

CSCI115 Lecture 9



Chapter 3

Another run at Recursion: a very important concept!

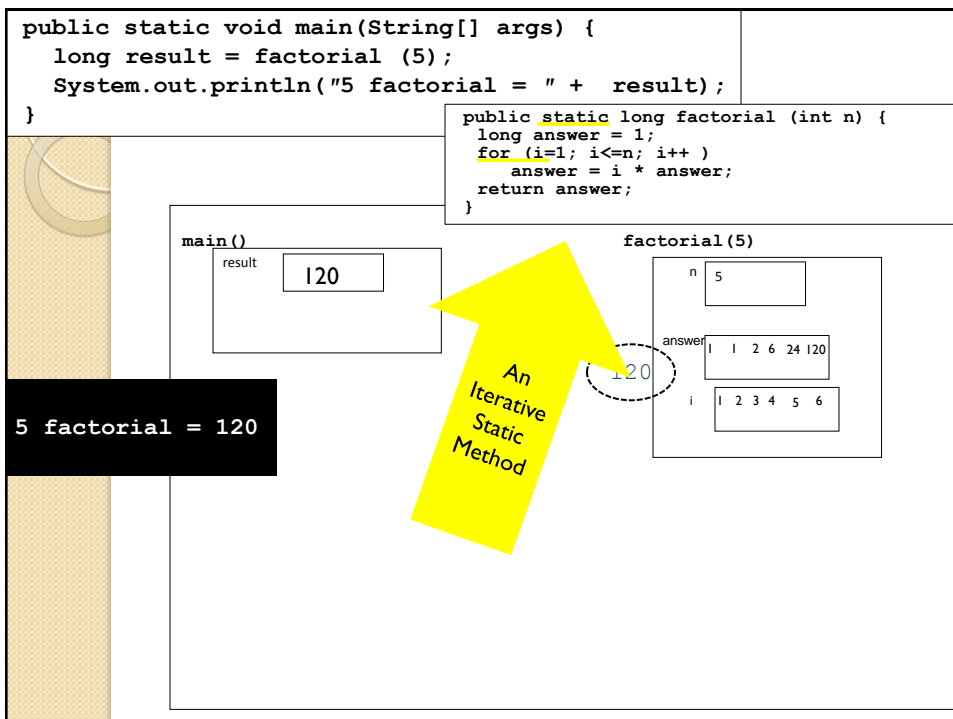
	Iterative	Recursive
Static Methods	Iterative Static Methods	Recursive Static Methods
Instance Methods	Iterative Instance Methods	Recursive Instance Methods

Iterative Static Method Example: n!

```
public static void main(String[] args) {
    long result = factorial (3);
    System.out.println("3 factorial = " +
                        result);
}

public static long factorial (int n) {
    long answer = 1;
    for (i=1; i<=n; i++ )
        answer = i * answer;

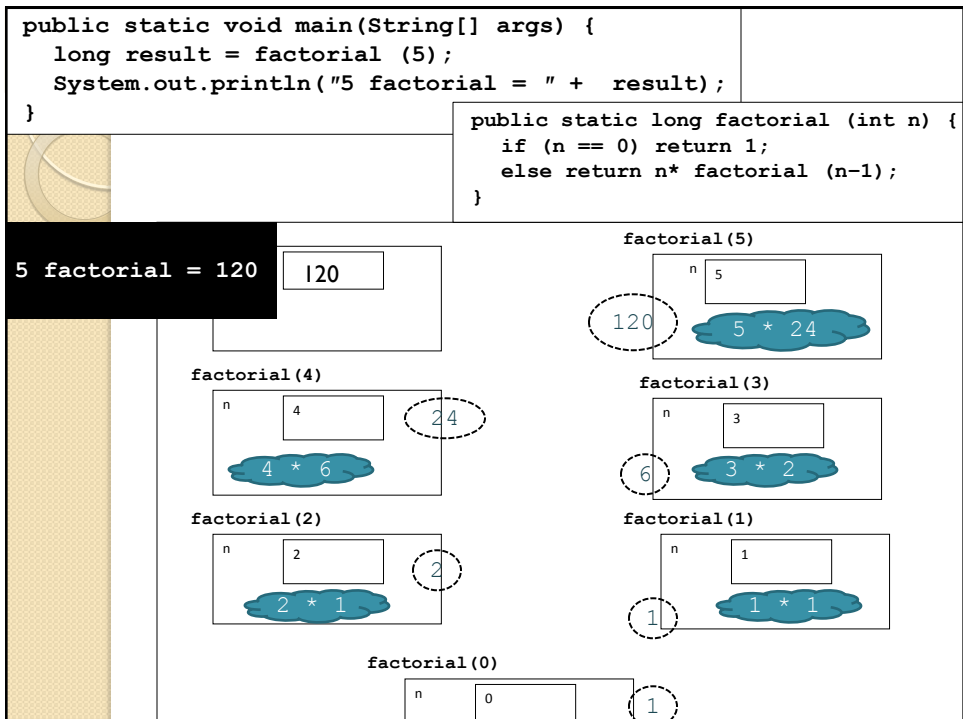
    return answer;
}
```



Recursive Static Example: $n!$

```
public static void main(String[] args) {
    long result = factorial (3);
    System.out.println("3 factorial = " +
                        result);
}

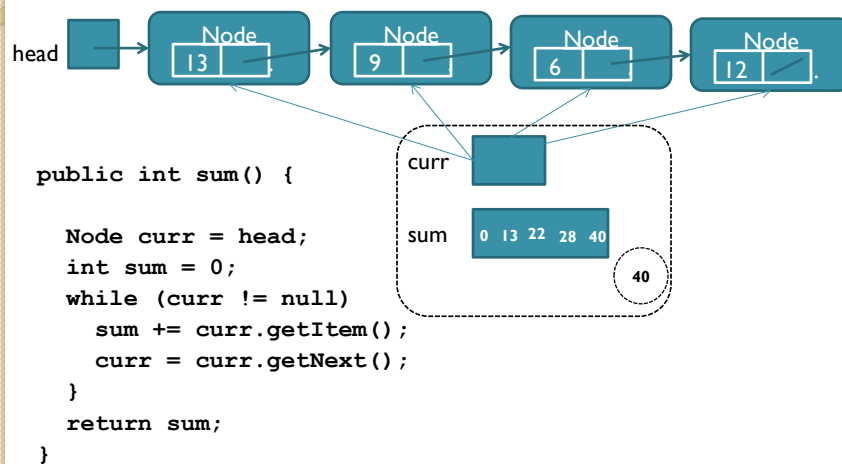
public static long factorial (int n) {
    long factorialResult;
    if (n == 0) factorialResult = 1;
    else factorialResult = n* factorial (n-1);
    return factorialResult;
}
```



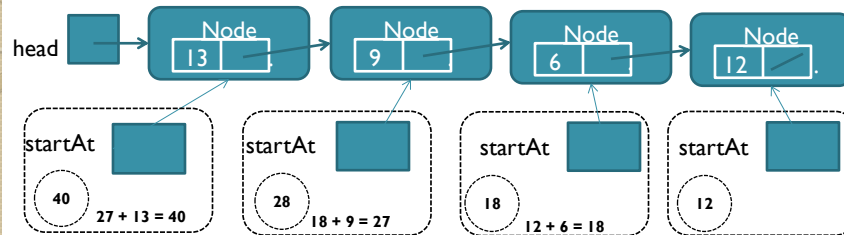
Box Trace

- Each box contains
 - a method's local environment at the time of and as a result of the call to the method

An Iterative Instance Method: Sum of a Linked List



A Recursive Instance Method: Sum of a Linked List



```
public int sum() {
    return sum(head);
}

public int sum(Node startAt) {

    if (startAt == null) return 0;
    if (startAt.getNext() == null)
        return startAt.getItem();
    else
        return sum(startAt.getNext()) + startAt.getItem();
}
```

The Towers of Hanoi

- Animation & Explanation:
<http://britton.disted.camosun.bc.ca/hanoi.swf>
- Recursive Solution:
<http://users.dickinson.edu/~braught/courses/cs132s03/code/TowerOfHanoi.src.html>
- Iterative Solution:
<http://www.cs.cornell.edu/courses/cs211/2006sp/Lectures/L03-Recursion/Hanoi-Iterative.java>