



Variables, Data Types, Operators



Variables

- A variable is a named space in memory
- When we create a variable, we are reserving some RAM and making it accessible using a “friendly name”
- Data can be assigned to a variable when we want to access data in the future



Declaring a variable

- Variable names should be nouns
- Variable names are case sensitive
- Good variable names should be descriptive
- Reserved keywords cannot be variable names
 - i.e. public, private, protected, return, if, else, new, for, switch, static, etc.



Assigning a variable

- It is best practice to declare variables before assigning values to them.

```
string bestFootballTeam;  
bestFootballTeam = "Green Bay Packers";
```

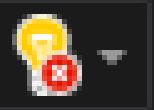
- With that said, it is possible to declare and assign a variable in the same statement.

```
string bestFootballTeam = "Green Bay Packers";
```



Things that can go wrong

```
Console.WriteLine(bestFootballTeam);
```



The name 'bestFootballTeam' does not exist in the current context

Show potential fixes (Alt+Enter or Ctrl+.)

```
string bestFootballTeam;
```

```
Console.WriteLine(bestFootballTeam);
```

[!] (local variable) string bestFootballTeam

Use of unassigned local variable 'bestFootballTeam'

Variables must be declared in order to be used.

Variable must be assigned values in order for us to use them.

```
string bestFootballTeam;
```

```
bestFootballTeam = "Green Bay Packers";
```

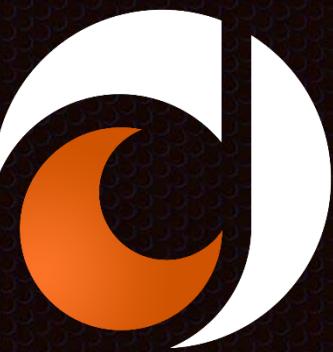
```
Console.WriteLine(bestFootballTeam);
```

How it should look.



Data Types

- C# is a strongly typed language
- That means you must inform the compiler about which data type you would like to use when you declare a variable.
- Value Type: assign a value directly to a variable
- Reference Type: pointed to the location of where the value is stored



Some Data Types

- int: Value type that stores numbers. 32-bit signed integer type
 - Default value is 0
- char: Value type that stores a single 16-bit Unicode character
- bool: Value type that is a Boolean value (True or False)
 - Default value is false
- string: Reference type that stores characters that make up text
 - Default value is null



Types of Numbers

- float: 32-bit (7 digits) floating point type
- double: 64-bit (15-16 digits) floating point type
- decimal: 128-bit (28-29 digits) floating decimal point type
- All three are value types that store numbers



Numbers

```
int price = 100;  
double wages = 50;  
double result = price * wages;  
Console.WriteLine(result);
```



Boolean

```
bool isInstructorAwesome = false;  
isInstructorAwesome = true;  
Console.WriteLine(isInstructorAwesome);
```



Strings

```
string firstString = "Green Bay ";
string secondString = "Packers";
string result = firstString + secondString;
Console.WriteLine(result);
```

The plus operator (+) can also be used to "add" strings together.
This is what is known as "string concatenation"



Operators

Operator

+

-

*

/

%

++

--

Description

Addition (also String concatenation)

Subtraction

Multiplication

Division

Modulus

Increment

Decrement



Operator Examples

Operator	Example
+	$2 + 2 = 4$
-	$4 - 2 = 2$
*	$5 * 5 = 25$
/	$10 / 5 = 2$
%	$4 \% 3 = 1$
++	$1++ = 2$
--	$1-- = 0$



Order of Operations is Important

- . The order of operations can matter a lot when writing code
- . Order of operations is left to right
- . Parentheses
- . Exponents
- . Multiply or Divide
- . Addition or Subtraction



Order of Operations Example

$$4 + 6 * 3 / 2 - (4 - 1) + 9 * (3 - (2 * 4)) / 3$$

$$4 + 6 * 3 / 2 - (4-1) + 9 * (3 - 8) / 3$$

$$4 + 6 * 3 / 2 - 3 + 9 * -5 / 3$$

$$4 + 18 / 2 - 3 + 9 * -5 / 3$$

$$4 + 9 - 3 + 9 * -5 / 3$$

$$4 + 9 - 3 + 9 * -5 / 3$$

$$4 + 9 - 3 + -15$$

$$10 + -15$$

Output: -5



Assignment Operators

Operator	Example	Same As
=	$x = y$	$x = y$
$+=$	$x += y$	$x = x + y$
$-=$	$x -= y$	$x = x - y$
$*=$	$x *= y$	$x = x * y$
$/=$	$x /= y$	$x = x / y$
$%=$	$x %= y$	$x = x \% y$



Comparison Operators

Operator

`==`

`!=`

`>`

`<`

`>=`

`<=`

Description

equal to

not equal to

greater than

less than

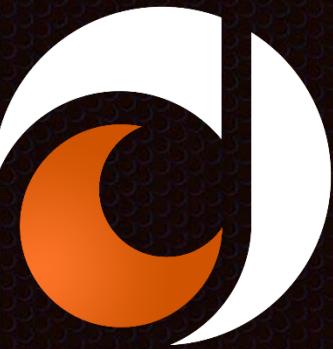
greater than or equal to

less than or equal to



Review Questions

- What is a variable?
- What is a data type?
- What is an example of a data type? Explain.
- What does PEMDAS stand for?



Assignment

Pay Calculator

Write a program to prompt the user for hours and rate per hour to compute gross pay.

Enter hours: 35

Enter rate: 2.75

Pay: 96.25

