NAME _____ DATE _____ PERIOD _____

13-5 Study Guide and Intervention

Probabilities of Independent and Dependent Events

Independent and Dependent Events **Compound events**, or two or more simple events happening together, can be independent or dependant. Events are **independent events** if the probability of one event does not affect the probability of the other. Events are **dependent events** if one event in some way changes the probability that the other occurs. The following are the **Multiplication Rules for Probability**.

Probability of Two Independent Events	$P(A \text{ and } B) = P(A) \cdot P(B)$
Probability of Two Dependent Events	$P(A \text{ and } B) = P(A) \cdot P(B\|A)$

$P(B|A)$ is the **conditional probability** and is read *the probability that event B occurs given that event A has already occurred*.

Example **The P.E. teacher puts 10 red and 8 blue marbles in a bag. If a student draws a red marble, the student plays basketball. If a student draws a blue marble, the student practices long jump. Suppose Josh draws a marble, and not liking the outcome, he puts it back and draws a second time. What is the probability that on each draw his marble is blue?**

Let B represent a blue marble.

$P(B \text{ and } B) = P(B) \cdot P(B)$ Probability of independent events

$= \frac{4}{9} \cdot \frac{4}{9}$ or $\frac{16}{81}$ $P(B) = \frac{4}{9}$

So, the probability of Josh drawing two blue marbles is $\frac{16}{81}$ or about 20%.

Exercises

Determine whether the events are *independent* or *dependent*. Then find the probability.

1. A king is drawn from a deck of 52 cards, then a coin is tossed and lands heads up.
   independent, $\frac{1}{26}$
2. A spinner with 4 equally spaced sections numbered 1 through 4 is spun and lands on 1, then a die is tossed and rolls a 1.
   independent, $\frac{1}{24}$
3. A red marble is drawn from a bag of 2 blue and 5 red marbles and not replaced, then a second red marble is drawn.
   dependent, $\frac{10}{21}$
4. A red marble is drawn from a bag of 2 blue and 5 red marbles and then replaced, then a red marble is drawn again.
   independent, $\frac{25}{49}$

NAME _____ DATE _____ PERIOD _____

13-5 Study Guide and Intervention *(continued)*

Probabilities of Independent and Dependent Events

Conditional Probabilities Conditional probability is used to find the probability of dependent events. It also can be used when additional information is known about an event.

The conditional probability of B given A is $P(B|A) = \frac{P(A \text{ and } B)}{P(A)}$ where $P(A) \neq 0$.

Example **The Spanish Club is having a Cinco de Mayo fiesta. The 10 students randomly draw cards numbered with consecutive integers from 1 to 10. Students who draw odd numbers will bring main dishes. Students who draw even numbers will bring desserts. If Cynthia is bringing a dessert, what is the probability that she drew the number 10?**

Since Cynthia is bringing dessert, she must have drawn an even number.

Let A be the event that an even number is drawn.

Let B be the event that the number 10 is drawn.

$P(B|A) = \frac{P(A \text{ and } B)}{P(A)}$ Conditional Probability

$= \frac{0.5 \cdot 0.1}{0.5}$ $P(A) = \frac{1}{2} = 0.5$ and $P(B) = \frac{1}{10} = 0.1$

$= 0.1$ Simplify.

The probability Cynthia drew the number 10 is 0.1 or 10%.

Exercises

1. A blue marble is selected at random from a bag of 3 red and 9 blue marbles and not replaced. What is the probability that a second marble selected will be blue?

   $\frac{8}{11}$

2. A die is rolled. If the number rolled is less than 5, what is the probability that it is the number 2?

   $\frac{1}{4}$

3. A quadrilateral has a perimeter of 16 and all side lengths are even integers. What is the probability that the quadrilateral is a square?

   $\frac{1}{4}$

4. A spinner with 8 evenly sized sections and numbered 1 through 8 is spun. Find the probability that the number spun is 6 given that it is an even number.

   $\frac{1}{4}$