

Probability

1. Two players take turns rolling a die. They keep score by adding the number rolled to each score. The game ends when the same number is rolled twice in a row. The winner is the player with the highest score when the game ends. How many rolls are in the shortest possible game? How many rolls are in the longest possible game? What is the average score expected? Use a simulation to determine the answer to the last question.



2. Five prisoners are each kept in a separate cell, and not permitted to communicate. There is also a lounge, with books, videos, and exercise machines. Every day, the warden picks a prisoner at random, and that prisoner may spend the day enjoying the lounge. Once prisoners are sure that everyone has been to the lounge at least one, they may declare this fact to the warden. If they are correct, they will all be released. If they are wrong, they will never be released.
 - a) Use cards or other counters to represent the prisoners. Develop a simulation to determine who is chosen at random to spend the day in the lounge.
 - b) Run your simulation, and determine how long it takes before all five prisoners have been to the lounge.
 - c) Repeat your simulation several times, and gather data on the length of time it takes for all of the prisoners to have visited the lounge at least once. Use grid paper and display your data on a graph.
 - d) Use your data to advise the prisoners on how long they should wait to be reasonably sure that they will be released. Justify your advice.

For information about which type of graph to use for displaying data, follow the web links on the same page where you found this file on the *MathLinks 8* Online Learning Centre.

3. Is it more likely that a boy has a sister, a girl has a sister, or are the probabilities of both outcomes the same?
 - a) Consider a family with two children. Write the different possibilities. Determine the average number of sisters per boy, and the average number of sisters per girl.
 - b) Extend your analysis to families with three children.
 - c) Extend your analysis to families with four children.

- d)** Combine the data from parts a) to c) to determine the average number of sisters per boy, and the average number of sisters per girl for these three types of families. What do calculations show about the likelihood of a boy having a sister compared to a girl having a sister?