Indian Institute of Technology Mandi

IC150: Computation for Engineering

Tutorial 2

1) Fill in the blanks

   (a) A pointer is a variable that contains as its value the _____ of another variable.

   (b) The elements of an array are related by the fact that they _____.

   (c) An m-by-n array contains _____ rows, _____ columns, and _____ elements.

   (d) Assume `a` is an array and `p` is a pointer. The assignment involving `a` and `p` that is not valid in C is _____=_____

2) Use a single-subscripted array to solve the following problem. Read in 100 numbers, each of which is between 0 and 20, inclusive. As each number is read, print it only if it is not a double of a number already read. Provide for the "worst case" in which all 100 numbers are different. Use the smallest possible array to solve this problem. Write pseudo-code (not C code).

3) Label the elements of 3-by-5 array `sales` to indicate the order in which they are set to zero by the following program segment:

```
for(column=0; column<5; column++)
   for(row=0; row<3; row++)
      sales[row][column]=0;
```

4) (a) Write a *recursive* function `void PrintVector(int v[], int size)` to print the `size` elements of `v` in order on one line, separated by space. Each call to `PrintVector` should print only one element and call itself recursively.
(b) Write an *iterative* function `void PrintMatrix(int m[][MAX], int rows, int cols)` to print the elements of `m` on `rows` lines. `PrintMatrix()` should use `PrintVector()` to print each row.

5) Answer each of the following. Assume that unsigned integers are stored in 2 bytes, and that the starting address of the array is at location 1002500 in memory.

   (a) Declare an array of type `unsigned int` called `values` with 5 elements, and initialise the elements to the even integers from 2 to 10. Assume the symbolic constant `SIZE` has been defined as `5`.

   (b) Declare the pointer `vPtr` that points to an object of type `unsigned int`.

   (c) Print the elements of array `values` using array subscript notation. Use a `for` structure and assume integer control variable `i` has been declared.

   (d) Give two separate statements that assign the starting address of array `values` to pointer variable `vPtr`.

   (e) Print the elements of array `values` using pointer/offset notation.

   (f) What address is referenced by `vPtr + 3`? What value is stored at that location.

6) Hand simulate the function below for the calls `n = Mystery("")` and `n = Mystery("Quiz 2")`. What does this function do?

```
int Mystery(const char *s)
  {
    for(int x=0; *s != '\0'; s++ )
      ++x;
    return x;
  }
```

7) Design a program that reads several lines of text from the keyboard and prints a table indicating the number of occurrences of each letter of the alphabet in the text. For example, the phrase

   `To be, or not to be: that is the question`

   contains one "a", two "b", no "c", etc. Draw a neat flowchart for the program. Do **not** write pseudo-code or C code.

8) Assume that the first two digits of a mobile number identify the operator, eg. 94 is BSNL, 98 is Airtel, 93 is Reliance, etc. Given a mobile number in the format xxyyy-yyyyy, it is desired to print it in the format <operator name>-yyy-yyyyy. Eg. 94180-43219 should be printed as BSNL-180-43219. Devise an algorithm to read a phone number and print it out in the desired format. Decide on the arrays and other variables necessary and write pseudo-code.