Determine Experimental Probabilities

Objective Determine experimental probabilities of compound events from sample spaces.	**Materials** coin, **Experimental Probability of Compound Events**

Students have already learned to find the experimental probability of simple events. They have also used lists, tables, and tree diagrams to represent the sample space of probability experiments. In this activity, students will extend their understanding of probability as they use sample spaces to help them determine the experimental probability of compound events. This will prepare students for finding the probability of more complex compound events.

Step by Step   15–20 minutes

1 Determine the sample space for a probability experiment involving compound events.

- Explain that a **compound event** is an event that consists of two or more simple events. Ask: *Why is tossing a coin twice and getting heads both times an example of a compound event?* (There are two simple events that make up this event: getting heads on the first toss and getting heads on the second toss.)

- Tell the student that they will explore experimental probability related to the experiment of tossing a coin twice. Have the student make a tree diagram or complete a table like the one shown to help them list all possible outcomes of the experiment, using H for heads and T for tails.

First Toss	Second Toss
H	H
H	T
T	H
T	T

Support English Learners Check that the student understands the meaning of *heads* and *tails* in the context of coins. Demonstrate using one or more coins that the *heads* side shows a face and the *tails* side is opposite the face. Ask the student to share what words their home language uses for the two side of a coin. For example, some Spanish-speaking regions use *cara*, meaning *face*, for heads and *cruz*, meaning *cross*, for tails.

2 Estimate the experimental probability of a compound event.

- Provide the student with a coin. Have the student perform at least 20 trials in which each trial consists of tossing the coin twice. The student should record their data in a table like the one shown that lists each possible outcome of the experiment and its frequency. (Sample data are given.)

Outcome	Frequency
HH	III
HT	ЖⱮ I
TH	ЖⱮ
TT	ЖⱮ I

- Ask: *Based on your data, what is the experimental probability of getting heads both times when tossing a coin twice? How do you know?* (Possible answer: There are 3 trials with an outcome of HH and 20 trials in all, so the experimental probability of getting two heads is $\frac{3}{20}$.)

- Ask: *Based on your data, what is the experimental probability of getting one head and one tail when tossing a coin twice? How do you know?* (Possible answer: There are 6 trials with an outcome of HT and 5 trials with an outcome of TH, so the experimental probability of getting one head and one tail is $\frac{11}{20}$.)

- Initiate discussion about whether the student would be likely to get the same results if they performed the experiment again. Elicit that the results and the experimental probabilities would likely be slightly different due to chance.

3 Practice finding experimental probability of compound events.

- Give the student **Experimental Probability of Compound Events** (page 4).
- Have the student show or explain their work as they find the experimental probability of each compound event. (**1.** $\frac{6}{50}$, or $\frac{3}{25}$; **2.** $\frac{19}{50}$; **3.** $\frac{25}{50}$, or $\frac{1}{2}$; **4.** $\frac{5}{40}$, or $\frac{1}{8}$; **5.** $\frac{20}{40}$, or $\frac{1}{2}$; **6.** $\frac{14}{40}$, or $\frac{7}{20}$)

Check for Understanding

Tell the student that, for each trial of an experiment, Leah rolls a number cube twice. Present the student with the table of Leah's results. Have the student use the data to find the experimental probability of rolling one odd number and one even number on two rolls of the number cube. $\left(\frac{14}{30}, \text{ or } \frac{7}{15}\right)$

Outcome	Frequency
odd, odd	9
odd, even	8
even, odd	6
even, even	7

For the student who struggles, use the chart below to help pinpoint where extra help may be needed.

If you observe…	the student may…	Then try…
the student gives the probability of rolling an odd number and then an even number (or an even number and then an odd number),	not recognize that there is more than one outcome corresponding to one odd number and one even number.	having the student circle the rows in the table that represent an outcome of one odd number and one even number.
the student uses the number of favorable trials as the denominator instead of the numerator,	not understand which quantities are being compared when calculating an experimental probability.	reminding the student that experimental probability is a ratio that compares the number of favorable trials to the total number of trials and having the student identify each of these quantities.

Name _____

Experimental Probability of Compound Events

On each trial of an experiment, Kendra tosses a coin three times. She records her results in the table. Use the results to find each experimental probability. Show your work.

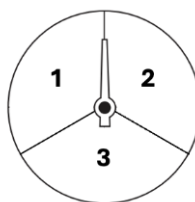[1] What is the experimental probability of getting 3 tails?

[2] What is the experimental probability of getting 1 head and 2 tails, in any order?

[3] What is the experimental probability of getting more than one head when tossing the coin three times?

Outcome (H = heads, T = tails)	Frequency
HHH	⅏ ‖
HHT	‖‖
HTH	⅏ │
HTT	‖‖
THH	⅏ ‖‖
THT	⅏
TTH	⅏ ⅏
TTT	⅏ │

On each trial of an experiment, Antonio spins the spinner shown twice. He records his results in the table. Use the results to find each experimental probability. Show your work.

[4] What is the experimental probability of spinning 2 twice?

[5] What is the experimental probability of spinning two odd numbers?

[6] What is the experimental probability of spinning two numbers with a sum of 4?

Outcome	Frequency
1, 1	7
1, 2	3
1, 3	3
2, 1	3
2, 2	5
2, 3	2
3, 1	6
3, 2	7
3, 3	4