Lab 2 – Recursive Algorithms

For this lab you will implement 3 different recursive algorithms. Create a single file called lab2.cpp which includes `main()` and all the functions required to implement the 3 recursive algorithms.

Problem 1 – Recursive Exponentiation

Write a recursive function `power(base, exponent)` that, when invoked, returns

$$base^{exponent}$$

For example, 3^4 would be `power(3,4)` would return 81. Assume the exponent is an integer greater than or equal to 0.

Your base case is $base^0 = 1$.

Your recursion step will use the relationship $base^{exponent} = base * base^{exponent\ -1}$

Use `main()` to call `power()` 3 times and show the following output to the console:

```
power(10,0) = 1
power(2,10) = 1024
power(8, 5) = 32768
```

Problem 2 – Sum the Sequence

Write a recursive function `sum(n)` which returns the sum of the integers from `n` through 0. Assume `n` is an integer greater than or equal to 0.

For example, `sum(4)` calculates 4 + 3 + 2 + 1 + 0 and returns 10. `sum(0)` returns 0.

Use `main()` to call `sum()` 3 times and show the following output to the console:

```
sum(0) = 0
sum(5) = 15
sum(10) = 55
```

Problem 3 – Sum the Digits

Write a recursive function `sumTheDigits(n)` which returns the sum of the digits in integer `n`. Assume `n` is an integer greater than or equal to 0.

For example, `sumTheDigits(5129)` calculates 5 + 1 + 2 + 9 and returns 17. For any `n` less than 10 the original number is returned. For instance, `sumTheDigits(5)` returns 5.

Hint: While I'm sure there are different solutions, consider pulling off the smallest digit first. For instance, given the integer 5129, first pull off 9 leaving you with 5120. Then convert 5120 to 512. You'll need to use the remainder operator (%) to do this.

Use `main()` to call `sumTheDigits()` 3 times and show the following output to the console:

```
sumTheDigits(3) = 3
sumTheDigits(123) = 6
sumTheDigits(90160) = 16
```

Turn In

Your lab2.cpp file should now have `main()` plus the 3 recursive functions. `main()` should still print out all the information described above. Place a comment with your name at the top of lab2.cpp and upload *only* your lab2.cpp file prior to the due date.