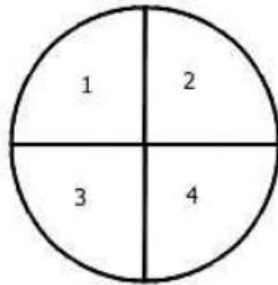


Lesson 2: Estimating Probabilities by Collecting Data

Classwork

Example 1: Carnival Game

At the school carnival, there is a game in which students spin a large spinner. The spinner has four equal sections numbered 1–4 as shown below. To play the game, a student spins the spinner twice and adds the two numbers that the spinner lands on. If the sum is greater than or equal to 5, the student wins a prize.



Exercises 1–8

You and your partner will play this game 15 times. Record the outcome of each spin in the table below.

Turn	1 st Spin Results	2 nd Spin Results	Sum
1	4	4	8
2	1	4	5
3	1	4	5
4	2	4	6
5	4	2	6
6	3	1	4
7	3	1	4
8	2	3	5
9	4	2	6
10	3	1	4
11	3	3	6
12	4	3	7
13	1	3	4
14	1	4	5
15	1	3	4

2 3 4 5 6 7 8
 1 111 111 111 111 111 111

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1. Out of the 15 turns how many times was the sum greater than or equal to 5?

10 times out of 15

2. What sum occurred most often?

4, 5, 6 occurred the most (4 times)

3. What sum occurred least often?

3 occurred the least (0 times)

4. If students were to play a lot of games, what proportion of the games would they win? Explain your answer.

Based on the evidence above we would expect a proportion of $\frac{10}{15}$.

10 wins for every 15 games.

5. Name a sum that would be impossible to get while playing the game.

Any sum less than 2 or greater than 8

6. What event is certain to occur while playing the game?

A sum between 2 and 8

When you were spinning the spinner and recording the outcomes, you were performing a *chance experiment*. You can use the results from a chance experiment to estimate the probability of an event. In the example above, you spun the spinner 15 times and counted how many times the sum was greater than or equal to 5. An estimate for the probability of a sum greater than or equal to 5 is

$$P(\text{sum} \geq 5) = \frac{\text{Number of observed occurrences of the event}}{\text{Total number of observations}}$$

Probability of sum $\geq 5 =$

7. Based on your experiment of playing the game, what is your estimate for the probability of getting a sum of 5 or more?

$$P(\text{sum} \geq 5) = \frac{10}{15} = 0.66 \approx 66\%$$

8. Based on your experiment of playing the game, what is your estimate for the probability of getting a sum of exactly 5?

$$P(\text{sum} = 5) = \frac{4}{15} = 0.26 \approx 26\%$$

Example 2: Animal Crackers

A student brought a very large jar of animal crackers to share with students in class. Rather than count and sort all the different types of crackers, the student randomly chose 20 crackers and found the following counts for the different types of animal crackers. Estimate the probability of selecting a zebra.

Lion	2
Camel	1
Monkey	4
Elephant	5
Zebra	3
Penguin	3
Tortoise	2
Total 20	

$$P(\text{zebra}) = \frac{3}{20} = 0.15 = 15\%$$

~~$$\frac{500}{20} = 25$$~~

~~$$\frac{1500}{20} = 75$$~~

$$75 = 2$$