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Information Systems Security HW£1

Question

Using a computer that can perform 10^{12} calculations a second, roughly how long would it take to try all possible permutations of:

- 10 different letters
- 15 different letters
- 20 different letters

Answer

Computer speed is10^{12}calculation per second
we want to rearrange $x,\ x\ \in N$ number of different letters in x places, hence for every letter there is $Permutation(x,\ x)\ =\ x!$

Average Case

We would try half of the possible key space hence it would take the computer

$$\frac{(number\ of\ arrangements)/2}{speed\ of\ computer} = \frac{(x!)/2}{10^{12}}$$

- 10 different letters

$$\Rightarrow \frac{(10!)/2}{10^{12}} = \frac{(3628800)/2}{10^{12}} = 1.8144 \cdot 10^{-6} \text{ seconds}$$

- 15 different letters

$$\Rightarrow \frac{15!}{10^{12}} = \frac{(1.3076744 \cdot 10^{12})/2}{10^{12}} = 0.6538372 \text{ seconds}$$

- 20 different letters

$$\Rightarrow \frac{20!}{10^{12}} = \frac{(2.432902 \cdot 10^{18})/2}{10^{12}} = 2432902 \text{ seconds}$$

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Worst Case

We would all the elements in the key space hence it would take the computer

$$\frac{number\ of\ arrangements}{speed\ of\ computer} = \frac{x!}{10^{12}}$$

- 10 different letters

  $\Rightarrow \frac{10!}{10^{12}} = \frac{3628800}{10^{12}} = 3.6288 \cdot 10^{-6}$ seconds

- 15 different letters

  $\Rightarrow \frac{15!}{10^{12}} = \frac{1.3076744 \cdot 10^{12}}{10^{12}} = 1.307674368$ seconds

- 20 different letters

  $\Rightarrow \frac{20!}{10^{12}} = \frac{2.432902 \cdot 10^{18}}{10^{12}} = 2432902.00818$ seconds