YEAR 11 - MATHEMATICS

Preliminary Topic 5 - The Binomial Expansion and Pascal's Triangle

MATHEMATICS EXTENSION

LEARNING PLAN			
Learning Intentions Student is able to:	**Learning Experiences** Implications, considerations and implementations:	**Success Criteria** I can:	**Resources**
expand $(x + y)^n$ for small positive integers n		expand $(x + y)^n$ for small positive integers n	
note the pattern formed by the coefficients of x in the expansion of $(1 + x)^n$ and recognise links to Pascal's triangle	The binomial expansion could be introduced by example, using $n = 1, 2, 3, 4$ and Pascal triangle constructed and both then extended to more general case, n. For example: Students find the binomial expansions for $n = 1, 2, 3, 4$ and construct of Pascal's triangle. Students connect the 'coefficients' in the expansions and the values in Pascal's triangle.	note the pattern formed by the coefficients of x in the expansion of $(1 + x)^n$ and recognise links to Pascal's triangle	Nice explanation of Pascal's triangle, here.
recognise the numbers $(n\,r)$ (also denoted ${}^nC_r$) as binomial coefficients	The (so far unknown) coefficients in the polynomial must be labelled by some symbol, such as 'C' for 'coefficient' and write the power of x as a right subscript r, the power n as a left superscript, ie ${}^nC_r$ is by definition the coefficient of x^r in	recognise the numbers $(n\,r)$ (also denoted ${}^nC_r$) as binomial coefficients	

	$(1 + x)^n$. Therefore: $(1 + x)^n = {}^nC_0x^0 + {}^nC_1x^1 + {}^nC_2x^2 + \ldots + {}^nC_nx^n$. This identity can be extended into an expression of $(x + y)^n$ by substituting $\frac{y}{x}$ for x in $(1 + x)^n$ and multiplying the equation by x^n to obtain: $(x + y)^n = {}^nC_0x^n + {}^nC_1x^{n-1}y + {}^nC_2x^{n-2}y^2 + \ldots {}^nC_ny^n$. Students should be aware that the size of the coefficients in the expansion of $(a + b)^n$ first increases and then decreases. However, problems that require the greatest coefficient to be found are **not part** of this course.		
derive and use simple identities associated with Pascal's triangle		derive and use simple identities associated with Pascal's triangle	
establish combinatorial proofs of the Pascal's triangle relations ${}^nC_0 = 1,\ {}^nC_n = 1$; ${}^nC_k = {}^{n-1}C_{k-1} + {}^{n-1}C_k$ for $1 \leq k \leq n - 1$; and ${}^nC_k = {}^nC_{n-k}$		establish combinatorial proofs of the Pascal's triangle relations ${}^nC_0 = 1,\ {}^nC_n = 1$; ${}^nC_k = {}^{n-1}C_{k-1} + {}^{n-1}C_k$ for $1 \leq k \leq n - 1$; and ${}^nC_k = {}^nC_{n-k}$	

Established Goals(Syllabus Outcomes): **ME11-5, 6,7**
Estimated Time: 1.4 weeks (*8 lessons*)

ASSESSMENT	
Performance Tasks: (Linked to Essential Questions)	**Other Evidence:**