Exceptions

- Signals
- A library in C to handle signals.
- Signals not the same as exceptions (though they could be caused by similar errors, such as dereferencing a null pointer). An example of a signal that is not an exception is a key-board interrupt. This is an external signal and it needs to be handled.

Functions

- Avoid repetition
- Terminology
  - Subroutine/Procedure: A call/return block of code that does not return a value
  - Function: A call/return block of code that returns a value
  - Method: A function or subroutine in a class
  - Argument: An expression used when calling a function or subroutine
  - Parameter: The identifier declared in a function or subroutine definition

Parameter Passing

- Pass by value: the computer evaluates the argument expression and places a copy of its value into the memory address referenced by the parameter. (C, C++, Java)
- Pass by reference: the computer evaluates the argument expression and places a reference to the result into the memory address referenced by the parameters. (C++)
- Pass by value-result: the computer evaluates the argument expression to a memory location and then copies its value to the memory address referenced by the parameter. When the function returns, the computer copies the value of the parameter back to the location holding the argument. (Ada)
- Pass by name: the compiler textually substitutes the argument expression for the parameter within the function call. (Algol 68)
What are the value of X and Y at these three breakpoints

```c
int x;

foo (int y)
begin
    y = y + 1;
    y = y * x;
end

bar ()
begin
    x = 2;
    foo (x);
    print (x);
end
```

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<th>Pass-by-value</th>
<th>Pass-by-reference</th>
<th>Pass-by-value-result</th>
<th>Pass-by-name</th>
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<tbody>
<tr>
<td>x</td>
<td>y</td>
<td>x</td>
<td>y</td>
</tr>
<tr>
<td>enter into foo</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>after y = y + 1</td>
<td>2</td>
<td>3</td>
<td>3</td>
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<tr>
<td>at foo's return</td>
<td>2</td>
<td>6</td>
<td>9</td>
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