In 1884, a German physicist by the name of Ludwig Boltzmann set out to explain apparently random phenomena in thermodynamics. In 1895, he published a paper entitled "entropy" where he laid down the foundation for statistical theory. The basic gist of statistical theory is that it's based on "random variables". The term "random variables" may sound too esoteric for you but don't worry about that just yet! From this point onwards we'll be very clear and you should have no problem understanding all of it. So what exactly is a random variable? A good way to think about a random variable is as a "variable quantity or quality. This sounds unhelpful because we want to specify some characteristic of a quantity or quality. For example, if we're talking about height then it's very helpful if we know the height of the person in question, but it would be just as helpful if we knew their weight or whether they were left-handed instead! So, unhelpful though that description may be, there is a useful sense in which a random variable is a variable quantity or quality. So for example let's take a very simple example. Suppose you have a bar of gold whose length is measured to be 2 cm and whose width is measured to be 1 cm. The bar of gold can be thought of as a "random variable" because its length and width are unpredictable. In other words, no matter how many times you measure that bar of gold, it will most likely come out somewhat differently each time. There is a different variation for every single measurement. So from our point of view it is a "random variable". Now, in statistical theory the word "variable" is often used to mean a variable quantity or quality so when someone says a random variable, they could just as well have said a random quantity or a random quality. In fact the word "random" is usually used by statisticians in place of the word "variable". So when we refer to a "random variable", what we're really saying is that it's some entity that possesses some degree of variability. When we say "variability" we usually mean something a little more specific than simply describing something as being unpredictable. What we usually mean by variability is that an entity is unpredictable within certain limits. For example, a football team's performance is unpredictable within certain limits. In statistical theory, these "limits of variability" are known as the "limits of randomness". So now we've got a few words we can use to describe quantities and qualities: quantity, quality and variable. So, let's think for a moment about all of the variables we can possibly have in our universe: variables quantities and qualities However, what we're never going to be able to do is specify which of those variables are real and which aren't! For example I could measure the temperature at your flat right now and say that it's "29 degrees Celsius".

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