

Serial No:

## **Final Exam**

**Total Time: 3 Hours**

**Total Marks: 150**

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Signature of Invigilator

## **CS-118: Programming Fundamentals**

Monday, 1<sup>st</sup> February 2021

### **Course Instructors**

Dr. Naveed Ahmad, Mr. Shoaib Mehboob, Mr.  
Muhammad Usman, Ms. Tayyaba Zainab, Ms.  
Ayesha Qamar

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Student Name

Roll No

Section

Signature

**DO NOT OPEN THE QUESTION BOOK OR START UNTIL INSTRUCTED.**

#### **Instructions:**

1. Attempt on question paper. Attempt all of them. Read the question carefully, understand the question, and then attempt it.
2. No additional sheet will be provided for rough work. Use the back of the last page for rough work.
3. If you need more space write on the back side of the paper and clearly mark question and part number etc.
4. After asked to commence the exam, please verify that you have () different printed pages including this title page. There are a total of six (6) questions.
5. There are two pages for **rough work** provided at the end of the paper.
6. Calculator sharing is strictly prohibited.
- 7.
8. Use permanent ink pens only. Any part done using soft pencil will not be marked and cannot be claimed for rechecking.

	Q-1	Q-2	Q-3	Q-4	Q-5	Q-6	Total
Marks Obtained							
Total Marks	75	15	15	10	10	15	150

## Question 1 [ Marks]

### SECTION A [17 Marks]

a) Write the output of the following code segment.

<pre>int main() {     switch(~(12 25))     {         case 0:             cout&lt;&lt;"Programing ";         case 1:             cout&lt;&lt;"Fundamentals!";             break;         case -12:         case 29:             cout&lt;&lt;"is";             break;         case -29:             cout&lt;&lt;"fun";             break;         default:             cout&lt;&lt;"None of the case is true";     }     return 0; }</pre>	<p>[2 marks]</p> <p>none of the case is true</p>
<pre>int calculation(int n) {     if (n &gt; 1) {         return n * calculation (n - 1);     } else {         return 1;     } }  int main() {     int n, result;      cout &lt;&lt; "Enter a non-negative number: ";     cin &gt;&gt; n;</pre>	<p>[2 marks]</p> <p>assume n=5 result = 120</p>

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	<pre> result = calculation(n); cout &lt;&lt; "result = " &lt;&lt; result; return 0; } </pre>	
	<pre> int main() {     const int UPPER = 7, LOWER = 6;     int num1, num2, num3 = 12, num4 = 3;      num1 = num3 &lt; num4 ? LOWER: UPPER;     num2 = num4 &gt; UPPER ? num3 : LOWER;      cout &lt;&lt; num1 &lt;&lt; " " &lt;&lt; num2 &lt;&lt; endl;     return 0; } </pre>	<p>[2 marks]</p> <p style="font-size: 1.5em;">7 6</p>
	<pre> int main() {     int limit=10;     cout&lt;&lt;((limit++) &amp;&amp; (++limit - 12)) ; } </pre>	<p>[1 mark]</p> <p style="font-size: 1.5em;">0</p>

- b) Rewrite the following program. Use a switch statement instead of the if/else-if statement in the space provided.

[ 4 marks]

	<pre> void menu() {     cout &lt;&lt; "Which formula do you want to see?\n\n";     cout &lt;&lt; "1. Area of a circle\n";     cout &lt;&lt; "2. Area of a rectangle\n";     cout &lt;&lt; "3. Area of a cylinder\n";     cout &lt;&lt; "4. None of them!\n"; } int main() {     int selection;     int op1=1,op2=2,op3=3,op4=4;      cin &gt;&gt; selection;      if (selection == op1)         cout &lt;&lt; "Pi times radius squared\n";     else if (selection == op2)         cout &lt;&lt; "Length times width\n";     else if (selection == op3)         cout &lt;&lt; "Pi times radius squared times height\n";     else if (selection == op4)         cout &lt;&lt; "Well okay then, good bye!\n";      return 0; } </pre>
--	--

```
void menu()
{
    cout << "Which formula do you want to see?\n\n";
    cout << "1. Area of a circle\n";
    cout << "2. Area of a rectangle\n";
    cout << "3. Area of a cylinder\n";
    cout << "4. None of them!\n";
}
int main()
{
    int selection;
    const int op1=1,op2=2,op3=3,op4=4;

    cin >> selection;

    switch (selection)
    {
        case op1:
            cout << "Pi times radius squared\n"; break;
        case op2:
            cout << "Length times width\n"; break;
        case op3:
            cout << "Pi times radius squared times height\n"; break;
        case op4:
            cout << "Well okay then, good bye!\n";
    }

    return 0;
}
```

Part c) Rewrite the following program. Use a ternary operator instead of the if/else-if statement in the space provided.

[ 4 marks]

```
int main()
{
    int x = 2;
    cout << "Start\n";
    if (x <= 3)
        if (x != 0)
            cout << "Hello from the second if.\n";
    else
        cout << "Hello from the else.\n";
    cout << "End\n";
}
```

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```
int main()
{
    int x = 2;
    cout << "Start\n";

    (x<=3)? (x!=0)? cout << "Hello from the second if.\n": cout << "Hello from the
else.\n": cout<<"";

    cout << "End\n";

}
```

### SECTION B [15 Marks]

Write the output of the following code segments (if any). If there is an error explicitly circle the syntax error and mention the error in the output.

<p>a) <code>#include &lt;iostream&gt;</code>  <code>using namespace std;</code>  <code>int main ()</code>  <code>{</code>              <code>int x, y;</code>              <code>x = 5.5;</code>              <code>y = ++x * ++x % x--;</code>              <code>cout &lt;&lt; static_cast&lt;double&gt;(x) &lt;&lt; y;</code>              <code>y += x++ * ++y % y / --x;</code>              <code>cout &lt;&lt; x &lt;&lt; static_cast&lt;double&gt;(y);</code>              <code>return 0;</code>  <code>}</code></p>	<p>[3 marks]</p> <p>6061</p>
<p>b) <code>#include &lt;iostream&gt;</code>  <code>using namespace std;</code>    <code>double n = 4;</code>  <code>double m = 3.5;</code>    <code>int main()</code>  <code>{</code>              <code>int n;</code>              <code>double m = 2.5;</code>              <code>{</code>                  <code>cout &lt;&lt; (n = 4.5) &lt;&lt; endl;</code>                  <code>cout &lt;&lt; m++ + (n    (n == 4) &amp;&amp; ::n) &lt;&lt; endl;</code>                  <code>cout &lt;&lt; ::n - (n &gt; 3 &amp;&amp; n * n % n) &lt;&lt; endl;</code>                  <code>int m = 2;</code>                  <code>cout &lt;&lt; ::m++ + (m &gt; 4 + n - (n / ::n)) &lt;&lt; endl;</code>              <code>}</code>              <code>return 0;</code>  <code>}</code></p>	<p>[3 marks]</p> <p>4</p> <p>3.5</p> <p>4</p> <p>3.5</p>

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e)	<p>Given the algebraic equation <math>y = ax^3 + 7</math>, which of the following, if any, are correct C++ statements for this equation?</p> <p>a) <code>y = a * x * x * x + 7;</code>  b) <code>y = a * x * x * ( x + 7 );</code>  c) <code>y = ( a * x ) * x * ( x + 7 );</code>  d) <code>y = (a * x) * x * x + 7;</code>  e) <code>y = a * ( x * x * x ) + 7;</code>  f) <code>y = a * x * ( x * x + 7 );</code></p>	<p style="text-align: right;"><b>[2 marks]</b></p> <p><b>Parts (a), (d) and (e).</b></p>
f)	<pre>#include &lt;iostream&gt; #include &lt;iomanip&gt; using namespace std;  int main () {     double f = 3.14159;     cout &lt;&lt; setprecision(5) &lt;&lt; f &lt;&lt; '\t';     cout &lt;&lt; setprecision(7) &lt;&lt; f+1.5f &lt;&lt; '\n';     cout &lt;&lt; fixed;     cout &lt;&lt; setprecision(5) &lt;&lt; f &lt;&lt; '\t';     cout &lt;&lt; setprecision(7) &lt;&lt; f+1.5f &lt;&lt; '\n';     return 0; }</pre>	<p style="text-align: right;"><b>[2 marks]</b></p> <p><b>3.1416    4.64159</b></p> <p><b>3.14159   4.6415900</b></p>

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## SECTION C [10 marks]

What is the output for the following code snippets?

<pre>int main(){     int arr[5]={1,5,9,11,15,19};     int i;     for(i=0;i&lt;5;i++)         cout&lt;&lt;arr[i]/4*arr[i]/2&lt;&lt;"\t";     return 0; }</pre>	<p style="text-align: right;"><b>[3 marks]</b></p> <p>Error: 6 elements are assigned to array of size 5</p>												
<pre>int main(){     int list[10]={21,12,13,3,55,16};     int i;     for(i=0;i&lt;5;i++)     {         int temp=list[i];         list[i]=list[9-i];         list[9-i]=temp;     }     for(i=0;i&lt;10;i++)         cout&lt;&lt;list[i]&lt;&lt;"\t";     return 0; }</pre>	<p style="text-align: right;"><b>[3 marks]</b></p> <p>0 0 0 0 16 55 3 13 12 21</p>												
<pre>int main() {     int i,j,Matrix[4][4];     for(i=0,j=N-1 ; i&lt;N ; i++,j--)     {         if (Matrix[i][j]%4==0)             cout&lt;&lt;Matrix[i][j]+1&lt;&lt;" ";         cout&lt;&lt;Matrix[i][j]-1&lt;&lt;" ";     }     return 0; }</pre> <p>Assume Following Matrix</p> <table><tr><td>1</td><td>3</td><td>6</td><td>2</td></tr><tr><td>5</td><td>9</td><td>1</td><td>7</td></tr><tr><td>8</td><td>4</td><td>5</td><td>3</td></tr></table>	1	3	6	2	5	9	1	7	8	4	5	3	<p style="text-align: right;"><b>[2 marks]</b></p> <p>Error: N is not declared in this scope</p>
1	3	6	2										
5	9	1	7										
8	4	5	3										
<pre>int main() {     int i,j,Matrix[5][5];     for(int i=0;i&lt;5;i++)     {         for(int j=0;j&lt;5;j++)         {             if(i==j)                 cout&lt;&lt;Matrix[i][j]&lt;&lt;" ";         }     } }</pre>	<p style="text-align: right;"><b>[2 marks]</b></p> <pre>int main() {     int i,Matrix[5][5];     for(int i=0;i&lt;5;i++)     {         cout&lt;&lt;Matrix[i][i]&lt;&lt;" ";     } }</pre>												



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<pre>     }     } } Rewrite the above code with single loop. Your program should show the same result as above code. Assume any input. </pre>	<pre> } </pre>
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## SECTION D [10 marks]

What is the output for the following code snippets? If there are any errors then mention them clearly.

<b>a)</b>	<pre> int main(){      int i = 50,j = 1, x=0 ;      do{         i= ++j;         x++;     }while(x&lt;5);      cout&lt;&lt;i&lt;&lt;" "&lt;&lt;j;  } </pre>	<p style="text-align: right;"><b>[2 marks]</b></p> <p>6 6</p>
<b>b)</b>	<pre> int main(){      for(int i=0;;){         i++;         cout&lt;&lt;i&lt;&lt;" ";         if(i==3)             break;     }  } </pre>	<p style="text-align: right;"><b>[2 marks]</b></p> <p>1 2 3</p>
<b>c)</b>	<pre> int main(){      int something = 1;     for(int i = n ; i&gt;=0; i--){         something = something * i;          if(i==2)             continue;         if(i&lt;3)             break;     }     cout&lt;&lt;something;  } </pre>	<p style="text-align: right;"><b>[2 marks]</b></p> <p>n isn't declared</p>

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d)	<pre> int main() {     int i=0, j=1;     while(i&lt;5)     {         while(j&lt;5){             cout&lt;&lt;"* ";             j++;         }         cout&lt;&lt;endl;         i++; j=i;     }     return 0; } </pre>	<p>[2 marks]</p> <pre> * * * * * * * * * * * * * * </pre>
e)	<pre> int main() {     int i = 0, j=1, c=0;     while(j-++i) {         c++;     }     cout&lt;&lt;"Executed "&lt;&lt;c&lt;&lt;" times\n";     return 0; } </pre>	<p>[2 marks]</p> <p>Executed 0 times</p>

## SECTION E [23 marks]

Write the output of the following program (if any). If there is an error or bug in the program, correct the code and then write the output.

1.	<pre> int fun(const int* ptr, const int N){     for(int i=0; i&lt;N; i++, ptr++) {         *ptr = 5;         cout &lt;&lt; *ptr;     } }  int main(){     int arr[4] = {1,2,3,4};     fun(arr, 4);     return 0; } </pre>	<p>[2 marks]</p>
2.	<pre> char *findChar(char *str) {     char *ptr = str;     while (*ptr != 's')         ptr++;     return ptr; }  int main(){     cout &lt;&lt; findChar("mystring");     return 0; } </pre>	<p>[2 marks]</p>

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3.	<pre> char *findChar(char *str) {     char *ptr = str;     while (*ptr != 's')         ptr++;     return ptr; }  int main(){     cout &lt;&lt; *findChar("mystring");     return 0; } </pre>	[2 marks]
4.	<pre> void print(const char* p){     for(int i = 0; i &lt; strlen(p);){         cout&lt;&lt;p&lt;&lt;endl;         p++;     } }  int main(){     char p[] ={'1','2','3','\0'};     print(p);     return 0; } </pre>	[3 marks]
5.	<pre> void fun3(int&amp;a){     a++;     cout&lt;&lt;a; }  void fun2(int &amp;a){     fun3(++a);     cout&lt;&lt;a; }  void fun1(int &amp;a){     fun2(++a);     cout&lt;&lt;a; }  int a=5; int main(){     int a = 1;     fun1(a);     cout&lt;&lt;a;     return 0; } </pre>	[4 marks]
6.	<pre> int g_One=1; void func(int* pInt){     pInt=&amp;g_One; }  void func2(int*&amp; rpInt){     rpInt=&amp;g_One; }  int main(){     int nvar=2;     int* pvar=&amp;nvar;     func(pvar); } </pre>	[2 marks]

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	<pre>         cout&lt;&lt;*pvar&lt;&lt;endl;         func2(pvar);         cout&lt;&lt;*pvar&lt;&lt;endl;         return 0;     } </pre>	
7.	<pre> int main(){     char sstring[] = {'g', 'n', 'o', 'r', 'w', '\0'};     char* chp = sstring;     chp += 4;     for(int i=0;i&lt;5;i++){         cout &lt;&lt;*(chp-i);     }     return 0; } </pre>	[3 marks]
8.	<pre> int main(){     int data = 10;     int * const what;     cout&lt;&lt;what&lt;&lt;"\t"&lt;&lt;*what&lt;&lt;"\\"&lt;&lt;&amp;what;      return 0; } </pre>	[2 marks]
9.	<pre> int main(){     int array[] = {1,2,3,4,5};     int*p = array;     cout&lt;&lt;(p++ == array+1);     return 0; } </pre>	[2 marks]
10.	<pre> int main(){     const int x = 10;     int *q = &amp;x;     int *const_ptr = q;     cout &lt;&lt; *const_ptr &lt;&lt; endl;     return 0; } </pre>	[2 marks]

## Question 2 [15 Marks]

Part a) The following problem is sometimes called “The Monty Hall Game Show Problem.” You are a contestant on a game show and have won a shot at the grand prize. Before you are three closed doors. Behind one door is a brand new car. Behind the other two doors are consolation prizes. The location of the prizes is randomly selected. The game show host asks you to select a door, and you pick one. However, before revealing the contents behind your door, the game show host reveals one of the other doors with a consolation prize. At this point, the game show host asks if you would like to stick with your original choice or switch your choice to the other closed door. What choice should you make to optimize your chances of winning the car? Does it matter whether you stick with your original choice or switch doors?

Write a simulation program to solve the game show problem. Your program should make 10,000 simulated runs through the problem, randomly selecting locations for the prize, and then counting the number of times the car was won when sticking with the original choice, and counting the number of times the car was won when switching doors. Output the estimated probability of winning for both strategies. [8 marks]

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

int monty_hall_game();

int main()
{
    int won_switching;    // keeps record of winning the car when you switch doors.
    for(int i=0;i<10000;i++)
    {
        won_switching+=monty_hall_game();
    }
    //Calculate the probability of wins when you switch doors and when you stick with the original choice
    cout<<" switch winning prob" << won_switching/10000;
    cout<<" stay winning prob" << 1-(won_switching/10000);

    return 0;
}

int monty_hall_game()
{
    int switchWins = 0;
    int chosenDoor;
    int remainingDoor;
    int revealedDoor;
    int winningDoor;
    int option;

    srand (time(NULL));
    chosenDoor = rand() % 3 + 1;
    winningDoor = rand() % 3 + 1;
```

```
do
{
    revealedDoor = rand() % 3 + 1;
} while (revealedDoor == chosenDoor || revealedDoor == winningDoor);

do
{
    remainingDoor = rand() % 3+1;
} while (remainingDoor == chosenDoor || remainingDoor == revealedDoor);

option = rand() % 2 + 1;
if (option == 2)
{
    chosenDoor = remainingDoor;
    if (chosenDoor == winningDoor)
    {
        switchWins++;
    }
}

return switchWins++;
```

```
}
```

Part b) The keypad on your oven is used to enter the desired baking temperature and is arranged like the digits on a phone:

1	2	3
4	5	6
7	8	9
0		

Unfortunately the circuitry is damaged and the digits in the leftmost column no longer function. In other words, the digits 1, 4, and 7 do not work. If a recipe calls for a temperature that can't be entered, then you would like to substitute a temperature that can be entered. Write a program that inputs a desired temperature. The temperature must be between 0 and 999 degrees. If the desired temperature does not contain 1, 4, or 7, then output the desired temperature. Otherwise, compute the next largest and the next smallest temperature that does not contain 1, 4, or 7 and output both. For example, if the desired temperature is 450, then the program should output 399 and 500. Similarly, if the desired temperature is 375, then the program should output 380 and 369.

```
int main()
{
    int temp;
    cout<< "input temp: ";
    do{
        cin>> temp;
        if(temp>0 &&temp<999)
            break;
    } while(1);

    int temp_copy=temp;
    int temp_min=temp;
    int temp_max=temp;
    //get the number of digits in temp and store it in size;

    int arr[size];
    for(int i=size-1 ; i>=0; i--)
    {
        arr[i] = temp_copy%10;
        temp_copy/=10;
    }
    int flag=0;
    while( //if any of the element in the array is either 1,4,7 then do the following by using a function)
    {
        flag=1;
        temp_min--;
        temp_max++;
    }

    if(flag==0)
        cout<<"temperature is "<<temp;
    else
        cout<<"min temp is "<< temp_min << endl<<"max temp is "<<temp_max;
}
```

## Question 3 [15 Marks]

**Pseudocode for Affine Cipher:** Affine Cipher is a substitution cipher. In the Affine Cipher, each letter is mapped to its numeric equivalent. The 26 letters from A to Z are mapped to integer values from 0 to 25 ( $m-1$ ) in the following way:

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
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

There are two steps in the Affine Cipher i.e. encryption of the plaintext and decryption of the ciphertext.

**Encryption:** The encryption for each letter is given by  $E(x) = (ax + b) \bmod m$ , where  $a$  and  $b$  are the key for the cipher. This means that we multiply our integer value for the plaintext letter by  $a$ , and then add  $b$  to the result. Finally, we take this modulus  $m$ . In the example below plaintext is “affine cipher” which is converted to cipher text “IHHWVC SWFRCP”

Plaintext	a	f	f	i	n	e		c	i	p	h	e	r
x	0	5	5	8	13	4		2	8	15	7	4	17
$5x+8$	8	33	33	48	73	28		18	48	83	43	28	93
$(5x+8) \bmod 26$	8	7	7	22	21	2		18	22	5	17	2	15
Ciphertext	I	H	H	W	V	C		S	W	F	R	C	P

**Decryption:** The decryption step is opposite of encryption process.

You have to write the pseudocode for encryption and decryption. Your **pseudocode** should be generic for any plaintext and keys values in the given range as stated above.

### Rubrics:

- Encryption logic for Affine Cipher [5 marks]
- Decryption logic for Affine Cipher [6 marks]
- Pseudocode writing style (Usage of declare, input, set, display keywords etc.) [4 marks]

*Happy Pseudo-coding 😊*

### Solution:

**Declare** string plain\_text, cipher\_text, original\_text

**Declare** integer a = 5, b = 8, m = 26

*/\*Encryption starts here\*/*

**Display** “Enter the plain text.”

**Input** plain\_text

**For** i = 0 To plain\_text.length()-1



If (plain\_text[i] != " ") Then

Set cipher\_text = cipher\_text + (char) (((a \* (plain\_text[i] - 'A')) + b) % m) + 'A')

Else

Set cipher\_text += plain\_text[i]

End If

End For

Display cipher\_text

*\*\*\*\*Decryption starts here\*\*\*\**

Declare integer inverse\_of\_a = 0

Declare bool status = 0

For j = 0 To m-1

Set status = (a \* j) % m

If (status == 1) Then

Set inverse\_of\_a = j

End If

End For

For i = 0 To cipher\_text.length()-1

If (cipher\_text[i] != " ") Then

Set original\_text += (char) (((inverse\_of\_a \* ((cipher\_text[i] + 'A' - b)) % m)) + 'A')

Else

Set original\_text += cipher\_text[i]

End If

End For

Display original\_text





## Question 4 [10 Marks]

Write a program to find the corresponding subarray within a one-dimensional array of numbers of size n. which has the largest sum and also find the maximum and minimum number from the subarray along with their respective index of the actual array.

**Example:**

-2	-3	4	-1	-2	1	5	-3
----	----	---	----	----	---	---	----

Maximum subarray is: 4, -1, -2, 1, 5

Sum of sub array is: 7

Maximum number in subarray is: 5

Index of Maximum number is: 6

Minimum number in subarray is: -2

Index of Minimum number is: 4

**Solution:**

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

int Sum(int arr[], int size) {
    int total = 0;
    for (int i = 0; i < size; i++) {
        total+=arr[i];
    }
    return total;
}

int Maximum(int arr[],int s, int e) {
    int max = 0;
    for (int i = s; i < e; i++) {
        if (arr[i] > arr[max]) {
            max = i;
        }
    }
    return max;
}

int Minimum(int arr[],int s, int e) {
```

```
int min = 0;
for (int i = s; i < e; i++) {
    if (arr[i] < arr[min]) {
        min = i;
    }
}
return min;
}

void MaxSubArray(int arr[], int size)
{
    int max_start = 0;
    int max_size = 1;
    for (int sub_size = 1; sub_size <= size; sub_size++) {
        for (int start = 0; start <= size - sub_size; start++) {
            if (Sum(arr+start, sub_size) > Sum(arr+max_start, max_size)) {
                max_start = start;
                max_size = sub_size;
            }
        }
    }
    cout << "Largest Subarray is: ";
    for (int i = 0; i < max_size; i++) {
        cout << (arr + max_start)[i] << ", ";
    }
    cout << endl;
    cout << "Sum is: " << Sum(arr + max_start, max_size) << endl;
    int max = Maximum(arr, max_start, max_size) + max_start;
    int min = Minimum(arr, max_start, max_size) + max_start;
    cout << "Min " << arr[max] << endl;
    cout << "Min index " << max << endl;
    cout << "Max " << arr[min] << endl;
    cout << "Max index " << min << endl;
}

int main() {
    int size;
    cout<<"Enter size of the array"<<endl;
    cin>>size;
    int *arr=new int[size];
    cout<<"Enter values in array"<<endl;
    for(int i=0;i<size;i++)
        cin>>arr[i];

    MaxSubArray(arr, size);
    return 0;
}
```





## Question 5 [ 10 Marks]

Write a program that takes a character array from the user as input and removes duplicate words from it. After removing the duplicate words, it should also sort all the remaining words.

You have to write two functions ***removeDuplicates()*** and ***sortWords()***.

- ***removeDuplicates()*** should remove all the duplicate words from the passed array,
- ***sortWords()*** should sort all the words

You need to take the input in *main()* and pass that character array to both of these two functions.

### Example#1

<b>Input:</b>	<i>Hello there hello how are you YOU</i>
<b>Output after removing duplicates:</b>	<i>hello there how are you</i>
<b>Output after sorting words:</b>	<i>are hello how there you</i>

### Example#2

<b>Input:</b>	<i>The more you practice the more you become better</i>
<b>Output after removing duplicates:</b>	<i>the more you practice become better</i>
<b>Output after sorting words:</b>	<i>become better more practice the you</i>

**Note:** You are not allowed to use any of the string library functions.





## Question 6 [ 15 Marks]

### Players Pick from a draft in a League

You have to develop a program that helps teams in a league pick new players for the coming 2021 season. League has a total of 4 teams where each team can have a maximum of 16 players. Let's assume that N Players have already been listed in the draft, and for each we have the following information as shown in the table below.

Sr. No.	Name	Type	Batting average	Batting strikrate	Bowling average	Bowling strikrate	Value	Availabilit y
1	Babar Azam	Batsman	50.93	130.00	-1	-1	10,00,000	true
2	Ben Cutting	Allrounder	23.08	149.73	31.45	21.0	9,00,000	true
3	Dale Steyn	Bowler	-1	-1	21.96	19.3	11,000,000	true
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
N	Imad Wasim	Allrounder	19.10	125.97	25.46	23.4	8,00,000	true

You have to write atleast the following functions. Only name of the functions are given you can have any number of arguments in them:

1. `playerData()`: Get the number of players to enlist in the draft and store their information (as shown in the table above). For a batsman bowling average and strike rate should be set to -1, similarly for a bowler batting average and strike rate should be set to -1. **[Hint: It might be useful to keep a count of batsman, bowler and allrounder who are enlisting].** [4 marks]
2. `sortPlayers()`: Reorganize the player information on the basis of their expertise. Only allocate memory required to store players' data separately (batsman bowler and allrounder). [4 marks]
3. `assignRanks()`: Assign ranking to the 4 teams on the basis of random number. **[2 marks]**
4. `teamPicks()`: To calculate how many new players each team can buy in the draft. Team ranked first gets to decide it first, then the 2<sup>nd</sup> and so on. **[4 marks]**
  - a. Each team will be asked to tell the number of players they want to retain out of 16 (lets say this number is R). R cannot be less than 7 and greater than 11.
  - b. New players they can have will be total players minus the players they want to retain (16 – R)
5. `playerSelection()`: Player selection function where each team chooses their pick one by one (starting with the team ranked first), you have to ask the team which type of player they want to pick (batsman, bowler and allrounder). Once a player is picked by a team change his status to **false** (meaning sold). **[4 marks]**
6. `main()`: Main function where all these functions will be called **[2 marks]**

**Note: Global variables are not allowed, Only dynamic memory allocation is allowed!**







**ROUGH WORK**

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