Module 3
Data Types, Variables, and Constants

# Lecture
Bits and Bytes

Module 3 Learning Objectives

Bloom Level	Number	Name	Description	Course Learning Objectives
3: Apply	1	Given Types	Develop a console application that uses specified data types	Basic Programming Concepts
3: Apply	2	Selected Types	Develop a console application that uses programmer-selected data types	Basic Programming Concepts
2: Understand	3	Data Type Comparison	Compare and contrast different C# data types	Basic Programming Concepts
3: Apply	4	Calculations	Develop a console application that uses variables and constants for calculations	Basic Programming Concepts

- Why do we care?
- 1s and 0s to represent anything, so computers are powerful
- But how many bits do we need to represent something?

Christmas morning, my family was trying to decide who of the 4 of us (one of my sons wasn't there yet) would get to open the first present using coin flips. My son (another computer scientist) and I came up with one answer while the non-computer scientists came up with another answer.
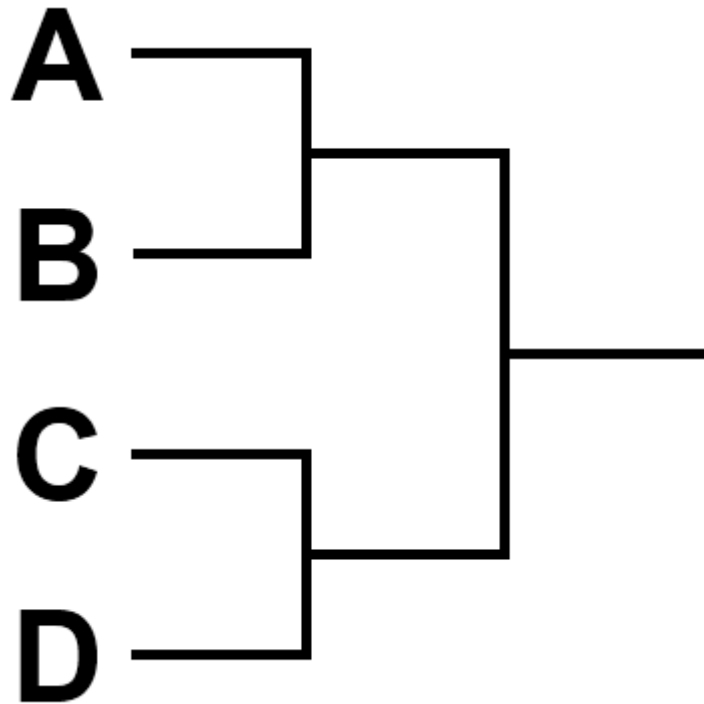
- Treat it like a tournament
- 3 flips
- Flip 1: Person A vs Person B
- Flip 2: Person C vs Person D
- Flip 3: Winner of Flip 1 vs Winner of Flip 2

00
A

01
B

10
C

11
D

- Use the power of binary!
- 2 flips
- 0 for tails, 1 for heads
- 00: Person A wins
- 01: Person B wins
- 10: Person C wins
- 11: Person D wins

$$n = 2^b$$

We need b bits to represent n distinct things

- Recap
  - n = 2b
  - b = log2n
- Next Time
  - Ones and Zeros