Functions & Abstraction

A function is a package for an algorithm; once written, it can be used over and over.

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Example Function

A function to compute a person’s weight in gold would be

```javascript
function worthInAu(weight) {
  return weight*12*566.99;
}
```

This computation is what’s being packaged

The Package

Functions have a specific syntax

```javascript
function <name> (<parameter list>) {
  <function definition>
}
```

- `<name>` names are identifiers; start w/ letter
- `<parameter list>` is the input variables, a list separated by commas
- `<function definition>` is just the program to do the work

A Sample Function

Compute the Body Mass Index when the inputs are in metric

```javascript
function bmiM(weightKg, heightM) {
  // Figure Body Mass Index in metric units
  return weightKg / (heightM * heightM);
}
```

Identify the corresponding parts

Writing Functions

Most programming is done by writing functions, so learning the form is key

```javascript
function bmiE(weightLBS, heightIn) {
  // Figure Body Mass Index in English units
  var heightFt = heightIn / 12; // Change to feet
  return 4.89 * weightLBS / (heightFt * heightFt);
}
```

Declarations

A function is declared by writing down the “package” ... the function is used when it is called

```javascript
function BMI(units, height, weight) {
  // Compute BMI in either metric or English
  if (units == "English")
    return bmiE(weight, height);
  else
    return bmiM(weight, height);
}
```
Summarizing

Declaration: the function "package," says what happens when the function runs

Call: the function use, asks for the computation to be run

- There is only one function declaration
- There can be many calls … functions are reusable
- In JS, functions tend to be grouped together but the calls go where they are needed

Gold Function

Suppose we compute "weight in Au"

\[ \text{worth in gold} = (\text{weight} \times 12) \times 566.99 \]

Begin with the form ...

Gold Function

Suppose we compute "weight in Au"

\[ \text{worthInAu} = (\text{weight} \times 12) \times 566.99 \]

Pick a Name

Pick the Parameter

Pick the Parameter

Gold Function

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Gold Function

Suppose we compute "weight in Au"

\[ \text{worthInAu} = (\text{weight} \times 12) \times 566.99 \]

Pick a Name

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Pick the Parameter

Define the Computation

Testing Template

No one writes perfect programs the first time … smart programmers check

To test, have a standard page handy

```html
<html><head><title>My Test Page</title></head><body>
<
```
Declare the Function

Put a function declaration in `<script>`

```html
<html><head><title>My Test Page</title></head>
<body>
<script language="JavaScript">
function worthInAu ( weight )  {
  // Compute the dollar value  
  // of weight at $566.99/troy oz
  return weight * 12 * 566.99;
}
alert(worthInAu(1/12));
</script>
</body>
</html>
```

Try The Function

Unquestionably, the best practice is to test everything.

Demonstration

Summary

Functions are packages for algorithms:
- They follow a series of rules, that quickly become routine
- Functions have both a declaration and a call
- Functions have both parameters (in the declaration) and arguments (in the call)
- Scope refers to the region of a program where a variable is "known"

Functions are the secret to building complex systems.