

## **Title: Passionate about Probability**

### **Brief Overview:**

This unit introduces the concept of probability using vocabulary and fractions. It is expected that prior to this unit students will have experience with graphing, tallies and fractions. During this unit students will explore the probability of events through dice, spinners, and real life experiences.

### **NCTM Content Standard/National Science Education Standard:**

Understand and apply basic concepts of probability:

- Describe events as likely or unlikely and discuss the degree of likelihood using such words as certain, equally likely, and impossible;
- Predict the probability of outcomes of simple experiments and test the predictions;
- Understand that the measure of the likelihood of an event can be represented by a number from 0 to 1.

### **Grade/Level:**

Grades 4-5

### **Duration/Length:**

Three class sessions, approximately 60 minutes per session

### **Student Outcomes:**

Students will:

- Identify the possible outcomes of an event
- Describe the probability of an event using the terms certain, likely, equally likely, unlikely or impossible
- Describe the probability of an event using a fraction
- Predict the frequency of outcomes for an event
- Identify how a change in the elements of an event affects the probability

### **Materials and Resources:**

Day 1

- Pre-Assessment, 1 per student (Student Resource 1)
- Pre-Assessment Answer Key (Teacher Resource 1)
- Probability Vocabulary, 1 set (Teacher Resource 2)
- Student Vocabulary Sheet, 1 per student (Student Resource 2)
- *Probably Pistachio* by Stuart J. Murphy, ISBN 0-06-028028-X
- *Probably Pistachio* Event Cards, at least 1 set (Teacher Resource 3)
- “How likely is it...?”, 1 per student (Student Resource 3)

- Transparency of Student Resource 3
- Student Resource 4, 1 for enrichment or reteach student
- Formative Assessment, 1 per student (Student Resource 5A-B)
- Answer Key for Student Resource 5 (Teacher Resource 4)

#### Day 2

- Transparency of Teacher Resource 5
- Student Resource 6, ½ page per student
- Student Resource 7, 1 per student
- Answer key for Student Resource 7 (Teacher Resource 6)
- Outcomes (Teacher Resource 3)
- Predicting Outcomes, 1 per group (Student Resource 8)
- Spinner, 1 per group (Teacher Resource 7)
- Paper clip, 1 per group
- Student Resource 9, 1 spinner per enrichment student
- Formative Assessment, 1 per student (Student Resource 10)
- Answer Key for Student Resource 10 (Teacher Resource 7)

#### Day 3

- Teacher created worksheet of student responses, one per student \*see lessons for explanation
- Bag with 4 red, 1 blue, 5 green and 3 yellow cups, 1 per group
- Student Resource 11A-B, 1 per student
- Transparency of Student Resource 12
- Answer Key for Student Resource 12 (Teacher Resource 8)
- Student Resource 12
- Student Resource 13, 1 per enrichment student
- Answer Key for Student Resource 13 (Teacher Resource 9)
- Summative Assessment, 1 per student, choose appropriate constructed response (Student Resource 14)
- Answer Key for Student Resource 14 (Teacher Resource 10A-D)

### **Development/Procedures:**

#### Day 1

- Pre-assessment  
Students will complete pre-assessment (Student Resource 1) to display knowledge of fractions, outcomes, and probability. Circulate throughout the classroom to view students' answers. Answer key can be found on Teacher Resource 1.
- Engagement
  - Draw or display an open number line on the board. Students will place fractions on the number line in the appropriate position.
  - Elicit responses about where impossible could be placed on the number line. (0) Present the term impossible. What does impossible mean? If I were to

- Elicit response for placement of certain. (1) What does certain mean? If you had to give certain a number what would it be? Certain is represented as 1 because 1 is a whole. What are examples of something that is certain? Use Teacher Resource 2b to label “certain” on the probability scale.
  - Next elicit placement for equally likely ( $\frac{1}{2}$ ), unlikely (greater than 0 and less than  $\frac{1}{2}$ ) and likely (greater than  $\frac{1}{2}$  and less than 1). Display terms impossible, certain, equally likely, unlikely, likely, events and probability on the board as you discuss the terms and possible events. Use Teacher Resource 2C-E.
  - Display some examples of student responses on the board.
  - After number line is completed discuss with students this number line displays probability. Probability is a number from 0 to 1 that measures the likelihood of an event occurring. Show the word, probability, and use Teacher Resource 2F-H.
  - Distribute Student Resource 2 for students to place in binder or notebook.
- Exploration
- Show students the cover of *Probably Pistachio* by Stuart J. Murphy which is a book about a child named Jack whose day does not seem to go right. Elicit ideas about the content of the story. Explain to students that this book will go through the probability of events during Jack’s day. Display the events on the board so that students can look out for the events in the story. Discuss where the “Jack will have a bad day” card (Teacher Resource 3A) should be placed on the number line. Students should explain the reason for their placement of the event.
  - Read the story to the class. Stop at each event in the story. Have a student place the event on the probability number line and explain his/her placement of the event. Have students use thumbs up or thumbs down to show agreement or disagreement. If there is a lot of disagreement, elicit reasons and justifications for different opinions.
  - Students will place “chance of pastrami” and “chance of tuna” for page 6 of the book. Have a student place the event on the probability number line and explain his/her placement of the event (Teacher Resource 3A-B). Instruct students to use thumbs up or thumbs down to show agreement or disagreement. If there is a lot of disagreement, elicit reasons for different opinions.
  - Model “Emma having pastrami” on the probability number line for page 8. Model appropriate thinking that may not have been displayed by first two student examples. Ask students why Emma had Liverwurst if it was likely that she would have pastrami. Students should explain that there are still other events that could happen if something is likely.
  - Place “chance of popcorn” for page 16. Place “chance of pizza” for page 21 (Teacher Resource 3C). Have a student place the event on the probability number line and explain his/her placement of the event. Use thumbs up or

thumbs down to show agreement or disagreement. If there is a lot of disagreement, elicit reasons for different opinions. If students believe it is certain because it smells like pizza, discuss if anything else could possibly smell like pizza. Lead the students to understand the idea that “likely” would be a more accurate description of the event.

- Place “chance of chocolate” and “chance of pistachio” for page 24. Discuss the two are equally likely because there are two options. Have a student place the event on the probability number line and explain his/her placement of the event (Teacher Resource 3D). Have students use thumbs up or thumbs down to show agreement or disagreement. If there is a lot of disagreement, elicit reasons for different opinions. \*Note: More than one set of event cards can be placed on the board to involve more students in the activity if necessary.

- Explanation

- Project a transparency of Student Resource 3 and distribute a copy to each student.
- Explain to students that they have placed the events of Jack’s day on a probability line and they will now place events in their day on a probability line.
- Model placing the first event on the number line and include a think aloud of reasons for placement. For example, “It is unlikely that I will watch television tonight because I have to grade the social studies assessment you completed this morning.” Ask students how this would change if it was a different day such as Friday. Students will think-pair-share for the second event in the activity. Listen to student discussions and responses to determine their understanding of the concept of probability.

- Application

- Students will independently complete placement of the events. Circulate throughout the room to observe placement and ask questions about the placement. Why did you place getting homework tonight as likely? (Possible Answer: It is Tuesday and we get homework everyday but Friday.)
- After most students are finished give students the opportunity to compare and discuss their answers with a partner.
- Discuss answers and reasons with the entire class. Students might say, “It is unlikely that my teacher will be absent tomorrow because she is never absent.”
- Possible questions to use during the application are listed below. What would happen to recess if it was January instead of \_\_\_\_? What is an event that is certain to happen in your day? Why was there a difference between your answer and your partner’s answer? Why was your answer the same as your partner’s answer?

- Differentiation

- Reteach  
For students who are struggling with the concept of probability begin with simple events in their life that are clear-cut. Examples of events: being moved

to a kindergarten class tomorrow or waking up on Mars tomorrow morning, you will have \_\_\_\_\_ special today, you will take the bus home, you will have desert after dinner, and you will go to the movies this weekend. Place events on sentence strips and students can place strips on the probability scale.

Distribute Student Resource 4A and Reteach, Student Resource 4B. Create a flip book of impossible, unlikely, equally likely, likely, and certain events in their life. Fold on dotted line. \*Note: Paper will not be folded exactly in half. Section titles should appear beneath the fold. On the smaller outside section have students write probability in large letters. Cut out events in Reteach A. Model placing the events above the appropriate vocabulary term. Distribute Reteach Student Resource 4C.. Student will cutout events then paste above the appropriate vocabulary term independently.

- Enrich  
Create a flip book of impossible, unlikely, equally likely, likely, and certain events in their life (Student Resource 4). Fold on dotted line. \*Note: Paper will not be folded exactly in half. Section titles should appear beneath the fold. On smaller outside have students write probability in large letters. Cut along solid lines only to center fold. On the inside state and illustrate an event for each vocabulary word.

- Assessment  
Distribute formative assessment to students (Student Resource 5A). Students must place vocabulary words on the probability line and in the sentence. Formative Assessment, Student Resource 5B contains lines for students that may need this assistance. Answer key can be found on Teacher Resource 4.

## Day 2

- Engagement  
Display a prompt that shows an answer to a question. Students are to design a possible question that relates to the given answer (Teacher Resource 5). Allow student time to write down a list of possible questions and then have students discuss the questions with a partner and as a class (Student Resource 6). Discuss a question that could not be an answer. For example, “Will we have school today?” It is certain because they are already in school. Another example is, “Will you wear flip-flops tomorrow?” (It is the middle of winter so I would not want to wear flip-flops and it would be unlikely.)
- Exploration
  - Distribute a copy of Student Resource 7 to each student.
  - Students will use vocabulary from the previous lesson to describe the probability of each outcome on the worksheet.
  - Read the questions as a class before beginning to work. Discuss each question before allowing students to begin working.

- Allow students that are struggling to use a coin or number cube when determining their answer for number two.
  - Encourage students struggling with number three to draw a picture or assist with illustrating the problem. Answer key can be found on Teacher Resource 6.
- Explanation
- Elicit responses for the first question from students. Ask students why they believe equally likely is the probability for tossing a coin and landing on heads. Ask students if they remember the fraction that describes equally likely. Lead students to explain there are only two things that can occur, heads or tails, and those are the outcomes. Place the vocabulary word, outcome, on the board (Teacher Resource 2H). Of the two outcomes, how many are heads? Include the language of “one out of two” for the probability of tossing heads. Relate that language to fractions. One out of two can be written as  $\frac{1}{2}$ .
  - For question 2, ask students to list the outcomes. Ask: How many outcomes are there? (6) Write \_\_\_\_\_ out of \_\_\_\_\_ on the board. Where would we place the 6 in the phrase?
  - Ask to describe an even number and identify other numbers that are even. Where should the 3 be placed in the phrase? (first blank)
  - Ask students for another way to represent that phrase (fraction). Students should say  $\frac{3}{6}$ .
  - Now ask students to determine the probability of rolling an odd number. How many outcomes are there?(6) If three of them are even, how many are odd?(6) Discuss the fact that  $\frac{3}{6}$  is equally likely because half of the numbers are even and half the numbers are odd.
  - Instruct students to go back to problems three and four and represent the probabilities as a fraction. \*Note: Instruct students to leave their first answer.
  - Discuss the fractions the students used to describe the probability of each event. Ask students to discuss why the fraction represents the probability.
  - For problem four, extension questions can be used to increase understanding. What is the probability of spinning a planet? Describe the probability in two ways. The answer should be  $\frac{4}{4}$  or 1 and certain.
  - Explain that probability can be written as a fraction instead of a vocabulary word such as “likely” because it is more specific. Unlikely can be slightly different from person to person but everyone knows the meaning of  $\frac{1}{4}$ .
- Application
- Distribute Student Resource 8A-C to groups of at least two students.
  - Students will list the possible outcomes and predict the frequency of the outcomes on the worksheet.
  - Students will then conduct the experiment by spinning the spinner 40 times and recording their results using tallies. Model making a five with tally marks. Students must describe the probability using vocabulary and fractions. Students will compare their predictions to the experimental results.
  - If time allows have students create a bar graph of their results (Student Resource 8C-E).

- Differentiation
  - Reteach  
Spinners have different amounts of sections. Students can receive a spinner with fewer options if they are struggling.  
  
Display spinner with three sections of one color and one section of another color. Tell students they can pick their color. If the spinner lands on their color they receive a point. If it does not land on their color you will receive a point. Students discuss the color they will choose and support their answers.
  - Enrich  
Students must design a spinner (Student Resource 9) and rules for an unfair game that makes it easier for them to win than their opponent.
- Assessment  
Distribute Student Resource 10 to students. Students will describe the probability of an event occurring using a fraction and then explain why events are likely and unlikely. Answer key can be found on Teacher Resource 7.

Before next class create a worksheet using 4 examples of students' responses.

### Day 3

- Engagement
  - Distribute four sample responses from day two formative assessment (Student Resource 10). Students grade the papers with a partner and determine the strengths and weaknesses of the papers. Discuss findings as a class.
  - Record student ideas on the board. Highlight the idea that a fraction is the best choice when expressing probability because it is specific.
- Exploration
  - Distribute bags filled with 4 red, 1 blue, 5 green and 3 yellow cubes. All bags should have the same amount and color of cubes.
  - Distribute Student Resource 11. Students will draw all of the possible outcomes in the bag and display the probability using fractions in the “before” section of the resource sheet.
  - Explain that students can play a game where the goal is to pick three of the same color. Demonstrate for students picking one cube out of the bag. Do not put the cube back in the bag. Now the goal is to pick two more of that color cube without looking before the other student. What happens if you do not put the cube back in the bag? Students will pick out their cube and draw the contents of the bag now in the “after” section of the resource sheet. Ask students: Does the probability of picking the same color change? Students should describe the new probabilities using fractions.
  - Tell students to discuss in groups how and why the probability changed after a cube was removed from the bag.

- Explanation
  - Discuss with class how the probability changes for the next draw after a cube is removed from the bag. Display transparency of Student Resource 11A-B or place magnets on back of blocks in order to place them on the board.
  - Discuss what happens to the probability of that color as well as the other colors in the bag. Visibly remove a cube from the example while discussing the changes. Students should be guided to the fact that the total number of object changes which means that all fractions change. Are any colors now equally likely? Has any color become impossible?
  
- Application
 

Distribute Student Resource 12 to students. Encourage students who are struggling to cross off their shape or draw the new content of the box in another place. Answer key can be found on Teacher Resource 8.
  
- Differentiation
  - Reteach
 

Provide one bag of candy with no more than five or six pieces. Using a dry erase board and marker students will split the board in half. Empty the contents of the bag for students to view. Students draw on first half of the bag. Model for students using the first letter of the candy for the drawing. Ask students what is the probability if we put all of the candy in the bag, what is the probability of drawing Candy A and have students write the fraction below the drawing. Return the candy to the bag and have one student choose a piece. Tell student to hold on to the candy. Empty the bag and repeat procedure from above. Ask students if the probability of choosing Candy A has changed. Students should say the fractions are different. Highlight the fact that the denominator has changed.
  
  - Enrich
 

Distribute Student Resource 13 that displays two bags with items and a list of the frequency of the objects picked from the bag. Students must decide and explain which bag was probably used for the event. Answer key can be found on Teacher Resource 9.

**Summative Assessment:**

The summative assessment will present students with a variety of probability events (Student Resource 14A-B). Students will display their knowledge of probability using appropriate vocabulary as well as fractions.

\*Note: Part B on the constructed response is differentiated to accommodate a variety of student levels. Use the question that is appropriate for the level of your students. Answer key can be found on Teacher Resource 10A-D.

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## Pre-Assessment

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. Order the following numbers from **least to greatest** on the number line below.

$$\frac{1}{2}, 1, \frac{1}{4}, 0, \frac{3}{4}$$



2. John has a number cube with the numbers 1, 2, 3, 4, 5, or 6 on a side. What are all the possible numbers John could roll?

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3. What are the chances that John will roll a 3?

\_\_\_\_\_ out of \_\_\_\_\_

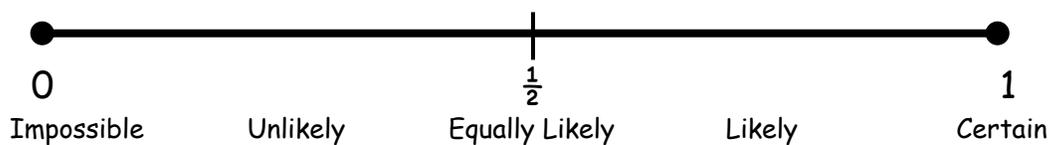
Student Vocabulary Sheet

|  |  |
|--|--|
| <p style="text-align: center;"><b>Probability<br/>Vocabulary Cards</b></p>   | <p style="text-align: center;"><b><u>PROBABILITY</u></b></p> <p style="text-align: center;">A number from 0 to 1 that measures the likelihood of an event occurring</p>  |
| <p style="text-align: center;"><b><u>OUTCOME</u></b></p> <p style="text-align: center;">The result of an experiment</p> <p style="text-align: center;"><i>I flipped a coin and the <u>outcome</u> was tails.</i></p>   | <p style="text-align: center;"><b><u>IMPOSSIBLE</u></b></p> <p style="text-align: center;">An event that can never happen.</p> <p style="text-align: center;"><i>If I pick a jelly bean out of a bag that has 2 red, 4 green and 1 yellow, it is <u>impossible</u> for me to pick a purple jelly bean.</i></p> |
| <p style="text-align: center;"><b><u>UNLIKELY</u></b></p> <p style="text-align: center;">An event that has a lower probability of occurring than other events.</p> <p style="text-align: center;"><i>If I roll a dice, it is <u>unlikely</u> that I will roll a number less than or equal to 2 because there are two out of six numbers that meet that criteria and four out of six numbers that do not.</i></p> | <p style="text-align: center;"><b><u>EQUALLY LIKELY</u></b></p> <p style="text-align: center;">Events having the same chance of occurring.</p> <p style="text-align: center;"><i>If you flip a coin, you are <u>equally likely</u> to land on heads as tails.</i></p>  |
| <p style="text-align: center;"><b><u>LIKELY</u></b></p> <p style="text-align: center;">The event that is more probable to occur than other events.</p> <p style="text-align: center;"><i>If I roll a dice, it is <u>likely</u> that I will roll a number greater than or equal to 2 because there are five out of six numbers that meet that criteria and one out of six numbers that does not.</i></p>          | <p style="text-align: center;"><b><u>CERTAIN</u></b></p> <p style="text-align: center;">An event that will always happen.</p> <p style="text-align: center;"><i>Every time I roll a number cube with the numbers 1, 2, 3, 4, 5, and 6, it is <u>certain</u> that I will land on a number.</i></p>              |

## How likely is it...?

What is the probability of each of the events below? Discuss with your group the likelihood of each event occurring. Then place the letter of each event in the appropriate place on the scale below.

- A. You will watch TV when you get home today.
- B. Your teacher will give you homework tonight.
- C. Your teacher will be absent tomorrow.
- D. There will be pizza served in the cafeteria tomorrow.
- E. You will have outside recess tomorrow.
- F. You will have vegetables with dinner.



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|  |
|  |
|  |

CERTAIN

LIKELY

EQUALLY  
LIKELY

UNLIKELY

IMPOSSIBLE

Day One Reteach A

I will have a math test sometime this year.

I will use scrap paper on my next math test.

I will have math homework every day this week.

My teacher will assign 35 problems for math homework.

I will never have a math test again in my life.

Day One Reteach B

Our hometown football team will win their next game.

At least one touchdown will be scored during the football game.

The players will use a tennis ball during the football game.

The football game will go into overtime.

Two teams will play against each other in the next football game.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Day One Formative Assessment A**

1. Using the terms from the text box, correctly place them on the probability line segment.

|             |                |            |
|-------------|----------------|------------|
| probability | unlikely       | likely     |
| certain     | equally likely | impossible |



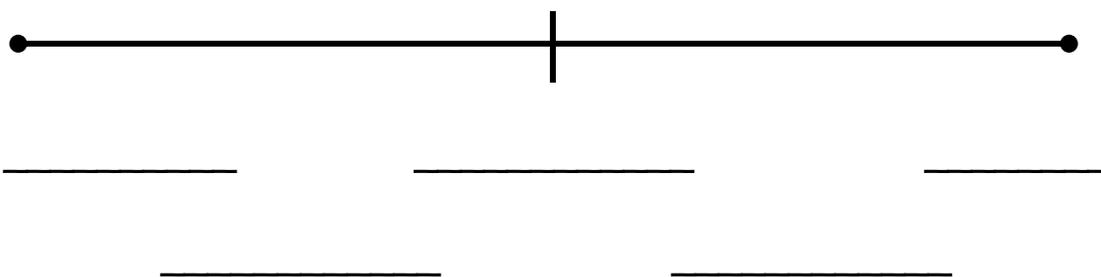
2. \_\_\_\_\_ measures the likelihood of an event occurring on a scale ranging from 0 to 1.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Day One Formative Assessment B**

1. Using the terms from the text box, correctly place them on the probability line segment.

|             |                |            |
|-------------|----------------|------------|
| probability | Unlikely       | likely     |
| certain     | equally likely | impossible |



2. \_\_\_\_\_ measures the likelihood of an event occurring on a scale from 0 to 1.

**Day 2 Engagement**

Your teacher was talking to a student in your class. The student asked a question and the teacher's response was, "It is more likely than unlikely."

**What question might the student have asked?**

\*Write down as many possible answers as you can think of. ☺

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**Day 2 Engagement**

Your teacher was talking to a student in your class. The student asked a question and the teacher's response was, "It is more likely than unlikely."

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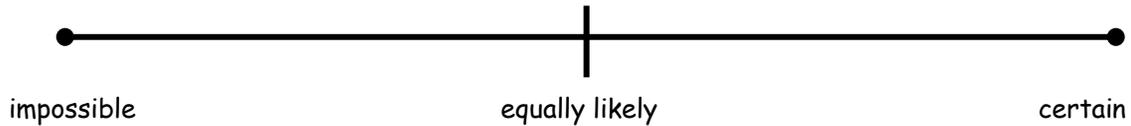
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**Day 2 Exploration**

1. Tyler and Tiffany are playing a game. Tyler has just flipped a quarter to determine who will have the first turn.

Place a star on the line segment below to indicate the probability of the coin landing on heads.



2. Julie rolled a six-sided number cube with 1, 2, 3, 4, 5 or 6 dots on a side. What is the likelihood of Julie rolling an even number?

\_\_\_\_\_

3. There are 1 yellow, 2 blue, and 2 purple cubes in a bag. Without looking, what is the likelihood of picking a yellow cube out of the bag?

\_\_\_\_\_

4. Observe the spinner below.

|         |        |
|---------|--------|
| Neptune | Saturn |
| Jupiter | Mars   |

What is the probability of the spinner landing on a planet other than Jupiter?

\_\_\_\_\_

What is the probability of the spinner landing on Earth?

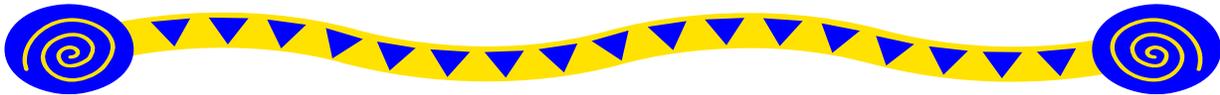
\_\_\_\_\_

## Predicting Outcomes

Look at your spinner. What are all of the possible outcomes? List them in the "Outcomes" column on the chart below.

| Outcomes | Prediction (show with tally marks) |
|----------|------------------------------------|
|          |                                    |
|          |                                    |
|          |                                    |
|          |                                    |
|          |                                    |
|          |                                    |
|          |                                    |

If you were to spin your spinner 50 times, how many times would you predict that it would land on each outcome? **Record your answer** in the "Prediction" column on the chart above.

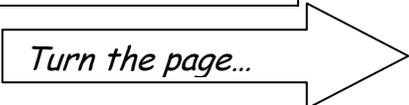


*Let's get spinning!!* Take turns spinning the spinner. **Record every spin on the frequency chart below.** Remember to spin the spinner a total of 50 times.

| Outcomes | Spins (show with tally marks) |
|----------|-------------------------------|
|          |                               |
|          |                               |
|          |                               |
|          |                               |
|          |                               |
|          |                               |
|          |                               |

After completing all 50 spins, represent your outcomes in word and fraction form on the frequency table below.

| Outcomes | Written Probability Term | Fractional Probability |
|----------|--------------------------|------------------------|
|          |                          |                        |
|          |                          |                        |
|          |                          |                        |
|          |                          |                        |
|          |                          |                        |



Compare your predictions (*theoretical probability*) to your actual results (*experimental probability*).

Did your predictions closely match your results?    YES   or   NO

Explain why your predictions were or were not accurate.

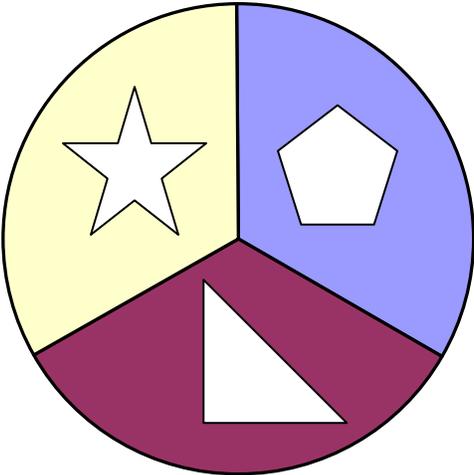
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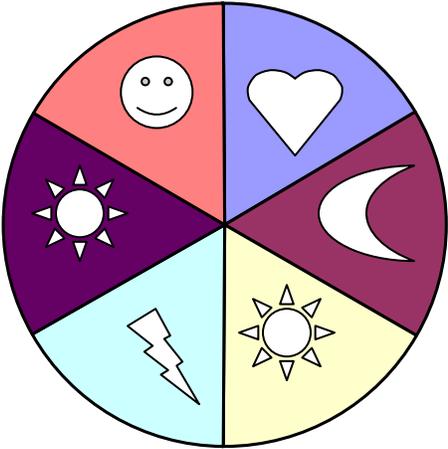
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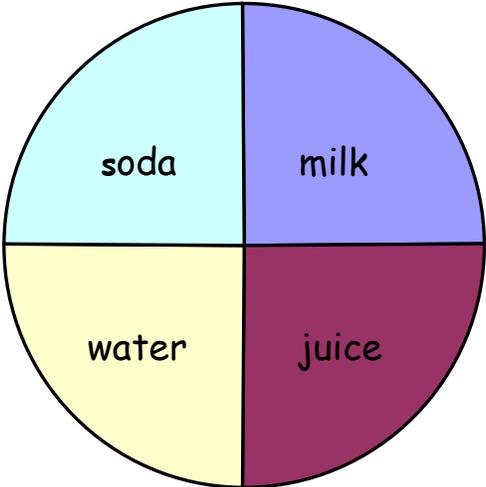
**Spinner A**



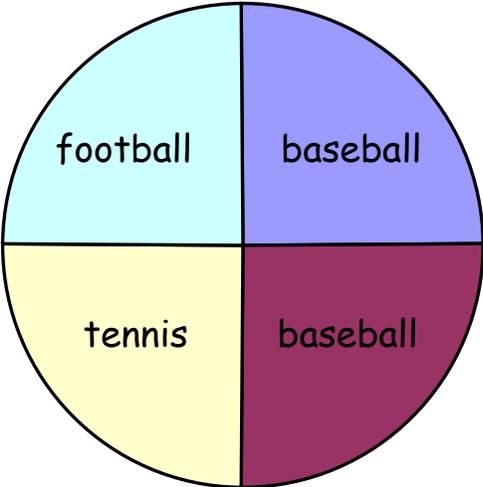
**Spinner B**

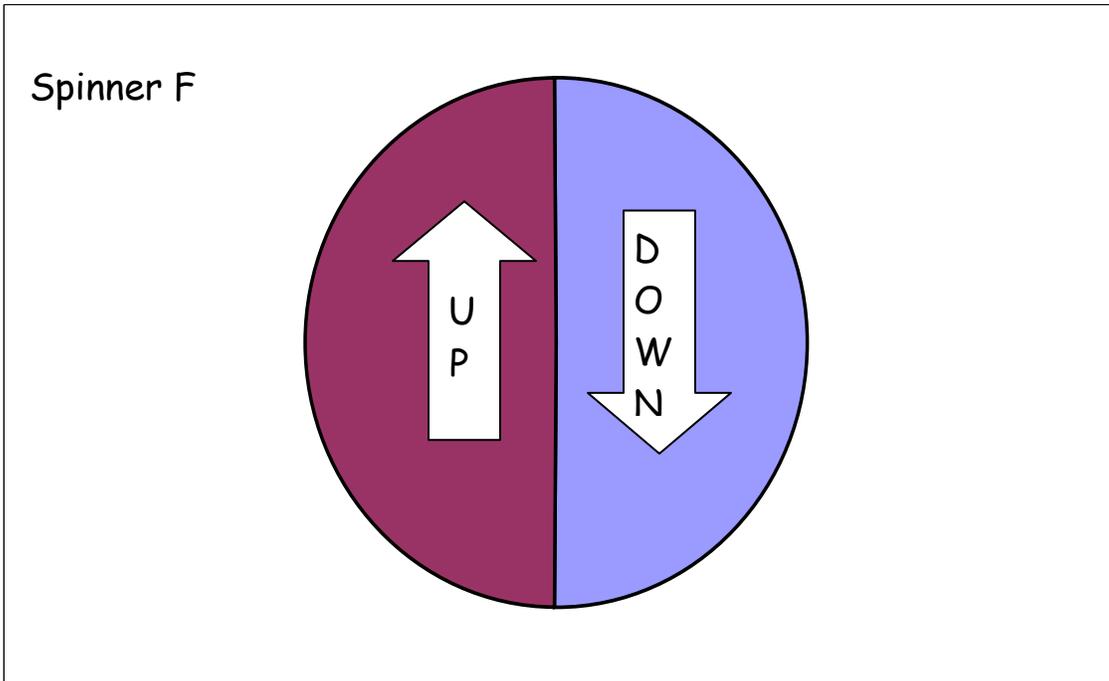
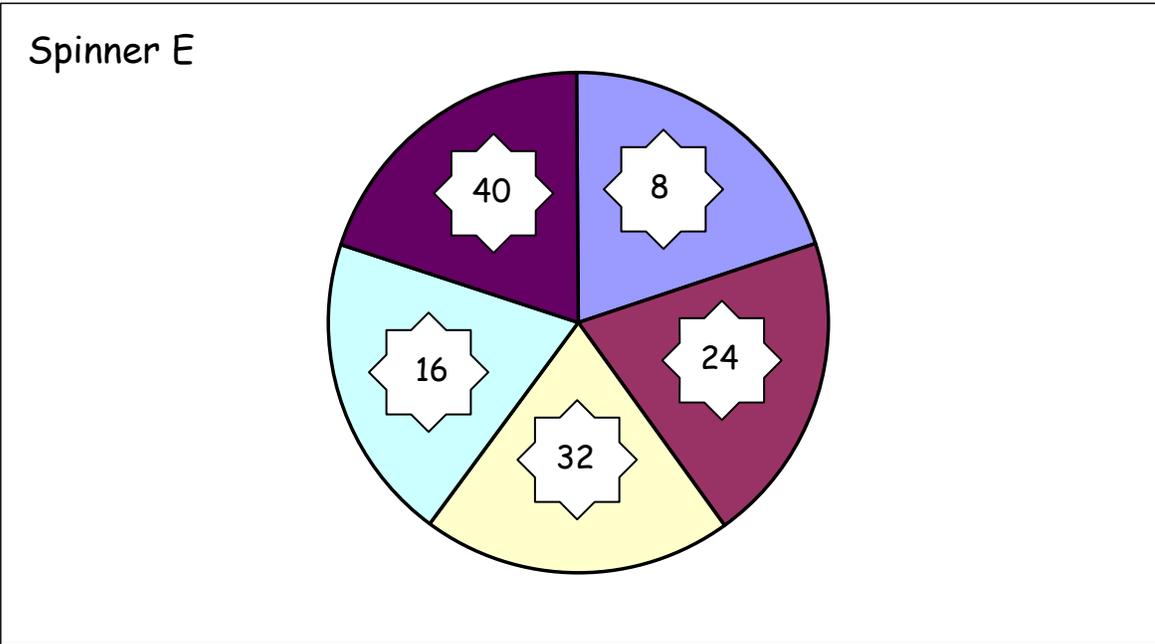


**Spinner C**

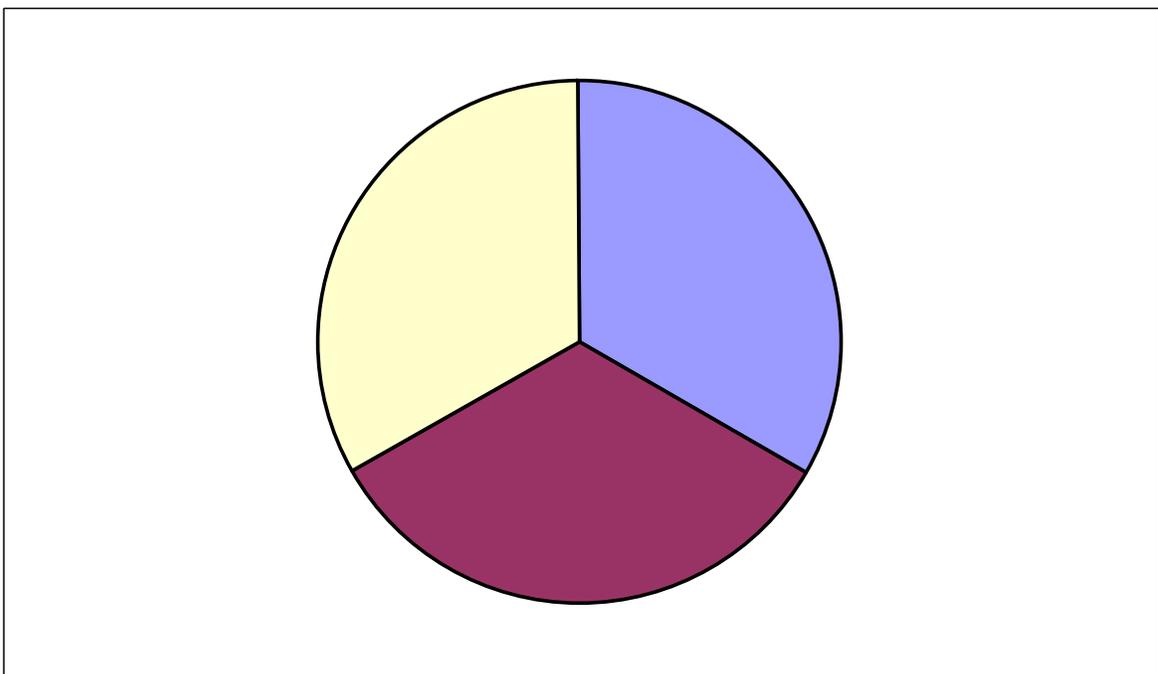
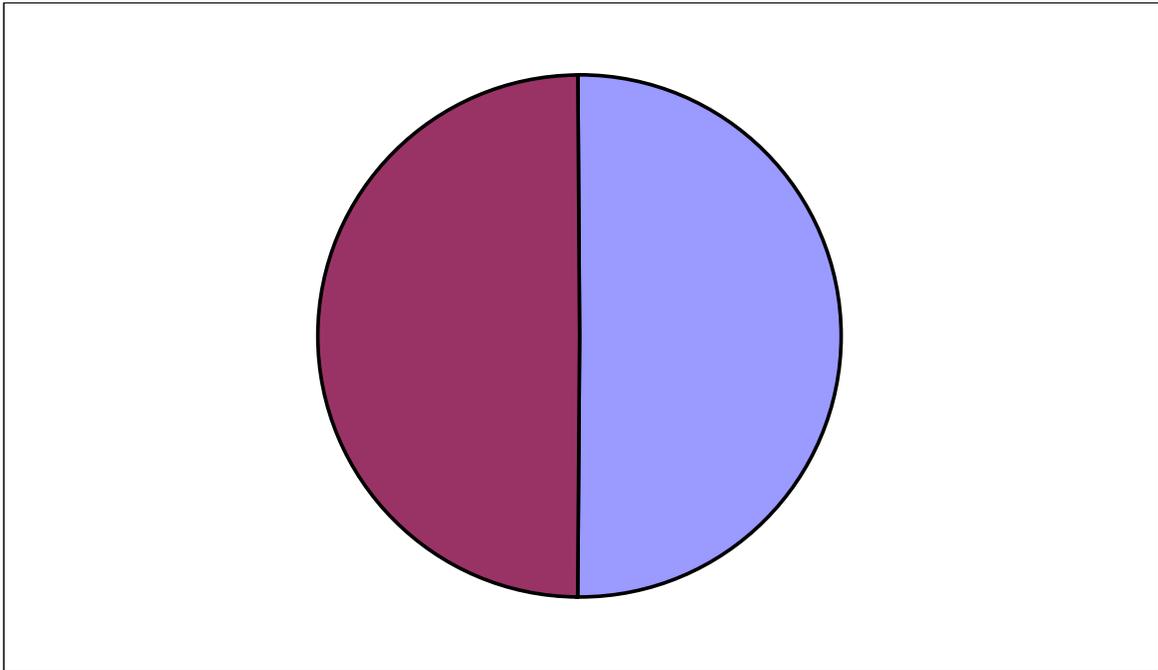


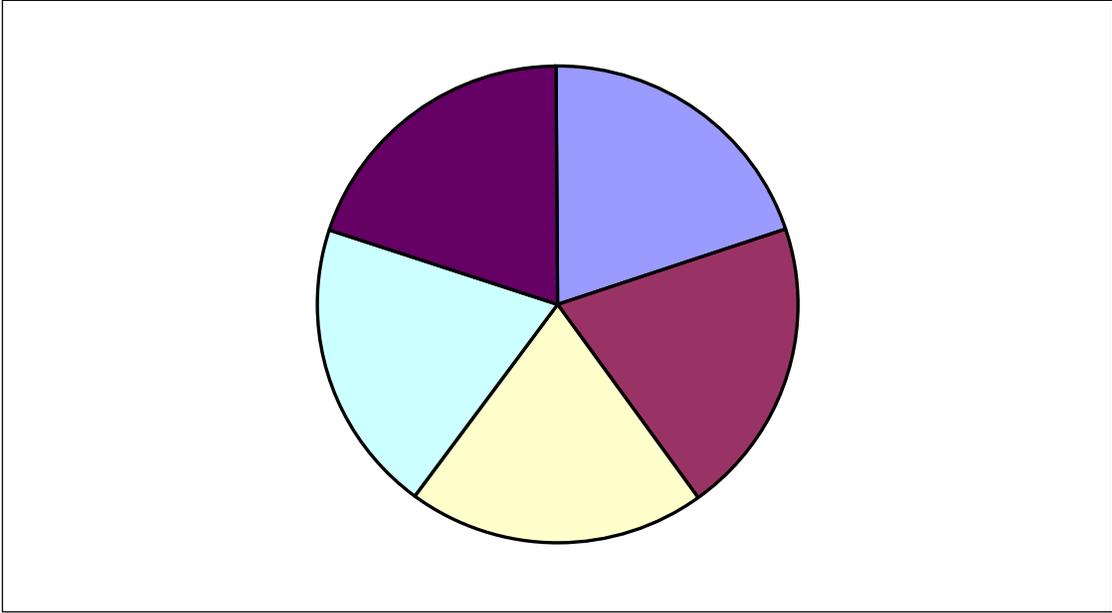
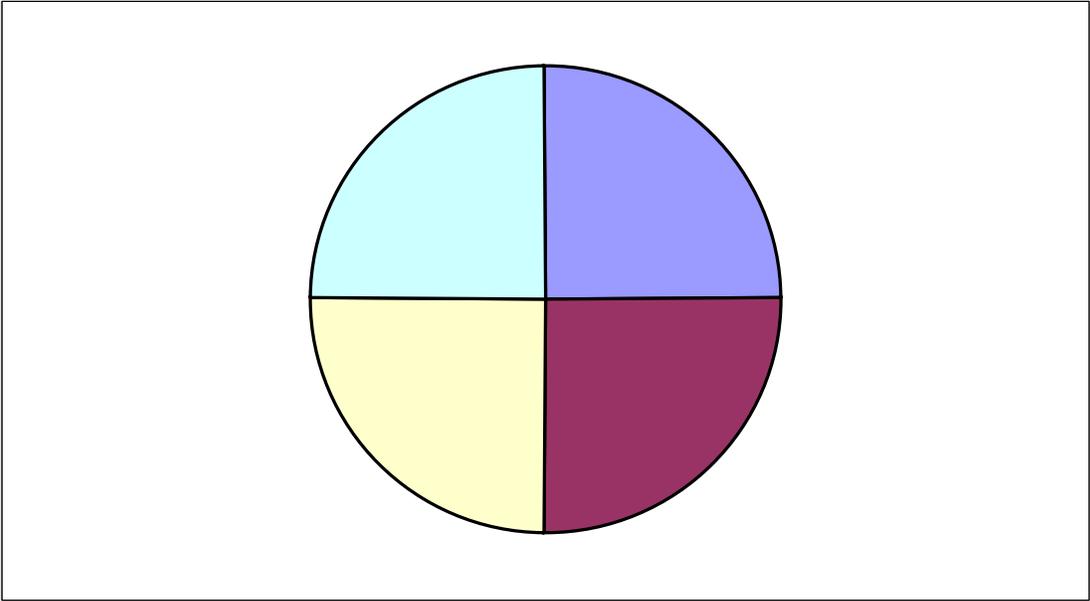
**Spinner D**

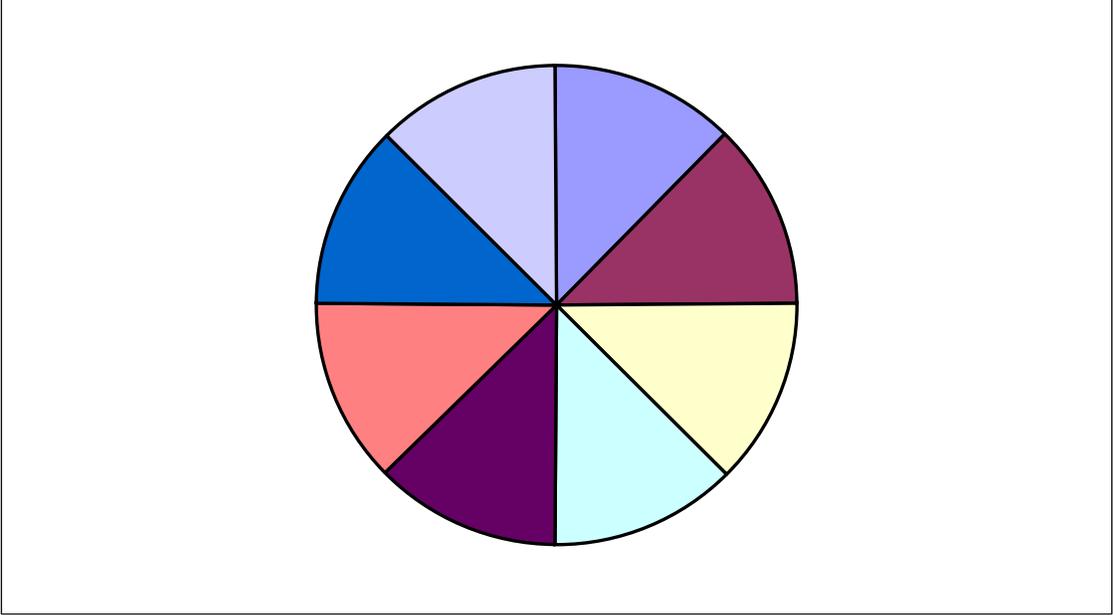
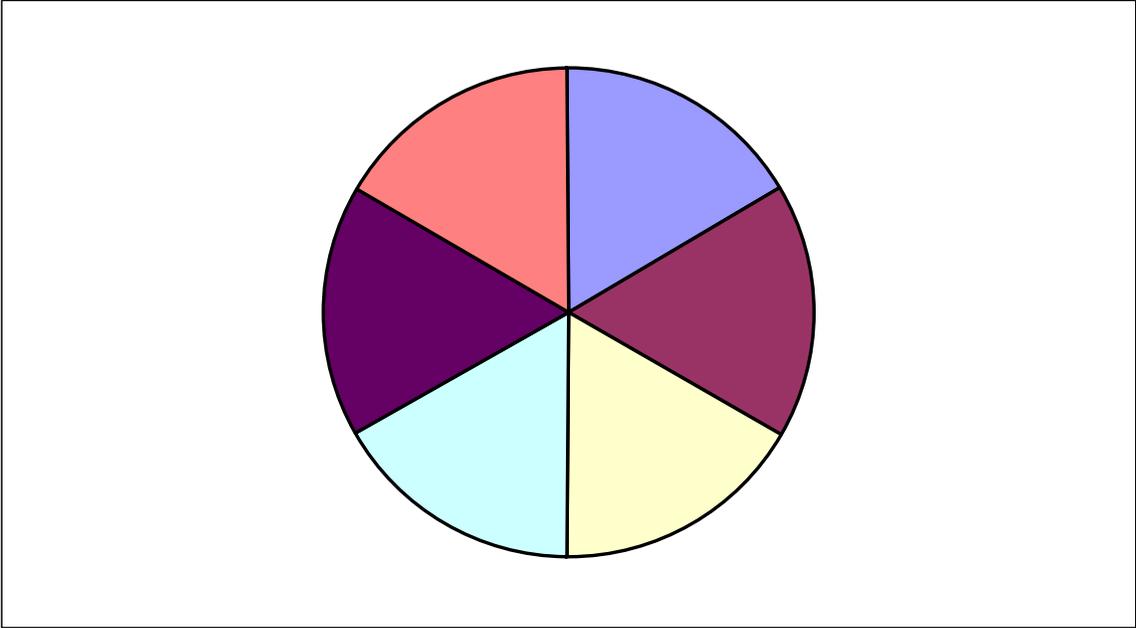




Blank Spinners  
(to be used with enrichment group)

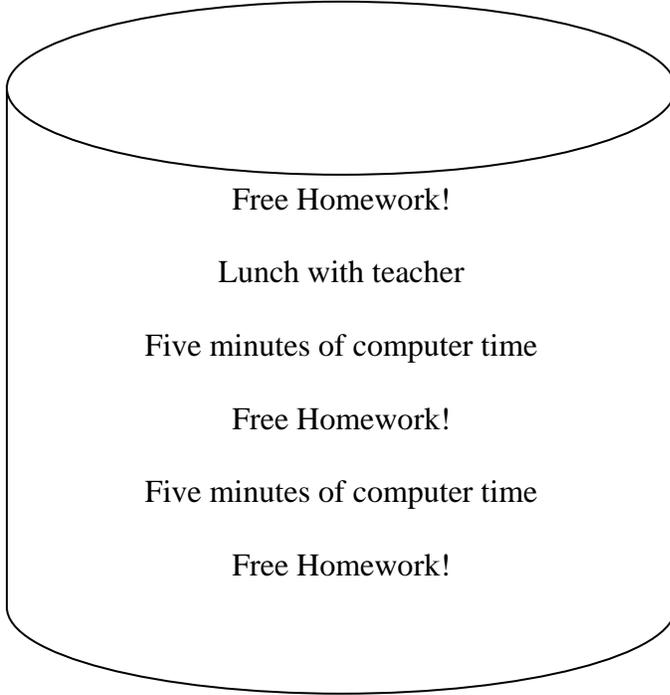






Day 2 Formative Assessment

Name: \_\_\_\_\_ Date: \_\_\_\_\_



Your teacher has a bag of coupons.

What are all of the possible events that could occur?

- List them in the "Outcomes" column on the chart below.
- Next list the likelihood of **each event as a fraction** in the "Probability of Outcomes." column.

| Outcomes | Probability of Outcomes |
|----------|-------------------------|
|          |                         |
|          |                         |
|          |                         |
|          |                         |

Which event is most likely to occur? \_\_\_\_\_

Which event is least likely to occur? \_\_\_\_\_

Explain why this event is the least likely to occur.

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**Day 3 Engagement**

With a partner, explore the contents of the bag. Illustrate all the possible outcomes in the "Before" section of the box below.

Before

What is the probability of each event occurring? Write your answer as a fraction.

Event: \_\_\_\_\_ Probability: \_\_\_\_\_

Event: \_\_\_\_\_ Probability: \_\_\_\_\_

Event: \_\_\_\_\_ Probability: \_\_\_\_\_

Event: \_\_\_\_\_ Probability: \_\_\_\_\_

Which events equally likely? \_\_\_\_\_

Which events are impossible? \_\_\_\_\_

Which events are certain? \_\_\_\_\_

Now, one person chooses an object from the bag.

What object was chosen? \_\_\_\_\_

Leave the object out of the bag and in the "After" box, illustrate what is now inside the bag.

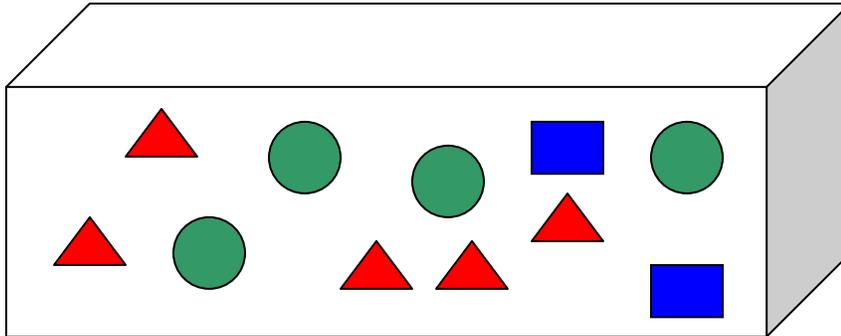
|   |
|---|
| <p>After</p>  |
| <p>Has the probability of each event changed? YES or NO</p> <p>What is the <i>new</i> probability of each event occurring? Write your answer as a fraction.</p> <p>Event: _____ Probability: _____</p> <p>Event: _____ Probability: _____</p> <p>Event: _____ Probability: _____</p> <p>Event: _____ Probability: _____</p> |

Discuss with your partner, why the probability of each event changed after the first person removed an item and did not return it to the bag.

**Day 3 Application**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Observe the contents of the box below.



What is the probability of choosing each object?

| Outcomes   | Probability of Outcomes |
|--|-------------------------|
| Triangle    |                         |
| Rectangle  |                         |
| Circle    |                         |

Choose an object to remove. Which object did you choose?

\_\_\_\_\_

How does the probability of each event change after you removed the object?

| Outcomes  | Probability of Outcomes |
|---|-------------------------|
| Triangle   |                         |
| Rectangle  |                         |
| Circle     |                         |

Name: \_\_\_\_\_ Date: \_\_\_\_\_

### What are the Chances?

Steven has a bag with ten insect cards.



**A**



**B**

Without looking in the bag, he chose a card. He recorded which card he took, then returned the card to the bag. He did this 10 times. Below is the record of Steven's outcomes:

|           |           |           |           |           |
|-----------|-----------|-----------|-----------|-----------|
| butterfly | dragonfly | butterfly | butterfly | butterfly |
| dragonfly | dragonfly | butterfly | butterfly | butterfly |

Which bag is more likely to be Steven's? \_\_\_\_\_

Explain how you determined your answer.

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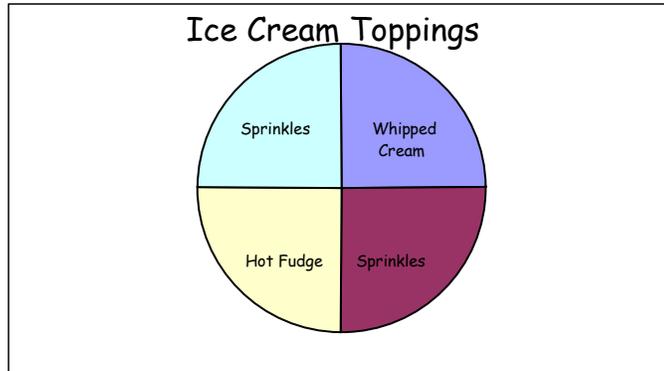


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**Summative Assessment**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. Given the spinner below, list all the possible outcomes on the frequency table provided.

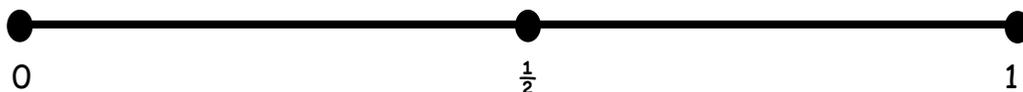


If you were to spin the spinner 20 times, how many times would you predict that it would land on each outcome? Record your answers on the table below.

| Outcomes | Prediction<br><i>(Show with tally marks)</i> |
|----------|--|
|          |  |
|          |  |
|          |  |
|          |  |

2. You roll a six-sided number cube with 1, 2, 3, 4, 5, or 6 dots on a side. Consider the **likelihood** of each outcome listed below. Place each letter that describes the likelihood of the event on the number line below.

- Rolling an even number
- Rolling a number greater than 4
- Rolling a number less than 7



3. Maria has a bag with 6 pieces of candy, which are all the same size. There are 2 pieces of caramel chocolate, 1 piece of milk chocolate and 3 pieces of peanut chocolate. She chooses a piece of candy without looking.



**Step A.**

What is the probability that Maria picks a caramel chocolate?

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**Step B.**

- Using what you know about probability, explain why your answer is correct. Use words, numbers, and/or symbols in your explanation.

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3. Maria has a bag with 6 pieces of candy, which are all the same size. There are 2 pieces of caramel chocolate, 1 piece of milk chocolate and 3 pieces of peanut chocolate. She chooses a piece of candy without looking.



**Step A.**

What is the probability that Maria picks a caramel chocolate?

\_\_\_\_\_

**Step B.**

- If Maria eats the caramel chocolate and pulls another piece of candy out of the bag, does she have the same likelihood of pulling a caramel chocolate from the bag again? Using what you know about probability, explain why your answer is correct. Use words, numbers, and/or symbols in your explanation.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3. Maria has a bag with 6 pieces of candy, which are all the same size. There are 2 pieces of caramel chocolate, 1 piece of milk chocolate and 3 pieces of peanut chocolate. She chooses a piece of candy without looking.



**Step A.**

What is the probability that Maria picks a caramel chocolate?

---

**Step B.**

- Using what you know about probability, explain why your answer is correct. Use words, numbers, and/or symbols in your explanation.
- If Maria eats the caramel chocolate and pulls another piece of candy out of the bag, does she have the same likelihood of pulling a caramel chocolate from the bag again? Using what you know about probability, explain why your answer is correct. Use words, numbers, and/or symbols in your explanation.

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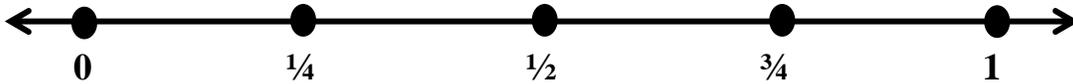
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## Pre Assessment Answer Key

Name: \_\_\_\_\_ Date: \_\_\_\_\_

4. Order the following numbers from **least to greatest** on the number line below.

$$\frac{1}{2}, 1, \frac{1}{4}, 0, \frac{3}{4}$$



5. John has a number cube with the numbers 1, 2, 3, 4, 5, or 6 on a side. What are all the possible numbers John could roll?

1, 2, 3, 4, 5, 6 (*answer does not have to appear in this exact order*)

6. What are the chances that John will roll a 3?

1 out of 6

CERTAIN

**IMPOSSIBLE**

EQUALLY  
LIKELY

UNLIKELY

LIKELY

# PROBABILITY

**EVENT**

**OUTCOME**

0

1

$\frac{1}{2}$

*Probably Pistachio* Event Cards

What are the  
chances...  
Jack will have a  
bad day?

What are the  
chances...  
Jack will have tuna  
for lunch?

What are the  
chances...  
Jack will have  
pastrami for lunch?

What are the  
chances...  
Emma will have  
pastrami for lunch?

What are the  
chances...  
Jack will pick  
popcorn?

What are the  
chances...  
Jack will have pizza  
for dinner?

What are the  
chances...  
Mom bought  
chocolate ice cream?

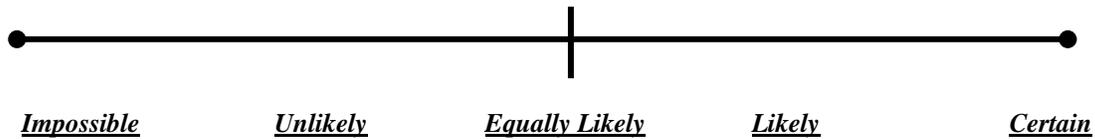
What are the  
chances...  
Mom bought  
pistachio ice cream?

Day One Formative Assessment Answer Key

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. Using the terms from the text box, correctly place them on the probability line segment.

|             |                |            |
|-------------|----------------|------------|
| probability | unlikely       | likely     |
| certain     | equally likely | Impossible |



3. Probability measures the likelihood of an event occurring on a scale ranging from 0 to 1.

## Day 2 Engagement Transparency Blackline Master

Your teacher was talking to a student in your class. The student asked a question and the teacher's response was, "It is more likely than unlikely."

*What question might the student have asked?*

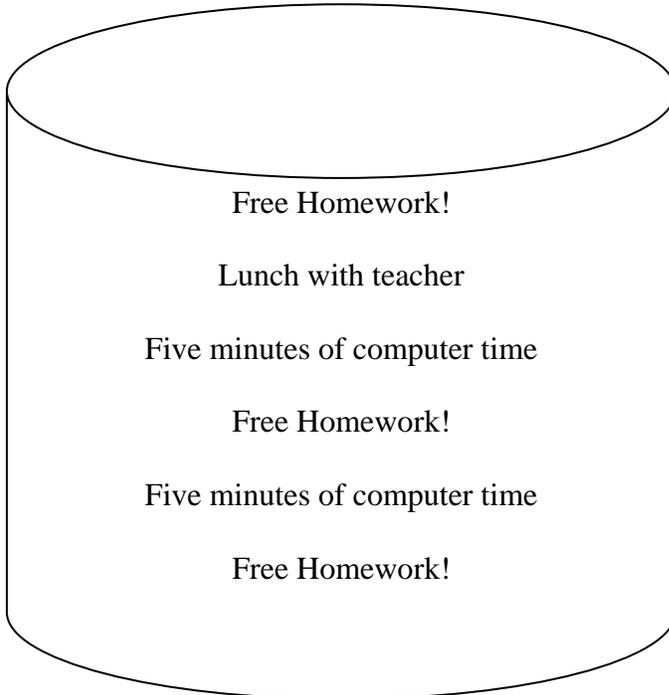
\*Write down as many possible answers as you can think of. 😊





Day 2 Formative Assessment Answer Key

Name: \_\_\_\_\_ Date: \_\_\_\_\_



Your teacher has a bag of coupons.

What are all of the possible events that could occur?

- List them in the "Outcomes" column on the chart below.
- Next list the likelihood of each event as a fraction in the "Probability of Outcomes." column.

| Outcomes                             | Probability of Outcomes |
|--------------------------------------|-------------------------|
| <u>Free Homework!</u>                | <u>3/6</u>              |
| <u>Lunch with teacher</u>            | <u>1/6</u>              |
| <u>Five minutes of computer time</u> | <u>2/6</u>              |

**\*\*Outcomes and Probability of Outcomes must match each other, but the order in which they are written does not matter.**

Which event is most likely to occur? Free Homework!

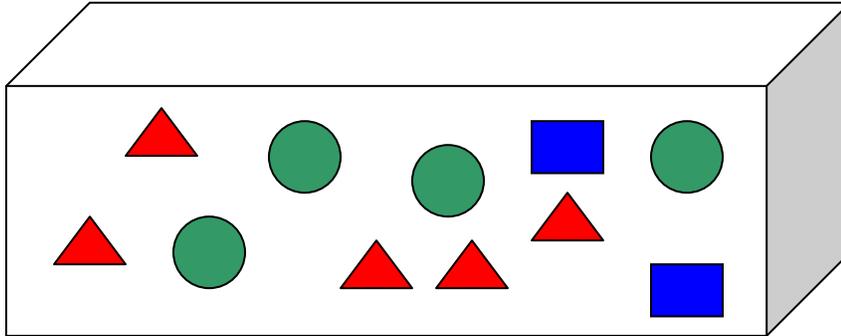
Which event is unlikely to occur? Lunch with Teacher

Explain why this event is the least likely to occur. Answers may vary. Sample Answer: Lunch with teacher is unlikely to occur because out of 6 possible outcomes, there is only one opportunity for me to pick "Lunch with Teacher." Picking something other than "Lunch with Teacher" is more likely because there are 4 other events that could occur.

Day 3 Application Answer Key

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Observe the contents of the box below.



What is the probability of choosing each object?

| Outcomes   | Probability of Outcomes |
|--|-------------------------|
| Triangle    | $\frac{5}{11}$          |
| Rectangle  | $\frac{2}{11}$          |
| Circle    | $\frac{4}{11}$          |

Choose an object to remove. Which object did you choose?

Answers will vary

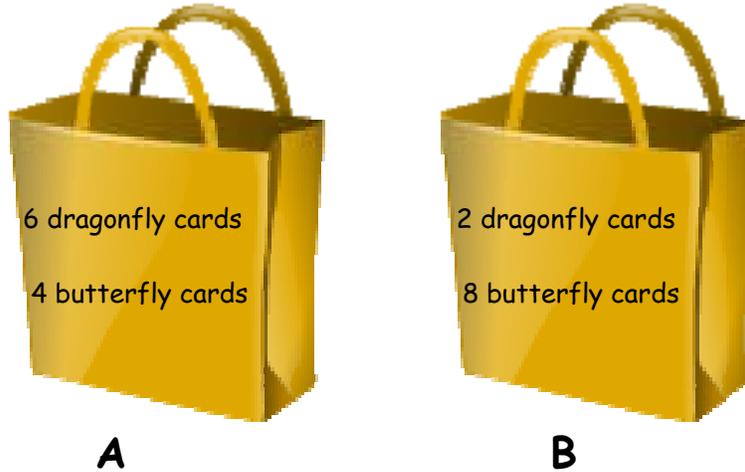
How does the probability of each event change after you removed the object?

| Outcomes  | Probability of Outcomes  |
|---|--|
| Triangle   | <u>Answers will vary depending upon object chosen, but all answers should reflect a new denominator of 10.</u> |
| Rectangle  |  |
| Circle     |  |

Day 3 Enrichment Answer Key

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Steven has a bag with ten insect cards.



Without looking in the bag, he chose a card. He recorded which card he took, then returned the card to the bag. He did this 10 times. Below is the record of Steven's outcomes:

|           |           |           |           |           |
|-----------|-----------|-----------|-----------|-----------|
| butterfly | dragonfly | butterfly | butterfly | butterfly |
| dragonfly | dragonfly | butterfly | butterfly | butterfly |

Which bag is more likely to be Steven's? Bag B

Explain how you determined your answer.

Steven picked 3 dragonfly cards and 7 butterfly cards. This outcomes more closely matches the probable outcomes for bag B. The probable outcomes for bag B would be 2 dragonfly cards and 8 butterfly cards.

**Summative Assessment Answer Key**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. Given the spinner below, list all the possible outcomes on the frequency table provided.



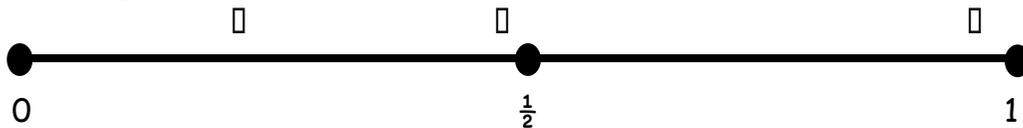
If you were to spin the spinner 20 times, how many times would you predict that it would land on each outcome? Record your answers on the table below.

Example:

| Outcomes             | Prediction<br><i>(Show with tally marks)</i> |
|----------------------|--|
| <u>Sprinkles</u>     |  |
| <u>Whipped Cream</u> |  |
| <u>Hot Fudge</u>     |  |
|                      |  |

2. You roll a six-sided number cube with 1, 2, 3, 4, 5, or 6 dots on a side. Consider the **likelihood** of each outcome listed below. Place each letter that describes the likelihood of the event on the number line below.

- Rolling an even number (equally likely—over  $\frac{1}{2}$ )
- Rolling a number greater than 4 (unlikely – between 0 and  $\frac{1}{2}$ )
- Rolling a number less than 7 (certain – over 1)





3. Maria has a bag with 6 pieces of candy, which are all the same size. There are 2 pieces of caramel chocolate, 1 piece of milk chocolate and 3 pieces of peanut chocolate. She chooses a piece of candy without looking.

**Step A.**

What is the probability that Maria picks a caramel chocolate?

**Sample answers (any one of these would be accepted): 2 out of 6;  $\frac{2}{6}$ ;  $\frac{1}{3}$**

**Step B.**

- Using what you know about probability, explain why your answer is correct. Use words, numbers, and/or symbols in your explanation.

**There are a total of 6 pieces of candy (2 caramel + 1 milk + 3 peanut butter = 6 total). This is represented as the denominator. The numerator tells how many in the group, which would be 2 because there are 2 caramel. So the probability of choosing a caramel chocolate is 2 out of 6 or  $\frac{2}{6}$ .  $\frac{2}{6}$  is equivalent to  $\frac{1}{3}$ .**

3. Maria has a bag with 6 pieces of candy, which are all the same size. There are 2 pieces of caramel chocolate, 1 piece of milk chocolate and 3 pieces of peanut chocolate. She chooses a piece of candy without looking.

**Step A.**

What is the probability that Maria picks a caramel chocolate?

Sample answers (any one of these would be accepted): 2 out of 6;  $2/6$ ;  $1/3$

**Step B.**

- If Maria eats the caramel chocolate and pulls another piece of candy out of the bag, does she have the same likelihood of pulling a caramel chocolate from the bag again? Using what you know about probability, explain why your answer is correct. Use words, numbers, and/or symbols in your explanation.

No, the probability of choosing a caramel has changed because there are now five pieces of candy. She now has a 1 out of 5 or  $1/5$  chance of choosing a caramel candy. It is unlikely that she will choose a caramel chocolate because  $1/5 < 1/2$ .

3. Maria has a bag with 6 pieces of candy, which are all the same size. There are 2 pieces of caramel chocolate, 1 piece of milk chocolate and 3 pieces of peanut chocolate. She chooses a piece of candy without looking.

**Step A.**

What is the probability that Maria picks a caramel chocolate?

*Sample answers (any one of these would be accepted): 2 out of 6; 2/6; 1/3*

**Step B.**

- Using what you know about probability, explain why your answer is correct. Use words, numbers, and/or symbols in your explanation.
- If Maria eats the caramel chocolate and pulls another piece of candy out of the bag, does she have the same likelihood of pulling a caramel chocolate from the bag again? Using what you know about probability, explain why your answer is correct. Use words, numbers, and/or symbols in your explanation.
- *There are a total of 6 pieces of candy (2 caramel + 1 milk + 3 peanut butter = 6 total). This is represented as the denominator. The numerator tells how many in the group, which would be 2 because there are 2 caramel. So the probability of choosing a caramel chocolate is 2 out of 6 or 2/6. 2/6 is equivalent to 1/3.*
- *No, the probability of choosing a caramel has changed because there are now five pieces of candy. She now has a 1 out of 5 or 1/5 chance of choosing a caramel candy. It is unlikely that she will choose a caramel chocolate because  $1/5 < 1/2$ .*