CS A250 - Practice Final

Question 1. What is the output of the following code segment?

```
int a = 3, b = 1, c = 2, d = 6;
do
{
       a += b;
       c = (++a < b) ? b : a;
       --c;
       cout << a << c;

} while (c++ < d);
cout << a << c;
```

Question 2. What is the output of the following code segment?

```
void oneParam(int& c)
{
       ++c;
       cout << c;
}
void twoParam(int& a, int b)
{
       a -= b;
       b++;
       cout << a << b;
       oneParam(b);
}
int main()
{
       int a = 5, b = 2;
       twoParam(a, b);
       cout << a << b;
       return 0;
}
```

Question 3. What is the output of the following code segment?

```
int a = 3, b = 5;
int *p1 = new int;
int *p2 = new int;
*p1 = a;
*p2 = a + b;
int *p3 = p2;
p1 = p3;
cout << *p1 << *p2 << *p3;
```

Question 4. Given the array below, how many comparisons will be performed by an iterative binary search algorithm (as seen on the slides) if searching for 60?

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
12	15	18	29	32	35	41	49	56	57	59	60	61	63	67	70	71	72	75	77	83	84	88	89	94	97	99

Question 5. What is the running time (**O-notation**) of the **destroyList** function implemented in the **singly-linked list** class?

Question 6. What is the running time of the code segment shown below?

```
for (int i = length - 1; i >= 0; --i)
{
        for (int j = 0; j < length / 2; ++j)
        {
                int k = 8;
                while (k > 0)
                {
                        cout << (length / 2);
                        cout << a[k] << " ";
                        k /= 2;
                }
        }
}
```

Figures 1-3 show nodes that are part of a **doubly-linked list** where **ptr** is a pointer pointing at one of the nodes. Using the functions below and referring to the appropriate figures, answer questions 1-3.

```
Node* getNext() const;          // returns the address of next node
Node* getPrevious() const;      // returns the address of previous node
void setNext(Node *p);          // re-sets the link that points to next node
void setPrevious(Node *p);      // re-sets the link that points to previous node
```

Fig. 1

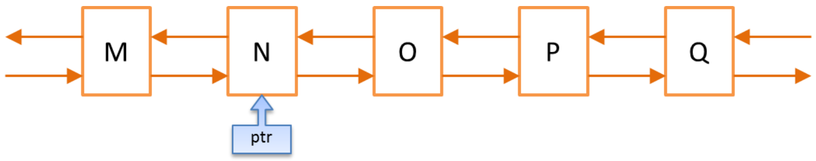


Fig. 2

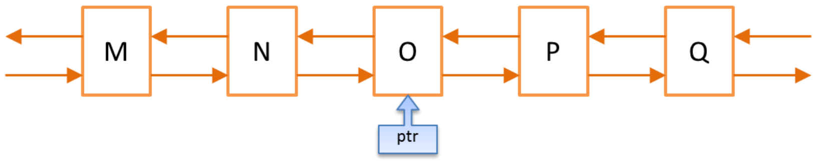
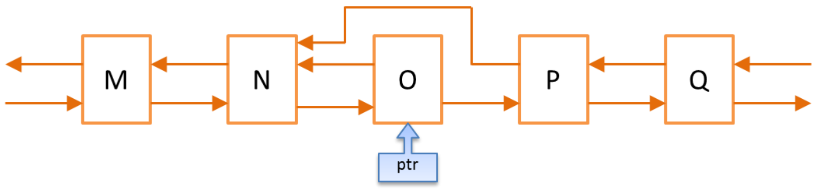


Fig. 3



Question 7. In **Fig. 1**, point **ptr** is pointing to **node N**. Write **one (1) single statement** to move **ptr** so that it points to **node O**, as shown in **Fig. 2**.

Question 8. Write **one (1) single statement** to change the structure of the doubly-linked list from **figure 2** to **figure 3**, **without** moving the pointer. The new list will have the **previous** link of **node P** point **to node N**.

Question 9. Write **one (1) single statement** to delete **node N** in **figure 3**, **without** moving the pointer. Do not worry about re-connecting the nodes.

Question 10. What is the output of this code segment?

```
void check(vector<int> v, int& sum)
{
        int size = static_cast<int>(v.size());
        for (int i = 1; i < size; ++i) sum += v[i];
}
int main()
{
        vector<int> v;
        int sum = 0;
        for (int cnt = 3; cnt >= 1; --cnt) v.push_back(cnt + 1);
        check(v, sum);
        sum += v[2];
        cout << sum;
        return 0;
}
```

Question 11. What is the output of this code segment?

```
vector<int> v = { 4, 9, 7, 5, 4, 2, 5, 4, 7, 2, 5, 9, 7 };
vector<int>::iterator iter = v.begin() + 1;
int i = 0;
while (i < 3)
{
        ++iter;
        cout << iter[1];
        cout << *(iter + 2);
        iter += 2;
        ++i;
}
```

Question 12. After executing the code segment below, what are the values stored in myList and yourList, and to which values are iter1, iter2, and iter3 pointing?

```
list<int> myList, yourList;
myList.push_back(5);
myList.push_back(6);
myList.push_back(2);
myList.push_front(1);
myList.push_front(7);
myList.push_front(4);
list<int>::iterator iter1 = myList.begin();
list<int>::iterator iter2 = myList.begin();
++iter2;
++iter2;
myList.pop_back();
yourList.push_back(*iter2);
list<int>::iterator iter3 = yourList.begin();
++iter2;
myList.push_front(9);
++iter2;
yourList.push_front(*iter2);
```

Question 13. What is the the output of the following code segment?

```
multimap<int, int> myMap;
for (int i = 1; i < 8; i += 2)
      myMap.insert(make_pair(i, i + 2));
for (int i = 2; i <= 16; i *= 2)
      myMap.insert(make_pair(i + 1, i * 2));
multimap<int, int>::iterator iter = myMap.begin();
++iter;
cout << iter->second << iter->first << endl;
```

For questions 14 and 15, refer to the definitions shown below.

```
(define a 1)
(define b 2)
(define c '())
(define d '(3))
(define e '(((4) 5) 6))
(define f '(2 1 3 6))
```

Question 14. Given the definitions shown above, what is the output of the following code segment?

```
(cond
    ((equal? a (first (rest f))) (cons d (rest e)))
    (else (cons (equal? (first f) b) c)))
```

Question 15. Given the definitions shown above, what is the output of the following code segment?

```
(cond
    ((equal? a (first (rest e))) (cons d (rest e)))
    (else (cons (equal? (first f) b) c)))
```

Question 16. Given the function shown below, what will the call `(recur 3 '(2 3))` return?

```
(define recur
  (lambda (a r)
    (cond
      ((empty? r) 1)
      ((equal? a (first r)) (+ (recur a (rest r)) a))
      (else (recur a (rest r))))))
```

Question 17. Define a **DrRacket** function **smallest** that takes two numbers, **x** and **y**, and outputs the smallest of the two. In the case the numbers are the same, it output the word ‘same (Note that ‘same should have an apostrophe, and not quotes). Your function should work with the following test cases:

```
> (smallest 1 2)        => 1
> (smallest 2 1)        => 1
> (smallest 1 1)        => 'same
```

Question 18. Write the declaration of a friend function **modify** of a class **MyClass** that passes a list of integers and a vector of integers and returns a Boolean value. The function compares the list and the vector and removes all the elements of the list that are equal to any of the elements in the vector.