Exercise: Functions, Conditionals

• What if we want to have 3 different levels of tip? Good / Normal / Terrible?

• Write out the new function in full (parameters, return value, etc.)

• Write down a first solution individually, then compare your solution with a neighbour! Those with laptops, try it out! (Google: tryit javascript)

One solution:

```javascript
function calcFlexTip(amount, baseRate, serviceLevel) {
  var adjustedRate;
  if (serviceLevel > 7) {
    adjustedRate = baseRate + 0.03;
  } else if (serviceLevel < 3) {
    adjustedRate = baseRate * 0.5;
  } else {
    adjustedRate = baseRate;
  }
  tip = amount * adjustedRate;
  return tip;
}
```

Anatomy of a Conditional Statement

Logical condition (= something that must be true or false)

```javascript
if (serviceLevel == 10) {
  adjustedRate = baseRate * 2;
} else if (serviceLevel < 3) {
  ...
} else {
  ...
}
```

Conditional statements can be nested (one inside another)

Clicker question: Conditionals

• What value of \(x\) after executing the following?

\[
x = -10;
\]

```javascript
if (x = 0) {
  x = x * 1.195;
}
else {
  x = x * 1.015;
}
```

A. -11.95  C. -10
B. -10.15  D. 0
Caution!

Two common mistakes:

- Always use `==` to test equality.
  
```java
if (serviceLevel = 10) {...}
```

- Do not use a semicolon in conditional statements.
  
```java
if (serviceLevel == 10) {...}
```

More Conditional Statements

- **==** equal:
  
```java
if (serviceLevel == 10) {...}
```

- **!=** unequal:
  
```java
if (serviceLevel != 10) {...}
```

- **&&** and:
  
```java
if ((food > 7) && (service > 7)) {...}
```

- **||** or:
  
```java
if ((food < 3) || (service < 3)) {...}
```

Conditional Statements - Summary

- **if** statements:
  - can be used to alter the flow of your program depending on user input or intermediate results
  - can help you make your program more flexible

Control Flow

- **Loops**
- **Functions**
- **Conditionals**
Module III: Processes

Arrays

Arrays - Motivation

var mark1 = 83;
var mark2 = 79;
var mark3 = 58;
var mark4 = 97;

var grade = (mark1+mark2+mark3+mark4)/4;

Arrays

• Arrays are a means to store tabular data:

```javascript
var colours = new Array("red","green","blue");
```

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
</table>
|   | "red" | "green" | "blue"

• Equivalent to:

```javascript
var colours = new Array();
colours[0] = "red";
colours[1] = "green";
colours[2] = "blue";
```

Clicker question: Arrays

• What is the value of `colours[1]`?

```javascript
var colours = new Array("red","green","blue");
```

A. "red"
B. "green"
C. "blue"
D. none of the above
Arrays – a common mistake

• The first element of an array has index 0, not 1!!

```javascript
var colours = new Array("red","green","blue");

index of "red" is 0, index of "green" is 1!
```

**Note:**
Normal folks count 1,2,3,…
Computer Scientists count 0,1,2,…

IAL vs NAL

A bigger example:
• Steps in IAL: 5+7+7+8+6+6 = 39
• Steps in NAL: 5*7*7*8*6*6 = 70560

Clicker question: Arrays

• What is the value of \( n \)?

```javascript
var colours = new Array("red","green","blue");
var n = colours.length;
```

A. 0 C. 3
B. 1 D. 4

Arrays

0 1 2
"red" "green" "blue"

• we use indices to access array values

```javascript
colours[2] = "purple";
```

• after this assignment statement the value stored in slot 2 of the array changes to "purple":

0 1 2
"red" "green" "purple"
Arrays & Loops

Calculating a grade by averaging over marks, stored in an array:

```javascript
var marks = new Array(83, 79, 58, 97);
var total = 0;
for (var i = 0; i < marks.length; i++) {
    total = total + marks[i];
}
var grade = total / marks.length;
```

2-Dimensional Arrays

Arrays can be nested (arrays within arrays):

```javascript
var phoneBook = new Array();
phoneBook[0] = new Array("Ada", "604-123-4567");
```

Clicker Exercise

What is phoneBook[1,1]?

A. “Ada”
B. “604-123-4567”
C. “Anne”
D. “604-234-4567”
Request

- Could you please go over the Alphabetize CDs Algorithm example in class?

- **Answer:** Yes, on Monday. *Homework: Review the algorithm (textbook, Ch.10).*

Learning Goals

- recognize and explain the five essential properties of an algorithm: input specified, output specified, definiteness, effectiveness, and finiteness

- recognize and explain the concept of sequences of instructions, variables, loops, functions, conditional statements, and arrays in short programs specified in a programming language such as JavaScript, or in other clearly expressed processes (which may or may not be computer related)

- determine, simulate and explain how short programs or program fragments work

- make small modifications to short program fragments to achieve clearly specified tasks

- explain and simulate simple algorithms for fundamental problems such as searching and sorting
Module IV:
Art and Images

Image Representation

Learning Goals [for 2+ classes]

you should be able to

• define the RGB colour specification, explain its basis, and convert from hexadecimal to decimal
• define “bitmap image” and “pixel” and explain how to construct a bitmap image representation
• define “vector image” and explain how to construct a vector image representation
• compare and contrast the suitability of bitmap and vector representations for different uses of images

Clicker Question

How many numbers are commonly used to specify the colour of a pixel?

A. 1
B. 2
C. 3
D. 4 or more

Key ideas:

1. represent images as grids of coloured points (2-dimensional arrays!)
2. represent colours using numbers
3. reduce storage by exploiting regularities in the image (areas of uniform colour, regular textures and patterns, ...)
Selected RQs:

"Does the combination of the colours red, green, and blue actually yield every colour possible? If so why did the company Sharp introduce yellow as a standard sub-pixel in their Quattron technology?"

(submitted by Ryan)

• If a picture has more pixels, does it mean that it will have more colours and therefore it will become more clear?

(submitted by Karen, 2011W1 Student)

A. More pixels => more colours
B. More pixels => more detail (clarity)

Clicker Question

Suppose red's intensity is 255 (full intensity). What happens if both the blue and green intensities increase at the same rate, starting from 0?

A. The colour remains red but gets lighter
B. The colour remains red but gets darker
C. The colour changes from red to an aqua shade
D. None of the above