

Compatible and Incompatible Events

Vocabulary

Compatible: two events that occur at the same time or at least one outcome in common.

Incompatible: when there are no outcomes in common.

Incompatible Events

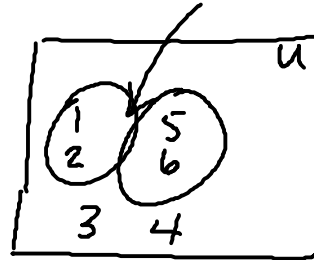
When 2 events have no chance of happening at the same time. The chances are 0.

Example

A die is rolled

Event A: Observing an outcome less than 3

Event B: Observing an outcome greater than 4



Event A and Event B are incompatible since you cannot have a number that is less than 3 and greater than 4 at the same time.

Compatible Events

The probability that 2 events happen at the same time is probable or 1.

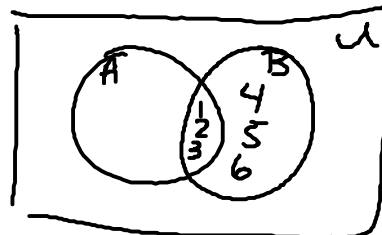
Example

Example: A die is rolled

Event A: Observing an outcome less than or equal to 3

Event B: Observing an outcome greater than or equal to 1

Event A and event B are compatible since you can have a number that is less than or equal to 3 and greater than or equal to 1.



Calculating the Probability of Complementary Events

Vocabulary

Complementary: if two incompatible events when combined result in the complete set of possible outcomes.

You can think of the probability of the complement of an event as the probability that the event will not occur. Whenever you add the probability of the event with the probability of its complement, you will get 1. This is because you have included all the possible outcomes in the scenario.

Symbol use $P(\text{event})'$
 $P(\text{event}) + P(\text{event})' = 1$

Examples

1. If an event is defined as rolling a prime number on a standard die, what is the complement of the event?

$\Omega = 1, 2, 3, 4, 5, 6$ $P(\text{prime})' = \text{rolling a } 1, 4 \text{ or a } 6.$
 $\text{Prime \#} = 2, 3, 5$

2. Sam is picking a number between 1 and 100. Identify the complementary event to picking a perfect square.

Perfect squares
 $1, 4, 9, 16, 25, 36, 49, 64, 81, 100$ $P(\text{perfect square})' = \text{not rolling a perfect square}$

3. The probability of an event occurring is $\frac{3}{8}$. Determine the probability of the complement.

$P(\text{event}) + P(\text{event})' = 1$
 $\frac{3}{8} + ? = \frac{8}{8}$ $\frac{8}{8} - \frac{3}{8} = ?$

4. Determine the probability of the complement of drawing a face card from a standard deck of cards.

Face cards = $3 \times 4 = 12$ cards
 Complement = not picking a face card
 $\frac{12}{52} + ? = \frac{52}{52}$ $\frac{52}{52} - \frac{12}{52} = ?$



5. Determine the probability of not rolling doubles when rolling two standard dice.

$P(\text{Rolling doubles}) = \frac{6}{36}$ $1 - \frac{6}{36} = \frac{30}{36} = \frac{5}{6}$ $P(\text{doubles})'$

$6 \times 6 = 36$