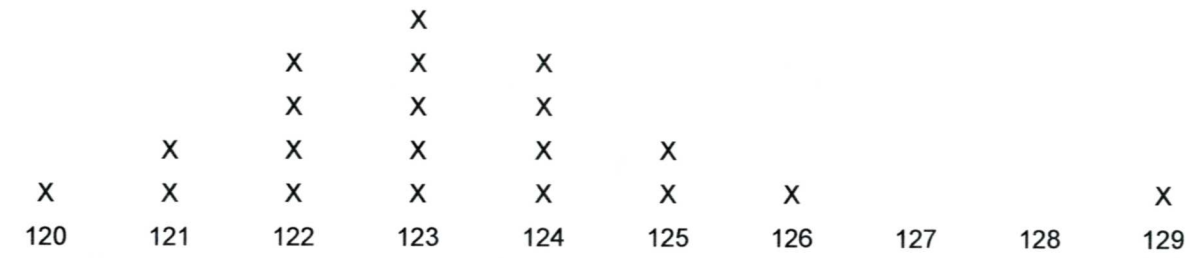
Let's put these results onto a graph – always remember that the first thing you need to do with stats or figures is to look at them, not start performing calculations. The human eye is a wonderfully sensitive and useful instrument. Use it before you start performing stats calculations in the hope that you will achieve some sort of clarity or understanding. Graph the figures and look at them to see what the spread of results looks like. We will make the x-axis (the horizontal one) represent the values we obtained, and the y-axis (the vertical one) the number of times we obtained that particular value.



Right, now this graph, called a frequency graph shows several important things.

First, there is that result that doesn't seem to belong, the one at the right hand side in the "129" column. What does it look like to you? Well, it should look like an outlier, a result that is due to random error and not systematic error. Let's define those two different sorts of errors here, although both will be much discussed in a later module.

Systematic error
Systematic errors are those that are constant. If for example your method is reading higher or lower than it should, you would call that a positive or negative bias. And a bias indicates a systematic error, which is the same as saying that you have an accuracy problem.

Random error
This is an inconsistent or totally unpredictable error. The dictionary definition of 'random' is 'haphazard'. A single random error, such as the value of 129 above may not have any significance but several random errors will mean that there is an increase in imprecision. So, in contrast to a systematic error, a random error means that there may be a precision problem.

Second, the remaining values seem to fit into a neat pattern. In fact the pattern is called a Gaussian curve, or normal curve and is a statistical phrase that describes the distribution of some result sequences. This is an important observation for it indicates that a whole range of statistical calculations can appropriately be performed on this group of results. Thus we can now do mean and SD calculations and know that the results we obtain will be useful to us. The opposite also applies. If the graph we see from our control sample do NOT show this type of curve, or something close to it, we CANNOT work out the mean and the SD and use them to control our future control results.