

**EXERCISES 10.1: THE BINOMIAL THEOREM**

1. State the structure of the coefficients in the binomial expansion of  $(a + b)^n$  for  $n \in \mathbb{N}$ . State the properties of the numbers  $\binom{n}{k}$ .

**2. Prove the following identities:**

- 1.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 2.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 3.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 4.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 5.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 6.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 7.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 8.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 9.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 10.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 11.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 12.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 13.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 14.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 15.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 16.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 17.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 18.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 19.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 20.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$

**3. Use the binomial theorem to find the following:**

- 1.  $(a + b)^n$
- 2.  $(a + b)^n$
- 3.  $(a + b)^n$
- 4.  $(a + b)^n$
- 5.  $(a + b)^n$
- 6.  $(a + b)^n$
- 7.  $(a + b)^n$
- 8.  $(a + b)^n$
- 9.  $(a + b)^n$
- 10.  $(a + b)^n$
- 11.  $(a + b)^n$
- 12.  $(a + b)^n$
- 13.  $(a + b)^n$
- 14.  $(a + b)^n$
- 15.  $(a + b)^n$
- 16.  $(a + b)^n$
- 17.  $(a + b)^n$
- 18.  $(a + b)^n$
- 19.  $(a + b)^n$
- 20.  $(a + b)^n$

**4. Prove the following identities:**

- 1.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 2.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 3.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 4.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 5.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 6.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 7.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 8.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 9.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 10.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 11.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 12.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
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- 16.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 17.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 18.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 19.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$
- 20.  $\sum_{k=0}^n \binom{n}{k} a^k b^{n-k} = (a + b)^n$