

4.1 PROBABILITY

Probability is the branch of mathematics concerning numerical descriptions of how likely an event is to occur.

The probability of an event is the likelihood of that event occurring and is always between 0 and 1, or 0% and 100%, 0 being an impossible event, and 1 being a certain event.

Simple Event: ex: the event of a puppy being female.

the event of making 7 freethrows in a row.

Not a "simple" event : A couple has two children, a boy and a girl.
BG or GB there are two possible ways.

Sample space: The collection of all simple events.

Ex: find the sample space of flipping a coin three times in terms of H or T.

$$S = \{ \text{HHH}, \text{TTH}, \text{HTH}, \text{HTT}, \text{THT}, \text{TTT} \}$$

Let A = the event HHH : this is a simple event

Let B = getting two TAILS: not simple.

$$P(\text{event}) = \frac{\text{\# of ways the event can occur}}{\text{the size of the sample space}}$$

$$P(A) = \frac{1}{8} = 12.5\%$$

$$P(B) = \frac{3}{8} = 37.5\%$$

Theoretical or Classical Method

Experimental or Empirical Method

C is the event of flipping a thumbtack and landing point up \perp not $\&$

$$P(C) = \frac{\text{\# of times event C occurs}}{\text{total number of trials}}$$

$$\begin{aligned} n &= 300 \\ x &= 147 \text{ up} \\ P(C) &= \frac{147}{300} \\ &= 0.49 \\ &\text{or } 49\% \end{aligned}$$

Subjective Probability:

I think there is a 20% probability that it will snow this christmas.

The Complement of an event A is a set that consists of all outcomes in which A does not occur.

Ex.

If A = getting 2 heads in 3 flips of a coin

\bar{A} = not getting 2 heads.

$$P(A) = \frac{3}{8} \quad \text{so} \quad P(\bar{A}) = \frac{5}{8}$$

$$\text{or } P(\bar{A}) = 1 - P(A)$$


$$\Rightarrow P(A) + P(\bar{A}) = 1$$

Let B = It will rain next Monday

If $P(B) = 0.25$ then $P(\bar{B}) = 0.75$

and $P(B) + P(\bar{B}) = 1$ or 100%

Ex: Find the sample space of rolling two die and calculating the sum.



2.....12?

	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

a) $P(\text{sum} > 9) = \frac{6}{36} = \frac{1}{6}$

b) $P(\text{sum of 6 or 8}) = \frac{10}{36} = \frac{5}{18}$

c) $P(\text{not getting a pair}) = 1 - P(\text{getting a pair})$
 $= 1 - \frac{6}{36}$
 $= \frac{36}{36} - \frac{6}{36}$
 $= \frac{30}{36}$
 $= \frac{5}{6}$