**3A Arithmetic Sequences Introduction**

1. An arithmetic sequence is generated as follows:

6, 20, 34, 48, 72…

1. Find the nth term
2. Find the first term in the sequence that exceeds 200
3. An arithmetic sequence is generated as follows:

101, 94, 87, 80, 73…

1. Find the nth term
2. Find the first term in the sequence that is negative
3. A sequence is generated by the formula $u\_{n}=a+(n-1)d$ , where $a$ and $b$ are constants to be found.

Given that $u\_{3}=5$ and $u\_{8}=20$, find the values of the constants $a$ and $d$.

**3B Arithmetic Series**

Proof:

1. Find the sum of the first 50 terms of the arithmetic series:

$32+27+22+17+12+$…

1. Find the smallest number of terms required for the sum of $4+9+14+19+$… to exceed 2000.

**3C Geometric Sequences Introduction**

1. Find the nth and 10th terms of the following sequences…
2. 3, 6, 12, 24…
3. 40, -20, 10, -5…
4. The second term of a Geometric sequence is 4, and the 4th term is 8. Find the values of the common ratio and the first term
5. The numbers 3, x, and (x + 6) form the first three terms of a positive geometric sequence. Calculate the 15th term of the sequence
6. What is the first term to exceed 1 million in the sequence:

$3, 6, 12, 24$…

**3D Geometric Series**

Proof:

1. Find the sum of the following Geometric Series:

$2+6+18+54$… (for 10 terms)

1. Find the sum of the following Geometric Series:

$1024-512+256-128+$……$+1$

1. Find the least value of $n$ such that the sum of the following series exceeds 2,000,000:

$$1+2+4+8…$$

**3E Geometric Sum to Infinity**

1. For the following series:

$$16+8+4+2…$$

1. Find the sum of the first 10 terms
2. Find the sum to infinity
3. The fourth term of a geometric series is 1.08 and the seventh is 0.23328.
4. Show that the series is convergent
5. Calculate the sum to infinity of the series
6. For a geometric series with first term $a$, and common ratio $r$, $S\_{4}=15$ and $S\_{\infty }=16$.
7. Find the possible values of $r$
8. Given that all terms in the series are positive, find the value of $a$

**3F Sigma Notation**

1. Calculate the following:

$$\sum\_{r=1}^{20}(4r+1)$$

1. Find the value of:

$$\sum\_{r=1}^{12}(5×3^{r-1})$$

1. Find the value of:

$$\sum\_{r=6}^{15}(5×3^{r-1})$$

**3G Recurrence Relationships**

1. Find the first four terms of the following sequences:

a) $u\_{n+1}=u\_{n}+4$, $u\_{1}=7$

b) $u\_{n+1}=u\_{n}+4$, $u\_{1}=5$

1. Find the first five terms generated by the following sequence:

$u\_{n+1}=2u\_{n}+3$, $u\_{1}=2$

1. A sequence $a\_{1}, a\_{2}, a\_{3},$… is defined by:

$$a\_{1}=p$$

$a\_{n+1}=\left(a\_{n}\right)^{2}-1,$ $n\geq 1$

where $p<0$

1. Show that $a\_{3}=p^{4}-2p^{2}$
2. Given that $a\_{2}=0$, find the value of $p$
3. Find:

$$\sum\_{r=1}^{200}a\_{r}$$

d) Find the value of $a\_{199}$

**3H Nature of Sequences**

1. For the following relationship, state whether the sequence is increasing, decreasing, or periodic:
2. $u\_{n+1}=u\_{n}+3$, $u\_{1}=7$
3. $u\_{n+1}=\left(u\_{n}\right)^{2}$, $u\_{1}=\frac{1}{2}$
4. $u\_{n}=sin⁡(90n)$

**3I Sequences & Series in Context**

1. Bruce starts a new company. He estimates that in Year 1 his profits will be £20000, and he predicts that his profits will increase by £5000 per year from that point on. He then models that once his annual profits reach £100000, they will then remain constant.
2. Calculate the profit for Bruce’s business in the first 20 years
3. State a reason why this model might not be suitable

Bruce’s financial advisor says that it is more likely that his profits would increase by 5% per year.

1. Using this model instead, calculate the profits that Bruce will make in the first 20 years.
2. A piece of A4 paper is folded in half repeatedly. The thickness of the sheet is 0.5mm.
3. Work out the thickness after 4 folds
4. Work out the thickness after 20 folds
5. State one reason why this might be an unrealistic model