

INTRO TO C++ FOR FRC: LESSON 1

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<https://github.com/JoeKueh/frc-cpp>

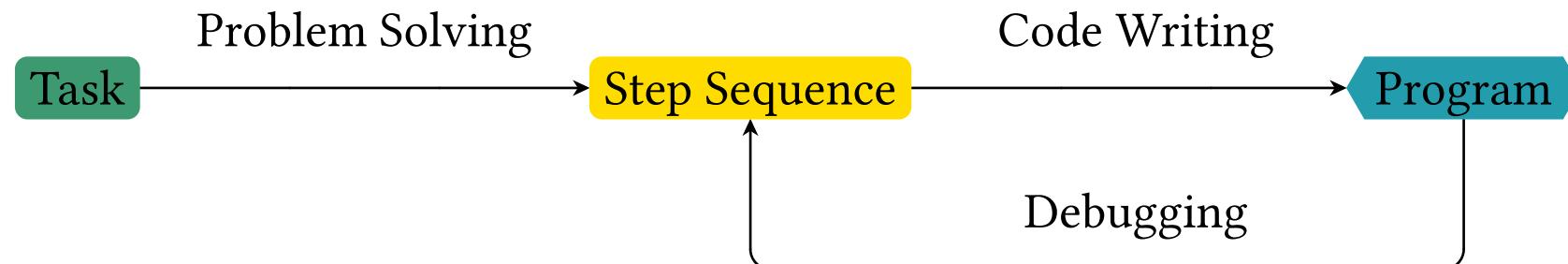
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- This course is an interactive introduction to C++ for FRC.
- Interspersed with “lecture” style content are real-world **EXAMPLES**.
- Additionally, a number of **EXCERSIZES** are prepared that you should do yourself.
 - ▶ You can write C++ online here: https://www.onlinegdb.com/online_c++_compiler¹
 - ▶ As we get further along, I will introduce more tools for you to use.

¹Online C++ Compiler: https://www.onlinegdb.com/online_c++_compiler

- Programming, at its root, is a means of turning complex logic into a series of statements that can be interpreted by a computer.
- The basic design flow for a program is as follows.
 1. Start with a task you want to automate.
 2. Break that task into a series of smaller steps (Problem Solving).
 3. Translate those smaller steps into a computer language (Code Writing).
 4. Test the resulting program and fix all of the errors (Debugging).



- Programming shares a lot of similarities with math.
- We compare computer programs programming to functions in math.
- Functions have inputs, outputs, and some “process” that maps inputs to outputs.
 - ▶ This is true for both math and programming.



$$f(x) = 10x + 13.3$$

Translates to...

```
float f(float x) {  
    return 10.0 * x + 13.3;  
}
```

1. Start with the logic that we want to implement.
 - Fahrenheit can be converted to Celsius using the following equation.

$$C(f) = (f - 32) \cdot \frac{5}{9}$$

2. Convert the logic function into a series of smaller steps
 - This doesn't really apply here, one equation is enough to get the job done.
3. Translate the steps into computer language.
 - `return (f - 32) * 5/9;`
4. Run the computer program and debug it.

Example 1: Fahrenheit to Celsius

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Here is the completed code for the example. For now, you should ignore syntax details. These will be discussed further in the next lesson on syntax and data types.

```
float celcius(float fahrenheit) {  
    return (fahrenheit - 32) * 5 / 9;  
}
```

- How about you try one yourself now.
- We will be translating from Yards to Killometers.
- You can run the code that you write in https://www.onlinegdb.com/online_c++_compiler.
- Boilerplate code is provided for you on the next slide.
 - I recommend that you copy and paste the code on the following slide, then fill out the line that is marked “**<WRITE YOUR CODE HERE>**”
 - I will explain this code further in the next lesson.
- **HINTS**
 - I don't remember how to convert yards to killometers, and I bet you don't either.
LOOK IT UP, Googling is a very important part of programming.
 - **DO NOT FEEL BAD IF YOU DO NOT GET IT.** I'm putting this example out here to get your brains working, but there's a lot I haven't taught you yet.
 - Once you've given it an honest attempt, move on to lesson 2.

Exercise 1: Yards to Killometers

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```
#include <iostream>

// This is a function that should convert yards to killometers.
float killometers(float yards) {
    return <WRITE YOUR CODE HERE>;
}

// This is the entrypoint of our application, we start executing from here.
int main() {
    // This line calls the function above and stores the output in "result".
    float result = killometers(1000);
    std::cout << "1000 yards = " << result << " killometers" << std::endl;
}
```