Case-study 3

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Question no. 1

(A) Pakistan is a great country.

In English, there are 26 Alphabets and 14 punctuation marks.

Total no. of characters = 26 + 14 = 40

Probability of any character is = $\frac{1}{40}$

Subsequent characters are independant of one another and all characters are equally likely

$$P \models A \perp B \Rightarrow P(A,B) = P(A) \cdot P(B)$$

There are 28 characters in sentence "Pakistan is a great country.". So the likelihood of this sentence is

$$P(S) = \left(\frac{1}{40}\right)\left(\frac{1}{40}\right)\left(\frac{1}{40}\right) \times \cdots \times \left(\frac{1}{40}\right)$$

$$= \left(\frac{1}{40}\right)^{28} = 1.3877 \times 10^{-45}$$

This is the probability of writing that sentence, which is very very small.

(B)

The universe was created out of pure chance.

Total no. of characters in English = 26+14 = 40

Probability of any character is = $\frac{1}{40}$

Subsequent characters are independent of one another and all the characters are equally likely

$$P = A \cap B \Rightarrow P(A,B) = P(A) \cdot P(B)$$

There are 44 characters in the given sentence, likelihood of the sentence is

$$P(S) = \left(\frac{1}{40}\right) \times \left(\frac{1}{40}\right) \times \cdots \times \left(\frac{1}{40}\right)$$

$$= \left(\frac{1}{40}\right)^{44} = 3.2311 \times 10^{-71}$$

This is the probability to write the given sentence, which is very very small.

Question no. 2

(A) What is probability ....?

Total number of characters in constitution
$= 10,000,000 = 10M$

Total number of characters in English
$= 26 + 14 = 40$

Probability of any character is $= \frac{1}{40}$

$P = A \cap B \Rightarrow P(A,B) = P(A) \cdot P(B)$

$P(S) = \left(\frac{1}{40}\right) \times \left(\frac{1}{40}\right) \times \cdots \times \left(\frac{1}{40}\right)$

$= \left(\frac{1}{40}\right)^{10M} = (0.25)^{10M}$

This is the probability to write the the constitution.

(B)

Let us assume ----?

Total number of charaters in English = 40

Probability of any character is = $\frac{1}{40}$

Time expected to correctly type charaters = 40 sec

Number of ~~days~~ seconds in day = 24 x 60 x 60 = 86400 seconds

Total characters in constitution = 10,000,000 = 10M

Time required = 40 x 10M = 4,000,000,000

number of days required = $\frac{4,000,000,000}{86400}$

= 4630 days

Question no. 3

(A) To create a universe like this one we need to make 10^{80} reactions and 2 atoms are required in each reaction. The hitting chance without any reaction $1-p=q$, where p is the number of atoms.

total number of atom $= 10^{80}$

The probability of hitting randomly is $= \frac{q}{10^{80}} = \frac{1-p}{10^{80}}$

This is the probability of hitting atoms

(B)

As one reaction takes place in 1 second. 2 atoms are required in one reaction.

Total number of atoms $= 10^{80}$

Total number of reactions $= \frac{10^{80}}{2} = 10^{40}$

no. of secs in one year = $12 \times 30 \times 24 \times 60 \times 60$

$= 31104000$

Years required $= \frac{10^{40}}{31104000}$

$= 3.25 \times 10^{32}$ years

This is the required time(years) to create this universe

Thinking problem:

As mentioned above, it takes 10^{80} atoms and 10^{90} reactions to create the universe, so the universe can not be created by chance.