

UNIT 7 LESSON 1: PROBABILITY & TREE DIAGRAMS

NOTES

Experiment

- A process used to obtain observations
- Examples: flipping a coin to observe if its heads, Rolling a die to see what number is on top, drawing a card from a deck to see if it is a heart

Outcome

- A particular result of an experiment
- Examples: Rolling a die the outcome could be a 4
Drawing a heart from a deck could be an Ace

Sample Space

- the set of all possible outcomes of an experiment
- Examples: Rolling a die the sample space is $\{1,2,3,4,5,6\}$
Drawing a heart from a deck $\{A, 2,3,4,5,6,7,8,9,10,J,Q,K\}$

Event

- A subset of the sample space of an experiment
- Examples: Rolling a die $\{2,3,4\}$ is a subset of the sample space $\{1,2,3,4,5,6\}$
Drawing a heart $\{A,K,Q,J\}$ is a subset of $\{A, 2,3,4,5,6,7,8,9,10,J,Q,K\}$

FUNDAMENTAL COUNTING PRINCIPAL OR THE MULTIPLICATION PRINCIPLE

If one event has m possible outcomes and a second independent event has n possible outcomes, then there is $m \times n$ total possible outcomes for the two events together.

EXAMPLE 1: Brian must dress up for his job interview. He has three dress shirts, two ties, and two pairs of dress pants. How many possible outfits does he have?

EXAMPLE 2: A restaurant serves 5 main dishes, 3 salads, and 4 desserts. How many different meals can be ordered if each has a main dish, a salad, and a dessert?

TREE DIAGRAM

- A visual display of the total number of outcomes of an experiment consisting of a series of events
- Using a tree diagram, you can determine the total number of outcomes and individual outcomes

EXAMPLE 3: You are going to Taco Bell for dinner. You can either get a crunchy or a soft taco. You can choose either beef, chicken, or fish. Create a tree diagram. Find the total number of possible outcomes and list them.

CLASSIC PROBABILITY

If all outcomes of a sample space are equally likely to occur, we denote the probability of event A occurring by $P(A)$ and calculate using the formula below:

FORMULA: $P(A) = \frac{n(A)}{n(S)}$ $n(A) = \# \text{ of different ways event A can occur}$

$n(S) = \text{total \# of possible outcomes for the experiment}$

Basic Rules of Probability

Probability - Likelihood of an uncertain outcome

- Probability must be a number between 0 and 1
 - Must be between 0% and 100%
- An event that is certain to occur has a probability of 1

Example 4: Rolling a die and getting less than a 7

- An event that is certain to not occur has a probability of 0

Example 5: Rolling a die and getting a 7

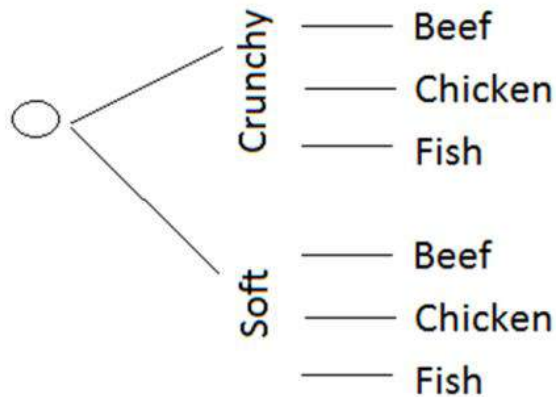
EXAMPLE 6:

1. A single fair six-sided die is rolled. Find the probability that the roll is even.
2. A card is drawn from a standard 52-card deck. Find the probability the card is red.

USING A TREE DIAGRAM AND THE FUNDAMENTAL COUNTING PRINCIPLE TO FIND THE PROBABILITY

***When using a tree diagram to find the probability of a certain outcome, multiply across the branches.**

EXAMPLE 7:



What is the probability of getting a crunchy chicken taco?

EXAMPLE 8: An Italian restaurant sells small, medium, and large pizzas. You can choose either pan or hand tossed crust. There are three toppings to choose from: pepperoni, sausage, and extra cheese. Draw a tree diagram to find the probability of ordering a medium, pan, pepperoni pizza?

NAME _____ DATE _____

PRACTICE:

Draw a tree diagram for each of the problems.

1. You go to the snack bar to buy a bagel and a drink for lunch. You can choose from a plain bagel, a blueberry bagel, or a raisin bagel. The choices for a drink include water or a sports drink. How many different lunches could be made with these choices?

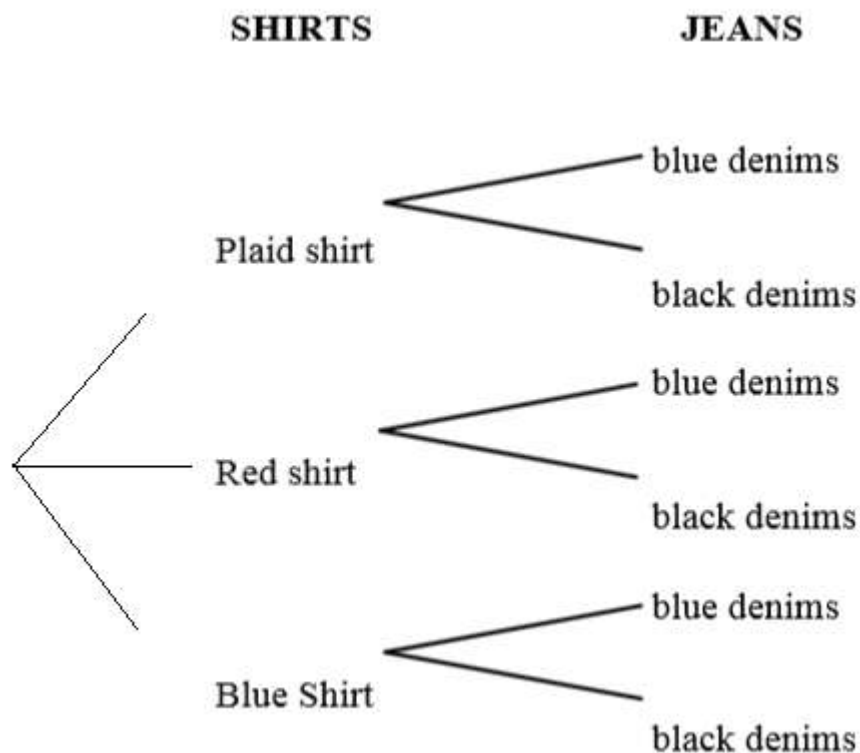


2. When you get ready to get dressed for school you open your closet to find that you have the following choices: a red, blue, or white shirt; jeans or sweatpants; tennis shoes or sandals. How many different outfits could be made with these choices?



Use the Fundamental Counting Principle to find the total number of outcomes.

3. You go to the cafeteria for lunch and have a choice of 4 entrees, 5 sides, 5 drinks, and 4 desserts. Assuming you have one of each category, how many different lunches could be made?
4. You go to the home electronics store to buy a new television. You have the following choices: rear projection, lcd, dlp, crt, or plasma; full screen or wide screen; 13", 19" 27", 32", 36", 41", 51", or 63". How many different televisions does the store have to offer?
5. You wake up in the morning and go to the pantry to look for breakfast. You have a choice of Pop-Tarts, muffins, granola bars, or cereal. To drink you have a choice of whole milk, 2% milk, skim milk, orange juice, apple juice, and water. Your mother insists that you take a multi-vitamin with your breakfast. You can choose from Flintstones vitamins, One-a-Day vitamins, or Chock's Vitamins. How many different breakfasts made up of an entrée, drink, and vitamin could you make?
6. Label the probabilities in the tree diagram below and determine what is the probability of wearing a red shirt and black jeans?



NAME _____ DATE _____

PRACTICE #2: USING TREE DIAGRAMS TO FIND OUTCOMES AND PROBABILITIES

Travel Time

A travel agent plans trips for tourists from Chicago to Miami. He gives them three ways to get from town to town: airplane, bus, train. Once the tourists arrive, there are two ways to get to the hotel: hotel van or taxi. The cost of each type of transportation is given in the table below.

Transportation Type	Cost
Airplane	\$350
Bus	\$150
Train	\$225
Hotel Van	\$60
Taxi	\$40

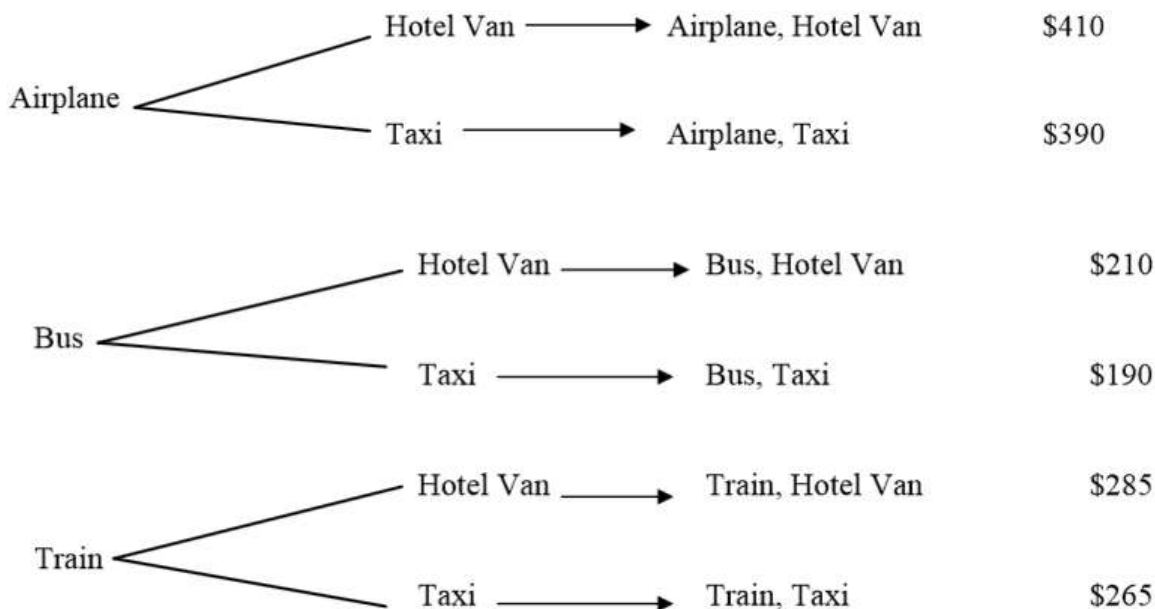
1. Draw a tree diagram to illustrate the possible choices for the tourists. Determine the cost for each outcome.
2. If these six outcomes are chosen equally by tourists, what is the probability that a randomly selected tourist travel in a bus?
3. What is the probability that a person's trip cost less than \$300?
4. What is the probability that a person's trip costs more than \$350?
5. If the tourists were flying to New York, the subway would be a third way to get to the hotel. How would this change the number of outcomes? Use the Fundamental Counting Principle to explain your answer.

Travel Time Answer Key

A travel agent plans trips for tourists from Chicago to Miami. He gives them three ways to get from town to town: airplane, bus, train. Once the tourists arrive, there are two ways to get to the hotel: hotel van or taxi. The cost of each type of transportation is given in the table below.

Transportation Type	Cost
Airplane	\$350
Bus	\$150
Train	\$225
Hotel Van	\$60
Taxi	\$40

1. Draw a tree diagram to illustrate the possible choices for the tourists. Determine the cost for each outcome.



2. If these six outcomes are chosen equally by tourists, what is the probability that a randomly selected tourist travel in a bus? $\frac{2}{6}$ or $\frac{1}{3}$
3. What is the probability that a person's trip cost less than \$300? $\frac{3}{6}$ or $\frac{1}{2}$
4. What is the probability that a person's trip costs more than \$350? $\frac{2}{6}$ or $\frac{1}{3}$
5. If the tourists were flying to New York, the subway would be a third way to get to the hotel. How would this change the number of outcomes? Use the Fundamental Counting Principle to explain your answer. *Using the Fundamental Counting Principle, I would multiply 3×3 to get 9 outcomes.*