

Table 1

#	Question	
1	in the demonstration of the property of Fibonacci numbers, we have at the end of inductive step : $\alpha^{(k-2)} + \alpha^{(k-3)} = \alpha^{(k-1)}$ . How is that possible ?	it's explained in the beginning of the inductive step. He proves it. This is indeed the case
2	How can we get an intuition of the complexity of mergesort ?	The complexity of merge sort is $n \log(n)$ . If I'm not mistaken, you can see the complexity as following : The merge sort can be represented as a tree (we did that in the course, focus on the bottom part of the tree where we are merging everything). - $\log(n)$ : is the depth of the tree - $n$ : the complexity of every merges since every merge at every depth have almost the same complexity : the more merges you do, the less things you are merging at each time, and vice versa. So at the end, the number of operations is almost the same and is proportional to $n$ . Good answer, thanks.
3	is there a way to know from what $n$ onwards the induction is valid for ?	live answered
4	what's the difference between all the proofs seen this week, they all seem very related and similar ?	live answered
5	Whats the difference between induction and recursion	Induction is a proof method, to show a property for a countable set (e.g. the integers). Recursion is a method to define a function for a countable set (e.g. the integers).
6	i dont get the difference between induction and strong induction	basically induction only uses the assumption that $P(k)$ is true to do the proof. Strong induction uses the assumption that $P(k)$ $P(k-1)$ $P(k-2)$ etc. are true to do the proof. In strong induction you use $P(k)$ for $k \geq b$ in the proof.
7	Hey, i dont really understand why the Merge Sort is better than the bubble sort.	it has a lower complexity level why ? I don't really understand but it's the magic of recursive algorithms. Indeed, Bubble sort has complexity $\Theta(n^2)$ while merge sort has $\Theta(n \log n)$ which is much better for large $n$ .
8	why bother using strong induction instead of simply using induction?	live answered
9	What is the difference between induction and recursion ? and when do we use the structural induction?	Induction is a proof method, to show a property for a countable set (e.g. the integers). Recursion is a method to define a function for a countable set (e.g. the integers). Structural induction you use when you want to show a property for a set that has been defined by structural recursion.
10	What's the difference between induction and strong induction?	induction only uses the assumption that $P(k)$ is true to do the proof. Strong induction uses the assumption that $P(k)$ $P(k-1)$ $P(k-2)$ etc. are true to do the proof. You use $P(k)$ for $k \geq b$ in the proof.
11	Are you going to prove the "principle of induction" ?	You find a proof on slide 9 of this week's slide deck.
12	Why dont we start the basis step from zero (why do we start from 1)	sometimes the property can't be applied to the first element. Look at the fibonacci numbers for example. They depend on the two previous terms which cannot be done for $P(0)$ . We don't actually start from 1, it is an example. As he said in the videos, you can start from any number. Correct, sometimes the property does not hold for all integers.
13	I don't understand how the mathematical induction is equivalent to the well ordering principle. Could you explain this equivalence ?	You find a proof of the fact that validity of mathematical induction results from the well-ordering principles on slide 9 of the slide deck this week. Showing the inverse (i.e. showing the well-ordering of natural numbers using induction is a good exercise)
14	can you re explain wff	Slide 41 provides the definition. What is important to understand is that the property of being well-formed has nothing to do with the logical properties of the formula (whether it is valid, satisfiable etc).
15	How do we know when to use induction and when to use strong induction?	You have to study the problem. You may start using mathematical induction and if it does not work you can try with strong induction. There is no general method to decide.
16	We mentioned that we can write every proof with induction as a proof with strong induction, is the opposite also true?	Yes,. However, it might not be totally obvious of how the proof with mathematical induction looks like.
17	What is the difference between induction and iteration?	These are two totally different concepts. Induction is a proof method, iteration is a computing paradigm, the repeated application of a process till an outcome is reached (or not).
18	shouldn't the worst case be when the order is reversed?	If you refer to merging lists in merge sort: the algorithm is designed such that the partial lists are always ordered. So the answer is no.
19	Can u explain the question 4 of the Kahoot	Will provide explanations on Moodle.
20	What is a well-formed formula?	Slide 41 there is the full definition. Yes, you have to study the definition. What is important to understand is that the property of being well-formed has nothing to do with the logical properties of the formula (whether it is valid, satisfiable etc).
21	can you please explain the question 5 of today's quiz?	first 2 is in S. Then you get $2^2 - 1 = 3$ . Then you obtain $2^3 - 1 = 5$ and $3^3 - 1 = 8$ . So now $S = \{2, 3, 5, 8\}$ . In the next step you can get $2^5 - 1 = 9$
22	can you explain question 7?	Will provide explanations on Moodle.
23	could you explain the answer during the kahoot? because sometime I don't understand my mistake and I still don't know now why I am wrong	I prefer to publish the answers on Moodle for reasons of time management.
24	can you explain/do the last question ? Because in my opinion the last one was right and not wrong like everybody is saying	Will provide explanations on Moodle.
25	Is recursive linear search more efficient than linear search? It seems to be the same thing (same complexity)	Yes, it is the same complexity.
26	I can't understand Structural Induction. What is the difference between structural induction and mathematical induction?	Mathematical induction applies to properties of natural numbers, structural induction is more general. It is a proof method for sets that have been defined using structural recursion. Since a natural number can be defined using structural recursion, mathematical induction can be considered as special case of structural induction.
27	Is there any news on the mock exam?	Not yet. But it will definitely be during the last two weeks. Modalities I have to figure out.
28	why we stopped at 15 for the basis step??	Because from there we can apply the inductive step. Actually it would not matter. You could give directly the solution up to any integer you like and then apply induction, but it is a waste of time :)
29	Is there an easy way to decide, which induction method to use?	Between mathematical and structural induction, yes. Mathematical induction cannot be applied to any set that has been defined using structural recursion. Between mathematical and strong induction, no. You have to study the problem. You may start using mathematical induction and if it does not work you can try with strong induction.
30	why the +1?	live answered
31	could we not have been able to do this by normal induction i think it might be very helpful to do the same proof with all 3 types of induction so we really understand the difference if this is possible... thank you	Good suggestion. I will try to find a good example and make a video.
32	would it be possible to eventually maybe have a cheat sheet of some chapters containing the key elements of the course?	A cheat sheet is not foreseen for the exam. We will however consider in the design of question the fact that you do not have one.
33	can you maybe show the previous slide next too the one you are writing, will make it easier to follow for me at least in general	Would be nice if possible. At the moment I do not see how I could do it with the available software.

#	Question	
34	Did you get the message from the assistants about the series of exercises ?	I do not know which question you are referring to. If you want to share it with me, please send me an email.