A hardcopy of your answers must be submitted to me at the beginning of class on the due date. Late assignments are not accepted. Electronic copies of the assignment are not accepted. The point value for each answer is given in brackets [ ].

A reasonable level of professionalism on submitted homework assignments is expected. This includes:
1. Your name at the top of every page of the assignment.
2. Paper size should be on standard typewriter paper, 8.5 x 11 inches, or standard notebook size, approx. 8 x 10.5 inches. You are permitted to type some answers and handwrite others if you prefer.
3. All pages stapled (preferred) or paper clipped, not folded at the corner.
4. If handwriting your answers, the ink or pencil should be dark, legible and of a normal size print (please do not write very small). Use navy blue (some kind of dark blue) or black ink if using a pen; do not write text with a highlighting pen.
5. The problems should appear in the order of the assignment and numbered accordingly. Grading your answers should not require leafing through pages or searching for your answers out of order.
6. Scribble is not professional. You may use pencil so that you can erase providing your print is dark.
7. If you are typing your answers, make certain the font is readable and LARGE; i.e. your font size should be size 12. A good font to use is Calibri.
8. The ratted edges of paper that remain after tearing paper from a spiral notebook is not acceptable.

Questions:
1. [3] Note, the table size is 10 in this question. You will show your final hash table. This is not a good table size because it is not a prime number. It is being used for easy computation and to obtain some collisions. Given ordered input {4371, 1323, 6173, 4199, 4344, 9679, 1989} and a hash function \( h(x) = x \mod (10) \), show the resulting
   a. separate chaining hash table
   b. hash table using linear probing
   c. hash table using quadratic probing
2. [3] Cuckoo Hashing Question. Consider hash function \( h_1(x) = (x \mod 7) \mod 5 \) and hash function \( h_2(x) = (x + 3) \mod 5 \). Given the ordered input { 34, 48, 18, 7, 47, 14, 12 },
   a. give the hash values for each input value
   b. show the final resulting hash tables (if a cycle occurs, note this)
   c. Assuming random input keys \( x \), why is hash function 1, \( h_1(x) = (x \mod 7) \mod 5 \), not a good hash function? Briefly explain.
4. [2] Show the result of inserting 15, 8, 7, 4, 20, 22, 11, 12, 3
   a. One at a time into an initially empty binary minheap
   b. By using the linear-time algorithm to in chapter 6 to build a binary minheap
5. [1] Explain the following regarding the maximum item in the minheap:
   a. It must be at one of the leaves.
   b. Every leaf must be examined to find it.