Probability

1. Five prisoners are each kept in a separate cell, and not permitted to talk to each other. There is also a lounge, with books, videos, and exercise machines.
   • Every day, the warden picks 1 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 once, 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 find how long it takes before all 5 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 to display your data on a graph.

   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 Adapted* Online Learning Centre.

   d) Use your data to advise the prisoners on how long they should wait to be reasonably sure that they will be released. Give 1 reason for your answer.

   _____

   _____

   _____

   _____

   _____

Day	Chosen Prisoner	All 5 Prisoners Chosen (YES or NO)
1		
2		
3		
4		
5		
6		

2. 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 2 children.
        • Write the different possibilities.
        • Find the average number of sisters for each boy, and the average number of sisters for each girl.

    b) Consider a family with 3 children.
        • Write the different possibilities.
        • Find the average number of sisters for each boy, and the average number of sisters for each girl.

    c) Consider a family with 4 children.
        • Write the different possibilities.
        • Find the average number of sisters for each boy, and the average number of sisters for each girl.

    d) Combine the data from parts a) to c) to find the average number of sisters per boy, and the average number of sisters per girl for these 3 types of families. What do calculations show about the likelihood of a boy having a sister compared to a girl having a sister?