

## Worksheet 11/17/2023

**Independent events:** two events are independent if the occurrence or non-occurrence of one event does not affect the probability of the other event.

Given two *independent* events  $A$  and  $B$ , the probability that  $A$  and  $B$  both occur is

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

**Overlapping/Non-overlapping event:** Two events are *non-overlapping* if they cannot occur together. Two events are *overlapping* if they can occur together.

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

**The At Least Once Rule:** The probability that event  $A$  occurs *at least once* in  $n$  independent trials is

$$P(A \text{ occurs at least once in } n \text{ trials}) = 1 - P(\text{not } A)^n$$

Determine whether the events described in each exercise are independent or dependent. Then find the *AND* probability of the events.

1) Getting five heads when you toss five (fair) coins simultaneously

2) Rolling a fair, 6-sided die three times and getting 1, 2, 3, in that order

3) Discovering that your three best friends were all born on a Sunday

Determine whether the events described in each exercise are overlapping or non-overlapping. Then find the *EITHER/OR* probability of the events.

4) Getting a sum of either 2, 3, 4, or 5 on a roll of two dice

5) Drawing either a black ace or a red king on one draw from a standard deck of 52 cards

6) Randomly selecting either a sophomore or an Honor Roll student at a high school with 25 students in each class (first-years, sophomores, juniors, and seniors) when five students from each class are on the Honor Roll

Use the *AT LEAST ONCE* rule to find the probabilities of the following events.

7) Getting rain at least once in three days when the probability of rain on each single day is 0.3

8) Getting at least one 50-year flood in the next ten years