Unit 7 Lesson 5: CONDITIONAL PROBABILITY

NOTES

CONDITIONAL PROBABILITY:

The **conditional probability** of an event B in relationship to an event A is the probability that event B occurs given that event A has already occurred. The notation for conditional probability is P(B|A) [pronounced as *The probability of event B given A*].

P(B|A) = $\frac{P(A \cap B)}{P(A)}$

EXAMPLE:

The probability that it is Friday and that a student is absent is 0.03. Since there are 5 school days in a week, the probability that it is Friday is 0.2. What is the probability that a student is absent given that today is Friday?

Independent: The probability of event A is unaffected by event B occurring or not occurring is considered independent.

Multiplication Rule for Independent Events:

If two events A and B are independent, then the probability of A and B occurring is given by the following formula:

$$P(A \cap B) = P(A) \cdot P(B)$$

Examples:

1) The probability that an elementary school student selects soccer as his or her favorite sport is $\frac{1}{4}$. If four elementary school students are selected at random, find the probability that they all select soccer as their favorite sport.

2) A school survey found that 9 out of 10 students like pizza. If three students are chosen at random with replacement, what is the probability that all three students like pizza?

PROVING TWO EVENTS ARE INDEPENDENT OR NOT

Independent if P(A|B)=P(A)

$$\boldsymbol{P(A|B) = \frac{P(A \cap B)}{P(B)}}$$

Examples:

1) Sixty percent of the households in Visalia have the *Visalia Times Delta* delivered to their house. Twenty-five percent of the households in Visalia have the *Fresno Bee* delivered to their house. Fifteen percent of the households in Visalia have the *Visalia Times Delta* and the *Fresno Bee* delivered to their house. Are the events "A household gets the *Times Delta* delivered to their house" and "A household gets the *Fresno Bee* delivered to their house" independent?

2) The probability that a student passes their math class is 0.8, the probability that a student makes the Dean's List is 0.4, and the probability that a student passes their math class and makes the Dean's List is 0.25. Are the events "A student passes their math class" and "A student makes the Dean's List" independent events?

DEPENDENT EVENTS:

Two events are **dependent** if the outcome or occurrence of the first affects the outcome or occurrence of the second so that the probability is changed

Multiplication rule for Dependent Events:

If A and B are any two events, then the probability of A and B occurring is given by

$$P(A \cap B) = P(A) \cdot P(B|A)$$

DEPENDENT With/Without Replacement:

EXAMPLES:

1) Two cards are drawn from a well shuffled standard 52-card deck of cards. Find the probability that you will draw a king on both draws if the first card is replaced.

2) Find the probability you will draw a king on both draws if you do not replace the first card.

3) A fifth grade class has 15 boys and 21 girls in it. Each week the teacher selects a student to clean the board at the end of the day. Find the probability that a boy will be selected 2 weeks in a row, if the same person cannot serve in consecutive weeks.

NAME_____ DATE _____

PRACTICE: UNIT 7 LESSON 5

CONDITIONAL PROBABILITY

For questions 1-3, Ebony has 4 male kittens and 7 female kittens. She picks up 2 kittens to give to a friend. Find the probability of each selection.

1. P(2 male)
2. P(2 female)
3. P(1 of each)

4. Mary has 4 dimes, 3 quarters and 7 nickels in her purse. She reaches in and pulls out a coin, only to have it slip from her fingers and fall back into the purse. She then picks out another coin. What is the probability that she picked a nickel on both tries?

5. A man who goes to work long before sunrise every morning gets dressed in the dark. In his sock drawer he has 6 black and 8 blue socks. What is the probability that his first pick was a black sock, but his second pick was a blue sock?

6. A player selects 3 cards from a deck. Find the probability that all three cards were face cards.

7. A bag of candy contains 4 apple flavored candies, and 5 strawberry. If Tim reaches in, takes one out and eats it, and then 20 minutes later selects another and eats that one as well, what is the probability that they were both strawberry flavored candies?

8. A basket of fruit contains 3 oranges, 1 apple, and 5 bananas. If two pieces of fruit are selected randomly, without replacement, find the probability of choosing:

a) 2 oranges

b) a banana and then an orange

9) A class has 12 boys and 3 girls. If three students are selected at random (without replacement) from the class, what is the probability that they are all boys?

For questions 10- 12, state whether the events are independent or dependent. Then find the probability.

10. There are 3 miniature chocolate bars and 5 peanut butter cups in a candy dish. Judie chooses 2 of them at random. What is the probability that she chooses 2 miniature chocolate bars?

11. A bag contains 7 red, 4 blue, and 6 yellow marbles. If 3 marbles are selected in succession, what is the probability of selecting blue, then yellow, then red, if replacement occurs?

12. Joe's wallet contains three $1 bills, four $5 bills, and two $10 bills. If he selects three bills in succession, find the probability of selecting a $10 bill, then a $5 bill, and then a $1 bill if the bills are not replaced.