C201 Homework #3 Due 2/17/14

The birthday paradox can be described as follows:

> *If 23 persons are chosen at random, then the chances are more than 50% that at least two will have the same birthday!*

When they first hear this stated, most persons have trouble believing it and are unconvinced by mathematical proofs[1]. The program that you write for this assignment will allow you to test the birthday paradox to see if it is really true. This will be done by simulating birthdays with random numbers between 1 and 365.

Your main program should display a menu that reads as follows:

```
1)  Explain birthday paradox
2)  Check birthday paradox by generating 1000 sets of birthdays
3)  Display one set of 23 birthdays
E)  Exit
```

If option 2) is selected, the output would be something like this:

```
Generating 1000 sets of 23 birthdays and checking for matches...

Results : 511 out of 1000 (51.1%) of the sets contained matching birthdays
==========================================================================
```

If option 3) is selected, the program will display the results in chronological order with matches indicated. The output should needs to look like this:

```
Here are the results of generating a set of 23 birthdays
=========================================================
    January      2     January      5     January     12
    January     25     February     3     February     6
    February    12     February    17     March        8
    April        4     April       12     June         3
    June        12     July         3     August       4
    September    3     September    9     September   25
(2) October     12     October     16     October     22
    December    22
```

Hints and Suggestions

* A "birthday" can be viewed as a random integer between 1 and 365. Recall that there is function named "rand()" in stdlib that can be used to generate such random numbers. The expression "1 + (rand() % 365)" yields a random number that is between 1 and 365 inclusive. You should use the srand() function, but be *sure to not to call it more than once*!

* As a bottom-up exercise, I recommend that you write the following function. *We'll write the algorithm in class.*

```
void ConvertDayOfYear (int  DayOfYear,   // "Converts" a day of the year, such as 32
                       int &MonthNumber, //  to a MonthNumber, 2 and a DayOfMonth, 1
                       int &DayOfMonth)
```

* We'll do a top-down design in class that will make your work go more smoothly. The Selection Sort code can be found on website. (also inline function swap is there)

* Very important to look at and follow the algorithm that will be given in class. Write one function at a time!

[1] It can be shown that in a group of 23, the probability of that *no two persons have the same birthday* is

$$\frac{365 * 364 * 363 * .. * (365 - 23 + 1)}{365 * 365 * 365 * .. *} \sim 2^{-365^{493}}$$