

Solutions

1. A die is rolled once and turns up a 4. Which statement is true about rolling a 3?

- A The experimental probability is 0 and the theoretical probability is $\frac{1}{6}$.
- B The experimental probability is 1 and the theoretical probability is $\frac{1}{6}$.
- C The experimental probability is $\frac{1}{6}$ and the theoretical probability is $\frac{1}{6}$.
- D The experimental probability is 1 and the theoretical probability is 1.

→ A

After one roll

$$\Rightarrow P(3) = \frac{0}{1} = 0$$

Theoretically

$$P(3) = \frac{1}{6}$$

2. Which of the following statements is true?
- A Experimental probability is always equal to theoretical probability.
 - B Experimental probability approaches theoretical probability when a very large number of trials are carried out.
 - C Experimental probability is always a more reliable predictor than theoretical.
 - D Theoretical probability is always a more reliable predictor than experimental.

→ B

The larger the sample size, the closer the two types of probability should be in value.

5. Suppose you rolled two 8-sided dice, each having values from 1 to 8 on their faces.
- a) What sums are possible? What is the theoretical probability of rolling each sum?
 - b) Sketch a bar graph showing the theoretical probability of rolling each sum.
 - c) Conduct a large number of trials of this probability experiment using a simulation tool or strategy of your choice. Discuss how the statistical and theoretical probabilities compare over:
 - a few trials
 - a very large number of trials
 - d) About how many trials did it take for the statistical and theoretical probability values to agree closely?

		Die 2							
		1	2	3	4	5	6	7	8
Die 1	1	2	3	4	5	6	7	8	9
	2	3	4	5	6	7	8	9	10
	3	4	5	6	7	8	9	10	11
	4	5	6	7	8	9	10	11	12
	5	6	7	8	9	10	11	12	13
	6	7	8	9	10	11	12	13	14
	7	8	9	10	11	12	13	14	15
	8	9	10	11	12	13	14	15	16

a) sums of 2 → 16

$$P(2) = \frac{1}{64}$$

$$P(3) = \frac{2}{64} = \frac{1}{32}$$

$$P(4) = \frac{3}{64}$$

$$P(5) = \frac{4}{64} = \frac{1}{16}$$

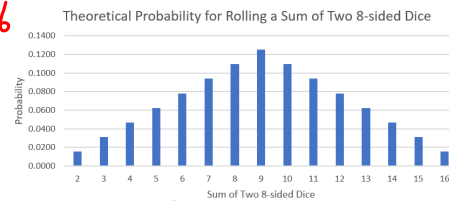
$$P(6) = \frac{5}{64}$$

$$P(7) = \frac{6}{64} = \frac{3}{32}$$

$$P(8) = \frac{7}{64}$$

$$P(9) = \frac{8}{64} = \frac{1}{8}$$

$$P(10) = \frac{7}{64}$$



$$P(11) = \frac{6}{64} = \frac{3}{32}$$

$$P(12) = \frac{5}{64}$$

$$P(13) = \frac{4}{64} = \frac{1}{16}$$

$$P(14) = \frac{3}{64}$$

$$P(15) = \frac{2}{64} = \frac{1}{32}$$

$$P(16) = \frac{1}{64}$$

c) Few trials → poor match
 Very large number of trials → good match

d) Will be different every time.