

## Problem

Let  $A = \{ \langle M \rangle \mid M \text{ is a DFA that doesn't accept any string containing an odd number of 1s} \}$ . Show that  $A$  is decidable.

## Step-by-step solution

### Step 1 of 2

Consider a language,

$A = \{ \langle M \rangle \mid M \text{ is a DFA which does not accept any string containing an odd number of 1s} \}$

The language is said to be decidable if there exists a Turing machine for it. Construct a Turing machine for  $A$  to check the decidability.

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### Step 2 of 2

The Turing machine for  $A$  is as follows:

$I =$  "On input  $\langle M \rangle$  where  $M$  is a DFA:

1. Construct a new DFA  $D_X$  that accepts any string containing an odd number of 1s.
2. Construct another DFA  $D_Y$  such that  $L(D_Y) = L(M) \cap L(D_X)$ .
3. Check whether  $L(D_Y) = \emptyset$ , using the  $E_{DFA}$  decider  $T$ .
4. If  $T$  accepts, accept; otherwise reject."

**There exists a Turing machine for  $A$ . Therefore,  $A$  is decidable.**

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