

MATHS TREATS

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THE POSSUM



DNA

DNA is short for deoxyribonucleic acid. It is a macromolecule containing up to billions of atoms. Most DNA is stored in the nucleus of a cell. DNA stores the biological information (or genetic instructions) that influence how our cells, and thus our body, will develop, function, and reproduce.

DNA STRUCTURE



The structure of DNA is famous for the double-helix formed by the intertwining of two strands which store the paired biological information. It can be helpful to think about DNA like two intersecting spirals with rungs which make it look like a twisted ladder.

ACTIVITY

Use geometry software to develop polynomials which model a single spiral, and then try to model the twisted ladder formation of the DNA double-helix. Investigate the process of cell division and how this has influenced the development of knot theory.

DNA SEQUENCES



The vertical part of the twisted ladder is made up of an alternating sugar-phosphate backbone. Attached to these backbones are nitrogenous bases called cytosine (C), guanine (G), adenine (A), or thymine (T). Each nitrogenous base is connected by a hydrogen bond to a nitrogenous base on the opposite backbone forming the rungs of the ladder, and these connections follow base pairing rules – A pairs with T, and C with G. Amino acids are formed by triplets of nitrogenous bases along the sugar-phosphate backbone.

ACTIVITY

Read more about the composition of DNA on the web. Compare the nitrogenous number of bases in human DNA to other living things. Compare the proportion of bases which are the same amongst humans and other organisms. Investigate how the order of the bases impacts an organism. Is the DNA of an individual unique?

REFERENCES AND FURTHER READING

DNA

DNA <https://en.wikipedia.org/wiki/DNA>

DNA STRUCTURE

Topology <https://en.wikipedia.org/wiki/Topology>

Graph theory https://en.wikipedia.org/wiki/Graph_theory

Mathematical Properties of DNA Structure in 3-Dimensional Space
[www.emis.de/journals/IJOPCM/files/IJOPCM\(vol.1.3.4.D.8\).pdf](http://www.emis.de/journals/IJOPCM/files/IJOPCM(vol.1.3.4.D.8).pdf)

Knot theory https://en.wikipedia.org/wiki/Knot_theory

That Knotty DNA www.ams.org/samplings/feature-column/fearc-knots-dna

DNA SEQUENCES

What is DNA? <https://ghr.nlm.nih.gov/primer/basics/dna>

DNA sequencing https://en.wikipedia.org/wiki/DNA_sequencing

DNA sequencing theory https://en.wikipedia.org/wiki/DNA_sequencing_theory

IMAGES

Leadbeater possum - Steve Kuitert

Other images - Pixabay