

7.SP.7

Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.

- Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events.
- Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.



Understand the Standards

You can use a probability model to determine the likelihood of various events in a sample space.

Mr. Collins is randomly selecting one student from all of his 7th-grade math classes to be the flag bearer in the homecoming parade. The table below shows the number of students in each class. What is a probability model that can be used for this situation? What is the probability that the student chosen will be from the 3rd-period class?

Words to Know

probability
model
sample space

Period	Number of Students
1	22
2	17
3	18
4	23
5	20

What is the probability model for this scenario?

$$\frac{\text{\# of students in period}}{\text{total students}}$$

What is the sample space for this model? all the students in the classes

What is the total number of students? 100

$$P(\text{student from 3rd period}) = \frac{18}{100} = \frac{9}{50}$$

The probability that the student selected will be from the 3rd-period class is $\frac{9}{50}$ or 18% or 0.18.

A **probability model** is a way to represent a random phenomenon mathematically.

The model is defined by the sample space, the outcomes or events in the sample space, and the probability of any event in the sample space. The **sample space** is the set of all possible outcomes.



Guided Instruction

The class is playing a game that involves rolling two number cubes at a time. Albie has listed the possible sums of two number cubes and the probabilities of rolling each sum in the table below. Define the sample space of the model. Determine which sum is most likely and least likely to occur.

Sum	2	3	4	5	6	7	8	9	10	11	12
Probability	$\frac{1}{36}$	$\frac{1}{18}$	$\frac{1}{12}$	$\frac{1}{9}$	$\frac{5}{36}$	$\frac{1}{6}$	$\frac{5}{36}$	$\frac{1}{9}$	$\frac{1}{12}$	$\frac{1}{18}$	$\frac{1}{36}$

Step 1 Define the sample space.

Possible outcomes: $\{(1, 1); (1, 2); (1, 3); (1, 4); (1, 5); (1, 6); (2, 1); (2, 2); (2, 3); (2, 4); (2, 5); (2, 6); (3, 1); (3, 2); (3, 3); (3, 4); (3, 5); (3, 6); (4, 1); (4, 2); (4, 3); (4, 4); (4, 5); (4, 6); (5, 1); (5, 2); (5, 3); (5, 4); (5, 5); (5, 6); (6, 1); (6, 2); (6, 3); (6, 4); (6, 5); (6, 6)\}$

Step 2 Determine the outcome that is most likely.

Which sum has the highest probability? 7

Step 3 Determine the outcome that is least likely.

Which sum has the lowest probability? 2 and 12



On Your Own

A survey was sent around the 7th grade to find out the students' favorite dessert. The results are shown in the table at the right. Use the table to answer each question.

1. What is the sample space for the probability model?

2. What is the probability of a student liking ice cream best?

3. What is the probability that a student likes pie or cookies best?

4. What is the probability that a student likes ice cream, cake, pie, or cookies best?

Dessert	Number
Ice Cream	12
Cake	3
Pie	4
Cookies	5

Answer the questions.

A survey was taken at Michael's workplace to determine what employees want as the main dish at the company picnic. The results are shown in the table below. Examine the results and answer the questions.

Dish	Hamburgers	Hot Dogs	Bratwursts	Veggie Burgers
Number	35	25	23	17

5. What is the sample space for the results of the survey?

6. What is the probability that an employee chooses hot dogs as his or her main dish?

7. What is the probability of an employee choosing either bratwursts or veggie burgers?

- Elevate** 8. What is the probability of an employee not choosing hamburgers?

Answer the questions. Share your ideas with a classmate.

9. A woman who works for a local bank wants to survey some of the customers about what kind of accounts are most important to them. The five accounts that she asks about are checking, savings, CDs, money market, and retirement accounts. What is the sample space of the survey given?

10. Discuss the probability model for a person randomly drawing a spade out of a standard deck of 52 cards.

Answer the questions below.

11. Dizzy surveys people on the type of vehicle they enjoy driving most; cars, SUVs, trucks, or vans. Which of the following is not a part of the sample space?

A. Dizzy B. cars
C. trucks D. vans

12. What is the sample space for the probability model used to find the probability that the number 2 will be rolled on a number cube?

A. $\{\frac{1}{6}\}$ B. $\{2\}$
C. $\{2, 4, 6\}$ D. $\{1, 2, 3, 4, 5, 6\}$

13. There are three equal-sized boxes on a table. In two of the boxes there is a \$1 dollar bill. Inside the other box there is a \$100 dollar bill. You get to keep what is inside the box you choose. Write a probability model and find the probability of choosing the box with the \$100 dollar bill.

14. For the scenario in the previous question, what is the probability that you will choose a box with just a \$1 dollar bill?



15. Write out the sample space of possible outcomes for the probability of flipping three heads in a row when flipping a coin. What is the probability, based on your model, of flipping 3 consecutive heads?



Critical Thinking

16. Work in groups of three. You will need a king-sized bag of candy-coated chocolate pieces and a bag that is not see-through. Take turns choosing one candy from the bag, noting the color, and then returning the candy to the bag. Repeat this process 30 times. Organize your trial data using a tally sheet. Based on your experiment, how many of each color of candy are in the bag? Now look at all the candies in the bag and count each color. Are the actual amounts of each color in the bag close to the values from your experiment? Why or why not? Which color is most likely to be chosen from the bag? Why?

There are a wide range of Web sites discussing the colors of candy-coated chocolate pieces. With your teacher, see if your experiment matches up with the probabilities expressed on different Web sites.

Example: joshmadison.com/2007/12/02/mms-color-distribution-analysis/