CSU200 Discrete Structures	Profs. Aslam & Fell
Fall 2005	October 27, 2005

Homework 03

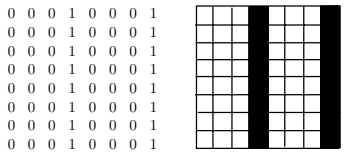
Assigned: Thu 27 Oct 2005
Due: Thu 03 Nov 2005

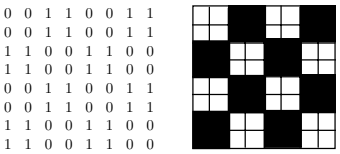
Instructions:

- The assignment is due at the *beginning* of class on the due date specified, i.e., 10:30am for Prof. Fell's section and 1:35pm for Prof. Aslam's section. Late assignments submitted within 24 hours of the official due date and time will receive a 20% penalty. Additional 10% penalties will be assessed in each subsequent 24 hour period, up to a maximum of 50% as stated in the course information sheet. Late assignments *will not be accepted* after the solutions have been distributed.

Problem 1 [36 pts, (24,12)]**:** Patterns.

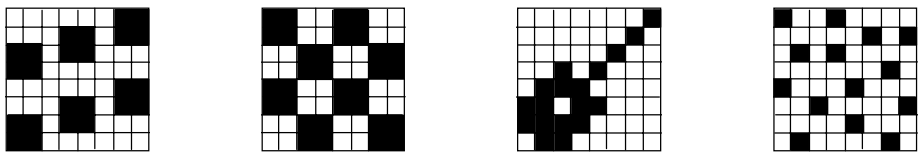
Patterns, like the ones above, are available in most drawing programs for filling regions. A pattern is defined by an 8×8 array of bits. In each of the following two examples, the 8×8 array of bits on the left corresponds to the pattern on the right.





The 0s represent white, and the 1s represent black. Each row is an 8-bit binary number. As we know, a 4-bit binary number can be expressed as a single hex-digit, so an 8-bit binary number can be expressed with two hex-digits. Designers specify a pattern by giving eight 2-hex-digit numbers, one 2-hex-digit number per row. The two patterns given above are encoded as "11, 11, 11, 11, 11, 11, 11, 11" and "33, 33, CC, CC, 33, 33, CC, CC."

i. For each of the following patterns, give the eight 2-hex-digit encoding.



ii. Use graph paper to show the pattern described by each of the following sequences of eight 2-hex-digit numbers. (See written Homework 01 for a link to printable graph paper.)

39, 7B, 42, 88, 88, 24, B7, 93 BD, A3, DB, 3A, BD, A3, DB, 3A

Problem 2 [64 pts, (24,24,16)]**:** Negative numbers and two's complement.
Read the on-line handout on representing positive and negative integers using two's complement, and then complete the following exercises. You *must* show your work to obtain full credit.

i. Give the 8-bit two's complement representations of the following integers: 43, 77, -17, -23.

ii. Give the integer (in standard base-10 notation) which is represented by each of the following 8-bit two's complement numbers: 01011010, 10101010, 00110011, 11001100.

iii. Compute the following sums and differences using 8-bit two's complement representations as shown in the on-line handout: $77 - 17$, $-17 - 23$. Verify that your answers are correct by converting the results back to standard base-10 notation.

Note: Use the two's complement representations from part i above.