What is a **genome**? In order to understand a genome, we to look at three things: DNA, genes and chromosomes. Let's look at DNA first. The body is made up of trillions of cells.

**DNA** is a long molecule contained within the nucleus of all of our cells. It contains our unique genetic code. Just like a recipe book or a blueprint for a house, DNA contains the instructions needed for us to develop, live and reproduce. DNA stands for deoxyribonucleic acid. It is made up of two strands that wrap around each other to form a double-helix shape, like a spiral staircase. The strands are connected by molecules called nucleotides. Nucleotides are like the steps of the staircase, and each step is made up two different nucleotides. There are four different nucleotides.

They are called adenine, cytocine, guanine and thymine. These are known by their initials, A, C, G, and T. Only certain pairings of nucleotides are possible. Adenine always pairs with thymine, and guanine always pairs with cytosine. The order of these nucleotides, known as the sequence, determines our unique genetic code. However, in some cases, the sequence that we inherited from mum and dad contains arrows, known as mutations. A mutation occurs when there is a missing letter. Or if the sequence is incorrect, mutation can lead to health disorders, such as sickle cell anaemia or cystic fibrosis. In other cases, we can inherit a correct sequence, but mutation can occur when cells divide. This can lead to disorders, like cancer.

**How does DNA make us who we are?** To answer this, we need to look at genes. Genes are a small section of DNA that carry the instruction for making protein molecules. We say that they code for proteins. Proteins do most of the work in the cell, carrying out all the functions necessary for life. Humans have about 20,000 to 23,000 genes, which call for different proteins. Because proteins are essential for the structure and function of our organs and tissues, something goes wrong at this stage, it can affect how our bodies work. **Genes** are organising chromosomes. Chromosomes are spaghetti-like structures and come in pairs. Humans have 23 pairs of chromosomes, one set from the mother, and one set from the father.

A **chromosome** is made up of a very long strand of DNA containing 500 to 4,000 genes. Different species of plants and animals have different numbers of genes and chromosomes. So what is a genome? Well, a genome is a whole set of an organism's chromosomes, and therefore, genes. If we could read a person's whole genome, it would like accessing the blueprint for the body functions. You could zoom in and out of it, and move around it like you might with an interactive map of the world. You could see all the detail you needed in order to understand how the human body works. However, although we have most of this information, scientists are still trying to understand it.

We are still exploring this map. With this knowledge, we can look at the genome for a cancerous tumour and understand which mutation of a code that have caused it to grow. We could understand how it works and perhaps how to stop it. Genomics, the study of genomes, can help us to recognise and find harmful mutations. The better we understand this map of our genes, the more we would be able to provide individual, personalised healthcare solutions.