Unit A5: The Binomial Theorem for Positive Integral Indices

Objective: (1) To learn and apply the binomial theorem for positive integral indices.
(2) To study the simple properties of the binomial coefficients.

Detailed Content	Time Ratio	Notes on Teaching
5.1 The binomial theorem for positive integral indices	3	Students should learn how to evaluate n! and C_r^n. The binomial theorem for positive integral indices may be proved by the Principle of Mathematical Induction. Discussions concerning the notation C_r^n should be related to its use as a binomial coefficient. The Pascal's triangle in relation to the coefficients C_r^n in the binomial expansion may be discussed. Students are not expected to know the general binomial theorem.
5.2 Application of the binomial theorem for positive integral indices	5	Students should be able to expand expressions using the binomial theorem for positive integral indices. The determination of a particular term or a particular coefficient in a binomial expansion should also be taught. Students are expected to be able to find the greatest term and the greatest coefficient in a binomial expansion. Applications to numerical approximation should be discussed.
5.3 Simple properties of the binomial coefficients	5	Students should know that both the notations C_r^n and $\binom{n}{r}$ may be used to represent the binomial coefficients. Discussions should include simple properties of the binomial coefficients and the relations between these coefficients such as $C_0^n + C_1^n + C_2^n + \ldots + C_n^n = 2^n$; $\binom{n}{0}^2 + \binom{n}{1}^2 + \binom{n}{2}^2 + \ldots + \binom{n}{n}^2 = \frac{(2n)!}{(n!)^2}$ and similar relations. N.B. Permutation and combination may be used to introduce the binomial theorem but problems concerning permutation and combination are not required. Problems involving the use of differentiation and integration may be taught after students have learnt calculus.
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