

## Reference

# Functions with Natural Language

A function is a group of statements that are run as a single unit when the function is called from another location, such as task main(). Commonly, each function will represent a **specific behavior** in the program.

Functions offer a number of distinct advantages over basic step-by-step coding.

- They save time and space by allowing common behaviors to be written as functions, and then run together as a single statement (rather than re-typing all the individual commands).
- Separating behaviors into different functions allows your code to follow your planning more easily (one function per behavior or even sub-behavior).
- Through the use of parameters, multiple related (but not identical) tasks can be handled with a single, intuitive function.

## Using Functions

Functions must be created and then run separately. A function is created by “declaring” it, and run by “calling” it.

### 1. Declare Your Function

Declare the function by using the word “void”, followed by the name you wish to give to the function. It’s helpful to give the function a name that reflects the behavior it will perform.

Within the function’s {curly braces}, write the commands exactly as you would normally. When the function is called, it will run the lines between its braces in order, just like task main does with the code between its own braces.

### 2. Call Your Function

Once you declare your function, it acts like a new command in the language of ROBOTC. To run the function, simply “call” it by name – remember that its name includes the parentheses – followed by a semicolon.

```
void rotateArm()  
{  
    startMotor(armMotor, 63);  
    wait(3.25);  
    stopMotor(armMotor);  
}  
  
task main()  
{  
    rotateArm();  
}
```

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# Advanced Functions

## Parameters

Parameters are a way of **passing information into a function**, allowing the function to run its commands differently, depending on the values it is given. It may help to think of the parameters as **placeholders** – all parameters must be filled in with real values when the function is called, so in the places where a parameter appears, it will simply be replaced by its given value.

### 1. Declare parameter

A parameter is declared in the same way that a variable is (type then name) **inside the parentheses** following the function name.

### 2. Use parameter

The parameter value behaves like a “placeholder”. Whatever value is provided for the parameter when the function is called will appear here.

### 3. Call function with parameter

When the function is called, a value must be provided within the parentheses to take the place of the parameter inside the function.

```

void rotateArm(float time)
{
    startMotor(armMotor, 63);
    wait(time);
    stopMotor(armMotor);
}

task main()
{
    rotateArm(3.25);
}
  
```

The diagram uses red arrows to show the flow of the parameter value. One arrow points from the `float` type in the function declaration to the `time` parameter name. Another arrow points from the `time` parameter name to the `wait(time);` line inside the function body. A third arrow points from the `3.25` value in the function call to the `wait(time);` line, indicating that `3.25` will replace `time` when the function is executed.

### Substitution

The arrows in the illustration to the right show the general “path” of the value from the place where it is provided in the function call, to where its value is substituted into the function.

The function will run as if the code read as it does in the bottom box.

```

void rotateArm(float time)
{
    startMotor(armMotor, 63);
    wait(time);
    stopMotor(armMotor);
}

task main()
{
    rotateArm(3.25);
}
  
```

This diagram is similar to the previous one but highlights the substitution process. A red arrow points from the `3.25` value in the function call to the `wait(time);` line, showing the path of the value being substituted into the function's parameters.



```

startMotor(armMotor, 63);
wait(3.25);
stopMotor(armMotor);
  
```

This block shows the final code after substitution, where the parameter `time` has been replaced by the value `3.25`.

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# Advanced Functions

## Return Values

Not all functions are declared "void". Sometimes, you may wish to capture a mathematical computation in a function, for instance, or perform some other task that requires you to **get information back out of the function** at the end. The function will "return" a value, causing it to behave as if the **function call itself** were a value in the line that called it.

### 1. Declare return type

Because the function will give a value back at the end, it must be declared with a type other than void, indicating what type of value it will give.

### 2. Return value

The function must "return" a value. In this case, it is returning the result of a computation, the square of the parameter.

### 3. Function call becomes a value

The function call itself becomes a value to the part of the program that calls it. Here, it is acting as an integer value for the wait command.

```
int squareOf(int t)
{
    int sq;
    sq = t * t;
    return sq;
}

task main()
{
    startMotor(rightMotor, 63);
    wait(squareOf(100));
    stopMotor(rightMotor);
}
```

The diagram illustrates the flow of data. A red arrow starts from the `return sq;` line in the `squareOf` function, goes up and then right to the `wait(squareOf(100));` line in the `main` function. Another red arrow points from the `wait` command back to the `main` function block, indicating the return path.

### Substitution

The arrows in the illustration to the right show the general "path" of the value as it is returned and goes back into the main function.

The parameter 100 is used (as `t` in the function) to calculate the value, but is not shown in the arrows.

The function will run as if the code read as it does in the bottom box.

```
int squareOf(int t)
{
    int sq;
    sq = t * t;
    return sq;
}

task main()
{
    startMotor(rightMotor, 63);
    wait(squareOf(100));
    stopMotor(rightMotor);
}
```

This diagram is similar to the one above, showing the return path from the `squareOf` function to the `wait` command in the `main` function.



```
wait(10000);
```