

Probability Models

- The sample space is the set of all possible outcomes for an experiment. Each element of a sample space has a probability between 0 (not going to happen!) and 1(will absolutely happen!)
- The sum of **all** probabilities within a sample space must be equal to 1 (or 100%)

Using Addition with Probability “OR”

Example: Drawing a red card or a club are **mutually exclusive** because...

If mutually exclusive then $P(A \text{ or } B) =$

Example: Drawing a card that is red or ace are **inclusive** events because....

If inclusive then $P(A \text{ or } B) =$

Using Multiplication with Probability “AND”

Definition: Two events are **independent** if the occurrence or non-occurrence of one event has no effect on the likelihood of the occurrence of the other event.

If A and B are independent events then $P(A \text{ and } B) =$

- Example: Mr. Kaplan and Mr. Bourque each get to select one student to send on a special trip to Washington D.C. If Hayden is in Bourque’s class of 20 and Noah is in Kaplan’s class of 24, what is the probability that they are **both** selected?

Complements and Probability

The probability that an event does not occur,

$$P(\bar{A}) =$$

Example: If I throw a die three times, what is the probability that I get at least one 5?

Using a Table with Probability

Example: For medical purposes, the managers of a company decide to record the blood type of all the employees. The results are shown in the table below.

	O	A	B	AB	totals
Women	8	5	4	2	19
Men	12	6	2	1	21
totals	20	11	6	3	40

- Find the probability that a person has type B blood or type A blood.
- Find the probability that a person is either a women or has type 0 blood.
- Find the probability that a person has type A blood **given** that a man was chosen.

LOTS of EXAMPLES:

1. Mary Papadopoulos and her husband plan to have three children. What is the probability that the new Papadopoulos family will welcome three baby girls? Assume no twins or triplets.
2. What is the probability that the Papadopoulos family does not have three girls?
3. A box contains 10 chocolate chip cookies and 8 sugar cookies. You are going to select 3 cookies from the box. What is the probability that you select exactly 2 chocolate chip cookies?
4. A fair coin is tossed **four** times. Determine $P(\text{exactly one tail})$.
5. A fair coin is tossed **four** times. Determine $P(\text{no more than one tail})$

6. Suppose two fair dice are rolled and the two digits are added. What is the probability that the sum is an 11?

7. A fair die is rolled. What is the probability that the outcome is odd or a multiple of three?

1,1	1,2	1,3	1,4	1,5	1,6
2,1	2,2	2,3	2,4	2,5	2,6
3,1	3,2	3,3	3,4	3,5	3,6
4,1	4,2	4,3	4,4	4,5	4,6
5,1	5,2	5,3	5,4	5,5	5,6
6,1	6,2	6,3	6,4	6,5	6,6

8. You are going to roll a pair of dice three times. Find the probability that you get...

a) A sum of five on all three rolls.

b) A sum of five **at least** twice.

9. Consider the data set regarding the probability of owning a certain number of TV sets.

# of TV sets	0	1	2	3	4 or more
Probability	0.05	0.24	0.33	0.21	0.17

- a) What is the probability that a randomly selected person owns less than 2 TV sets?
- b) What is the probability that a randomly selected person owns one or more TVs?
10. A bag of M&Ms contains 15 reds, 24 browns, 11 yellows, and 10 blues. You are going to reach in to the bag and select one M&M at a time without replacement.
- a) What is the probability that you select either a red or blue?
- b) What is the probability that you select a brown, then a yellow, then a blue, then another yellow?
- c) What is the probability that you select a red, then a blue or yellow, then a yellow?