THE NUMBER OF INHABITED WORLDS IN OUR SOLAR SYSTEM

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The 619 inhabited planets in our local system are distributed across 562 physical ("solar") systems in the following way:

511	worlds	511	1-planet systems	51	decimal.
92	worlds	46	2-planet systems	9	decimal.
12	worlds	4	3-planet systems	1	decimal.
4	worlds	1	4-planet system	0	decimal.

Denoting the decimal (experimental, every 10th in each category) planets by superscripted asterisk, we can represent the above four groupings of planets into systems by the four sets:

$$\mathcal{S} = \{s_1, \ldots, s^*_{10}, \ldots, s^*_{510}, s_{511}\} \quad (1)$$
$$\mathcal{D} = \{d_1, \ldots, d^*_{10}, \ldots, d^*_{90}, d_{91}, d_{92}\} \quad (2)$$
$$\mathcal{T} = \{t_1, \ldots, t^*_{10}, t_{11}, t_{12}\} \quad (3)$$
$$\mathcal{Q} = \{q_1, q_2, q_3, q_4\} \quad (4)$$

Let us denote by $\mathcal{P}$ the set of all inhabited planets in the local system, numbered serially in the order of their registration:

$$\mathcal{P} = \{p_1, \ldots, p_{619}\} \quad (5)$$

Here p_{606} is our own planet. It is well known that our planet is the 60th experimental world (i.e., it is one of the starred elements of the sets $\mathcal{S}$, $\mathcal{D}$ or $\mathcal{T}$) and we also know that there is only one other experimental world among the younger ones, namely of the 13 planets in the range between p_{607} and p_{619}.

The question we would like to ask now is this: which class does our planet p_{606} belong to? Obviously, it cannot belong to $\mathcal{Q}$, because this class does not contain even one experimental planet. Let us see if there exists enumeration sequence which places our planet in the $\mathcal{S}$-class. This is equivalent to the existence of a bijective map π:

$$\pi : \mathcal{S} \cup \mathcal{D} \cup \mathcal{T} \cup \mathcal{Q} \to \mathcal{P} \quad (6)$$

which maps some experimental planet of $\mathcal{S}$-class to p_{606}:

$$\pi(s^*_i) = p_{606} \quad (7)$$

for some $i = 10k, 1 \leq k \leq 51$. Let us first calculate the total number of *all* bijections of the kind (6). If we do not impose any further constraints, then the total number of all such bijections will be $619!$, which is far beyond any mortal's comprehension. However, if we make the assumption that the worlds in the same physical system become inhabited *simultaneously* (which is reasonable, because we know that the life implantations on such worlds do in fact occur *simultaneously*), then the number of bijections to be considered is reduced considerably and can be calculated exactly:

$$N = 562 \times C^4_{561} \times C^{46}_{556} \approx 10^{82} \quad (8)$$

This is still an enormous number, so we cannot approach the problem by the brutal force method. Fortunately, we do not need to do this, because a few minutes' consideration suggests the following enumeration, while satisfying all our conditions:

$$\{\mathcal{Q}, \mathcal{D}, \mathcal{S}, \mathcal{T}\} \quad (9)$$

Here we enumerate the 4 q-planets, then all 92 d-planets, then all s-planets followed by the 12 t-planets. In this enumeration our world comes out as S^*_{510} followed by the normal (non-decimal) S_{511} and the 12 t-planets making the required number 13 with only one experimental planet (t^*_{10}).

Therefore, we have just proved that there is a possibility for our world to be the *only* inhabited planet in the Solar System. Of course, it is still possible that our planet belongs to $\mathcal{D}$ or $\mathcal{T}$ class — all we can say is that this is not demanded mathematically from the available data.

In addition to this *negative* fact we have also ascertained something *positive*, namely this: *if* our world is the only inhabited planet in the Solar System, then it must necessarily be the youngest such world bar one, i.e. there can only be one $\mathcal{S}$-class planet younger than our own — the one we have denoted by S_{511}.

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