

# Objectives

- Be able to explain the strategy behind the Insertion Sort
- Be able to explain the strategy behind the Merge Sort and the Quick Sort
- Be able to give the best-case, worst-case, and average-case analyses of Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, and Quick Sort
- Be able to identify all the following parts of a tree: Node, Edge, Root, Child, Descendant, Path, Parent, Sibling, Subtree, Leaf Node, Level, and Height

# Analysis of Selection Sort

# Analysis of Bubble Sort

# Insertion Sort

29

72

34

58

61

38



# Analysis of Insertion Sort

# Quick Sort

50

40

47

46

69

82

65





# Analysis of Quick Sort

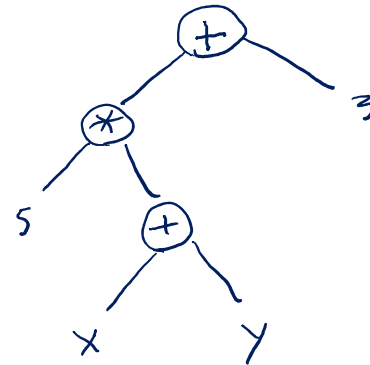
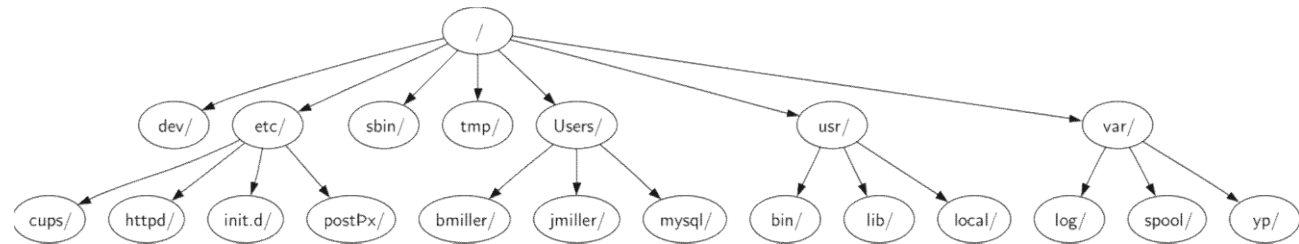
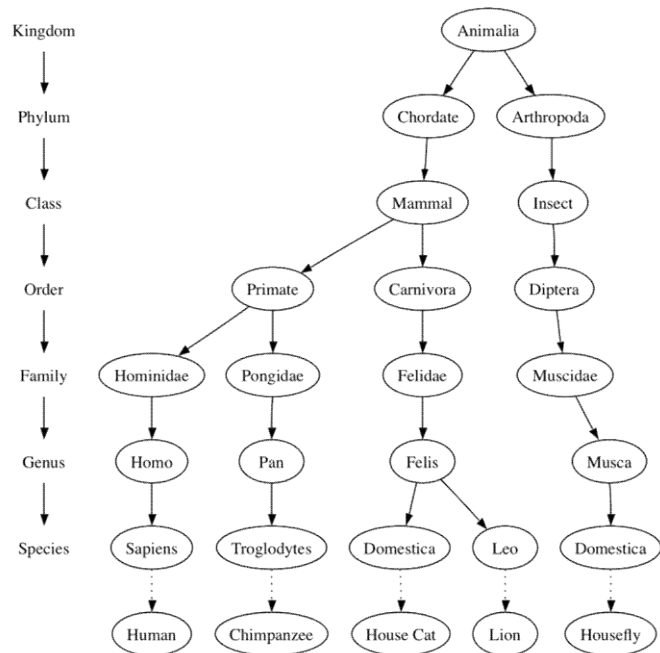
# The Master Theorem



**Theorem:** If  $T(n)$  is increasing, and if  $T(n) = aT\left(\frac{n}{b}\right) + cn^d$  whenever  $n$  is a power of  $b$ , with  $a \geq 1$ ,  $b > 1$ ,  $c > 0$ , and  $d \geq 0$ , then

- (a)  $T(n)$  is  $O(n^d)$  if  $a < b^d$ ;
- (b)  $T(n)$  is  $O(n^d \log n)$  if  $a = b^d$ ; and
- (c)  $T(n)$  is  $O(n^{\log_b a})$  if  $a > b^d$ .

# Chapter 6: Trees and Tree Algorithms



# Terms

- Node
- Edge
- Root
- Child

# Terms Continued

- Descendant
- Path
- Parent
- Sibling

# Terms Continued

- Subtree
- Leaf Node
- Level
- Height