Actual Problems from Previous Exams

1. [2] The programming technique to cause repetition used in this function has what name?

```javascript
function f(n)
{
    if ( n <= 0 )
    {
        return 0;
    }
    return n + f(n-1);
}
```

2. [4] What is the value of the variable `x` after the following code is executed?

```javascript
var a = 9;
var x = 0;
while ( a > 5 ){
    x = x + a;
    a = a - 1;
}
```

Use this space for your work:

3. [4] Using the function defined below, what is the value of `f( f(3, 20), f(1,2) )`?

```javascript
function f(x,y)
{
    if ( x > y )
    {
        return ( 2 * x - y );
    }
    else {
        return ( y - x );
    }
}
```

Use this space for your work:
4. [3] Write a Javascript function called smaller that takes two numbers as arguments and returns the smaller of the two values. Therefore smaller(2, 8) returns the value 2.
Write your function here:

5. [3] Write a Javascript function called smallest that takes three numbers as arguments and returns the smallest of the three values. Therefore smallest(4, 3, 5) returns the value 3. If you like, you may call the function specified in the preceding problem.
Write your function here:
6. [8] Complete the HTML shown below by adding Javascript in the `head`, and by adding attributes to the input elements as needed. Do not add anything that is not necessary, else you will be penalized. Do not assume the user enters valid data. If the values are not valid numbers, use an alert box to tell the user and do not move any numbers.

The web page shown at left puts two numbers into ascending order. The user types numbers into these boxes then clicks the button. Javascript on the page then puts those two values into increasing order from left to right as shown in these two images.

```html
<html>
<head>
  <script type='text/javascript'>
  </script>
</head>
<body>
  <table border='0' cellpadding='4'>
    <tr><td align='center'>
      <input type='text' />
      <input type='text' />
    </td></tr>
    <tr><td align='center'>
      <input type='text' />
      <input type='text' />
    </td></tr>
  </table>
</body></html>
```
Here is a version of a slot machine. On the server are ten pictures called 1.jpg, 2.jpg, ..., 10.jpg. The user presses the start button and the page simulates pairs of images rolling by ten times until they finally stop. If the images match, the counter box increases by 1.

In more detail: When the user clicks the button, the script on the page picks two random numbers in the range 1 to 10 and shows on the page the two images with those numbers. For example, if the script picks 2 and 6, the page shows 2.jpg and 6.jpg in the two image elements. A second later, the page shows another pair, then a second later the page shows yet another pair, until it has shown ten pairs of images. The idea is to simulate a slot machine with pictures rolling by for a while.

When the ten seconds are over, the page checks if the two images show the same picture. If they are the same picture, the counter in the box marked MATCHES increases by 1. That is it for now. In a later version, the program will accept bets and pay off fabulous prizes.

There are two parts to this problem: planning and coding.

a. Planning: Write in outline form the steps your script has to perform to make this slot machine simulation work. You do not have to use precise javascript, just simple, step-by-step instructions. You will be graded on how complete and accurate your plan is.

b. Coding: Say the image tags are have name='pic1' and name='pic2' and the box has id='matches'. Write the function(s) that translates your answer from part a into Javascript.

(use the space below and on the next page for your answer)
Extra Credit. For an extra 5 points, write a new solution to the order number problem that processes three numbers, not just two. You need one more input box, call it 'c'. Then write the function that puts three numbers in order.
9. [4] What is the value of the variable \( x \) after the following code is executed?

```javascript
var i = 1;
var x = 0;
while (i < 5) {
    x = x + i;
    i++;
}
```

Use this space for your work:

10. [4] Using the function defined below, what does \( f(f(3, 20), 20) \) return?

```javascript
function f(x, y)
{
    var n = 0;
    while (a < b) {
        n = n + 1;
        a = a * 2;
    }
    return n;
}
```

Use this space for your work:

11. [4] Write a function called `distance` that takes two numbers as arguments and returns the distance between them as a positive number. Therefore `distance(2, 8)` and `distance(8, 2)` both return the value 6, because the distance from 2 to 8 is the same as the distance from 8 to 2.

Write your function here:
12. [8] Complete the HTML shown below by adding Javascript in the \texttt{head}, and by adding attributes to the input elements as needed. Do not add anything that is not necessary, else you will be penalized.

Here is a web page that helps travelers plan trips that require two flights, one into a hub and one out of the hub to their destination. The user enters the departure and arrival times of the two flights then clicks the \texttt{check} button. If the arrival time of flight1 is an hour or more before the departure time of flight2, the program puts the word "OK" in the text box, otherwise it puts the word "NO".

Furthermore, the program puts the total time from departure to arrival in the second text box at the bottom or blanks it if the status is "NO".

Assume: all times are whole numbers, times are entered using a 24 hour clock, all flights are in the same time zone and on the same day, and that the user enters valid data in all four boxes.

\begin{verbatim}
<html>
<head>
<script type='text/javascript'>

</script>
</head>
<body>
<table border='0'>
<tr><td></td><td>leaves</td><td>arrives</td></tr>
<tr><td>Flight1</td><td><input type='text' id='f1dep' size='4'></td><td><input type='text' id='f1arr' size='4'></td></tr>
<tr><td>Flight2</td><td><input type='text' id='f2dep' size='4'></td><td><input type='text' id='f2arr' size='4'></td></tr>
<tr><td>< ></td><td>< ></td><td>< ></td></tr>
</table> </body> </html>
\end{verbatim}
13. [5] Below is a function moves an image across a 5x5 grid. In this version, the image moves horizontally left to right and top to bottom. Modify this function so (a) it depicts an elephant chasing a peanut horizontally left to right and top to bottom across the grid. You can rewrite the function or make changes and additions to the code below.

At the start, the elephant is in the first spot and the peanut is in the second spot. Throughout the animation, the peanut is always one step ahead of the elephant. When each play gets to the lower right corner, it next appears at the upper left corner. They chase around forever.

```javascript
var pic = 'elephant.jpg';
var pic2 = 'peanut.jpg'
var currspot = 0;

// show_pic() - shows the image at the current cell and
// increments the current cell number

function show_pic()
{
    show_image(pic, currspot);
    if ( currspot > 0 ){
        show_image(blank, currspot-1);
    }
    currspot++;
    if ( currspot >= numcells ){
        currspot = 0;
    }
    timerID = setTimeout('show_pic()', document.ctl.delay.value);
}
```
14. [3] The following grid contains a short message. When read top to bottom, left to right (down the first column, then down the second column, etc), treating each black square as a 1, and each white square as a 0, the 28 bits represent a sequence of binary 7-bit ASCII codes. That is, the first bit of the ASCII code is not included in the value. What message is encoded in this image?

End of Exam                                  Total points 61
Solutions

1. recursion
2. \[9 + 8 + 7 + 6 = 30\]
3. 33
4. function smaller(a, b) {
   if (a < b) {
     return a;
   } else {
     return b;
   }
}
5. function smallest(a, b, c) {
   return smaller(smaller(a, b), c);
}
6. Script part:
   function sortem() {
     var a, b;
     a = parseFloat(document.getElementById("a").value);
     b = parseFloat(document.getElementById("b").value);
     if (isNaN(a) || isNaN(b)) {
       alert("Bad data");
     } else {
       if (a > b) {
         document.getElementById("a").value = b;
         document.getElementById("b").value = a;
       }
     }
   }

Form Part

<td><input type='button' value='order' onclick='sortem()'/></td>

7
8
9
10
11 function distance(a, b) {
   if (a < b) {
     return b - a;
   } else {
     return a - b;
   }
}
12 Script part:
function checkit()
{
    var arrives = parseFloat(document.getElementById("f1arr").value);
    var leaves = parseFloat(document.getElementById("f2dep").value);

    if ( leaves >= arrives + 1 ){
        document.getElementById("status").value = "OK";
        document.getElementById("total").value =
            document.getElementById("f2arr").value -
            document.getElementById("f1dep").value;
    } else {
        document.getElementById("status").value = "NO";
        document.getElementById("total").value = "";
    }
}

Form Part
<td><input type='button' value='check' onClick='checkit()' /></td>
<td><input type='text' id='status' /></td>
<td><input type='text' id='total' /></td>

var pic = 'elephant.jpg';
var pic2 = 'peanut.jpg'
var currspot = 0;
var peaspot = 1;
var blankspot = numcells - 1;

//
// show_pic() - shows the image at the current cell and
//       increments the current cell number
//
function show_pic()
{
    show_image(pic, currspot);
    show_image(pic2, peaspot);
    show_image(blank, blankspot);
    currspot++;
    if ( currspot >= numcells ){
        currspot = 0;
    }
    peaspot++;
    if ( peaspot >= numcells ){
        peaspot = 0;
    }
    blankspot++;
    if ( blankspot >= numcells ){
        blankspot = 0;
    }
    timerID = setTimeout('show_pic()', document.ctl.delay.value);
}

13

14 DONE