CS109 Lab 2

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What is an IDE?

A modern IDE typically consists of,

- Source code editor: assists you in writing code with features such as highlighting syntax, providing auto-completion, and controlling version, etc
- Build automation: automatically compiles multiple source code files so that you can build your program with just ONE click
- Debugger: tests your program graphically for you to find bugs

Intellj IDEA Setup

Intellj IDEA is a great option for you.

1. Download from `https://www.jetbrains.com/idea/download`
2. Run the excutable (Windows)
3. Follow the instructions.

For Mac users

Open the *.dmg* file, and in the following window, drag the icon into the *Application* folder

Project Configuration

Since program is considered as a project in IDEA, you may follow these steps before writing code:

1. Create a new project, name it and choose its location
2. Select JDK and other options
   (in this lab, we'll leave them aside)
3. Create new *Java Class* files at *src* folder.

I/O

Java program input and output the data by System I/O

- Input: create a *Scanner* object, pass *System.in* to it, and call its methods

  ```
  Scanner input = new Scanner(System.in);
  int a = input.nextInt();
  String b = input.next();
  ```

- Output: simply call the methods of *System.out*

  ```
  System.out.println("CS109 is easy!");
  ```

More about input

Scanner has these methods below:

- nextByte(), nextShort, nextInt(), nextLong(): read integer
- nextFload() & nextDouble(): read decimal
- next() & nextLine(): read String, but nextLine() will read the entire line of String, including blank character

Each data is separated by blank space.

More about input

Scanner can also check whether the user's input is legal

```
if(input.hasNextInt()) {
    int a = input.nextInt();
}
```

Similarly, other methods are hasNextFload(), hasNext(), and so on.

More about output

System.out has these methods below:

- print(): display information without outputting new line
- println(): with outputting a new line
- printf(): display formatted information

Format String

Format specifiers are present in the following sequence,

```
%<flag><width><.precision><conversion-character>
```

For example,

```
String name = "Bob";
float weight = 114.514;
String.format("I am %-5s, weigh %.1f kg", name, weight);
//I am Bob , weigh 114.5 kg
```

Expression

What does expression mean?

- **Math**: figures, formulae and equations . . .
  0xdeadbeef, $1 + 1$, $f(x) = x^2$, $e^{i\theta} = i\sin\theta + \cos\theta$
- **CS**: completed instructions composed by operators

```
int a = 2; //variable declaration
a++; //a increases by 1 and return previous value 2
System.out.println(a = 4); //assign 4 to a and output 4
```

Thus, expression can operate variables besides evaluation.

Runtime Error

RE usually occurs when your program encounters unexpected input,

```
int a = input.nextInt();
int b = input.nextInt();
System.out.println(a / b);//input: 1 0
//java.lang.ArithmeticException: / by zero
```

Since we can't divide anything by zero, the JVM will raise a RE.

Before learning try/catch, seek to avoid RE by checking the input.

Debugging with IDEA

1. Add breakpoint (where the program stops)
2. Click bug-shaped button at toolbar
3. Run it step by step
   - Step Into means jumping into the method called
   - Step Over means not getting inside
4. Check the variables if necessary, pay attention to how they change

Tips for Lab Exercise

- Exercise 1: Try to type the code yourself, instead of copying.
- Exercise 3-4: Test your program with various data.
  Debug it when fails, don't fake the result.
- Submit **screenshots** of the execution results to bb.