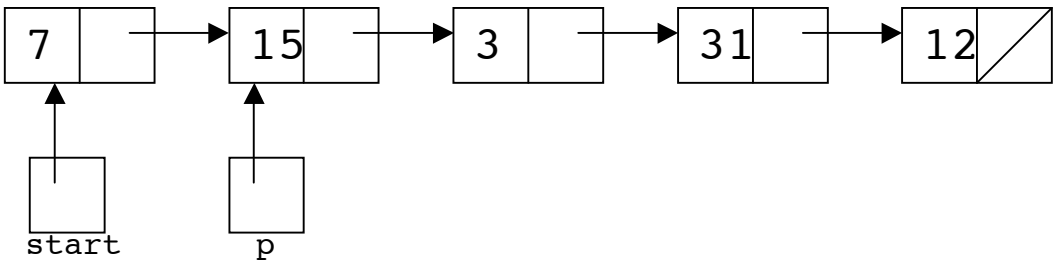
15-103 HOMEWORK 2 - Spring 2008

due in class on Sunday, January 27

1. Draw a flowchart for the following algorithm from Homework 1:

```
1. Set x = 0
2. Set y = 1
3. Set z = 1
4. Set x' = x + 4 / z
5. While |x' – x| > 0.00001 do the following:
     a. Set x = x'
     b. Add 1 to y
     c. Add 2 to z
     d. If y is odd, set x' = x + 4 / z
        else, set x' = x – 4 / z
6. Output x'
```

2. Consider the following linked list of nodes:



Each node contains a data value and a pointer to the next node of the list (or null if there is no next node). Let *start* be a pointer variable that holds the location (address) of the first node of the list. Assume when you have a pointer variable *p*, that *p.data* refers to the data in the node that p points to. Similarly, *p.next* refers to the pointer to the next node from the node that p is pointing to. For example, in the picture above, *p.data* is 15 and *p.next* is the pointer to the node that contains 3.

a) Provide an algorithm to delete the node that *p* points to.

b) For your algorithm, how many nodes need to be moved in computer memory?

3. Using the RPN (Reverse Polish Notation) algorithm discussed in class,

a) trace the algorithm for the following expression, showing the stack at the end of each iteration of the loop (draw a separate picture of the stack each time, so that we can see the overall process of the algorithm):

2 4 4 7 3 - 1 + * + 6 / + $

b) convert the following mathematical expression into RPN so the stack algorithm can compute its value (remember operator precedence and make sure the numerical values are in the same order as the original expression):

(2 + 4 * 5 – 2) / 4 - 1

4. Consider the following list of numbers:

18 12 37 6 21 13 7 32 24

a) insert these values into a Binary Search Tree in the order given above (from left to right)

b) for any BST, how do you find the smallest data value?