Important Distribution Formulas PDF

Formulas
Examples
with Units

List of 33
Important Distribution Formulas

1) Variance in Bernoulli Distribution Formula

Evaluate Formula

Formula

$$\sigma^2 = p \cdot (1 - p)$$

Example

$$0.24 = 0.6 \cdot (1 - 0.6)$$

2) Binomial Distribution Formulas

2.1) Binomial Probability Distribution Formula

Evaluate Formula

Formula

$$P_{Binomial} = \left(C\left(n_{Total\ Trials}, r \right) \right) \cdot p_{BD}^{\ r} \cdot q^{n_{Total\ Trials} - r}$$

Example

$$0.0003 = \left(C\left(20, 4 \right) \right) \cdot 0.6^{4} \cdot 0.4^{20 - 4}$$

2.2) Mean of Binomial Distribution Formula

Evaluate Formula

Formula

$$\mu = N_{Trials} \cdot p$$

Example

$$6 = 10 \cdot 0.6$$

2.3) Mean of Negative Binomial Distribution Formula

Evaluate Formula

Formula

$$\mu = \frac{N_{Success} \cdot q_{BD}}{p}$$

Example

$$3.3333 = \frac{5 \cdot 0.4}{0.6}$$

2.4) Standard Deviation of Binomial Distribution Formula

Evaluate Formula

Formula

$$\sigma = \sqrt{N_{Trials} \cdot p \cdot q_{BD}}$$

Example

$$1.5492 = \sqrt{10 \cdot 0.6 \cdot 0.4}$$

2.5) Standard Deviation of Negative Binomial Distribution Formula

Evaluate Formula

Formula

$$\sigma = \frac{\sqrt{N_{Success} \cdot q_{BD}}}{p}$$

Example

$$2.357 = \frac{\sqrt{5 \cdot 0.4}}{0.6}$$

2.6) Variance in Binomial Distribution Formula

Evaluate Formula

Formula

$$\sigma^2 = N_{Trials} \cdot p \cdot (1 - p)$$

Example

$$2.4 = 10 \cdot 0.6 \cdot (1 - 0.6)$$

2.7) Variance of Binomial Distribution Formula

Evaluate Formula

Formula

$$\sigma^2 = N_{Trials} \cdot p \cdot q_{BD}$$

Example

$$2.4 = 10 \cdot 0.6 \cdot 0.4$$

2.8) Variance of Negative Binomial Distribution Formula

Evaluate Formula

Formula

$$\sigma^2 = \frac{N_{Success} \cdot q_{BD}}{p^2}$$

Example

$$5.5556 = \frac{5 \cdot 0.4}{0.6^2}$$

3) Exponential Distribution Formulas

3.1) Exponential Distribution Formula

Evaluate Formula

Formula

$$P_{(Atleast\ Two)} = 1 - P_{((AUBUC)')} - P_{(Exactly\ One)}$$

Example

$$0.5 = 1 - 0.08 - 0.42$$

3.2) Variance in Exponential Distribution Formula

Evaluate Formula

Formula

$$\sigma^2 = \frac{1}{\lambda^2}$$

Example

$$0.16 = \frac{1}{2.5^2}$$

4) Geometric Distribution Formulas

4.1) Geometric Distribution Formula

Evaluate Formula

Formula

$$P_{Geometric} = p_{BD} \cdot q^{n_{Bernoulli}}$$

Example

$$0.0025 = 0.6 \cdot 0.4^6$$

4.2) Mean of Geometric Distribution Formula

Evaluate Formula

Formula

$$\mu = \frac{1}{p}$$

Example

$$1.6667 = \frac{1}{0.6}$$

4.3) Mean of Geometric Distribution given Probability of Failure Formula

Evaluate Formula

Formula

$$\mu = \frac{1}{1 - q_{BD}}$$

Example

$$1.6667 = \frac{1}{1 - 0.4}$$

4.4) Standard Deviation of Geometric Distribution Formula

Evaluate Formula

Formula

$$\sigma = \sqrt{\frac{q_{BD}}{p^2}}$$

Example

$$1.0541 = \sqrt{\frac{0.4}{0.6^2}}$$

4.5) Variance in Geometric Distribution Formula

Evaluate Formula

Formula

$$\sigma^2 = \frac{1 - p}{p^2}$$

Example

$$1.1111 = \frac{1 - 0.6}{0.6^2}$$

4.6) Variance of Geometric Distribution Formula

Evaluate Formula

Formula

$$\sigma^2 = \frac{q_{BD}}{p^2}$$

Example

$$1.1111 = \frac{0.4}{0.6^2}$$

5) Hypergeometric Distribution Formulas

5.1) Hypergeometric Distribution Formula

Evaluate Formula

Formula

$$P_{Hypergeometric} = \frac{C\left(m_{Sample}, x_{Sample}\right) \cdot C\left(N_{Population} - m_{Sample}, n_{Population} - x_{Sample}\right)}{C\left(N_{Population}, n_{Population}\right)}$$

Example

$$0.0442 = \frac{C\left(5, 3\right) \cdot C\left(50 - 5, 10 - 3\right)}{C\left(50, 10\right)}$$

5.2) Mean of Hypergeometric Distribution Formula

Evaluate Formula

Formula

$$\mu = \frac{n \cdot N_{Success}}{N}$$

Example

$$3.25 = \frac{65 \cdot 5}{100}$$

5.3) Standard Deviation of Hypergeometric Distribution Formula

Evaluate Formula

Formula

$$\sigma = \sqrt{\frac{n \cdot N_{Success} \cdot \left(N - N_{Success} \right) \cdot \left(N - n \right)}{\left(N^2 \right) \cdot \left(N - 1 \right)}}$$

Example

$$1.0448 = \sqrt{\frac{65 \cdot 5 \cdot \left(100 - 5 \right) \cdot \left(100 - 65 \right)}{\left(100^2 \right) \cdot \left(100 - 1 \right)}}$$

5.4) Variance of Hypergeometric Distribution Formula

Evaluate Formula

Formula

$$\sigma^2 = \frac{n \cdot N_{Success} \cdot \left(N - N_{Success} \right) \cdot \left(N - n \right)}{\left(N^2 \right) \cdot \left(N - 1 \right)}$$

Example

$$1.0915 = \frac{65 \cdot 5 \cdot \left(100 - 5 \right) \cdot \left(100 - 65 \right)}{\left(100^2 \right) \cdot \left(100 - 1 \right)}$$

6) Normal Distribution Formulas

6.1) Normal Probability Distribution Formula

Evaluate Formula

Formula

$$P_{Normal} = \frac{1}{\sigma_{Normal} \cdot \sqrt{2 \cdot \pi}} \cdot e^{\left(-\frac{1}{2} \right) \cdot \left(\frac{x - \mu_{Normal}}{\sigma_{Normal}} \right)^2}$$

Example

$$0.1506 = \frac{1}{2 \cdot \sqrt{2 \cdot 3.1416}} \cdot e^{\left(-\frac{1}{2} \right) \cdot \left(\frac{7 - 5.5}{2} \right)^2}$$

6.2) Z Score in Normal Distribution Formula

Evaluate Formula

Formula

$$Z = \frac{A - \mu}{\sigma}$$

Example

$$2 = \frac{12 - 8}{2}$$

7) Poisson Distribution Formulas

7.1) Poisson Probability Distribution Formula

Evaluate Formula

Formula

$$P_{Poisson} = \frac{e^{-\lambda_{Poisson}} \cdot \lambda_{Poisson}^{x_{Sample}}}{x_{Sample}!}$$

Example

$$0.0011 = \frac{e^{-0.2} \cdot 0.2^{3}}{3!}$$

7.2) Standard Deviation of Poisson Distribution Formula

Evaluate Formula

Formula

$$\sigma = \sqrt{\mu}$$

Example

$$2.8284 = \sqrt{8}$$

8) Sampling Distribution Formulas

8.1) Standard Deviation in Sampling Distribution of Proportion Formula

Evaluate Formula

Formula

$$\sigma = \sqrt{\frac{p \cdot (1 - p)}{n}}$$

Example

$$0.0608 = \sqrt{\frac{0.6 \cdot (1 - 0.6)}{65}}$$

8.2) Standard Deviation in Sampling Distribution of Proportion given Probabilities of Success and Failure Formula

Evaluate Formula

Formula

$$\sigma = \sqrt{\frac{p \cdot q_{BD}}{n}}$$

Example

$$0.0608 = \sqrt{\frac{0.6 \cdot 0.4}{65}}$$

8.3) Standard Deviation of Population in Sampling Distribution of Proportion Formula

Evaluate Formula

Formula

$$\sigma = \sqrt{\left(\frac{\Sigma x^2}{N}\right) - \left(\left(\frac{\Sigma x}{N}\right)^2\right)}$$

Example

$$0.9798 = \sqrt{\left(\frac{100}{100}\right) - \left(\left(\frac{20}{100}\right)^2\right)}$$

8.4) Variance in Sampling Distribution of Proportion Formula

Evaluate Formula

Formula

$$\sigma^2 = \frac{p \cdot (1 - p)}{n}$$

Example

$$0.0037 = \frac{0.6 \cdot (1 - 0.6)}{65}$$

8.5) Variance in Sampling Distribution of Proportion given Probabilities of Success and Failure Formula

Evaluate Formula

Formula

$$\sigma^2 = \frac{p \cdot q_{BD}}{n}$$

Example

$$0.0037 = \frac{0.6 \cdot 0.4}{65}$$

9) Uniform Distribution Formulas

9.1) Continuous Uniform Distribution Formula

Evaluate Formula

Formula

$$P_{((A \cup B \cup C)')} = 1 - P_{(A \cup B \cup C)}$$

Example

$$0.08 = 1 - 0.92$$

9.2) Discrete Uniform Distribution Formula

Evaluate Formula

Formula

$$P_{((A \cup B \cup C)')} = 1 - P_{(A \cup B \cup C)}$$

Example

$$0.08 = 1 - 0.92$$

9.3) Variance in Uniform Distribution Formula

Evaluate Formula

Formula

$$\sigma^2 = \frac{(b - a)^2}{12}$$

Example

$$1.3333 = \frac{(10 - 6)^2}{12}$$

Variables used in list of Distribution Formulas above

- **a** Initial Boundary Point of Uniform Distribution
- **A** Individual Value in Normal Distribution
- **b** Final Boundary Point of Uniform Distribution
- m_{Sample} Number of Items in Sample
- **n** Sample Size
- **N** Population Size
- $n_{Bernoulli}$ Number of Independent Bernoulli Trials
- $n_{Population}$ Number of Successes in Population
- $N_{Population}$ Number of Items in Population
- $N_{Success}$ Number of Success
- $n_{Total\ Trials}$ Total Number of Trials
- N_{Trials} Number of Trials
- **p** Probability of Success
- $P_{((A \cup B \cup C)')}$ Probability of Non Occurrence of Any Event
- $P_{(A \cup B \cup C)}$ Probability of Occurrence of Atleast One Event
- $P_{(Atleast\ Two)}$ Probability of Occurrence of Atleast Two Events
- $P_{(Exactly\ One)}$ Probability of Occurrence of Exactly One Event
- p_{BD} Probability of Success in Binomial Distribution
- $P_{Binomial}$ Binomial Probability
- $P_{Geometric}$ Geometric Probability Distribution Function
- $P_{Hypergeometric}$ Hypergeometric Probability Distribution Function
- P_{Normal} Normal Probability Distribution Function
- $P_{Poisson}$ Poisson's Probability Distribution Function
- **q** Probability of Failure
- q_{BD} Probability of Failure in Binomial Distribution

Constants, Functions, Measurements used in list of Distribution Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- constant(s): **e**, 2.71828182845904523536028747135266249 *Napier's constant*
- Functions: **C**, C(n,k) *In combinatorics, the binomial coefficient is a way to represent the number of ways to choose a subset of objects from a larger set. It is also known as the "n choose k" tool.*
- Functions: **sqrt**, sqrt(Number) *A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.*

- r Number of Successful Trials
- x Number of Successes
- x_{Sample} Number of Successes in Sample
- Z Z Score in Normal Distribution
- λ Population Parameter of Exponential Distribution
- $\lambda_{Poisson}$ Rate of Distribution
- μ Mean in Normal Distribution
- μ_{Normal} Mean of Normal Distribution
- σ Standard Deviation in Normal Distribution
- σ_{Normal} Standard Deviation of Normal Distribution
- σ^2 Variance of Data
- Σx Sum of Individual Values
- Σx^2 Sum of Squares of Individual Values

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