Institut for Matematik og Datalogi
Syddansk Universitet

Assignment 1 — Introduction to Computer Science 2013

This is your first assignment in DM534. The assignment is due at 8:15 on Friday, October 11. You may write this either in Danish or English. It must be made in LaTeX. (though you do not need to include your LaTeX code). Write your full name, your section number, and your "instruktor"s name (Uffe Thorsen or Magnus Gausdal Find) clearly on the first page of your assignment (on the top, if it's not a cover page). You should turn in both a paper copy of this assignment (to Uffe Thorsen's mailbox, which is among all the "instruktor"s mailboxes) and an electronic version as a PDF file via Blackboard through your DM534 course. The assignment hand-in is in the menu for the course and is called "SDU Assignment". Keep the receipt it gives you proving that you turned your assignment in on time. Blackboard will not allow you to turn in an assignment late.

Cheating on this assignment is viewed as cheating on an exam. You are allowed to talk about course material with your fellow students, but working together on this assignment is cheating. If you have questions about the assignment, come to Joan Boyar or your "instruktor" for DM534.

Please note that you must have this assignment approved in order to pass DM534. If it is not turned in on time, or if you do not get it approved, it will count as one of your two retries in the course, and you must have it approved on your only allowed retry for this assignment.

Assignment 1

Do the following problems and write your solutions in LaTeX. (Do not include the statements of the problems or other information not asked for in the problems, but show your work.)

1. Convert 10110100 from two's complement to its equivalent base ten form.

2. Decode 10111101 from the floating-point representation described in class (and on the notes for the lecture on September 5).

3. Encode 5/32 into the floating-point representation described in class (and on the first weekly note).

4. Write a program in the machine language from Appendix C which will read values stored in two memory cells `C2` and `C3`, and then create a new value which is the same as the value in `C3`, except for the fifth and sixth bits (not the two least significant, but the next two) of the value which should be the complements of the two high order bits of `C2`. For example (note this is only an example — your code should work more generally), if 11101100 is in `C3` and 01001101 is in `C2`, then the result should be 11101000. Store the result in memory cell `B3`. Write the instructions in hexadecimal, and also write down the meaning of the opcodes. Comment your code.

5. Consider the problem of walking down a narrow aisle in a grocery store with a grocery cart. Suppose the aisle is not wide enough for two grocery carts to pass each other. A deadlock can occur if two people try to go down the aisle from opposite directions and meet each other. Explain how the three conditions for deadlock are met.

   Describe an algorithm for this which avoids deadlock, but allows more than one person to be going in the same direction at the same time, following each other. Which of the three conditions does your algorithm avoid.