Java Foundations

Keyboard Input

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

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?

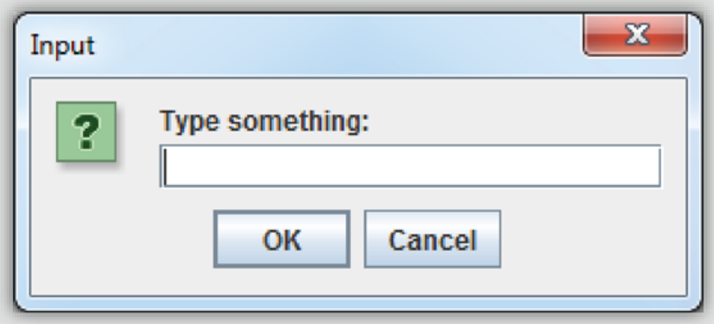
How to Get User Input

- 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

JOptionPane

- This is a simple way to get input from users:

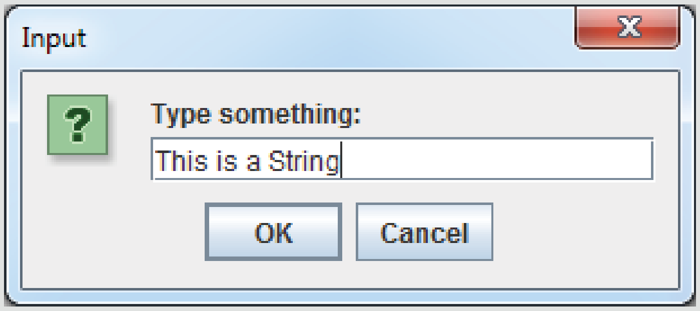
```
JOptionPane.showInputDialog("Type something:");
```



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++;
```

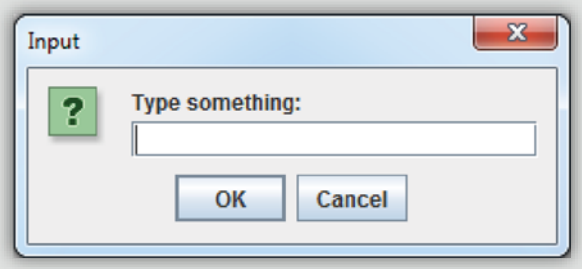
- Or condense this into a single line:

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

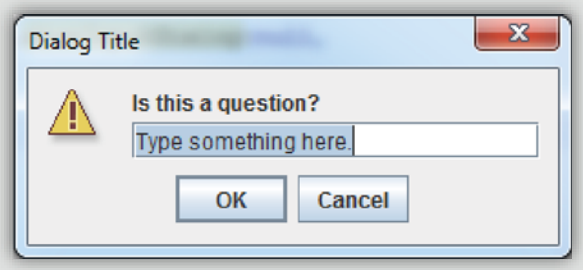
- This choice is a matter of personal preference
  - But if you need to reference certain values again later, it would be helpful to store these values in a variable

Different InputDialogs

- We created a simple InputDialog:

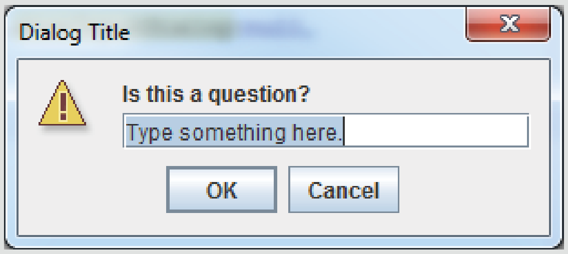


- With more complicated code, we can customize the InputDialog more:



More Options with InputDialogs

- This version of an InputDialog doesn't return a String



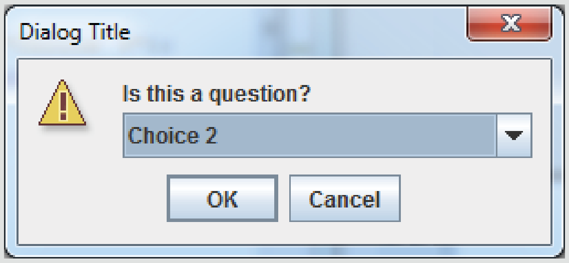
- The result must be cast to a String to be usable:

Casting

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

More Options with InputDialogs

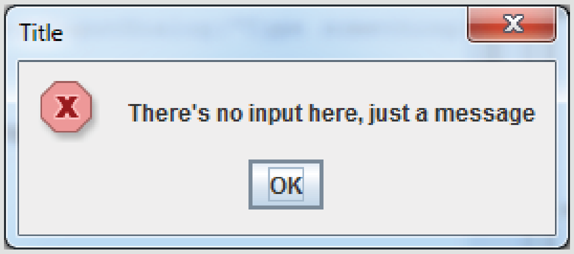
- To avoid unwanted input, it's possible to provide only acceptable values to users
- Some of this syntax is discussed in greater detail in Section 8



```
String[] acceptableValues = {"Choice 1", "Choice 2", "Choice 3"};
Input2 string= (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

Getting Input with a Scanner

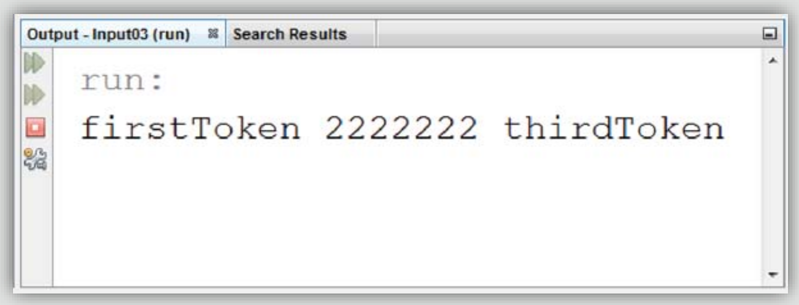
- A Scanner object opens a stream for collecting input:
  - System.in readies Scanner to collect input from the console
  - Type your input in the NetBeans output window
  - It's also possible to use Scanner without an IDE
- It's best practice to close the Scanner stream when you're finished

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

    sc.close();
}//end method main
```

Reading Input with a Scanner

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



```
run:
firstToken 2222222 thirdToken
```

The Scanner Class

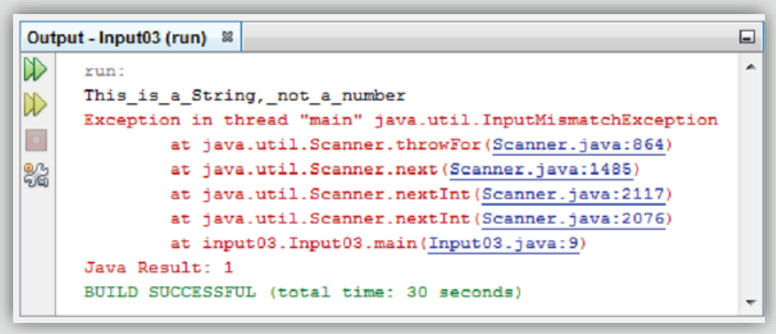
- Scanner, like any other class, has fields and methods
- A few useful Scanner methods …
  - nextInt() reads the next token as an int
  - nextDouble() reads the next token as a double
  - next() reads the next token as a String

```
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();
}//end method main
```

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

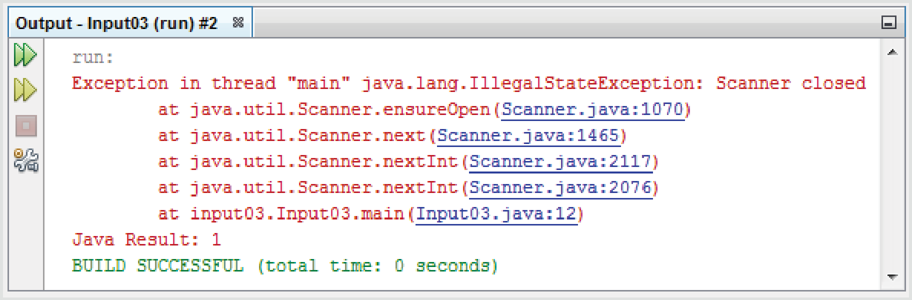


```
run:
This_is_a_String,_not_a_number
Exception in thread "main" java.util.InputMismatchException
	at java.util.Scanner.throwFor(Scanner.java:864)
	at java.util.Scanner.next(Scanner.java:1485)
	at java.util.Scanner.nextInt(Scanner.java:2117)
	at java.util.Scanner.nextInt(Scanner.java:2076)
	at input03.Input03.main(Input03.java:9)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

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

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

Exceptions: IllegalStateException

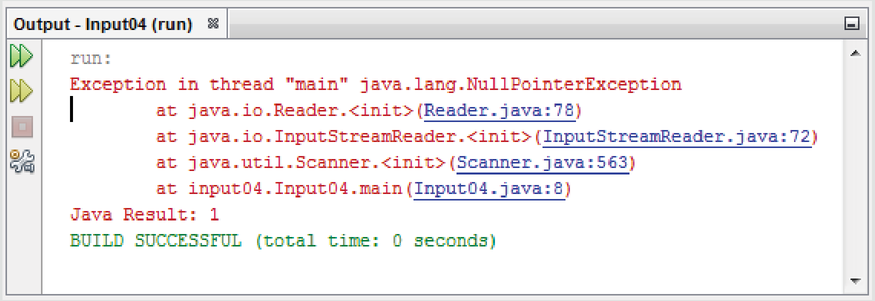

Output - Input03 (run) #2

```
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:

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

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();
} //end method main
```

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();
} //end method main
```

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