What is an Exception?

```java
public class Crash1 {

    static int[] a = { 10, 20, 30, 40, 50 };

    public static void main(String[] args) {
        for (int i = 0; i < a.length; i++) {
            System.out.println(a[i]);
        }
        System.out.println("Done printing the array!");
    }
}
```

Change condition: `i <= a.length`

```
Exception in thread "main"
java.lang.ArrayIndexOutOfBoundsException: 5
at Crash1.main(Crash1.java:8)
```

Java Exception Handlers

```
try {
    // some code during whose execution errors may occur...
} catch (some exception <variable>) {
    // some corrective action you could perform...
}
```

Example:

```java
while (true) {
    try {
        String dataStr = JOptionPane.showInputDialog("Enter a number.");
        if (dataStr != null) {
            double data = Double.parseDouble(dataStr);
            JOptionPane.showMessageDialog(null, "Square root of " + data + " is " + Math.sqrt(data));
        }
    } catch (NumberFormatException e) {
        JOptionPane.showMessageDialog(null, "Bad Numeric String - try again.", "Input Error", JOptionPane.ERROR_MESSAGE);
    }
}
```

17 Exceptions & Exception Handling

Monday, November 16, 2020 9:07 AM
JOptionPane.showMessageDialog(null, "Bad Numeric String - try again.", "Input Error", JOptionPane.ERROR_MESSAGE);
17 Exceptions - Terminology & Design Space

Wednesday, November 18, 2020    9:24 AM

"Cognitive overconfidence bias"

Exceptions
- Raised/Thrown
- Handlers

Exception Handlers
1. Recover and continue
2. Cannot recover, but require clean up
3. Nothing can be done, exit gracefully by printing message

Questions
- How/where are exceptions/handlers specified? [Scope]
- Can information about the exception be passed to handler?
- Does the PL allow a continuation or a termination model?

pre-defined?
user-defined?
Stack Error

Hardware?
interrupts?
software?
array index?
file not found?
divide by zero?

Implicit (raised by system)
Explicit (raised by user program)

Fatal?
recoverable?
clean up?

Matching?
propagating?

checked?
unchecked?
17 Exceptions in Java

Handlers

```java
try {
    // code block
    
    3 catch (Exception type e) {
        // catch block
    }
    
    3 finally {
        // finally block
    }
}
```

User-defined Exceptions

```java
public class StackError extends Exception {
    public StackError(String message) {
        super(message);
    }

    public E pop() throws StackError {
        if (empty()) {
            throw new StackError("stack underflow");
        }

        // pop code
    }
}
```
try:
    
except e1:
    
except e2:
    
finally:

else:

```python
class StackError( Exception):
    def __init__(self, msg = "Stack Error"):
        self.message = msg
        super().__init__(self.message)

def pop(self):
    if (self.isEmpty):
        raise StackError("""
```

```
```
17 Exceptions in Go?

Wednesday, November 18, 2020       9:24 AM

error handling
panic
defer