Introduction to Probability

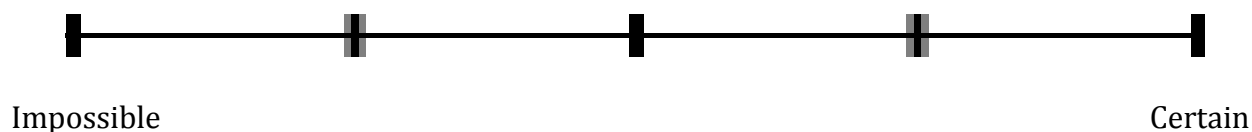**LEARNING GOALS:**
- Recognize that probability is a number between 0 and 1 that indicates how likely or unlikely an event is to occur
- Distinguish between events with low and high probabilities, and what that means in context (e.g. which of these two probabilities is higher)
- Review that high probabilities do not guarantee outcomes occurring, and low probabilities do not guarantee outcomes not occurring

RANKING ACTIVITY

In today's first activity, we will look at five prompts about different likelihoods of events occurring. *Place the letter corresponding to the event on the scale below, ranking them in order of impossible to certain of occurring.*

A. The likelihood of a winning the lottery

B. The likelihood that you see a dinosaur on your way to class

C. The likelihood that tomorrow is Thursday

D. The likelihood a flipped coin will land on heads

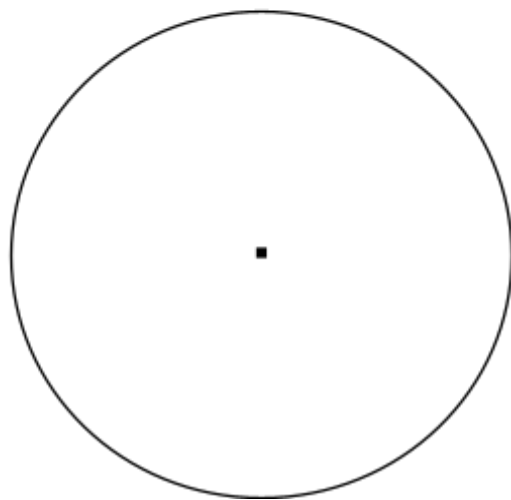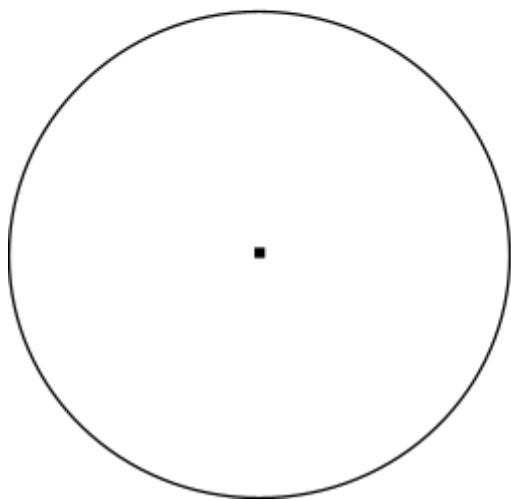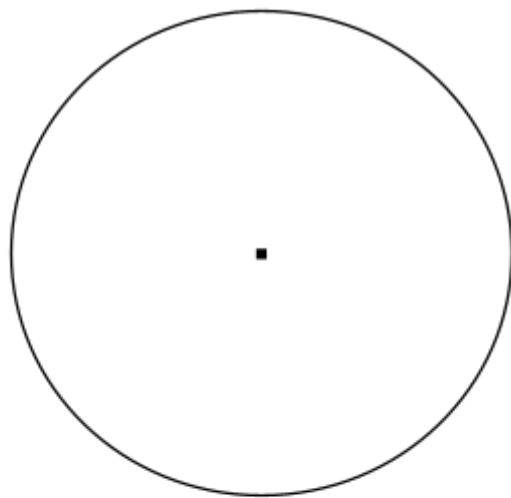E. The likelihood that it is a sunny day in San Luis Obispo

Impossible   Certain

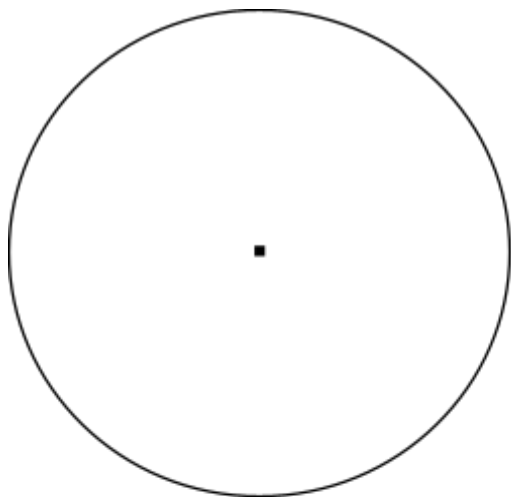**Definition (probability):**

The probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability near 0.5 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

SPINNER ACTIVITY

In our second activity, we will design four spinners to meet the requirement of likeliness for the given context. To start, you will write in the name of the color based upon the context on the slide. Then you will use a paperclip to test if you designed your spinner correctly.

Definition (Classical Definition of Probability): If all outcomes are equally likely then:

Probability of an event = Number of favorable outcomes
                         ―――――――――――――――――――
                            Total number of outcomes

PRACTICE WITH PROBABILITY

EXAMPLE QUESTION: Neymar Jr. has a bag of marbles. In his bag, there are 6 red marbles and 4 green marbles. He pulls one out without looking. What is the probability the marble is red?
EXAMPLE SOLUTION: The total number of marbles is 6 (red) + 4 (green) = 10. The probability of drawing a red marble is the number of red marbles divided by the total number of marbles, which is 6/10 = 0.6

1) Hermione rolls a fair six-sided die. What is the probability she rolls a 3? Write a one sentence interpretation in context.

2) Bruce Banner has three boxes. One of them is filled with rats. The other two are filled with cash. What is the probability that the first box he opens has cash? Write a one sentence interpretation in context.

3) Captain Jack Sparrow has buried his treasure in one of 12 islands. Unfortunately, he forgot which one! What's the probability that he finds his treasure on the first island he digs? Write a one sentence interpretation in context.

4) Bonferroni has a bag of trail mix, with 10 raisins, 6 cashews, 10 almonds, and 9 chocolates. He reaches in and grabs one snack without looking?

   I.   What is more likely, that he grabs a cashew or a chocolate?
       A. The probability he grabs a cashew is more likely
       B. The probability he grabs a chocolate is more likely
       C. The probabilities are equally likely

  II.   What is more likely, that he grabs a raisin or an almond?
       A. The probability he grabs a raisin is more likely
       B. The probability he grabs an almond is more likely
       C. The probabilities are equally likely

Fill In The Blank

When you know an event is impossible, that means the probability that an event occurs is _____.

When you know an event is certain, this means the probability that the event occurs is _____.

The closer a probability is to _____, the less likely it is to occur.

The closer a probability is to _____, the more likely it is to occur.

CHALLENGE QUESTIONS

1) Katniss wants to pick a berry from either of two opaque bags, each containing blueberries and poisonous berries. Bag A contains 4 poisonous berries and 8 blueberries. Bag B contains 8 poisonous berries and 12 blueberries. Katniss wins if she picks a blueberry, and she loses if she picks a poisonous berry. Which bag gives Katniss the higher chance of winning? Explain.

2) In Dr. Sabbag's class, there are 20 students. She conducts a small survey to find out who prefers ice cream and who prefers cake. According to the survey:
   - 8 students prefer ice cream.
   - 12 students prefer cake.

Excited to share her findings, Dr. Sabbag accidentally says, "Based on my survey, there's a 1.67 = 20/12 probability that a student from my class prefers cake!"

   I. Identify the Mistake: Explain why Dr. Sabbag's statement about a 1.67 = 20/12 probability is incorrect.

   II. Correct the Problem: Calculate the probability that a student from Dr. Sabbag's class prefers cake.

EXIT TICKET

Description	Example	Explanation
Some events are *impossible*. These events have a probability of 0.	*Picking a green marble out of a bag of 5 yellow marbles.*	*There is no way to select a green marble if there are no green marbles in the bag.*
Some events are *certain*. These events have a probability of 1.		
Some events are classified as *equally likely to occur or not to occur*. These events have a probability of ½.		
Some events are more likely to occur than not to occur. These events have a probability that is greater than 0.5. These events could be described as *likely* to occur.		
Some events are less likely to occur than to not occur. These events have a probability that is less than 0.5. These events could be described as *unlikely* to occur.		