

CS101 Midsem Practice

Spring 2023-24

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Question 1

What is the Output?

```
#include <iostream>
using namespace std;
int main()
{
    int a = 5; int b = 7;
    int c = 2; int d = 9;
    int e = a * b % c + d;
    cout<<"e="<<e<<"\n";
    int i = a++ + ++b - c--;
    cout<<"i="<<i<<"\n";
    int f = d * i / 2;
    float f2 = d * i / 2;
    cout<<"f="<<f<<" f2="<<f2<<"\n";
}
```

Solution 1

e=10

i=11

f=49 f2=49



Operator Precedence



Pre/Post Inc/Dec



Datatypes

What is the Output?

```
#include <iostream>
using namespace std;
int main()
{
    int a = 5; int b = 7;
    int c = 2; int d = 9;
    int e = a * b % c + d;
    cout<<"e="<<e<<"\n";
    int i = a++ + ++b - c--;
    cout<<"i="<<i<<"\n";
    int f = d * i / 2;
    float f2 = d * i / 2;
    cout<<"f="<<f<<" f2="<<f2<<"\n";
}
```

Question 2

Find all the errors in this program:

```
1 # include < iostream >
2 using namespace std;
3 int main () {
4
5 cout >> " Program to find area of a trapezium : ";
6 int a,b,h;
7 float area ;
8 cout << " Enter values of a and b, and h:"
9 cin >> a >> b >> h;
10 area = (h/2) *(a+b) ;
11 cout << "The area is " area ;
12 return a;
13 }
```

Solution 2

Find all the errors in this program:

```
1 # include < iostream >
2 using namespace std;
3 int main () {
4
5 cout >> " Program to find area of a trapezium : ";
6 int a,b,h;
7 float area ;
8 cout << " Enter values of a and b, and h:"
9 cin >> a >> b >> h;
10 area = (h/2) *(a+b) ;
11 cout << "The area is "area ;
12 return a;
13 }
```

Should be <<

Missing ;

Missing <<

Solution 2

Corrected code:

```
1 # include < iostream >
2 using namespace std;
3 int main () {
4
5 cout << " Program to find area of a trapezium : ";
6 int a,b,h;
7 float area ;
8 cout << " Enter values of a and b, and h:";
9 cin >> a >> b >> h;
10 area = (h/2) *(a+b) ;
11 cout << "The area is " << area ;
12 return a;
13 }
```



Syntax matters!

Question 3

Consider the following badly indented snippet. What is the output if a=5, b=7, c=9? What is the output if a=4, b=4, c=4? Can the program ever output “AAA CCC ZZZ”? (Yes or No)

```
if(a >= 5)
if(b < 6)
cout<<"AAA ";
else
cout<<"BBB ";
else if(c == 9)
cout<<"CCC ";
cout<<"ZZZ\n";
```

Solution 3

BBB ZZZ

ZZZ

No

Consider the following badly indented snippet. What is the output if a=5, b=7, c=9? What is the output if a=4, b=4, c=4? Can the program ever output “AAA CCC ZZZ”? (Yes or No)

```
if(a >= 5)
if(b < 6)
cout<<"AAA ";
else
cout<<"BBB ";
else if(c == 9)
cout<<"CCC ";
cout<<"ZZZ\n";
```



Corresponding if and
else blocks

Question 4

Find the output:

```
int a = 5;
if (a > 1){
    int a = 6;
    cout << a <<endl;
    a++;
}
cout << a <<endl;
```

Solution 4

Find the output:

```
int a = 5;
if (a > 1){
    int a = 6;
    cout << a <<endl;
    a++;
}
cout << a <<endl;
```

Output:

6

5



Scope of Variables

Question 5

Consider the following code snippet. What is the output if $N=52$? What does this program compute? [Write answer as a mathematical function of N]

```
int N;  
cout<<"Enter number: ";  
cin>>N;  
int x = 0;  
int y = 1;  
while( y < N) {  
    y = y*2;  
    x++;  
}  
cout<<x;
```

Solution 5

6

$\lceil \log_2 N \rceil$

Consider the following code snippet. What is the output if $N=52$? What does this program compute? [Write answer as a mathematical function of N]



While Loops

```
int N;  
cout<<"Enter number: ";  
cin>>N;  
int x = 0;  
int y = 1;  
while( y < N) {  
    y = y*2;  
    x++;  
}  
cout<<x;
```

Question 6

What is the output of this program?

```
#include<simplecpp>

int func(int &a){
    a = 1;
    return 0;
}

main_program{
    int a = 10;
    func(a);
    Cout << func(a) - a << endl;
}
```

Solution 6

What is the output of this program?

```
#include<simplecpp>
```

```
int func(int &a){  
    a = 1;  
    return 0;  
}
```

```
main_program{  
    int a = 10;  
    func(a);  
    Cout << func(a) - a << endl;  
}
```

Output:

-1



Pass by reference

- > Variable address copied
- > Original value changes

Question 7

```
int N;
cout<<"Enter number: ";
cin>>N;
int i = 0;
int j = 0;
while(i < N) {
    j = 0;
    while(j < N) {
        if(_A_) cout<<"1";//fill A
        else cout<<"0";
        _B_; //fill B
    }
    _C1_; //fill C1
    _C2_; //fill C2
}
```

Consider the following program which takes an input a positive integer N , and prints a $N \times N$ matrix whose diagonal elements (on both diagonals) are 1, and the remaining elements are 0. Fill in the blanks [A, B, C1, C2]

e.g. $N = 5$

```
10001
01010
00100
01010
10001
```

Solution 7

```
int N;
cout<<"Enter number: ";
cin>>N;
int i = 0;
int j = 0;
while(i < N) {
    j = 0;
    while(j < N) {
        if(i==j || i+j==N-1)//fill A
            cout<<"1";
        else
            cout<<"0";
        j++; //fill B
    }
    cout<<"\n"; //fill C1
    i++; //fill C2
}
```



Pattern Printing

Question 8

Outputs again!

```
1 # include < iostream >
2 using namespace std;
3 int main ()
4 {
5
6 int FACT = 1;
7 for (unsigned int i = 6; i >= 0; --i)
8 {
9 FACT *= i;
10 }
11 cout << FACT << endl ;
12 return 0;
13 }
```

Solution 8

Outputs again!

```
1 # include < iostream >
2 using namespace std;
3 int main ()
4 {
5
6 int FACT = 1;
7 for (unsigned int i = 6; i >= 0; --i)
8 {
9 FACT *= i;
10 }
11 cout << FACT << endl ;
12 return 0;
13 }
```

Infinite loop! (Why?)
How do we fix this?

Solution 8

Outputs again!

```
1 # include < iostream >
2 using namespace std;
3 int main ()
4 {
5
6 int FACT = 1;
7 for (unsigned int i = 6; i > 0 or i > 1; --i)
8 {
9 FACT *= i;
10 }
11 cout << FACT << endl ;
12 return 0;
13 }
```

Change the condition on i
OR
Just remove 'unsigned'



Loop conditions

Question 9

Consider the following program which takes an input a positive integer N, and prints the number of 7s in the number. Fill in the blanks [A, B, C]

```
#include <iostream>
using namespace std;
int main() {
    int num;
    cout<<"Enter number: ";
    cin>>num;
    int count = 0; int digit;
    while (_A_) { //fill A
        digit = _B_; //fill B
        num = _C_; //fill C
        if(digit == 7) count++;
    }
    cout<<count;
}
```

Solution 9

```
#include <iostream>
using namespace std;
int main() {
    int num;
    cout<<"Enter number: ";
    cin>>num;
    int count = 0; int digit;
    while ( num > 0 ) { //fill A
        digit = num % 10; //fill B
        num = num / 10; //fill C
        if(digit == 7) count++;
    }
    cout<<count;
}
```



Digit based problems

Question 10

Complete the following code so the program outputs the **square root of y** ($y > 0$) The precision is given as 0.001.

```
main_program {  
    double y; cin >> y;  
    double x = 1, eps = 0.001;  
  
    while(_____) {  
        x = (x + y/x) / 2;  
    }  
  
    cout << x << endl;  
}
```

Solution 10

Complete the following code so the program outputs the **square root of y** ($y > 0$) The precision is given as 0.001.

```
main_program {  
    double y; cin >> y;  
    double x = 1, eps = 0.001;  
  
    while( abs(x*x - y) > eps ) {  
        x = (x + y/x) / 2;  
    }  
  
    cout << x << endl;  
}
```



Understanding the
intent of the code

Question 11

What is the Output?

```
#include <iostream>
using namespace std;
int main()
{
    int a = 5, b = 7;
    int c;
    c = func1(a, b);
    cout<<"a = "<<a<<endl;
    cout<<"b = "<<b<<endl;
    cout<<"c = "<<c<<endl;
}

int func1(&b, &a)
{
    int ret = 2*a+b;
    int temp = b;
    b = a;
    a = temp;
    return ret;
}
```


Solution 11

a = 7

b = 5

c = 19



Function Calls



Call by Reference



Local Variables

What is the Output?

```
#include <iostream>
using namespace std;
int func1(int &b,int &a);

int main()
{
    int a = 5, b = 7;
    int c;
    c = func1(a, b);
    cout<<"a = "<<a<<endl;
    cout<<"b = "<<b<<endl;
    cout<<"c = "<<c<<endl;
}

int func1(int &b,int &a)
{
    int ret = 2*a+b;
    int temp = b;
    b = a;
    a = temp;
    return ret;
}
```

Question 12

Aaaaaaand another output!

```
main_program {  
  for (int i = 0; i < 8; i++);  
  {  
    if (i%2 == 0)  
      cout << i + 1 << " ";  
    else  
      cout << i << " ";  
  }  
  cout << "EOP";  
}
```

Question 12

Aaaaaaand another output!

```
main_program {  
  for (int i = 0; i < 8; i++);  
  {  
    if (i%2 == 0)  
      cout << i + 1 << " ";  
    else  
      cout << i << " ";  
  }  
  cout << "EOP";  
}
```

Okay, a few things...

Question 12

Aaaaaaand another output!

```
main_program {  
  for (int i = 0; i < 8; i++)  
  {  
    if (i%2 == 0)  
      cout << i + 1 << " ";  
    else  
      cout << i << " ";  
  }  
  cout << "EOP";  
}
```

Interesting? This actually works!
Think of it like an empty loop.
It iterates over itself with no other operation.

Question 12

Aaaaaaand another output!

```
main_program {  
  for (int i = 0; i < 8; i++);  
  {  
    if (i%2 == 0)  
      cout << i + 1 << " ";  
    else  
      cout << i << " ";  
  }  
  cout << "EOP";  
}
```

But error here!
i is not declared outside
the scope of the 'for' loop

Solution 12 (with modified code)

Aaaaaaand another output!

```
main_program {  
    int i;  
    for (int i = 0; i < 8; i++);  
    {  
        if (i%2 == 0)  
            cout << i + 1 << " ";  
        else  
            cout << i << " ";  
    }  
    cout << "EOP";  
}
```

What's the output?

Solution 12 (with modified code)

Aaaaaaand another output!

```
main_program {  
    int i;  
    for (i = 0; i < 8; i++);  
    { // i = 8 at this point  
        if (i%2 == 0) // 8%2 = 0, so true  
            cout << i + 1 << " "; // 8+1 = 9  
        else  
            cout << i << " ";  
    }  
    cout << "EOP";  
}
```

Ans. 9 EOP



Read code carefully; not everything is an error :)

Question 13

What is the output if $n1=2$, $n2=22$? What is the program doing?

```
#include <iostream>
using namespace std;
int main() {
    int n1, n2;
    cout<<"Enter two numbers: ";
    cin>>n1>>n2;
    int sum = 0;
    for(int i= n1; i<=n2; i++) {
        if(i % 10 == 0)
            break;
        if(i % 2 == 0)
            continue;
        sum += i;
    }
    cout<<sum;
}
```


Solution 13

24



Break



Continue

```
#include <iostream>
using namespace std;
int main() {
    int n1, n2;
    cout<<"Enter two numbers: ";
    cin>>n1>>n2;
    int sum = 0;
    for(int i= n1; i<=n2; i++) {
        if(i % 10 == 0)
            break;
        if(i % 2 == 0)
            continue;
        sum += i;
    }
    cout<<sum;
}
```

Question 14

Given the following program:

```
main_program {  
    for(int outval=0; outval<_A_; outval++){  
        for(int inval=0; inval<=outval; inval++){  
            cout<<(inval+_B_);  
        }  
        cout<<endl;  
    }  
}
```

Complete the code such that the output is as shown below:

```
0  
12  
234  
3456
```

Solution 14

Given the following program:

```
main_program {  
    for(int outval=0; outval < 4 ; outval++){  
        for(int inval=0; inval<=outval; inval++){  
            cout<<(inval + outval );  
        }  
        cout<<endl;  
    }  
}
```

Complete the code such that the output is as shown below:

```
0  
12  
234  
3456
```



Understanding the purpose
of code through the output

All the best!