Password Entropy

$E = Entropy$
$R = Range\ of\ Keyspace$
$\mathrm{L} = \text{Length of Password}$
$\mathrm{L_A} = \text{Length of Password A (Complex Password)}$
$\mathrm{L_B} = \text{Length of Password B (Non} - \text{Complex Password)}$
$\mathrm{R_A} = \text{Password A Range 94 Characters (ASCII 33} - \text{126: uppercase, lowercase, digits, and symbols)}$
$\mathrm{R_B} = \text{Password B Range 26 Characters (ASCII 97} - \text{122: lowercase)}$

Basic Entropy Formula

$E = \log_2(R^L)$

Entropy Equality Formula

$L_B \times \log_2(R_B) = L_A \times \log_2(R_A)$

$Solve\ for\ L_B = L_A\text{:}\ \boxed{L_B = L_A \times \frac{\log_2(R_A)}{\log_2(R_B)}}$

Entropy Exceedance Formula

$L_B \times \log_2(R_B) > L_A \times \log_2(R_A)$

$Solve\ for\ L_B > L_A\text{:}\ \boxed{L_B = \left\lfloor L_A \times \frac{\log_2(R_A)}{\log_2(R_B)} \right\rfloor + 1}$

Entropy Factor Conversion Formula

$F_C = \frac{\log_2(R_A)}{\log_2(R_B)}$

$Solve\ for\ F_C\text{:}\ \boxed{F_C = \frac{\log_2(R_A)}{\log_2(R_B)} \approx 1.394}$

Simplified Formulas for Equality and Exceedance Using Entropy Factor

$Solve\ for\ L_B = L_A\text{:}\ \boxed{L_B = L_A \times 1.394}$

$Solve\ for\ L_B > L_A\text{:}\ \boxed{L_B = \lfloor L_A \times 1.394 \rfloor + 1}$

Length Entropy of Non-Complex Password $\mathrm{L_B}$ vs Complex Password $\mathrm{L_A}$		
$\mathrm{L_A}$	$L_B\ Entropy = L_A\ Entropy$	$L_B\ Entropy > L_A\ Entropy$
8	11.152	12
9	12.546	13
10	13.940	14
11	15.334	16
12	16.728	17
13	18.122	19
14	19.516	20