**Worksheet for Lab #2 Ex2: Square-free Integer**

<http://www.comp.nus.edu.sg/~cs1010/labs/2016s1/lab2/controlstructures.html>

**Task Statement**

Read 4 positive integers *lower1*, *upper1*, *lower2*, *upper2*, determine which of the 2 ranges [*lower1*, *upper1*] and [*lower2*, *upper2*] contains more square-free integers, and report the number of square-free integers in the range that has more square-free integers.

A square-free integer is a positive integer not divisible by any square number except 1.

For this exercise, let’s try a bottom-up design.

**Step 1**

We should have a function that takes in an integer and determines if it is square-free or not. Let’s call this function **is\_square\_free()**. Complete the table about **is\_square\_free()** below.

|  |  |  |  |
| --- | --- | --- | --- |
| ***Return type*** | ***Parameter*** | | ***Precondition*** |
| ***Type*** | ***Name*** |
|  |  |  |  |

**Step 2**

Write out your algorithm for **is\_square\_free()**. What control structures does it use?

*Algorithm:*

\_\_\_\_\_\_\_ is\_square\_free( \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ) {

}

The algorithm uses (circle all appropriate answers): Sequence / Selection / Repetition

**Step 3**

You may practise **Incremental Coding** (refer to Unit 7: Testing and Debugging) here. The correctness of your final program depends on the correctness of **is\_square\_free()** function. So it is worthwhile checking that the function works before you proceed.

How do you think you can test the **is\_square\_free()** function?

**Step 4**

After you have ensured that **is\_square\_free()** is perfect, how do you use it to solve the task? Since you are going to do the same thing (count the number of square-free integers) for TWO ranges, you should write a function for it. Let’s call it **count\_square\_free()**.

Complete the table about **count\_square\_free()** below.

|  |  |  |
| --- | --- | --- |
| ***Return type*** | ***Parameters***  ***(types and names)*** | ***Precondition*** |
|  |  |  |

**Step 5**

Write out your algorithm for **count\_square\_free()**.

*Algorithm:*

\_\_\_\_\_\_\_ count\_square\_free( \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ) {

}

**Step 6**

Complete your main() function and test your program thoroughly before you submit it to CodeCrunch.