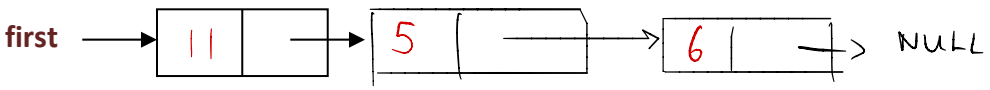
Review Activity 5

List ADT, Recursion Exercises

1) Consider the following code fragment that is executed on a linked implementation of List ADT.

```
LinkedList* list = new LinkedList(); // creates a new list
InsertFront(list, new Node(6)); // inserts node at the front
InsertFront(list, new Node(5));
InsertFront(list, new Node(3));
InsertBack(list, new Node(12)); // inserts node at the end
DeleteFirst(list); // deletes node from the front
InsertFront(list, new Node(11));
DeleteLast(list); // deletes node from the end
```

In the diagram below, illustrate what happens (the final outcome) after this code is run by drawing additional nodes, filling in the node values, and connecting nodes as appropriate. Each node includes data of `int` type and a pointer to the next node, and both values have to be set correctly.



2) Consider the following pseudocode that is executed on a sequential implementation of List ADT.

```
insert('m', 1);
insert('t', 0);
insert('e', 2);
insert('1', 2);
insert('4', 0);
insert('0', 1);
delete(2);
```

In the diagram below, illustrate what happens (the final outcome) after this code is run by filling in the node values below. Each node includes data of char type, and to indicate empty space, use '#' symbol. You can assume that the list is empty at first.

3) Design a recursive function that converts a string of digits into the matching integer. For example, ascii2int("2456") returns 2456.

4) Design a recursive function that converts an integer into the matching string of digits. For example, int2ascii(3452) returns "3452".

5) Design a recursive function that converts a given binary string into the matching decimal number. For example, bin2dec("101") returns 5.

6) Design a recursive function that converts a given decimal number into the matching binary string. For example, dec2bin(12) returns "1100".

0 - 48 4 - 52
1 - 49
2 - 50
3 - 51 9 - 57

3. #include <math.h>

```
int ascii2int(string num, int index, int char_left){
    if (char_left == 0)
        return 0;
    else {
        int digit = pow(10, char_left-1);
        int value = num[index] -48;
        if (num[index] = 45 ) // -ve
            return (-1 * ascii2int(num, ++index, char_left));
        return (value* digit + asciiint(num,++index, --char_left));
}
```

4.

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

string int2ascii (int num) {
    if( num < 0)
        return int2ascii ("-" + num * -1);
    else if (num <= 9)
        return string(1, '0' + num);
    else {
        return(int2ascii(num/10) + char('0' + num%10));
    }
}
```

5.

```
#include<math.h>
#include <iostream>
using namespace std;

int binarystring2decimal(string num, int index){
  if (index == num.size())
      return 0;
  else if (num.at(index) == '-') // Converts to string
    return (-1 * binarystring2decimal(num.substr(1), index));
  else if (num.at(index) == "1" // num.at(index) == '0')
      return binarystring2decimal(num, ++index);
  else{
    if (num.at(index) == '0')
        return binary2decimal(num, ++index)
    int sum = pow(2, index)
    return (sum + binarystring2decimal(num, ++index));
    }
}
```

6 #include<math.h>
#include <iostream>
using namespace std;

String decimal2binary string (int num){
if (num<0)
return "-" + decimal2binary(-1*num);

else if(num==0)
return "0";
else if (num==1)
return "1";

else
return (decimal2binary string (num/2) + (num%2!="1":"0"));