Module 10 Checkpoint Exercises

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Checkpoint 10.4

To answer all the questions, you need to read the external links in the lecture notes first.

1. Suggest two ways to debug a program.
   Adding print statements or using a debugger.
2. A student wants to use the GDB debugger to debug a c++ program but the debugger fails to tell
   which line of the code causes the error. Identify the problem and suggest a solution to fix it.
   He didn't add the "-g" flag when compiling the program. Adding the flag may fix it.

```
$ g++ -std=c++11 main.cpp -o main
```
```
$ ./main
Segmentation fault (core dumped)
```
```
$ gdb main
```
```
(gdb) r
Starting program: /home/research/ra/1801/cklai/main

Program received signal SIGSEGV, Segmentation fault.
0x00005555555547d2 in main ()
```

3. Give one advantage and one disadvantage of inserting cout statements to debug a program.
   It can show the values of the variables for verification.
   However, too many printing statements may make the output hard to read.
4. What is a breakpoint in the GDB debugger? How do you set a breakpoint to a program?
   It is a break in the program execution, namely pausing the program.
   By using the command "b <line>" in gdb to set a breakpoint.
5. GDB debugger is used to debug the following program. Suppose a breakpoint is set to line 12. When
   the program runs, it will pause at line 12. What are the values of n1 and n2 when the program pauses
   at the first time? Fill in the blank.

```
$ cat gcd.cpp
#include <iostream>
using namespace std;

int main()
{
    int n1 = 32;
    int n2 = 8;
```

```
    while(n1 != n2)
    {
        if(n1 > n2)
            n1 -= n2;   // This line is line 12
        else
            n2 -= n1;
    }

    cout << "GCD = " << n1;
    return 0;
}
```

```
$ g++ -g gcd.cpp -o gcd
```

```
$ gdb gcd
```

```
(gdb) b 12
Breakpoint 1 at 0x870: file gcd.cpp, line 12.
```

```
(gdb) r
Starting program: /home/research/ra/1801/cklai/gcd

Breakpoint 1, main () at gcd.cpp:12
12                      n1 -= n2;
```

```
(gdb) p n1
$1 =   32
```

```
(gdb) p n2
$2 =   8
```

6. Suppose a breakpoint is set to a certain line in a for loop in a program. The program pauses at that breakpoint when it runs on the debugger. Instead of entering the 'n' command multiple times, what command allows the program to resume execution and to pause at the same breakpoint in the next iteration?

   continue

7. The following C program is to find the sum of Natural Numbers but it contains error(s). Fix the error(s) by modifying the code.

```c
#include <stdio.h>
int main() {
    int n;
    int i;
    int sum = 0;

    printf("Enter a positive integer: ");
    scanf("%d", &n);

    for (i = 1; i <= n; ++i) {
        sum += i;
    }
```

```c
    printf("Sum = %d", sum);
    return 0;
}
```