Worksheet #1

1. \[ x \cdot y \cdot z = 36 \]
   \[ x + y + z = 11 \cdot n \]
   Let \( x = 2 \), \( y = 3 \) and \( z = 6 \)

2. Mint, Candy, Mixed

3. Chocolate

=> Assuming 2 mints are selected from the mint box and 2 chocolates are selected from the chocolate box, then the last box is a mixed box.

The least number of candies to select to be able to select label the boxes are 3.
2. Correct answer:

Key: Incorrectly labelled.

Answer is 1.

3. Flip two on and off, one off at a time later.

If the bulb - Open the door.
Then feel the temperature of the bulb to determine which is which.

5. Freedom Captivity

A: Which door would the other person choose for freedom?
Note to the students: Your role in this course is to solve the problems presented in class. Feel free to work out of order - sometimes the problems you will understand and be able to complete first will happen later in the problem sequence. However, when working on later problems, remember things that have already been solved - sometimes they provide hints about how to proceed with later problems.

The purpose of these notes, worksheets, and homework problems is to guide you on a path towards critical thinking - by the end of the course, you should be able to write clear and concise solutions to the problems posed (it is your instructor’s job to provide you with feedback about your writing), be able to critically examine solutions posed by other students, and, therefore, critically evaluate your own solutions. This last is the most difficult of all - it is easy to convince yourself that your solution works, but will it convince others? Having a critical eye for your own work is a necessary and challenging skill to develop.

One of the best skills that you can learn as a student is to ask good questions. For this course, you should be asking good questions of your instructor, your colleagues (in the appropriate forum as indicated by your instructor), and (mostly importantly) yourself.

Good luck and enjoy!

Worksheet #1

1. A man has three daughters. The product of their ages is 36, and the sum of their ages is his house number. His oldest daughter plays the piano. How old are the daughters?

2. There are three boxes of candy. One box contains mint candies, one chocolate candies, and the other is mixed. All three boxes are incorrectly labeled. What is the smallest number of candies that you need to remove and sample to be able to correctly label all three boxes?

3. A sealed room contains one light bulb. Outside of the room, there are three switches, only one of which operates the bulb. You are outside the room, able to operate the switches in any way you see fit, but when the door is opened for the first time, you must determine which switch operates the light. What do you do?

4. Describe how one can use a four-minute hourglass and a seven-minute hourglass to measure a period of nine minutes.

5. Two doors are guarded by two men, one of whom always lies and one of whom always tells the truth; however, you do not know which man is which. One of the doors leads to freedom and one to captivity. Determine a single question that, if asked of one of the guards, would reveal the door to freedom with certainty.
6. Some number of coins are spread out on a table. They lie either heads up or tails up. Unfortunately you are blindfolded and thus both the coins and the table upon which they sit are hidden from view. Certainly you can feel your way across the table and count the total number of coins on the table’s surface, but you cannot determine if any individual coin rests heads up or down (perhaps you are wearing gloves). You are informed of one fact (beyond the total number of coins on the table): Someone tells you the number of coins that are lying heads up. You can now rearrange the coins, turn any of them over, and move them in any way you wish, as long as the final configuration has all the coins resting (heads or tails up) on the table. Your challenge is to turn over whatever coins you wish and divide the coins into two collections so that one collection of coins contains the same number of heads up coins as the other collection contains.

7. A drawer contains unsorted black, brown, blue and grey socks. How many socks must be chosen in order to be certain of choosing 2 of the same color?

8. You find yourself on a reality TV show that has you completing with other real people in totally artificial circumstances. In one scenario, you are given nine balls of clay. You are informed by the program’s B-celebrity host that hidden inside one of those clay balls is a key that will unlock a refrigerator that houses a vast quantity of food. Since the producers “thought” the ratings would be higher if the contestants were deprived of nutrition, even the thought of brussel sprouts makes your mouth water. You are told that the eight balls that do not contain the key to your dietary dreams all weigh the same. The special ball with the key insider weighs slightly more, but not enough for you to feel the difference by holding the balls in your hand. One of the program’s sponsors, Replace-Oh!, the company that manufactures one-time-use balance scales (with the slogan “Weigh aweigh then throw away!”), has agreed to provide some of its scales in exchange for a few shameless plugs throughout the program. Their scales will tell which side is heavier and then instantly self-destruct. You are only allowed to break open one clay ball to see if you can find the refrigerator key. Your challenge is to determine the fewest disposable balance scales required to guarantee that you can identify the ball with the key.