GCSE: Algebraic proof | CM

This worksheet is designed to give you extra practice on **algebraic proof**.

1 Write down algebraic expressions for

(a) an even number

(b) an odd number

(c) a multiple of four

(d) a positive number which leaves a remainder of 1 upon division by 5

(e) the sum of two consecutive even numbers

(f) the sum of two even numbers

(g) the product of two odd numbers

(e) the cube of a multiple of 6

(h) the sum of the squares of two consecutive multiples of 3

2 Prove algebraically that

(a) the sum of two consecutive numbers is odd

(b) the product of two even numbers is even

(c) the sum of any three consecutive numbers is a multiple of 3

3 (a) Prove algebraically that the sum of the squares of two consecutive odd numbers is **not** a multiple of 4.

(b) What is the remainder when the sum of the squares of two consecutive odd numbers is divided by 4? Is the number odd or even?

4 Johnny has an even number. He adds 3 to this number and then squares it.
The result is 81.
What even number did Johnny start with?

5 Prove algebraically that $(5n + 1)^2 – (5n – 1)^2$ is both a multiple of 4 and a multiple of 5 for positive integers n.

6 Anne has a number which is not a multiple of 3.

(a) Explain why it must be of the form $(3n + 1)$ or $(3n + 2)$, where n is an integer.

(b) Hence, by considering these two different cases, show that the square of Anne's number leaves a remainder of 1 when divided by 3.

7 (a) Prove that if n is an even integer, then $3n^2 + n + 14$ is even.

(b) Prove that if n is an odd integer, then $3n^2 + n + 14$ is even.

(c) What can you deduce about the number $3n^2 + n + 14$ for all integers n?

END OF WORKSHEET