

**Objectives of this lab:**

- Practice some basic file operations
- Write, compile and execute a simple Java program
- Turn in your work using a “turnin” command (not email!!)
- You can probably finish this during lab period. If not, you have until **midnight tonight**.

**Pre-lab Reading Material:**

You should read the material before coming to the lab. If you have not done so, you will need to read it while the TA is explaining the lab and you can read them after the lab to re-enforce what you have learned.

- Manipulating files:  
<http://www.mathcs.emory.edu/~cheung/Courses/170/Syllabus/02/UNIX-files.html>
- Editing files using gedit:  
<http://www.mathcs.emory.edu/~cheung/Courses/170/Syllabus/02/gedit.html>

**Review:**

- Shell: the command line interpreter in UNIX
- A terminal application is running a shell program
- Editor: a computer application that lets you edit files
- Review of special directories:
  - ~/ means /home/UserID/ (this is your home directory)
  - ~cs170003/ means /home/cs170003 (the grader home directory). Each section has a different grader account ending in 000, 001, 002, or 003.

**Exercise Preparation:**

- Start a terminal application (see previous lab or ask the TA) and follow the next steps by typing the appropriate commands:
  - Create the lab2 directory inside your cs170 directory  
`mkdir ~/cs170/lab2`
  - Copy the files you will need  
`cp ~cs170003/share/lab2/* ~/cs170/lab2`
  - Move into the lab2 directory (ie make it the working directory)  
`cd ~/cs170/lab2`
  - List the contents of the current directory  
`ls`
  - You should see 2 files: `Convert.java` and `Cylinder.java`. If you do not see these files, ask the TA for help.

**Execute the "Convert" Java program:**

- The `Convert` Java program reads from the terminal a distance in kilometers and prints the corresponding measure converted in miles.

- Take a look at the `Convert.java` program by typing:  
`cat Convert.java`
    - *Note:* `cat` is a Unix command which causes the content of a file to be displayed in the terminal.
  - You should see this output:
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```
import java.util.Scanner;

/* This program converts km to miles. */

public class Convert {
    public static void main(String [] args) {

        // declaration of the variables
        double km, miles;

        // create a Scanner
        Scanner input;
        input = new Scanner(System.in);

        // Enter distance in kilometer
        System.out.print("Please enter a distance in km: ");
        km = input.nextDouble(); // Read in input from terminal
                                // and stores it in the variable "km"

        // Calculate distance in miles
        miles = 0.62 * km;

        // print out the result
        System.out.print(km);
        System.out.print(" kilometers = ");
        System.out.print(miles);
        System.out.println(" miles");
    }
}
```

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### Compiling the `Convert.java` program:

- Remember that a Java program must first be translated into executable code using a Java compiler.
- To translate (compile) the `Convert.java` program, execute this command in a terminal window:  
`javac Convert.java`
- Now list the contents of the directory with the `ls` command. You should see:  
`Convert.java Convert.class Cylinder.java`

### Executing the compiled `Convert.class` program

- To execute the compiled program, type the command  
`java Convert`

- Sample execution:  

```
>>> java Convert
Please enter a distance in km: 2.3
2.3 km = 1.426 miles
```
- 

### Lab Assignment :

You should have a copy of the Java program called `Cylinder.java` in your `lab2` directory. The `Cylinder.java` file represents the starting point for your program.

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### Tasks:

- Edit the `Cylinder.java` file and write the code to compute the volume and surface area of a cylinder.
- Use this command to start the `gedit` editor to edit your `Cylinder.java` file:  

```
gedit Cylinder.java &
```
- `gedit` should start and the file should be displayed.
- Add the following to the `Cylinder.java` program: (the tasks are also given inside the `Cylinder.java` program with comments (`//`))
  - The program must use a `Scanner` (just like in the `Convert.java` program) to read from the terminal:
    - the radius of the cylinder
    - the height of the cylinder
    - *Note:* both of these numbers can be fractional numbers (i.e. of double type)
  - Define the variables needed to store the inputs (radius and height) provided by the user. Use meaningful variable names!
  - Define a variable of type `double` called `pi` and initialize it to 3.14.
  - Compute the volume and surface area of the cylinder and store the results in variables with meaningful names.
    - The formula to compute the volume and surface area of a cylinder are:
      - $\text{volume} = \text{baseArea} * \text{height}$
      - $\text{surfaceArea} = 2 * \text{baseArea} + (2 * \text{radius} * \text{pi}) * \text{height}$
      - where  $\text{baseArea} = \text{pi} * \text{radius} * \text{radius}$
  - Using `System.out.print` and `System.out.println`, print out the volume and the surface area, similar to the `Convert.java` program.
- When you have entered the necessary Java statements, Save your file
- From the terminal window, compile your file using the command:  

```
javac Cylinder.java
```
- Remove the bugs (errors) if necessary. If you can't figure one out, ask the TA for help.
  - Remember to save each time you edit your file
  - Save and recompile your file until there are no bugs
- After a successful compilation, in a terminal window, run the program using the command:  

```
java Cylinder
```
- The program will prompt you for two inputs and then print the volume and surface area. An example of the interaction you should see is:

```
>>> java Cylinder
Please enter the radius: 4.5
Please enter the height: 12.2
The volume of the cylinder = 775.737
The surface of the cylinder = 471.942
```

**Turning in your work:**

- When you are done, turn-in lab 2 using this command:  
    /home/cs170xxx/turnin-lab Cylinder.java lab2
  - ***Note: you will need to replace 'xxx' with your section number.***
- This makes a copy of your file (Cylinder.java) in the grader's account.
- Your turnin is successful when you see this message:  
    Program `Cylinder.java' has been turned in by YOUR\_ID as lab2