

Problem

Let A be the language containing only the single string s , where

$$s = \begin{cases} 0 & \text{if life never will be found on Mars.} \\ 1 & \text{if life will be found on Mars someday.} \end{cases}$$

Is A decidable? Why or why not? For the purposes of this problem, assume that the question of whether life will be found on Mars has an unambiguous YES or NO answer.

Step-by-step solution

Step 1 of 1

Decidable language: A language is decidable if and only if some Turing machine decides it.

We call a Turing machine a decider if all branches halt on all inputs.

The given data is, A is the language containing only the single string s , where

$$s = \begin{cases} 0 & \text{if life never will be found on Mars} \\ 1 & \text{if life will be found on mars someday} \end{cases}$$

So, the language A may contain either 0 or 1 but not both

Thus $A = \{0\}$ (or) $A = \{1\}$

In both these cases A are finite and string s is fixed, so we know the same finite language is always decidable.

We are not able to determine whether

$$A = \{0\} \text{ or } A = \{1\}.$$

So we will not able to describe the decider for A .

In this case, we need to give two Turing machines for both the cases. So, definitely one of them will be the decider of A .

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