Maths Formula Sheet

Chapter by chapter, topic by topic. Written by the PadhoNa team for quick revision.

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CHAPTER 6

Binomial Theorem

Expansion and general term

BINOMIAL THEOREM

$$(x+a)^n = \sum_{r=0}^{n} {}^nC_r \, x^{n-r} a^r$$

GENERAL TERM

$$T_{r+1} = {}^nC_r \, x^{n-r} a^r$$

MIDDLE TERM

$$n \text{ even: } T_{\frac{n}{2}+1}; \qquad n \text{ odd: } T_{\frac{n+1}{2}},\ T_{\frac{n+3}{2}}$$

TERM INDEPENDENT OF X

$$\text{put the power of } x \text{ in } T_{r+1} \text{ equal to } 0$$

GREATEST COEFFICIENT

$$n \text{ even: } {}^nC_{n/2}; \qquad n \text{ odd: } {}^nC_{(n-1)/2} = {}^nC_{(n+1)/2}$$

Binomial coefficients

SUMS

$$\sum_{r=0}^{n} {}^nC_r = 2^n, \qquad C_0 + C_2 + \cdots = C_1 + C_3 + \cdots = 2^{n-1}$$

WEIGHTED SUM

$$\sum_{r=0}^{n} r \, {}^nC_r = n \, 2^{n-1}$$

SQUARES

$$\sum_{r=0}^{n} \left({}^{n}C_{r}\right)^{2} = {}^{2n}C_{n}$$

VANDERMONDE

$$\sum_{r} {}^{m}C_{r}\ {}^{n}C_{k-r} = {}^{m+n}C_{k}$$

NUMBER OF TERMS

$$(x+a)^{n}:\ n+1; \qquad (x_1+\cdots+x_r)^{n}:\ {}^{n+r-1}C_{r-1}$$

Any index

$$(1+x)^{n} = 1 + nx + \frac{n(n-1)}{2!}x^{2} + \cdots, \qquad |x|<1,\ n\in\mathbb{Q}$$

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