Math 2311

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Office Hours: MW 11am to 12:45pm in 639 PGH

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Class webpage: http://www.math.uh.edu/~bekki/Math2311.html

Math 2311
Class Notes for Section 2.2-2.4

Last week:

- Reviewed graphs
- Counting techniques
- Venn Diagrams

Some Review:

How many ways can you line 4 people up for a picture?

How many ways can you choose 4 people from 10 for a committee?

How many ways can you arrange the letters of CASABLANCA?

How many ways can you get a 5 card poker hand?

How many ways can you get a full house 5 card poker hand?

Draw a Venn Diagram for the following situation: A group of 100 people are asked about their preference for soft drinks. The results are as follows:

55 Like Coke

25 Like Diet Coke

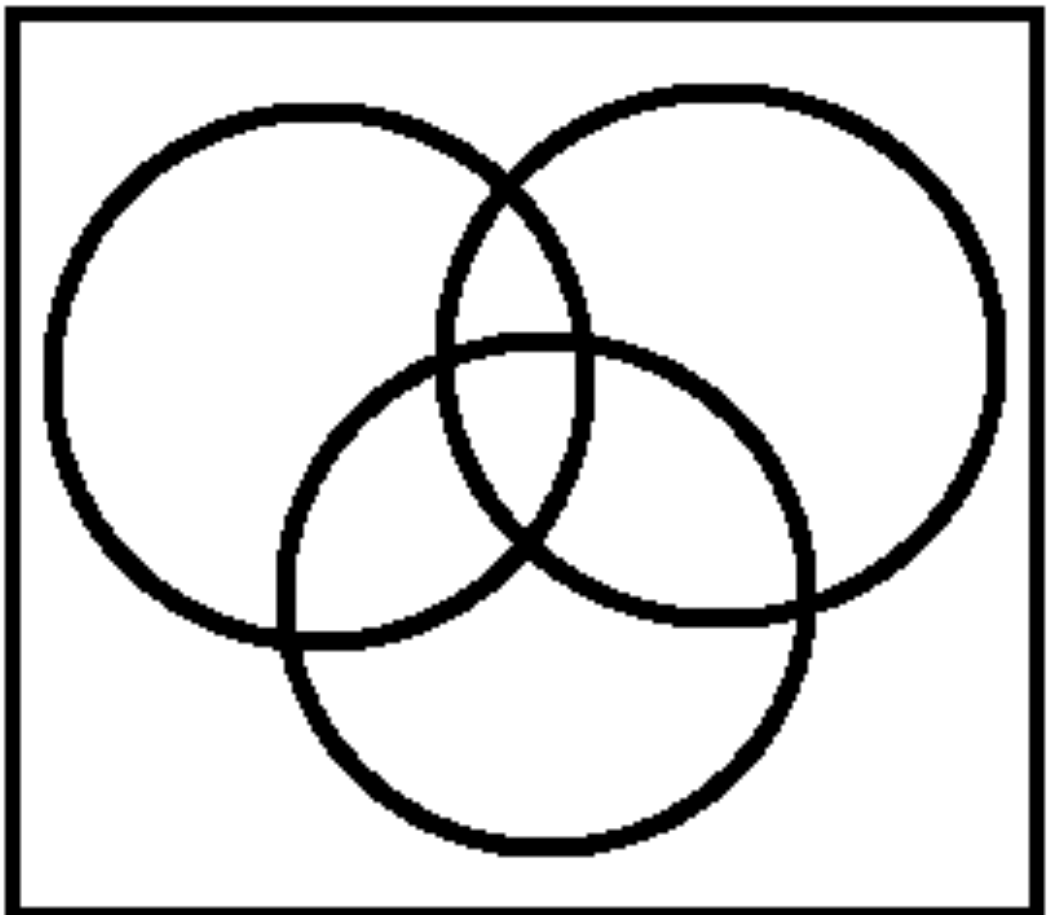
45 Like Pepsi

15 like Coke and Diet Coke

5 Like all 3 soft drinks

25 Like Coke and Pepsi

5 Only like Diet Coke



Section 2.3 – Basic Probability Models

The probability of any outcome of a random phenomenon is the proportion of times the outcome would occur in a very long series of repetitions.

The sample space of a random phenomenon is the set of all possible outcomes.

An event is an outcome or a set of outcomes of a random phenomenon. It is a subset of the sample space. A simple event is an event consisting of exactly one outcome.

To compute the probability of some event *E* occurring, divide the number of ways that *E* can occur by the number of possible outcomes the sample space, *S*, can occur:

$$P(E) = \frac{n(E)}{n(S)}$$

Basic Rules of Probability

1. All events have a probability between zero and one. $0 \le P(E) \le 1$
2. All possible outcomes together must have a probability of one. $P(S) = 1$
3. Complement Rule: For any event E, $P(E^c) = 1 - P(E)$
4. Addition Rule: If A and B are disjoint events, then $P(E \cup F) = P(E) + P(F)$
5. If E and F are any events of an experiment, then $P\left(E \cup F\right) = P\left(E\right) + P\left(F\right) - P\left(E \cap F\right)$

Examples:

1. Suppose we draw a single card from a deck of 52 fair playing cards.

a. What is the probability of drawing a heart?

b. What is the probability of drawing a queen?

2. If 5 marbles are drawn at random all at once from a bag containing 8 white and 6 black marbles, what is the probability that 2 will be white and 3 will be black?

3. The qualified applicant pool for six management trainee positions consists of seven women and five men.

a. What is the probability that a randomly selected trainee class will consist entirely of women?

b. What is the probability that a randomly selected trainee class will consist of an equal number of men and women?

4. A sports survey taken at UH shows that 48% of the respondents liked soccer, 66% liked basketball and 38% liked hockey. Also, 30% liked soccer and basketball, 22% liked basketball and hockey, and 28% liked soccer and hockey. Finally, 12% liked all three sports.

a. What is the probability that a randomly selected student likes basketball or hockey? Solve this by also using an appropriate formula.

b. What is the probability that a randomly selected student does not like any of these sports?

Section 2.4 – General Probability Rules

Two events are independent if knowing that one occurs does not change the probability that the other occurs.
(Note: This is not the same as sets that are disjoint or mutually exclusive)

If *E* and *F* are independent events, then $P(E \cap F) = P(E)P(F)$

Example:

5. If P(A) = .36 and P(B) = .58 and A and B are independent,
a. What is P(A and B)?

b. What is the probability of A or B occurring?

Dependent events, the occurrence of one event does have an effect on the occurrence of the other event. The probability $P(E \mid F)$ is read "the probability of event *E* given event *F* had already occurred". If *E* and *F* are independent, then $P(E \mid F) = P(E)$.

If events *E* and *F* are dependent then $P(E \mid F) = \dfrac{P(E \cap F)}{P(F)}$.

This means $P(E \cap F) =$

Examples:

6. A clothing store that targets young customers (ages 18 through 22) wishes to determine whether the size of the purchase is related to the method of payment. A sample of 300 customers was analyzed and the information is below:

	Cash	Credit	Layaway	Total
Under $40	60	30	10	100
$40 or more	40	100	60	200
Total	100	130	70	300

a. If a customer is selected at random from this group of customers, what is the probability that the customer paid cash?

b. If a customer is selected at random from this group of customers, what is the probability that the customer paid with a credit card?

c. If a customer is selected at random from this group of customers, what is the probability that the customer paid with the layaway plan?

d. If a customer is selected at random from this group of customers, what is the probability that the customer purchased under $40?

e. If a customer is selected at random from this group of customers, what is the probability that the customer purchased $40 or more?

f. If a customer is selected at random from this group of customers, what is the probability that the customer paid with a credit card given that the purchase was under $40?

g. If a customer is selected at random from this group of customers, what is the probability that the customer paid with the layaway plan given that the purchase was $40 or more?

7. Determine if events A and B are independent.

a. $P(A) = 0.9,\ P(B) = 0.3,\ P(A \cap B) = 0.27$

b. $P(A) = 0.4,\ P(B) = 0.6,\ P(A \cap B) = 0.20$