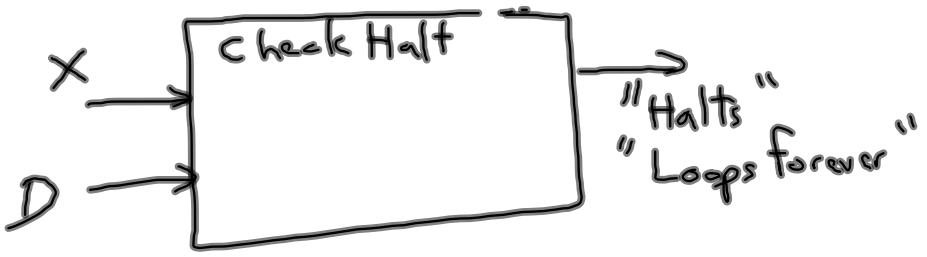
$$S = \{A \mid A \text{ is a set and } A \notin A\}$$

$$S \in S?$$

The halting problem:

There is no computer algorithm that will accept as input any algorith X and data set D and then outputs "halts" or "loops forever" to indicate whether X terminates in a finite number of steps when X is run w/ D as input.



Proof (by contradiction)

Suppose there is such an algorithm CheckHalt(X, D)

CheckHalt(X, D) prints
"halts" if X Terminates on input D in finite # of steps

"loops forever" if X does not terminate on D

Note: we can run CheckHalt(X, X)

Define a second algorithm Test(X) where X is a progra

Test(X) : call CheckHalt(X, X)

~~output:~~

loops forever; iff CheckHalt(X, X) prints "halts"

halt; iff CheckHalt(X, X) prints "loops forever"

---

now run Test(Test)

if Test(Test) terminates
then CheckHalt(Test, Test)
printed "Loops forever"
meaning Test(Test) looped forever

if Test(Test) loops forever
then CheckHalt(Test, Test)
printed "halts"
indicating that Test(Test) terminates.

which are contradictions
Since Test follows from the def. of CheckHalt,
CheckHalt cannot exist.

Ch. 6: Counting and Probability

a random process:
- one outcome from a set of outcomes
- impossible to say w/ certainty which will occur.

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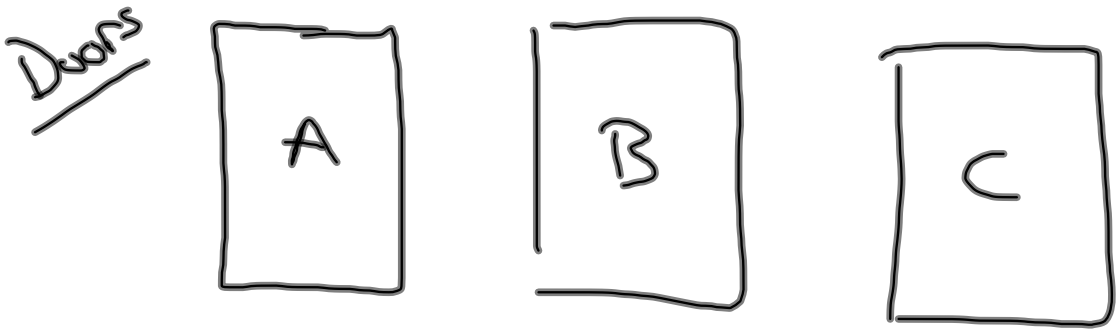
sample space: set of all possible outcomes of a random process.

event: subset of the sample space

If S is a finite sample space in which all outcomes are equally likely and E is some event in S

The probability of E, $P(E)$

$$P(E) = \frac{\text{the number of outcomes in } E}{\text{the total \# of outcomes in } S}$$


Doors
A
B
C