Finding Fibonacci

Is everything mathematical? This workshop challenges your pupils to take a second look a the world around them and discover the mathematical patterns hidden in nature.

How long? Two hours

Who? Year 5-7, Maths.

Where? The Core workshop room, Mediterranean Biome and Rainforest Biome.

Students will:

- Use observational skills to collect a primary data set from the natural world.
- Extrapolate the Fibonacci sequence from their data set and look for further evidence in the world around us.
- Understand the significance of maths and mathematical patterns in shaping the world around us.

Curriculum Links

At Key Stage 2, Maths, students should be taught to perform mental calculations, solve problems involving addition, subtraction, multiplication and division and generate, identify and describe linear number sequences. At Key Stage 3, Maths, students should be taught to generate terms of a sequence from either a term-to-term or a position-to-term rule and recognise arithmetic sequences and find the *n*th term. They should develop their mathematical knowledge to solve problems.

What Happens?

Students are sent on a journey around the biomes to collect a plant based data set. From the class data set they then identify commonly occurring numbers which lead them to the Fibonacci sequence. Using further examples from the natural world and a geometric drawing activity they begin to realise that mathematical patterns are at work all around us, from the spiral shapes of the Milky Way to the packing of seeds in a sunflower head. Finally students are challenged to investigate Eden's iconic 'Seed' and take a closer look at the Core building to see how people, art and architecture have also been influenced by this intriguing sequence of numbers.

Location: This takes place in a workshop room inside our purpose built education centre, as well as in our biomes. Which biomes are used will be dependent on the time of year.

Practicalities

Please ensure your group is divided into workshop teams, each with an adult helper.

Our Education Team will lead your workshop session, but the participation of your staff is essential to the success of our programmes. We provide all the equipment for the workshop.

Our programmes are focussed learning experiences; they do not provide a general introduction to Eden Project, so please allow sufficient unstructured exploration time for your students during your day.

Additional information is on our website
www.edenproject.com

eden project

Finding Fibonacci – Ideas to support your visit
Activities related to this workshop could include the following dependent on your group and their ability

Before you come

- Review the structure and function of a flower – particularly the distinction between sepals and petals.
- Ensure that your students are familiar with using the tally system and frequency tables.
- Practice identifying simple patterns in number sequences appropriate for the ability of your group. Can the students identify the 'rule' for any particular sequence? More able students might be able to look at square, cube and triangle number patterns and more complex number sequences. Perhaps they could design number patterns for their peers to try and crack?
- Where do we find spiral shapes in nature? Take your students outside or go online and search for spiral shapes and patterns in the plant and animal kingdom. Students could create a collage or photograph their discoveries. This will lead nicely into the content of the workshop.

Follow up

- Younger students could plant and grow their own sunflowers. You should sow the seeds in April or May and record the growth of each plant. Students can design an appropriate table to record the growth and watch for the development of the seed heads. Can they identify the spiral arrangement of the seeds? Is it possible to create casts of the seed heads using plaster of Paris?
- Create a piece of artwork inspired by what you have learnt about the Fibonacci sequence and its role in the world around us.
- Some students may be able to take the work from the workshop a step further and begin to investigate golden rectangles, the golden ratio and its occurrence in art and architecture. This could provide a basis for their own artwork.
- Go foraging and collect a class set of pinecones. Get the students to count the spirals in each direction. Are they Fibonacci numbers? It's easiest to count the spirals on pinecones that have not yet opened up.
- Set up a debate – 'The occurrence of the Fibonacci sequence in nature and the world that humans have created is pure coincidence'. Ask the students to try and collect evidence to support or refute this statement. They could create a 'for' and 'against' wall on each side of the classroom and stick evidence to each side. Who can develop the most convincing arguments? This activity can be differentiated easily for different abilities.
- Investigate Fibonacci in fruit and vegetables. Ask the students to help you collect a wide selection of fruits and vegetables. You need as many different types as possible. Ask the students to examine them very carefully and look for any evidence of Fibonacci numbers. They can do this by first examining the outsides of the fruit and veg - how many leaves do they have and how are they arranged? Are there any patterns/spirals on the outside? Do they comprise of different compartments? Cut through them in different planes – can they identify different numbers of sections? Try these to start with; peppers, bananas, apples, starfruit, tomatoes, cauliflowers, lettuce.

Useful Websites

www.maths.surrey.ac.uk/hosted-sites/R.Knott/Fibonacci/fib.html This webpage provides a good summary for teachers about Fibonacci and the golden ratio together with ideas of activities to do with your class. There is a wealth of really useful information here – although the site isn't particularly easy to navigate.

http://momath.org/home/fibonacci-numbers-of-sunflower-seed-spirals/ This webpage has useful diagrams to how to count spirals.

www.edenproject.com/whats-it-all-about/climate-and-environment/sustainability-at-eden/how-we-built-the-core Visit this webpage and find out more about Eden's iconic Core building and Seed sculpture, both of which are based on the Fibonacci sequence.

http://www.mensaforkids.org/teach/lesson-plans/fabulous-fibonacci/ This webpage provides some useful activities for KS2 students about Fibonacci.