

Will's Way to Java

By William Brown and other teams I stole slides from :)

Programming Software

- Java and C++ are both coded in an software called VS Code.
- Vscod is and IDE or Integrated Development Environment.
- Vscod allows us to import libraries and develop code with the added bonus of “spellchecking” code like Word does your homework.
- Just like Spellcheck it can “correct” your code into the wrong thing



Programming Software

You can install VScode with the FRC plugin by following the instructions here

<https://docs.wpilib.org/en/stable/docs/zero-to-robot/step-2/wpilib-setup.html>

Third Party Libraries (CAN-Devices, Advanced Sensors, etc.):

<https://docs.wpilib.org/en/stable/docs/software/vscode-overview/3rd-party-libraries.html>

CTRE Phoenix Framework Downloads:

http://www.ctr-electronics.com/hro.html#product_tabs_technical_resources

CTRE Phoenix Framework Documentation:

<https://phoenix-documentation.readthedocs.io/en/latest/index.html>

REV SPARK MAX Software (Docs/Downloads): <http://www.revrobotics.com/sparkmax-software/>

PhotonVision PhotonLib Docs: <https://docs.photonvision.org/en/latest/>



How to Java Repository

Here is a link to many teams training resources that another mentor has accumulated. The teams have been teaching this for years there is great material here.

Repository link:

https://docs.google.com/document/d/1jcBLAyJ3iTbsYSnWMVWqHaK8uywGTaTjF98eY_xxpl0/edit?usp=sharing



INTRO TO JAVA

To be honest I believe that the greatest skill of an engineer is “stealing” from the best and inventing the rest. In that Spirit this is a link to Team Spectrums intro to java slides and training videos that they have used to training their own team and others through the years

[Intro To java Team Spectrum Slide](#)

[Intro to Java Team Spectrum Video](#)



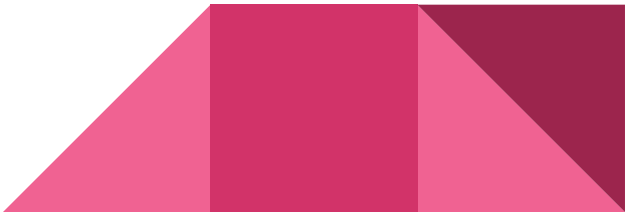
Key Concepts of Java

- Basic Syntax
- Data Types
- Basic math
- Boolean Operators
- If Statements
- For loop
- While Loops
- Command based Programming
 - Subsystems
 - Commands
 - Triggers
- Vision
 - Limelight
 - Photon Vision
 - Pixy Cam
 - RoboRio native
- PathePlanner
- GitHub



Basic Syntax

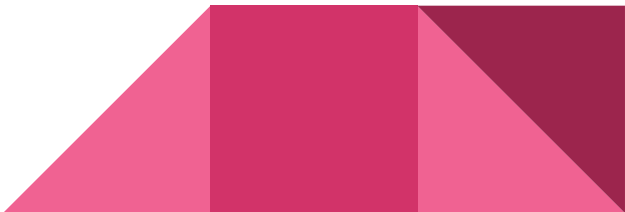
- Java is case sensitive
- Variables naming rules
 - Names can contain letters, digits, underscores, and dollar signs
 - Names must begin with a letter
 - Names should start with a lowercase letter, and cannot contain whitespace
 - Names can also begin with \$ and _
 - Names are case-sensitive ("myVar" and "myvar" are different variables)
 - Reserved words (like Java keywords, such as `int` or `boolean`) cannot be used as names
- It's Recommended that you use CamelCase when naming objects in Java
 - UpperCaseCamelCase starts the name with a uppercase letter to indicate it is a Class or Interface
 - lowerCaseCamelCase starts the name with a lowercase letter to indicate Methods and Variables



Basic Syntax

- All uppercase variable names should be used to indicate constant values declared in the program and should have words in the name separated by an underscore
 - Ex: the constant max speed would be MAX_SPEED
- All Statements must end with a semicolon (;)
 - Ex : Double myDouble= 2.0 ;
 - Output = myDouble/10 ;
- All though it is not required it is highly recommended that you indent each level of your code
 - EX:

```
public void myMethod()  
  
    {  
  
        Int i= 0;  
  
    }
```



Basic Syntax Pop Quiz

What symbol should all statements be ended with

- a. :)
- b. ;
- c. ?
- d. Statements don't need to be ended with a symbol



Basic Syntax Pop Quiz

What is the recommended way to capitalize names in java?

- a. WillsWay
- b. Follow the rules of the English language
- c. CamelCase
- d. ju57 d0 wh473v32



Basic Syntax Pop Quiz

Which of these is a valid variable name?

- a. myBot1
- b. Mybot1
- c. MYBOT1
- d. My_bot



Data Types

1. byte
2. short
3. Int
4. double
5. float
6. long
7. Char
8. boolean

Most Common in FRC

- int
- double
- boolean



Data Types

Integer Types :

An integer is a positive or negative whole number, including 0.

Decimal Types :

A decimal is a number that consists of a whole and a fractional part. Decimal numbers lie between integers and represent numerical value for quantities that are whole plus some part of a whole.



Data Types

Integer type:Byte

- Minimum value is -128 Maximum value is 127
- Default value is 0
- Byte data type is used to save space in large arrays, mainly in place of integers, since a byte is four times smaller than an int.



Data Types

Integer type:Short

- Minimum value is -32,768 Maximum value is 32,767
- Short data type can also be used to save memory as byte data type. A short is 2 times smaller than an int
- Default value is 0.



Data Types

Integer type: Int

- Minvalue is - 2,147,483,648 Maxvalue is 2,147,483,647
- Int is generally used as the default data type for integral values unless there is a concern about memory.
- The default value is 0.



Data Types

Integer Data Types: Long

Minimum value is $-9,223,372,036,854,775,808$. (-2^{63})

Maximum value is $9,223,372,036,854,775,807$ (inclusive).
($2^{63} - 1$)

This type is used when a wider range than int is needed.

Default value is 0



Data Types

Decimal Data Types: Float

Minimum value is $-9,223,372,036,854,775,808$. (-2^{63})

Maximum value is $9,223,372,036,854,775,807$ (inclusive).
($2^{63} - 1$)


This type is used when a wider range than int is needed.

Default value is 0L.



Data Types

Decimal Data Types: Double

- This data type is generally used as the default data type for decimal values, generally the default choice.
 - Double data type should never be used for precise values such as currency. BigDecimal class should be used.
 - Default value is 0.0d.
- 

Data Types

Boolean Data Type

boolean data type represents one bit of information.

There are only two possible values: true and false.

This data type is used for simple flags that track true/false conditions.

Default value is false.

Example: `boolean one = true`



Data Types

Char data type

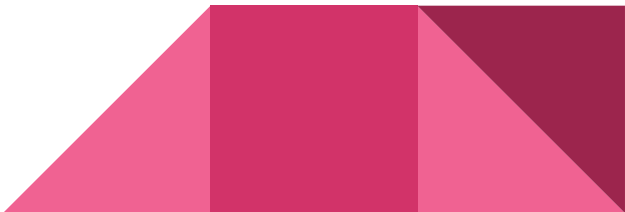
char data type is a single 16-bit Unicode character.

Minimum value is '\u0000' (or 0).

Maximum value is '\uffff' (or 65,535 inclusive).

Char data type is used to store any character.

Example: char letterA ='A'



Data Types

How to Declare common types :

- Integer - `public int myInt= 0;`
- Double - `public double myDouble = 1.2;`
- Boolean - `public boolean myBoolean= true;`



Basic Math

Doing math in java is the exact same as doing math in real life

$2+2 = 4$ is exactly the same in math and java

You can also do math with variables

```
public int int1=7; public int int2=2;
```

```
public int int3=int1+int2;
```

What is value of int3?



Basic Math

Other math functions are :

- subtraction : -
- Multiplication: *
- division : /
- Modulus : %
- Increment: ++
- Decrement: - -



Boolean Operators

- And - &&
- Or - ||
- XOR - ^
- Not - !



If Statement

- If statements are how you make a single decision.
- Can be combine with else if and else statements to check multiple conditions and make complex decisions
- If you can phrase the the decision as an if then statement the you can code it.



If Statement

Example of IF statements in code

```
if(x>y)
```

```
Output =y;
```

Is the same as this except one thing,

```
If (x>y)
```

```
{
```

```
output= y;
```

```
}
```



For Loop

Used to repeat a set of statements as for a certain amount times.

EX:

```
for (int i = 0; i < 5; i++) {  
    System.out.println(i);  
}
```



While Loops

Used to repeat a set of statements until a certain condition is met.

EX:

```
While (x<5)
```

```
{
```

```
  X++;
```

```
}
```

```
do{
```

```
  X++;
```

```
}
```

```
while(x<5);
```



Command and Control

<https://docs.google.com/presentation/d/e/2PACX-1vR-730U1Q2f0C9cJMM9ZtX12QNSbEe2apapZbLYKaGS0XfJnP8J3QAU7D-1nZo5ITMpi3DTCwoR9Yh5/pub?start=false&loop=false&delayms=3000&slide=id.p>



Vision

Common Vision Systems

- [Photonvision](#)
- Limelight
- RoboRio



Vision

Common Vision Systems

- Photonvision
- Limelight
- ~~RoboRio~~



Vision

You can use vision to :

- Find objects of a certain color
- Track location using april tags
- Auto aim on a target
- Use custom trained models to find specific game pieces in realtime.

