Mathematical Concepts and Notations

1. Expected Value Formula

The expected value E(cur_state) is calculated as:

E(cur_state) = 1 + Sum(pi * E(Si)) = Sum(pi * val_i)

- Si: Represents the i-th state.

- pi: Probability of occurrence of the i-th state.

2. Linearity of Expectation

The property of linearity states:

E(X + Y) = E(X) + E(Y)

- This holds ALWAYS, even when X and Y are dependent variables.

3. Expected Value for Multiplication of Independent Variables

For two independent variables X and Y, the expected value of their product is given by:

E(XY) = E(X) * E(Y)

- This is true ONLY IF X and Y are independent.

4. Generating Functions

Generating functions are used to represent a sequence of probabilities:

G(s) = P0 * s^0 + P1 * s + P2 * s^2 + ...

- P0, P1, P2, ...: Coefficients representing probabilities.

5. Calculation of Expected Value Using the Generating Function

The expected value E can also be derived from the generating function as:

E = dG(s)/ds | at s=1

- Derivative of G(s) with respect to s, evaluated at s = 1.