Functions

Chapter 20

Computing A Person's Body Mass Index

- A person's body mass index (BMI) is computed as follows (units are in inches and pounds):

$$BMI = \frac{weight}{height^2} \times 703$$

- Write a program to compute the BMI (via popup boxes) for the following two profiles:

    Person 1: 62.5 inches, 130.5 pounds
    Person 2: 58.5 inches, 90 pounds

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Solution

```
var height1 = 62.5;
var weight1 = 130.5;
var bmi1 = weight1 / (height1 * height1) * 703;
alert("1. BMI = [" + bmi1 + "]");

var height2 = 58.5;
var weight2 = 90;
var bmi2 = weight2 / (height2 * height2) * 703;
alert("2. BMI = [" + bmi2 + "]");
```

- What if we wanted to add another person's profile?
    - Observation: Code is a little repetitive.
    - Just copy and paste with a few changes?

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Solution?

Repetitive code is prone to copy-paste errors.

```
var height1 = 62.5;
var weight1 = 130.5;
var bmi1 = weight1 / (height1 * height1) * 703;
alert("1. BMI = [" + bmi1 + "]");

var height2 = 58.5;
var weight2 = 90;
var bmi2 = weight2 / (height2 * height2) * 703;
alert("2. BMI = [" + bmi2 + "]");
```

Forgot some necessary changes after copying and pasting

```
var height3 = 70;
var weight3 = 170.5;
var bmi3 = weight② / (height② * height②) * 703;
alert("3. BMI = [" + bmi3 + "]");
```

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In Search Of A Black Box
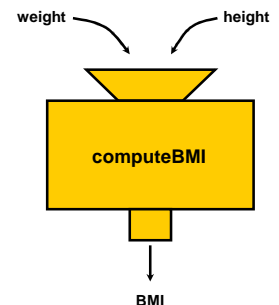
- What if there were a "black box" that computed the BMI such that if you gave the black box a height and a weight, it would give you back a BMI?
    - Suppose the black box was called `computeBMI`.
    - Computing the BMI of one person could look like the following:

```
var height1 = 62.5;
var weight1 = 130.5;
var bmi1 = computeBMI(height1, weight1);
alert("1. BMI = [" + bmi1 + "]");
```

- What are the advantages of having such a black box?
    - Code will be easier to understand as complex computations are hidden in the black box.
    - Computations can be re-used by invoking the name of the black box.

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Black Box

- We refer to these black boxes as **functions**.

- The inputs to a function are referred to as its **parameters**.

- The output is **returned** to whatever **called** (invoked) the function.

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Using Functions

- To use a function:
  1. **declare** it   (create the black box)
     - Write a group of statements and give it a name.
  2. **call** it   (use the black box)
     - Tell our program to execute the statements in the function.

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Declaring Functions That Do Not Return

- Declaring a function that does not return a value, general syntax:
  ```
  function <identifier>(<parameter list>) {
      <statement(s)>
  }
  ```

- Example:
  ```
  function soundAlarm(message) {
      alert(message);
      alert("I repeat: " + message);
  }
  ```

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Calling Functions

- Calling a function, general syntax:
  <function name>(***<parameters>***);

- Example:
  ```
  soundAlarm("We're out of cookies!");
  ```

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Writing Functions That Return A Value

- Declaring a function that returns a value, general syntax:
  ```
  function <identifier>(<parameter list>) {
      <statement(s)>
      return <expression>;
  }
  ```
  value of this expression is the output of this function

- Example:
  ```
  function computePay(hours, payRate) {
      var taxRate = 0.1;
      var grossPay = hours * payRate;
      return grossPay – taxRate * grossPay;
  }
  ```

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What To Do With The Return Value?

- Use it right away
  ```
  alert("IOU: " + computePay(10, 8));
  ```

- Store it in a variable for later use
  ```
  var myPay = computePay(10, 8);
  ```

- If you ignore the return value, it gets lost into oblivion. The following line of code is useless on its own:
  ```
  computePay(10, 8);
  ```

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Exercise

- Write the `computeBMI` function.

- Solution:
  ```
  function computeBMI(height, weight) {
      return weight / (height * height) * 703;
  }
  ```

- Rewrite the BMI solution to use this function.

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Solution

> **The code is still somewhat repetitive in that each call to `computeBMI` is followed by a call to `alert`... What can be done? (see Lab #6)**

```
var height1 = 62.5;
var weight1 = 130.5;
var bmi1 = computeBMI(height1, weight1);
alert("1. BMI = [" + bmi1 + "]");

var height2 = 58.5;
var weight2 = 90;
var bmi2 = computeBMI(height2, weight2);
alert("2. BMI = [" + bmi2 + "]");

var height3 = 70;
var weight3 = 170.5;
var bmi3 = computeBMI(height3, weight3);
alert("3. BMI = [" + bmi3 + "]");
```

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Calling Function With Multiple Parameters

- When calling a function with multiple parameters, list the parameters in the same order that they were written in the function declaration.

- Function declaration:
```
function computeBMI(height, weight) {
    return weight / (height * height) * 703;
}
```

- Suppose the following variables have been declared:
```
var patientHeight = 70.5;
var patientWeight = 170;
```

- Function call:
```
var bmi = computeBMI(patientHeight, patientWeight);
```
✔

```
var bmi = computeBMI(patientWeight, patientHeight);
```
✘

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