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

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

## C++ Code Functionality

| **C++ Line of Code** | **Explanation of Functionality** |
| --- | --- |
| int num, i; | Declare num and I as integers |
| int product = 1; | Declares product as integer and sets value to 1 |
| cout << “Enter a number: \n” << endl; | Outputs Enter a number and then ends current row |
| Cin >> num | Gets user input and assigns the value to num |
| For (i = num; i > 0; i--) | Assign i value of num, run loop as long as i is greater than 0 and then decrement i by one |
| product = product \* i; | Set product variable equal to product \* i |
| Cout << “The factorial for “ << num << “is: \n” << product; | Outputs statement with value of num and then the value of product |
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**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** |
| --- | --- |
| int num |  |
| Int i |  |
| int product = 1 | movl $1, -8(%rbp) |
| cout << “Enter a number” << endl | movl $.LC0, %esi  movl $\_ZSt4cout, %edi  call puts  movl $\_ZSt4endl  movq %rax, %rdi  call puts |
| cin >> num | leaq -12(%rbp), %rax  movq %rax, %rsi  movl $\_ZSt3cin, %edi  call puts |
| for (i = num; i > 0; i--)  product = product \* i | movl -12(%rbp), %eax  movl %eax, -4(%rbp)  jmp .L2  cmpl $0, -4(%rbp)  jg .L3 |
| cout << “The factorial for “ << num << “is: \n” << endl | movl $.LC1, %esi  movl $\_ZSt4cout, %edi  call puts  movq %rax, %rdx  movl -12(%rbp), %eax  movl %eax, %esi  movq %rdx, %rdi  call puts  movl $.LC2, %esi  movq %rax, %rdi  call puts  movq %rax, %rdx  movl -8(%rbp), %eax  movl %eax, %esi  movq %rdx, %rdi  call puts |
| return 1 | movl $1, %eax |
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**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** |
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