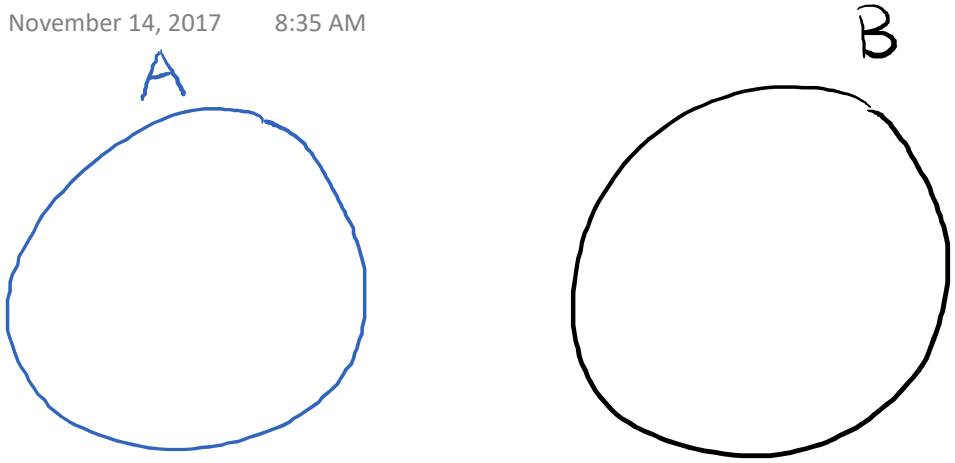


$A \cap B = \phi$

(A, B are mutually exclusive)

$$P(A \cup B) = P(A) + P(B)$$

E.g. Experiment: toss 2 fair coins once.

A = event that we get at least 1H

$A = \{HT, HH, TH\}$

B = event that we get exactly 2T

$B = \{TT\}$

$A \cap B = \phi$. $\underbrace{P(A \cup B)}_{1} = \underbrace{P(A)} + \underbrace{P(B)}$

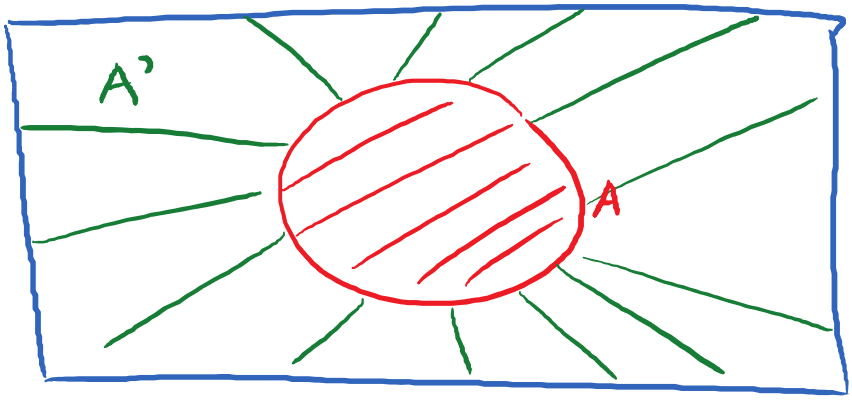
$1 = \frac{3}{4} + \frac{1}{4}$

The complement of an event

Experiment : toss 2 coins

A = get at least 1H = {HT, TH, HH}

A' = the complement of A in S = {TT}



$$\frac{n(A) + n(A')}{n(S)} = \frac{n(S)}{n(S)}$$

$$\frac{n(A)}{n(S)} + \frac{n(A')}{n(S)} = 1$$

$$P(A) + P(A') = 1$$

$$P(A') = 1 - P(A)$$

E.g. Toss 2 dice

Q: Find the probability that the # of points on each dice are not the same?

Let A be the event that the # of points on the 2 dice are the same: $A = \{(1,1), (2,2), \ldots, (6,6)\}$

So, $P(A) = \frac{6}{36}$.

A': the event we are interested in.

$$P(A') = 1 - P(A) = 1 - \frac{6}{36} = \frac{30}{36} = \boxed{\frac{5}{6}}$$

Eg. Toss 2 dice

Q: Find the probability that sum > 4

A = event that sum ≤ 4

$A = \{(1,1), (1,2), (1,3), (2,2), (2,1), (3,1)\}$

$P(A) = \frac{6}{36}$.

A' = event that we are interested in:

$P(A') = 1 - P(A) = 1 - \frac{6}{36} = \frac{30}{36} = \frac{5}{6}$.

Odds against an event and odds in favor of an event.

E: event.

The odds in favor of $E = \frac{P(E)}{P(E')}$ (success : failure)

The odds against $E = \frac{P(E')}{P(E)}$ (failure : success)

E.g. Toss 2 fair coins:

E = get at least 1H = $\{HT, TH, HH\}$

E' = $\{TT\}$

$P(E) = \frac{3}{4}$; $P(E') = \frac{1}{4}$.

Odds in favor of E : 3 : 1. $\left(= \frac{\frac{3}{4}}{\frac{1}{4}} \right)$

Odds against E : 1 : 3.

E.g. Roulette

One number bet : odd in favor : 1 : 37

odd against : 37 : 1

Even / odd bet : odd in favor : 18 : 20

odd against : 20 : 18.