CPSC 1620A Final Exam Question Sheet

Instructor: Robert Benkoczi Dec 15, 2008

NAME: _____

INSTRUCTIONS:

- Please write your answers in the exam booklet provided. Write your name on BOTH the exam booklet and this question sheet. Hand in BOTH the exam booklet and question sheet when you are done.
- You must clearly identify the problem and sub-problem number for each solution you provide in the exam booklet.
- No books or calculators are allowed. **The last page of this question sheet contains some reference material.**
- TIME: 2hrs.
  TOTAL MARKS: 100

1. **(10 marks)**
   What is the value and the type for the following expressions?

   (a) $3 > 2 > 1$

   (b) $(\text{static\_cast} < \text{int} > (2.5 + 3))/2$

   (c) $2 + 3 - 4 + 5 - 6 + 7$

   (d) $2 * 4/3/3 - 10 + 2 * 3 * 10$

   (e) $(2.5 * \text{static\_cast} < \text{double} > (2/3) + 7)/2$

2. **(10 marks)**
   The following sub-problems use variables a and b of type `unsigned int`. The initial values of a and b are given in each sub-problem. Write the values of a and b after all statements for a sub-problem are executed.

   (a) $a : \boxed{2}$, $b : \boxed{3}$

   ```
   a++;  b = (a+b)/2;
   ```

   (b) $a : \boxed{0}$, $b : \boxed{0}$

   ```
   b = ++a - b;
   ```

   (c) $a : \boxed{0}$, $b : \boxed{0}$

   ```
   a = a - b++;
   ```

   (d) $a : \boxed{4}$, $b : \boxed{4}$

   ```
   a = b = (b+1);
   ```

(e) a : $\boxed{1}$, b : $\boxed{100}$

```
a = 10 * a;
b /= a;
```

3. **(20 marks)**
You are given the following crazy function:

```
void crazy(int & a, int & b)
{
  a = a-b;
  b = a+b;
  a = b-a;
}
```

Notice that the parameters are passed by reference.

(a) What is the value of variables u and v after the following instructions are executed?

```
int u,v;  u = 10; v = 4;
crazy(u,v);
```

(b) What is the value of variables u and v after the following instructions are executed?

```
int u,v;  u = -4; v = 4;
crazy(u,v);
```

(c) What do you think is the purpose of function `crazy()`, besides tormenting the students in exams?

(d) What is the value of variable u after calling function `crazy()` as follows:

```
int u = 7;
crazy(u, u);
```

(e) Given the role of function `crazy()` you identified in sub-problem (3c), provide another implementation that achieves the same purpose but does not destroy the information in variable u when the function is called as in `crazy(u, u);`.

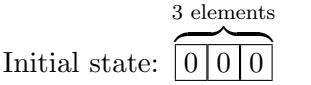
4. **(15 marks)**
Write the `main()` function for a program that reads two integers x and y and displays all the odd integers between x and y in increasing order. The program should behave as in the following example:

```
Enter 2 integers: 12 3
The odd integers between 12 and 3 are
3 5 7 9 11
```

5. **(20 marks)**
In each of the following sub-problems, the size and the values of an integer array `a[]` are illustrated by an initial diagram. The value of the elements marked by '?' are unknown. Write C++ code that modifies the array to the state illustrated by the *target* diagram. Your code must be complete and short. In all diagrams, the first element in the array is given by the leftmost box.

You may assume that the array is declared and initialized, but you need to declare and initialize any other variables you might need. Just write the C++ fragment without including it in some function or in `main()`.

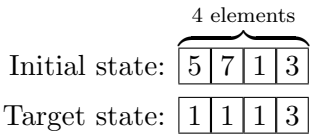
EXAMPLE:



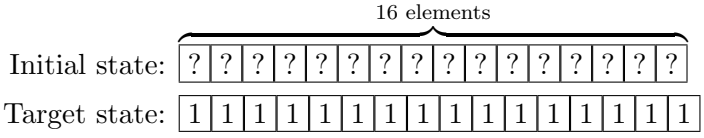
Solution:

```
a[0] = 10;
a[2] = 20;
```

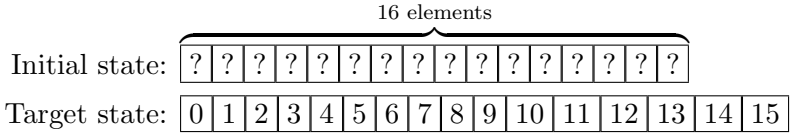
(a)



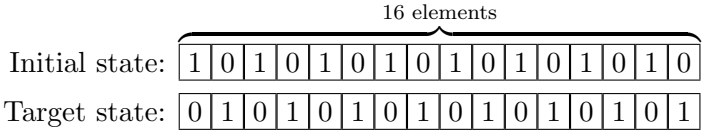
(b)



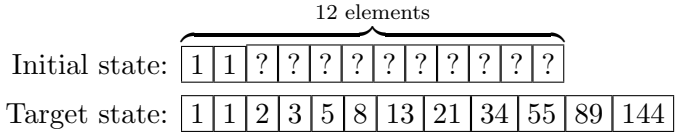
(c)



(d)



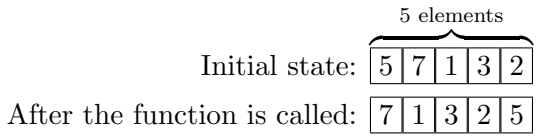
(e) In the target state, each element except the first two equals the sum of the two elements to its left.



6. **(15 marks)**
Write a function called *rotateLeft* that receives an array as parameter and rotates the values in the array to the left by one position. Notice that you have to write a correct function header. In particular, you must know how arrays of any size are passed as parameters to functions.

Then, write how a call to your function would rotate the array given as example below. Assume the name of this array is `a[]`. Write just the line of code that contains the function call.

Example:



7. **(10 marks)**
Answer the following questions. Be brief and precise.

(a) What data types can you use in C++ to handle text?

(b) What are C++ structures? Give one example of a structure definition.

(c) For the call to function `crazy()` illustrated by sub-problem 3d, explain how the parameters to the function are set.

(d) Explain the difference between *source code* and *machine code*.

(e) Which of the assignments for this course you liked most and which one, *other than printing the diamond*, you hated most?

8. **Bonus problem (5 marks)**
Have you finished all your questions? Do you have time to kill? For an extra 5 marks to be added to your final exam score, correct the following loop statement so that it prints ten stars, by **adding exactly one character** somewhere in the source code.

```
for (int i = 0; i < 10; i--)
  cout << '*';
```

APPENDIX.

Operator precedence, from high to low (from the text):

- ()
- ++, – (as postfix operators)
- ++ and – (as prefix operators), !, + and - (unary)
- *, /, %
- + and - (binary)
- << and >>
- <, <=, >, >=
- ==, !=
- && (logical and)
- || (logical or)
- =, +=, -=, *=, /=, %=