

Work in small groups to solve these problems. If you can find space, please write your answers on the whiteboard.

1. **Three prisoners** Three prisoners A, B, and C are on death row. The governor decides to pardon one of the prisoners and chooses one at random. He informs the warden of his choice but requests that the name be kept secret.

The next day, A tries to get the warden to tell him who had been pardoned. The warden refuses. A then asks which of B and C will be executed. The warden thinks for a while and then tells A that B is to be executed. A's sighs in relief and says, "The chance of me being pardoned has risen to $\frac{1}{2}$!" Is A correct? Explain why or why not using the rules of probability.¹

¹This problem adapted from Casella and Berger.

2. **Monty Hall** Welcome to *Let's Make a Deal!* You are on this famous game show hosted by Monty Hall. You have a chance to win a brand new car! Here's the rules of the game.²

Assume that a room is equipped with three doors. Behind two are goats, and behind the third is a shiny new car. (The location of the car is chosen uniformly at random.) You are asked to pick a door, and will win whatever is behind it. Let's say you pick door 1. Before the door is opened, however, someone who knows what's behind the doors (Monty Hall) opens one of the other two doors, revealing a goat, and asks you if you wish to change your selection to the third door (i.e., the door which neither you picked nor he opened). The Monty Hall problem is deciding whether you do.

Suppose that you choose door 1, Monty chooses door 2. Use Bayes' rule to derive a probability distribution for the location of the car. (To simplify things, you can assume that you always choose door 1 and focus on two random variables, the location of the car C and Monty's choice M .)

3. Is it significant that Monty knows what's behind the doors?

²from Mathworld <http://mathworld.wolfram.com/MontyHallProblem.html>