Name:

CSE 1400 Applied Discrete Mathematics

Spring 2015 Week 2 Practice

1. List the elements in each of the finite sets $\mathbb{B}$, $\mathbb{D}$ and $\mathbb{H}$. These sets are called the bits, digits and hexadecimal numerals.
2. The symbols $\mathbb{N}$, $\mathbb{Z}$, $\mathbb{Z}_m$, and $\mathbb{Q}$ stand for common sets of numbers. (m is a natural number greater than 0.)
   (a) What are the names of these sets?
   (b) Give examples of values that are in and not in each of these sets.
   (c) How is set $\mathbb{Z}_m$ different than the rest?
   (d) How does *remaindering* map $\mathbb{Z}$ to $\mathbb{Z}_m$?
3. You are familiar with decimal notation. Numbers are written in positional form.
   (a) How are the positions of the digits in 2718 used to determine the value of the number?
   (b) How are the positions of the digits in 2.718 used to determine the value of the number?
4. I want to know you understand numbers written in binary notation too.
   (a) How are the positions of the bits in $(1101)_2$ used to determine the value of the number?
   (b) How are the positions of the bits in $(1.101)_2$ used to determine the value of the number?
5. So what is the *normal, decimal way* to write these hexadecimal values?
   (a) $(FED)_{16}$
   (b) $(F.ED)_{16}$
6. Numbers can be positive or negative. Sign-magnitude is the common way to write signed numbers. But, as explained in class, ten's complement notation leads to a more simple arithmetic.

   On a 4-digit computer two numbers $0 \leq n$, $m \leq 9999$ are negatives of each other if $n + m = 10,000$. The rule for mapping a ten's complement number $(n)_{10c}$ to a normal value is:

$$(n)_{10c} \mapsto n \quad \text{if } 0 \leq n \leq 4999$$
$$(n)_{10c} \mapsto n - 10,000 \quad \text{if } 5000 \leq n \leq 9999$$

   (a) What is the *normal (decimal)* value of $(3141)_{10c}$?
   (b) What is the *normal* value of $(6859)_{10c}$?
   (c) What is the *normal* value of the sum $(6859)_{10c} + (2718)_{10c}$
7. How many bit strings of length n are there?

   How many truth assignments can be made on n Boolean variables?

   A complete truth table for an n variables Boolean expression will have how many rows?
8. How many bit strings of length 2^n are there?

   In how many ways can 2^n expressions be map to `True` or `False`?

   In a truth table with 2^n row, how many different columns of 0's and 1's can be constructed?
9. Construct truth tables (or a single table) for the Boolean expressions: $(\mathrm{P} \wedge \mathrm{Q}) \Rightarrow \mathrm{R}$, $\mathrm{P} \Rightarrow (\mathrm{Q} \Rightarrow \mathrm{R})$, $\mathrm{P} \wedge (\mathrm{Q} \Rightarrow \mathrm{R})$, $(\mathrm{P} \Rightarrow \mathrm{Q}) \Rightarrow \mathrm{R}$. Are any of the expressions equivalent?

Total Points: 0 2015-01-19 to 2015-01-23