# CMSC 131 Lab, Notes Week 1, Wednesday

## Notes for TAs

* 1. Every week after Wednesday’s lab please send us an email letting us know how many students were present and how things went in lab. Please include a brief summary of what questions you think they still have, what went well, what didn't, etc.
  2. Please do not provide these lab notes to the students.

## Announcements

* 1. Remember we don’t use the CS Department laptop carts. We expect students to bring their own laptops. If a student does not have one, feel free to pair students up.

## Lecture (Eclipse)

* 1. **CVS Repository**
     1. Ask students to pair up, in particular to pair up based on the kind of computer (PC or Mac) they use. Try to form groups of three students.
     2. Ask students to connect to their CVS repository as described at:

<http://www.cs.umd.edu/class/fall2015/cmsc131/content/resources/cvsRepositoryAccount.shtml>

Encourage students to help each other in order to get the CVS repository connection set.

* + 1. As students work on this task, go around the room addressing any questions students may have.
    2. Plan to spend around 10 minutes on this task.

## Number Bases

* 1. You can cover this material any way you want. We are not covering it in lecture. The goal is to get them to be able to convert numbers in base 10 to and from other bases. Also, we would like them to be able to do the easy conversions between binary, octal, and hexadecimal.
  2. Remind them how base 10 works:

592 = 5 \* 10^2 + 9 \* 10^1 + 2 \* 10^0

* 1. Let’s use a base other than binary (e.g., base 6). Explain that in base 6, we are only allowed digits 0 to 5, and we want to represent all of the number but just with these symbols.
  2. Show that 253\_6 (253 base 6) =

2 \* 6^2 + 5 \* 6^1 + 3 \* 6^0 (everything on the right is base 10)

= 2 \* 36 + 5 \* 6 + 3 \* 1

= 72 + 30 + 3

= 105\_10 (105 base 10)

* 1. Do another example going from a different base. Come up with others examples if they are having difficulty.

136\_7 = 76\_10, 423\_5 = 113\_10

* 1. Show the algorithm for going the other direction. For example, start with a base 10 number and convert it into base 7. We can tell them to do this by repeated integer division of the base they are going into. (Integer division means holding onto the remainder). The remainders of the integer division form the number when they are written in the reverse order from how you got them.

76\_10 divided by 7 gives you 10 remainder 6

10\_10 divided by 7 gives you 1 remainder 3

1\_10 divided by 7 gives you 0 remainder 1 so 76\_10=136\_7

113\_10 divided by 5 gives 22 remainder 3

22\_10 divided by 5 gives 4 remainder 2

4\_10 divided by 5 gives 0 remainder 4 so 113\_10 = 423\_5

* 1. Do the same above steps, but for base 2. Motivate this by explaining how internally the computer stores everything this way, so it is a good skill to be able to translate numbers back and forth between our usual representation (base 10) and the computer’s usual representation (base 2).
  2. Introduce the terms hexadecimal (base 16) and octal (base 8).
  3. Do direct conversions among bases 2, 8, and 16. This just amounts to translating digits. For example, to translate 75 (base 8) into base 2 you just translate one digit at a time. 7 becomes “111” and 5 becomes “101” so the result is 111101 (base 2)

* 1. By the end of today’s lab period, they should be able to convert from base 10 to any other base, from any other base to base 10, from octal to binary and back, from hexadecimal to binary and back.

## Office Hours

* 1. Hold in-lab office hours if you have any time left. Any students without any questions can leave.
  2. Address any questions students may have. Don’t stay sitting at the front desk; go around asking students whether they have any questions.