

BINOMIAL IDENTITIES

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ABSTRACT. Binomial identities

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1. BINOMIAL IDENTITIES

1.1. Part 1.

$$\binom{n}{k} = \binom{n-1}{k} + \binom{n-1}{k-1} \quad (1.1)$$

$$\binom{n}{k} = \frac{n^k}{k!} \quad (1.2)$$

$$\sum_{r=0}^n \binom{r}{c} = \binom{n+1}{c+1} \quad (1.3)$$

$$\sum_{k=0}^n \binom{r+k}{k} = \binom{r+n+1}{n} \quad (1.4)$$

$$\sum_{k=0}^m \binom{n-k}{m-k} = \binom{n+1}{m} \quad (1.5)$$

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$$\sum_{k=0}^n \binom{n-k}{k} = f_{n+1} \quad (1.6)$$

$$k \binom{n}{k} = n \binom{n-1}{k-1} \quad (1.7)$$

$$\binom{n}{m} \binom{m}{k} = \binom{n}{k} \binom{n-k}{m-k} \quad (1.8)$$

$$\sum_{j=0}^n \binom{n}{j} \binom{m}{k-j} = \binom{n+m}{k} \quad (1.9)$$

1.2. Part2.

$$k \binom{n}{k} = n \binom{n-1}{k-1} \quad (1.10)$$

$$\frac{k}{n} \binom{n}{k} = \binom{n-1}{k-1} \quad (1.11)$$

$$\frac{k+1}{n+1} \binom{n+1}{k+1} = \binom{n}{k} \quad (1.12)$$

$$\binom{n+1}{k+1} = \frac{n+1}{k+1} \binom{n}{k} \quad (1.13)$$

1.3. Part 3.

$$\binom{t}{r} \binom{r}{k} = \binom{t}{k} \binom{t-k}{r-k} \quad (1.14)$$

$$\binom{t}{k} \binom{t-k}{r-k} = \binom{t}{t-k} \binom{t-k}{r-k} = \binom{t}{r-k} \binom{t-r+k}{t-r} \quad (1.15)$$

$$\binom{t}{k} \binom{t-k}{r-k} = \binom{t}{k} \binom{t-k}{t-r} \quad (1.16)$$

$$\binom{t}{k} \binom{t-k}{t-r} = \binom{t}{t-k} \binom{t-k}{t-r} \quad (1.17)$$

1.4. Part 4.

$$\binom{t}{r} \binom{r}{k} = \binom{t}{k} \binom{t-k}{r-k} = \binom{t}{t-k} \binom{t-k}{r-k} = \binom{t}{r-k} \binom{t-r+k}{t-r} = \binom{t}{r-k} \binom{t-r+k}{k} \quad (1.18)$$