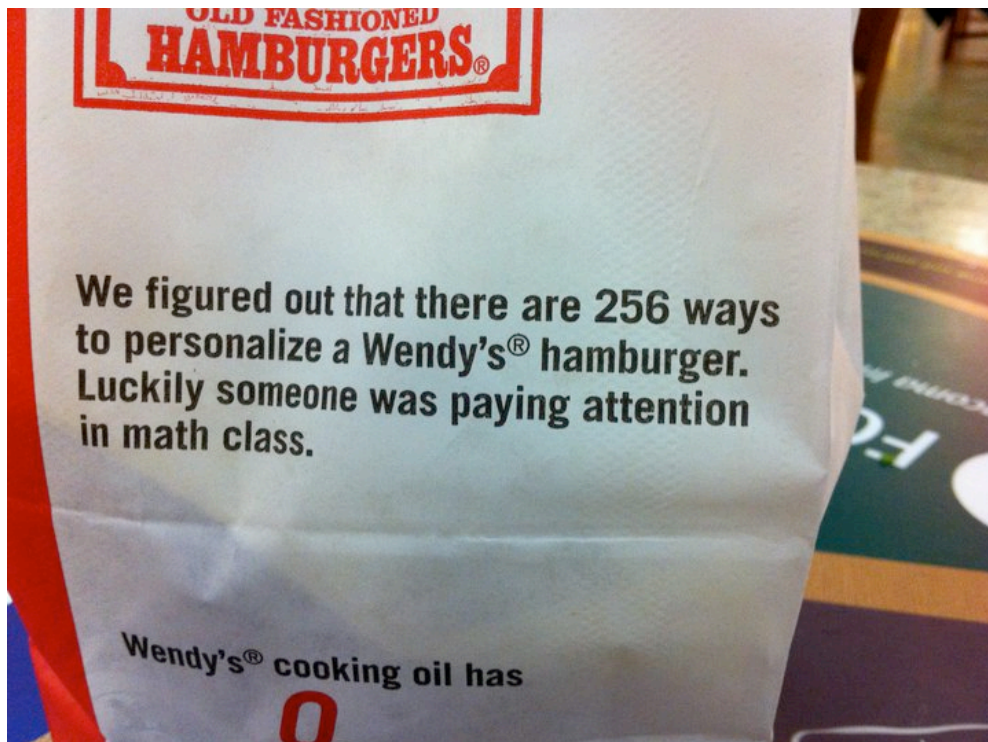


University of California, San Diego  
Dept. of Computer Science and Engineering  
CSE 30 – Computer Organization and Systems Programming  
Problem Set #1

1. **(10 points)** If you can represent 1 K “things” with 10 bits and 16 M “things” with 24 bits, how many (K, M, G, T, E, ...) “things” can you represent with:
  - a. 15 bits
  - b. 28 bits
  - c. 32 bits
  - d. 47 bits
  - e. 64 bits
  
2. **(5 points)** There are approximately 140 students in CSE 30 this quarter.
  - a. How many bits do you need to uniquely represent each student?
  - b. If 3 times as many students added into the class, how many bits would you need to uniquely represent each student.
  
3. **(5 points)** How many different things can you represent with  $N$  bits?
  
4. **(10 points)** I have  $N$  bits to represent data, and every bit pattern has a unique meaning. I want to represent 6 times as many things. How many additional bits do I need?
  
5. **(20 points)**



- a. **(5 points)** How many yes/no options (e.g., mustard/no mustard, lettuce/no lettuce, etc.) do you have to “personalize” your Wendy’s hamburger?
  - b. **(5 points)** If Wendy’s added two additional yes/no options, how many total ways would one now have to “personalize” your Wendy’s burger? Assume that these two options are totally independent of the 256 current ways of personalization.
  - c. **(5 points)** Assume that In-N-Out has  $N$  ways to personalize their burger. How many bits do they require to represent all of these personalization options?
  - d. **(5 points)** Knowing the secret In-N-Out menu expands the number of options by 17 times, i.e., there are  $17N$  ways to personalize your burger if you know the secret menu options. How many bits does this require?
6. **(10 points)** What are the hexadecimal values of each of the following binary numbers?
- a. 0101 0010
  - b. 0111 1001
  - c. 0110 0001
  - d. 0110 1110
7. **(10 points)** What are the ASCII values of each of the following binary numbers?
- a. 0101 0010
  - b. 0111 1001
  - c. 0110 0001
  - d. 0110 1110
8. **(10 points)** What are the decimal values of each of the following binary numbers if you interpret them as 2's complement integers?
- a. 1000 0101
  - b. 0001 0110
  - c. 0000 1101
  - d. 1111 1111
9. **(10 points)** What are the decimal values of each of the following binary numbers if you interpret them as unsigned integers?
- a. 1000 0101
  - b. 0001 0110
  - c. 0000 1101
  - d. 1111 1111
10. **(10 points)** What are the decimal values of each of the following binary numbers if you interpret them as 1's complement integers?
- a. 1000 0101
  - b. 0001 0110
  - c. 0000 1101
  - d. 1111 1111