

## P Chapter 4 Project

### Law of Large Numbers

This project is designed to be completed in groups, but it may be completed by an individual. Each group is to follow the steps below using a standard six-sided die.

**Step 1:** Calculate the probability of rolling a single die and getting a four. Round the probability to four decimal places.

$$\text{Probability} = \frac{\# \text{ of ways of getting a four}}{\# \text{ of ways to roll a die}} = \boxed{\phantom{0.1667}}$$

**Step 2:** Each group member is to roll a die ten times and record the outcomes. Compile the outcomes for all group members, and compute the proportion of the group's rolls that were fours. Round the proportion to four decimal places.

$$\begin{aligned} \text{Proportion of group rolls that were fours} &= \frac{\text{Total \# of group rolls that were fours}}{\text{Total \# of group rolls}} \\ &= \boxed{\phantom{0.1667}} \end{aligned}$$

**Step 3:** This time, each group member is to roll a die an additional 40 times, for a total of 50 rolls per person. Again, combine the outcomes for all group members, and compute the proportion of the group's rolls that were fours. Round the proportion to four decimal places.

$$\begin{aligned} \text{Proportion of group rolls that were fours} &= \frac{\text{Total \# of group rolls that were fours}}{\text{Total \# of group rolls}} \\ &= \boxed{\phantom{0.1667}} \end{aligned}$$

**Step 4:** Let's combine the information from all groups in order to look at the results for the class as a whole. On the board, make a chart with one column for "number of fours" and one for "number of rolls." Fill in the chart with the information from each group.

Number of Fours	Number of Rolls

Using this information, calculate the proportion of all rolls for the class that were fours. Round the proportion to four decimal places.

$$\begin{aligned} \text{Proportion of class rolls that were fours} &= \frac{\text{Total \# of class rolls that were fours}}{\text{Total \# of class rolls}} \\ &= \boxed{\phantom{000000}} \end{aligned}$$

**Step 5:** Let's evaluate the results of this experiment. Compare the proportions calculated in [Steps 2, 3, and 4](#). You should see that as the number of times the dice were tossed increases, the proportion of fours rolled becomes closer to the probability calculated in [Step 1](#). This is precisely what the Law of Large Numbers says: the greater the number of trials, the closer the experimental probability comes to the classical probability. In fact, if it were possible to complete an infinite number of die tosses, the proportion of all rolls that were fours would indeed be equal to the classical probability.