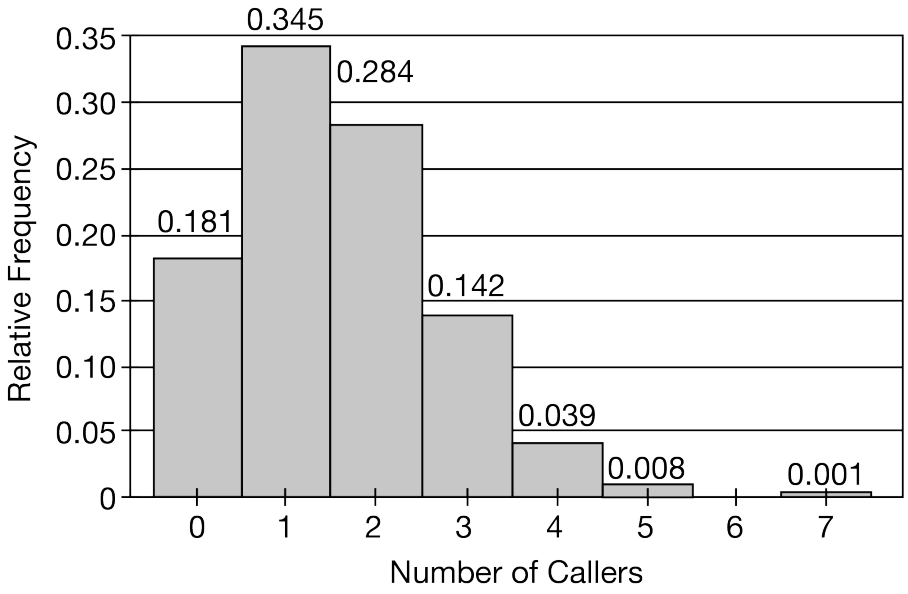
Estimating Probabilities Using Simulation Quiz

1. An online customer service department estimates that about 15 percent of callers have to wait more than 8 minutes to have their calls answered by a person. The department conducted a simulation of 1,000 trials to estimate the probabilities that a certain number of callers out of the next 10 callers will have to wait more than 8 minutes to have their calls answered. The simulation is shown in the following histogram.



Based on the simulation, what is the probability that at most 2 of the next 10 callers will have to wait more than 8 minutes to have their calls answered?

(A) 0.150

(B) 0.190

(C) 0.474

(D) 0.526

(E) 0.810 ✓

Answer E

Correct. The phrase "at most 2" means 0, 1, or 2. The sum of the relative frequencies for the bars corresponding to 0, 1, and 2 callers is $0.181 + 0.345 + 0.284 = 0.810$.

2. Mateo plays on his school basketball team. From past history, he knows that his probability of making a basket on a free throw is 0.8. Suppose he wants to create a simulation using random numbers to estimate the probability of making at least 3 baskets on his next 5 free throw attempts. Which of the following assignments of the digits 0 to 9 could be used for the simulation?

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(A) Let the even digits represent making a basket and the odd digits represent not making a basket.

(B) Let the digits 0 and 1 represent making a basket and the digits from 2 to 9 represent not making a basket.

(C) Let the digits from 0 to 3 represent making a basket and the digits from 4 to 9 represent not making a basket.

(D) Let the digits from 0 to 6 represent making a basket and the digits from 7 to 9 represent not making a basket.

(E) Let the digits from 0 to 7 represent making a basket and the digits 8 and 9 represent not making a basket. ✓

Answer E

Correct. The eight digits 0 to 7 represent 80% of the 10 digits. This matches Mateo's probability of making a basket.

3. Joslyn performed an experiment using a die with its faces numbered from 1 to 6. She rolled the die and recorded whether the 5 landed face up. She repeated the process many times and kept a cumulative record of the total number of rolls and the total number of 5s landing face up. The following table shows part of her record.

Total Number of Rolls	Total Number of 5s
5	1
10	2
15	2
20	3

Suppose Joslyn could roll the die 10,000 times and keep a record of the total number of 5s landing face up in the 10,000 rolls. What would such a record illustrate?

(A) The conditional probability rule

(B) The multiplication rule

(C) The addition rule

(D) The law of large numbers ✓

(E) The property of mutually exclusive events

Answer D

Correct. As the number of repetitions increases, the relative frequencies of the 5 landing face up out of the total number of rolls will approach the theoretical probability of $\frac{1}{6}$.