

PROBABILITY IN GAMES OF CHANCE

ABOUT

This chapter just uses the formula for finding the probability for a Bernoulli Trial – a trial that has two outcomes: success, or failure. Given running the trial n times, and with success having a probability of p each time, we can figure out the probability of getting k successes in our trial.

TOPICS

1. Bernoulli Trials

2. Example Problems

BERNOULLI TRIAL

1. BERNOULLI TRIAL

Theorem 1: Given a simple experiment, called a Bernoulli trial, and an event that occurs with probability p , if the trial is repeated independently n times, then the probability of having exactly k successes is

$$C(n, k) * p^k * (1 - p)^{n-k}$$

From Discrete Mathematics, Ensley & Crawley, page 460

We can define basic games like flipping a coin to receive a Heads, or rolling a die to receive a 6, in terms of a Bernoulli trial, where getting a Heads or getting a 6 is a “success”.

Notes

Bernoulli trial

n: # of trials

p: Probability of one success

k: Amount of successes

$$C(n, k) \cdot p^k \cdot (1 - p)^{n-k}$$

EXAMPLE PROBLEMS

2. EXAMPLE PROBLEMS

What is the probability that in 10 rolls of a fair 6-sided die, we get exactly five results of 6?

$n = ?$

$p = ?$

$k = ?$

Notes

Bernoulli trial

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$$C(n, k) \cdot p^k \cdot (1-p)^{n-k}$$

2. EXAMPLE PROBLEMS

What is the probability that in 10 rolls of a fair 6-sided die, we get exactly five results of 6?

$$n = 10$$

$$p = 1/6$$

$$k = 5$$

Notes

Bernoulli trial

n: # of trials

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$$C(n, k) \cdot p^k \cdot (1-p)^{n-k}$$

2. EXAMPLE PROBLEMS

What is the probability that in 10 rolls of a fair 6-sided die, we get exactly five results of 6?

$$n = 10 \quad p = 1/6 \quad k = 5$$

Probability of having k successes:

$$C(10, 5) * (1/6)^5 * (1 - 1/6)^{10-5}$$

$$\binom{10}{5} \left(\frac{1}{6}\right)^5 \left(1 - \frac{1}{6}\right)^5$$

Exact result:

$$\frac{21875}{1679616}$$

Decimal approximation:

$$0.01302381020423$$

Notes

Bernoulli trial

n: # of trials

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k: Amount of successes

$$C(n, k) \cdot p^k \cdot (1-p)^{n-k}$$