Proof

Grade 8/9 topic · Higher tier · Edexcel and AQA

How to use this pack
20 questions that get harder as you go. Questions 1–15 (60 marks) build up to the harder Grade 8–9 style questions at the end; aim to complete all 20. Show your working on the lines and write your final answer on the answer line, then mark yourself with the answers at the back. Diagrams are not drawn accurately. Total: 80 marks.

Warm-up

1 Prove that the sum of two consecutive integers is odd. **[3 marks]**

Answer _____

2 Prove that the sum of three consecutive integers is a multiple of 3. **[3 marks]**

Answer _____

3 Prove that the sum of two odd numbers is even. **[3 marks]**

Answer _____

4 Prove that the product of two even numbers is a multiple of 4. **[3 marks]**

Answer _____

5 Prove that the square of an odd number is odd. **[4 marks]**

Answer _____

Core

6 Prove that $(n + 1)^2 - (n - 1)^2$ is a multiple of 4. **[4 marks]**

Answer _____

7 Prove that $(2n + 1)^2 - 1$ is a multiple of 8. **[5 marks]**

Answer _____

8 Prove that $n^2 + n$ is always even. **[4 marks]**

Answer _____

9 Prove that the sum of the squares of two consecutive integers is odd. **[4 marks]**

Answer _____

10 Prove that the sum of five consecutive integers is a multiple of 5. **[4 marks]**

Answer _____

Stretch

11 Prove that $(a + b)^2 \geq 4ab$ for all real numbers a and b. **[5 marks]**

Answer _____

12 Prove that the difference of the squares of two consecutive integers is odd. **[4 marks]**

Answer _____

13 Prove that $(2n + 3)^2 - (2n - 1)^2$ is a multiple of 8. **[5 marks]**

Answer _____

14 Prove that the sum of three consecutive even numbers is a multiple of 6. **[4 marks]**

Answer _____

15 Prove that $n^3 - n$ is divisible by 6 for any integer n. **[5 marks]**

Answer _____

Challenge

16 Prove that $x^2 + 6x + 10$ is always positive. **[4 marks]**

Answer _____

17 Prove that 0.4545... (45 recurring) = 5/11. **[4 marks]**

Answer _____

18 Prove that $(n + 2)^2 - n^2$ is a multiple of 4. **[4 marks]**

Answer _____

19 Prove that the product of two consecutive integers is even. **[3 marks]**

Answer _____

20 Prove that the sum of the squares of two odd numbers is even. **[5 marks]**

Answer _____