Summer 2017 Paper 1 Q16

1 *n* is an integer greater than 1

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

(Total for Question 1 is 4 marks)

Summer 2018 Paper 1 Q12

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

(Total for Question 2 is 4 marks)

Summer 2019 Paper 1 Q13

3 Given that n can be any integer such that $n > 1$, prove that $n^2 - n$ is never an odd number.

(Total for Question 3 is 2 marks)

Autumn 2018 Paper 3 Q15

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

(Total for Question 4 is 3 marks)

Autumn 2019 Paper 3 Q15

5 Prove algebraically that the sum of the squares of any two consecutive even numbers is always a multiple of 4

(Total for Question 5 is 3 marks)

Autumn 2022 Paper 1 Q16

6 (a) Prove that

$$(2m + 1)^2 - (2n - 1)^2 = 4(m + n)(m - n + 1)$$

(3)

Sophia says that the result in part (a) shows that the difference of the squares of any two odd numbers must be a multiple of 4

(b) Is Sophia correct?
You must give reasons for your answer.

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(1)

(Total for Question 6 is 4 marks)

Autumn 2017 Paper 1 Q17

7 n is an integer.

Prove algebraically that the sum of $\frac{1}{2}n(n + 1)$ and $\frac{1}{2}(n + 1)(n + 2)$ is always a square number.

(Total for Question 7 is 2 marks)

Autumn 2017 Paper 3 Q19

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

(Total for Question 8 is 5 marks)