ECE177: Programming I: From C...
Lab #2 — Number Systems and printf()
Week of 2 February 2026

1   Introduction

In this lab you will experiment with binary and hexadecimal numbers in C.

When converting numbers, note that all negative numbers are going to be in two's complement as described in class.

For this assignment you will do your work in a brightspace quiz, with two screenshots of your final C code / results shown to the TA at the end.

2   Brightspace Quiz / Worksheet

1. For the first part of this assignment work through the Brightspace Quiz titled:
   Lab 02 Worksheet Number Conversion and printf()

2. TODO: add a link

3. To aid you in this we provide a C code template as described below. Follow the directions there on how to use C in helping you calculate the answers.

3   Setting up the Code

1. Download `lab02.zip` from here:
   `https://web.eece.maine.edu/~vweaver/classes/ece177_2026s/labs/lab02_code.zip`

2. Unzip `lab02.zip` in `Documents/ece177/labs/` (this will create a `lab02_code` folder)

3. Open two terminals, one for code, the other for compilation

   (a) If you're using Windows, use WSL

   (b) On MacOS/Linux use a terminal

4. Change directory to the `lab02_code` folder

   (a) Windows
       `cd /mnt/c/Users/USERNAME/Documents/ece177/labs/lab02_code`
       where USERNAME is your username

   (b) Windows/Onedrive: if running Onedrive it might be here instead:
       `cd /mnt/c/Users/USERNAME/Onedrive/Documents/ece177/labs/lab02_code`

   (c) MacOS/Linux `cd ~/Documents/ece177/labs/lab02_code`

5. Aside, if you are wondering how the files work in Windows WSL, your C: drive ends up under "/mnt/c/" in WSL, but with the backslashes swapped with slashes. And if you want to access your WSL files from file explorer you can browse to

```
wsl$
```

6. Open `worksheet.c` with `nano` (or another terminal editor of your choice) in the first terminal window

```
nano worksheet.c
```

4   Completing the Quiz/Worksheet

1. If you have strong number-systems skills already you can complete the quiz/worksheet without using C

2. However, we require you to do at least the first three questions (47, 150, -150) using the C file

3. Currently `worksheet.c` is just a bare-bones C program

4. You can build in the second window we had you open. Before you can do that though it needs to be in the same directory as the files. So do the same `cd` command you did before starting nano to get there.

5. You can build it with the command

```
gcc -o worksheet worksheet.c
```

Alternately a Makefile has been provided so if you have "make" installed you can type "make" and it will build it for you.

6. To run the program type

```
./worksheet
```

7. Things will be easier if you edit the code in one terminal window and do the compile/runs steps in the other.

8. HINT: to avoid having to re-type (or copy/paste) the same commands over and over, you can press the up/down arrows on the keyboard while in the terminal and it will let you select previous commands you've entered

5   Some printf() Hints

1. If you want to print the value of a constant or variable with `printf()` you put a placeholder value that tells it to substitute in a function argument. For example:

```
printf("Hello %d %x\n",23,45);
```

Says to print hello, followed by an integer (%d) and a hex value (%x) and the values it puts there come from the comma-separated arguments at the end (23 and 45 in this case).

2. The `worksheet.c` file contains some sample substitution combinations that will help you do the worksheet. A brief subset of them:

```
"%016hb" for 16 bit binary printing with leading zeros
"%hd"  for 16 bit signed decimal printing
"%hu"  for 16 bit unsigned decimal printing
"%08hhb" can be used for 8 bit binary printing
"%hhd"   can be used for 8 bit signed decimal printing
"%hhu"   can be used for 8 bit unsigned decimal printing
"%02hhx" can be used for 8 bit hexadecimal printing
"%04hx"  can be used for 16 bit hexadecimal printing
One "h" above means "short" or, typically, 16 bit values
Double "H" above means "short short" or, typically, 8 bit values
```

6   Finishing up the Worksheet

1. **After completing the worksheet/quiz, take a screenshot of your** `worksheet.c` **file and upload it to brightspace (screenshot of 2)**

2. Also upload your `worksheet.c` file to Brightspace

7   Colorful Text

1. It is possible to change the color of text printed in the terminal.

2. You can use code that looks like this:

   ```
   printf("\033[36m");
   ```

3. The `\033` part is a way to put an octal constant in a string in C. In this case we want to print the special character ESCAPE which is 27, or Octal 33.

4. The following part with `[36m` specifies a color. This is an ANSI escape sequence.

5. Here is a table of colors you can pick.

color	number
Black	30
Red	31
Green	32
Yellow	33
Blue	34
Magenta	35
Cyan	36
White	37

6. If for some reason you're curious about what this is all about, there's an overly thorough Wikipedia page about ANSI escape sequences here:
   `https://en.wikipedia.org/wiki/ANSI_escape_code/`

7. Edit the file `test_color.c` and change it to print the text in the color of your choice. Do this by replacing the 36 in the `printf()` call with the number corresponding to the color you want (note, don't pick black or your text might not be visible!)

8. Compile and run the code

9. **Take a screenshot of your code running and upload it to brightspace (screenshot 2 or 2)**

8   Submitting

1. Upload the following items to BrightSpace:

   (a) A screenshot of the code section that prints values

   (b) The modified `worksheet.c` file

   (c) A screenshot of your colorful text program running

2. The TAs will ask you to demonstrate the lab requirements and will enter grades after the screenshots have been uploaded.

3. TAs: Enter grades only after the screenshot and C file have been uploaded and the assignment has been submitted.