


COMP SCI 1101 Introduction to Programming

# Variables, Data Types & Expressions

# Variables

- A variable is a named location in memory where we can store a value. This value can be accessed and modified using the variable name.
- Declaration - when we declare a new variable in our program

```
int x;
```

- Initialisation – when we give a new variable it's first value

```
x = 2;
```

- Note that we can declare and initialise in the same line of code

```
int x = 2;
```

# Variables

- Update – when we give an initialised variable a new value

```
int x = 2;
x = 4;
```

- Access – we can use the variable's name to access it's current value

```
int x = 2;
println(x);
```

# Data Types

- int
  - Whole numbers
  - Examples
    - Id number – 1234567
    - Day of month – 15
    - Product quantity – 3,564
- float
  - Number with a decimal point
  - Examples
    - Weight – 66.8
    - Age – 12.5
    - Account balance – 10,780.98

# Data Types

- char
  - Single character
  - Examples
    - User input – ‘u’ for up
    - Multiple choice answers – ‘b’
- String
  - Sequence of characters
  - Examples
    - “Programming is fun!”
    - “1982 was a great year”

# Data Types

- boolean
  - True or false
  - Examples
    - Current student – true
    - Game complete – false
- color
  - Stores a RGB colour code
  - Examples
    - color black = #000000;
    - color green = color(0,255,0);

# Data Types

```
// Student ID
int id = 1234567;

// Student GPA
float gpa = 6.5;

// Student undergrad/postgrad status
char gradStatus = ‘u’;

// Student currently studying
boolean currStudent = true;

// Student name
String name = “Joe Bloggs”;
```

# A Note About float

- What does the following code produce?

```
float x = 2/3;
```

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```
0.0
```

- Why?

# A Note About float

- What does the following code produce?

```
float x = 2/3;
```

0.0

- Why?
  - We are asking Processing to divide the integer 2 by the integer 3
  - This results in the value 0 - as 3 does not go into 2
  - This 0 is then assigned to x, which is a float, and therefore becomes 0.0

# A Note About float

- What does the following code produce?

```
float x = 2/3;
```

```
0.0
```

- How can we fix it?

# A Note About float

- A solution:

```
float x = 2/3.0;
```

0.666666…

# Converting Data Types

- Suppose we wanted a random integer value:

```
int rand = random(100);
```

- Will this line of code work?

# Converting Data Types

- Suppose we wanted a random integer value:

```
int rand = random(100);
```

- Will this line of code work?
  - No, the random function will give us a float value, which cannot be assigned to an integer variable as we will lose some information.
  - How to fix?

# Converting Data Types

- A solution:

```
int rand = int(random(100));
```

- Now we are first converting the float value given to us by the random function into an integer, and then assigning it to the rand variable.

# Converting Data Types

- More data conversion functions:
  - int()
  - float()
  - boolean()
  - char()
  - str()
    - The str() function is useful if you want to display a boolean value in your sketch using the text function

```
boolean loveToProgram = true;
// Will print true to the sketch at (50,50)
text(str(loveToProgram), 50, 50);
```

# Expressions

- The usual culprits:
  - ( ) brackets
  - * multiplication
  - / division
  - + addition
  - - subtraction

# Expressions

- % Modulo
  - Gives the remainder when one number is divided by another
  - 4 % 3 = 1
  - 4 % 2 = 0
  - 63 % 5 = 3

# Expressions

- Increment and decrement
  - ++ increment
  - -- decrement

```
int x = 2;
x++; // x now has the value of 3

int y = 5;
y--; // y now has the value of 4
```

# Expressions

- Operator assign
  - *= Multiplication assign
  - /= Division assign
  - += Addition assign
  - -= Subtraction assign

```
int x = 2;
x *= 5; // x now has the value of 10

int y = 20;
y /= 5; // y now has the value of 4

int z = 30;
z -= 20 // z now has the value of 10

int i = 30;
i += 30 // i now has the value of 60
```

# Expressions

- The ^ is used as a symbol in some programming languages as a square operator, i.e. 2^3 = 8
- In Processing you will need to use either the inbuilt sq or pow functions

```
int value = pow(2,3);
```


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