## 4. DEBUGGING

## Patient Debugging

**Fixing Regular Expressions Sometimes Isn't Easy**
Now that we have seen some Regular Expressions, it's important to note that writing the Regular Expression often isn't the hard bit, it's when we try to run it, and it gives us lots and lots of wrong matches, and sometimes it can be hard to figure out exactly what the problem is. So we have to have the patience and persistence to review each part of the Regular Expression (as well as the rest of the program that the RegEx is in) to see if we can identify the problem. And often we have to stare at the RegEx for a few minutes before we will, in a flash, figure out what's wrong. This is not easy, and it requires a lot of determination, because often when we have figured out (and fixed) one bug, another one follows. So, we have to type in our Regexes very carefully, and review each part as we write it. And when we are finished writing a RegEx, and go to run it, we need to accept that it may not work correctly the first time, and when we fix the initial bug, there may be another, and another.

**Breathing**
Fixing RegExes can be a bit stressful, and the longer we are working on a single one, the more frustrated we can get. This can lead to short-term thinking, where we move parts of the RegEx around at random in hopes that it will fix itself. Try to avoid doing this, and try to avoid getting stressed, by breathing. There are a variety of breathing techniques that can be used to calm down, including the following:

- *Left Nostril Breathing*: As the name suggests, just close your right nostril off, and breath in and out through your left nostril slowly, with your eyes closed. This creates a calming effect in your nervous systems within minutes.
- *7-2-11 Breathing*: Breath in through your nose for 7 seconds, hold the breath for 2 seconds, and exhale through your mouth for 11 seconds. This takes a bit of practice, but after a few days of 4-8 sessions a day, you will master it.

**Take a Break**
One important trick to know is when to take a break; so if I am staring at an bug and I can't figure it out, my rule of thumb is after 7 minutes I walk away from the computer and get a glass of water and stop thinking about it for 2-3 minutes. More often than not as soon as I return to the computer, I know exactly the bug is, because I gave my unconscious mind time to work on it, and can fix it in no time.

**Cardboard Helper**
Sometimes the easiest way to fix a bug is to ask someone for help, and you will find that as soon as you say to someone "*Excuse me, can you help me with this problem…*", even before you have even outlined the problem, you know what the solution is, because you got a chance to think about it in a different way. In fact, you don't really need another person, just get a cardboard cutout and ask them for help.