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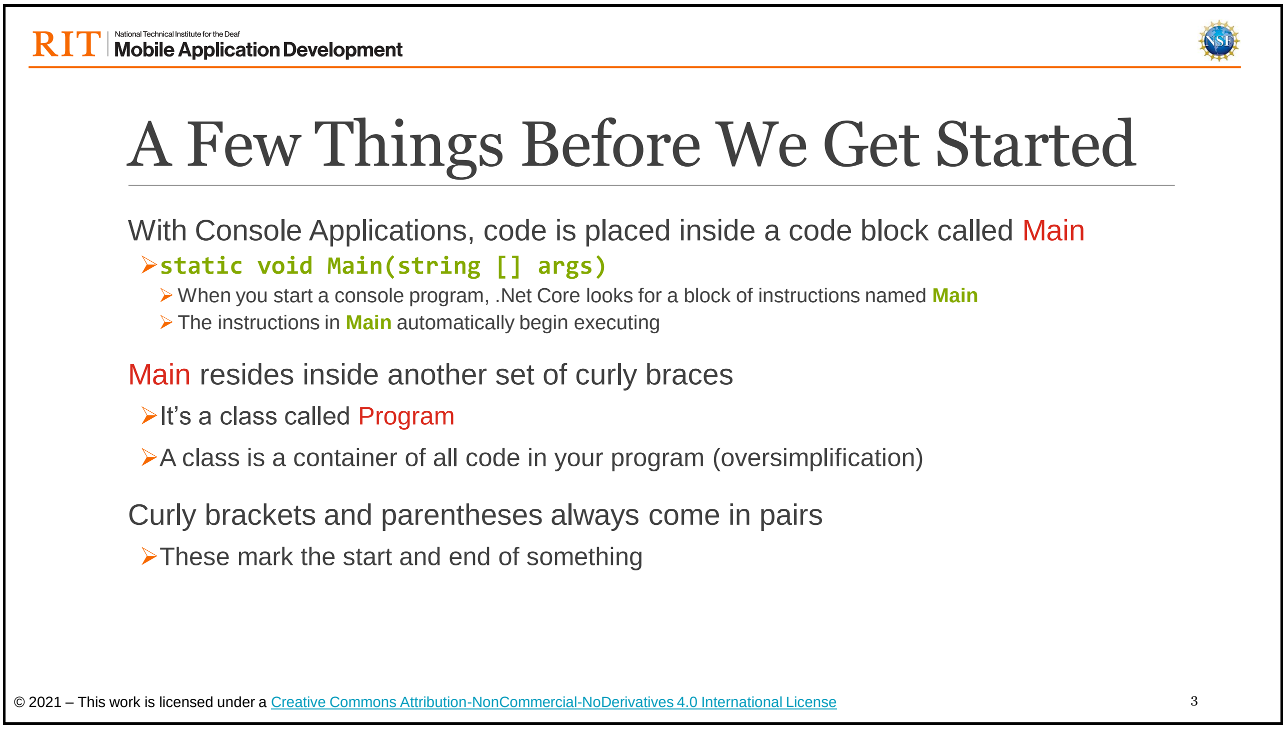
1

Variables & Statements

A BRIEF INTRODUCTION TO VARIABLES, DATA TYPES, AND HOW C# USES THEM

2



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A Few Things Before We Get Started

With Console Applications, code is placed inside a code block called Main

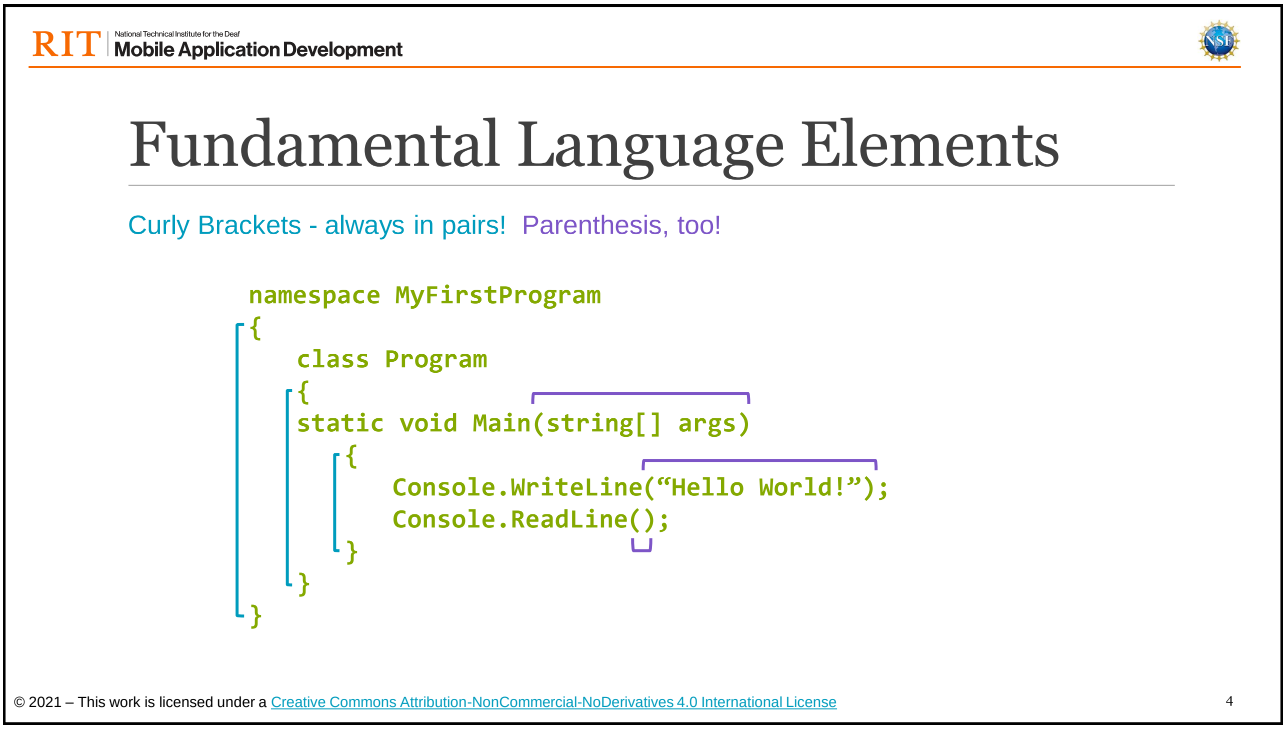
- `static void Main(string [] args)`
  - When you start a console program, .Net Core looks for a block of instructions named **Main**
  - The instructions in **Main** automatically begin executing

Main resides inside another set of curly braces

- It's a class called Program
- A class is a container of all code in your program (oversimplification)

Curly brackets and parentheses always come in pairs

- These mark the start and end of something



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Fundamental Language Elements

Curly Brackets - always in pairs! Parenthesis, too!

```
namespace MyFirstProgram
{
    class Program
    {
    static void Main(string[] args)
        {
            Console.WriteLine(“Hello World!”);
            Console.ReadLine();
        }
    }
}
```

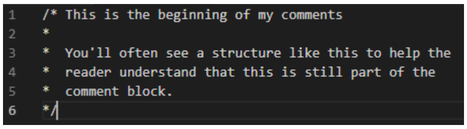
Comments

Entirely for human readers;
ignored by the compiler.

Two ways to comment in C#.

- `// A single line (inline) comment.`
- `/* The text of a multi-line comment may be spread over several lines. */`

Read Chapter 4 in *The C# Player's Guide* for more information about comments



```
/* This is the beginning of my comments
 *
 *  You'll often see a structure like this to help the
 *  reader understand that this is still part of the
 *  comment block.
 */
```

You might see multi-line comments formatted like this

The World Of Coding

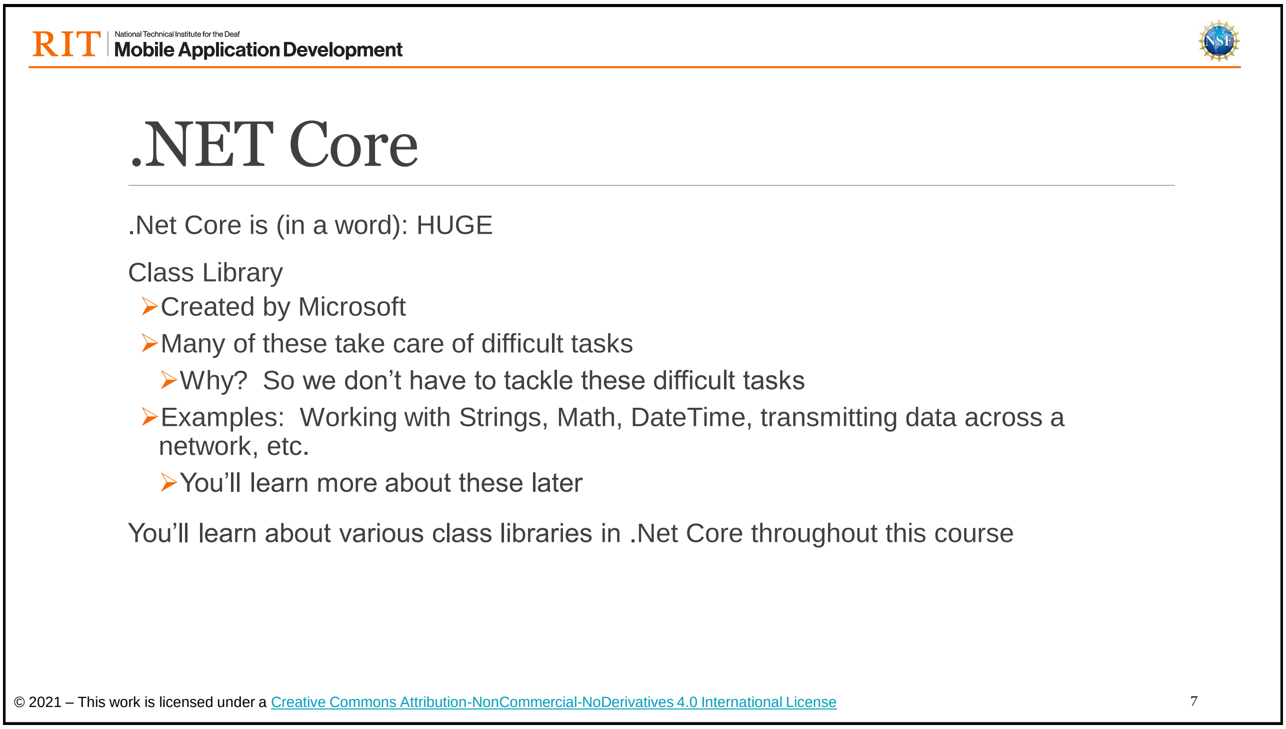
Half of learning code is the syntax of a programming language, in this case, C#

- Syntax involves nouns, verbs, punctuations, etc.

The other half is learning about the pre-built functionality of programming

- Such as Write() and WriteLine()

Pre-built functionality comes from the .NET Core



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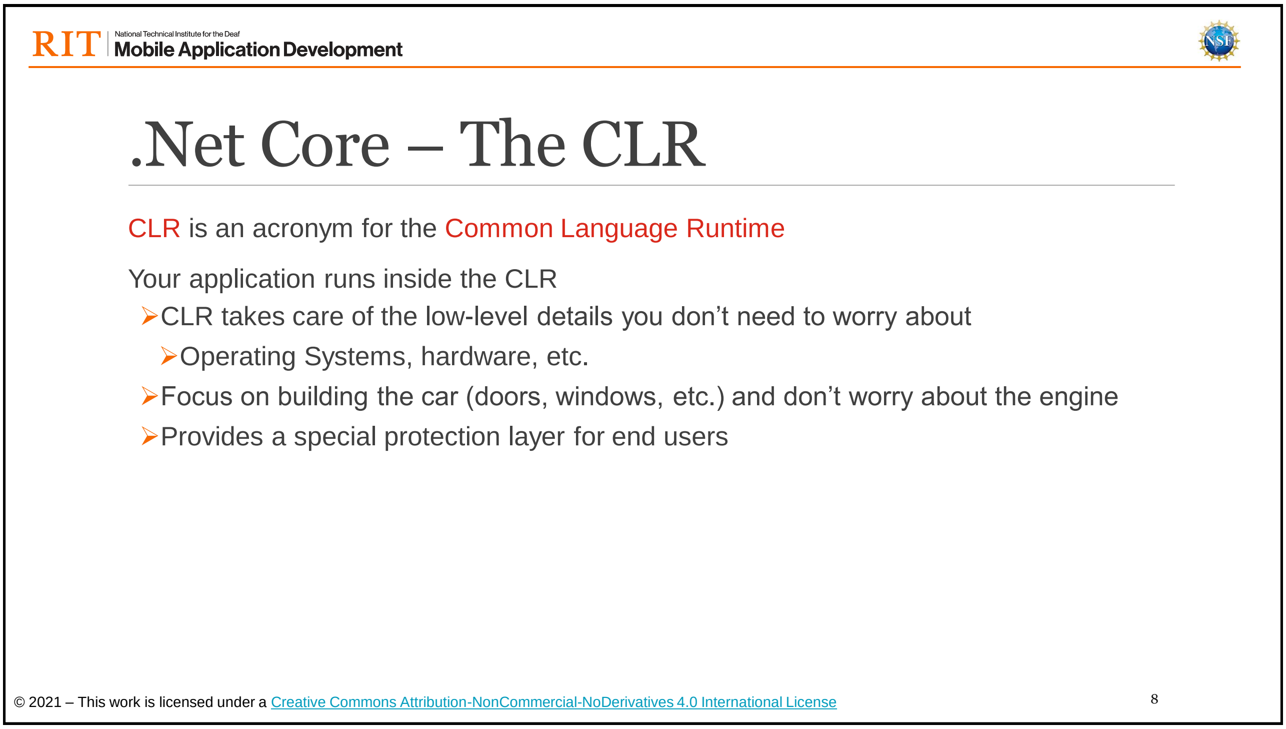
.NET Core

.Net Core is (in a word): HUGE

Class Library

- Created by Microsoft
- Many of these take care of difficult tasks
  - Why? So we don't have to tackle these difficult tasks
- Examples: Working with Strings, Math, DateTime, transmitting data across a network, etc.
  - You'll learn more about these later

You'll learn about various class libraries in .Net Core throughout this course



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.Net Core – The CLR

CLR is an acronym for the Common Language Runtime

Your application runs inside the CLR

- CLR takes care of the low-level details you don't need to worry about
  - Operating Systems, hardware, etc.
- Focus on building the car (doors, windows, etc.) and don't worry about the engine
- Provides a special protection layer for end users

Definition Of “Variable”

Definition from Oxford Dictionaries:

Adjective

- ➢not consistent or having a fixed pattern; liable to change
- ➢able to be changed or adapted

Noun

- ➢an element, feature, or factor that is liable to vary or change

Note the word that appears in every definition: **change**

In programming, a variable is a place in memory to store information

- ➢Think of it as a bucket or box to put something in
- ➢When the program runs, what’s “in the bucket” may change or stay the same

This is really important!

On the previous slide, we said:

- ➢“In programming, a variable is a place in memory to store information” and to think of it like a bucket to put stuff in

Here’s the important part: ***The variable (bucket) can hold one (and only one) value!!!!***

- ➢For example, your age, your cell phone number, etc.
- ➢It cannot hold both your first name and age

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Variables: Names

We need to create a name for each piece of information (data) we want to work with

Each variable in C# has a unique name

The name of the variable allows you to access the specific data associated with that variable

- ➢You can have 1,000 variables and each would have its own unique name
- ➢Names should be easily identifiable; not arbitrary
- ➢Names should clearly indicate what data is being stored there
- ➢For example, studentTuitionBalance is more clear than owesTheCollege

Which bucket did I store the first name in?

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Variables: Names – II

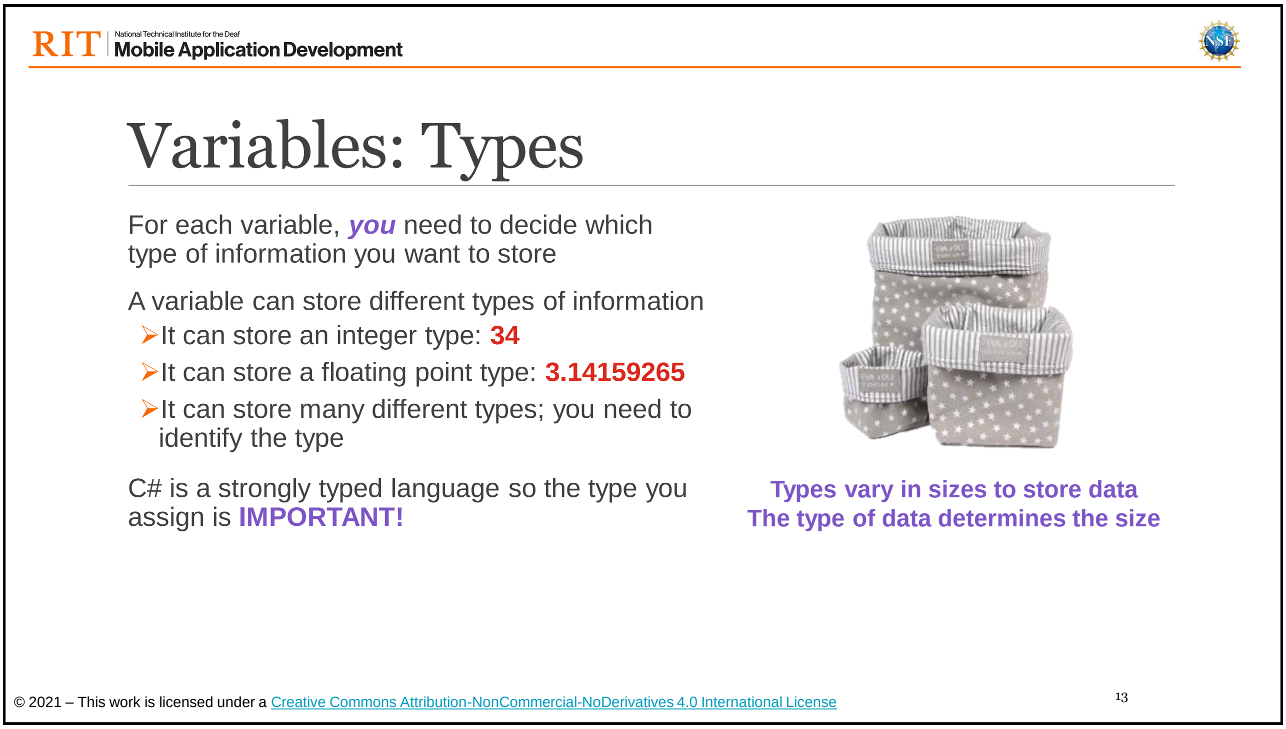
Use (lower) camel casing for names

- ➢One or more words with no space
- ➢First word is in lowercase format
- ➢Remaining word element begins with uppercase letter

Examples:

- ➢**school**
- ➢**myFirstCar**
- ➢**thisIsAReallyLongVariableName**

Which bucket did I store the first name in?



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Variables: Types

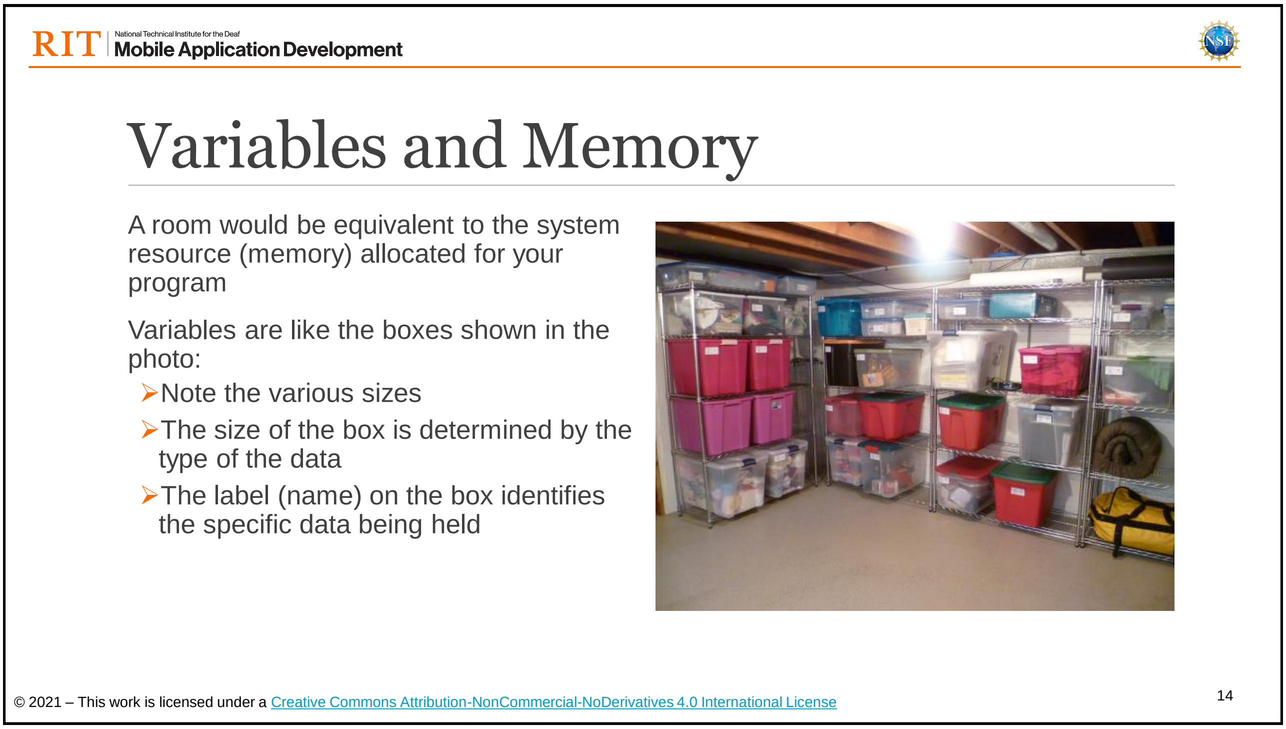
For each variable, ***you*** need to decide which type of information you want to store

A variable can store different types of information

- It can store an integer type: **34**
- It can store a floating point type: **3.14159265**
- It can store many different types; you need to identify the type

C# is a strongly typed language so the type you assign is **IMPORTANT!**

Types vary in sizes to store data
The type of data determines the size



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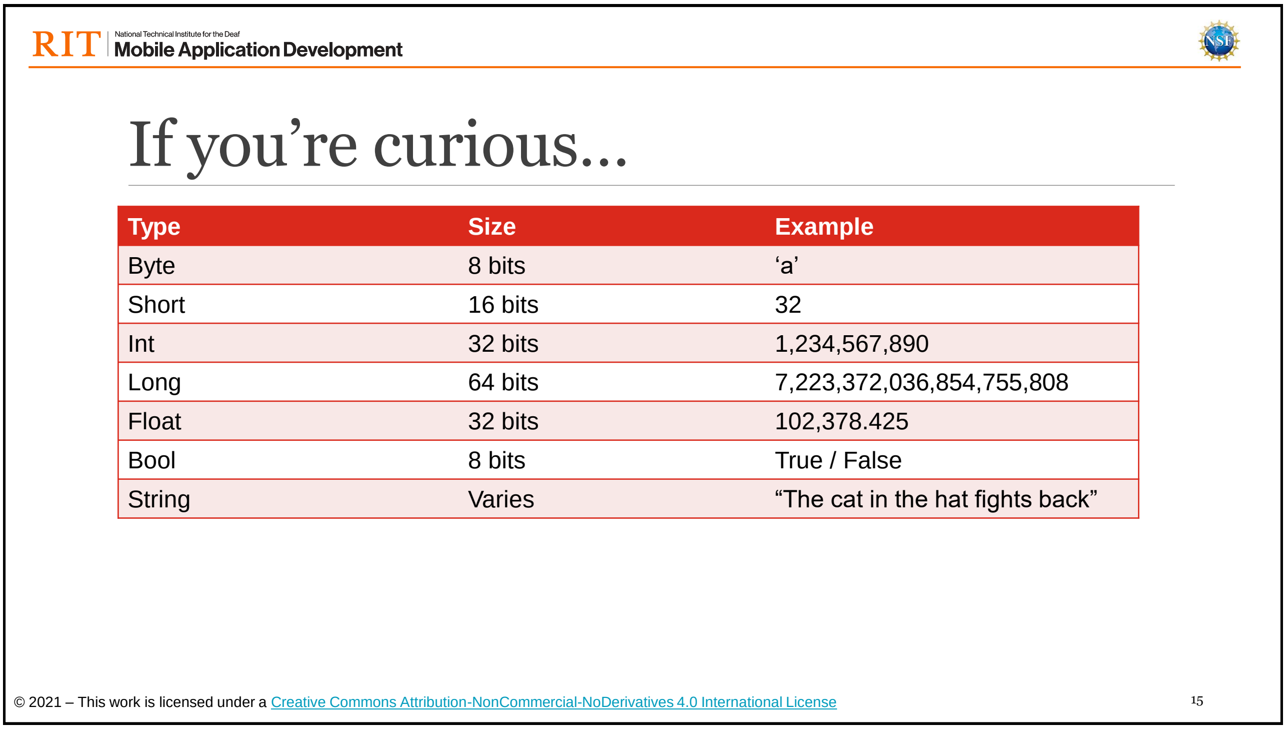
Variables and Memory

A room would be equivalent to the system resource (memory) allocated for your program

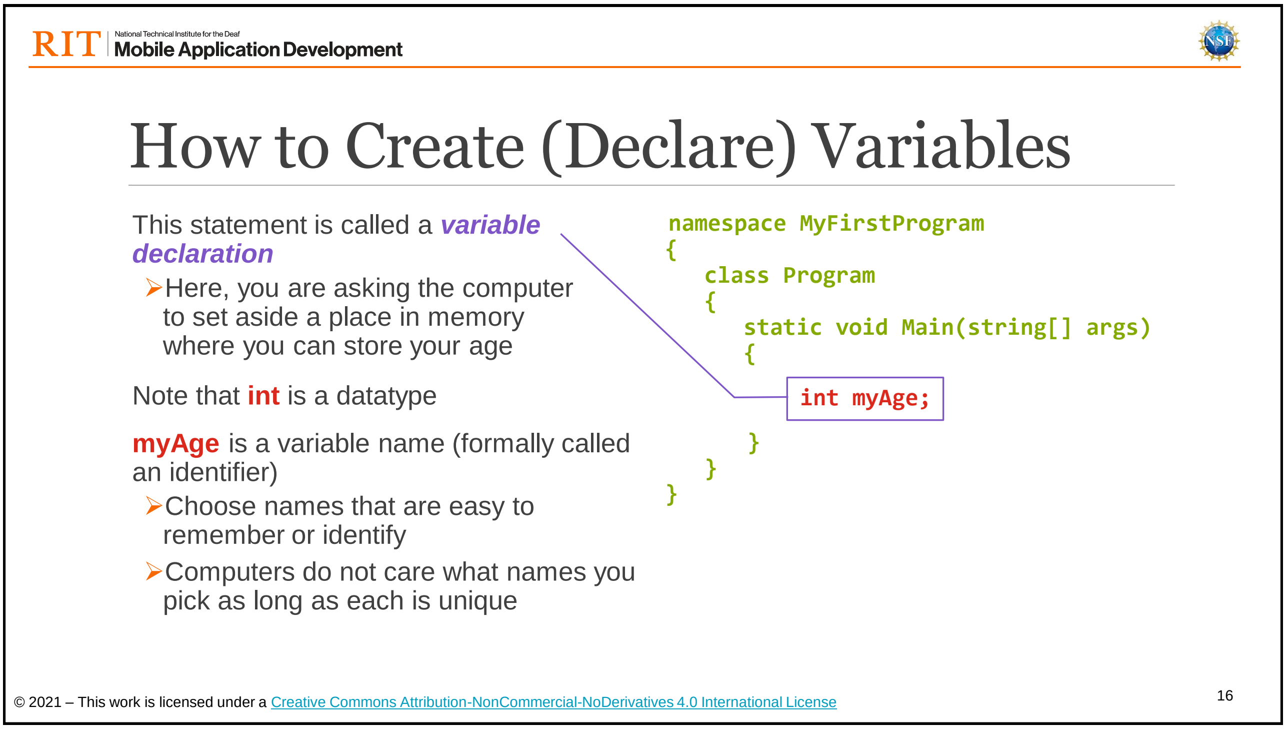
Variables are like the boxes shown in the photo:

- Note the various sizes
- The size of the box is determined by the type of the data
- The label (name) on the box identifies the specific data being held



If you're curious…

Type	Size	Example
Byte	8 bits	'a'
Short	16 bits	32
Int	32 bits	1,234,567,890
Long	64 bits	7,223,372,036,854,755,808
Float	32 bits	102,378.425
Bool	8 bits	True / False
String	Varies	"The cat in the hat fights back"



How to Create (Declare) Variables

This statement is called a ***variable declaration***

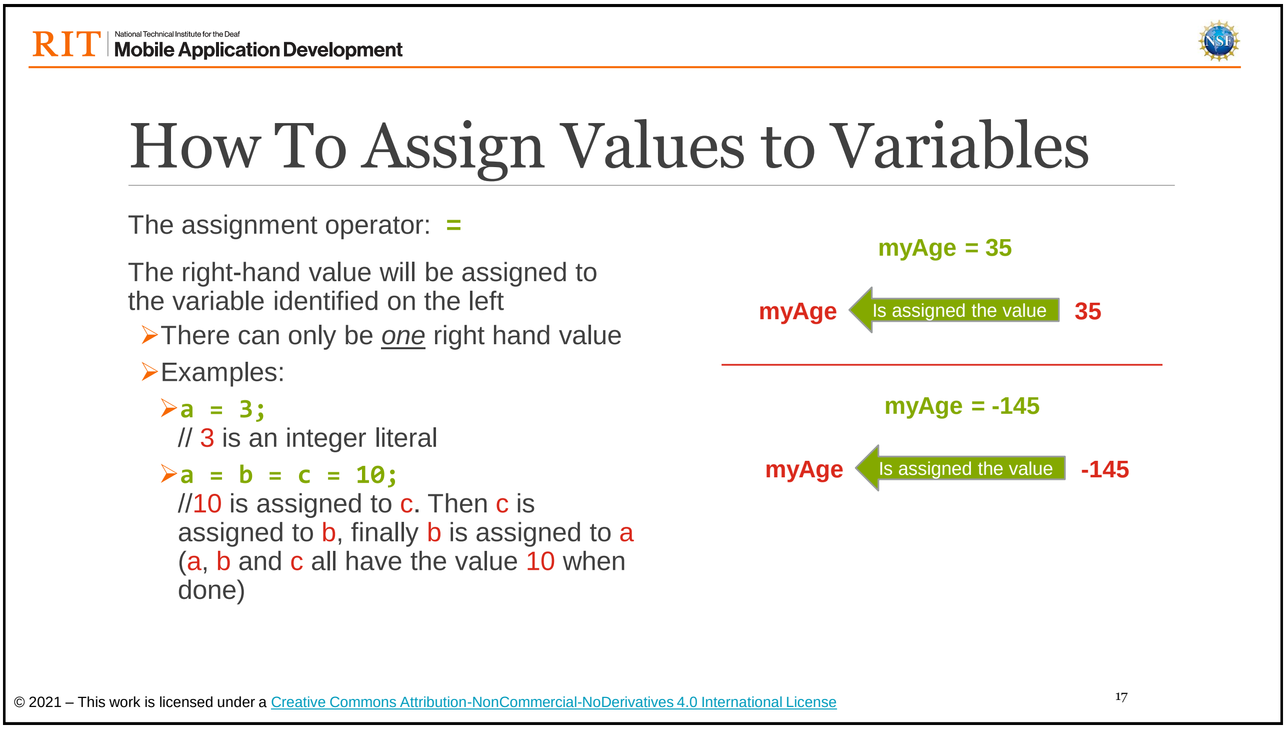
- Here, you are asking the computer to set aside a place in memory where you can store your age

Note that **int** is a datatype

myAge is a variable name (formally called an identifier)

- Choose names that are easy to remember or identify
- Computers do not care what names you pick as long as each is unique

```
namespace MyFirstProgram
{
   class Program
   {
      static void Main(string[] args)
      {
            int myAge;
      }
   }
}
```



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How To Assign Values to Variables

The assignment operator: `=`

The right-hand value will be assigned to the variable identified on the left

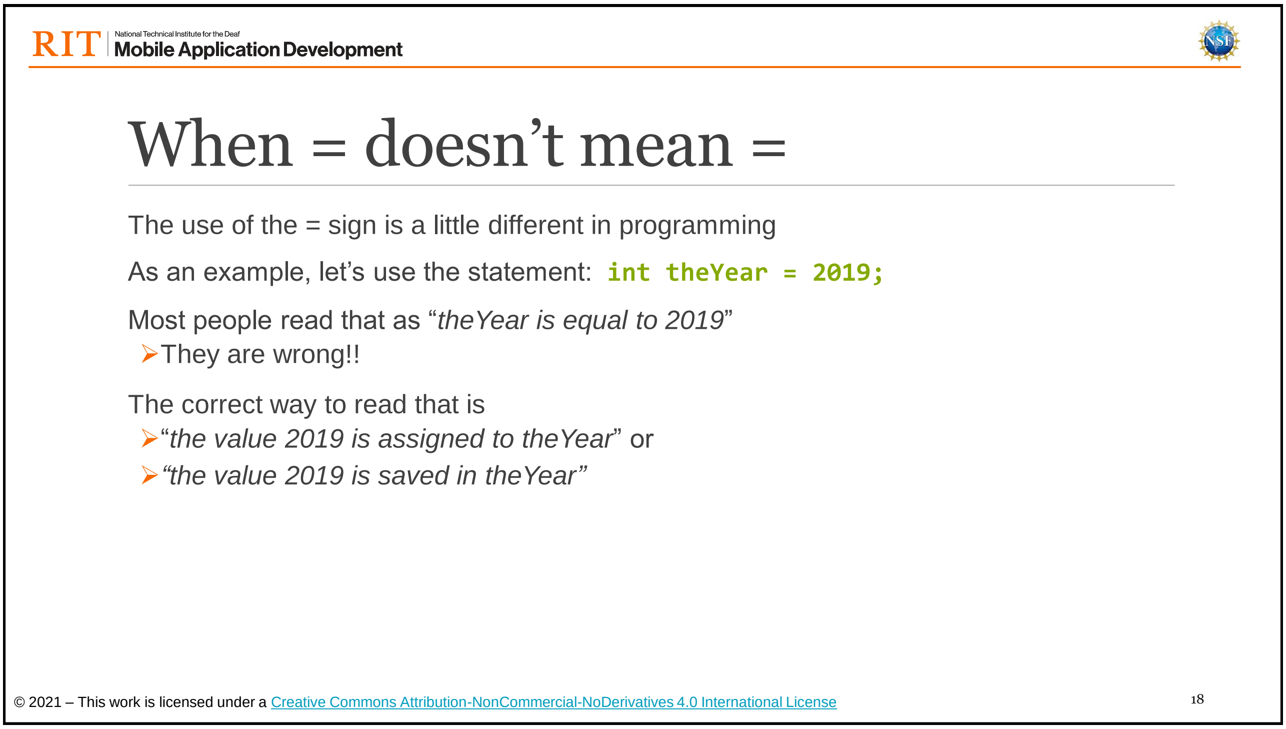
- There can only be *one* right hand value
- Examples:
  - `a = 3;`
    // 3 is an integer literal
  - `a = b = c = 10;`
    //10 is assigned to c. Then c is assigned to b, finally b is assigned to a (a, b and c all have the value 10 when done)

myAge = 35

myAge ← Is assigned the value **35**

myAge = -145

myAge ← Is assigned the value **-145**



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When = doesn’t mean =

The use of the = sign is a little different in programming

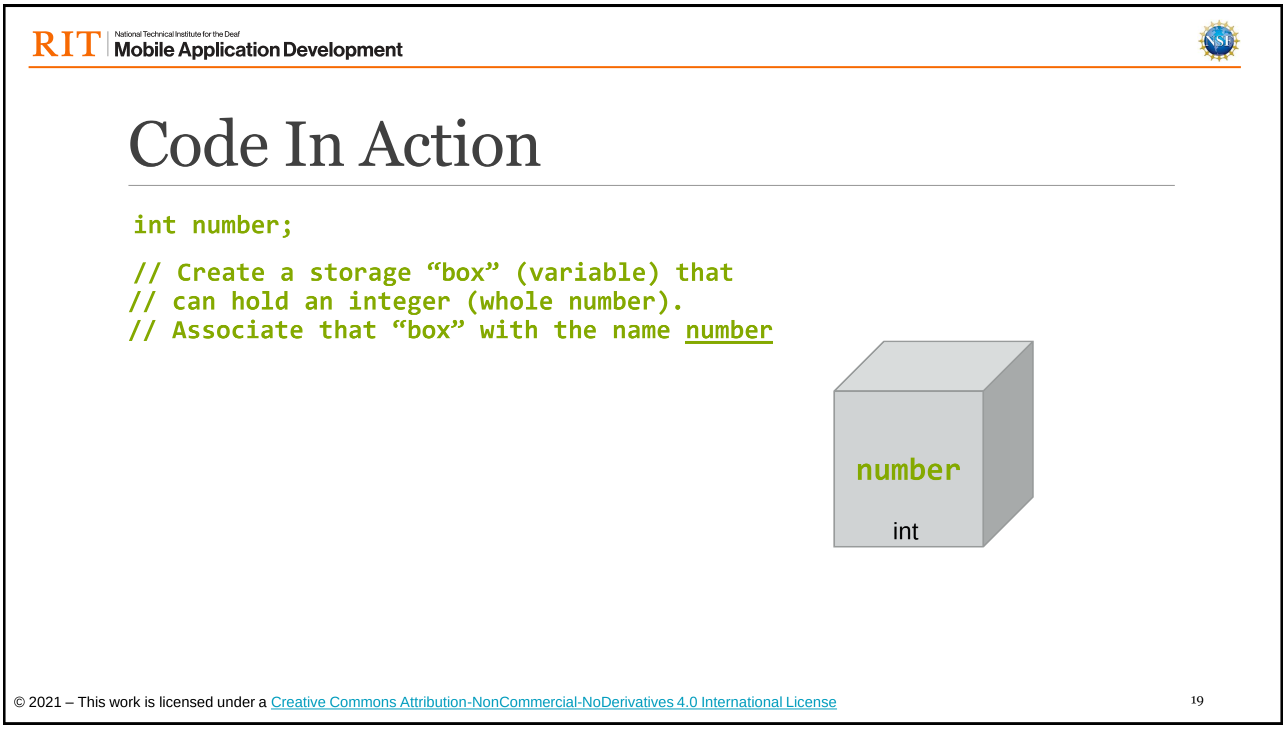
As an example, let’s use the statement: `int theYear = 2019;`

Most people read that as “*theYear is equal to 2019*”

- They are wrong!!

The correct way to read that is

- “*the value 2019 is assigned to theYear*” or
- *“the value 2019 is saved in theYear”*



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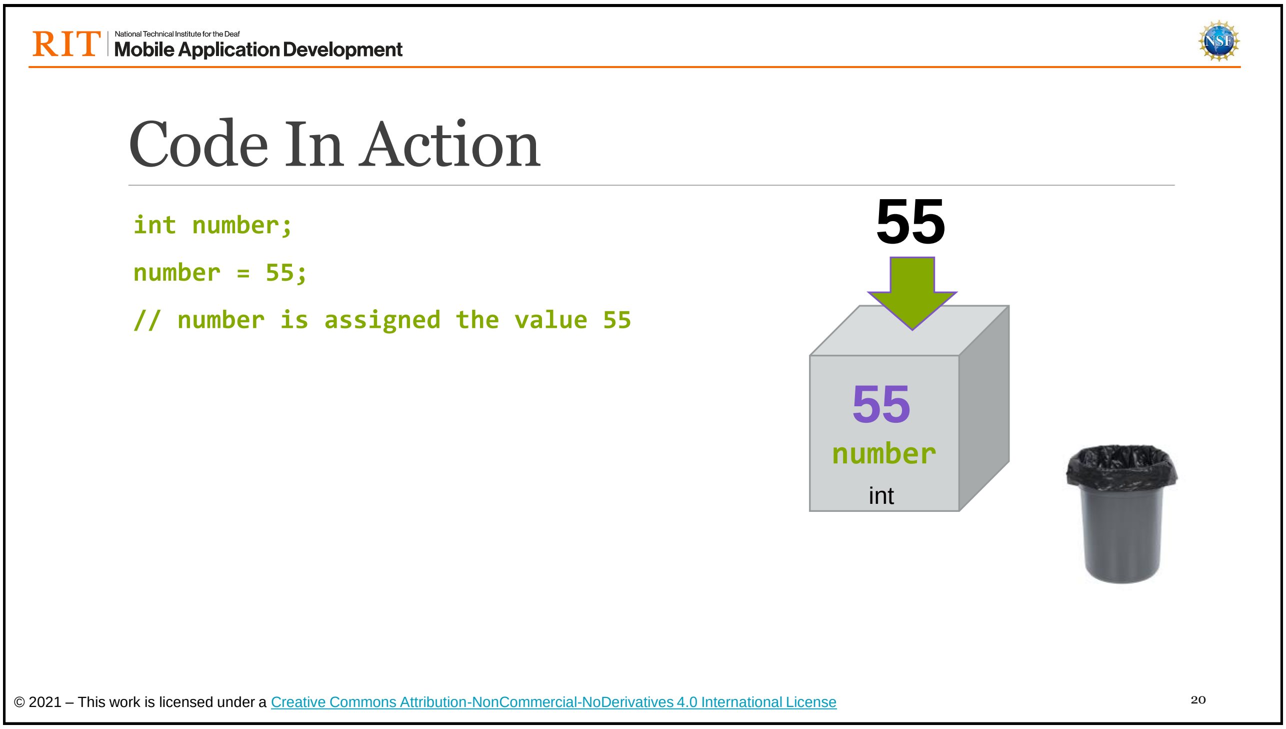
Code In Action

```
int number;

// Create a storage "box" (variable) that
// can hold an integer (whole number).
// Associate that "box" with the name number
```



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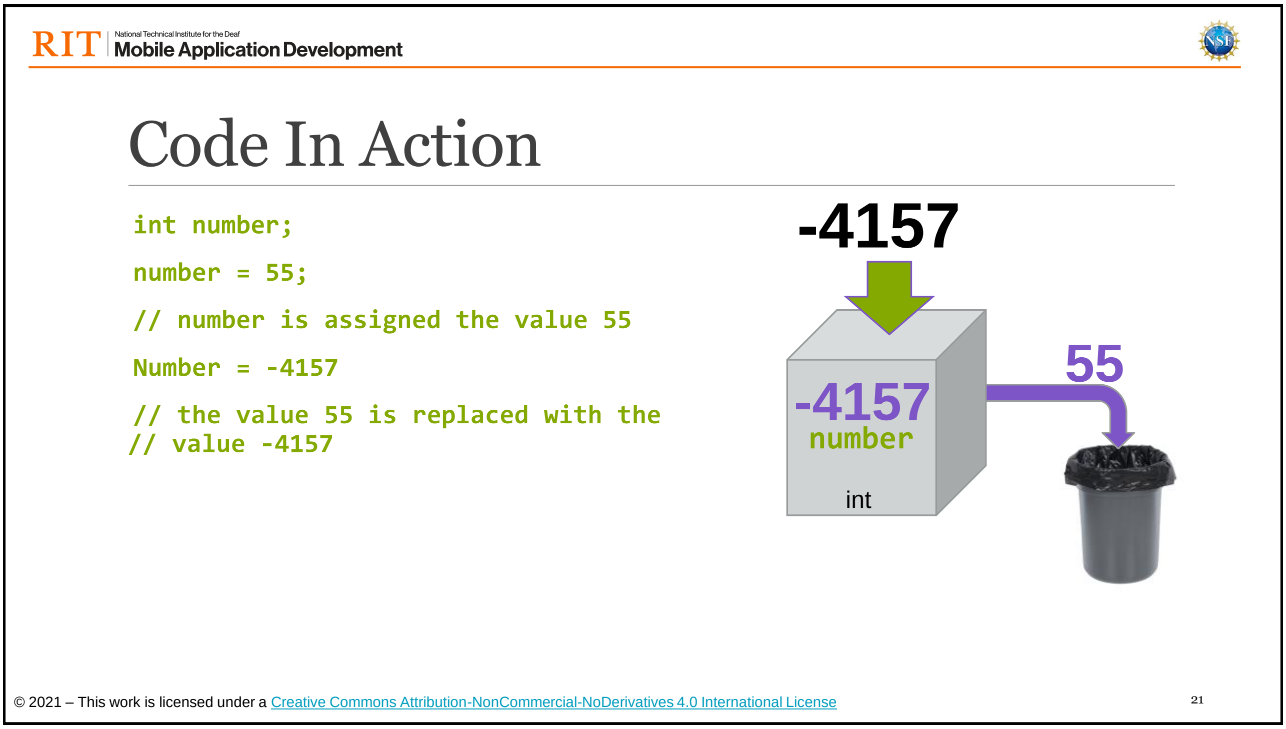
Code In Action

```
int number;

number = 55;

// number is assigned the value 55
```

55
55
number
int



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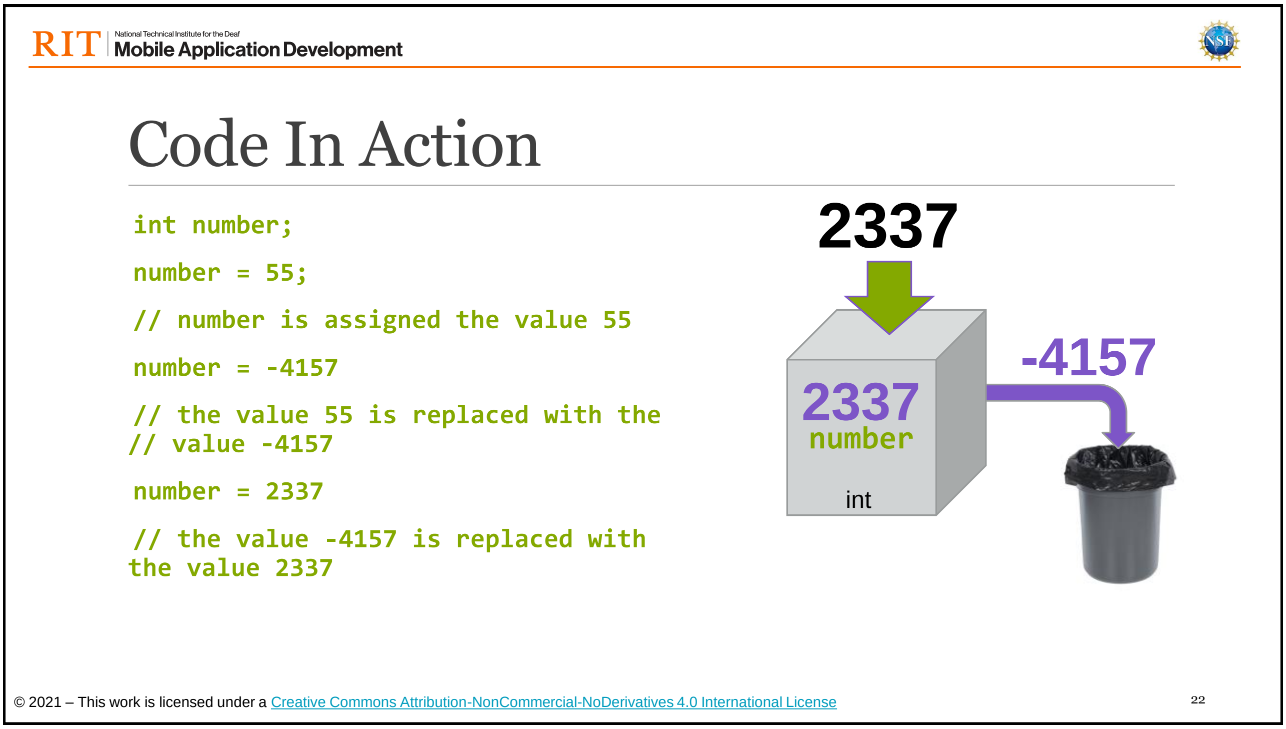
Code In Action

```
int number;

number = 55;

// number is assigned the value 55

Number = -4157

// the value 55 is replaced with the
// value -4157
```

-4157
-4157
number
int
55



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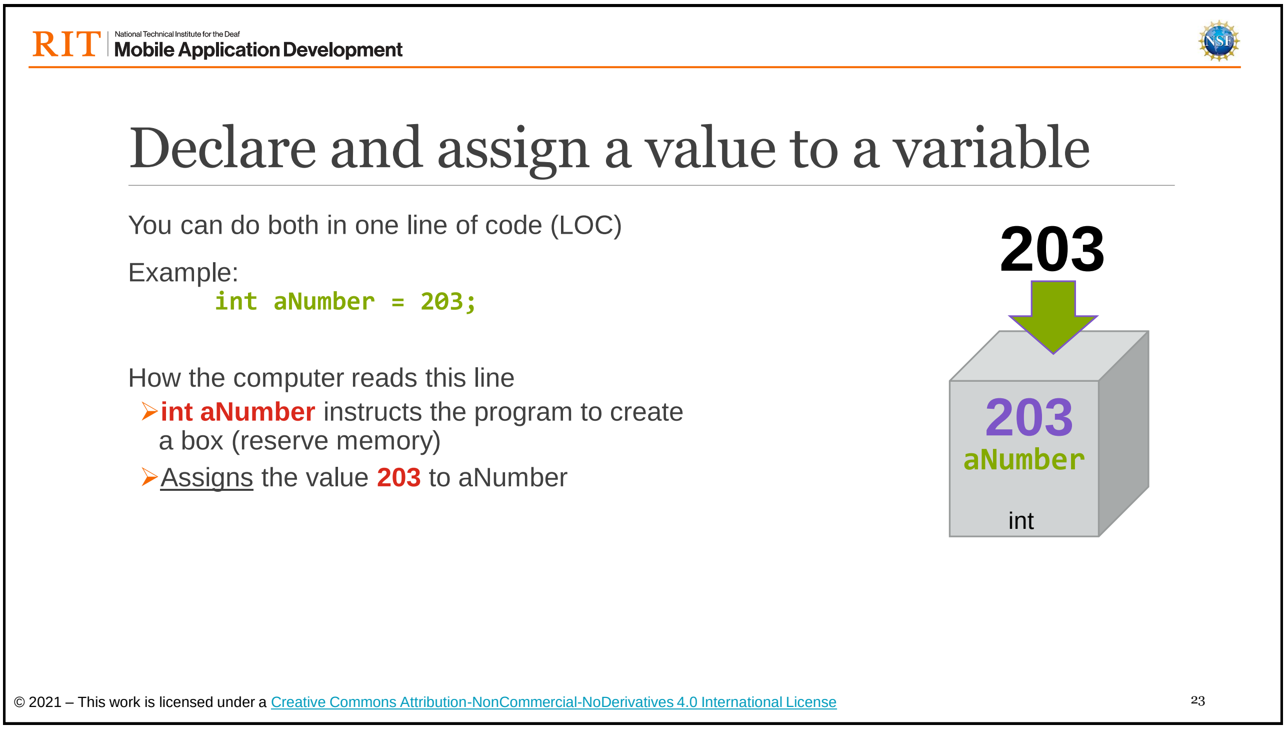
Code In Action

```
int number;

number = 55;

// number is assigned the value 55

number = -4157

// the value 55 is replaced with the
// value -4157

number = 2337

// the value -4157 is replaced with
the value 2337
```

2337
2337
number
int
-4157



Declare and assign a value to a variable

You can do both in one line of code (LOC)

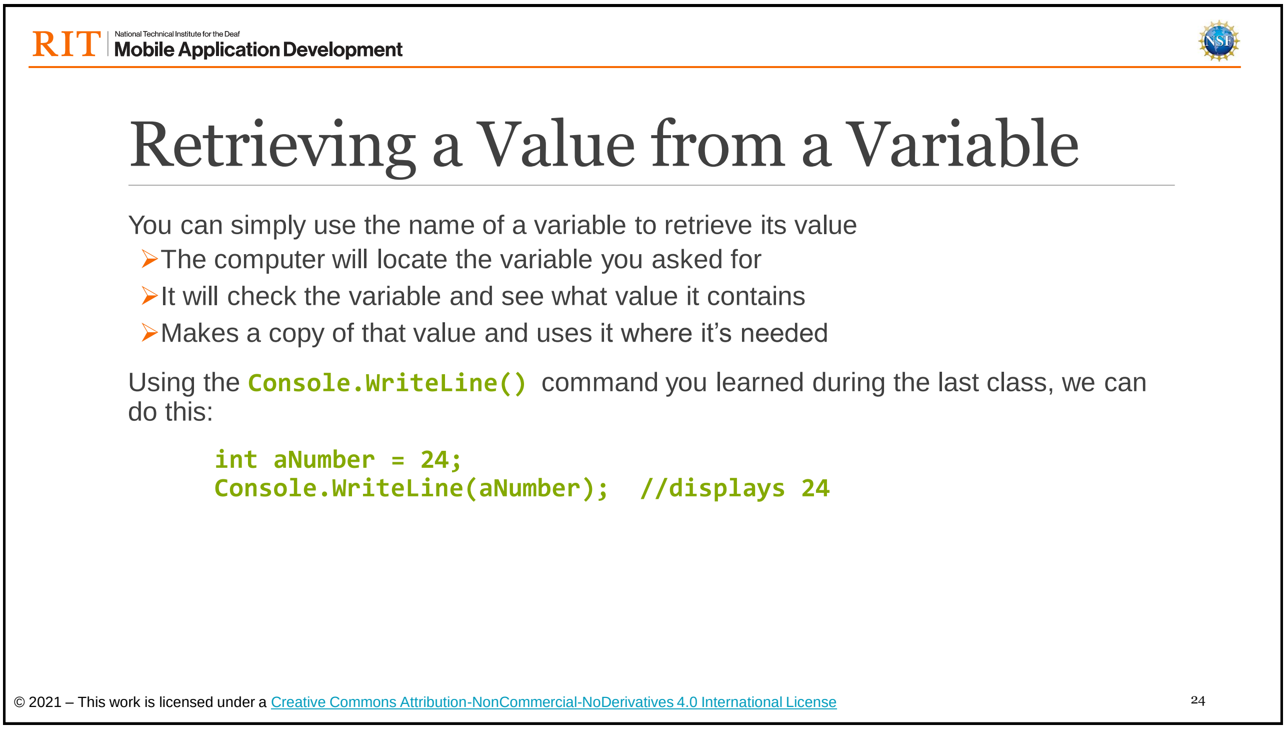
Example:

```
int aNumber = 203;
```

How the computer reads this line

- ➢**int aNumber** instructs the program to create a box (reserve memory)
- ➢Assigns the value **203** to aNumber

203
203
aNumber
int



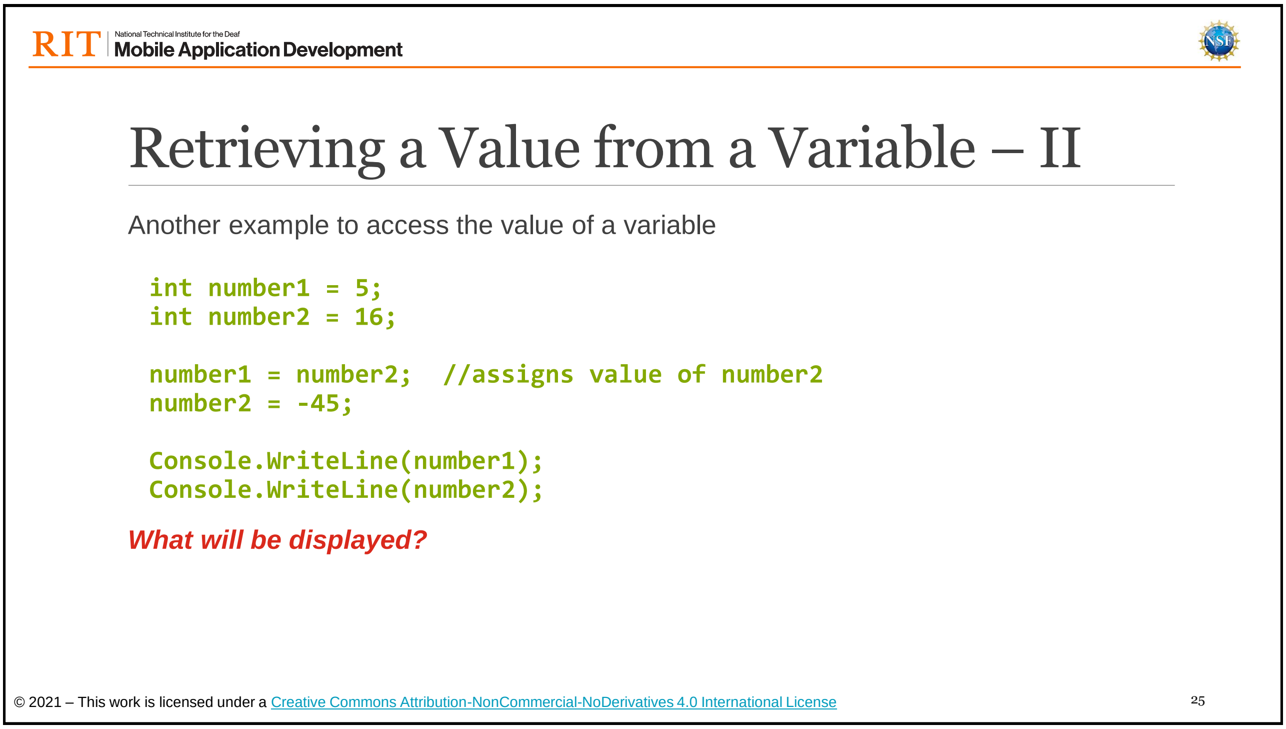
Retrieving a Value from a Variable

You can simply use the name of a variable to retrieve its value

- ➢The computer will locate the variable you asked for
- ➢It will check the variable and see what value it contains
- ➢Makes a copy of that value and uses it where it’s needed

Using the `Console.WriteLine()` command you learned during the last class, we can do this:

```
int aNumber = 24;
Console.WriteLine(aNumber);  //displays 24
```



Retrieving a Value from a Variable – II

Another example to access the value of a variable

```
int number1 = 5;
int number2 = 16;

number1 = number2;  //assigns value of number2
number2 = -45;

Console.WriteLine(number1);
Console.WriteLine(number2);
```

What will be displayed?

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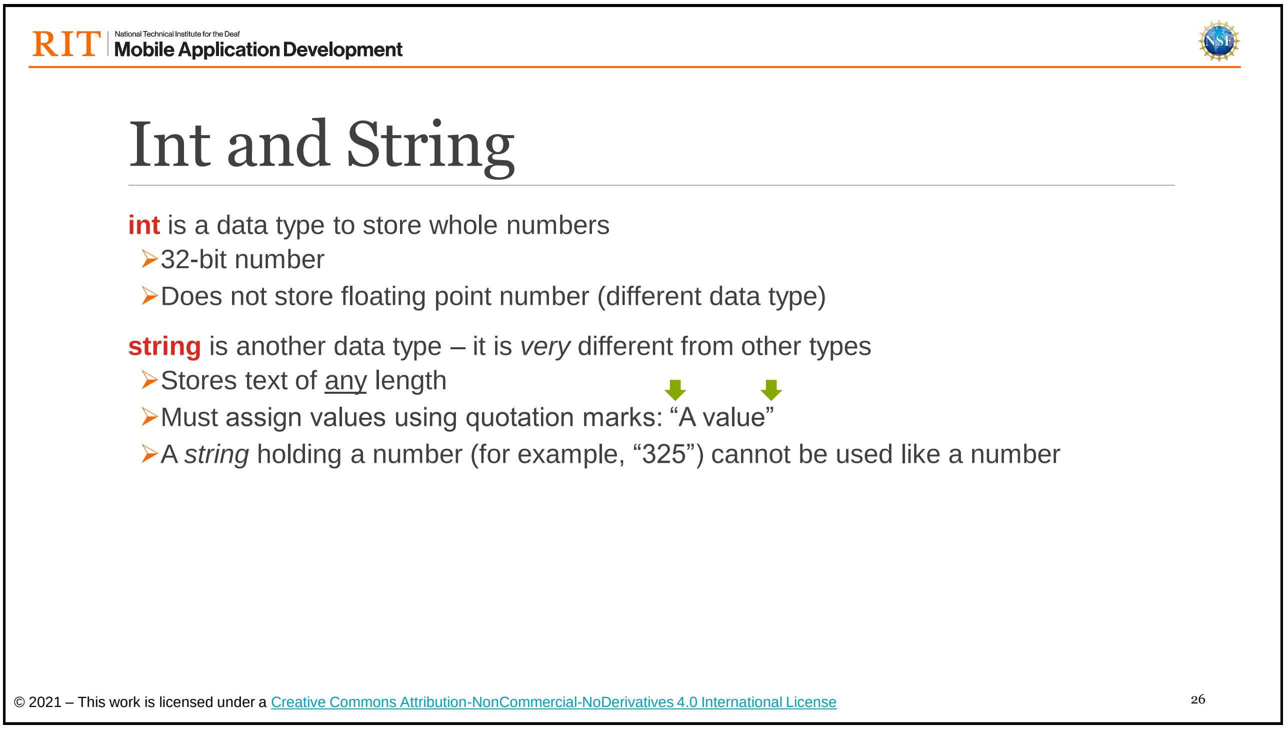

Int and String

int is a data type to store whole numbers

- ➢32-bit number
- ➢Does not store floating point number (different data type)

string is another data type – it is *very* different from other types

- ➢Stores text of any length
- ➢Must assign values using quotation marks: “A value”
- ➢A *string* holding a number (for example, “325”) cannot be used like a number

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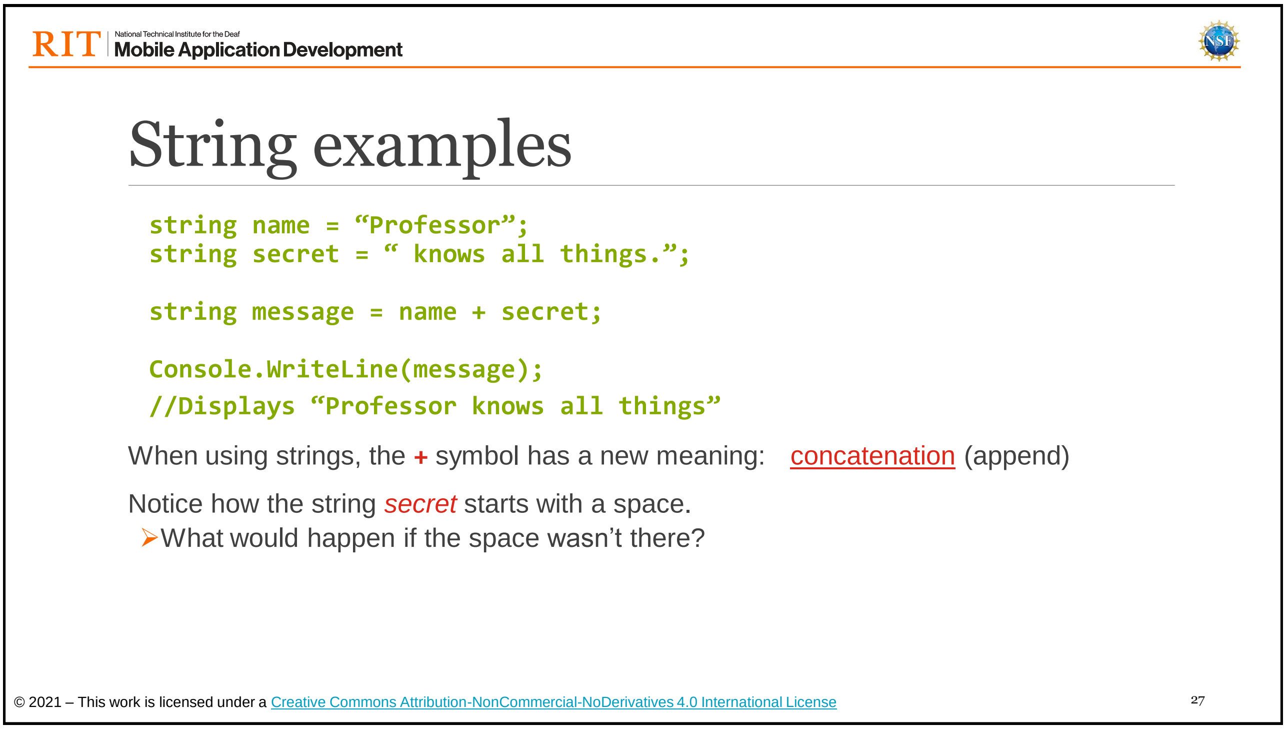


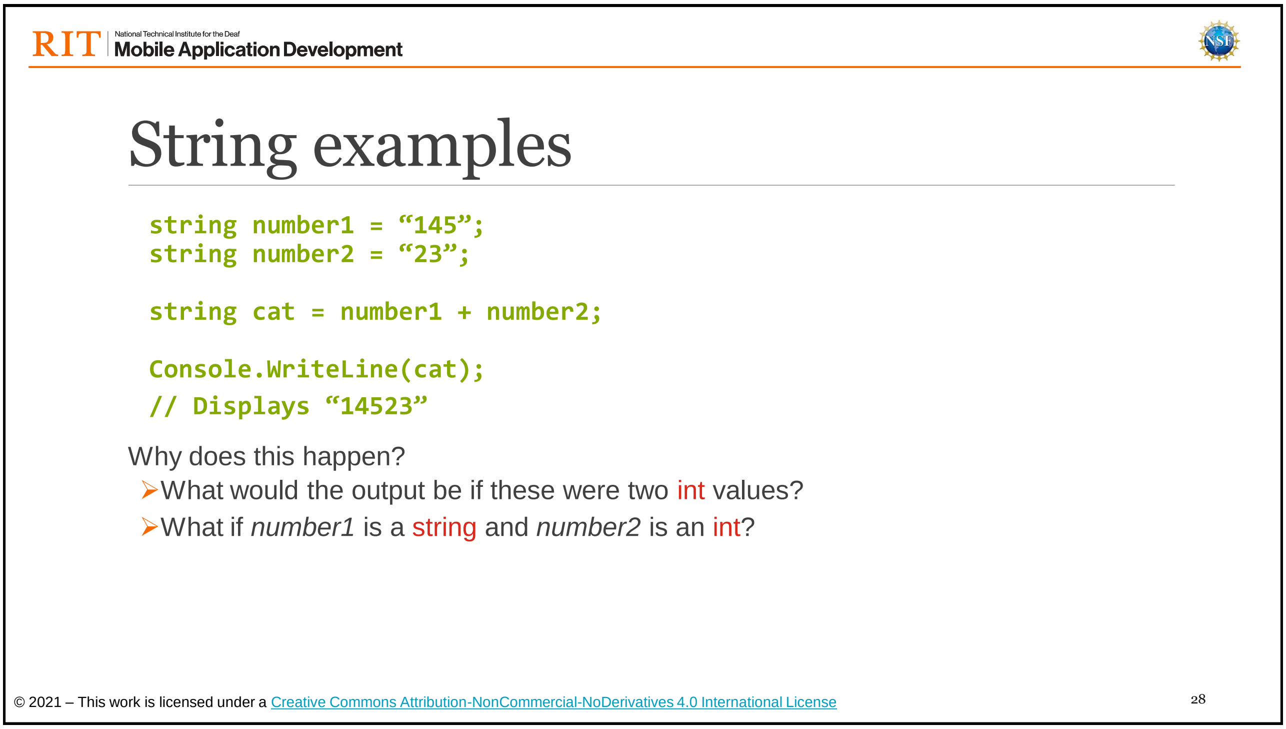
String examples

```
string name = “Professor”;
string secret = “ knows all things.”;

string message = name + secret;

Console.WriteLine(message);
//Displays “Professor knows all things”
```

When using strings, the **+** symbol has a new meaning: concatenation (append)

Notice how the string *secret* starts with a space.

- What would happen if the space wasn’t there?

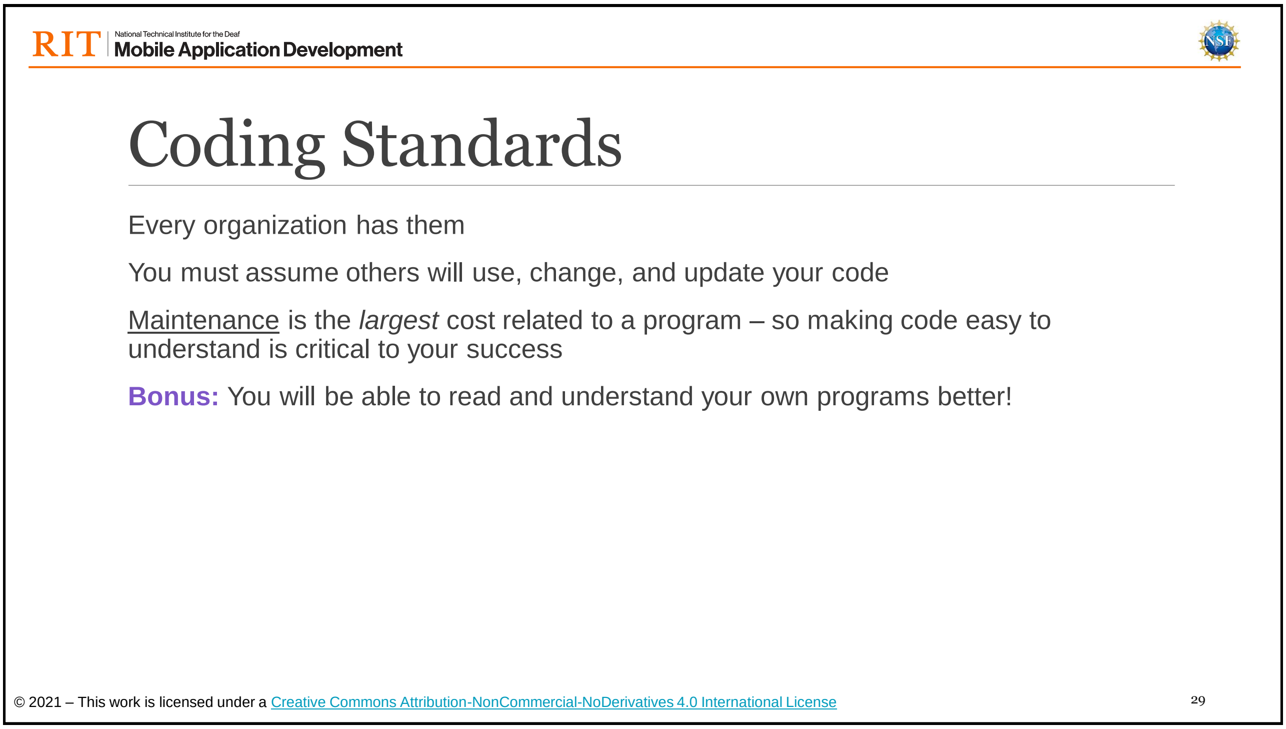


String examples

```
string number1 = “145”;
string number2 = “23”;

string cat = number1 + number2;

Console.WriteLine(cat);
// Displays “14523”
```

Why does this happen?

- What would the output be if these were two int values?
- What if *number1* is a string and *number2* is an int?



Coding Standards

Every organization has them

You must assume others will use, change, and update your code

Maintenance is the *largest* cost related to a program – so making code easy to understand is critical to your success

Bonus: You will be able to read and understand your own programs better!