Proof Past Paper Questions GCSE Edexcel – Non-Calculator

1.

Prove algebraically that the difference between the squares of any two consecutive odd numbers is always a multiple of 8

2.

Prove that the square of an odd number is always 1 more than a multiple of 4

3.

S is a geometric sequence.

(a) Given that $(\sqrt{x} - 1)$, 1 and $(\sqrt{x} + 1)$ are the first three terms of S, find the value of x.
You must show all your working.

....

(3)

(b) Show that the 5th term of S is $7 + 5\sqrt{2}$

4.

Prove algebraically that the straight line with equation $x - 2y = 10$ is a tangent to the circle with equation $x^2 + y^2 = 20$

5.

Show that $(x + 1)(x + 2)(x + 3)$ can be written in the form $ax^3 + bx^2 + cx + d$ where a, b, c and d are positive integers.

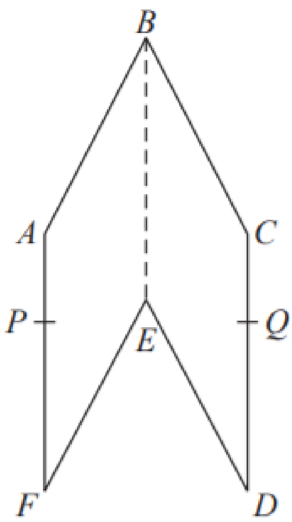
6.

n is an integer greater than 1

Prove algebraically that $n^2 - 2 - (n - 2)^2$ is always an even number.

7.

The diagram shows a hexagon *ABCDEF*.



ABEF and *CBED* are congruent parallelograms where $AB = BC = x$ cm.
P is the point on *AF* and *Q* is the point on *CD* such that $BP = BQ = 10$ cm.

Given that angle $ABC = 30°$,

prove that $\cos PBQ = 1 - \frac{(2 - \sqrt{3})}{200}x^2$

8.

The product of two consecutive positive integers is added to the larger of the two integers.

Prove that the result is always a square number.

9.

Prove algebraically that the difference between the squares of any two consecutive integers is equal to the sum of these two integers.

10.

Show that

$$(3x - 1)(x + 5)(4x - 3) = 12x^3 + 47x^2 - 62x + 15$$

for all values of x.

11.

Here are the first five terms of an arithmetic sequence.

7 13 19 25 31

Prove that the difference between the squares of any two terms of the sequence is always a multiple of 24

12.

Prove algebraically that

$$(2n + 1)^2 - (2n + 1) \text{ is an even number}$$

for all positive integer values of n.

13.

Prove algebraically that the recurring decimal $0.2\dot{5}$ has the value $\frac{23}{90}$

14.

Show that $\dfrac{1}{6x^2 + 7x - 5} \div \dfrac{1}{4x^2 - 1}$ simplifies to $\dfrac{ax + b}{cx + d}$ where a, b, c and d are integers.