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Java Foundations

3-5
Keyboard Input

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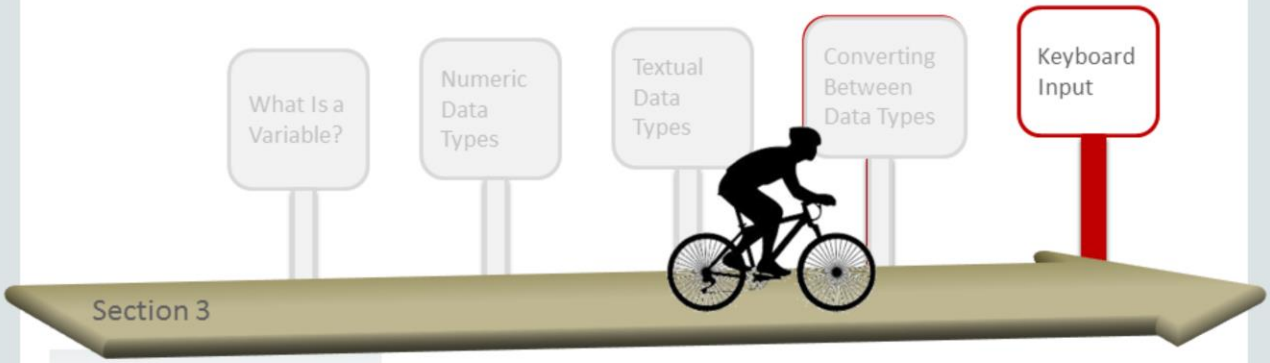
Objectives

This lesson covers the following objectives:

- Understand user input
- Create a JOptionPane to collect user input
- Use a Scanner to collect input from the console
- Use a Scanner to collect input from a file
- Understand how a Scanner handles tokens and delimiters

Topics

- User Input
- JOptionPane
- Scanner



Why Should You Get User Input?

- When you manually assign values to variables, this is known as **hard-coding** values:

```
String input = "This is a String";
```

- You can easily change hard-coded values because you have the source code and NetBeans:

```
String input = "This is a different String";
```

  – But when you distribute software, your users won't have the same luxury.

Types of User Input

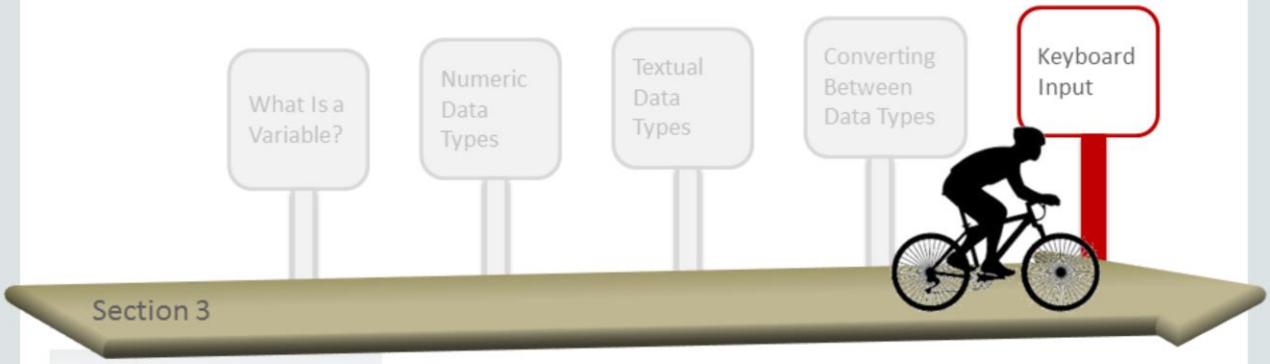
- Examples of user input include …
  - Pressing a button on a game controller
  - Entering an address on a GPS
  - Entering numbers and functions into a calculator
  - Telling people your name
- But without user input …
  - When will the game make your character jump?
  - Where will your GPS guide you?
  - What numbers will your calculator crunch?
  - What will people call you?

How to Get User Input

- There are many ways to get user input:
  - Buttons (physical or virtual)
  - Wheels and dials
  - Voice recognition
  - Text dialog boxes
  - Property files
- Java offers many ways of getting user input, including …
  - Swing `JOptionPane`
  - JavaFX (a successor of Swing, covered later)
  - `Scanner`

Topics

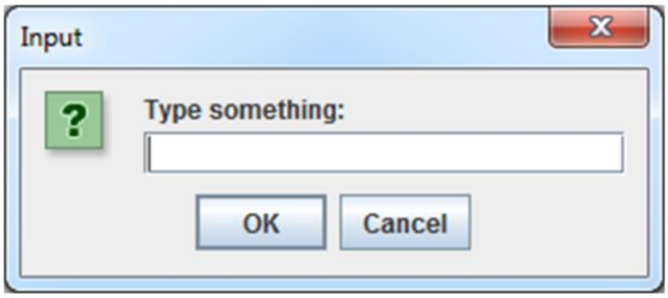
- User Input
- JOptionPane
- Scanner



JOptionPane

This is a simple way to get input from users:

```
JOptionPane.showInputDialog("Type something:");
```



JOptionPane Returns Strings

- The input can be stored as a String:

```
String input = JOptionPane.showInputDialog("Type something:");
```

- This is equivalent to writing:

```
String input = "This is a String";
```

Exercise 1, Part 1

- Import and edit the Input01 project.
- Create a JOptionPane:
  - NetBeans will complain.
  - Follow the NetBeans suggestion of importing `javax.swing.JOptionPane`
  - We'll cover importing in another section.

Exercise 1, Part 2

- Store this input as a `String`.
- Print the `String` variable.
- Parse the `String` as a separate `int` variable.
  - You'll need to input a value that can be parsed.
  - Print this value +1.
- Try creating a dialog box, parsing it, and initializing an `int` in a single line. You should have only one semicolon (`;`).

Condensed Code

- You could spread your input, parsing and calculating across several lines:

```
String inputString  =
JOptionPane.showInputDialog("??");
int input = Integer.parseInt(inputString);
input++;
```

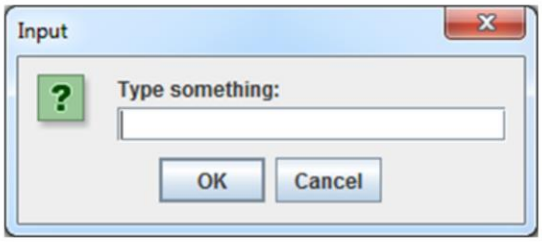
- Or condense this into a single line:

```
int input = Integer.parseInt(JOptionPane.showInputDialog("??")) +1;
```

- This choice is a matter of personal preference.
  - But if you need to reference certain values again later, it would be helpful to store these values in a variable.

Different InputDialogs

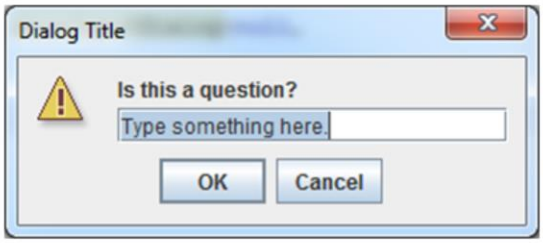
- We created a simple InputDialog:



- With more complicated code, we can customize the InputDialog more:

More Options with InputDialogs

- This version of an InputDialog doesn't return a `String`.
- The result must be cast to a `String` to be usable:



Casting

```
String input = (String)JOptionPane.showInputDialog(null,
         "Is this a question?",
         "Dialog Title",
         2,
         null,
         null,
         "Type something here.");
```

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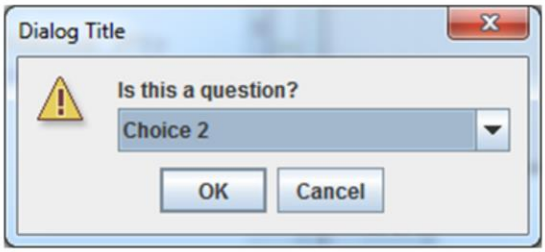
JFo 3-5
Keyboard Input

15

Confused about this code? Don't worry. Even experienced programmers can get confused when they see new code. A very helpful way to develop your understanding is to modify existing code and watch what happens. We'll do this in the next exercise.

More Options with InputDialogs

- To avoid unwanted input, it's possible to provide only acceptable values to users.
- Some of this syntax is discussed in greater detail in Section 8.




```
String[] acceptableValues = {"Choice 1", "Choice 2", "Choice 3"};
String input2 = (String)JOptionPane.showInputDialog(null,
                "Is this a question?",
                "Dialog Title",
                2,
                null,
                acceptableValues,
                acceptableValues[1]);
```

showMessageDialog

- A showMessageDialog doesn't provide a field for input.
- There are many other variations of JOptionPane.


```
JOptionPane.showMessageDialog(null,
          "There's no input here, just a message",
          "Title",
           0);
```

Exercise 2

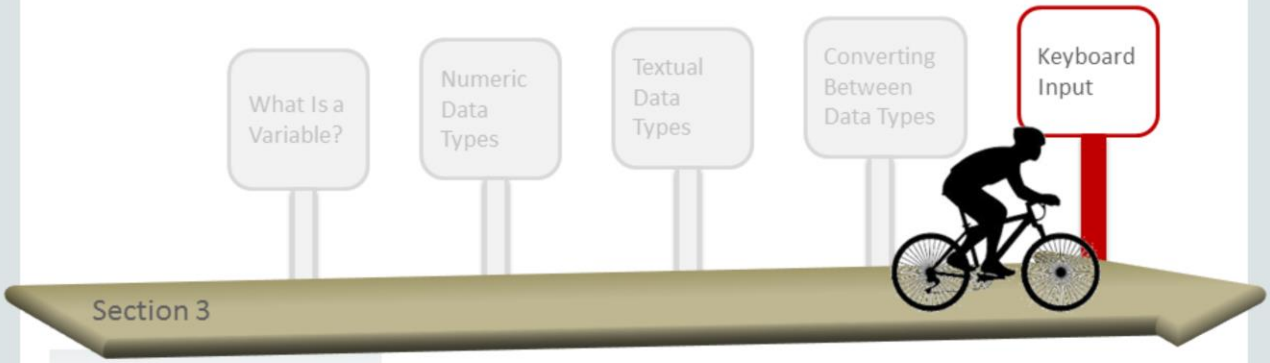
- Import and edit the Input02 project.
- Experiment with the code and try to change …
  - The message title
  - The message
  - Any default input text
  - The dialog box's icon

- Parse, manipulate, and print any input.

Hint: Ignore the nulls. If you need help, the Java documentation might be useful: http://docs.oracle.com/javase/8/docs/api/javax/swing/JOptionPane.html.

Topics

- User Input
- JOptionPane
- Scanner



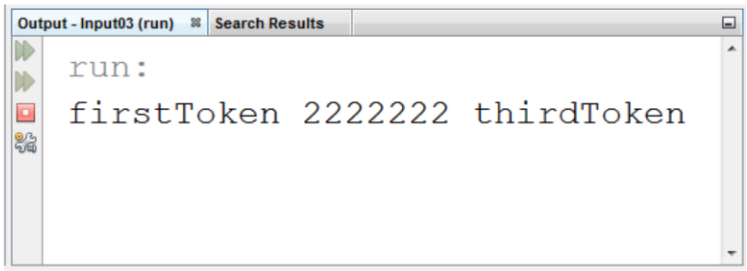
Getting Input with a Scanner

- A `Scanner` object opens a stream for collecting input:
  - `System.in` readies `Scanner` to collect input from the console.
  - Type your input in the NetBeans output window.
  - It's also possible to use Scanner without an IDE.
- It's best practice to close the Scanner stream when you're finished.

```
public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);
    System.out.println(sc.nextInt());
    System.out.println(sc.next());
    sc.close();
}
```

Reading Input with a Scanner

- The Scanner searches for **tokens.**
- Tokens are separated by a **delimiter.**
  - The default delimiter is a space.



The Scanner Class

- Scanner, like any other class, has fields and methods.
- A few useful Scanner methods …
  - `nextInt()` reads the next token as an `int`.
  - `nextDouble()` reads the next token as a `double`.
  - `next()` reads the next token as a `String`.

```
public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);
    int    x = sc.nextInt();
    double y = sc.nextDouble();
    String z = sc.next();
    sc.close();
}
```

Exercise 3

- Import and edit the Input03 project.
- Create a Scanner:
  - NetBeans will complain.
  - Follow the NetBeans suggestion of importing `java.util.Scanner`
  - Remember to close the Scanner.
- Use Scanner and `System.in` to write a program that …
  - Finds and prints the sum of three integers entered by the user.
- Try entering less than three tokens.
- Try entering a token that can't be parsed as an `int`.

Exceptions: InputMismatchException

```
Output - Input03 (run)
run:
This_is_a_String,_not_a_number
Exception in thread "main" java.util.InputMismatchException
        at java.util.Scanner.throwFor(Scanner.java:864)
        at java.util.Scanner.next(Scanner.java:1485)
        at java.util.Scanner.nextInt(Scanner.java:2117)
        at java.util.Scanner.nextInt(Scanner.java:2076)
        at input03.Input03.main(Input03.java:9)
Java Result: 1
BUILD SUCCESSFUL (total time: 30 seconds)
```

Occurs because the input cannot be parsed as the expected type:

```
public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);
    System.out.println(sc.nextInt());
    sc.close();
}
```

Exceptions: IllegalStateException

```
Output - Input03 (run) #2
run:
Exception in thread "main" java.lang.IllegalStateException: Scanner closed
        at java.util.Scanner.ensureOpen(Scanner.java:1070)
        at java.util.Scanner.next(Scanner.java:1465)
        at java.util.Scanner.nextInt(Scanner.java:2117)
        at java.util.Scanner.nextInt(Scanner.java:2076)
        at input03.Input03.main(Input03.java:12)
Java Result: 1
BUILD SUCCESSFUL (total time: 0 seconds)
```

Occurs because the stream is accessed after it's been closed:

```java
public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);
    sc.close();
    System.out.println(sc.nextInt());
}
```

Exceptions: NullPointerException

```
Output - Input04 (run)
run:
Exception in thread "main" java.lang.NullPointerException
        at java.io.Reader.<init>(Reader.java:78)
        at java.io.InputStreamReader.<init>(InputStreamReader.java:72)
        at java.util.Scanner.<init>(Scanner.java:563)
        at input04.Input04.main(Input04.java:8)
Java Result: 1
BUILD SUCCESSFUL (total time: 0 seconds)
```

Occurs because "fakeFile.txt" doesn't exist. It's also a common error to forget the `.txt` extension.

```
public static void main(String[] args) {
    Scanner sc = new Scanner(
        Input04.class.getResourceAsStream("fakeFile.txt"));
    sc.close();
}
```

Remember the extension.

Reading from a File

- Java offers several way to read files.
- More useful `Scanner` methods include:
  - `nextLine()` advances this Scanner past the current line and returns the input that was skipped.
  - `findInLine("StringToFind")` Attempts to find the next occurrence of a pattern constructed from the specified String, ignoring delimiters.

```
public static void main(String[] args) {
    Scanner sc = new Scanner(
        Input04.class.getResourceAsStream("fakeFile.txt"));
    int x = sc.nextInt();
    String entireLine = sc.nextLine();
    sc.close();
}
```

Exercise 4, Part 1

- Import and edit the Input04 project.
- Run the code and examine the output.
- Read through each next line until you find `"BlueBumper"`.
- The two numbers following `"BlueBumper"` are the object's `xPositon` and `yPosition`. Store these coordinates as integers and print them.
- Examine `input04text.txt`, if necessary.

Exercise 4, Part 2

- Examine Level05.txt if you're curious:
  - This is how level data is stored for Java Puzzle Ball.
  - Reading and parsing level data is slightly more complicated than what you've done in this exercise.
  - But if you finished this exercise, you're close to understanding how it's done.

Summary

In this lesson, you should have learned how to:

- Understand user input
- Create a JOptionPane to collect user input
- Use a Scanner to collect input from the console
- Use a Scanner to collect input from a file
- Understand how a Scanner handles tokens and delimiters

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