

Algebraic Proof

For AQA Level 2 Certificate in Further Mathematics (8365)

Name _____

Total marks: **22**

Answer **all** questions in the spaces provided. Show your working: marks are given for correct method. You may use a calculator.

1 n is an integer.

Circle the expression that is a multiple of 4 for every value of n .

[1 mark]

$4n + 2$

$2n + 4$

$2(2n + 6)$

$n^2 + 4$

2 n is an integer.

Show that $4(2n + 3) - 2(n - 3)$ is a multiple of 6

[2 marks]

3 The n th term of a sequence is $6n + 3$

Prove that the sum of any two consecutive terms of the sequence is a multiple of 12

[3 marks]

- 4** a is an odd number and b is an even number.
Prove that $a^2 + ab + b^2$ is odd.

[3 marks]

- 5** Prove that $2x^2 - 20x + 53 > 0$ for all values of x .

[3 marks]

- 6** k is an integer.
Prove that $(4k + 3)(k + 6) - (2k + 5)^2$ is a multiple of 7

[3 marks]

- 7** Prove that the difference between the cubes of two consecutive integers is always odd.
[3 marks]

- 8** (a) Prove that $n(n + 1)(n + 2)(n + 3) + 1 = (n^2 + 3n + 1)^2$
[3 marks]

- (b) Hence prove that one more than the product of any four consecutive integers is a square number.
[1 mark]