CS 101
Computer Programming and Utilization

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Lecture 16, Analysis of Midsem Exam

Q.1 Control structures

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```
cin >>  x, y;
if (x >=y){
    if (x == y){
       sum = x + y;
    }
    else{
        sum = x + y - 1;
    }
else  { sum = x + y + 1;}
cout << sum;
```

Q 1 (Continued)

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```
cin >> N;
sum = 0;
for (i = 0; i < N; i++){
 sum = sum + i;
 while (sum > 32){
     sum = sum – 3;
  }
}
cout << sum;
```

Q 2 Function ModifiedSalary

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```
float newsal;
If (sal < 10000.0) {
  newsal = 1.22 * sal;
}
else if ( sal < 20000.0){
   newsal = 1.23 * sal;
}
else newsal = sal;
return newsal;
// case of salary beyond 30000 does not arise
// Sal of Rs 10000 included for 23% raise
```

Addition and Subtraction revisited

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- Two numbers are given as input:

4

9 5 2 1

6

9 9 6 3 5 7

- We do not add numbers like this. First we align the numbers on the right

  0 0 9 5 2 1

  9 9 6 3 5 7

Addition

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- Then perform the addition digit by digit

```
  0 0 9 5 2 1
  9 9 6 3 5 7
---------------
1 0 0 5 8 7 8
```

Whenever the sum of two digits exceeds 9, we add a “carry” to the next digit

Program segment to add numbers

```
maxdigits = m[0]>n[0]?m[0]:n[0];
carry = 0;
for (i=99; i>=99-maxdigits+1; i--){
  rdash[i+1]=mdash[i] + ndash[i]+carry;
  if(rdash[i+1] > 9){
    rdash[i+1] = rdash[i+1]%10;
    carry = 1;
  }
 else carry =0;
}
```

Subtraction

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7

1 7 0 0 5 8 2

-4

6 7 4 9

The representation we want is

1 7 0 0 5 8 2

\- 6 7 4 9

Subtraction technique with Borrow

Explained separately

Program for subtraction - Reading the numbers

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```
#include <iostream>
#include <fstream>
using namespace std;
// Given two hi precision integers strored in
// arrays m and n, add these in array r
// Representation of first number in an array m[] is
// m[0] has number of digits
// m[1], m[2], etc have actual individual digits
// second number n, which is negative, is stored
// similarly, except n[0], showing number of digits, is
// a negative number. n is smaller than m
```

Reading numbers …

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```
 int main(){
 int m[100],n[100], r[101];
// result r may have an extra digit
int i, j, digit;
// read the two numbers in arrays m and n
int inputflag = 0; // used to check input health
```

Reading numbers …

```
cin >> m[0]; cout << m[0] << endl;
if (m[0] < 0 || m[0] > 99){
// end of data, terminate reading file
   inputflag=1;
   cout << "ill formed number " <<m[0] <<endl;
}
```

Reading numbers …

```
else{
  for (i = 1; i <=m[0]; i++){
    cin >> m[i]; cout << m[i];
    if ( m[i] > 9 || m[i] < 0){
       cout << "bad digit " << m[i];
       cout << " at: " << i << endl;
       inputflag = 2;
    }
  }
  cout << endl;
}
if (inputflag!=0) return inputflag;
```

Reading numbers …

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```
// read second number
cin >> n[0]; cout << n[0] << endl;
if (n[0] > 0 || n[0] < -99){
// end of data, terminate reading file
   inputflag=1;
   cout << "ill formed number" << n[0] << endl;
}
```

Reading numbers …

```
    else{
      n[0] = -n[0];
      for (i = 1; i <= n[0]; i++){
        cin >> n[i]; cout << n[i];
        if (n[i] < 0 || n[i] > 9){
           cout << "bad digit " << n[i] << " at: ";
           cout << i << endl;
           inputflag = 1;
        }
      }
      cout << endl;
    }
```

Reading numbers …

```
if (inputflag==0) {
  for(i=0; i <= m[0]; i++) cout << m[i];
  cout << endl;
  for(i=0; i <= n[0]; i++) cout << n[i];
  cout << endl;
}
else{
  return inputflag;
}
```

Subtraction - shifted representation

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```
// put these numbers into right shifted format
 int mdash[100], ndash[100], rdash[101];
 int carry, borrow, maxdigits;
 // first put zeros in all digit positions
 for (i=1; i <100; i++){
   mdash[i]=0;
   ndash[i]=0;
   r[i]=0;
 }
 r[100]=0;
```

Shifted representation …

```
// now transfer given numbers to these arrays
// propagate negative sign to each digit of ndash

for(i=99,j=m[0]; i>=99-m[0]+1; i--,j--)mdash[i]=m[j];
for(i=99,j=n[0]; i>=99-n[0]+1; i--,j--) ndash[i]=-n[j];
mdash[0]=m[0]; ndash[0] = n[0];

maxdigits = m[0]>n[0]?m[0]:n[0];
```

Subtraction …

```
// now subtract second number ndash from first
 // starting from last position backwards
 carry = 0; borrow = 10;
 for (i=99; i>=99-maxdigits+1; i--){
    rdash[i+1]=mdash[i]+borrow + ndash[i]+carry;
    if(rdash[i+1] > 9){
      rdash[i+1] = rdash[i+1]%10;
      carry = 0;
    }
    else carry = -1;
 }
```

Subtraction

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```
if(carry==-1){
  rdash[0]=maxdigits+1;
  rdash[100-maxdigits]=1;
}
else{
  rdash[0]=maxdigits;
}
```

Announcements