

# HW #4: C Expressions & Control Flow

Due dates:

Part I: Monday Feb 8<sup>th</sup>, at the beginning of the class. Make sure to write your name and msunetid on your paper.

Part II: Sunday Feb 7<sup>th</sup>, 11:59 pm through Handin (<https://secure.cse.msu.edu/handin>)

## Part I: Comprehension Questions

1. Write an expression that evaluates to: (2pts)
  - a. 1 if three integers a and b and c are equal and 0 otherwise  
`(a == b) && (a == c)`

- b. 0 if integer t is between integers x and y

SOL 1: `!(t > x && t < y)`

SOL 2: `(t <= x) || (t >= y)`

2. What is the output of the following program fragment? (3pts)

- a. Program 1

```
int one = 1, two = 2, three = 3;
one *= two += three;
printf("%d %d %d\n", one, two, three);
```

5 5 3

Explanation:

The statement is equivalent to the following:

`one *= (two += three);`

So first `two += three` is evaluated which yields: `three = 3` (unchanged), `two = 5`;

The `one *= 5` is evaluated which yields `one = 5`

- b. Program 2

```
int alpha = 4;
float beta = 11/2;
int theta = 2*beta;
printf("%d", alpha++ + --theta);
```

13

Explanation:

`int alpha = 4;` Stores 4 in alpha

`float beta = 11/2;` first, 11/2 is computed as 5 since this is an int division. Then 5 is transformed into float (5.0) and stored in beta.

`int theta = 2*beta;` theta becomes 2\*5 = 10

```
printf("%d", alpha++ + --theta);
```

theta is decremented, and becomes 9  
alpha (4) is added to 9, the output 13 is printed  
Finally, alpha is incremented after the whole expression  
is evaluated and its value becomes 5

c. Program 3

```
int x = 7;  
int y = --x << 3;  
printf("x = %d, y = %d", x, y);
```

x = 6, y = 48

Explanation:

```
int x = 7;  
int y = --x << 3;
```

First decrement x, x becomes 6  
then compute  $6 \ll 3$  and put the result in y. The result is 48

To compute  $6 \ll 3$ , write 6 in binary: 000000110

Shift the bits to the left 3 places: 000110000

The binary number obtained is the decimal:  $2^4 + 2^5 = 48$

3. Write a C program that reads a number from the user and outputs one of the following four statements according to the divisibility of the number by 13 and 7. (3 pts)

X is divisible by 13 and 7

X is divisible by 13

X is divisible by 7

X is not divisible by 13 or 7

(X should actually be replaced by the number read)

```

#include<stdio.h>
int main(void) {
    int x;

    //Read user input
    printf("Enter a number: ");
    scanf("%d", &x);

    //Check which of 4 cases applies based on remainder
    if (x % 13 == 0 && x % 7 == 0) {
        printf("%d is divisible by 13 and 7", x);
    } else if (x % 13 == 0) {
        printf("%d is divisible by 13", x);
    } else if (x % 7 == 0) {
        printf("%d is divisible by 7", x);
    } else {
        printf("%d is not divisible by 13 and 7", x);
    }
    return 0;
}

```

4. Convert the following if statement to a case statement: (2pts)

```

if (areaCode == 517) {
    printf("Go White! Go Green\n");
} else if (areaCode == 212) {
    printf("I love New York\n");
} else if (areaCode == 415) {
    printf("Hello San Francisco!\n");
} else {
    printf("I've never been there.\n");
}

switch (areaCode) {
    case 517: printf("Go White! Go Green\n");
              break;
    case 212: printf("I love New York\n");
              break;
    case 415: printf("Hello San Francisco!\n");
              break;
    default: printf("I've never been there.\n");
              break;
}

```

## Part II: Lab Assignment

### Getting started

Change into the cse220 directory

Create a new directory called lab04

Change into the new directory

Implement the program below in your lab04 directory

### Project Description

Write a program that asks the user to enter their birthdate in mm/dd/yyyy format and reads the user input. Call your program FindTheDay.c

Your program should first check if the date is valid:

The month is between 1 and 12.

The day is between 1 and 31.

The day does not exceed the number of days of the month (e.g Jan 31 is valid, April 31 is not).

You do not have to check if the year is a leap year.

If the date is not valid, your program should output an error message and exit.

If the date is valid, your program should output the following:

You were born on a day-of-week

Compute the day-of week as follows:

1. Compute the month coefficient, mc, for each month according to the following table:

| Month | mc | Month | mc |
|-------|----|-------|----|
| Jan   | 0  | Jul   | 5  |
| Feb   | 3  | Aug   | 1  |
| Mar   | 2  | Sep   | 4  |
| Apr   | 5  | Oct   | 6  |
| May   | 0  | Nov   | 2  |
| Jun   | 3  | Dec   | 4  |

2. Decrement the year by 1 if the month is Jan or Feb, otherwise keep it the same
3. Compute the rank as follows:
  - a. Compute the following value:  $\text{year} + \text{year}/4 - \text{year}/100 + \text{year}/400 + \text{mc} + \text{day}$
  - b. Find the remainder of the previous value when divided by 7. You will get an integer between 0 and 6.
  - c. Find the day according to the following schedule:

| Remainder | Day       |
|-----------|-----------|
| 0         | Sunday    |
| 1         | Monday    |
| 2         | Tuesday   |
| 3         | Wednesday |
| 4         | Thursday  |
| 5         | Friday    |

|   |          |
|---|----------|
| 6 | Saturday |
|---|----------|

Compile your program and generate an executable file called findTheDay.

## Handin

Submit through the handin system the following files: FindTheDay.c and findTheDay.

*The “handin” system has options to allow you to review your files online and to download them. You Should always verify that you submitted the correct files and they were received by the handin system. You can submit files as many times as you like for a particular assignment. Handin will only keep the last version of each file. Remember to submit your files prior to the deadline as you won't be able to use handin if the deadline has passed.*