Grade 7

Introduction to Probability

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Today's Learning Goals

03/06/2024

- 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

How We Developed the Lesson

- Interactive lesson where students discovered the probability concepts through examples
- Referenced Engage NY examples and examples from previous classes

What Students Will Get Out of the

- How to make better decisions
- Learn to work with other people

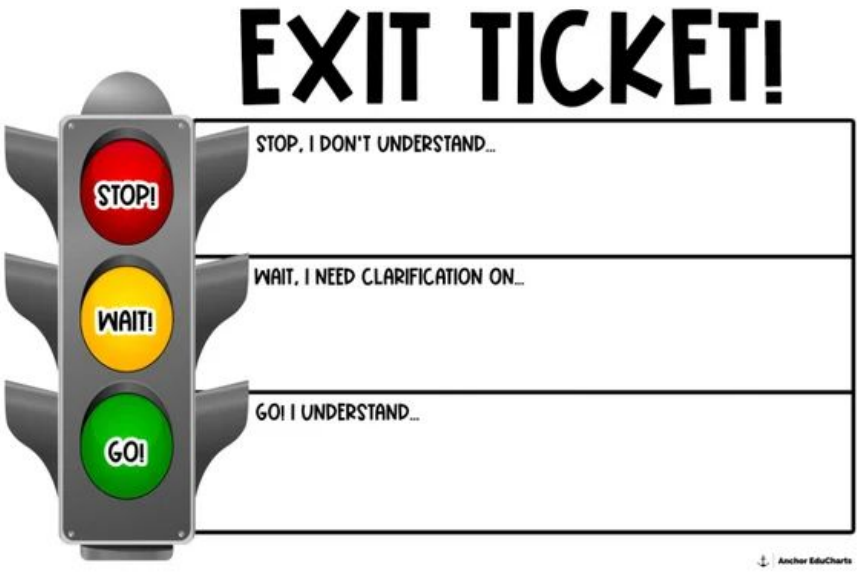
Monitoring Student Progress

During each activity, we will be walking around checking in with each student

- ❏ Available to ask questions and address misconceptions

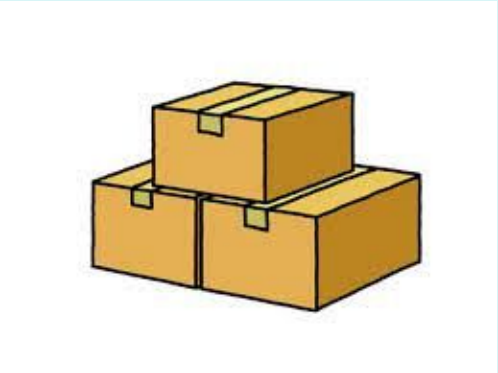
Assess Understanding after Lesson

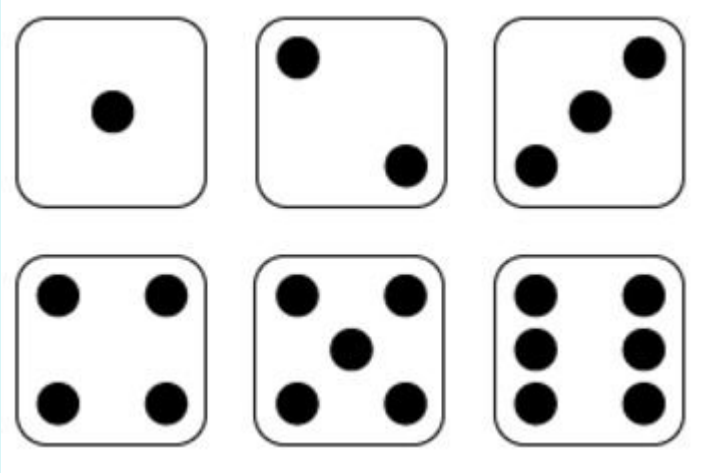
We have an Exit Ticket at the end of our handout that summarizes the key concepts from the lesson, so students can apply what they've learned



Constructivism

- Students come to class with preconceived knowledge
- We use applicable situations with probability and chance
- Scaffolding





Scaffolding

- Teachers support students to build a bridge to the desired level of knowledge
- We support students through a series increasingly difficult questions

Misconceptions

Context From Ranking Activity: The likelihood that it is a sunny day in San Luis Obispo.

If this event has a large probability of occurring, can we guarantee the event will occur?

Misconceptions – Ratio Concept

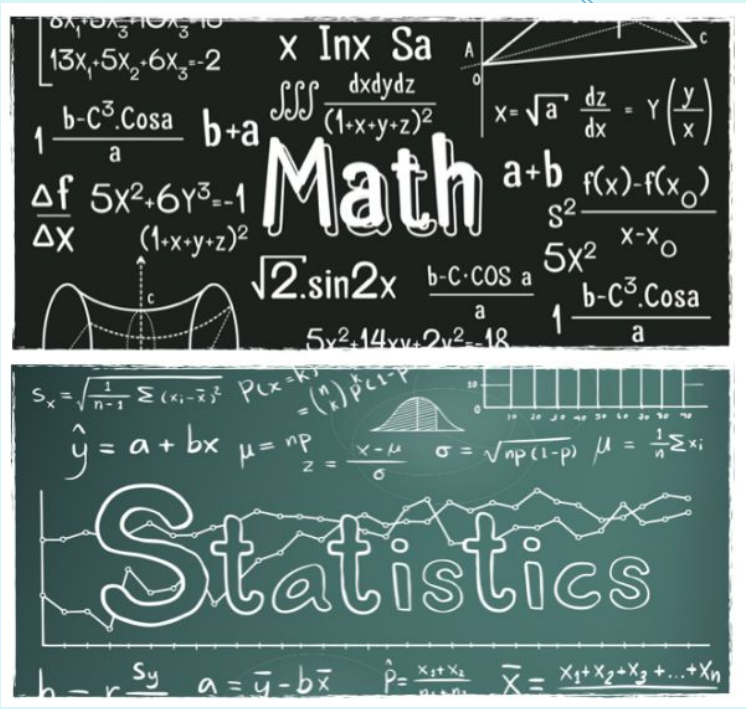
When comparing the likelihood of events, students should focus on the relative size of a particular outcome in a probability experiment, not the absolute size

Misconceptions – Equiprobability

Students think that all outcomes from a probability experiment have the same chance of happening

Math versus Statistics

- Rossman, Chance, and Medina article focused on context in statistics, versus the abstract nature of math
- Applied this by not having them just calculate probabilities, but also interpret and compare probabilities in different contexts



Cooperative Learning

- Positive interdependence and individual accountability
- Groups will be called on to defend their answers
- Individual performance is assessed with an exit ticket

Cooperative Learning ;)

Let’s Start the Lesson!

Agenda

01	Ranking Activity
02	What is Probability?
03	Spinner Activity
04	Practice With Probability
05	Exit Ticket

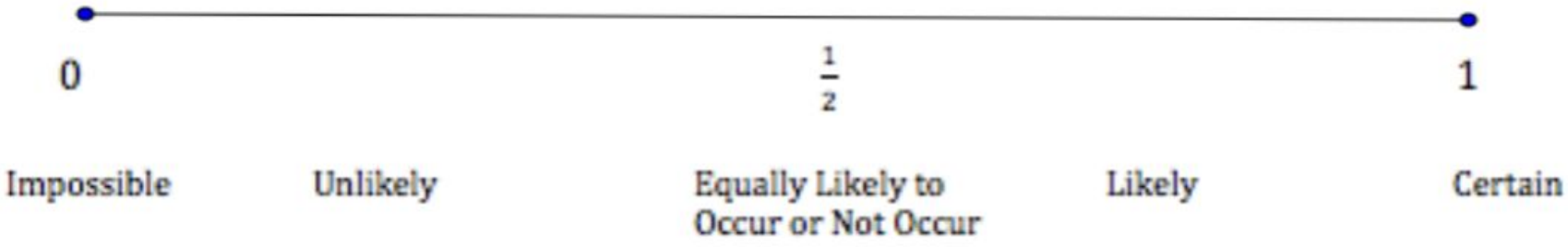
Ranking Activity

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 coin will land on head
E. The likelihood that it is a sunny day in San Luis Obispo

Ranking Activity Solutions

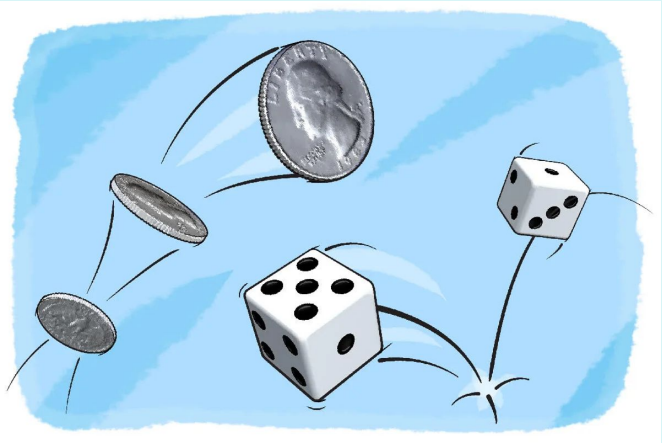
- B. The likelihood that you see a dinosaur on your way to class
  Impossible
- A. The likelihood of a winning the lottery
  Not likely
- D. The likelihood a coin will land on heads
  50/50 chance
- E. The likelihood that it is a sunny day in San Luis Obispo
  Very likely
- C. The likelihood that tomorrow is Thursday
  Certain

PROBABILITY SCALE



Definition of 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.

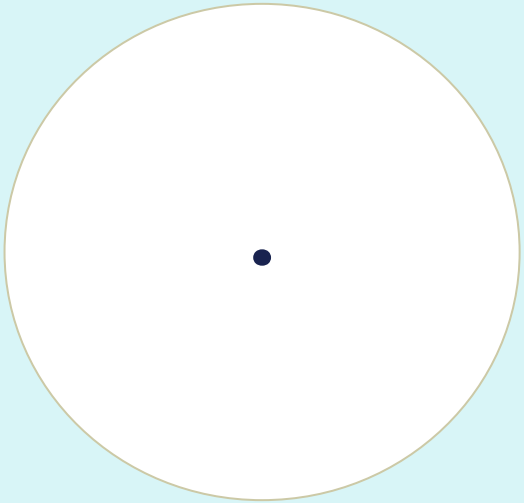


Spinner Activity

Choose two different colors!

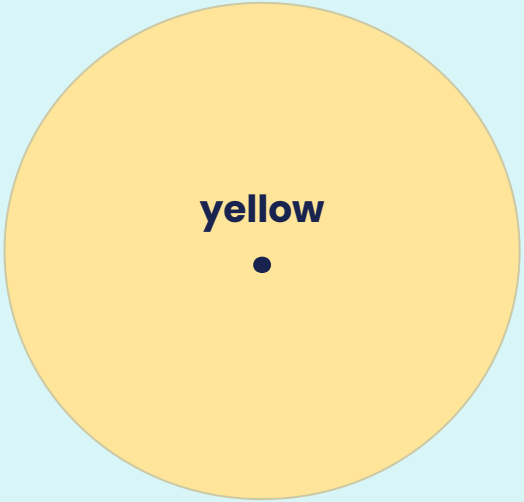
Assign one color as *Color A* and the other as *Color B*.

Spinner Activity

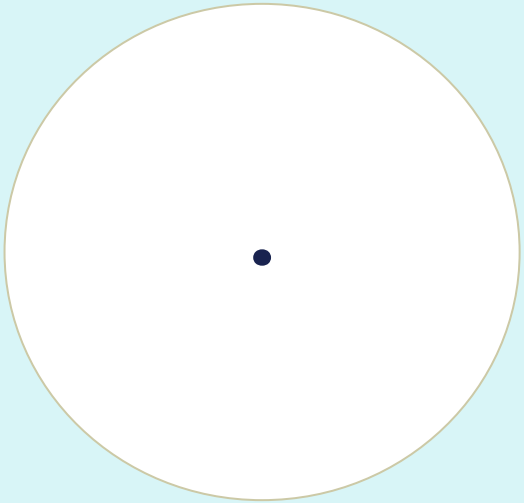


Design a spinner so that the probability of spinning a *Color A* is 1.

Spinner Activity – Example Solutions

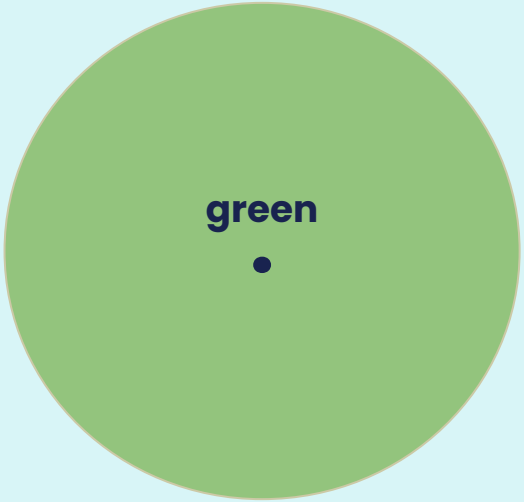


Spinner Activity

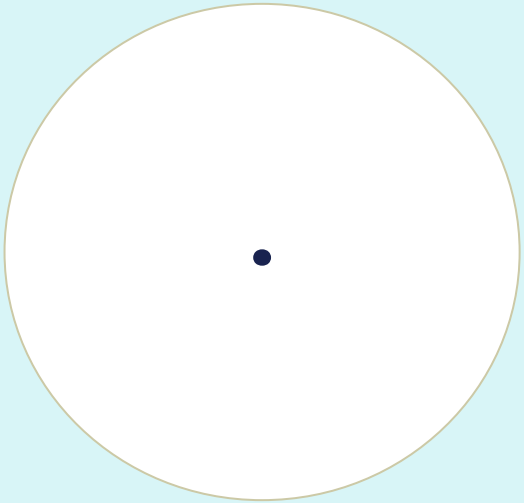


Design a spinner so that the probability of spinning a *Color A* is 0.

Spinner Activity – Example Solutions

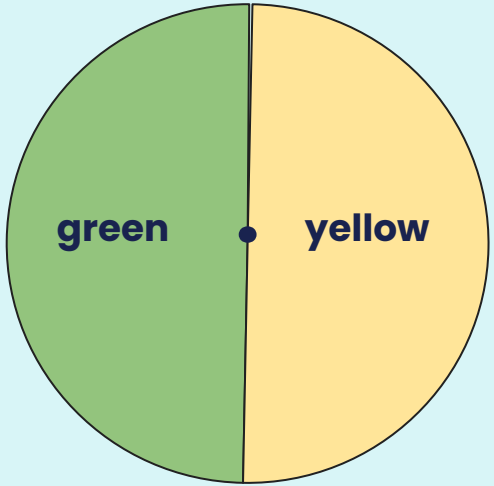


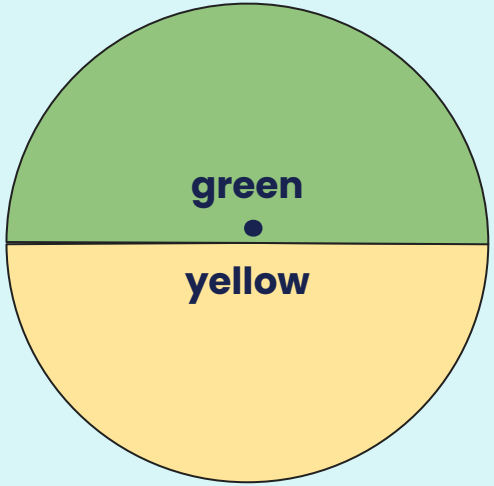
Spinner Activity



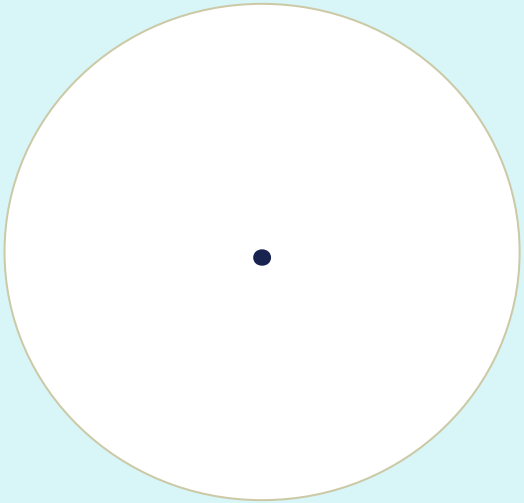
Design a spinner with two equal outcomes in which it is equally likely to land on the *Color A* and *Color B* parts.

Spinner Activity – Example Solutions



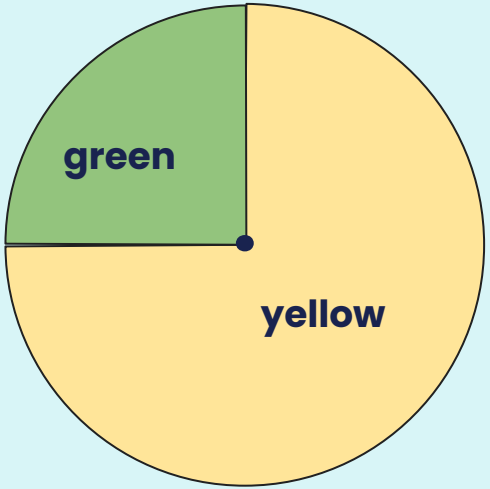


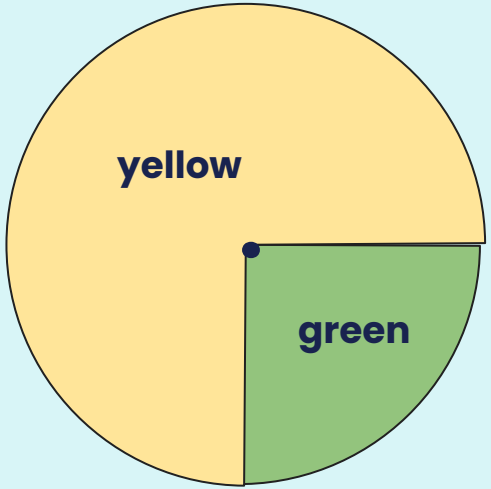
Spinner Activity



Design a spinner with a probability of 0.75 for *Color A* and a probability of 0.25 for *Color B*.

Spinner Activity – Example Solutions





Definition (Classical Definition of Probability)

If all outcomes are *equally likely* then:

$$\text{Probability of an event} = \frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$$

Let's Practice!

1. 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?

1. **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?**

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.**

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

$$\text{Probability} = \frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$$

$$= \frac{1}{6}$$

Interpretation: If Hermione rolls the die, there is a 1 in 6 chance that the die will land on a 3, so it is unlikely to happen.

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.

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$$\text{Probability} = \frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$$

$$= \frac{2}{3}$$

Interpretation: If Bruce picks a box at random, there is a 2 in 3 chance that he will open one filled with cash instead of rats, so it is very likely to happen.

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.

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.

- Probability = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

  $= 1/12$

- Interpretation: If Captain Jack starts digging for his treasure, there is a 1 in 12 chance that he will find it on the very first island he chooses, which is very unlikely.

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?

1) 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

1) 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

2) 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

2) 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 _____.

Fill In The Blank

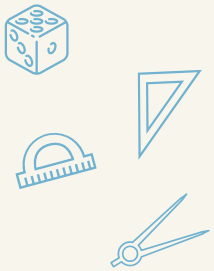
When you know an event is impossible, that means the probability that an event occurs is 0.

Fill In The Blank

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

Fill In The Blank

When you know an event is certain, this means the probability that the event occurs is 1.



Fill In The Blank

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

Fill In The Blank

The closer a probability is to 0, the less likely it is to occur.

Fill In The Blank

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

Fill In The Blank

The closer a probability is to 1, the more likely it is to occur.

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.		

3:59.

Thanks!

Do you have any questions?