

## Lesson 01 – The Bit

- a. The Bit
  - i. Picture of Binary Code
    1. Ask Students if they know what this is.
      - a. Streams of Binary Digits
      - b. Computer Code
      - c. Each one of these is a bit
  - ii. Video: Tron Bit
  - iii. Examples of Bits
    1. 0/1
      - a. Look at the On/Off Switch
      - b. Used to be 1/0, a binary state for On/Off
      - c. Now 1 in a broken 0, for hibernate
  - iv. Unary Number System (Base-2)
    1. We work in a Base-10 number system
      - a. We count from zero to nine, and then we reset to 0 again and add a one in front of it. What is this 1 called? The tens place.
      - b. If I count from zero to nine again in the ones place, the one in the tens place becomes two. If we count all the way up to 9 in the tens place and 9 in the ones place, what happens next?
      - c. Both reset to zero and we put a one in the... what's this place? Hundreths place.
      - d. Thousandths place, Millionths place, Billionths place, etc.
      - e. So that's a Base-10 number system.
    2. Binary is a Base-2 number system
      - a. We start at zero, count to one, add one to that, and what do you think happens?
      - b. It resets to zero and we put a one in front of it.
      - c. This one was the tenths place in Base-10, what is it in Base-1? The twos place.
      - d.  $10 = 2$
      - e.  $100 = 4$
      - f.  $1000 = 8$
      - g. 1, 2, 4, 8, 16, 32, 128, 256, 512, 1024
      - h. What's missing here? How do we show the number three or five?
        - i.  $011 = 3$
        - j.  $101 = 5$
  - v. Exercise: Count in Binary on Your Hands
    1. Demonstrate Counting
      - a. Thumb is 1
      - b. Forefinger is 2
      - c. Thumb and forefinger is three
      - d. What's two plus two? (Middle finger)
        - i. Goodnight Everybody.

2. Everyone count with me (1 to 32)
  3. How many numbers can you represent with your two hands?
    - a. If 1023:
      - i. You can count up to 1023, but you can represent 1024 numbers with both hands, why is that?
      - ii. What number did we forget?
      - iii. Zero.
      - iv. What just happened is known as the “Off By One” error. It’s a mistake we make in programming all the time.
      - v. You know the number zero was invented by...
  4. So that’s Base-2, and there are other Base number systems too. Base-6, Base-8, Base-12, Base-16.
    - a. The ancient Babylonians, who lived 5,000 years ago, used a Base-60 number system.
    - b. My favorite is Base-12.
      - i. 12 is divisible by 1,2,4,6, and 12
      - ii. While 10 is divisible by 1,2,5,10
      - iii. We represent base twelve by counting 1,2,3...9, A, B, 10 (12)
      - iv. With so many options for Base number systems, why do you think we use Base-10?
- b. Measuring Data
- i. Byte
    1. Eight Bits
    2. Exercise:
      - a. Create a Text File
      - b. Right Click > Properties
      - c. 0 Bytes
      - d. Open it, Type a single character, Save
      - e. 1 Byte
      - f. BBS Days: Bytes were the Currency
      - g. ASCII Byte Codes
  - ii. Kilobyte
    1. Word Document.
    2. Image File
  - iii. Megabyte
    1. MP3
  - iv. Gigabyte
    1. A Movie or Game
  - v. Terabyte
    1. The Library of Congress (LOC) (20 Terabytes)
  - vi. Petabyte
    1. The Amount of Data the Human Race Produces each year
    2. X LOCs

- c. Bits, Bytes, Kilobytes and Megabytes are what make up the Universe of Information Technology
  - i. Video: Powers of 10, Relate to Bits, Bytes, and Megabytes
- d. Housekeeping:
  - 2. Pick a password
    - a. 8-12 Characters
    - b. Must include numbers
    - c. Must include one special character
    - d. Give me your password, so in case you forget it
  - 3. Lab: Set Up an E-mail Account
    - a. Send the teacher an e-mail