

Name:

Date:

# Proof

## GCSE

Edexcel

Mathematics

Grade (9-1)

Mark

Score (%)

— 56
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### Materials

For this paper you must have:

- Ruler
- Pencil, Rubber, Protractor and Compass
- Scientific calculator, which you are expected to use when appropriate

### Instructions

- Answer all questions
- Answer questions in the space provided
- All working must be shown
- Do all rough work in this book. Cross out any rough work you don't want to be marked

### Information

- The marks for the questions are shown in brackets

1 Circle the expressions which are even:

(a)  $8n$

(b)  $12n + 4$

(c)  $3n + 4$

(d)  $4n + 3$

(e)  $2n^2 + 6n + 4$

(f)  $6n$

(Total 6 marks)

2 Show that  $6n + 1$  is odd.

.....

(Total 2 mark)

3 Show that  $8n + 3$  is odd.

.....

(Total 2 mark)

4 Show that  $8n^2 + 4n + 12$  is a multiple of 4.

.....

(Total 2 marks)

5 Prove that  $4n^2 + 6n + 7$  is odd for all integer values of  $n$ .

Leave  
blank

.....  
(Total 2 marks)

6 Prove that an odd integer multiplied by an even integer is always even.

.....  
(Total 3 marks)

7 Show that  $8n^2 + 16n + 25$  is never a multiple of 8.

.....  
(Total 2 marks)

8 Show that  $(2n + 1)(4n + 1)$  is always odd.

.....

**(Total 3 marks)**

9 (a) Write down an expression, in terms of  $n$ , for the next number after  $n$ .

.....

**(1)**

(b) Use algebra to show that the sum of any two consecutive integers is always odd.

.....  
**(Total 3 marks) (2)**

10 Prove that the square of any odd number is always odd.

Leave blank

.....  
**(Total 3 marks)**

12 The  $n$ th even number is  $2n$ .  
The next even number after  $2n$  is  $2n + 2$ .

(a) Explain why.

.....  
.....  
**(1)**

(b) Write down an expression, in terms of  $n$ , for the next even number after  $2n + 2$ .

.....  
**(1)**

(c) Show algebraically that the sum of any 3 consecutive even numbers is always a multiple of 3.

.....  
**(Total 4 marks) (2)**

14 Show that  $n^2 + 6n + 9$  is always a square number.

Leave  
blank

.....  
(Total 3 marks)

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

.....  
(Total 3 marks)

**16** Show that  $(4n + 7)^2 - (4n - 7)^2$  is a multiple of 16.

.....

**(Total 3 marks)**

**17** Prove the difference of the squares of two consecutive odd number is always a multiple of 8.

.....

**(Total 4 marks)**

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

Leave  
blank

.....

**(Total 3 marks)**

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

.....

**(Total 4 marks)**

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

Leave  
blank

.....

**(Total 4 marks)**