



## Problem of the Week

### Problem B and Solution

#### Luck of the Draw

#### Problem

James' classroom is organizing a draw to give out a prize which is a "MATHIE" T-shirt. Possible ways to organize the draw are presented below.

- Tiles with the whole numbers from 0 through 9 are thrown into a hat. Each tile has a single digit on it. Each digit is represented exactly once. Without looking, you reach in and draw out one tile. You will win the draw if you pull out a 9. What is the probability of winning this draw?
- Tiles with the letters A through Z are thrown into a hat. Each tile has a single letter on it. Each letter is represented exactly once. Without looking, you reach in and draw out one tile. You will win the draw if you pull out an X or a Z. What is the probability of winning this draw?
- Tiles with the whole numbers from 1 through 4 are thrown into a hat. Each tile has a single digit on it. Each digit is represented exactly once. Without looking, you reach in and draw out two tiles. You will win if your two tiles, placed side-by-side, can form the number 13. What is the probability of winning this draw?
- Which of the above draws has the greatest probability of winning the T-shirt?

#### Solution

- There are 10 tiles (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) so the probability of drawing a 9 and winning is 1 in 10, or  $\frac{1}{10}$ .
- There are 26 tiles, each with one letter of the alphabet. You are hoping to draw an X or Z. Since there are two possible successful outcomes, the probability of winning is 2 in 26, or  $\frac{2}{26} = \frac{1}{13}$ .
- There are six possible combinations of two numbers that you could draw. They are; 1 and 2, 1 and 3, 1 and 4, 2 and 3, 2 and 4, or 3 and 4. To form the number 13 you need to draw the 1 and the 3. Thus the probability of winning is 1 in 6, or  $\frac{1}{6}$ .
- If you take a whole number and divide it in equal sections, then the size of each section gets smaller as the number of sections increases. (For example:  $\frac{1}{2} > \frac{1}{3}$ , and  $\frac{1}{5} > \frac{1}{10}$ .) Therefore, using the probabilities  $\frac{1}{10}$ ,  $\frac{1}{13}$  and  $\frac{1}{6}$ , the fraction with the smallest denominator is the greatest. Therefore the draw in c) will have the greatest probability of winning with a probability of  $\frac{1}{6}$ .

