

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

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

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

$$\boxed{P(A') = 1 - P(A)}$$

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.

$$A = \{(1,1), (2,2), \dots, (6,6)\}$$

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

→ A' : the event that we are interested in.

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

E.g. Pick a card from a standard 52 card deck
Find the probability that the card is not a
high card?

A = event that we get a high card.

$$P(A) = \frac{16}{52}.$$

A' : event we are interested in

$$P(A') = 1 - P(A) = 1 - \frac{16}{52} = \frac{36}{52} = \frac{9}{13}$$

Ex. Roll a pair of dice

Find the probability that the sum is > 4 .

A = event that the sum is ≤ 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.

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

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

E : event.

The odds in favor of $E = \frac{P(E)}{P(E')} \cdot \left(\frac{\text{success}}{\text{failure}} \right)$

The odds against $E = \frac{P(E')}{P(E)} \cdot \left(\frac{\text{failure}}{\text{success}} \right)$

E.g. Toss a pair of fair coin.

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

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

$$\text{The odds in favor of } E = \frac{P(E)}{P(E')} = \frac{\frac{3}{4}}{\frac{1}{4}} = 3:1$$

$$\text{The odds against } E = \frac{P(E')}{P(E)} = \frac{\frac{1}{4}}{\frac{3}{4}} = 1:3$$

E.g. Roulette.

One number bet.

$$P(E) = \frac{1}{38} ; \quad P(E') = \frac{37}{38}$$

odds in favor of E : $1:37$

odds against E : $37:1$.