Applications of Algebra and Calculus

1.1 Applying Algebraic skills to the binomial theorem and to complex numbers	VG	OT	NS
Calculate permutations and combinations.			
Understand the notation $n!$ ${}^{n}C_{r}$ and $\binom{n}{r}$			
Generate Pascal's triangle up to $n = 7$.			
Expand brackets using the binomial theorem.			
Find specific terms in the expansion.			
Identify the real and imaginary parts of a complex number.			
Perform operations +, -, × and ÷ on complex numbers and equate real and imaginary parts.			
Plot a complex number on an argand diagram.			
Know that a polynomial of degree n has n roots and that they occur in conjugate pairs.			
Factorise polynomials with real coefficients.			
Assessment mark			**P/F**

1.2 Applying algebraic skills to sequences and series	VG	OT	NS
Understand terms: **infinite sequence, infinite series, nth term, sum to n terms, sum to infinity, common difference, arithmetic sequence, common ratio, geometric sequence, recurrence relation.**			
Know how to find n^{th} terms: $U_n = a+(n-1)d$ for arithmetic sequences and $U_n = ar^{n-1}$ and for geometric sequences.			
Use summation formulae (given): $S_n = \frac{1}{2}n[2a+(n-1)d]$ for arithmetic sequences and $S_n = \frac{a(1-r^n)}{1-r}\, r \neq 1$ for geometric sequences.			
Know that $S_\infty = \frac{a}{1-r}\, \lvert r \rvert < 1$ for geometric sequences and expand $\frac{1}{1-r}$ and $\frac{1}{a+b}$ as geometric sequences.			
Find the Maclaurin expansion for simple functions and composites and their *range of validity*.			
Use the Maclaurin expansion to find a power series for a simple function to a stated number of terms.			
Assessment mark			**P/F**

1.3 Applying geometric skills to complex numbers	**VG**	**OT**	**NS**
Evaluate the modulus and argument of a complex number.			
Convert between polar and Cartesian form of a complex number.			
Use De Moivre's theorem to expand powers of complex numbers.			
Apply De Moivre's theorem to multiple angle formulae.			
Use De Moivre's theorem to find the nth roots of unity.			
Find the locus of a point in the complex plane.			
Assessment mark			**P/F**

1.4 Applying Algebraic skills to number theory	**VG**	**OT**	**NS**
Know the division algorithm.			
Use the Euclidian Algorithm to find the greatest common divisor of two positive integers.			
Express the gcd as a linear combination of two integers.			
Use the division algorithm to write integers in bases other than 10.			
Assessment mark			**P/F**

1.5 Applying algebraic skills and geometric skills to methods of proof	**VG**	**OT**	**NS**
Recognise the need for proof in mathematics.			
Understand the terms **implies** $(\Rightarrow)$, **is implied by** $(\Leftarrow)$ and **equivalence** $(\Leftrightarrow)$.			
Directly prove simple results.			
Disprove a conjecture by providing a counter example.			
Prove a result using the contrapositive.			
Know and use the fundamental theorem of arithmetic.			
Use proof by contradiction.			
Assessment mark			**P/F**