DEBUGGING

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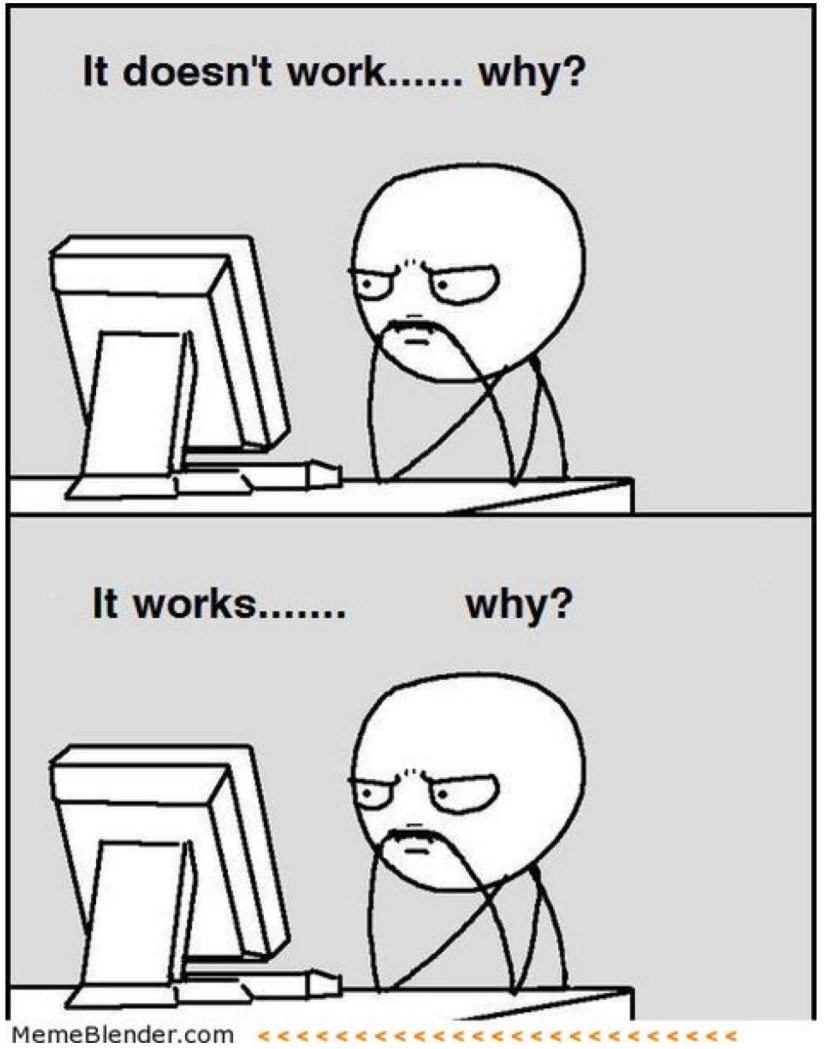
WHAT IS DEBUGGING?

- *Debugging is the routine process of locating and removing bugs, errors or abnormalities from programs.*

WHY DEBUG?

- Three types of errors
  - Compilation Error:
    - Mostly syntactical errors which are shown by the IDE or diagnosed upon attempt at compilation hence a debugger is unnecessary.
  - Run-time Error:
    - Exceptions, I/O issues. Easy to trace type but potentially difficult to diagnose the cause, hence debugging is helpful.
  - Logical Error:
    - Incorrect output. Hard to trace type and difficult to diagnose the cause, hence debugging is necessary.



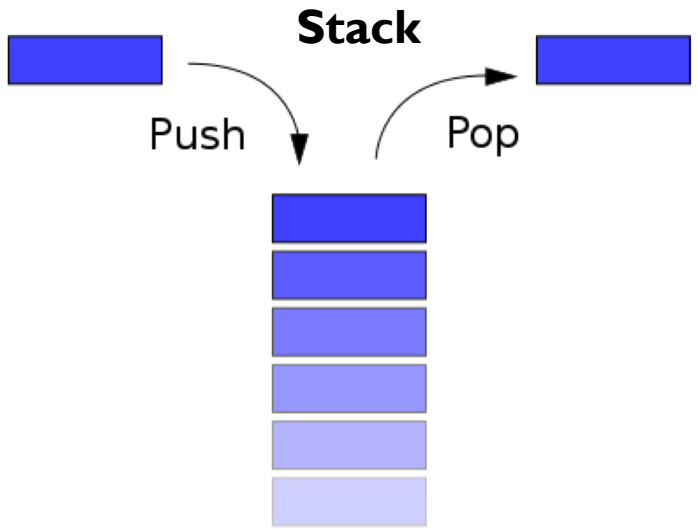
HOW DOES A DEBUGGER WORK?

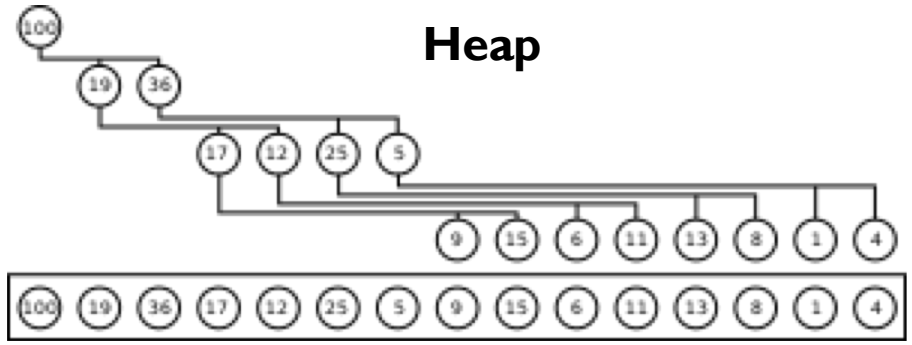
- **Basic utility of the debugger includes:**
  - Executing a process
  - Single stepping through a process
  - Breakpoints
  - Variable values
  - Stack traces
- **Memory Management in Java:**
  - Application allocated a certain amount of RAM (Random Access Memory) and the Java Virtual Machine organizes this memory.

Stack memory:

- Stack memory stores variable values when their methods are called and stores references to objects which are located in heap memory. A "block" of memory is erased when method ends, and a new "block" is created.

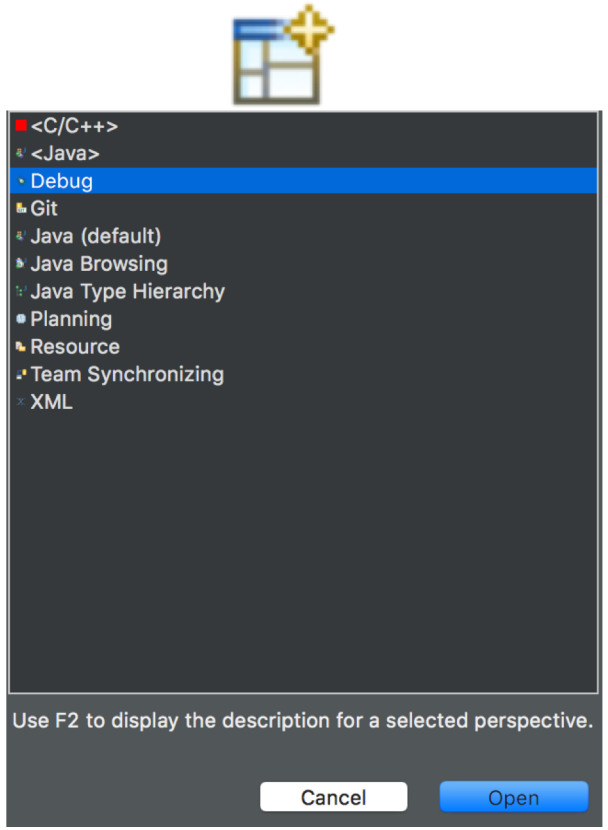
- **Heap memory:**
  - Heap memory stores objects and classes, and is always available in the heap space therefore having global access.
- **Garbage Collection:**
  - Clears any objects which aren't referenced in methods and other advanced memory management techniques.





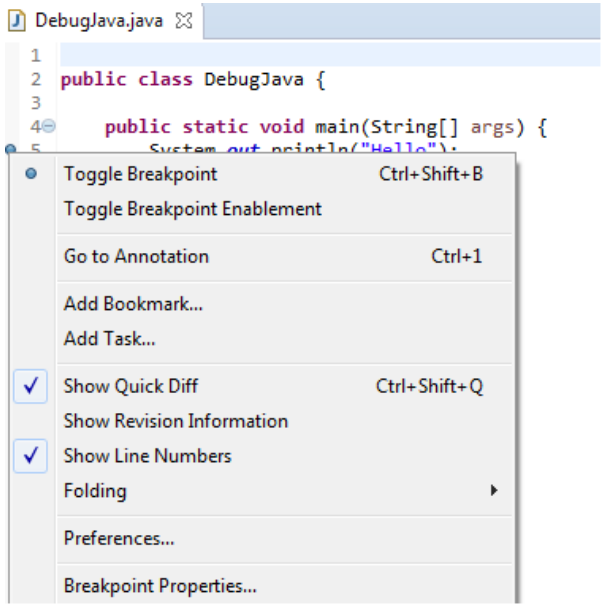
DEBUGGING IN ECLIPSE

- **To enter Debugger view:**



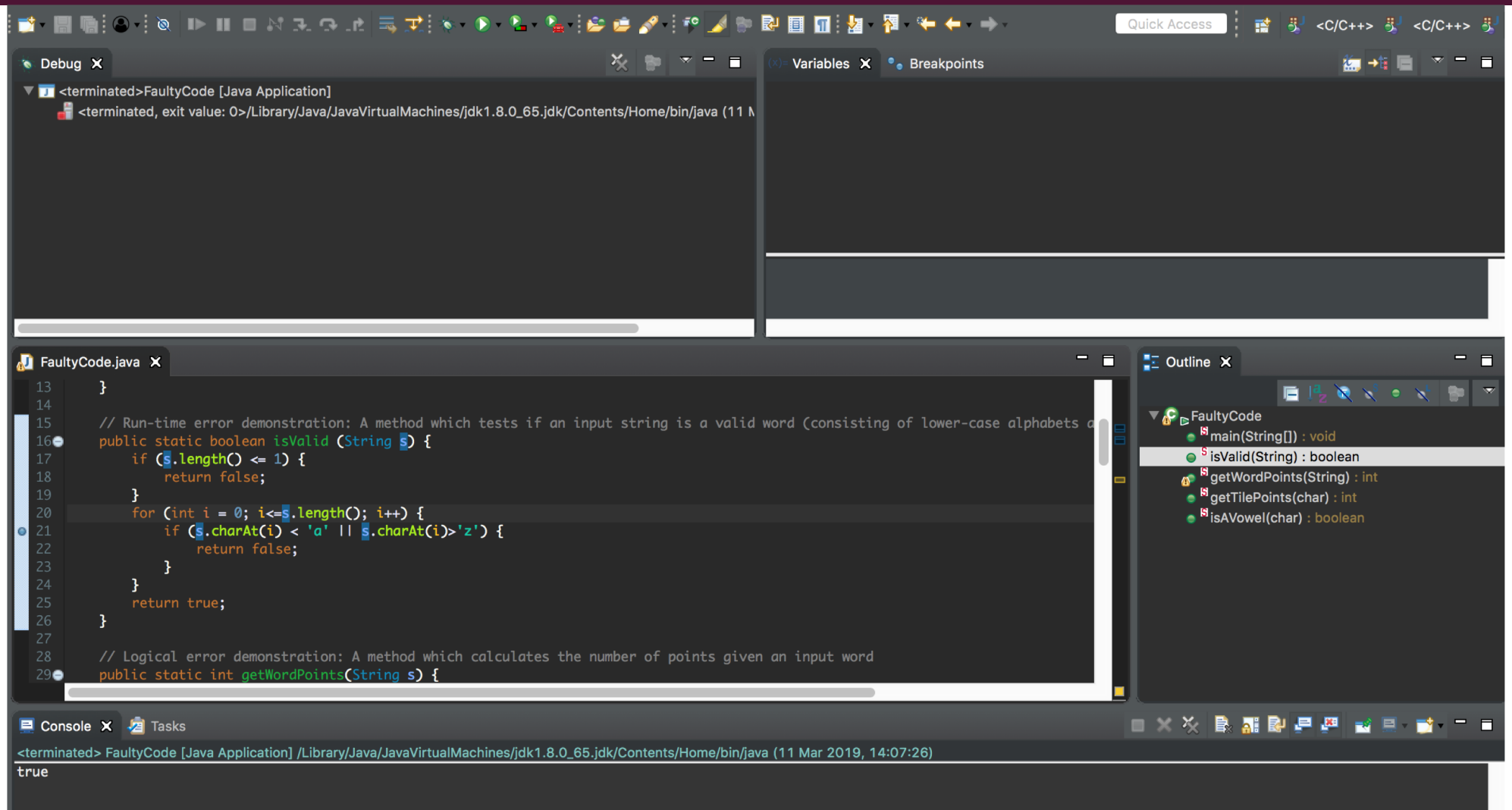
- **Breakpoints:**

To define a breakpoint in your source code, right-click in the left margin in the Java editor and select Toggle Breakpoint. Alternatively, you can double-click on this position.

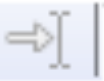


- **Contents of Debug perspective:**
- **Debug view** – Visualizes call stack and provides operations on that.
- **Breakpoints view** – Shows all the breakpoints.
- **Variables/Expression view** – Shows the declared variables and their values. Press Ctrl+Shift+d or Ctrl+Shift+i on a selected variable or expression to show its value. You can also add a permanent watch on an expression/variable that will then be shown in the
- **Expressions view** when debugging is on.
- **Display view** – Allows to Inspect the value of a variable, expression or selected text during debugging.
- **Console view** – Program output is shown here.

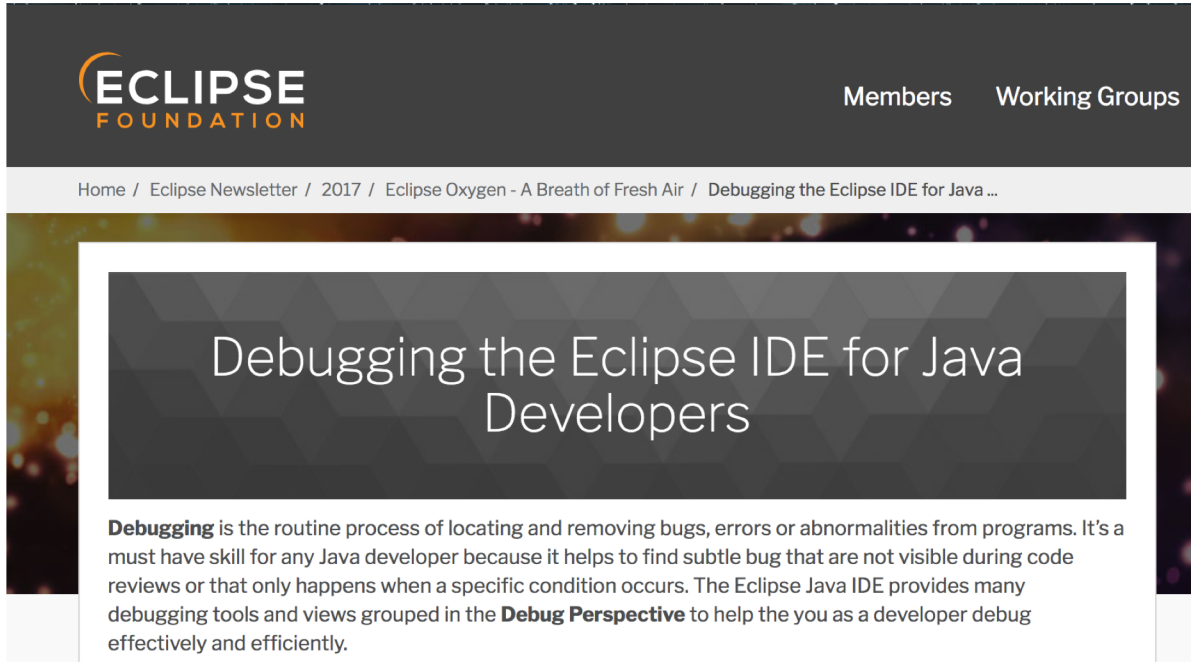
DEBUGGING IN ECLIPSE



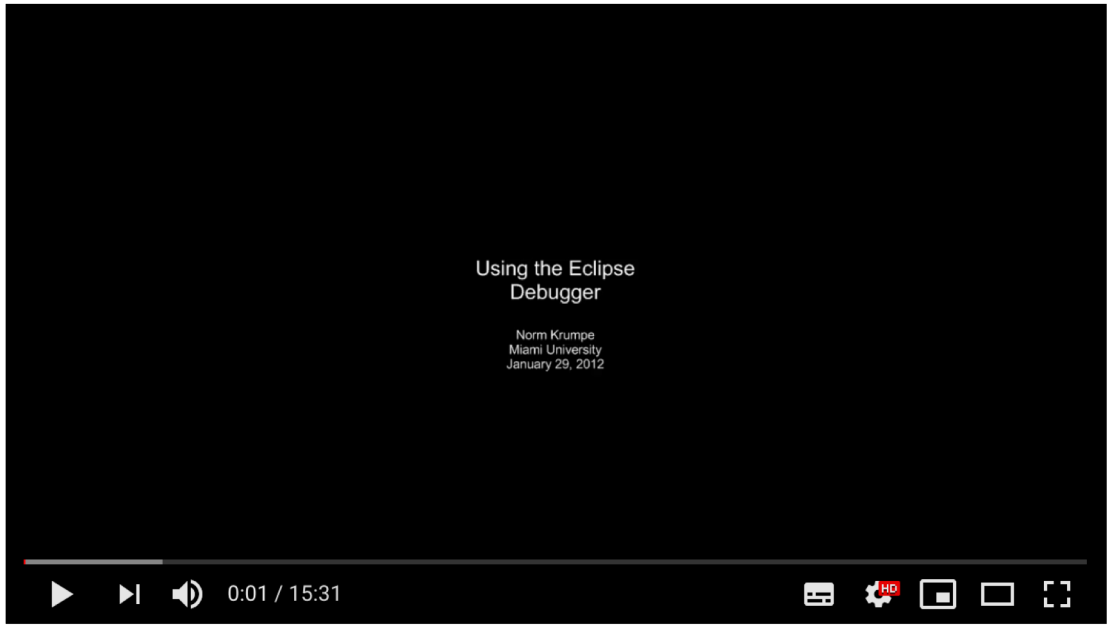
DEBUGGING IN ECLIPSE

Shortcut	Toolbar	Description
F5 (Step Into)		Steps into the call
F6 (Step Over)		Steps over the call
F7 (Step Return)		Steps out to the caller
F8 (Resume)		Resumes the execution
Ctrl + R (Run to Line)		Run to the line number of the current caret position
Drop to Frame		Rerun a part of your program
Shift + F5 (Use Step Filters)		Skipping the packages for Step into

RESOURCES FOR FURTHER INVESTIGATION



https://www.eclipse.org/community/eclipse_newsletter/2017/june/article1.php



Using the Eclipse Debugger

https://www.youtube.com/watch?v=9gAjIQc4bPU&ab_channel=NormKrumpe