Birthday

- Please upload your birthday:

  http://bit.ly/2DA9ajQ

Assessing Probability

- There are three approaches to assessing the probability of an uncertain event:

    1. classical probability

    2. relative frequency probability

    3. subjective probability

Classical Probability

- Gerlamo Cardano: We should count the number of equally possible outcomes, the proportion relating to an event.

- The spirit of a priori probability:
  1. Count the number of all possible outcomes
  2. Attach equally likely probability to each
  3. Count the number of outcomes for an event

Classical Probability

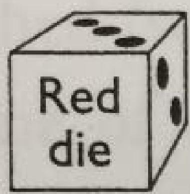
- Assumes all outcomes in the sample space are equally likely to occur

Classical probability of event A:

$$P(A) = \frac{N_A}{N} = \frac{\text{number of outcomes that satisfy the event A}}{\text{total number of outcomes in the sample space}}$$

Requires a count of the number of outcomes in the sample space

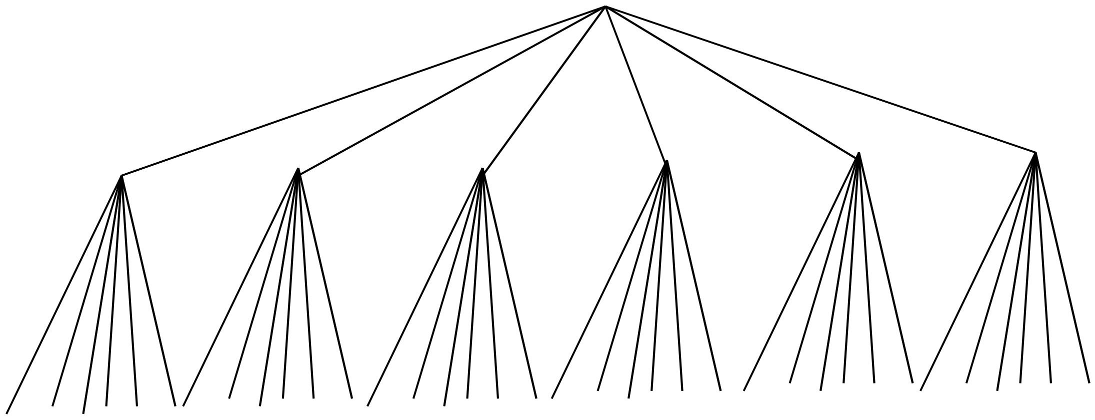
Comprehend All Outcomes



	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

Comprehend All Outcomes

- It is easier to comprehend all possible outcomes (sample space) by virtually sequential tosses



Permutation vs Combination

- Permutation: The order matters
- Combination: The order does not matter
- With repetition: The thing is return back after being drawn
- Without repetition: The thing can be drawn for at most one time

Counting the Possible Outcomes

- Use the Permutations with repetition to determine the number of combinations of n items taken k at a time

$$n^k$$

- Ex. The number of all possible outcomes (sample space) in de Mere's problem are

6^4 and 36^{24}

Permutations and Combinations

The number of possible orderings

- The total number of possible ways of arranging x objects in order is

$$x! = x(x-1)(x-2)\ldots(2)(1)$$

- x! is read as "x factorial"

Permutations and Combinations

Permutations without repetition: the number of possible arrangements when x objects are to be selected from a total of n objects and arranged in order [with (n – x) objects left over]

$$P_x^n = n(n-1)(n-2)\ldots(n-x+1)$$

$$= \frac{n!}{(n-x)!}$$