# **CS 410 C++ to Assembly Activity Template**

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**Step 1:** Explain the functionality of the C++ code.

## C++ Code Functionality

| **C++ Line of Code** | **Explanation of Functionality** |
| --- | --- |
| #include<iostream> | Include the C++ library and input output stream |
| Using namespace std; | Enables std for making coding easier. You don’t have to put std::cin. |
| Int main(){ | This is the main function, where the program starts its execution. |
| Int width=10; | Defines integer variable width and sets it to 10. |
| Int height=50; | Defines integer variable height and sets it to 5. |
| Int area; | Defines integer variable area |
| Area = width \* height; | Assigned area with the product of width and height |
| Cout<<endl<<area; | Output area |
| Return 0; | End program |
| } |  |
|  |  |

**Step 2:** Convert the C++ file into assembly code.

**Step 3:** Align each line of C++ code with the corresponding blocks of assembly code.

## C++ to Assembly Alignment

| **C++ Line of Code** | **Blocks of Assembly Code** |
| --- | --- |
| #include<iostream> | None |
| Using namespace std; | None |
| Int main(){ | .cfi\_startproc    pushq %rbp    .cfi\_def\_cfa\_offset 16    .cfi\_offset 6, -16 |
| Int width=10; | movl $10, -12(%rbp) |
| Int height=50; | movl $5, -8(%rbp) |
| Int area; | None |
| Area = width \* height; | movl -12(%rbp), %eax    imull -8(%rbp), %eax    movl  %eax, -4(%rbp) |
| Cout<<endl<<area; | movq \_ZSt4endlIcSt11char\_traitsIcEERSt13basic\_ostreamIT\_T0\_ES6\_@GOTPCREL(%rip), %rax    movq  %rax, %rsi    leaq  \_ZSt4cout(%rip), %rdi    call  \_ZNSolsEPFRSoS\_E@PLT    movq  %rax, %rdx    movl  -4(%rbp), %eax    movl  %eax, %esi    movq  %rdx, %rdi    call  \_ZNSolsEi@PLT |
| Return 0; | movl  $0, %eax |
| } | leave    .cfi\_def\_cfa 7, 8    ret |
|  |  |

**Step 4:** Explain how the blocks of assembly code perform the same tasks as the C++ code.

## Assembly Functionality

| **Blocks of Assembly Code** | **Explanation of Functionality** |
| --- | --- |
| .cfi\_startproc    pushq %rbp    .cfi\_def\_cfa\_offset 16    .cfi\_offset 6, -16 | The start of the program were the execution of the it begins. |
| movl $10, -12(%rbp) | A variable is created and 10 is assigned to it. $10 being the value that’s being set, and -12(%rbp) is the location or address of the variable. |
| movl $5, -8(%rbp) | A variable is created and 10 is assigned to it. $5 being the value that’s being set, and -8(%rbp) is the location or address of the variable. |
|  |  |
| movl -12(%rbp), %eax    imull -8(%rbp), %eax    movl  %eax, -4(%rbp) | Set the variable -4(%rbp) (area) to the product of the data in location -12(%rbp) (width) and data in location -8(%rbp) (height) |
| movq \_ZSt4endlIcSt11char\_traitsIcEERSt13basic\_ostreamIT\_T0\_ES6\_@GOTPCREL(%rip), %rax    movq  %rax, %rsi    leaq  \_ZSt4cout(%rip), %rdi    call  \_ZNSolsEPFRSoS\_E@PLT    movq  %rax, %rdx    movl  -4(%rbp), %eax    movl  %eax, %esi    movq  %rdx, %rdi    call  \_ZNSolsEi@PLT | Display the value that was assigned to the third variable -4(%rbp) the area. |
| movl  $0, %eax | Return |
| leave    .cfi\_def\_cfa 7, 8    ret | End of program |
|  |  |
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