Algorithmics	Student information	Date	Number of session
	UO:UO277653	04/03/2021	5
	Surname: Stanci		
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Activity 1. Basic recursive models.

- **A brief explanation for each of the given classes indicating how you calculated the complexity of that class.**

We have to take into consideration that a is the number of subproblems, b is the constant by which we reduce the subproblem, and k is the complexity of the code when excluding the recursive calls, and also, for divide and conquer by subtraction, we consider the following:

- Complexity
  - $O(n^k)$ if a < 1 (never happens)
  - $O(n^{k+1})$ if a = 1
  - $O(a^{n \text{ div } b})$ if a > 1

With this information we can compute the complexity of the classes having a, b, and k:

Subtraction 1: a=1 , b=1 and k=0. So the complexity is O(1)
Subtraction 2: a=1 , b=1 and k=1. So the complexity is $O(n^2)$
Subtraction 3: a=2 , b=1 and k=0. So the complexity is $O(2^n)$

For divide and conquer by division we consider this other one:

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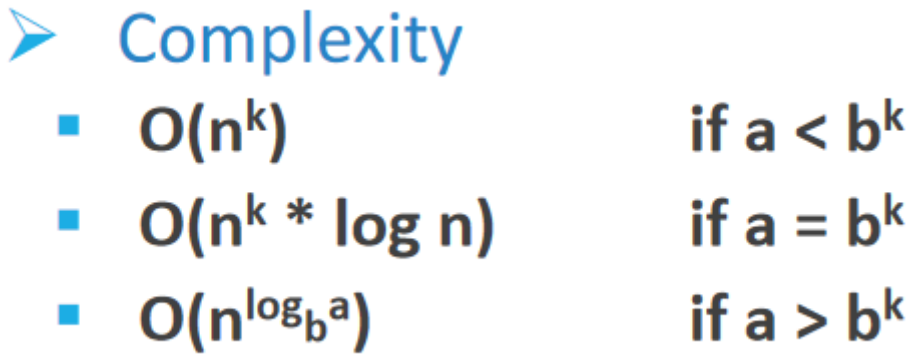

Division 1: a=1 , b=3 and k=1. So the complexity is O(n)

Division 2: a=2 , b=2 and k=1. So the complexity is O(nlogn)

Division 3: a=2 , b=2 and k=0. So the complexity is O(n)

- **A brief explanation for each of the two new classes indicating how you calculate the complexity to get the requested one.**

Using the same images as before:

For Subtraction4, for getting a complexity $O(3^{n/2})$, we see that the exponential complexity is obtained when a > 1, and looking at the arguments, we can deduce that b should be equal to 2 and a = 3. The value of k is not relevant. For getting b = 2 we reduce the value of n by 2 in every recursive call, and to get a = 3 put 3 recursive calls to the method.

For Division4, for getting a complexity $O(n^2)$, with a number of subproblems a = 4, we have to make sure that $a < b^k$, and that k = 2, for that purpose we can use for example b = 3, as it satisfies the condition.