

## ✓ Addition Rules for Probability

Addition rule is used to find the probability of two or more events.

If two events are mutually inclusive (occurs at the same time) the probability can be calculated by adding the each probability. Two events are mutually exclusive events or disjoint events if they cannot occur at the same time (i.e. they have no outcomes in common).

Rule: When two events A and B are mutually exclusive, the probability that A or B will occur is:

$$P(A \text{ or } B) = P(A) + P(B)$$

For example The corporate research and development centers for three local companies have the following numbers of employees:

Companies	Employees
U.S. Steel	110
Alcoa	750
Bayer Material Science	250
total	1110

If a research employee is selected at random, find the probability that the emoloyee is employed by U.S. Steel or Alcoa.

```
1 US_steel = 110
2 Alcoa = 750
3 total = 1110
4
5 probability_US_steel = US_steel/total
6 probability_Alcoa = Alcoa/total
7
8 probability_US_steel_or_Alcoa = probability_US_steel + probability_Alcoa
9
10 print(f"The probability that the employee is employed by U.S. Steel or Alcoa
    is {probability_US_steel_or_Alcoa:.3f}")
```

➡ The probability that the employee is employed by U.S. Steel or Alcoa is 0.775

## ✓ Question 1

From the above table, find the probability that an employee is either of Alcoa or Bayer Material Science.

```
1 ## Write Your Code Here ##
```

If there are multiple events which are mutually exclusive events, probability can be calculated as:

$$P(A \text{ or } B \text{ or } C) = P(A) + P(B) + P(C)$$

Rule 2

If A and B are not mutually exclusive, then

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

## ✓ For example:

A single card is drawn at random from an ordinary deck of cards. Find the probability that it is either an ace or a black card.

```
1 total_card = 52
2 ace_card = 4
3 black_card = 26
4 black_ace = 2
5
6 probability_ace_black = (ace_card + black_card - black_ace)/total_card
7 print(f"The probability that the card is either an ace or a black card is {probability_ace_black:.3f}")
```

➡ The probability that the card is either an ace or a black card is 0.538

## ✓ Question 2

A card is randomly drawn from a deck of card, find the probability that the card is either a red card or a jack.

```
1 ## Write Your Code Here ##
```

If the three events are not mutually exclusive.

$$P(A \text{ or } B \text{ or } C) = P(A) + P(B) + P(C) - P(A \text{ and } B) - P(A \text{ and } C) - P(B \text{ and } C) + P(A \text{ and } B \text{ and } C)$$