Computing A Person's Body Mass Index

- A person's body mass index (BMI) is computed as follows (units are in inches and pounds):
  \[\text{BMI} = \frac{\text{weight}}{\text{height}^2} \times 703\]
- 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

Solution

```javascript
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?
```

Solution?

```javascript
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.
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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.

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.

<table>
<thead>
<tr>
<th>weight</th>
<th>height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

computeBMI

BMI
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.

Declaring Functions That Do Not Return

- Declaring a function that does not return a value, general syntax:
  ```javascript
  function <identifier>(<parameter list>) { 
    <statement(s)>
  }
  ```
- Example:
  ```javascript
  function soundAlarm(message) {
    alert(message);
    alert("I repeat: " + message);
  }
  ```

Calling Functions

- Calling a function, general syntax:
  ```javascript
  <function name>(<parameters>);
  ```
- Example:
  ```javascript
  soundAlarm("We're out of cookies!");
  ```

Writing Functions That Return A Value

- Declaring a function that returns a value, general syntax:
  ```javascript
  function <identifier>(<parameter list>) { 
    <statement(s)>
    return <expression>;
  }
  ```
- Example:
  ```javascript
  function computePay(hours, payRate) {
    var taxRate = 0.1;
    var grossPay = hours * payRate;
    return grossPay - taxRate * grossPay;
  }
  ```

What To Do With The Return Value?

- Use it right away
  ```javascript
  alert("IOU: " + computePay(10, 8));
  ```
- Store it in a variable for later use
  ```javascript
  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:
  ```javascript
  computePay(10, 8);
  ```

Exercise

- Write the `computeBMI` function.
- Solution:
  ```javascript
  function computeBMI(height, weight) { 
    return weight / (height * height) * 703;
  }
  ```
- Rewrite the BMI solution to use this function.
Solution

```javascript
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 + "]");
```

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)

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

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

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

  ```javascript
  var bmi = computeBMI(patientWeight, patientHeight);  // ✗
  ```