Sequences and Series 1i

A Level

A sequence of terms u_1, u_2, u_3, ... is defined by

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

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

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`

Give the value of u_3.

The following symbols may be useful: `u_3`

Give the value of u_4.

The following symbols may be useful: `u_4`

Part B Behaviour

Describe the behaviour of the sequence.

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

Part C Sum

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

Arithmetic Progression 1

A Level Further A

In an arithmetic progression, the fifth term is 32 and the tenth term is 57.

Part A First term

Find the first term, a.

Part B Common difference

Find the common difference, d.

Part C Sum of first 70 terms

Hence, find the sum of the first 70 terms.

Created for isaacphysics.org by Julia Riley.

Gameboard:

STEM SMART Single Maths 35 - Sequences & Series

Arithmetic Series 5i

A Level

A sequence of terms u_1, u_2, u_3, ... is defined by

$$u_n = 2n + 5, \text{ for } n \geqslant 1.$$

Part A Values

Write down the values of u_1, u_2, and u_3.

State the value of u_1.

The following symbols may be useful: `u_1`

State the value of u_2.

The following symbols may be useful: `u_2`

State the value of u_3.

The following symbols may be useful: `u_3`

Part B Type of Sequence

What type of sequence is made by the terms of u_n?

- A periodic sequence
- A Fibonacci sequence
- An arithmetic sequence (arithmetic progression)
- A geometric sequence (geometric progression)

Part C Value of N

Given that $\sum_{n=1}^{N} u_n = 2200$, find the value of N.

The following symbols may be useful: `N`

Gameboard:

STEM SMART Single Maths 35 - Sequences & Series

Arithmetic Series 1

A Level Further A

Find the sum of the arithmetic series

$$10.0 + 10.1 + 10.2 + \cdots + 12.0$$

Created for isaacphysics.org by Julia Riley.

Gameboard:

STEM SMART Single Maths 35 - Sequences & Series

Arithmetic Series 2ii

A Level

The tenth term of an arithmetic progression is equal to twice the fourth term. The twentieth term of the progression is 44.

Part A First Term

Find the first term.

Part B Common Difference

Find the common difference.

Part C Sum of the Series

Find the sum of the first 50 terms.

Gameboard:

STEM SMART Single Maths 35 - Sequences & Series

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^{th} Week

The number of copies that will be sold in the 20^{th} week after publication.

Part B Total copies sold in 20 weeks

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

Part C Total sold copies

The total number of copies that will ever be sold.

Gameboard:

STEM SMART Single Maths 35 - Sequences & Series

Geometric Series 4

A Level Further A

The second and fourth terms of an infinite geometric series are $\frac{1}{2}$ and $\frac{1}{72}$ respectively. Deduce the common ratio (given that it is positive) and the first term. Hence find the sum of the series, giving your answer in the form of an improper fraction.

Created for isaacphysics.org by Julia Riley

Gameboard:

STEM SMART Single Maths 35 - Sequences & Series

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.

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

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

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.

Gameboard:

STEM SMART Single Maths 35 - Sequences & Series

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.

Gameboard:

STEM SMART Single Maths 35 - Sequences & Series

Arithmetic Series 1i

A Level

In an arithmetic progression the first term is 5 and the common difference is 3. The n^{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`