The Company Employee Program

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WHAT'S COVERED

In this lesson, you will construct a program by manipulating files using libraries and file inputs when using Java. Specifically, this lesson covers:

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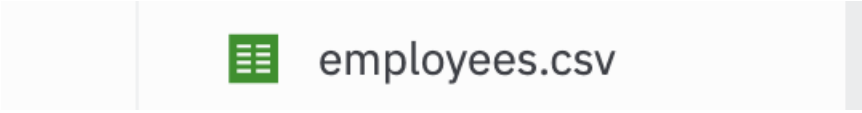
1. Storing Information to a File

In this lesson, we will give the employee class program some final touches! You will begin by creating a program that stores the employee ID, salary, last name, and first name for our employees into a file. Rather than having it entered every single time, you will write that information to a file so that we can easily recall that information. You could extend this program to include in the additional details of the employee, but instead, you will focus on the key elements (namely employee ID and salary). Let's first start by creating an *employees.csv* file in Replit by clicking on the 'Add file' icon at the top of the Files panel. Name it *employees.csv*.

EXAMPLE



TRY IT

Directions: Create a new file in Replit called *employees.csv*.

The icon will automatically change to a file that looks like a spreadsheet, just like our text files earlier looked like a few lines of text as an icon. Our file has a .java file extension since it is a Java file, and it has the Java icon.

DID YOU KNOW

The new file is a spreadsheet file that has a suffix of csv. What is that? Comma separated value (or .csv) is a file

format where each of the data elements for a row of data would be split by a comma. This is very common to spreadsheet applications like Microsoft Excel. In a .csv file, we would see data that is saved in a format like this example (it's important to have a blank line at the end of the file):

↗ EXAMPLE

```
10001,75000,Johnson,Mary
10002,68500,Doe,John
```

This would be a file that contains the employee ID, salary, first name, and last name. As more information (individuals) is added, the data separation would continue.

Later, you will review the *employees.csv* file to see what that looks like as data is added to it. For now, the file should be completely empty.

As this is meant to be a larger program, start by defining a CompanyEmployee class to encapsulate data about an employee.

TRY IT

Directions: Type this code into a file named CompanyEmployee.java:

```
public class CompanyEmployee {
  private String lastName;
  private String firstName;
  int id;
  int salary;

  public CompanyEmployee(String lastName, String firstName, int id, int salary) {
    this.lastName = lastName;
    this.firstName = firstName;
    this.id = id;
    this.salary = salary;
  }

  public String getLastName() {
    return lastName;
  }

  public String getFirstName() {
    return firstName;
  }

  public int getId() {
    return id;
  }
```

```
  public int getSalary() {
    return salary;
  }

  // toString() method provides format for printing company employee data:
  // Smith, John ID: 10123 ($85000)
  public String toString() {
    return lastName + ", " + firstName + " ID: " + id + " ($" + salary + ")";
  }
}
```

TRY IT

Directions: After you have typed in the code above, remember that you need to compile the CompanyEmployee class so that it will be available for use in the program. Run the following command in the Replit shell:

→ EXAMPLE

```
javac CompanyEmployee.java
```

Next, start the driver class for the application in a file named CompanyEmployeesProgram.java. We will start with an empty `main()` method.

TRY IT

Directions: Type in this code to start with, in a file named CompanyEmployeesProgram.java:

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

  }
}
```

You will return to the code in main() later, but let's continue at this point with a method to read the data from the .csv file and convert it into an `ArrayList` of `CompanyEmployee` objects. You will call the method to read the data `readEmployees()`. Since it will be part of the driver class and called from `main()`, it will need to be declared as a static method. This method takes a `String` parameter for passing in the name of the file. When done processing the data in the file, it will return an `ArrayList<CompanyEmployee>` collection. The line with the return type and the signature for the method should look like this:

→ EXAMPLE

```
public static ArrayList readEmployees(String csvFile) {
```

Since the code will work with an `ArrayList`, the code will need to import `java.util.ArrayList`. Since we will be working with files, we also need the File and Files classes (along with associated exception types). We might as well go ahead and add the other needed import statements at the top of the file. The complete list reads:

↷ EXAMPLE

```
import java.util.ArrayList; import java.io.File; import java.io.FileNotFoundException; import java.io.IOException; import java.nio.file.Files;
```

This list could be simplified a bit using a wildcard (*), if you prefer:

↷ EXAMPLE

```
import java.util.ArrayList; import java.io.*; import java.nio.file.Files;
```

As part of the code statement of the `readEmployees()` *method*, we create an empty `ArrayList` of `CompanyEmployee` objects called `employeeList`. Then, we open up the data file using a File object and use a Scanner to read the data from the file. The code then takes a line from the file and splits the data into individual data elements (an array of String data).

The data is read from the file as String data, but the first two items (the employee ID and the salary) need to be converted to integer values. The Integer wrapper class that we met when discussing generic types includes a method named `Integer.parseInt()`, which takes a String value and converts it to an int value.

Here is a partial initial draft of the method:

```
public static ArrayList<CompanyEmployee> readEmployees(String csvFile) {
  // Create an empty ArrayList of CompanyEmployee objects
  ArrayList<CompanyEmployee> employeeList = new ArrayList<>();

  // File object for accessing the CSV file
  File inputDataFile = new File(csvFile);
  List<String> lines = new ArrayList<>();
  // Because the following statements can through exceptions, they are in a try block
  try {
    lines = Files.readAllLines(inputDataFile.toPath());
    for(String line : lines) {
      String[] employeeData = line.split(",");
      int id = Integer.parseInt(employeeData[0]);
      int salary = Integer.parseInt(employeeData[1]);
      // Last name & first name don't need conversion to another datatype.
      String lastName = employeeData[2];
      String firstName = employeeData[3];
      // Now construct a CompanyEmployee object for each employee
      CompanyEmployee empl = new CompanyEmployee(lastName, firstName, id, salary);
      // Add CompanyEmployee object to ArrayList
      employeeList.add(empl);
    }
  }
```

```
  catch(FileNotFoundException ex) {
    System.out.println("File not found: " + ex.getMessage());
  }
  catch(IOException ex) {
    System.out.println("I/O error: " + ex.getMessage());
  }
  catch(NumberFormatException ex) {
     System.out.println("Number Format Error: " + ex.getMessage());
  }
  return employeeList;
}
```

TRY IT

Directions: Add the readEmployees() method to your CompanyEmployeesProgram.java. Don't forget the import statements at the top of the file.

Here is the first line of data from the .csv file:

→ EXAMPLE

```
10001,75000,Johnson,Mary
```

REFLECT

This CSV data shows an employee ID of 10001, a salary of $75000, a last name of Johnson, and a first name of Mary. Each line in the file corresponds to another employee. However, there are some potential errors and problems that could exist. Let's give it a try by switching the name slightly for the file to *wrong.csv* file instead of *employees.csv* file.

TRY IT

Directions: Add this code for the main() method:

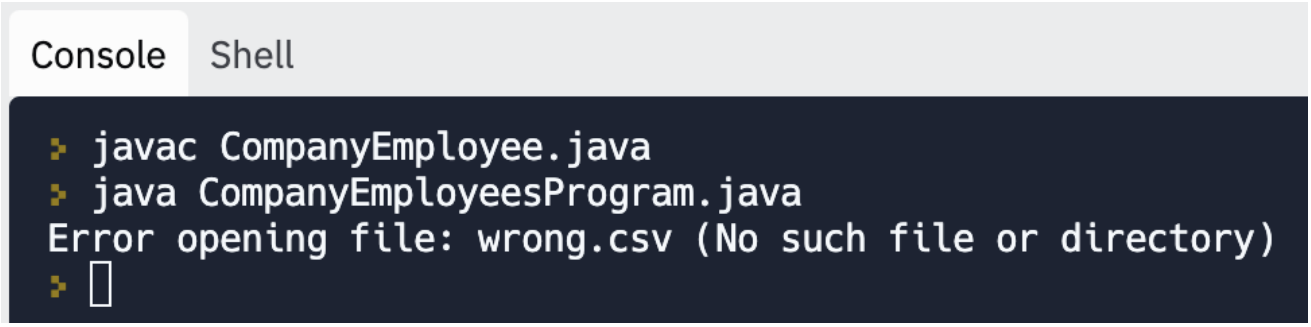
```
public static void main(String[] args) {
  // Try using the wrong file name
  ArrayList<CompanyEmployee> employees = readEmployees("wrong.csv");
}
```

TRY IT

Directions: Next, switch out the filename for *wrong.csv* and try running the program.

REFLECT

Do you see the same output as shown below?



This output is produced by the first catch block (rather than the rather messy output from an uncaught exception).

TRY IT

Directions: Change the file name back to the correct name employees.csv before continuing. The second catch block handles NumberFormatExceptions. This type of exception occurs if the Integer.parseInt() can't convert a String to an int because it contains non-numeric characters. Open the employees.csv file and edit the first line so that the ID begins with the letter A (which doesn't occur in a base 10 integer) like this:

EXAMPLE

```
A0001,75000,Johnson,Mary
```

Running the program now triggers the second catch block, so the output looks like this:

TRY IT

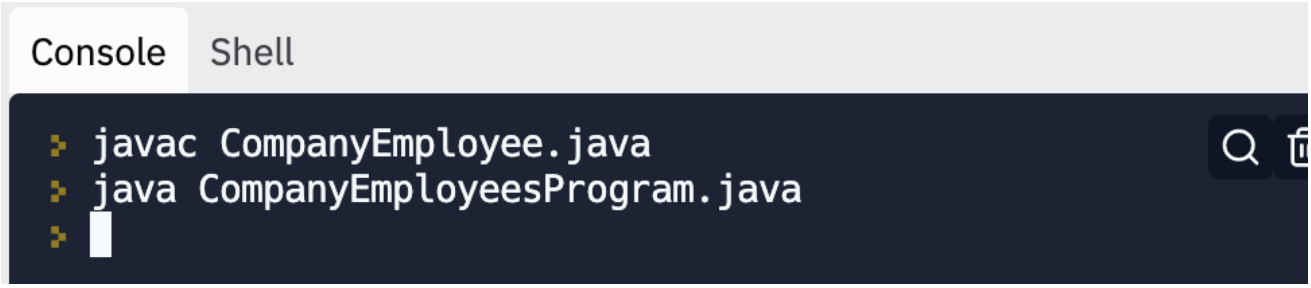
Directions: Edit the first line in the CSV file to correct the entry so that it starts with 1 rather than A:

EXAMPLE

```
10001,75000,Johnson,Mary
```

TRY IT

Directions: Go ahead and run the code when the file name and the data are correct. No exceptions should be thrown, so now there should be no output from the program:



REFLECT

There is no output as there were no errors. The program up to this point shouldn't have any errors to begin with. Now you can move on to the next step to be able to write to the file:

```
public static void writeEmployees(String csvFile, ArrayList<String> employees) {
  File outputFile = new File(csvFile);
  try {
    // Write to output file in APPEND mode
    Files.write(outputFile.toPath(), employees, StandardOpenOption.APPEND);
  }
  catch(IOException ex) {
    System.out.println("Error writing to file: " + ex.getMessage());
  }
}
```

REFLECT

In this writeEmployees() method, you have the parameters set to take the`employees` list. Similar to the readEmployees() method, you will also incorporate the `try` and `catch` blocks since you are setting this method up for error handling as well. Within the `try` block, you are opening up the employees.csv file and writing to it in append mode, thanks to the argument StandardOpenOption.APPEND.

Here is an example of how writing to the file is handled by this line in the method:

EXAMPLE

```
Files.write(outputFile.toPath(), employees, StandardOpenOption.APPEND);
```

REFLECT

The first argument is provided by the call to `OutputFile.toPath()` that converts the File object to the Path object that the `Files.write()` method expects. The second argument is the iterable `ArrayList`with the lines for the employees to write to the file. The last argument, `StandardOpenOption.APPEND`, puts the `write()` method into append mode.

TRY IT

Directions: Next, add the *writeEmployees()* method to your program:

Let's take the next step to create a method that prompts the user for the new employee's information.

TRY IT

Directions: We will name this addEmployees() and pass in a Scanner to read from the console the name of the CSV file for the output:

```
public static void addEmployees(Scanner input, String csvFile) {
   ArrayList<CompanyEmployee> employeesToAdd = new ArrayList<>();
   char keepGoing = 'Y';
   while(keepGoing == 'Y') {
     System.out.print("Enter Employee Last Name: ");
     String last = input.nextLine();
     System.out.print("Enter Employee First Name: ");
     String first = input.nextLine();
     System.out.print("Enter Employee ID#: ");
     int id = input.nextInt();
     System.out.print("Enter Salary: ");
     int salary = input.nextInt();
     // Remove new line remaining in input buffer
     input.nextLine();
     CompanyEmployee employee = new CompanyEmployee(last, first, id, salary);
     employeesToAdd.add(employee);

     // Check if user want to continue adding employees
     System.out.print("Continue adding? (Y/N): ");
     // Read line as a String but just grab 1st char
     keepGoing = input.nextLine().charAt(0);
   }

   // Now call method to write new data to file
   writeEmployees("employee.csv", employeesToAdd);
 }
```

REFLECT

After reading in the data entered by the user, we create a CompanyEmployee object and add it to the ArrayList of employees to add to the file.

BIG IDEA

You may have noticed that we have been creating variables that are very similar, employee and employees, inside our functions. As long as these variables are within local scope, we will have no issues. Remember, if we were to pull one or two of these out from the function scope, we could potentially have scope errors like naming collisions. Always keep in mind that when creating variables, you should know what they are called and where they exist.

This newly created variable employee is appended to the *employees* list that was passed into the function. After this is done, we call the *write_employees()* function passing in the employees list. After that has been returned, we output to the screen that the employee was added:

```
import java.io.File;
import java.io.FileNotFoundException;
import java.io.IOException;
import java.nio.file.Files;
import java.nio.file.StandardOpenOption;
import java.util.ArrayList;
import java.util.List;
import java.util.Scanner;

class CompanyEmployeesProgram {
  public static void main(String[] args) {
    ArrayList<CompanyEmployee> employees = readEmployees("employees.csv");
    for(CompanyEmployee empl : employees) {
      System.out.println(empl);
    }
    ArrayList<String> newEmployees = new ArrayList<>();
  }

  public static ArrayList<CompanyEmployee> readEmployees(String csvFile) {
    // Create an empty ArrayList of CompanyEmployee objects
    ArrayList<CompanyEmployee> employeeList = new ArrayList<>();

    // File object for accessing the CSV file
    File inputDataFile = new File(csvFile);
    List<String> lines = new ArrayList<>();
    // Because the following statements can through exceptions, they are in a try block
    try {
      lines = Files.readAllLines(inputDataFile.toPath());
      for(String line : lines) {
        String[] employeeData = line.split(",");
        int id = Integer.parseInt(employeeData[0]);
        int salary = Integer.parseInt(employeeData[1]);
        // Last name & first name don't need conversion to another datatype.
        String lastName = employeeData[2];
        String firstName = employeeData[3];
        // Now construct a CompanyEmployee object for each employee
        CompanyEmployee empl = new CompanyEmployee(lastName, firstName, id, salary);
        // Add CompanyEmployee object to ArrayList
        employeeList.add(empl);
      }
    }
    catch(FileNotFoundException ex) {
      System.out.println("File not found: " + ex.getMessage());
    }
```

```
  catch(IOException ex) {
    System.out.println("I/O error: " + ex.getMessage());
  }
  catch(NumberFormatException ex) {
    System.out.println("Number Format Error: " + ex.getMessage());
  }
  return employeeList;
}

public static void addEmployees(Scanner input, String csvFile) {
  ArrayList<CompanyEmployee> employeesToAdd = new ArrayList<>();
  char keepGoing = 'Y';
  while(keepGoing == 'Y') {
    System.out.print("Enter Employee Last Name: ");
    String last = input.nextLine();
    System.out.print("Enter Employee First Name: ");
    String first = input.nextLine();
    System.out.print("Enter Employee ID#: ");
    int id = input.nextInt();
    System.out.print("Enter Salary: ");
    int salary = input.nextInt();
    // Remove new line remaining in input buffer
    input.nextLine();
    CompanyEmployee employee = new CompanyEmployee(last, first, id, salary);
    employeesToAdd.add(employee);

    // Check if user want to continue adding employees
    System.out.print("Continue adding? (Y/N): ");
    // Read line as a String but just grab 1st char
    keepGoing = input.nextLine().charAt(0);
  }

  // Now call method to write new data to file
  writeEmployees("employee.csv", employeesToAdd);
}

public static void writeEmployees(String csvFile, ArrayList<CompanyEmployee> employees) {
  // Convert ArrayList<CompanyEmployee> to ArrayList<String>
  ArrayList<String> newEmployees = new ArrayList<>();
  for(CompanyEmployee empl : employees) {
    newEmployees.add(empl.getId() + "," + empl.getSalary() + "," + empl.getLastName() +
                "," + empl.getFirstName());
  }
  File outputFile = new File(csvFile);
  try {
    // Write to output file in APPEND mode
```

```
      Files.write(outputFile.toPath(), newEmployees, StandardOpenOption.APPEND);
    }
    catch(IOException ex) {
      System.out.println("Error writing to file: " + ex.getMessage());
    }

  }
}
```

Let's put this together with what we have so far by first returning the employees list from`read_employees()` function, and then we will call the `add_employee()` function.

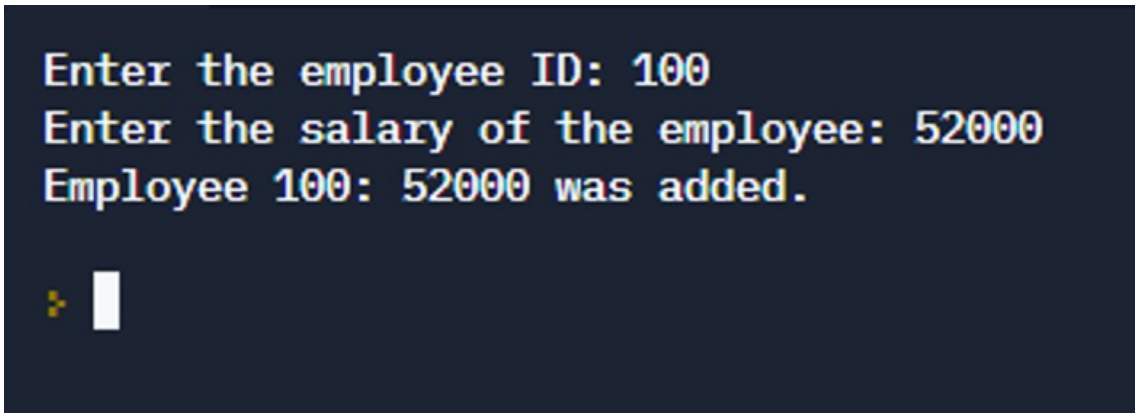
TRY IT

Directions: Add the `add_employee()` function to your program. Remember to also add the calls to the `read_employees()` and `add_employee()` functions at the bottom. When finished, run the program and give input for the employee ID and the salary of your first employee.

↷ EXAMPLE

> Use 100 as ID and 52,000 as salary.

The output screen would reflect:



On screen, it looks correct so far. Let's take a look at what is in the*employees.csv* file.

TRY IT

Directions: See if your employee.csv file is showing the correct data too.

Here are the expected results:

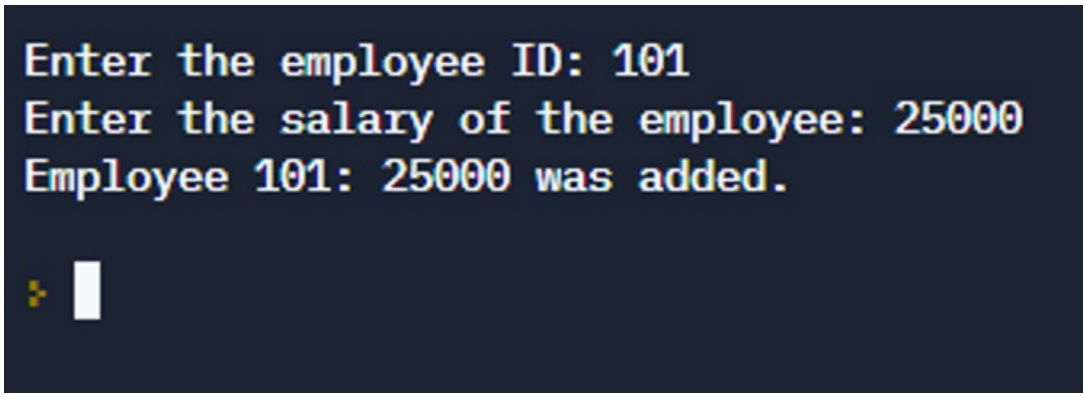
REFLECT

This looks good, as well as the data was saved correctly.

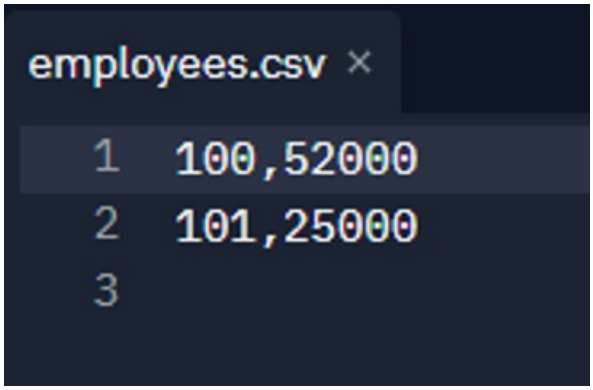
TRY IT

Directions: Run the program again now.

We expect to see the second employee ID as 101 and salary of 25000.



Looking back again at the employees.csv file, we should see:



REFLECT

This is useful, but it's probably not always ideal to have to keep looking at the *employees.csv* file. As an alternative, you could create a function to output the list of employees. Remember back when you first learned about loops, that an iterable is any object that can return its members one at a time. The enumerate() function from Java allows you to loop in the same way with the data.

Here is a method called listEmployees() that prints out a numbered list based on the data in the CSV file (which is passed in as a parameter):

```
public static void listEmployees(String csvFile) {
   ArrayList<CompanyEmployee> employees = readEmployees(csvFile);
   int menuNumber = 1;
   for(CompanyEmployee empl : employees) {
    System.out.println(menuNumber++ + ". " + empl);
   }
 }
```

REFLECT

Let's break down this method. Here, you are passing the name of the file as a string. The contents of the CSV file are read into an ArrayList, which is, in turn, iterated over by an enhanced `for` loop, The variable `menuNumber` is initialized to 1 (since the menu numbers need to count the way people do, not starting with 0 as the computer does) and incremented on each pass through the loop. The `println()` relies on the CompanyEmployee class's toString() method (implicitly, since it is not called directly) to format the output so that it is simple to read. In this line, note how the ++ increment operator is placed right after the variable name and is then followed by a space before the + that does the concatenation:

↗ EXAMPLE

```
System.out.println(menuNumber++ + ". " + empl);
```

The current value of menuNumber is concatenated first and then incremented (so the new value will be in place for the next iteration).

Let’s review what happens when we run this function with the rest of our program.

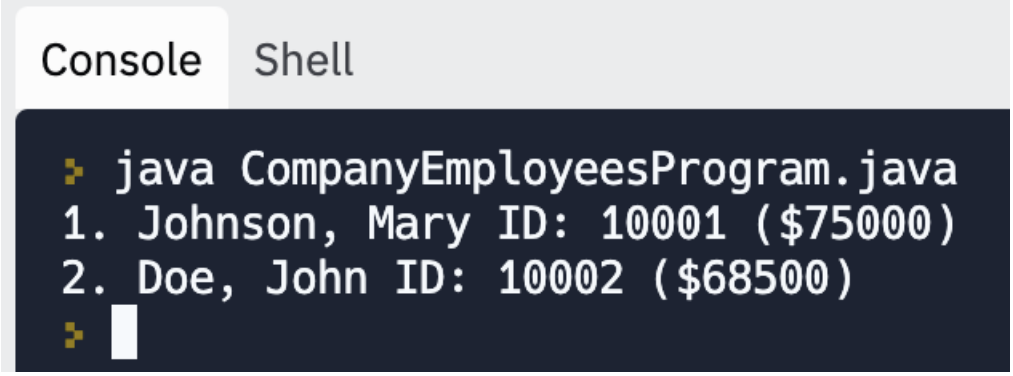
```
import java.io.File;
import java.io.FileNotFoundException;
import java.io.IOException;
import java.nio.file.Files;
import java.nio.file.StandardOpenOption;
import java.util.ArrayList;
import java.util.List;
import java.util.Scanner;

class CompanyEmployeesProgram {
  public static void main(String[] args) {
    listEmployees("employees.csv");
  }

  public static ArrayList<CompanyEmployee> readEmployees(String csvFile) {
    // Create an empty ArrayList of CompanyEmployee objects
    ArrayList<CompanyEmployee> employeeList = new ArrayList<>();
```

```
  // File object for accessing the CSV file
  File inputDataFile = new File(csvFile);
  List<String> lines = new ArrayList<>();
  // Because the following statements can through exceptions, they are in a try block
  try {
    lines = Files.readAllLines(inputDataFile.toPath());
    for(String line : lines) {
      String[] employeeData = line.split(",");
      int id = Integer.parseInt(employeeData[0]);
      int salary = Integer.parseInt(employeeData[1]);
      // Last name & first name don't need conversion to another datatype.
      String lastName = employeeData[2];
      String firstName = employeeData[3];
      // Now construct a CompanyEmployee object for each employee
      CompanyEmployee empl = new CompanyEmployee(lastName, firstName, id, salary);
      // Add CompanyEmployee obejct to ArrayList
      employeeList.add(empl);
    }
  }
  catch(FileNotFoundException ex) {
    System.out.println("File not found: " + ex.getMessage());
  }
  catch(IOException ex) {
    System.out.println("I/O error: " + ex.getMessage());
  }
  catch(NumberFormatException ex) {
    System.out.println("Number Format Error: " + ex.getMessage());
  }
  return employeeList;
}

public static void addEmployees(Scanner input, String csvFile) {
  ArrayList<CompanyEmployee> employeesToAdd = new ArrayList<>();
  char keepGoing = 'Y';
  while(keepGoing == 'Y') {
    System.out.print("Enter Employee Last Name: ");
    String last = input.nextLine();
    System.out.print("Enter Employee First Name: ");
    String first = input.nextLine();
    System.out.print("Enter Employee ID#: ");
    int id = input.nextInt();
    System.out.print("Enter Salary: ");
    int salary = input.nextInt();
    // Remove new line remaining in input buffer
    input.nextLine();
```

```
    CompanyEmployee employee = new CompanyEmployee(last, first, id, salary);
    employeesToAdd.add(employee);

    // Check if user want to continue adding employees
    System.out.print("Continue adding? (Y/N): ");
    // Read line as a String but just grab 1st char
    keepGoing = input.nextLine().charAt(0);
   }

   // Now call method to write new data to file
   writeEmployees("employee.csv", employeesToAdd);
  }

  public static void writeEmployees(String csvFile, ArrayList<CompanyEmployee> employees) {
   // Convert ArrayList<CompanyEmployee> to ArrayList<String>
   ArrayList<String> newEmployees = new ArrayList<>();
   for(CompanyEmployee empl : employees) {
    newEmployees.add(empl.getId() + "," + empl.getSalary() + "," + empl.getLastName() +
                "," + empl.getFirstName());
   }
   File outputFile = new File(csvFile);
   try {
    // Write to output file in APPEND mode
    Files.write(outputFile.toPath(), newEmployees, StandardOpenOption.APPEND);
   }
   catch(IOException ex) {
    System.out.println("Error writing to file: " + ex.getMessage());
   }

  }

  public static void listEmployees(String csvFile) {
   ArrayList<CompanyEmployee> employees = readEmployees(csvFile);
   int menuNumber = 1;
   for(CompanyEmployee empl : employees) {
    System.out.println(menuNumber++ + ". " + empl);
   }
  }
}
```

TRY IT

Directions: Add the list_employees() function to your program. Notice that we replaced the call to add_employee() function with the new list_employees() function. This time, the program will not have input, only listing the contents of the employee.csv. Remember to keep the read_employees() and list_employees() functions at the bottom. When finished, run the program.



The output is much cleaner now, as we have a centralized place to see the list of employees with the employee ID and the salary for each.

---

2. Delete From File

Next, you will create a method that will remove an employee from the file based on the employee ID.

```
public static boolean deleteEmployee(String csvFile, int emplID) {
  // Read contents of existing file
  ArrayList<CompanyEmployee> employees = readEmployees(csvFile);
  // Track if employee has been found and deleted
  boolean employeeDeleted = false;
  CompanyEmployee emplToDelete = null;
  for(CompanyEmployee empl : employees) {
    if(empl.getId() == emplID) {
      emplToDelete = empl;
    }
  }
  if(emplToDelete != null) {
    employees.remove(emplToDelete);
    employeeDeleted = true;
    ArrayList<String> remainingEmployees = new ArrayList<>();
    for(CompanyEmployee empl : employees) {
      remainingEmployees.add(empl.getId() + "," + empl.getSalary() + "," + empl.getLastName() +
        "," + empl.getFirstName());
    }
    File outputFile = new File(csvFile);
    try {
      // Write to output file - overwrite if it already exists
      Files.write(outputFile.toPath(), remainingEmployees, StandardOpenOption.TRUNCATE_EXISTING);
    }
    catch(IOException ex) {
      System.out.println("Error writing to file: " + ex.getMessage());
    }
  }
```

```
    return employeeDeleted;
  }
```

In this method, we will prompt the user for an employee ID. Next, we will loop through the list to find that employee ID. If we find it in the list, we will remove it using the `remove()` method and set `employeeDeleted` to true. If, after looping through the entire list, the employeeDeleted variable is still false, it means that the employee was not found. Otherwise, the method writes an updated list with the item removed. Let's give it a try now.

TRY IT

Directions: Input the following to loop through the list:

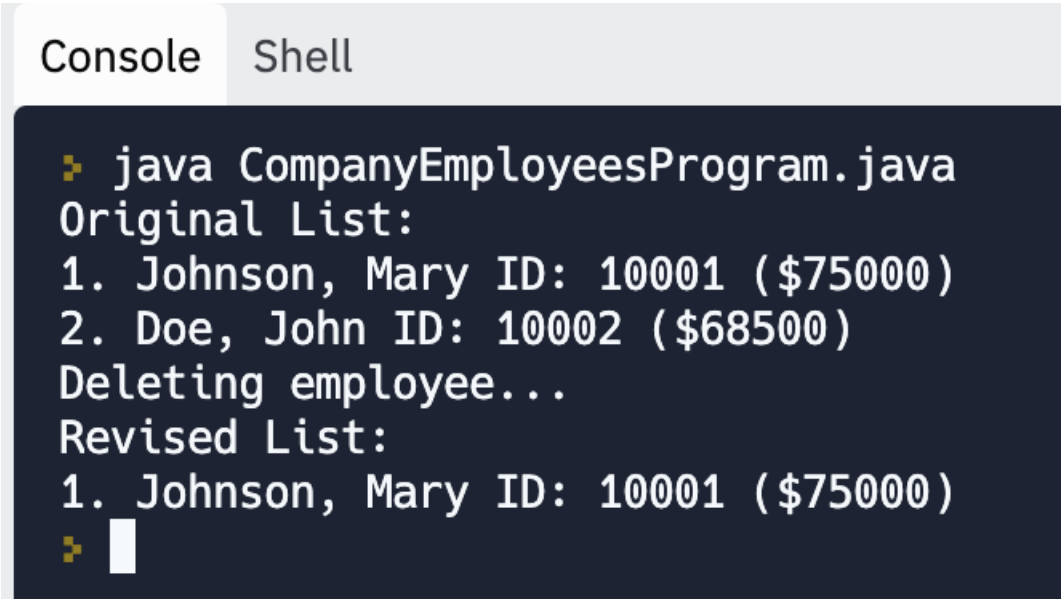
```
import java.io.*;
import java.nio.file.*;
import java.util.ArrayList;
import java.util.List;
import java.util.Scanner;

class CompanyEmployeesProgram {
  public static void main(String[] args) {
    System.out.println("Original List: ");
    listEmployees("employees.csv");
    System.out.println("Deleting employee...");
    deleteEmployee("employees.csv", 10002);
    System.out.println("Revised List: ");
    listEmployees("employees.csv");
  }

  public static ArrayList<CompanyEmployee> readEmployees(String csvFile) {
    // Create an empty ArrayList of CompanyEmployee objects
    ArrayList<CompanyEmployee> employeeList = new ArrayList<>();

    // File object for accessing the CSV file
    File inputDataFile = new File(csvFile);
    List<String> lines = new ArrayList<>();
    // Because the following statements can through exceptions, they are in a try block
    try {
      lines = Files.readAllLines(inputDataFile.toPath());
      for(String line : lines) {
        String[] employeeData = line.split(",");
        int id = Integer.parseInt(employeeData[0]);
        int salary = Integer.parseInt(employeeData[1]);
        // Last name & first name don't need conversion to another datatype.
        String lastName = employeeData[2];
        String firstName = employeeData[3];
        // Now construct a CompanyEmployee object for each employee
```

```
      CompanyEmployee empl = new CompanyEmployee(lastName, firstName, id, salary);
      // Add CompanyEmployee obejct to ArrayList
      employeeList.add(empl);
    }
  }
  catch(FileNotFoundException ex) {
    System.out.println("File not found: " + ex.getMessage());
  }
  catch(IOException ex) {
    System.out.println("I/O error: " + ex.getMessage());
  }
  catch(NumberFormatException ex) {
    System.out.println("Number Format Error: " + ex.getMessage());
  }
  return employeeList;
}

public static void addEmployees(Scanner input, String csvFile) {
  ArrayList<CompanyEmployee> employeesToAdd = new ArrayList<>();
  char keepGoing = 'Y';
  while(keepGoing == 'Y') {
    System.out.print("Enter Employee Last Name: ");
    String last = input.nextLine();
    System.out.print("Enter Employee First Name: ");
    String first = input.nextLine();
    System.out.print("Enter Employee ID#: ");
    int id = input.nextInt();
    System.out.print("Enter Salary: ");
    int salary = input.nextInt();
    // Remove new line remaining in input buffer
    input.nextLine();
    CompanyEmployee employee = new CompanyEmployee(last, first, id, salary);
    employeesToAdd.add(employee);

    // Check if user want to continue adding employees
    System.out.print("Continue adding? (Y/N): ");
    // Read line as a String but just grab 1st char
    keepGoing = input.nextLine().charAt(0);
  }

  // Now call method to write new data to file
  writeEmployees("employee.csv", employeesToAdd);
}

public static void writeEmployees(String csvFile, ArrayList<CompanyEmployee> employees) {
  // Convert ArrayList<CompanyEmployee> to ArrayList<String>
```

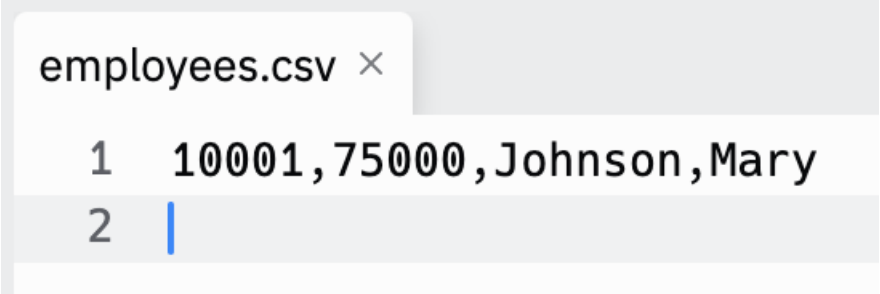
```
  ArrayList<String> newEmployees = new ArrayList<>();
  for(CompanyEmployee empl : employees) {
    newEmployees.add(empl.getId() + "," + empl.getSalary() + "," + empl.getLastName() +
                "," + empl.getFirstName());
  }
  File outputFile = new File(csvFile);
  try {
    // Write to output file in APPEND mode
    Files.write(outputFile.toPath(), newEmployees, StandardOpenOption.APPEND);
  }
  catch(IOException ex) {
    System.out.println("Error writing to file: " + ex.getMessage());
  }

}

public static void listEmployees(String csvFile) {
  ArrayList<CompanyEmployee> employees = readEmployees(csvFile);
  int menuNumber = 1;
  for(CompanyEmployee empl : employees) {
    System.out.println(menuNumber++ + ". " + empl);
  }
}

public static boolean deleteEmployee(String csvFile, int emplID) {
  // Read contents of existing file
  ArrayList<CompanyEmployee> employees = readEmployees(csvFile);
  // Track if employee has been found and deleted
  boolean employeeDeleted = false;
  CompanyEmployee emplToDelete = null;
  for(CompanyEmployee empl : employees) {
    if(empl.getId() == emplID) {
      emplToDelete = empl;
    }
  }
  if(emplToDelete != null) {
    employees.remove(emplToDelete);
    employeeDeleted = true;
    ArrayList<String> remainingEmployees = new ArrayList<>();
    for(CompanyEmployee empl : employees) {
      remainingEmployees.add(empl.getId() + "," + empl.getSalary() + "," + empl.getLastName() +
        "," + empl.getFirstName());
    }
    File outputFile = new File(csvFile);
    try {
      // Write to output file - overwrite if it already exists
```

```
      Files.write(outputFile.toPath(), remainingEmployees, StandardOpenOption.TRUNCATE_EXISTING);
    }
    catch(IOException ex) {
      System.out.println("Error writing to file: " + ex.getMessage());
    }
   }
   return employeeDeleted;
  }
}
```

The output should look like the following:



Looking at the employees file, the result is correct:



3. Adding Main Menu

Now that we have this much of the program written, next we will create a method and revise the code in the application's main() so that it runs more like a real application. You will set up a basic menu that will allow the user to know how to run the program to call each of these functions with a basic menu:

```
public static void displayMenu() {
  System.out.println("\nlist - List all employees");
  System.out.println(" add - Add an employee");
```

```
  System.out.println(" del - Delete an employee");
  System.out.println("exit - Exit program");
  System.out.print("Enter Command: ");
}
```

This method allows the user to enter list, add, del, or exit to work through the program. Now, we can set up a basic program that will loop through the program to display the user the menu, and allow the user to perform actions on our employee list using the functions we have created. Here is the revised main() method:

```
public static void main(String[] args) {
  Scanner input = new Scanner(System.in);
  String cmd = "";
  System.out.print("Enter the name of the CSV file: ");
  String csvFile = input.nextLine();

  while(!cmd.toLowerCase().equals("exit")) {
    displayMenu();
    cmd = input.nextLine();
    if(cmd.toLowerCase().equals("list")) {
      listEmployees(csvFile);
    }
    else if(cmd.toLowerCase().equals("add")) {
      addEmployees(input, csvFile);
    }
    else if(cmd.toLowerCase().equals("del")) {
       System.out.print("Employee ID to delete: ");
       int empId = input.nextInt();
        deleteEmployee(csvFile, empId);
    }
  }
}
```

The only difference here is that we're using a while loop to iterate until the exit is entered.

The completed program will look like the following:

```
import java.io.*;
import java.nio.file.*;
import java.util.ArrayList;
import java.util.List;
import java.util.Scanner;

class CompanyEmployeesProgram {
  public static void main(String[] args) {
    Scanner input = new Scanner(System.in);
    String cmd = "";
```

```
  System.out.print("Enter the name of the CSV file: ");
  String csvFile = input.nextLine();

  while(!cmd.toLowerCase().equals("exit")) {
    displayMenu();
    cmd = input.nextLine();
    if(cmd.toLowerCase().equals("list")) {
      listEmployees(csvFile);
    }
    else if(cmd.toLowerCase().equals("add")) {
      addEmployees(input, csvFile);
    }
    else if(cmd.toLowerCase().equals("del")) {
      System.out.print("Employee ID to delete: ");
      int emplId = input.nextInt();
      // Remove remaining \n in input
      input.nextLine();
      deleteEmployee(csvFile, emplId);
    }
  }
}

public static void displayMenu() {
  System.out.println("\nlist - List all employees");
  System.out.println(" add - Add an employee");
  System.out.println(" del - Delete an employee");
  System.out.println("exit - Exit program");
  System.out.print("Enter Command: ");
}

public static ArrayList<CompanyEmployee> readEmployees(String csvFile) {
  // Create an empty ArrayList of CompanyEmployee objects
  ArrayList<CompanyEmployee> employeeList = new ArrayList<>();

  // File object for accessing the CSV file
  File inputDataFile = new File(csvFile);
  List<String> lines = new ArrayList<>();
  // Because the following statements can through exceptions, they are in a try block
  try {
    lines = Files.readAllLines(inputDataFile.toPath());
    for(String line : lines) {
      String[] employeeData = line.split(",");
      int id = Integer.parseInt(employeeData[0]);
      int salary = Integer.parseInt(employeeData[1]);
      // Last name & first name don't need conversion to another datatype.
      String lastName = employeeData[2];
```

```
      String firstName = employeeData[3];
      // Now construct a CompanyEmployee object for each employee
      CompanyEmployee empl = new CompanyEmployee(lastName, firstName, id, salary);
      // Add CompanyEmployee obejct to ArrayList
      employeeList.add(empl);
    }
   }
   catch(FileNotFoundException ex) {
    System.out.println("File not found: " + ex.getMessage());
   }
   catch(IOException ex) {
    System.out.println("I/O error: " + ex.getMessage());
   }
   catch(NumberFormatException ex) {
    System.out.println("Number Format Error: " + ex.getMessage());
   }
   return employeeList;
 }

 public static void addEmployees(Scanner input, String csvFile) {
   ArrayList<CompanyEmployee> employeesToAdd = new ArrayList<>();
   char keepGoing = 'Y';
   while(keepGoing == 'Y') {
    System.out.print("Enter Employee Last Name: ");
    String last = input.nextLine();
    System.out.print("Enter Employee First Name: ");
    String first = input.nextLine();
    System.out.print("Enter Employee ID#: ");
    int id = input.nextInt();
    System.out.print("Enter Salary: ");
    int salary = input.nextInt();
    // Remove new line remaining in input buffer
    input.nextLine();
    CompanyEmployee employee = new CompanyEmployee(last, first, id, salary);
    employeesToAdd.add(employee);

    // Check if user want to continue adding employees
    System.out.print("Continue adding? (Y/N): ");
    // Read line as a String but just grab 1st char
    keepGoing = input.nextLine().charAt(0);
   }

   // Now call method to write new data to file
   writeEmployees(csvFile, employeesToAdd);
 }
```

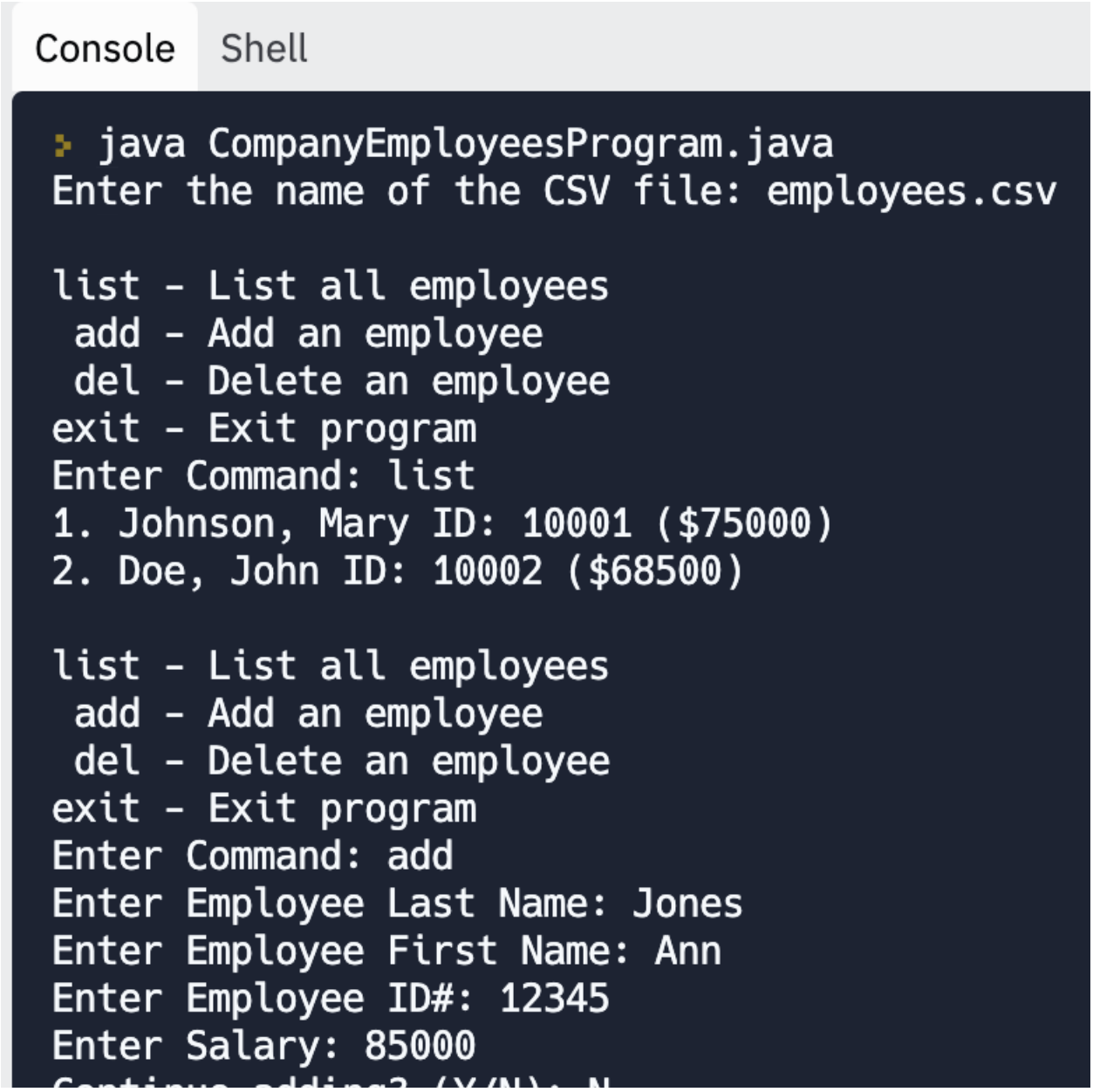
```
public static void writeEmployees(String csvFile, ArrayList<CompanyEmployee> employees) {
  // Convert ArrayList<CompanyEmployee> to ArrayList<String>
  ArrayList<String> newEmployees = new ArrayList<>();
  for(CompanyEmployee empl : employees) {
    newEmployees.add(empl.getId() + "," + empl.getSalary() + "," + empl.getLastName() +
                "," + empl.getFirstName());
  }
  File outputFile = new File(csvFile);
  try {
    // Write to output file in APPEND mode
    Files.write(outputFile.toPath(), newEmployees, StandardOpenOption.APPEND);
  }
  catch(IOException ex) {
    System.out.println("Error writing to file: " + ex.getMessage());
  }

}

public static void listEmployees(String csvFile) {
  ArrayList<CompanyEmployee> employees = readEmployees(csvFile);
  int menuNumber = 1;
  for(CompanyEmployee empl : employees) {
    System.out.println(menuNumber++ + ". " + empl);
  }
}

public static boolean deleteEmployee(String csvFile, int emplID) {
  // Read contents of existing file
  ArrayList<CompanyEmployee> employees = readEmployees(csvFile);
  // Track if employee has been found and deleted
  boolean employeeDeleted = false;
  CompanyEmployee emplToDelete = null;
  for(CompanyEmployee empl : employees) {
    if(empl.getId() == emplID) {
      emplToDelete = empl;
    }
  }
  if(emplToDelete != null) {
    employees.remove(emplToDelete);
    employeeDeleted = true;
    ArrayList<String> remainingEmployees = new ArrayList<>();
    for(CompanyEmployee empl : employees) {
      remainingEmployees.add(empl.getId() + "," + empl.getSalary() + "," + empl.getLastName() +
        "," + empl.getFirstName());
    }
    File outputFile = new File(csvFile);
```

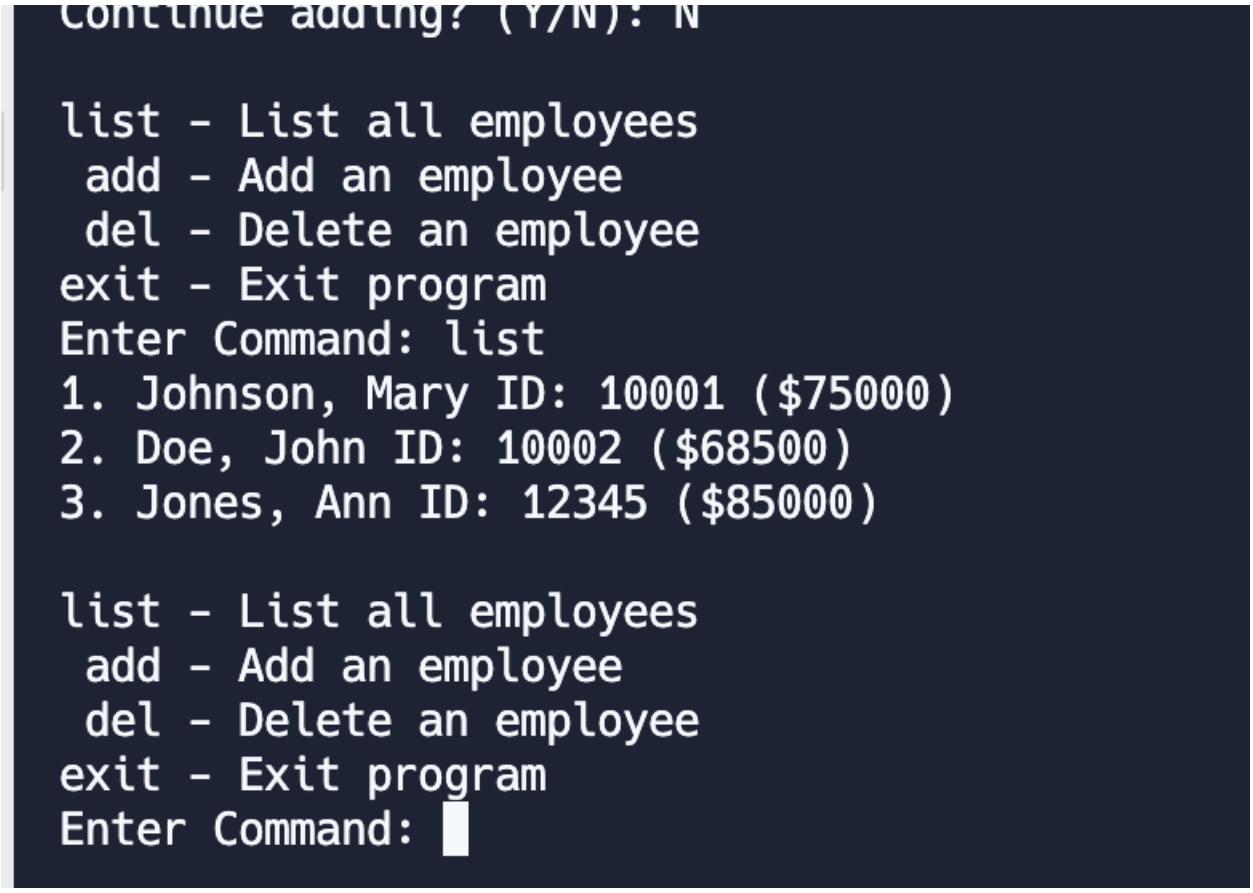
```
    try {
      // Write to output file - overwrite if it already exists
      Files.write(outputFile.toPath(), remainingEmployees, StandardOpenOption.TRUNCATE_EXISTING);
    }
    catch(IOException ex) {
      System.out.println("Error writing to file: " + ex.getMessage());
    }
   }
   return employeeDeleted;
  }
}
```

TRY IT

Directions: Try and see if the results from the employee is as expected:

The output should reflect the following:





```
list - List all employees
 add - Add an employee
 del - Delete an employee
exit - Exit program
Enter Command: del
Employee ID to delete: 12345

list - List all employees
 add - Add an employee
 del - Delete an employee
exit - Exit program
Enter Command: list
1. Johnson, Mary ID: 10001 ($75000)
2. Doe, John ID: 10002 ($68500)

list - List all employees
 add - Add an employee
 del - Delete an employee
exit - Exit program
Enter Command: exit
```

REFLECT

Everything looks accurate. Now the next time we launch the program, it should work exactly as expected with the employee list available to start with.

SUMMARY

In this lesson, you learned about how to create a program that allows the user to open a .csv file, add items to the .csv file, read from the .csv file and delete them. This included **storing information to a file, deleting from a file**, and **adding a main menu program** to help iterate through that entire process.

Source: This content and supplemental material has been adapted from Java, Java, Java: Object-Oriented Problem Solving. Source cs.trincoll.edu/~ram/jjj/jjj-os-20170625.pdf

It has also been adapted from “Python for Everybody” By Dr. Charles R. Severance. Source py4e.com/html3/