

Algebraic Proof

For AQA GCSE Mathematics (8300) • Higher tier

Name _____

Total marks: **29**

Answer **all** questions in the spaces provided. Show your working: marks are given for correct method.

- 1** n is an integer.
Tick **one** box for each expression.

[3 marks]

	Always even	Always odd	Either
$2n$	☐	☐	☐
$2n + 1$	☐	☐	☐
$n + 1$	☐	☐	☐
$2n + 4$	☐	☐	☐
n^2	☐	☐	☐
$4n - 1$	☐	☐	☐

- 2** p is an even number and q is an odd number.
Which expression is **always** odd?
Circle your answer.

[1 mark]

pq	$p^2 + q$	$4q$	$p + q + 1$
------	-----------	------	-------------

- 3** Prove that the sum of three consecutive integers is always a multiple of 3
[2 marks]
- 4** Prove that the product of two odd numbers is always odd.
[3 marks]
- 5** Sam says, " $n^2 + n$ is always odd."
Prove that Sam is wrong.
[2 marks]
- 6** Two even numbers have a difference of 2
Prove that when they are multiplied together, the answer is always a multiple of 8
[3 marks]

- 7 Keira thinks of an integer that is not zero.
She adds 2 to it and squares the result.
She subtracts 4
She then divides by the integer she first thought of.
Prove algebraically that her final answer is always 4 more than the integer she first thought of.

[3 marks]

- 8 x is a square number.
Show that the next square number is $x + 2\sqrt{x} + 1$

[2 marks]

- 9 The n th triangular number is $\frac{n(n+1)}{2}$
Prove that 8 times any triangular number, plus 1, is always a square number.

[3 marks]

- 10** (a) Write $x^2 - 10x + 32$ in the form $(x - a)^2 + b$

[2 marks]

Answer _____

- (b) Hence prove that $x^2 - 10x + 32 \geq 7$ for all values of x .

[1 mark]

- 11** n is an integer.

Prove that $(n + 1)^3 - (n - 1)^3$ is always 2 more than a multiple of 6

[4 marks]