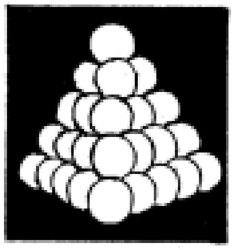
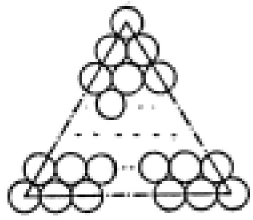
Detailed Content	Time Ratio	Notes on Teaching
	~~8~~ 10	(3) Simple practical problems such as finding the total number of balls in a pyramidal heap of balls.   Teachers should remind students that for some propositions the starting values of may differ from 1 such as $2^n > n^2$ for $n > 5$.

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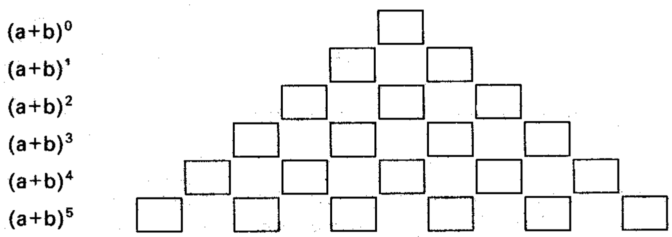
UNIT 2: Binomial Theorem for Positive Integral Indices

Specific Objectives:

1. To recognize the notations n! and C^n_r .
2. To learn to expand a binomial with positive integral index by the binomial theorem.

Detailed Content	Time Ratio	Notes on Teaching
2.1 The n! and C^n_r notations	1	The definitions of n! and C^n_r should be introduced. The idea of permutation and combination may only be mentioned to abler students. The definition of O! = 1 should also be mentioned. It is desirable to bring students' attention to the other forms of C^n_r , viz, ${}_nC_r$ and $\binom{n}{r}$. Students are expected to be able to verify $C^n_r = C^n_{n-r}$ and $C^n_{r-1} + C^n_r = C^{n+1}_r$. In the latter part, teachers should guide students to start from L.H.S. and end up with R.H.S. Examples like the one below can be given. *Example* Solve for n if $C^{18}_{n+1} = C^{18}_{2n+1}$.
2.2 The Pascal Triangle	1	Teachers can ask students to expand $(a + b)^2$, $(a + b)^3$, $(a + b)^4$ and $(a + b)^5$ by multiplication and fill the coefficients of the terms of the expanded expressions into the boxes below. 

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Detailed Content	Time Ratio	Notes on Teaching
		Teachers should guide students to discover that the coefficients can be expressed as C^n_r and the properties of the elements of the Pascal triangle such as $C^n_r = C^n_{n-r}$, $C^n_0 = 1$, $C^n_n = 1$ and $C^n_{n-r} + C^n_r = C^{n+1}_r$.
2.3 Expanding Binomials Using the Pascal Triangle	2	Students are expected to expand $(a + b)^n$ with the aid of Pascal triangle up to and including n=5. The following examples are relevant. *Example 1* Expand (*a*) $(2x+3)^4$ in descending powers of x, (*b*) $(3x^2-1)^5$ in ascending powers of x. *Example 2* Find the term independent of x in the expansion of $(2x^3 - \frac{1}{3x^2})^5$.
2.4 Binomial Theorem for Positive Integral Indices	~~4~~ 7	Starting with the Pascal triangle, teachers can introduce binomial theorem for positive integral indices. The proof of the theorem using mathematical induction is a good exercise for the students. Students should discover for themselves that in expanding $(x + y)^n$, (*a*) there are (n+1) terms and (*b*) the $(r + 1)^{th}$ term is $C^n_r x^{n-r} y^r$, if the expansion is expressed in descending powers of x. The determination of the greatest term and relations between coefficients are not necessary. Examples such as the following can be given.

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Detailed Content	Time Ratio	Notes on Teaching
		Example 1 Expand (*a*) $(2x+3y)^4$ (*b*) $(3x-\frac{2}{x})^5$. *Example 2* Find the coefficient of x^3 in the expansion of $(3-\frac{1}{2}x)^6 \cdot (1+x)^5$. *Example 3* In the expansion of $(1+ax)(1+bx)^6$, the coefficients of x and x^2 are respectively 0 and $-\frac{21}{4}$, find the values of a and b. Although problems of multinomial expansion can be solved by repeated binomial expansions, teachers should avoid teaching multinomial expansion beyond the trinomials. The following can be useful exercises. *Example 4* Expand $(1-2x+3x^2)^3$ in ascending powers of x. *Example 5* Find the constant term in the expansion of $(1+\frac{1}{2x}-3x)^4$. For abler students, teachers may mention that the binomial theorem is also true for negative integral indices. Nevertheless, further development should be avoided.
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