York University
Electrical Engineering and Computer Science

EECS2031: Software Tools
SU2016
Assignment #4

Chapter 8: Exercises

5. The Fibonacci numbers are 0, 1, 1, 2, 3, 5, 8, 13, …, where each number is the sum of the two preceding numbers. Write a program fragment that declares an array named `fib_numbers` of length 40 and fills the array with the first 40 Fibonacci numbers. *Hint:* Fill in the first two numbers individually, then use a loop to compute the remaining numbers.

Chapter 8: Programming Projects

2. Modify the `repdigit.c` program of Section 8.1 so that it prints a table showing how many times each digit appears in the number:

```
Enter a number: 41271092
Digit:          0  1  2  3  4  5  6  7  8  9
Occurrences:    1  2  2  0  1  0  0  1  0  1
```

7. Write a program that reads a 5 × 5 array of integers and then prints the row sums and the column sums:

```
Enter row 1: 8 3 9 0 10
Enter row 2: 3 5 17 1 1
Enter row 3: 2 8 6 23 1
Enter row 4: 15 7 3 2 9
Enter row 5: 6 14 2 6 0

Row totals: 30 27 40 36 28
Column totals: 34 37 37 32 21
```

14. Write a program that reverses the words in a sentence:

```
Enter a sentence: you can cage a swallow can't you?
Reversal of sentence: you can't swallow a cage can you?
```

Hint: Use a loop to read the characters one by one and store them in a one-dimensional `char` array. Have the loop stop at a period, question mark, or exclamation point (the "terminating character"), which is saved in a separate `char` variable. Then use a second loop to search backward through the array for the beginning of the last word. Print the last word, then search backward for the next-to-last word. Repeat until the beginning of the array is reached. Finally, print the terminating character.

Chapter 9: Exercises

1. The following function, which computes the area of a triangle, contains two errors. Locate the errors and show how to fix them. (*Hint:* There are no errors in the formula.)

```
double triangle_area(double base, height)
double product;
{
  product = base * height;
  return product / 2;
}
```

6. Write a function `digit(n, k)` that returns the k^{th} digit (from the right) in `n` (a positive integer). For example, `digit(829, 1)` returns 9, `digit(829, 2)` returns 2, and `digit(829, 3)` returns 8. If `k` is greater than the number of digits in `n`, have the function return 0.

9. What will be the output of the following program?

```
#include <stdio.h>

void swap(int a, int b);

int main(void)
{
  int i = 1, j = 2;

  swap(i, j);
  printf("i = %d, j = %d\n", i, j);
  return 0;
}

void swap(int a, int b)
{
  int temp = a;
  a = b;
  b = temp;
}
```

10. Write functions that return the following values. (Assume that `a` and `n` are parameters, where `a` is an array of `int` values and `n` is the length of the array.)

    (a) The largest element in `a`.
    (b) The average of all elements in `a`.
    (c) The number of positive elements in `a`.

Chapter 9: Programming Projects

1. Write a program that asks the user to enter a series of integers (which it stores in an array), then sorts the integers by calling the function `selection_sort`. When given an array with n elements, `selection_sort` must do the following:

   1. Search the array to find the largest element, then move it to the last position in the array.
   2. Call itself recursively to sort the first $n - 1$ elements of the array.

2. Modify Programming Project 5 from Chapter 5 so that it uses a function to compute the amount of income tax. When passed an amount of taxable income, the function will return the tax due.

6. Write a function that computes the value of the following polynomial:

   $3x^5 + 2x^4 - 5x^3 - x^2 + 7x - 6$

   Write a program that asks the user to enter a value for x, calls the function to compute the value of the polynomial, and then displays the value returned by the function.