



Name: _____ **Date:** _____ **Score:** _____ / 41

- 1** Prove algebraically that the difference between the squares of two consecutive integers is equal to the sum of the two integers. (3 marks)

Answer _____

- 2** A regular hexagon is drawn inside a circle of radius r so that all six vertices lie on the circle. Each side of the hexagon is equal to r .
The perimeter of the hexagon is less than the circumference of the circle.
Use this to show that $\pi > 3$. (3 marks)

Answer _____

- 3** Prove that $x^2 - 6x + 11$ is greater than 0 for all values of x . (3 marks)

Answer _____

- 4** Prove algebraically that the sum of the squares of any three consecutive integers is always 2 more than a multiple of 3. (3 marks)

Answer _____

- 5** Prove algebraically that $(3n + 1)^2 - (3n - 1)^2$ is a multiple of 12 for every integer n . (3 marks)

Answer _____

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

(4 marks)

Answer _____

- 7 a. Show that $(n + 3)^2 - (n - 2)^2 \equiv 5(2n + 1)$

- b. Hence explain why the difference between $(n + 3)^2$ and $(n - 2)^2$ is always an odd multiple of 5, for every integer n .

(4 marks)

Answer _____

- 8 Prove algebraically that $n^3 - n$ is a multiple of 6 for every positive integer n .

(4 marks)

Answer _____

- 9 Prove algebraically that the square of any odd number is 1 more than a multiple of 8.

(4 marks)

Answer _____

- 10** Prove algebraically that the difference between the squares of any two odd numbers is a multiple of 8.

(6 marks)

Answer _____

- 11** Prove that the product of four consecutive integers, plus 1, is always a perfect square.

(4 marks)

Answer _____

End of questions | Total 41 marks