

Important Data Analysis Formulas PDF



Formulas Examples with Units

List of 15 Important Data Analysis Formulas

1) Actual S by N Ratio at Output Formula ↻

Formula

$$SN_{out} = \frac{SN_m}{F}$$

Example with Units

$$30 \text{ dB} = \frac{390 \text{ dB}}{13 \text{ dB}}$$

Evaluate Formula ↻

2) Average Duration of Fade Formula ↻

Formula

$$n_R = \frac{CDF}{t_{avg}}$$

Example with Units

$$11 = \frac{38.5}{3.5s}$$

Evaluate Formula ↻

3) Capability of Error Correction Bits Formula ↻

Formula

$$t = \frac{d - 1}{2}$$

Example

$$7 = \frac{15 - 1}{2}$$

Evaluate Formula ↻

4) Coding Noise Formula ↻

Formula

$$CN = \frac{I_W^2}{SNR}$$

Example with Units

$$6.25 \text{ dB} = \frac{25 \text{ V}^2}{100 \text{ dB}}$$

Evaluate Formula ↻

5) Expected Number of Transmission Formula ↻

Formula

$$E_n = \frac{1}{(1 - P_{ew})^m}$$

Example

$$3.9951 = \frac{1}{(1 - 0.697)^{1.16}}$$

Evaluate Formula ↻

6) Expected One Transmission(E1) Formula ↻

Formula

$$E_1 = \frac{1}{1 - P_{ew}}$$

Example

$$3.3003 = \frac{1}{1 - 0.697}$$

Evaluate Formula ↻



7) Header Bits Formula

Formula

$$H = B_{wd} \cdot L$$

Example

$$9 = 12 - 3$$

Evaluate Formula 

8) Information Bits Formula

Formula

$$L = B_{wd} \cdot H$$

Example

$$3 = 12 - 9$$

Evaluate Formula 

9) Input Waveform Formula

Formula

$$I_W = \sqrt{SNR \cdot CN}$$

Example with Units

$$25\text{ V} = \sqrt{100\text{ dB} \cdot 6.25\text{ dB}}$$

Evaluate Formula 

10) Number of Bits Per Word Formula

Formula

$$m = \frac{\log_{10}\left(\frac{1}{E_n}\right)}{\log_{10}(1 - P_{ew})}$$

Example

$$1.161 = \frac{\log_{10}\left(\frac{1}{4}\right)}{\log_{10}(1 - 0.697)}$$

Evaluate Formula 

11) Success Probability Formula

Formula

$$P_s = \frac{P_u \cdot (1 - P_{um})}{P_{um}}$$

Example

$$0.3 = \frac{0.2 \cdot (1 - 0.4)}{0.4}$$

Evaluate Formula 

12) Undetected Error Probability per Single-Word Message Formula

Formula

$$P_{um} = \frac{P_u}{P_u + P_s}$$

Example

$$0.4 = \frac{0.2}{0.2 + 0.3}$$

Evaluate Formula 

13) Undetected Probability per Word Formula

Formula

$$P_u = \frac{P_{um} \cdot P_s}{1 - P_{um}}$$

Example

$$0.2 = \frac{0.4 \cdot 0.3}{1 - 0.4}$$

Evaluate Formula 

14) Unsuccess Probability Formula

Formula

$$P_{ew} = 1 - P_s$$

Example

$$0.7 = 1 - 0.3$$

Evaluate Formula 



15) Word Error Rate Formula

Formula

$$P_{ew} = 1 - \left(\frac{1}{E_n} \right)^{\frac{1}{m}}$$

Example

$$0.6973 = 1 - \left(\frac{1}{4} \right)^{\frac{1}{1.16}}$$

Evaluate Formula 



Variables used in list of Data Analysis Formulas above

- **B_{wd}** Number of Bits per Word
- **CDF** Cumulative Distribution Function
- **CN** Coding Noise (Decibel)
- **d** Hamming Distance
- **E_1** Expected One Transmission
- **E_n** Expected Number of Transmission
- **F** Noise Figure of Amplifier (Decibel)
- **H** Header Bits
- **I_W** Input Waveform (Volt)
- **L** Information Bits
- **m** Message Length
- **n_R** Normalized LCR
- **P_{ew}** Word Error Rate
- **P_s** Success Probability
- **P_u** Undetected Probability
- **P_{um}** Undetected Error Probability
- **SN_m** Maximum Possible S/N Ratio (Decibel)
- **SN_{out}** Actual S/N Ratio at Output (Decibel)
- **SNR** Signal to Noise Ratio (Decibel)
- **t** Capability of Error Correction Bits
- **t_{avg}** Average Duration of Fade (Second)

Constants, Functions, Measurements used in list of Data Analysis Formulas above

- **Functions: $\log_{10}$** , $\log_{10}(\text{Number})$
The common logarithm, also known as the base-10 logarithm or the decimal logarithm, is a mathematical function that is the inverse of the exponential function.
- **Functions: $\sqrt{}$** , $\sqrt{\text{Number}}$
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.
- **Measurement: Time** in Second (s)
Time Unit Conversion 
- **Measurement: Noise** in Decibel (dB)
Noise Unit Conversion 
- **Measurement: Electric Potential** in Volt (V)
Electric Potential Unit Conversion 
- **Measurement: Sound** in Decibel (dB)
Sound Unit Conversion 



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