Independent Events

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Two events A and B are said to be independent if the occurrence of A is in no way influenced by the occurrence of B. Likewise occurrence of B is in no way influenced by the occurrence of A.

Rules for Computing Probability

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1) Addition Rule -Mutually Exclusive Events

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

This rule says that the probability of the union of A and B is determined by adding the probability of the events A and B.

Here the symbol $A \bigcup B$ is called A union B meaning A occurs, or B occurs or both A and B simultaneously occur. When A and B are mutually exclusive, A and B cannot simultaneously occur.

Rules for Computing Probability

2) Addition Rule –Events are not Mutually Exclusive

$$P(A \bigcup B) = P(A) + P(B) - P(A \bigcap B)$$

This rule says that the probability of the union of A and B is determined by adding the probability of the events A and B and then subtracting the probability of the intersection of the events A and B.

The symbol $A \bigcap B$ is called A intersection B meaning

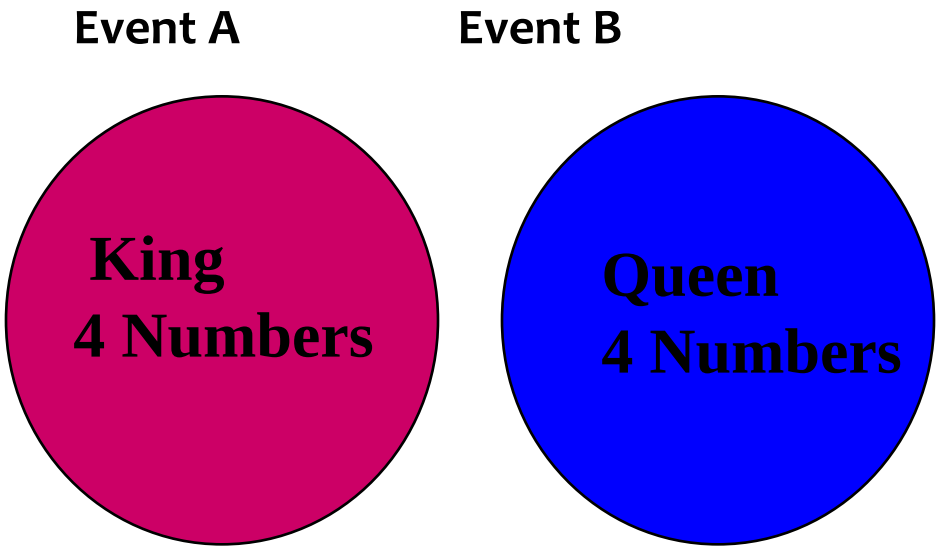
both A and B simultaneously occur.

Example for Addition Rules

From a pack of well-shuffled cards, a card is picked up at random. 1) What is the probability that the selected card is a King or a Queen? 2) What is the probability that the selected card is a King or a Diamond?

Solution to part 1)

Look at the Diagram:



Let A = getting a King
Let B = getting a Queen

There are 4 kings and there are 4 Queens. The events are clearly mutually exclusive. Applying the formula

$$P(A \bigcup B) = P(A) + P(B)$$ = 4/52 +4/52 = 8/52 =2/13

Solution to part 2)

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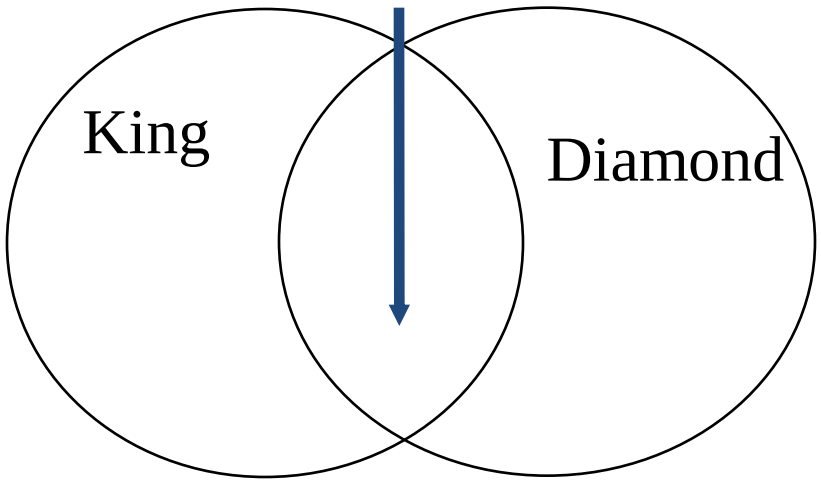
Look at the Diagram:

There are totally 52 cards in a pack out of which 4 are Kings and 13 are Diamonds. Let A= getting a King and B= getting a Diamond. The two events here are not mutually exclusive because you can have a card, which is both a King and a Diamond called King Diamond.

= 4/52+13/52-1/52= 16/52=4/13

King and Diamond

$$P(K \bigcup D) = P(K) + P(D) - P(K \bigcap D)$$



Multiplication Rule

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Independent Events

$$P(A \cap B) = P(A).P(B)$$

This rule says when the two events A and B are independent, the probability of the simultaneous occurrence of A and B (also known as probability of intersection of A and B) equals the product of the probability of A and the probability of B. Of course this rule can be extended to more than two events.

Multiplication Rule

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Independent Events-Example

Example:

The probability that you will get an A grade in Quantitative Methods is 0.7. The probability that you will get an A grade in Marketing is 0.5. Assuming these two courses are independent, compute the probability that you will get an A grade in both these subjects.

Solution:

Let A = getting A grade in Quantitative Methods

Let B =getting A grade in Marketing

It is given that A and B are independent.

$$P(A \cap B) = P(A).P(B)$$

= 0.7.0.5 = 0.35.