers is always a multiple of 6.

(Total for question 2 is 2 marks)

3 Prove that $(3n + 1)^2 - (3n - 1)^2$ is always a multiple of 12, for all positive integer values of n.

(Total for question 3 is 2 marks)

---

4 n is an integer.
Prove algebraically that the sum of $n(n + 1)$ and $n + 1$ is always a square number.

(Total for question 4 is 2 marks)

5 Prove that $(2n + 3)^2 - (2n - 3)^2$ is always a multiple of 12, for all positive integer values of n.

(Total for question 5 is 2 marks)

---

6 n is an integer.
Prove algebraically that the sum of $(n + 2)(n + 1)$ and $n + 2$ is always a square number.

(Total for question 6 is 2 marks)

7 Prove that the sum of 3 consecutive odd numbers is always a multiple of 3.

(Total for question 7 is 2 marks)

---

8 Prove that the sum of 3 consecutive even numbers is always a multiple of 6.

(Total for question 8 is 2 marks)

9 Prove algebraically that the sum of the squares of any 2 even positive integers is always a multiple of 4.

(Total for question 9 is 2 marks)

---

10 Prove algebraically that the sum of the squares of any 2 odd positive integers is always even.

(Total for question 10 is 2 marks)

11 Prove that the sum of the squares of any two consecutive integers is always an odd number.

(Total for question 11 is 3 marks)

12 Prove that the sum of the squares of two consecutive odd numbers is always 2 more than a multiple of 8

(Total for question 12 is 2 marks)

13 Prove that the difference between the squares of any 2 consecutive integers is equal to the sum of these integers.

(Total for question 13 is 3 marks)

14 Prove algebraically that the sums of the squares of any 2 consecutive even number is always 4 more than a multiple of 8.

(Total for question 14 is 3 marks)