

**Just in Time Quick Check**  
**Standard of Learning 4.PS.2**  
**Strand: Probability and Statistics**

**Standard of Learning 4.PS.2**

**The student will model and determine the probability of an outcome of a simple event.**

*Students will demonstrate the following Knowledge and Skills:*

- a) Describe probability as the degree of likelihood of an outcome occurring using terms such as *impossible, unlikely, equally likely, likely, and certain*.
- b) Model and determine all possible outcomes of a given simple event where there are no more than 24 possible outcomes, using a variety of manipulatives (e.g., coins, two-sided counters, number cubes, spinners).
- c) Write the probability of a given simple event as a fraction between 0 and 1, where there are no more than 24 possible outcomes.
- d) Determine the likelihood of an event occurring and relate it to its whole number or fractional representation (e.g., impossible or zero; equally likely; certain or one).
- e) Create a model or contextual problem to represent a given probability.

**Just in Time Quick Check**

**Just in Time Quick Check Teacher Notes**

**Supporting and Prerequisite SOL: 4.NS.3, 4.NS.5**

### Just in Time Quick Check 4.PS.2

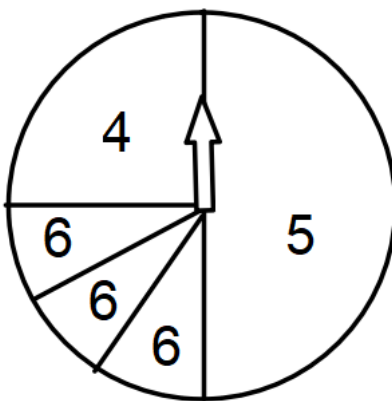
1. Mark will get a prize at a school event.

- Each prize is written on a ticket.
- Mark will pull one of these tickets from a box, without looking, to find the prize he will get.
- This chart has information about the prizes on the tickets in the box.

Prizes on the Tickets	Numbers of Tickets
Teddy Bear	22
Race Car	7
Video Game	0
Action Figure	18

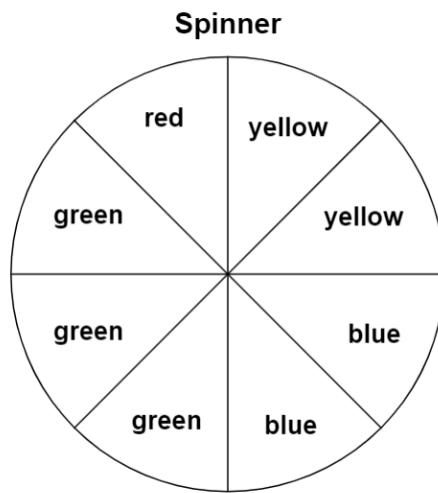
- a) It is unlikely, but not impossible, to pull a ticket with a \_\_\_\_\_. Explain how you decided which prize to write in the blank.
- b) It is impossible to pull a ticket with a \_\_\_\_\_. Explain how you decided which prize to write in the blank.

2. Sara will spin the arrow on this spinner one time.



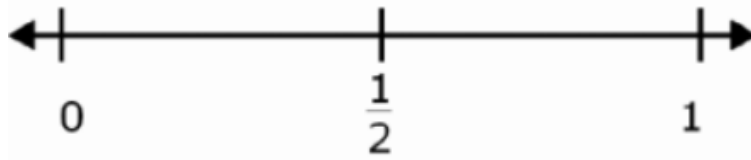
- a) The arrow is most likely to land on the number \_\_\_\_\_. Why is this most likely?
- b) Look at Sarah's spinner. Choose a number and write a sentence describing the chance that the arrow will land on that number. Use one or more of these words in your sentence: impossible, unlikely, or certain.

3. Jack has 3 green marbles, 4 yellow marbles, and 1 blue marble in a bag. All marbles are the same shape and size. Answer the questions about Jack's marbles. Model your thinking using a tool or pictures.
- a) If Jack chooses one marble from the bag, what are all the possible marble colors he could choose?
  - b) If Jack chooses one marble from the bag, which color is most likely to be chosen?
  - c) If Jack chooses one marble from the bag, which color is least likely to be chosen?
4. Use the spinner to answer the following questions.

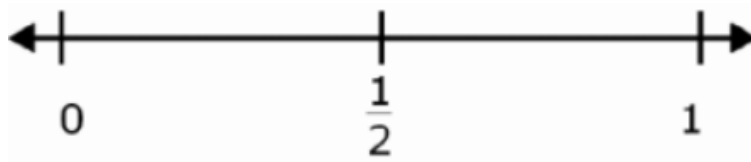


- a) When spinning the spinner, which color is it most likely to land on?
  - b) When spinning the spinner, which color is it least likely to land on?
  - c) Is the spinner equally likely to land on any color?
5. Parker bought a box of 10 cookies. If Parker selects a cookie from the box and it is impossible to select a chocolate chip cookie, how many of the cookies are chocolate chip?

6. Label the number line with the probability terms *certain*, *likely*, *equally likely*, *unlikely*, and *impossible*.

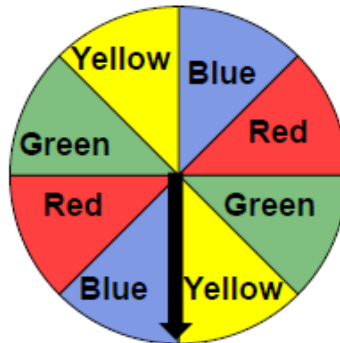


7. Locate the probability of each event described on the number line. Write the letter of the event where you think it belongs on the number line.



- a) A coin with one side heads and one side tails will land on heads.
- b) You will have one birthday each year.
- c) You roll a fair number cube with faces labeled 1 through 6 and get a number less than 2.
- d) On your way home from school you will see a live dinosaur.
- e) You pull a yellow tile from a bag containing 1 blue tile and 9 yellow tiles.

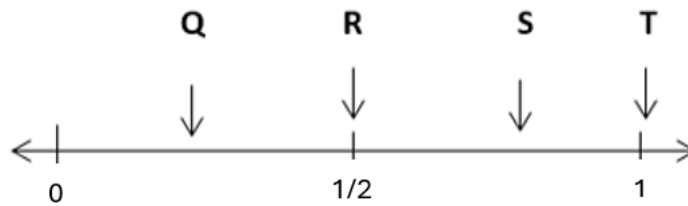
8. Mia has a spinner with eight equal sections as shown.



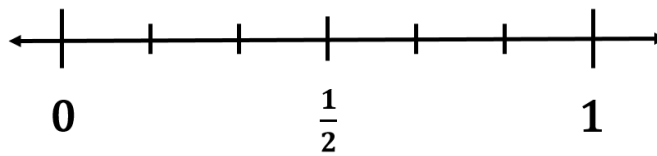
Mia will spin the arrow on the spinner one time. What is the probability the arrow will land on a blue or green section? Write the probability as a fraction on the number line.



9. Hayden has a fair coin with one side heads and one side tails. Which letter on this number line best represents the probability that this coin flipped one time will land with tails facing up? How would you describe this using a probability term?



10. Austin will roll a fair number cube that has faces labeled 1 through 6. Place a point on the number line to represent the probability that Austin will roll a number greater than 3. Write the probability term that describes the chance of rolling a number greater than 3.



11. Joe has a bag of marbles. Create a drawing of Joe's bag of marbles in which the probability of choosing a blue marble is  $\frac{7}{7}$ .

12. Create a model of a spinner where the probability of landing on an even number is  $\frac{3}{4}$ .

13. Create a set of 15 tiles. This set of 15 tiles consists of red, yellow, and green tiles where it is most likely to choose a red tile and least likely to choose a green tile.

## 4.PS.2 Just in Time Quick Check Teacher Notes

### Common Errors/Misconceptions and their Possible Indications

1. Mark will get a prize at a school event.

- Each prize is written on a ticket.
- Mark will pull one of these tickets from a box, without looking, to find the prize he will get.
- This chart has information about the prizes on the tickets in the box.

Prizes on the Tickets	Numbers of Tickets
Teddy Bear	22
Race Car	7
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Action Figure	18

- a) It is unlikely, but not impossible, to pull a ticket with a \_\_\_\_\_.  
Explain how you decided which prize to write in the blank.

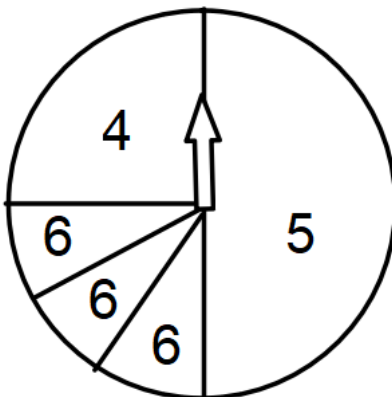
*Students may choose the video game as the correct answer. The students may say that it is the least because it is zero. Students with this misconception will benefit from more experience with data that contains zero and opportunities to determine which outcomes are unlikely, but not impossible versus outcomes that are impossible.*

- b) It is impossible to pull a ticket with a \_\_\_\_\_. Explain how you decided which prize to write in the blank.

*Students may have a difficult time understanding and/or using the word impossible to describe what is impossible in this problem. Because they like video games, they may have difficulty understanding that there are no tickets with "video game" listed, and therefore, it is impossible to pull a ticket with video games. Some students may think that probability is connected to a person's "luck" or view probability as certain for particular objects because they "want" that particular outcome to occur.*

*It may be helpful to give students outrageous scenarios for them to understand that impossible means that there is zero likelihood that an event will occur. Some examples might include but are not limited to: Your teacher has a real live dinosaur for a pet. Your family's hair will all turn blue tonight. This week there will be no Wednesday.*

2. Sara will spin the arrow on this spinner one time.



- a) The arrow is most likely to land on the number \_\_\_\_\_. Why is this most likely?

*Some students may pick the number 6 because it is the largest number or because it is listed three times in comparison to the numbers 4 and 5 which are only listed once each. This may indicate that students are not considering the size of the sections which dictate the likelihood the arrow could land on a particular number. It may be beneficial for students to have additional experience with spinners partitioned into unequal sections. Providing students with opportunities to experiment with a variety of spinners, including some that are equally partitioned and some that are not, will help with these misconceptions.*

- b) Look at Sarah's spinner. Choose a number and write a sentence describing the chance that the arrow will land on that number. Use one or more of these words in your sentence: impossible, unlikely, or certain.

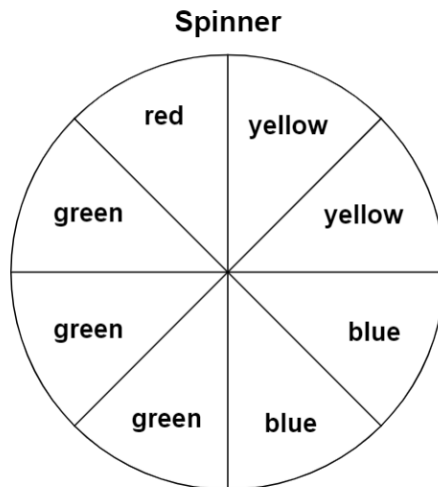
*Students who are unable to choose a number that is on the spinner, or not located on the spinner, and describe the probability of spinning that number need experiences to experiment and describe the results of the experiment. Classroom discussions around what is impossible, what is unlikely, and what is certain, will benefit students who are still making sense of probability. It may be beneficial for students to hear their classmates' reasoning as they make statements that describe the probability of certain outcomes.*

3. Jack has 3 green marbles, 4 yellow marbles, and 1 blue marble in a bag. All marbles are the same shape and size. Answer the questions about Jack’s marbles. Model your thinking using a tool or pictures.
- If Jack chooses one marble from the bag, what are all the possible marble colors he could choose?
  - If Jack chooses one marble from the bag, which color is most likely to be chosen?
  - If Jack chooses one marble from the bag, which color is least likely to be chosen?

*A common misconception that some students may have is confusing or not correctly understanding the meaning of the probability terms (certain, likely, unlikely, impossible). Appropriate vocabulary and manipulatives (e.g., marbles, spinners, number cubes) should be used when teaching these terms. Students may benefit from practice demonstrating each term using manipulatives. Allowing students to have a concrete tool to show each probability sample allows them to see the relationships between the fractional part and the whole.*

*Some students may not understand that all the possible marble colors (outcomes) are referring to every selection that can be made. These students would benefit from examples using manipulatives in which they identify all outcomes that can possibly be chosen.*

4. Use the spinner to answer the following questions.



- When spinning the spinner, which color is it most likely to land on?
- When spinning the spinner, which color is it least likely to land on?
- Is the spinner equally likely to land on any color?

*A common misconception some students may have is representing fractional parts when using spinners. Some students may not understand that green is “most likely” to be spun because they may not be able to visualize that the green sections represent 3 out of 8 fractional parts. Similarly, some students may not see that red is the “least likely” because there is only 1 red section out of 8. For both instances, manipulatives and spinners can be used to demonstrate the concept of “most” and “least” in terms of favorable outcomes as*

*well as other situations. Some students would benefit from hands-on experiments testing the outcome of each color.*

*Some students may not associate yellow and blue as being “equally likely” because the fractional parts are separated into eighths, instead of halves. A student would benefit from practice using visuals and manipulatives when describing “equally likely” as an outcome of a simple event.*

5. Parker bought a box of 10 cookies. If Parker selects a cookie from the box and it is impossible to select a chocolate chip cookie, how many of the cookies are chocolate chip?

*Some students may not know the meaning of the term “impossible” as a probability outcome. Manipulatives, scenarios, and other visuals can be used for reinforcement. Teachers may wish to provide students with concrete situations using manipulatives in which the outcome is impossible.*

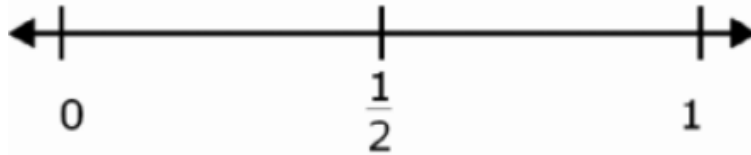
*Some students may also see the phrase “how many,” and interpret it as a key phrase for addition. Some students may then try to solve  $10 + 0 = 10$ . Encourage these students to break down the problem and to use strategies for problem solving. Numberless word problems can help students visualize the content and make sense of the problem solving process.*

6. Label the number line with the probability terms *certain*, *likely*, *equally likely*, *unlikely*, and *impossible*.



*Students may struggle with correctly representing probability on a number line if they lack understanding of the vocabulary terms associated with probability. This may indicate that a student does not understand why each term is located at the appropriate place on the number line. Manipulatives such as color tiles, number cubes, and spinners can be used to promote concrete understanding, as well as situational examples. For example, students may not understand what it means for an event to be “certain” until they are given a concrete representation or model of a situation in which that is the outcome. They may also have trouble understanding that “certain” means the fraction is represented as the whole number 1 on the number line. The same issue may arise for an outcome that is “impossible” – students may have difficulty understanding that “impossible” is represented as zero on the number line. Provide plenty of opportunities for students to conduct probability experiments and become familiar with the terms associated with probability for this grade level.*

7. Locate the probability of each event described on the number line. Write the letter of the event where you think it belongs on the number line.

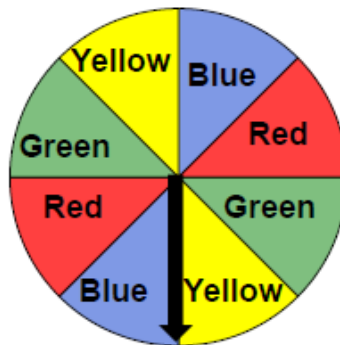


- a) A coin with one side heads and one side tails will land on heads.
- b) You will have one birthday each year.
- c) You roll a fair number cube with faces labeled 1 through 6 and get a number less than 2.
- d) On your way home from school you will see a live dinosaur.
- e) You pull a yellow tile from a bag containing 1 blue tile and 9 yellow tiles.

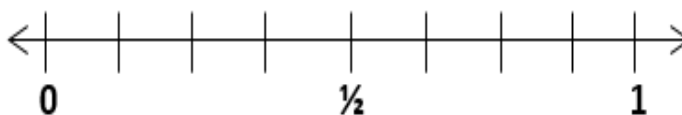
*A common misconception some students may have is knowing how to determine the number of favorable outcomes and total number of possible outcomes of each simple event described. This may indicate that some students struggle with writing a fraction to describe the likelihood of an event. Provide students with different examples so that they can describe the likelihood of various events.*

*Students may not be able to measure the probability of each event. Factors such as not understanding the statement or difficulty with reading comprehension may contribute to difficulty with questions like these. Encourage students to read each statement carefully, highlight important words, and draw a representation of the problem. It may also be helpful to provide students with a variety of manipulatives (number cubes, coins, color tiles, etc.) and opportunities to conduct their own probability experiments, and to model how to record results as fractions.*

8. Mia has a spinner with eight equal sections as shown.



Mia will spin the arrow on the spinner one time. What is the probability the arrow will land on a blue or green section? Write the probability as a fraction on the number line.

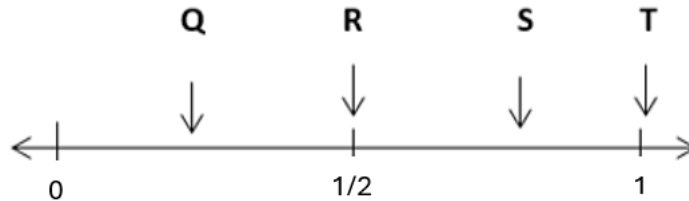


A common error some students may make is to not use the total of blue and green sections to represent the number of favorable outcomes (numerator) to get a fraction of  $\frac{4}{8}$ . This may indicate that students do not understand that blue or green represents all the sections labeled blue and green. A student would benefit from the use of manipulatives to show that more than one outcome can be included in the number of favorable outcomes.

While Grade 4 students are not expected to simplify fractions related to probability, it may be beneficial to help students see these connections during instruction. In the problem above, students may not understand that  $\frac{4}{8}$  is equivalent to  $\frac{1}{2}$ . It may be helpful to provide students with manipulatives and fraction tiles to understand equivalency if needed. Guide students to understand that the whole number (1) on the number line would represent a combination of red, green, blue, and yellow as outcomes. Help them recognize that the total number of possible outcomes represents the denominator.

Students may have difficulty pulling out both the green and blue fractional parts to determine the total of each because they are separated on the spinner. Provide opportunities for students to use spinners and act out the problem. Students can use manipulatives, number the sections on the spinner, and even cut out a spinner to visualize the parts.

9. Hayden has a fair coin with one side heads and one side tails. Which letter on this number line best represents the probability that this coin flipped one time will land with tails facing up? How would you describe this using a probability term?

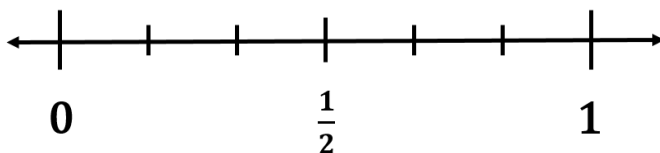


Students may have difficulty with probability on a number line due to a lack of fractional understanding and number sense. Ensure that students understand what each letter on the number line represents as a fraction and have them record the fraction for each letter on the number line. It may be necessary to revisit how these fractions relate to the benchmarks of 0,  $\frac{1}{2}$ , and 1. Discuss the relationship between these fractional benchmarks and probability – for example, ask students, “If there are zero chances that something will happen, how would you describe that in terms of probability?” and “What if something is certain to happen, how would you represent that as a fraction?” Students may need additional support to understand that an event that is “impossible” is represented as 0 on a number line and an event that is “certain” is represented as 1 on a number line.

Students may not understand that there are only two possible outcomes for flipping a coin: the coin can land heads up, or the coin can land tails up. They may not understand that the two are equally likely and can each be represented by the fraction  $\frac{1}{2}$ . It may be helpful to provide students

*with a coin as a manipulative and the opportunity to conduct their own investigations. It may also be beneficial to model for students how to record results as fractions.*

10. Austin will roll a fair number cube that has faces labeled 1 through 6. Place a point on the number line to represent the probability that Austin will roll a number greater than 3. Write the probability term that describes the chance of rolling a number greater than 3.



*Students may not have an understanding that the denominator represents the number of differently labeled faces on the number cube. Additionally, students may not have an understanding that the numbers greater than 3 are 4, 5, and 6, and so they may not be able to represent the probability as the fraction  $\frac{3}{6}$ . They may also lack the understanding of equivalent fractions and may have trouble understanding where  $\frac{3}{6}$  lies on the number line in relation to  $\frac{1}{2}$ .*

*While it is not expected for Grade 4 students to simplify fractions in probability situations, it may be beneficial to help them see these connections during instruction. It may be helpful to provide students with fraction manipulatives and opportunities to represent equivalent fractions and then place them on a number line.*

11. Joe has a bag of marbles. Create a drawing of Joe's bag of marbles in which the probability of choosing a blue marble is  $\frac{7}{7}$ .

*A common error is for students to draw a set of seven marbles and only include one blue marble. This may indicate students believe having one blue marble contained in the drawing represents the likelihood of the event being "certain." Students may need more experience with manipulatives and understanding the probability of a given simple event as a fraction, especially with the outcomes of "impossible" and "certain."*

12. Create a model of a spinner where the probability of landing on an even number is  $\frac{3}{4}$ .

*Students may struggle to create a spinner with three even numbers and one odd number or any ratio of three even numbers to one odd number (e.g., 6 even numbers and 2 odd numbers). This may indicate that students do understand that the numerator of three represents the number of favorable outcomes and the denominator of four represents the total number of possible outcomes. Students may benefit from a refresher lesson on representing probability as a fraction using manipulatives and visuals.*

*Students may also benefit from revisiting the concept of even and odd numbers from Grade 2. Guide students to use manipulatives to determine if numbers can be grouped in pairs with no remainders or leftovers. Review what it means to be divisible by two. Since this question is open-ended, students may label the spinner with any even and odd numbers of their choice. If students are struggling with*

*the concept of even and odd, it may be helpful to limit the numbers they are working with (for example: Using only the numbers 1-9, create a model of a spinner where the probability is...).*

13. Create a set of 15 tiles. This set of 15 tiles consists of red, yellow, and green tiles where it is most likely to choose a red tile and least likely to choose a green tile.

*A common misconception students may have is to create a set of tiles where red is the predominant color, but they do not understand that they need more yellow tiles than green tiles so that green is least likely. This may indicate that students need to examine the problem and connect the probability terms that should be associated with each color of tile. For example, the total tiles needed is 15. Most likely- red, least likely- green. Therefore, the remaining tiles need to be yellow and that number of yellow tiles must be more than green but less than red. It may be helpful to use tile manipulatives to demonstrate most likely and least likely. It may also be beneficial to encourage students to create a graphic organizer (see below) to organize the information.*

<i>Red</i>	<i>Most (largest number)</i>	<i>?</i>
<i>Yellow</i>		<i>?</i>
<i>Green</i>	<i>Least (smallest number)</i>	<i>?</i>
<i>TOTAL (sum of all numbers must be equal to 15)</i>		<i>15</i>

*Students may have trouble getting to an outcome using 15 tiles when there are three possible outcomes. It may be helpful to scaffold a similar problem using a set of 15 tiles that only contain two possible outcomes (e.g., red and green). This set of 15 tiles using only red and green tiles would represent red as the most likely to be chosen.*