16.216: ECE Application Programming

Summer 2013

Lecture 2: Key Questions
July 11, 2013

1. What are the basic binary arithmetic operators supported by C?

2. Explain the modulus operator (%).

3. What determines the type of a binary operation's result?

4. What is the difference between division of integers and floating-point types?

5. Explain the operation of the unary negation operator (e.g., `-x`).

6. **Example:** Evaluate each of the following expressions, including the type (`int` or `double`) in your answer.

a. `19/3`

b. `3/19`

c. `19%3`

d. `3%19`

e. `5 + 7/2`

f. `5.0 + 7/2`

g. `5 + 7.0/2`

h. `5 * 3 % 3 / 6 + 14 + 10 / 2`

i. `5 * (3 % 3) / 6 + 14.0 + 10/3`

7. Describe the use of `printf()` to print numeric values and characters.

8. **Example:** Show the output of each of the following short programs:

a.
```
#include <stdio.h>
void main()
{
     int i=2, j=3, k, m;
     k = j * i;
     m = i + j;
     printf("%d %d %d %d\n", i, j, k, m);
}
```

b.
```
#include <stdio.h>
void main() {
     double f, g;
     f = 1.0 / 4.0;
     g = f * 20;
     printf("f = %lf,\ng = %lf\n", f, g);
}
```

c.
```
#include <stdio.h>
void main(){
    int a = 5, b = 2;
    printf("Output%doesn't%dmake%dsense", a, b, a + b);
}
```

9. Describe the use of `scanf()` for reading input values into variables.

10. How does `scanf()` handle whitespace and other characters in format string?

11. **Example:** Assume you have the following variables: `int i; double d; char c;` If your program contained each of the following calls to scanf(), what values would be read into the appropriate variables, given user input?

a. Input: `34 5.7`
```
scanf("%d%lf", &i, &d)
```

b. Input: `34 5.7`
```
scanf("%d       %lf", &i, &d)
```

c. Input: `34 5.7`
```
scanf("%lf%d", &d, &i)
```

d. Input: `34 5.7`
```
scanf("%d%c", &i, &c)
```

e. Input: `34 5.7`
```
scanf("%d %c", &i, &c)
```

12. Describe the basic elements of a flowchart.

13. Design a flowchart to solve the following:
    - Prompt a user to enter four numbers on a single line, which represent the contents of a 2x2 array
    - After reading the values, your program should print the matrix represented by these values
        - For example, if the user enters “1 2 3 4”, print:
          ```
          1  2
          3  4
          ```
        - Assume all values have the same number of digits
    - Also, calculate the matrix discriminant and print it on a separate line
        - In the example above, discriminant = (1x4) - (2x3) = 4-6 = -2

14. Convert the flowchart you wrote into a C program.

15. Explain the useful features of a debugger.
Note: At this point, we'll run through the use of the Visual Studio debugger; feel free to use this space to take notes on that demonstration.