Class 3: The Eclipse IDE

Introduction to Computation and Problem Solving

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What is an IDE?

- An integrated development environment (IDE) is an environment in which the user performs the core development tasks:
  - Naming and creating files to store a program
  - Writing code (in Java or another language)
  - Compiling code (checks correctness, generates an executable binary)
  - Debugging and testing the code
  - And many other tasks: version control, projects, code generation, etc.
- Eclipse is one of the "standard" Java IDEs and the one that we will use in 1.00 for labs, tutorials and homework

Why Use an IDE?

- The alternative to an IDE is a 'command line' interface:
  - Not visual
  - Tools for each task are generally not tightly integrated
- 1.00 students in past terms have not used good software development practice with command line interfaces
  - Neither do many industry programmers
  - While you can do the same things with a command line interface as an IDE, in fact people don't
- People write software better with an IDE
  - The learning curve for an IDE is about the same as for command line tools, so it's what we use in 1.00

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What Do IDEs Do?

What does an IDE provide?

- Visual representation of program components
- Ability to browse existing components easily, so you can find ones to reuse
- Quick access to help and documentation on existing libraries and tools (vs writing your own)
- Better feedback and error messages when there are errors in your program
- A debugger, which is not primarily used to debug, but is used to read and verify code
- Communication between programmers in a team, who share a common view of the program

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Before Starting Eclipse

- Create a folder for your Java files
  - In Windows Explorer, create folders:
    - Java
      - Lectures
        - Lecture3
  - Put each homework, tutorial, and lecture projects each in a separate folder
    - Java thinks that files in the same directory are closely related

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Starting Eclipse

- Start Eclipse by double clicking the icon on your desktop.
- Identify all the interface areas labeled on the next slide.
  - The Main Window is the command center, holding menus, tabs, and buttons.
  - The Explorer allows you to manage files and sets of files (projects) that form programs.
  - The Working Area holds editor, compiler, output or debugger windows as appropriate.
- If your display looks different, click the option to choose the "Java Perspective"

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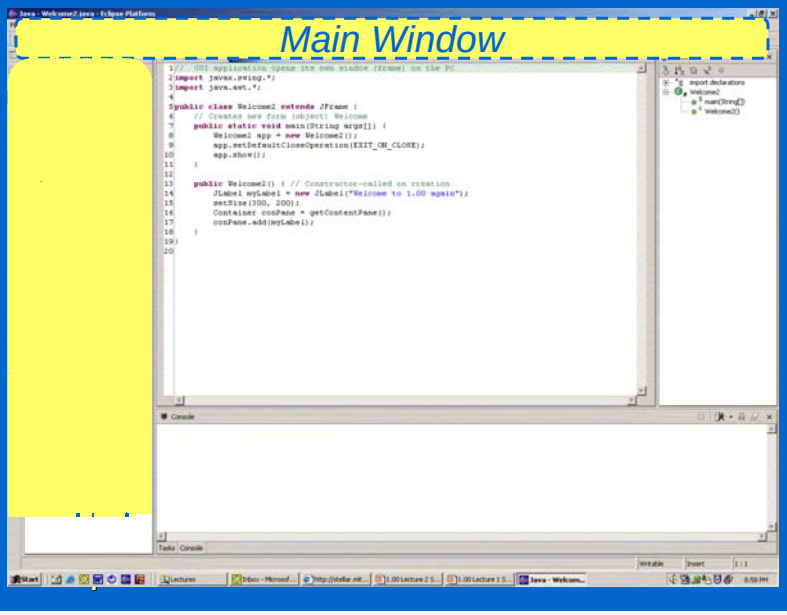
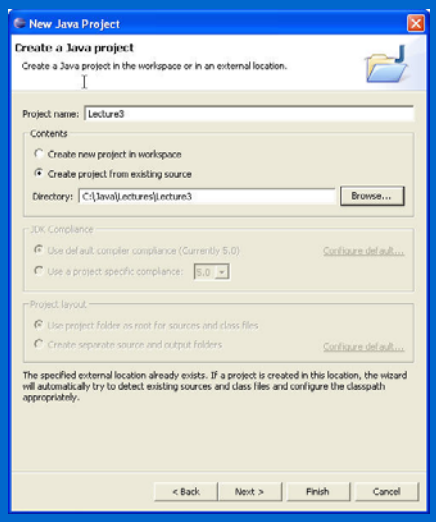
Anatomy of Eclipse



Creating a Project (2)

A 'New Java Project' page appears:

- Project name: Lecture3
- Check 'Create Project from existing source'
- Browse and select C:\Java\Lectures\Lecture3 using 'New Folder' button as necessary
- Hit 'Finish'



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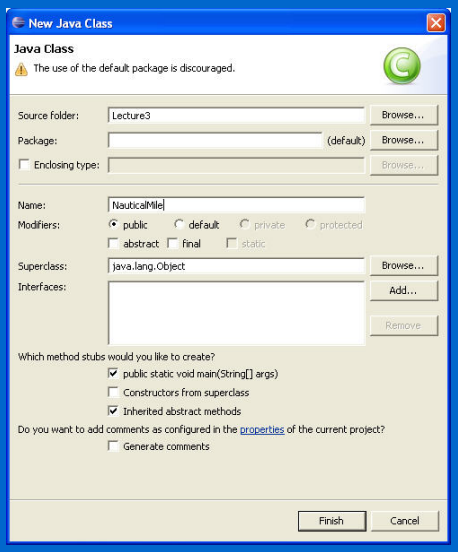
Creating a Project (3)

- File->New->Class (or click 'New' icon)
- Type class name: `NauticalMile`
- Make sure '`public static void main(…)`' is checked
- Hit 'Finish'



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The NauticalMile Program

- A nautical mile is defined as the average length of a 1 minute arc of latitude on the earth's surface.
- So if I told you that the polar circumference of the earth was 24859.82 miles, you could calculate the length of a nautical mile in feet, right?

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NauticalMile.java

```
public class NauticalMile {
   public static void main( String [] args ) {
     double circum = 24859.82*5280;
     int minutesInCircle = 360*60;  // a comment
     double nautMile = circum / minutesInCircle;
     System.out.println(
        "Feet in a nautical mile = " + nautMile);
   }
}
```

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Creating `NauticalMile.java` in Eclipse

- Write `NauticalMile.java` in Eclipse
  - Delete the Eclipse-generated comments at top
- Save it (ctrl-S or File->Save); Eclipse will compile when you save
- If you get any errors, fix them!
- After it compiles, make some errors, experiment

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Compile Time Errors

- Remove the semicolon from the end of the line that starts
  ```
  double circum
  ```
- Look in the Problems window at the bottom. You should see:
  ```
  Syntax error, insert ";" to complete
  BlockStatements | NauticalMile.java | Lecture3 |
  line 6
  ```
  with a wavy underline where the error was detected and an X at the margin.
- Click on error message and the corresponding line will be highlighted in the source file.
  - Fix the error.

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Running `NauticalMile` in Eclipse

- Once you're able to save with no errors, select Run->Run As-> Java Application
- Save changes if prompted (OK)
- Working area changes from editor to output view with console output at bottom of page.

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Neat Things About Eclipse

- Key words are highlighted.
- Java built-in classes have 'tool tips' that show when you place your mouse over them.
- Type into the window to mess up the alignment of the text lines. Then right click in the editor window and select `Source->Format`. It will realign your margins.
- Get full documentation of Java methods:
  - Place cursor on any method or class
  - Hit Navigate-> Open External Javadoc
  - If you don't have this enabled, we'll do it at the end of class

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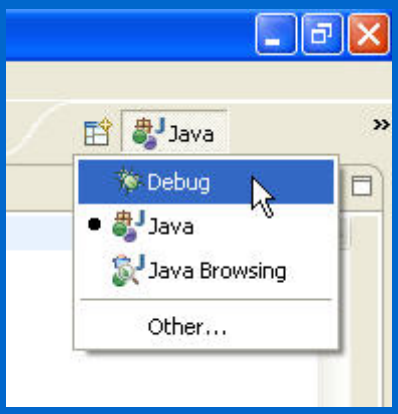
Checking Your Program

- Select Debug from the "Perspective menu in the upper right corner
- The "Debug Perspective" appears, as shown on the next page (you had been in the "Java Perspective" when writing the program)
- You'll use this a lot to read and correct (debug) your programs



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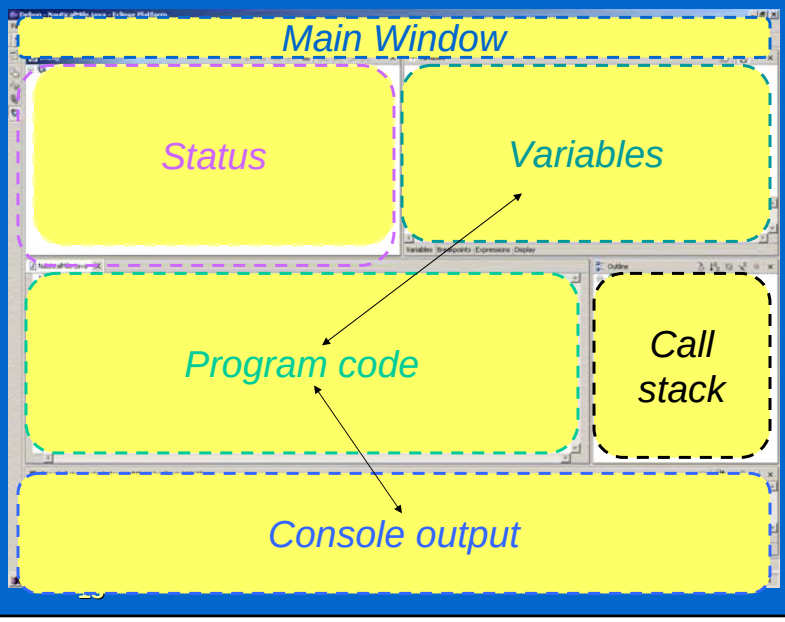
Eclipse Debug Perspective



Reading `NauticalMile`

- Set a breakpoint to stop your program at or near its beginning
  - Right click on the left margin of the text editor at the desired line (`double circum= …`)
  - Select “Toggle Breakpoint”
  - Or simply double click on the left margin
- Select Run->Debug As->Java Application
- Eclipse displays the Debug Perspective
  - Your program stops at the breakpoint line

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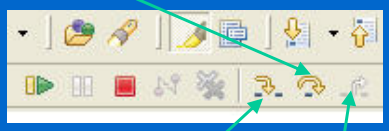
Stepping Through

- Now step through NauticalMile line by line
  - Use the ‘Step Over’ icon or hit F6



  - (Later we’ll use ‘Step Into’ and ‘Step Return’)
- Variable values display in the Variables Window

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Stepping Through, 2

- The Step buttons are a functional family unit:
  - Step Into means stop at every line of code including following method calls.
  - Step Over means stop at every line of code in the current method but execute method calls in one step.
  - Step Return means hurdle over everything in the current method and stop when the method returns.
- Click Step Over

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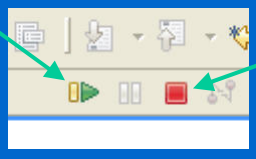
Examining Variable Values

- In the top right frame of the Debugging View, you'll see the variables
- Click Step Over once more to advance another line. You should see that you just defined another variable, `minutesInCircle`.
- Set another breakpoint at the last line (`System.out…`)
- Click the Resume button



- The program stops at the last line.
- Click Continue
- The program output appears, and the program exits.

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Breakpoints

- What if you are trying to figure out what is wrong with a homework program that's about 100 lines long?
  - Set a breakpoint at the beginning.
  - Run->Debug As->Java Application
  - Step Over line by line looking at variable values until you find an error
  - Terminate and go back to Java Perspective, fix the error, save the file
  - Set a breakpoint at the line you fixed
  - Run->Debug Last Launched
  - The program will run to the line you fixed
  - Resume using Step Over from there
- You can right click and select 'Remove Breakpoint' to get rid of unneeded ones

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Exiting the Debugger

- Sometimes you want to exit the debugger without allowing your program to run to completion.
- Just click the Terminate button (square) near the Resume button
- Occasionally you need to clean up the Status Window in the upper left frame
  - Right click in the Status Window
  - Select Remove All Terminated
  - If something is still there, right click on it
  - Select Terminate and Remove

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Managing Files in a Project

- Deleting files:
  - Go back to the Java Perspective, and right click NauticalMile. Selecting Delete will erase the file. (But hold onto it for now.)
- Adding files:
  - Same as the first one: File->New Class and so on.
  - Later in the term you'll add other kinds of files to a project.

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Definition of the Meter

- The French originally defined the meter to be 1/40,000,000 of polar circumference of the earth.
  - A kilometer is 1/40,000 of polar circumference
- Using that fact and whatever you want to cut and paste from `NauticalMile`, create the code in class `Kilometer` to calculate how many kilometers there are in a nautical mile and print it to the Output Window.
  - Since you need decimal arithmetic, define variables as `double`
  - Or cast (convert) `int` to `double` as in Lecture 1 notes
- Compile and debug. Raise your hand if you need help. To execute `Kilometer` rather than `NauticalMile` the first time, from the Java view right click `Kilometer` in the Package Explorer and select Run (or Debug).
- If you get 1.609, that's the wrong answer.

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Attaching Javadoc

- In the Eclipse menu bar, go to
  - 'Window'->'Preferences'->'Java'->'Installed JREs'.
- There should be only one installed JRE (jre1.5.0_04)
- Highlight it and click 'Edit...'.
  - Make sure that “Use default system libraries” is unchecked.
  - Browse for the correct folder (`'C:\Program Files\Java\jre1.5.0_04\docs\api'`)
  - Click OK.
- Javadoc is now linked to Eclipse.
- In Eclipse:
  - Place the cursor on any builtin Java method or class,
  - Select 'Navigate'->'Open External Javadoc' (or Shift+F2)
  - You now have full documentation on the Java class or method
- Ask a TA for help if you have questions

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