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A NOTE ON HOGBEN'S "FIGURATE SERIES AND FACTORIAL NOTATION" A GENERALIZATION

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Let:-

$$\chi_{Hr} = x(x+r) \dots (x+2r) \dots (x+n^{\wedge}r). \quad (i)$$

Then:-

$$\chi_{Hr}^{[n]} = \frac{r!}{n!} \chi_{Hr}^{[n-r]} \dots \chi_{Hr}^{[1]} \dots \chi_{Hr}^{[0]} \quad (ii)$$

where a and b and r are any rational quantities, b and r positive or negative, and n a positive integer.

We have the following special cases: -

$$(a+b)^n = \sum_{t=0}^n \binom{n}{t} a^{n-t} b^t \quad (iii)$$

which is Newton's Binomial Theorem, and is derived from (ii) when $r = 0$.

$$(a+b)^Q = \sum_{n=0}^{\infty} \binom{Q}{n} a^{Q-n} b^n \quad (iv)$$

which is Vandermonde's Theorem for factorial powers, and is derived from (ii) when r is -1 .

$$(a+b)^N = \sum_{n=0}^N \binom{N}{n} a^{N-n} b^n \quad (v)$$

which is a formula forming part of a generalization of Vandermonde's Theorem given by Professor *Hogben*, in "Acta Genetica et Statistica Medica", 5, 1955, pp. 115-133, and is derived from (ii) when $r = 1$.