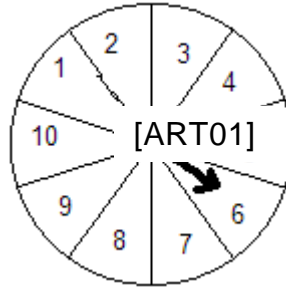


Learn the Math

A spinner has ten equally likely outcomes: 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10. What is the probability of the pointer stopping on 6?

**Vocabulary**

mathematical probability

Mathematical probability is a comparison of the number of favorable outcomes to the number of possible outcomes. The probability of an event can be written as a fraction.

Probability = $\frac{\text{number of favorable outcomes}}{\text{total number of possible outcomes}}$

Probability of 6 is:

$\frac{1}{10}$ ← one favorable outcome (6)
10 ← total possible outcomes (1, 2, 3, 4, 5, 6, 7, 8, 9, and 10)

So the probability of the pointer stopping on 6 is $\frac{1}{10}$, or 1 out of 10.

The probability of an event occurring can be expressed as 0, 1, or a fraction between 0 and 1.



The closer a probability is to 1, the more likely the event is to occur. The closer it is to 0, the more unlikely. A probability of $\frac{1}{2}$ means that the event is just as likely to happen or not happen.

So in the above example, it is **unlikely** that the spinner will land on 4, because the probability is less than $\frac{1}{2}$.

REASONING If an event has a probability of 1, how many favorable outcomes are there in comparison to the number of possible outcomes? [wo] **The number of favorable outcomes is the same as the number of possible outcomes.**

Do the Math

1. What is the probability that the spinner will land on a number greater than 4?

How many possible outcomes are there? [wol] 11

What are the favorable outcomes? [wol] 5, 6, 7, 8, 9, 10, 11

How many favorable outcomes are there? [wol] 7

Write the probability as a fraction:

$\frac{\text{Number of favorable outcomes}}{\text{Total number of possible outcomes}} =$ [wol] $\frac{7}{11}$

Total number of possible outcomes [wol] 11

So the probability is [wol] $\frac{7}{11}$ or [wol] $\frac{7}{11}$ out of [wol] 11.

Is this event impossible, unlikely, likely, or certain? [wol] likely; $\frac{7}{11}$ is greater than $\frac{1}{2}$



Remember

- The numerator in the fraction is the number of favorable outcomes.
- The denominator is the total number of possible outcomes.
- The closer the fraction is to 1, the more *likely* the event is to occur. Likewise, the closer it is to 0, the more *unlikely* it is.
- If an event is *certain*, it will always happen. If an event is *impossible*, it will never happen.

Find the probability using the spinner above.

2. an odd number
[wol] $\frac{6}{11}$

3. an even number
[wol] $\frac{5}{11}$

4. a number divisible by 3
[wol] $\frac{3}{11}$

5. the number 8
[wol] $\frac{1}{11}$

6. a number
[wol] $\frac{11}{11}$, or 1

7. the number 12
[wol] $\frac{0}{11}$, or 0

Write *impossible*, *unlikely*, *likely*, or *certain* for each event, and find the probability.

8. a number less than 1
[wol] impossible; $\frac{0}{11}$, or 0

9. a number less than 13
[wol] certain; $\frac{11}{11}$, or 1

10. a number divisible by 5
[wol] unlikely; $\frac{2}{11}$

11. a number greater than 5
[wol] likely; $\frac{6}{11}$

Problem Solving • Show Your Work

12. Write a fraction that shows the probability of landing on an odd number on a spinner labeled 1–7. [wol] $\frac{4}{7}$

13. **REASONING** Jackie says that an event with a probability of $\frac{1}{2}$ is more likely to occur than an event with a probability of $\frac{2}{3}$. Explain her error. [wols] $\frac{2}{3}$ is closer to 1 than $\frac{1}{2}$ is, so the event with a probability of $\frac{2}{3}$ is more likely to occur.

Independent Practice

Find the probability using the spinner on the right.

1. a consonant

[wo] $\frac{6}{8}$, or $\frac{3}{4}$

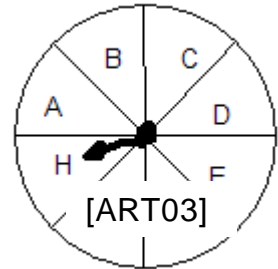
3. a letter in the word BACK

[wo] $\frac{3}{8}$

2. the letter D

[wo] $\frac{1}{8}$

4. a letter in the word HEAD

[wo] $\frac{4}{8}$, or $\frac{1}{2}$ Write *impossible*, *unlikely*, *likely*, or *certain* for each event, and find the probability. Use the spinner above.

5. a vowel

[wo] *unlikely*; $\frac{2}{8}$, or $\frac{1}{4}$

6. the letter I

[wo] *impossible*; $\frac{0}{8}$, or 0

7. the letter F

[wo] *unlikely*; $\frac{1}{8}$

8. a letter in the word FABLED

[wo] *likely*; $\frac{5}{8}$ **Problem Solving • Show Your Work**

9. A spinner has 10 equal sections. Two are red,
- $\frac{1}{2}$
- are orange, and the remaining sections are green. What is the probability of getting green? [wo]
- $\frac{3}{10}$

10. Lenny has a spinner with 6 equal sections. Two are labeled 8,
- $\frac{1}{3}$
- are labeled 5,
- $\frac{1}{6}$
- are labeled 3, and
- $\frac{1}{6}$
- are labeled 4. What is the probability Lenny will land on a 5? [wo]
- $\frac{2}{6}$
- , or
- $\frac{1}{3}$

11. A spinner has 8 equal sections.
- $\frac{3}{4}$
- are gray, and the remaining sections are white. What is the probability of landing on white? [wo]
- $\frac{2}{8}$
- , or
- $\frac{1}{4}$

12. Write certain, likely, unlikely, or impossible to describe the chance of spinning either grey or white if you spin the pointer in Exercise 11. Explain. [wols]
- certain; the probability of spinning either gray or white is $\frac{8}{8}$ or 1, which makes it certain.*

- 13.
- Write Math**
- If you had a
- $\frac{2}{5}$
- chance of spinning a 3 on a spinner, describe what the spinner could look like. [wo]
- Possible answer: The spinner could have 5 equal parts with two of the parts labeled 3.*

Probability as a Fraction

Skill 50

Objective

To write the probability of a simple event as a fraction

Vocabulary

mathematical probability The number of favorable outcomes compared to the number of possible outcomes

Common Errors [insert icon from basal prototype]

- Students may write the total number of possible outcomes over the number of favorable outcomes. Explain that the numerator is the number of favorable outcomes. It may help to have students list all the possible outcomes and circle the favorable ones. Then they can write a fraction that represents the number of circled outcomes over the number of possible outcomes.

LEARN THE MATH page XX Read the problem with students. Ask: **What is meant by the term *favorable outcome*?** *It is the outcome you want to happen.* **Why can probability be written as a fraction?** *It shows a part of a group or represents the number of favorable outcomes out of the total number of outcomes.*

Explain that the number of favorable outcomes makes the numerator. The number of possible outcomes makes the denominator.

Tell students that once they have a fraction, they can determine how likely an event is to occur. If it is less than $\frac{1}{2}$, then it is unlikely. If it is 0, then it is impossible. Exactly $\frac{1}{2}$ means the event is as likely to happen as not happen. A probability of greater than $\frac{1}{2}$ means the event is likely, but once you reach 1, the event is certain to happen.

REASONING Discuss the question with students. Remind them that a probability of 1 means that the event is certain to happen. So, all the possible events will be favorable as well.

DO THE MATH page XX Do Exercise 1 with students. Go through each part with them. Tell them this is how they should approach problems. Assign Exercises 2–13 and check students' work.

If they are having trouble, have them write down all the favorable outcomes as they did on the top.

REASONING Discuss the question with students. Have them draw the number line like on the Learn the Math page. Have them label where $\frac{1}{2}$ and $\frac{2}{3}$ are and see which is closer to 1.

INDEPENDENT PRACTICE page XX Assign Exercises 1–13 and check students' work. Students who made more than 4 errors in Exercises 1–13 in the **Independent Practice** may benefit from the **Alternative Teaching Strategy** on page XX.

Optional Alternative Teaching Strategy

MATERIALS For each group: 10 coins, bag

OBJECTIVE To write the probability of a simple event as a fraction

Divide the class into groups. Give each group a bag of coins. Each bag should contain a different number of pennies, nickels, dimes, and quarters.

Discuss probability with students and how to write it as a fraction. Write the formula on the board.

Probability = $\frac{\text{number of favorable outcomes}}{\text{total number of possible outcomes}}$

Tell students that if they wanted to find the probability of pulling a penny out of the bag, they would put the number of pennies as the numerator and the total number of coins as the denominator.

Write the formula on the board again as:

Probability = $\frac{\text{number of pennies}}{\text{total number of coins}}$

Tell them that for each coin, they would change the formula of the numerator to match the coin they are working with.

Have each group record the probability of picking different coins from their bag. **Check students' work.** Once all groups are done, draw the number line on the board for how likely an event is.

Discuss unlikely, likely, impossible, and certain with students. If the probability is less than $\frac{1}{2}$, then it is unlikely. If it is 0, then it is impossible. Exactly $\frac{1}{2}$ means the event is as likely to happen as not happen. A probability of greater than $\frac{1}{2}$ means the event is likely, but once you reach 1, the event is certain to happen.

Plot each group's probability on the number line and discuss which group's coins would be more likely or less likely to be pulled based on the mathematical probability of each type of coin.

Have groups switch bags and do it again. **Check students' work.**