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Algorithms homework 3
On my honor, as a University of Colorado at Boulder student, I have neither given nore reveived unauthorized assistance on this work.

1. a. T(n) = 4T(n/2)+n^2
a=4 b=2 k=1 p=0 log_2(4)=2
4<2 a>b^k
T(n)=Theta(n^2)

b. since the recurrence relation comes out to:
T(n) = 2^kT(n-k)+c and you get down to level k (n-k)=1
all we are left with is 2^k +c and since c would be dominated
by the 2^k at this level k = (n-1)we have 2^(n-1) and
we can get 2^-1*2^n which is (1/2)2^n and the constant
drops off
the run time is 2^n
T(n)=O(2^n)

c. T(n) = 9T(n/3)+n^2
a =9 b =3 k=2 p=0 log_3(9)=2
9=3^2 a=b^k and p > -1
T(n) = Theta[(n^2)log(n)]

I would choose Algorithm a

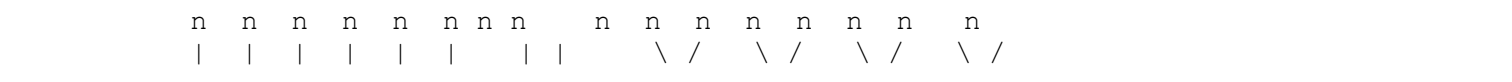
2. best case run time for a comparison sorting algorithm would be that the list is already sorted and in one go of comparisons the list is returned

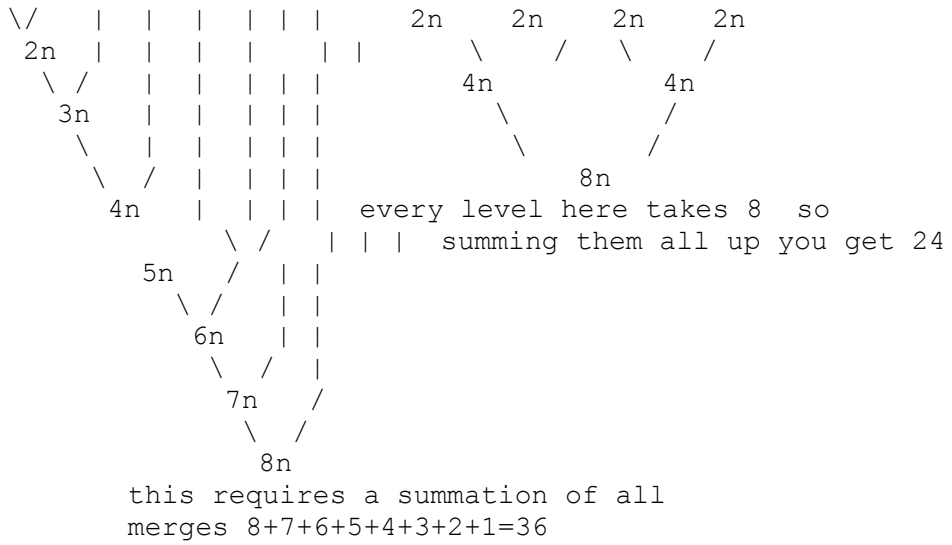
```
InsertionSort(A){                              cost  times
for j in range(2, A.length)                    c1          n
      key = A[j]                               c2        n-1
      i =j-1                                   c4          n-1
      while i > 0 and A[i] > key               c5          ∑ from (2, n) t_j
            A[i+1] = A[i]                      c6          ∑ from (2, n) (t_j-1)
            i = i-1                            c7          ∑ from (2, n) (t_j-1)
      A[i+1] = key                             c8          n-1
      }
```

T(n) = c1*n + c2(n-1) + c4(n-1) +c5∑ from (j=2, n) t_j +
c6∑ from (j=2, n) (t_j-1) +c7∑ from (j=2, n) (t_j-1) + c8(n-1)

T(n) = c1*n +c2(n-1) +c4(n-1) +c5(n-1) +c8(n-1)
= (c1+c2+c4+c5+c8)n-(c2+c4+c5+c8)
we can express this running time as a funtion an+b for some constants a and b that depend on the costs
c_i; it is therefore a linear funcion of n

3.





4.

TSLA
date range: 2010/06/29 - 2015/09/22
buy on: 2010/07/08
sell on: 2014/09/03
Maximum Profit: 271.53

PG
date range: 2013/09/23 - 2015/09/22
buy on: 2013/10/01
sell on: 2013/10/30
Maximum Profit: 7.01

KO
date range: 2014/09/22 - 2015/09/22
buy on: 2015/03/16
sell on: 2015/08/06
Maximum Profit: 2.0