Edexcel

A Level

A Level Mathematics

C1 Sequences and Series

Name:

MME

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Total Marks: /28

1. Consider an arithmetic sequence with k^{th} term given by $a_k = a + (k-1)d$. Prove that

$$S = \sum_{k=1}^{n} a_k = \frac{1}{2}n(2a + (n-1)d).$$

[8]

Hint: this is a proof that you may have seen in class. To begin, write out the sum term by term:

$$S = a + (a+d) + (a+2d) + (a+3d) + \cdots + (a+(n-2)d + (a+(n-1)d).$$

Now compute $S + S$ using the above by adding the first term to the last term, the second term to the second-to-last term, the third term to the third-to-last term and so on. One the left hand side you have $2s$, but what do you have on the right hand side? Can you make any simplifications by collecting like terms and rearranging?

2. Consider the sequence defined recursively by:

$$u_{n+2} = 3u_{n+1} - u_n, \qquad n \geq 1,$$

where,

$$u_1 = 1, \quad u_2 = 3.$$

(a) Calculate u_3 and u_4. [3]

(b) Calculate $\sum_{n=1}^{5} u_n$. [3]

3. Consider the sequence defined recursively by:

$$u_{n+2} = 2u_{n+1} - u_n, \qquad n \geq 1,$$

where,

$$u_1 = 5, \quad u_2 = 7.$$

(a) Calculate u_3, u_4 and u_5. [3]

(b) Calculate $\sum_{n=1}^{5} u_n$. [2]

(c) Write u_n in the form $u_n = a + bn$ for some coeficients a, b to be determined. [4]

(d) Calculate $\sum_{n=1}^{100} u_n$. [5]