

Name: Derek A.

Expected Score (0-120):

100

NOTES: (1) No curving; (2) Questions 1-10 are multiple-choice problems. Book and notes open. You have two hours and thirty minutes to complete the exam (question answering, scanning and submission)

1. (4 points: recursive function) describe the objective of the following

```
double hoo(int n) {
    double result;
    if (n <= 0) result = 0;
    else {
        result = 1.0*(n+2)/n + hoo(n-1);
    }
    return result;
}
```

- a. $hoo(n) = 1*2*3*\dots*n$
b. $hoo(n) = 1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{n}$
c. $hoo(n) = 3 + 2 + \dots + (n+2)/n$
d. $hoo(n) = 1/3 + 2/4 + \dots + n/(n+2);$

2. (4 points: if-else) What is the output after the following code executes?

```
int alpha = 68; double beta=3.75; string comment;
if (alpha > 75 && beta > 3.6) comment= "full scholarship";
else if (alpha > 70 && beta > 3.2) comment= "3/4 scholarship";
else if (alpha > 65 && beta > 3.0) comment = "half scholarship";
else comment = "no scholarship";
cout << comment << endl;
```

- a. full scholarship
b. 3/4 scholarship
c. half scholarship
d. no scholarship

- 3.(4 points: for-loop) Choose the output of the following C++ statement:

```
int result = 1;
for (int i = -2; i < 5; i+=2) result += i;
cout << result << endl;
```

- a. 1
b. 3
c. 5
d. 6

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4. (4 points: variable, datatype and pointer) What will be the output of this program?

```
1. #include <iostream>
2. using namespace std;
3. int main() {
4.     struct ShoeType {
5.         string style;
6.         double price;
7.     };
8.     ShoeType shoe1, *pshoe2;
9.     shoe1.style = "Adidas"; shoe1.price = 9.99;
10.    pshoe2 = &shoe1;
11.    pshoe2->price = pshoe2->price / 9;
12.    cout << shoe1.style << " $" << shoe1.price;
13.    cout << shoe2.style << " $" << pshoe2->price;
14.    return 0;
15. }
```

a) Adidas \$ 9.99

Adidas \$ 9.99

b) Adidas \$ 9.99

Adidas \$ 1.11

c) Adidas \$ 1.11

Adidas \$ 1.11

d) Adidas \$ 1.11

Adidas \$ 9.11

5. (4 points: switch statement) which is the output after the following statement:

```
char ch = 'b';
switch (ch) {
    case 'a': cout << "I "; break;
    case 'b':
    case 'B': cout << "Love ";
    case 'c': cout << "Nemo "; break;
    default: cout << "Terribly"; break;
}
```

a. I

b. I Love Nemo

c. Love Nemo

d. I Love Nemo Terribly

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6. (4 points: casting) Given the following function

```
int mystery(int u, int &v) {  
    u *= 2;  
    v ++;  
    return u + v;  
} // mystery(int, int)
```

choose the output of the following statement:

```
main() {  
    int audra = 7;  
    int molley = 10;  
    cout << "audra=" << audra << "molley=" << molley << endl;  
} // main
```

- a. audra=14 molley=10
- b. audra=7 molley=11
- c. audra=7 molley=10
- d. audra=14 molley=11

7. (4 points: pointer and array) What is the output of this program?

```
1. #include <iostream>  
2. using namespace std;  
3. int main()  
4. {  
5.     int arr[4] = {4, 5, 6, 7};  
6.     int *p = (arr + 1);  
7.     cout << *p;  
8.     return 0;  
9. }
```

- a) 4
- b) 5
- c) 6
- d) 7

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8. (4 points: program error) After the following statements execute, what are the contents of matrix?

```
int matrix[4][3];
int j, k;
for (j = 0; j < 4; j++)
    for (k = 0; k < 3; k++)
        matrix[j][k] = 2 * j + k;
```

a. 0 2 4
1 3 5
2 4 6
3 5 7

b. 0 1 2
1 2 3
2 3 4
3 4 5

c. 0 2 4
2 4 6
4 6 8
6 8 10

d. 0 1 2
2 3 4
4 5 6
6 7 8

9. (4 points) circle the wrong description about constructors

- a) default, regular and copy constructors are overloading functions
- b) a constructor can be static
- c) constructors used to initialize the attributes of objects
- d) constructors are always needed in a class

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10. (4 points) Circle the following legal C++ statement:

- a) boolean good = true;
- b) double x = rand(); double y = rand(); if (x==y) cout << "Good";
- c) Student x, y; if (x<y) cout << "I am good" << endl;
- d) char adam = 'A'; int eva = adam;

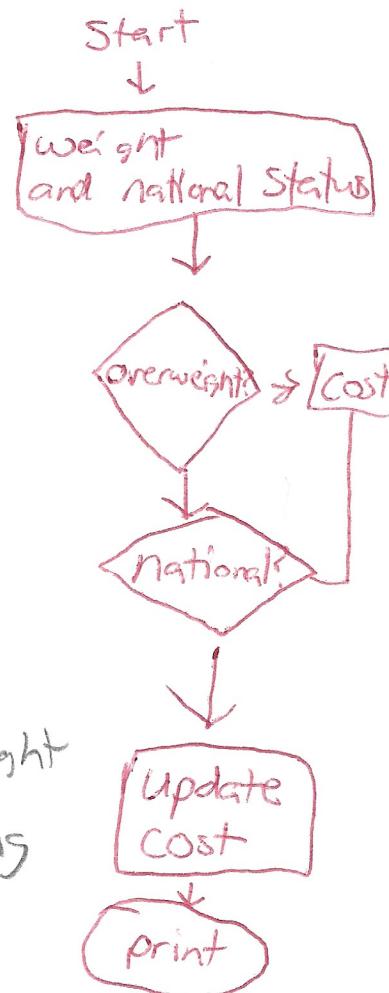
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11. (20 points) Write a program to prompt user to input the **weight of letter**, **whether or not it is international letter**, and then compute and output the related post rate via following the rules:

- If the letter weights no more than 30gram, then the post rate is \$0.41;
- Otherwise, the total post rate is \$0.41 plus extra over-weight cost (\$0.05 per extra gram).
- If a letter is international, an extra 15% tax should be introduced into the post-cost. (Flow-chart and comments are needed, 5 points)

```
#include <iostream>
#include <string>
using namespace std

int main() {
    cout << "Input weight\n";
    int weight;
    cin >> weight;
    cout << "Mark y/n if letter is international\n";
    char international;
    double post;
    if (weight <= 30) // finding cost
        post = 0.41;
    else
        post = 0.41 + (0.05 * (weight - 30)); // cost if overweight
    if (international == 'y') // International cost flag
        post += (post * 0.15);
    cout << post;
    return 0;
} // end of main()
```



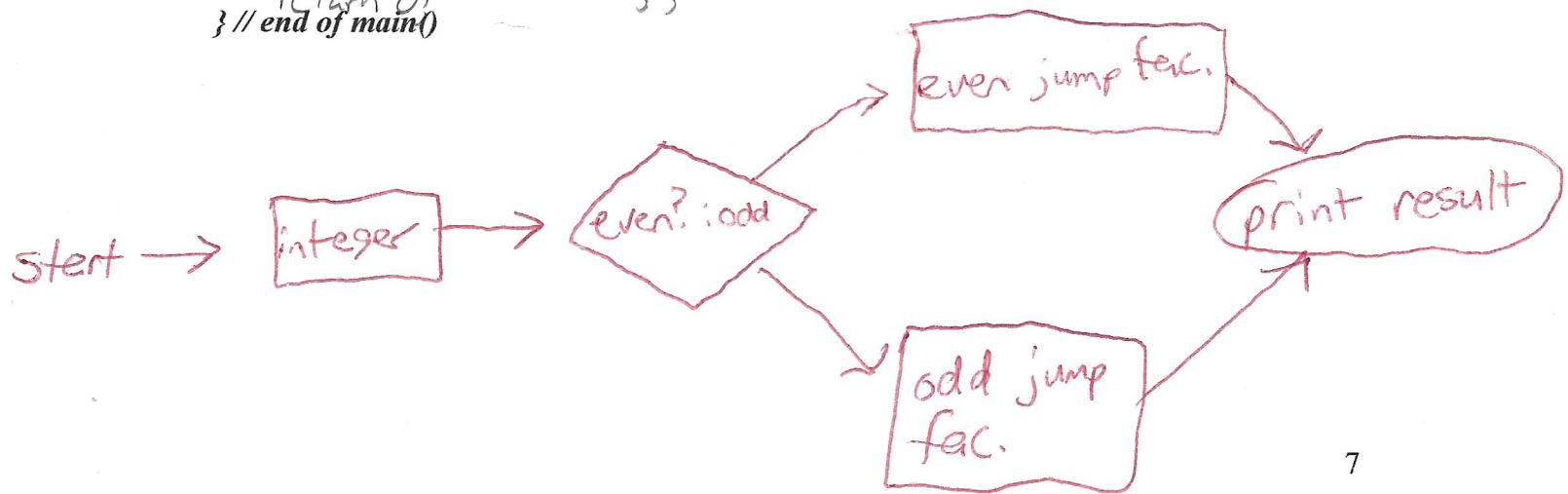
Name:

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10. (20 points) Prompt the user to enter an integer **n**. If **n** is odd, then compute the following jump-factorial: $1-3+5-7+\dots+(-1)^{n/2} *n$; if **n** is even, compute the following jump-factorial: $2*4*6*\dots*n$; if **n** is negative or zero, the result is 0. Finally, output the result (comments and flowchart are needed as well: 5 points).

```
#include <iostream>
#include <string>
using namespace std;

int main() {
    cout << "Enter an integer\n"; // user prompt
    int n;
    cin >> n;
    int result;
    if(n < 0 || n == 0) // zero or negative condition
        result = 0;
    if((n % 2) != 0) // odd condition
    {
        int i = 3;
        for(int j = 1; i <= n; i += 4)
        {
            result += i - j;
            j += 4;
            result += pow(-1, (n / 2)) * n;
        }
    }
    else
    {
        for(int l = 2; i <= n; i += 2) // Even
            result *= i;
    }
    return 0;
} // end of main()
```



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11. (20 points) write a program that prompts users to enter a sequence of positive integer numbers till a non-positive one (negative or 0) is typed in.

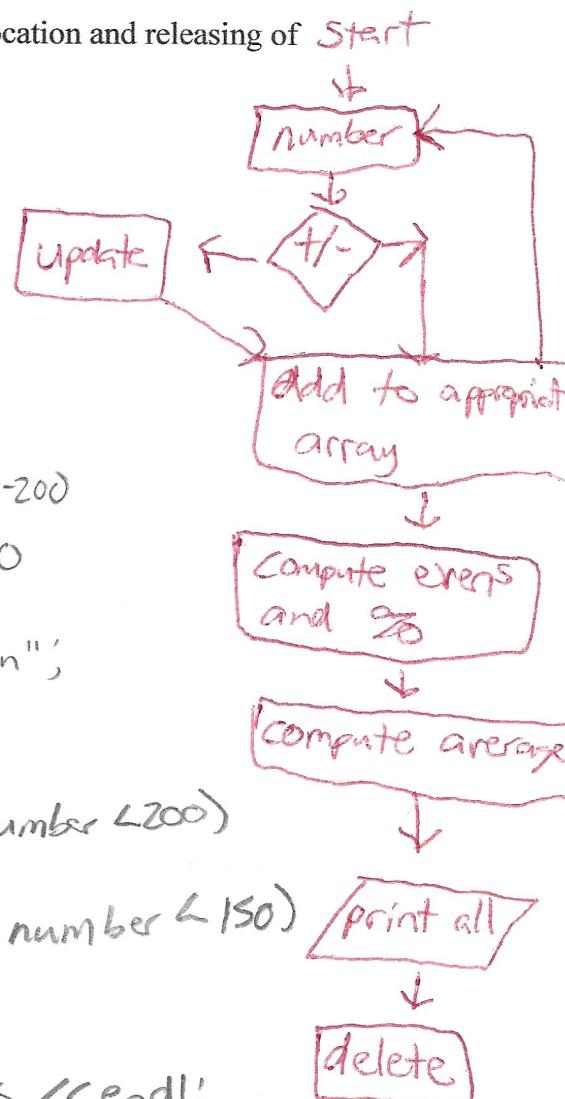
- Count and output the total number of even numbers; and then show the percentage of even number.
- Save all the input integers (including both even and odd number) whose values are between 100 and 200 into the DYNAMIC array. The size of the **DYNAMIC array** is 100 (**you need to take care of out-of-bound issue**). At the end compute the average of integers whose value is between 50 and 150 (**you need to take care of “divided-by-0” issue**).

Comments and Flowchart are needed (5 points). In addition, allocation and releasing of dynamic array is needed.

```
#include <iostream>
#include <string>
using namespace std;
define SizeArray 100

int main() {
    int number = 1, total = 0, evens = 0;
    double average = 0.0;
    int *list = new int[SizeArray]; // for 100-200
    int *list2 = new int[SizeArray]; // for 50-150
    while (number > 0) {
        cout << "Enter a positive integer.\n";
        cin >> number;
        if (number % 2 == 0) // Evens
            evens++;
        if (total < 100 && number > 100 && number < 200)
            list[total] = number;
        if (total < 100 && number > 50 && number < 150)
            list2[total] = number;
        total++;
    }
    cout << "number of evens " << evens << endl;
    cout << "percentage " << (evens / total) * 100 << endl;
}

// end of main()
for (int i = 0; i < total; i++)
    average += list2[i];
cout << average / total;
delete [] list, list2;
```



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12. (Bonus, 20 points) Develop a function that draws a low-left triangular multiplication table – drawLowRightTriMulTable(int n); then use it in the main program to draw a 12*12 low-left triangular multiplication table.

For example, a 5-by-5 low right triangular multiplication table is given below:

5
8 10
9 12 15
8 12 16 20
5 10 15 20 25

```
#include <iostream>
#include <string>
#include <iomanip>
using namespace std;

void drawLowRightTriMulTable(int ); //prototype

int main() {
    int size; cin >> size;      // input the size of low-right-triangular multiplication table
    drawLowRightTriMulTable(size);
}

// end of main()

void drawLowRightTriMulTable(int n) {
}
```