CSc 144 — Discrete Mathematics for Computer Science I
Spring 2023 (McCann)

http://u.arizona.edu/~mccann/classes/144

Homework #1

(50 points)

Due Date: January 27th, 2023, at the beginning of class

Directions

1. **This is an INDIVIDUAL assignment; do your own work! Submitting answers created by computers or by other people is NOT doing your own work.**
2. Start early! Getting help is much easier n days before the due date/time than it will be n hours before.
3. Write complete answers to each of the following questions, in accordance with the given directions. Create your solutions as a PDF document such that each answer is clearly separated from neighboring answers, to help the TAs easily read them. Show your work, when appropriate, for possible partial credit.
4. The questions that have section numbers are found in the Rosen text, available via D2L. Note that "(w,z)" is asking you to complete parts w and z only, not parts x and y.
5. If you have questions about any aspect of this assignment, help is available from the class staff via piazza.com and our office hours.
6. When your answers are ready to be turned in, do so on gradescope.com. Be sure to assign pages to problems after you upload your PDF. Need help? Visit https://help.gradescope.com/ and search for "Submitting an Assignment."
7. **Solutions submitted more than five minutes late will cost you a late day. Submissions more than 24 hours late are worth no points.**

Math Review:

1. (2 points) For each of the following expressions, what is the most precise relationship that exists between a and e? Assume that a through e are all integers.
   (a) $a = b \leq c = d \leq e$
   (b) $e = d \geq c > b \geq a$
2. (4 points) For each of the following decimal representations, determine the reduced fraction that represents the same value. (We didn't demonstrate how to do this in class, but Section A.2 in "Kneel Before $\mathbb{Z}^{\text{odd}}$" does.)
   (a) $0.\overline{68}$
   (b) $4.75\overline{2}$
3. (6 points) If $\mathcal{U} = \{a, b, c, d, e, f, g, h, i, j\}$, $L = \{b, c, e, g, h, j\}$, $M = \{c, f, h, i, j\}$, and $N = \{c, d, e, f, g, h\}$, what is the result of the evaluation of each of the following set expressions? (Recall: $\mathcal{U}$ is the universe.)
   (a) $\overline{M \cup N}$
   (b) $(L - M) \cup (L - N) \cup (M - N)$
   (c) $\mathcal{U} - (L \cup M \cup N)$

(Continued on the back . . .)

4. (6 points) Evaluate each of the following expressions, producing a single integer result for each.

   (a) $\sum_{i=0}^{4} i(i+1)+1$

   (b) $\sum_{m=0}^{2} \prod_{n=1}^{2} (m+n)$

5. (4 points) Evaluate each of the following expressions, producing a single result value for each.

   (a) $68 \,/\, 17$

   (b) $68 \setminus 17$

   (c) $68 \,\%\, 17$

   (d) $68 \mid 17$

6. (2 points) What do we know to be true about the positive integers A and B if $A \equiv B \pmod 1$, beyond the fact that they are congruent modulo 1?

7. (6 points) Evaluate each of the following expressions, producing as reduced a result as possible.

   (a) $\frac{(a^2)^3}{a^3} \cdot \frac{(bc)^3}{c^3}$

   (b) $\log_4(2^{16})$

   (c) $\frac{\log_9 64}{\log_9 4}$

8. (8 points) Perform each of the following base conversions.

   (a) Convert 89_{10} to Base 2 (Binary).

   (b) Convert 10011101101110_2 to Base 8 (Octal) and to Base 16 (Hexadecimal).

   (c) Convert 6533_7 to Octal.

Propositional Logic: (See the directions for information on how to locate these questions.)

9. (2 points) Section 1.1, 2(b,e)

10. (2 points) Section 1.1, 8(a,c)

11. (2 points) Section 1.1, 10(d)

12. (2 points) Section 1.1, 14(d)

13. (4 points) Section 1.1, 22(a,d)