MA 162: Finite Mathematics - Section 7.1/7.2

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Announcements:

- Homework 6.4 due Tuesday at 6pm.
- Homework 7.1/7.2 due Friday at 6pm.
- Exam Grades will be returned today.

7.1 - Probability Terminology

1. An **experiment** us an activity with observable results.
2. A **sample point** is an outcome of an experiment. (an element of a universal set)
3. A **sample space** is the set consisting of all possible sample points of an experiment. (a universal set)
4. An **event** is a collection of some of the sample points of an experiment. (a subset of a universal set)
5. A **simple event** is an event consisting of exactly one sample point.

7.1 - Example

- The experiment: You roll a 6-sided die and flip a coin.
- What is the sample space?
- What are the simple events?

7.1 - Application Example

- (Example, Tan, Section 7.1, #32) From a list of 5 job applicants: a, b, c, d, and e, two are selected for the next round of interviews.
  - Describe an appropriate sample space for this experiment.
  - Describe the event E that the interviewees include applicant a.
  - Describe the event F that the interviewees include applicants a and c.

7.1 - Mutually Exclusive Events

- Two events E and F are mutually exclusive if they can not happen at the same time.
- That is, two events E and F are mutually exclusive if $E \cap F = \emptyset$.
- E and F from the previous example are not mutually exclusive because $\{(a, c)\}$ is in both E and F.
- Are the events "one applicant is b" and "one applicant is d" mutually exclusive?

7.2 - The Definition of Probability

- The probability of an event is a number between 0 and 1.
- In general, the larger the probability of an event, the more likely that the event will occur.
- A probability of 0 means that an event will **never** happen.
- A probability of 1 means that an event will **always** happen.

7.2 - More About Probability

- Suppose an experiment has sample space

$$S = \{s_1, s_2, \ldots, s_n\}$$

- For any event E, $0 \leq P(E) \leq 1$.

- $P(s_1) + P(s_2) + \ldots + P(s_n) = 1$.

- If E and F are mutually exclusive then

$$P(E \cup F) = P(E) + P(F)$$

7.2 - Empirical Probability

- If an event E happens m times out of n trials, then the **relative frequency** of the event is m/n.
- If this ratio approaches a number, $P(E)$, as n gets very large, then $P(E)$ is called the **empirical probability**.
- Therefore, we will often find probabilities by finding the number of ways E can occur and divide this by the total number of possible outcomes from an experiment.

7.2 - Example, Tan, Section 7.2, #19 (modified)

In an online survey of 500 adults living with children under the age of 18, the participants were asked how many days per week they cook at home. The results of the survey are summarized below:

Number of days	0	1	2	3	4	5	6	7
Respondents	25	30	45	75	55	100	85	85

- What is the probability that an adult in this survey cooked 3 nights per week?

- What is the probability that an adult in this survey cooked more than 4 nights a week?

7.2 - Example

An urn contains 3 red balls, 2 white balls, and 5 blue balls. A man reaches into the urn and chooses one ball. What is the probability that the chosen ball is white?

7.2 - Playing Cards

- A card is randomly chosen from a standard deck of 52 cards. What is the probability that the card is a J?

7.2 - Playing Cards

- A card is randomly chosen from a standard deck of 52 cards. What is the probability that the card chosen is red or a 3?