Probability and Statistics Standard #2

Standard Set 2.0 Probability and Statistics
Students know the definition of "conditional probability" and use it to solve for probabilities in finite space.

Deconstructed Standard
1. Students know the definition of "conditional probability."
2. Students can solve for probabilities using the *conditional probability* of particular events in finite sample spaces.

Prior Knowledge Necessary
Students should have the computational and conceptual knowledge outlined in Probability and Statistics Standard #1.

Students should know how to:
- calculate probabilities of events involving combinations and permutations.
- calculate probabilities involving compound and mutually exclusive events.
- calculate probabilities involving independent events produce tree diagrams and Venn diagrams.

New Knowledge
Students will need to learn to:
- recognize the definition of "conditional probability".
- calculate conditional probabilities.
- determine whether events are dependent.
- recognize the notation $P(A|B)$ and its meaning.

Categorization of Educational Outcomes
Competence Level: Application and Analysis
1. Students will compute probabilities.
2. Students will produce examples of conditional events.
3. Students will illustrate probabilities of conditional events.
4. Students will explain outcomes.
5. Students will interpret conditional probability in the context of real world problems.

Necessary New Physical Skills
None

Assessable Result of the Standard
1. Students will solve probability problems dealing with conditional events.
2. Students will be able to produce examples of conditional events.
3. Students will be able to create an illustration that depicts probabilities of conditional events.

Probability and Statistics Standard #2
Model Assessment Items

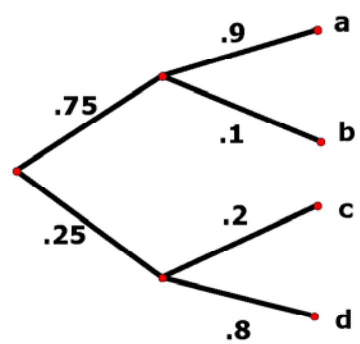
Computational and Procedural Skills

1. A and B are dependent events. If $P(A) = 1/10$ and $P(B|A) = 8/10$, calculate $P(A \text{ and } B)$.

2. A and B are dependent events. If $P(A) = 4/5$ and $P(A \text{ and } B) = 1/5$, calculate $P(B|A)$.

3. Given the tree diagram shown below.
   A. Calculate the probability of each path a – d.

   B. Calculate the sum of probabilities a, b, c, and d.



Conceptual Understanding

1. Produce a simple example of a probability problem involving dependent events using a standard 52-card deck. Solve your example and explain each step.

2. Mr. Thometz teaches three classes. Each class has 20 students. His first class has 12 sophomores, his second class has 8 sophomores, and his third class has 10 sophomores. He randomly chooses one student from each class to participate in a competition. Scenarios A and B are stated below. Compare the two scenarios. Decide which describes dependent events and which describes independent events. Explain your answer and illustrate with a diagram.
   A. That he selects three sophomores to participate in the competition.

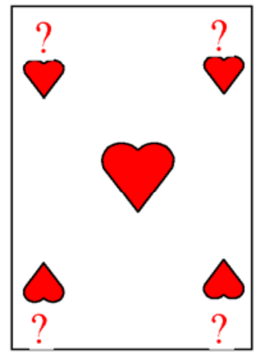
   B. That he selects only one sophomore to participate in the competition.

Problem Solving/Application

1. You will randomly select 2 cards from a standard 52-card deck. What is the probability that the first card you select is an ace and the second is a non-face card?

1st Card

2nd Card



2. A box contains 3 red marbles, 4 white marbles and 3 blue marbles. If 3 marbles are removed from the box without replacement, what is the probability that the third marble is white if the first two marbles are red?

3. If a pair of fair dice are rolled and the first die is a 3, what is the probability that the sum on the two dice is greater than 7?

4. A random sample of 100 men and 150 women showed that 53 men and 70 women are going to vote "Yes" on Proposition 27. If one person is randomly chosen from this sample, what is the probability that:
   A. a female is chosen?

   B. someone who voted "Yes" on the proposition is chosen?

   C. a female is chosen, given that someone who voted "Yes" on the proposition was chosen?

   D. someone who voted "Yes" on the proposition was chosen, given a female was chosen?

4. The ratios of the number of phones manufactured at three sites, M1, M2, and M3, are 20%, 35%, and 45%, respectively. The diagram below shows some of the ratios of the numbers of defective (D) and good (G) phones manufactured at each site. The top branch indicates a 0.20 probability that a phone made by this manufacturer was manufactured at site M1. The ratio of these phones that are defective is 0.05. Therefore, 0.95 of these phones are good. The probability that a randomly selected phone is both from site M1 and defective is (0.20)(0.05), or 0.01.
   A. Copy the diagram and determine the missing probabilities.

   B. Determine P (a phone from site M2 is defective).

   C. Determine P (a randomly chosen phone is defective).

   D. Determine P (a phone was manufactured at site M2 if you already know it is defective).