Accelerated Geometry B/Algebra II Unit 3
Applications of Probability

References

Textbook Connection:
HMH Acc. Analytic Geometry B/Adv. Alg. Unit 7
Online Access:
http://www.my.hrw.com

Helpful Links:

- ☐ Set Notation:
- ☐ Venn Diagrams and Set Notation:
- ☐ Conditional Probability:
- ☐ Two way Frequency Tables:
- ☐ Conditional Probability and Independence:

Dear Parents

In this unit, students will take their previously acquired knowledge of probability for simple and compound events and expand that to include conditional probabilities (events that depend upon and interact with other events) and independence. Students will be exposed to elementary set theory and notation (sets, subsets, intersection and unions). Finally, students will use their knowledge of conditional probability and independence to make determinations on whether or not certain variables are independent.

Concepts Students will Use & Understand

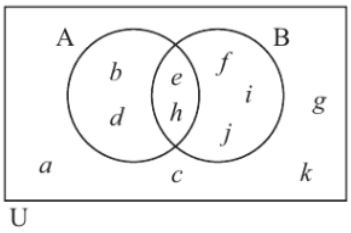
- Use set notation as a way to algebraically represent complex networks of events or real world objects.
- Represent everyday occurrences mathematically through the use of unions, intersections, complements and their sets and subsets.
- Use Venn Diagrams to represent the interactions between different sets, events or probabilities.
- Find conditional probabilities by using a formula or a two-way frequency table.
- Understand independence as conditional probabilities where the conditions are irrelevant.
- Analyze games of chance, business decisions, public health issues and a variety of other parts of everyday life can be with probability.
- Model situations involving conditional probability with two-way frequency tables and/or Venn Diagrams.
- Confirm independence of variables by comparing the product of their probabilities with the probability of their intersection.

Vocabulary

- **Complement:** Given a set A, the complement of A, denoted $\overline{A}$ or A', is the set of elements that are not members of A.
- **Conditional Probability:** The probability of an event A, given that another event, B, has already occurred; denoted $P(A \mid B)$.
- **Dependent Events:** Two or more events in which the outcome of one event affects the outcome of the other event or events.
- **Element:** A member or item in a set.
- **Independent Events:** Events whose outcomes do not influence each other.
- **Intersection of Sets:** The set of all elements contained in all of the given sets, denoted $\cap$.
- **Outcome:** A possible result of an experiment.
- **Sample Space:** The set of all possible outcomes from an experiment.
- **Set:** A collection of numbers, geometric figures, letters, or other objects that have some characteristic in common.
- **Subset:** a set in which every element is also contained in a larger set.
- **Union of Sets:** The set of all elements that belong to at least one of the given two or more sets denoted $\cup$.
- **Venn Diagram:** A picture that illustrates the relationship between two or more sets.

Sample Practice Problems:

1.



List the letters in set:

a A **b** B **c** A' **d** B'
e $A \cap B$ **f** $A \cup B$ **g** $(A \cup B)'$
h $A' \cup B'$

2. Suppose a study of speeding violations and drivers who use car phones produced the following fictional data:

	Speeding violation in the last year	**No speeding violation in the last year**	**Total**
Car phone user	25	280	305
Not a car phone user	45	405	450
Total	70	685	755

a. P(person is a car phone user)
b. P(person had no violation in the last year)
c. P(person had no violation in the last year AND was a car phone user)
d. P(person is a car phone user GIVEN that they had a violation in the past year)

3. If there is a 10% chance that the moon will be in the Seventh House and Jupiter will also align with Mars, and a 25% chance that Jupiter will align with Mars, then what is the probability that the Moon is in the Seventh House given that Jupiter aligns with Mars?

Solutions:

1. **a** $A = \{b, d, e, h\}$ **b** $B = \{e, f, h, i, j\}$
c $A' = \{a, c, f, g, i, j, k\}$ **d** $B' = \{a, b, c, d, g, k\}$
e $A \cap B = \{e, h\}$ **f** $A \cup B = \{b, d, e, f, h, i, j\}$
g $(A \cup B)' = \{a, c, g, k\}$
h $A' \cup B' = \{a, b, c, d, f, g, i, j, k\}$

2. a. $\dfrac{\text{number of car phone users}}{\text{total number in study}} = \dfrac{305}{755}$

b. $\dfrac{\text{number that had no violation}}{\text{total number in study}} = \dfrac{685}{755}$

c. $\dfrac{280}{755}$

d. $\dfrac{25}{70}$ (The sample space is reduced to the number of persons who had a violation.)

3. Let: M=The Moon is in the Seventh House and J= Jupiter aligns with Mars, then

M|J) = P(M ∩ J)/P(J) = .10/.25 = 0.4