Institut for Matematik og Datalogi
Syddansk Universitet

Assignment 1 — Introduction to Computer Science 2015

This is your first assignment in DM534/DM558. The assignment is due at **8:15 on Thursday, October 1**. You may write this either in Danish or English. It must be made in LaTeX. Write your full name, your section number (D1, D2, or D3), and your "instruktor"s name (Kristine Vitting Klinkby Knudsen, Mathias W. Svendsen, or Jesper With Mikkelsen) clearly on the first page of your assignment (on the top, if it's not a cover page). You should turn it in as a PDF file via Blackboard through your DM534/DM558 course. The assignment hand-in is in the menu for the course and is called "SDU Assignment". Choose the correct one for your section number, D1, D2 or D3. 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/DM558.

Please note that you must have this assignment approved in order to pass DM534/DM558. 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 single 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/calculations.

1. Convert 10110011 from two's complement to its equivalent base ten form.

2. Decode 10110101 from the floating-point representation described in class (and on the notes for the lecture on September 8 — it is slightly different from what the textbook uses).

3. Encode -11/16 into the floating-point representation described in class (and on the notes for the lecture on September 8 — it is slightly different from what the textbook uses).

4. Write a program in the machine language from Appendix C which will read values stored in two memory cells `A3` and `A4`, and then create a new value which is the same as the value in `A3`, except for the fourth fifth and sixth bits (the least significant bit is the eighth bit) of the value which should be the complements of the first, second and third bits of `A4`:

   - the 4th bit in the result should be the complement of the 1st bit in A4
   - the 5th bit in the result should be the complement of the 2nd bit in A4
   - the 6th bit in the result should be the complement of the 3rd bit in A4

   For example (note this is only an example — your code should work more generally, for any values), if 11000100 is in `A3` and 01000101 is in `A4`, then the result should be 11010100.

   Your program should store the result in memory cell `B1`. Write the instructions in hexadecimal, and also write down the meaning of the opcodes. Comment your code. (Note that comments should tell more about what is happening than what one could just read from the instructions with their opcodes. They should make it easy for the reader to understand why those instructions work to do what you want.)

   Hint: Use masking. Explain how you use it.

5. Include your LaTeX code for this assignment at the end.