

Probability and Statistics Standard # 1

Standard Set 1.0 Probability and Statistics

Students know the definition of *independent events* and can use the rules for addition, multiplication, and complementation to compute probabilities of particular events in finite sample spaces.

Deconstructed Standard

1. Students know the definition of “*independent events*.”
2. Students can use the rules for addition to compute probabilities of particular events in finite sample spaces.
3. Students can use the rules for multiplication to compute probabilities of particular events in finite sample spaces.
4. Students can use the rules for complementation to compute probabilities of particular events in finite sample spaces.

Prior Knowledge Necessary

Students should know how to:

- perform arithmetic computations with rational numbers.
- calculate the probability of an event.
- calculate probabilities of events involving combinations and permutations.
- calculate probabilities involving compound and mutually exclusive events.
- produce tree diagrams and Venn diagrams.

New Knowledge

Students will need to learn to:

- recognize when an event is an “independent event”.
- recognize when events are “mutually exclusive events”.
- compute probabilities of independent events using the rules for addition of probabilities.
- compute probabilities of independent events using the rules for multiplication of probabilities.
- compute probabilities of events using the rules for complementation.

Categorization of Educational Outcomes

Competence Level: Application and Analysis

1. Students will calculate probability for outcomes of independent events.
2. Students will calculate probability using the rules of addition, multiplication and complementation.
3. Students will create examples of probability problems involving independent events.
4. Students will explain the relationship between the outcome of an event and its complement.
5. Students will compare outcomes of events to determine if they are independent or dependent events.

6. Students will interpret the solution of probability problems in the context of real world problems.

Necessary New Physical Skills

None

Assessable Result of the Standard

1. Students will solve probability problems involving independent events.
2. Students will be able to create examples of problems involving independent events that require use of the probability rules for addition, multiplication, and complementation.
3. Students will be able to create an illustration that depicts probabilities of complementation.

Probability and Statistics Standard #1 Model Assessment Items

Computational and Procedural Skills

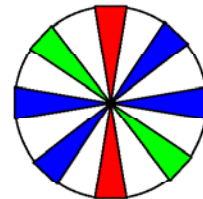
- Given events A and B .
 - Events A and B are mutually exclusive. If $P(A) = 2/10$ and $P(B) = 2/3$, calculate $P(A \text{ or } B)$.
 - If $P(A) = 2/5$, $P(B) = 2/5$, and $P(A \text{ and } B) = 1/5$, calculate $P(A \text{ or } B)$.
- Events A and B are independent. If $P(A) = 1/3$ and $P(B) = 3/4$, calculate $P(A \text{ and } B)$.
- Given event A .
 - For Event A , if $P(A) = 2/5$, calculate $P(A')$.
 - For Event A , if $P(A') = 1/3$, calculate $P(A)$.

Conceptual Understanding

- Consider a standard 52-card deck.
 - Produce an example of two events that are mutually exclusive.
 - Produce an example of two events that are not mutually exclusive.
- Is it possible that $P(A) = P(A')$? If yes, give an example. If no, explain why not.
- A five is rolled on a six-sided dice and a one is rolled on a four-sided die. Determine if the outcome is an independent outcome or a dependent outcome. Support your answer.
- For events A and B , $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$. If A and B are mutually exclusive, determine $P(A \text{ or } B)$. Explain your answer and illustrate it with a Venn diagram.

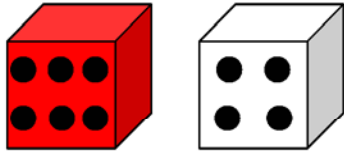
Problem Solving/Application

- You have just entered a high stakes game of Black Jack. The object of the game is to get 21, or as close as possible to 21, and beat the dealer. Determine the probability that the first card pulled is an ace or a face card from a standard deck of 52 Cards?
- Determine the probability of spinning a red color followed by a white color from a spinning wheel.



Spinning Wheel

3. You are rolling a red die followed by a white die. Determine the probability of not rolling a total of 7 with both dice.



4. You arrive at math class and find that the teacher is giving a true-false quiz for which you are totally unprepared. You decide to guess randomly at the answers. There are four questions. Find the probabilities described below. Explain your reasoning and use a diagram to illustrate your answers.
- A. $P(\text{none correct})$
 - B. $P(\text{exactly one correct})$
 - C. $P(\text{exactly two correct})$
 - D. $P(\text{exactly three correct})$
 - E. $P(\text{all four correct})$
 - F. Predict the sum of the probabilities in A-E.
 - G. In order to pass the quiz, you must get at least three correct answers. What is the probability of passing the quiz?