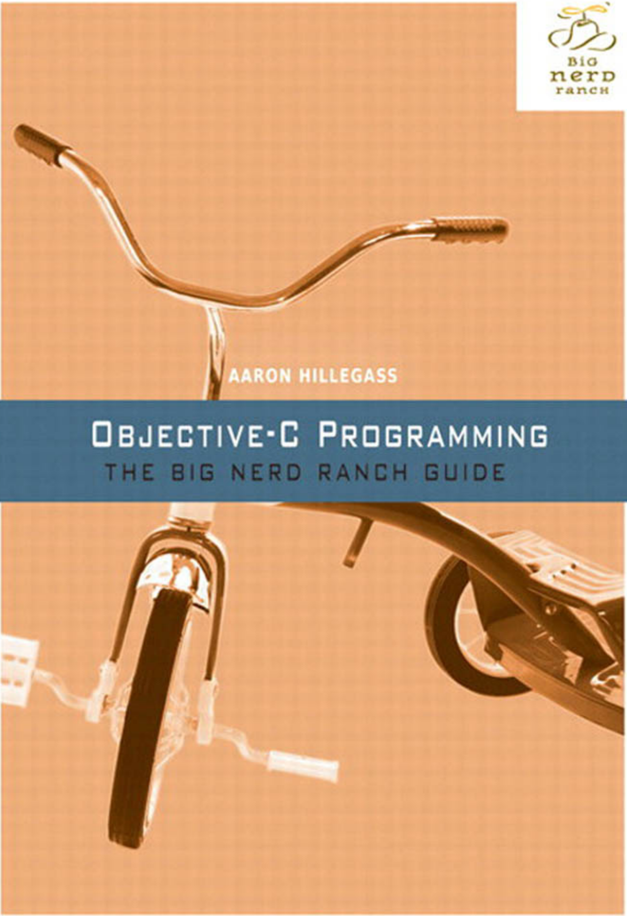

AARON HILLEGASS

Objective-C Programming

THE BIG NERD RANCH GUIDE

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AARON HILLEGASS

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Objective-C Programming: The Big Nerd Ranch Guide

by Aaron Hillegass

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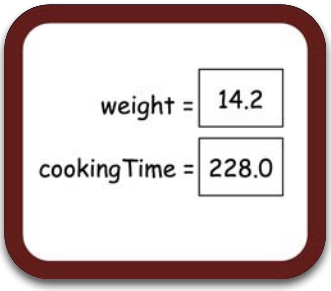
3

Variables and Types

Continuing with the recipe metaphor from the last chapter, sometimes a chef will keep a small blackboard in the kitchen for storing data. For example, when unpacking a turkey, he notices a label that says “14.2 Pounds.” Before he throws the wrapper away, he will scribble “weight = 14.2” on the blackboard. Then, just before he puts the turkey in the oven, he will calculate the cooking time (15 minutes + 15 minutes per pound) by referring to the weight on the blackboard.

Figure 3.1 Keeping track of data with a blackboard



During execution, a program often needs places to store data that will be used later. A place where one piece of data can go is known as a *variable*. Each variable has a name (like `cookingTime`) and a *type* (like a number). In addition, when the program executes, the variable will have a value (like 228.0).

Types

In a program, you create a new variable by *declaring* its type and name. Here’s an example of a variable declaration:

```
float weight;
```

The type of this variable is `float`, and its name is `weight`. At this point, the variable doesn’t have a value.

In C, you must declare the type of each variable for two reasons:

- The type lets the compiler check your work for you and alert you to possible mistakes or problems. For instance, say you have a variable of a type that holds text. If you ask for its logarithm, the compiler will tell you something like “It doesn’t make any sense to ask for this variable’s logarithm.”

- The type tells the compiler how much space in memory (how many bytes) to reserve for that variable.

Here is an overview of the commonly used types. We will return in more detail to each type in later chapters.

`short`, `int`, `long`
These three types are whole numbers; they don’t require a decimal point. A `short` usually has fewer bytes of storage than a `long`, and `int` is in between. Thus, you can store a much larger number in a `long` than in a `short`.

`float`, `double`
A `float` is a floating point number – a number that can have a decimal point. In memory, a `float` is stored as a mantissa and an exponent. For example, 346.2 is represented as 3.462 x 10^2 A `double` is a double-precision number, which typically has more bits to hold a longer mantissa and larger exponents.

`char`
A `char` is a one-byte integer that we usually treat as a character, like the letter `'a'`.

pointers
A pointer holds a memory address. It is declared using the asterisk character. For example, a variable declared as `int *` can hold a memory address where an `int` is stored. It doesn’t hold the actual number’s value, but if you know the address of the `int` then you can easily get to its value. Pointers are very useful, and there will be more on pointers later. Much more.

`struct`
A `struct` (or *structure*) is a type made up of other types. You can also create new `struct` definitions. For example, imagine that you wanted a `GeoLocation` type that contains two float members: `latitude` and `longitude`. In this case, you would define a `struct` type.

These are the types that a C programmer uses every day. It is quite astonishing what complex ideas can be captured in these five simple ideas.

A program with variables

Back in Xcode, you are going to create another project. First, close the AGoodStart project so that you don’t accidentally type new code into the old project.

Now create a new project (File → New → New Project...). This project will be a C Command Line Tool named Turkey.

In the project navigator, find this project’s `main.c` file and open it. Edit `main.c` so that it matches the following code.

```
#include <stdio.h>

int main (int argc, const char * argv[])
{
    // Declare the variable called 'weight' of type float
    float weight;

    // Put a number in that variable
    weight = 14.2;

    // Log it to the user
    printf("The turkey weighs %f.\n", weight);

    // Declare another variable of type float
    float cookingTime;

    // Calculate the cooking time and store it in the variable
    // In this case, '*' means 'multiplied by'
    cookingTime = 15.0 + 15.0 * weight;

    // Log that to the user
    printf("Cook it for %f minutes.\n", cookingTime);

    // End this function and indicate success

    return 0;
}
```

Build and run the program. You can either click the Run button at the top left of the Xcode window or use the keyboard shortcut Command-R. Then click the 💬 button to get to the log navigator. Select the item at the top labeled Debug Turkey to show your output. It should look like this:

```
The turkey weighs 14.200000.
Cook it for 228.000000 minutes.
```

Now click the 📁 button to return to the project navigator. Then select `main.c` so that you can see your code again. Let's review what you've done here.

In your line of code that looks like this:

```
    float weight;
```

we say that you are "declaring the variable `weight` to be of type `float`."

In the next line, your variable gets a value:

```
    weight = 14.2;
```

You are copying data into that variable. We say that you are "assigning a value of 14.2 to that variable."

In modern C, you can declare a variable and assign it an initial value in one line, like this:

```
    float weight = 14.2;
```

Here is another assignment:

```
    cookingTime = 15.0 + 15.0 * weight;
```

The stuff on the right-hand side of the = is an *expression*. An expression is something that gets evaluated and results in some value. Actually, every assignment has an expression on the right-hand side of the =.

For example, in this line:

```
weight = 14.2;
```

the expression is just `14.2`.

Variables are the building blocks of any program. This is just an introduction to the world of variables. You'll learn more about how variables work and how to use them as we continue.

Challenge

Create a new C Command Line Tool named TwoFloats. In its **`main()`** function, declare two variables of type `float` and assign each of them a number with a decimal point, like 3.14 or 42.0. Declare another variable of type `double` and assign it the sum of the two `float`s. Print the result using **`printf()`**. Refer to the code in this chapter if you need to check your syntax.

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