RECURSION FAIRY TALE*

Imagine the Queen of the land has a golden crown, which is a list with 100 elements in it. She turns to you, the Court Programmer, and asks "Oh programmer, I've heard you can answer nearly any question. Can you tell me if my crown is made purely of Qs?"
You think to yourself: "gee, I have no idea how to do this. I only know how to tell if an individual element is a Q. And I haven't learned the Iteration spell yet to loop through everything in crown/list"

However, then you remember that you know the Magic Recursion Fairies outside the queendom in the haunted forest, and rumor among your fellow programmers is that they can do virtually anything. So despite not having an answer at your finger tips, you tell the queen "I can't tell you right this second, but if you lend me your crown for the day, I can give you the answer by nightfall". So the queen entrusts you with the crown and you sneak off to the haunted forest to get the answer from the magic recursion fairies to get the answer, which you plan on relaying to the queen

So, after some harrowing adventures fighting off the Turing Monster and wading through the hexadecimal swamp, you and the crown find your way to the fairy grove, and you say "Fairies, I have traveled far to beseech you and your powerful recursion magic. Can you please tell me if this crown is All Qs?"

The Fairies reply in their twinkling voices "Indeed, we can help you and are happy to do so, since we long to use our Recursion Magic on noble problems. The only thing we ask is that **you never question the correctness of our answer nor wonder how we obtained our answer.** Just know that is is obtained solely through our powerful Recursion Magic, and you can rest assured that any answer we give you is 100% correct"

You breathe a sigh of relief, since you don't really care right now about *HOW* the answer is obtained, all you want to do is fulfill your promise to the Queen. You start to hand over the crown to them for them to work their magic, however, the Fairies sadly turn away! They exclaim: "we're sorry, but that crown is **too big** for our Recursion Magic to work. The Queen has 100 elements in her crown list, but our spell only works on lists of double digit length., so regretfully, we can't even begin to tell you the answer as to whether it is All Qs or not"

You are about to cry out in despair and head back defeated, when suddenly a bit of logic inspiration hits you! You break off the first element of the crown and hide it in your pocket. Since you do know enough programming knowledge to handle a single individual element (as opposed to a whole list like the crown), you take a peek at that piece and are able to discern that indeed it is a genuine Q! Rather than continuing to do this and break off piece after piece of the crown (the "iterative loop" way of that shyster talking snake Python), you take the rest of the crown and present it to the fairies. "Oh Fairies, before I depart your forest realm, can you take a look at this (ahem) *different* crown? Perhaps you can work your Recursion Magic on this one instead?"

The Fairies take the crown from you and exclaim after the briefest touch "ah yes, this crown has just 99 elements in it, and so is within our divining powers. Our recursion magic tell us that YES, this slightly smaller crown is in fact made of All Qs!", and they hand the crown back to you , happy to have been able to help you and to put their powers to use.
You take the crown and pull that first Q piece back out of your pocket from hiding and pop it snugly back into its inset place at the front of the crown. Even though the Fairies wouldn't look at this original crown, you realize that you can nonetheless figure out an answer for it by combining the knowledge you know about the single piece together with the answer the Fairies gave you about the partial crown.

You return back to the queen just before sunset declaring "My Queen, I can answer the question you asked me this morning about your crown. And i have wonderful news: it is indeed the purest of Qs!" And with that, your reputation as a Master programmer is cemented throughout the queendom, and they all lived happily ever after (well, until that evil busy beaver started rampaging the countryside, but that's for another tale)

Now here are my questions to you, dear reader:

(a) suppose you popped out that first piece of the crown, and you noticed that it was ***not*** a Q. Would you still have had to make a trip to the forest to visit the recursion fairies to obtain an answer for the Queen?

(b) suppose that piece in your pocket was a Q, but after the recursion fairies looked at the rest of the crown, they declared "No, this smaller crown is ***not*** All Qs". Then what could you have deduced about the whole crown?

The moral of the story is this: whenever writing a recursive function, I pretend like i have access to Magic Fairies that already know how to answer the question I need... EXCEPT they can only do it for smaller input than the one I have. So, I have to think about how I can use the answer the Fairies give me to get the answer i need (usually this entails modifying the answer in some way by incorporating with other knowledge I have, such as from the first element)

* based on a concept originated by Jeff Erikson
http://jeffe.cs.illinois.edu/teaching/algorithms/book/01-recursion.pdf