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# Sequences and Series 1i

A Level



A sequence of terms  $u_1, u_2, u_3, \dots$  is defined by

$$u_1 = 2 \text{ and } u_{n+1} = 1 - u_n$$

$$\text{for } n \geq 1$$

## Part A Values

Give the values of  $u_2, u_3$  and  $u_4$ .

Give the value of  $u_2$ .

The following symbols may be useful:  $u_2$

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Give the value of  $u_3$ .

The following symbols may be useful:  $u_3$

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Give the value of  $u_4$ .

The following symbols may be useful:  $u_4$

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## Part B Behaviour

Describe the behaviour of the sequence.

- ☐ It is a geometric sequence, with first term 2 and constant ratio  $-\frac{1}{2}$ .
- ☐ The sequence is periodic, with a period of four. The first two values that repeat are 2 and  $-1$ .
- ☐ The sequence is periodic, with a period of three. It cycles through values of 2,  $-1$  and 1.
- ☐ The sequence is periodic, with a period of two. It alternates between values of 2 and  $-1$ .
- 

## Part C Sum

Find  $\sum_{n=1}^{100} u_n$ .

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# Arithmetic Series 1ii

A Level



## Part A Value of $x$

The first three terms of an arithmetic progression are  $2x$ ,  $x + 4$ , and  $2x - 7$  respectively. Find the value of  $x$ .

The following symbols may be useful:  $x$

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## Part B An Arithmetic Progression

The 20<sup>th</sup> term of an arithmetic progression is 10 and the 50<sup>th</sup> term is 70.

What is the first term?

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What is the common difference?

---

Calculate the sum of the first 29 terms.

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# Arithmetic Series 1i

A Level



In an arithmetic progression the first term is 5 and the common difference is 3. The  $n^{\text{th}}$  term of the progression is denoted by  $u_n$ .

## Part A Value of $u_{20}$

Find the value of  $u_{20}$ .

The following symbols may be useful:  $u_{20}$

## Part B Sum

Find the value of  $\sum_{n=10}^{20} u_n$ .

## Part C Value of $N$

Find the value of  $N$  such that  $\sum_{n=N}^{2N} u_n = 2750$ .

The following symbols may be useful:  $N$



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# Geometric Series 1ii

A Level



Records are kept of the number of copies of a certain book that are sold each week. In the first week after publication, 3000 copies were sold, and in the second week 2400 copies were sold. The publisher forecasts future sales by assuming that the number of copies sold each week will form a geometric progression with first two terms 3000 and 2400. Calculate (to the nearest number of whole books) the publisher's forecasts for:

## Part A 20<sup>th</sup> Week

The number of copies that will be sold in the 20<sup>th</sup> week after publication.

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## Part B Total copies sold in 20 weeks

The total number of copies sold during the first 20 weeks after publication.

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## Part C Total sold copies

The total number of copies that will ever be sold.

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# Geometric Series 2ii

A Level



## Part A Geometric Progression 1

In a geometric progression, the sum to infinity is four times the first term.

Find the common ratio.

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Given that the third term is 9, find the first term.

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Find the sum of the first twenty terms. (To three significant figures.)

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## Part B Geometric Progression 2

The first term of a geometric progression is 6 and the sum to infinity is 10.

Find the common ratio.

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# Geometric Series 4ii

A Level



In a geometric progression, the first term is 5 and the second term is 4.8.

## Part A Sum to Infinity

Find the sum to infinity.

---

## Part B Value of $n$

The sum of the first  $n$  terms is greater than 124. By showing that

$$0.96^n < 0.008$$

and using logarithms, calculate the smallest possible value of  $n$ .

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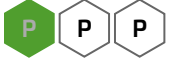


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## Series: Summation - Standard Results 2ii

Further A



Find

$$\sum_{r=1}^n (4r^3 + 6r^2 + 2r),$$

expressing your answer in a fully factorised form.

The following symbols may be useful: n

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## Series: Summation - Standard Results 1i

Further A



### Part A   $\sum_{r=n}^{2n} r^3$

Express  $\sum_{r=n}^{2n} r^3$  in terms of  $n$ , giving your answer in fully factorised form.

The following symbols may be useful:  $n$

### Part B   $\sum_{r=n}^{2n} r (r^2 - 2)$

Hence find  $\sum_{r=n}^{2n} r (r^2 - 2)$ , giving your answer in a fully factorised form.

The following symbols may be useful:  $n$

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