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## Algorithms, Hash Table Collision Probabilities

1. Consider  $n$  people with birthdays distributed uniformly at random.

How large does  $n$  need to be before there is at least a 50% chance that two people have the same birthday? (Same question as: *How many objects need to be inserted before there is a 50% chance of a collision?*)

2. Let's say that we have an array with 100 buckets. What is the probability of a collision if we have a perfect hash function (generates hash values uniformly at random) and we try to store (note that  $\prod_{i=1}^x \frac{n-i}{n} \sim e^{-x(x-1)/2n}$ ):
  - 10 values
  - 20 values,
  - 30 values