## **Topic: Sequences**

| Topic/Skill     | Definition/Tips                                 | Example  |
|-----------------|---|--|
| 1. Linear       | A number pattern with a <b>common</b>           | 2, 5, 8, 11 is a linear sequence                       |
| Sequence        | difference.                                     |  |
| 2. Term         | Each value in a sequence is called a term.      | In the sequence 2, 5, 8, 11, 8 is the                  |
|                 |   | third term of the sequence.                            |
| 3 Torm to       | A rule which allows you to find the payt        | First term is 2. Term to term rule is                  |
| term rule       | term in a sequence if you know the              | add 3'   |
| termitute       | previous term                                   |  |
|                 |   | Sequence is: 2, 5, 8, 11                               |
| 4. nth term     | A rule which allows you to <b>calculate the</b> | nth term is $3n - 1$                                   |
|                 | term that is in the <b>nth position</b> of the  |  |
|                 | sequence.                                       | The $100^{\text{th}}$ term is $3 \times 100 - 1 = 299$ |
|                 |   |  |
|                 | Also known as the 'position-to-term' rule.      |  |
|                 | n refere to the negition of a term in a         |  |
|                 | sequence  |  |
| 5 Finding the   | 1 Find the <b>difference</b>                    | Find the nth term of: 3 7 11 15                        |
| nth term of a   | 2. Multiply that by <i>n</i> .                  |  |
| linear          | 3. Substitute $n = 1$ to find out what          | 1. Difference is +4                                    |
| sequence        | number you need to add or subtract to           | 2. Start with 4n                                       |
|                 | get the first number in the sequence.           | 3. $4 \times 1 = 4$ , so we need to subtract 1         |
|                 |   | to get 3.  |
|                 |   | nth term $= 4n - 1$                                    |
| 6. Fibonacci    | A sequence where the next number is found       | The Fibonacci sequence is:                             |
| type sequences  | by adding up the previous two terms             | 1,1,2,3,5,8,13,21,34                                   |
|                 |   | An example of a Fibonacci-type                         |
|                 |   | sequence is:   |
|                 |   | 4, 7, 11, 18, 29                                       |
| 7. Geometric    | A sequence of numbers where each term is        | An example of a geometric sequence is:                 |
| Sequence        | found by <b>multiplying the previous one</b> by | 2, 10, 50, 250   |
|                 | a number called the <b>common ratio, r</b> .    | The common ratio is 5                                  |
|                 |   |  |
|                 |   | Another example of a geometric                         |
|                 |   | sequence is: $01  27  0  2  1$                         |
|                 |   | $01, -27, 9, -3, 1 \dots$                              |
|                 |   | $\frac{1 \text{ he common ratio is} -\frac{1}{3}}{2}$  |
| 8. Quadratic    | A sequence of numbers where the <b>second</b>   |  |
| Sequence        | difference is constant.                         | +4 +6 +8 +10 +12                                       |
|                 | A quadratic sequence will have a $n^2$ term     | +2 +2 +2 +2  |
| 9 nth term of a | n quadratic sequence with have a $n$ term.      | The nth term of 2 10 50 250 $I_{\rm S}$                |
| geometric       | ai  | The null term of 2, 10, 30, 230 18                     |
| sequence        | where $a$ is the first term and $r$ is the      | $2 \times 5^{n-1}$                                     |
| 1               | common ratio                                    | 0  |

| 10. nth term of | 1. Find the first and second differences.    | Find the nth term of: 4, 7, 14, 25, 40          |
|-----------------|--|---|
| a quadratic     | 2. Halve the second difference and multiply  |   |
| sequence        | this by $n^2$ .                              | Answer:   |
| -               | 3. Substitute $n = 1, 2, 3, 4$ into your     | Second difference = $+4 \rightarrow$ nth term = |
|                 | expression so far.                           | $2n^2$  |
|                 | 4. Subtract this set of numbers from the     |   |
|                 | corresponding terms in the sequence from     | Sequence: 4, 7, 14, 25, 40                      |
|                 | the question.                                | $2n^2$ 2, 8, 18, 32, 50                         |
|                 | 5. Find the nth term of this set of numbers. | Difference: 2, -1, -4, -7, -10                  |
|                 | 6. Combine the nth terms to find the overall |   |
|                 | nth term of the quadratic sequence.          | Nth term of this set of numbers is              |
|                 |  | -3n + 5   |
|                 | Substitute values in to check your nth term  |   |
|                 | works for the sequence.                      | Overall nth term: $2n^2 - 3n + 5$               |
|                 |  |   |
| 11. Triangular  | The sequence which comes from a pattern      | 1 3 6 10  |
| numbers         | of dots that form a triangle.                |   |
|                 |  |   |
|                 | 1, 3, 6, 10, 15, 21                          |   |
|                 |  |   |
|                 |  |   |