# Cluster IV

## Data Analysis, Probability, and Discrete Mathematics

### Probability

When we say that one event is more probable than another, we mean it is more likely to happen. If a person tosses a coin, there are only two ways it can fall—heads or tails. The coin is as likely to fall one way as the other. Thus the probability of getting a head is $\frac{1}{2}$ (theoretical probability). If a coin is tossed 100 times and $x$ is the number of times heads occurs, we can expect the ratio $\frac{x}{100}$ to be close to $\frac{1}{2}$ (experimental probability).

Definitions:

***Experimental probability*** is the probability of an event based on the result of an experiment.

***Theoretical probability*** is the expected probability.

The probability that an event will occur is somewhere between 0 and 1.

**A probability of 0 means that it is impossible for an event to occur**.

*Example 1.* There are 12 blue and 6 red marbles in a bag. What is the probability of picking a yellow marble from the bag?

*Solution:* $\text{P(event)} = \frac{\text{number of favorable outcomes}}{\text{total number of possible outcomes}}$; $\text{P(yellow)} = \frac{0}{18} = 0$

**A probability between 0 and 1 means that an event is possible.**

*Example 2.* In example 1, what is the probability of picking a blue marble?

*Solution:* $\text{P(event)} = \frac{\text{number of favorable outcomes}}{\text{total number of possible outcomes}}$; $\text{P(blue)} = \frac{12}{18} = \frac{2}{3} = 0.67$