MATH IN NATURE

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MATH IN NATURE – THE FIBONACCI SEQUENCE AND THE GOLDEN RATIO
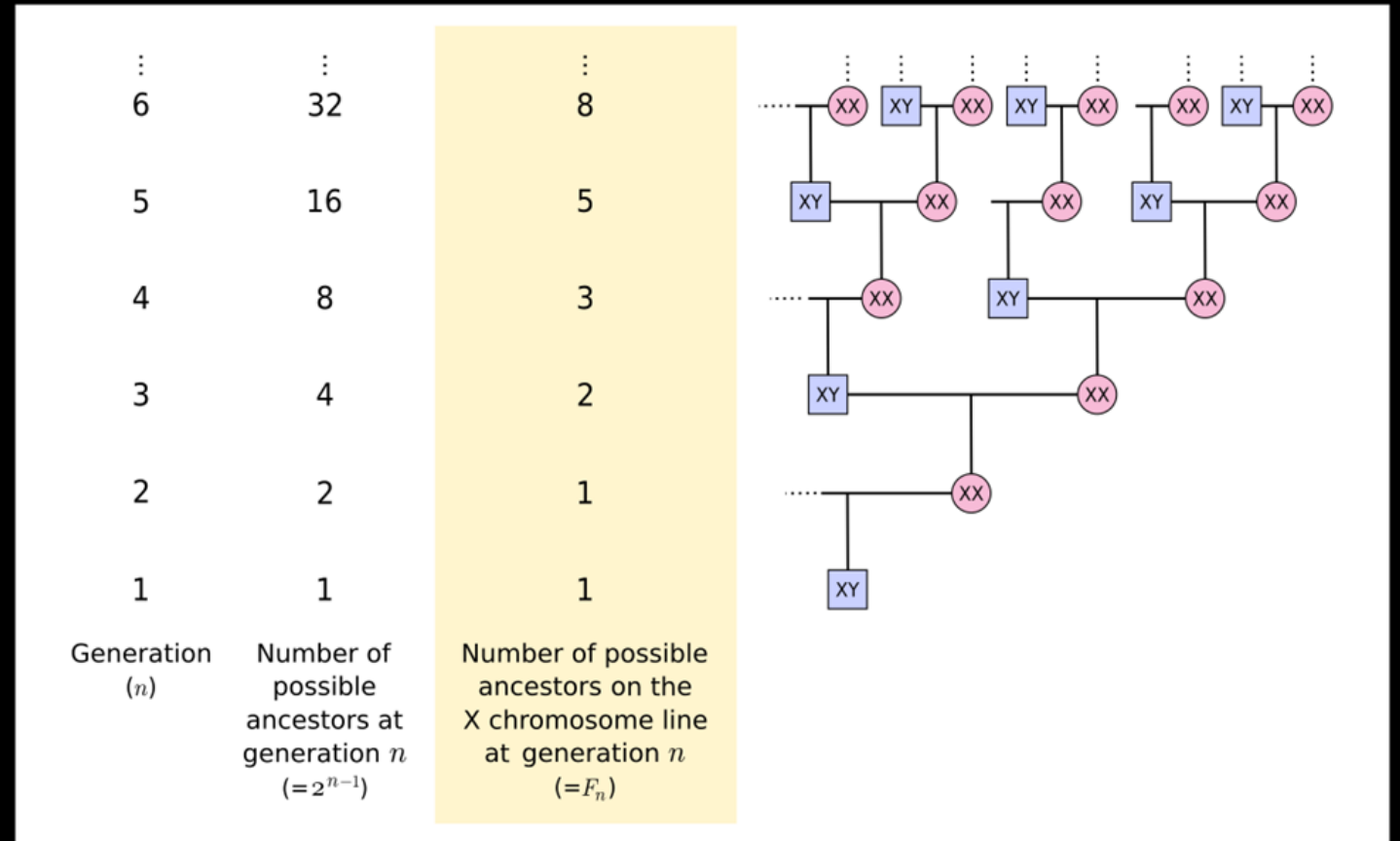
- Remember the Fibonacci Sequence?
  0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, …

It shows up in the most interesting places!

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MATH IN NATURE – GENETICS & THE FIBONACCI SEQUENCE

In a paper by Luke Hutchison titled "Growing the Family Tree: The Power of DNA in Reconstructing Family Relationships," it was shown that the number of ancestors on the X chromosome line follows the Fibonacci Sequence.

| Generation (n)	Number of possible ancestors at generation n $(=2^{n-1})$	Number of possible ancestors on the X chromosome line at generation n $(=F_n)$
6	32	8
5	16	5
4	8	3
3	4	2
2	2	1
1	1	1

MATH IN NATURE – GOLDEN RATIO & HUMAN ARM

- The ratio between the forearm and the hand is the Golden Ratio.   Not sure how? Ask for a ruler and measure your hand and forearm.
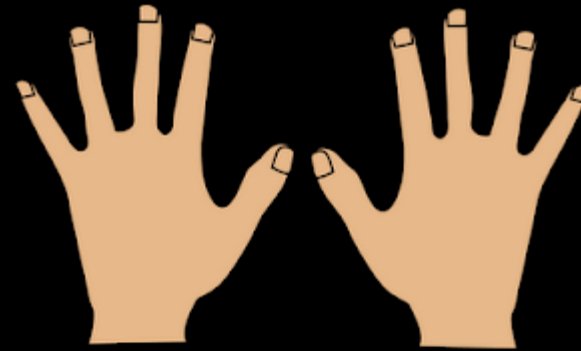
MATH IN NATURE - FIBONACCI SEQUENCE & BONES

- The bones of your finger (including the bone from your knuckle to your wrist) follow the Fibonacci sequence.
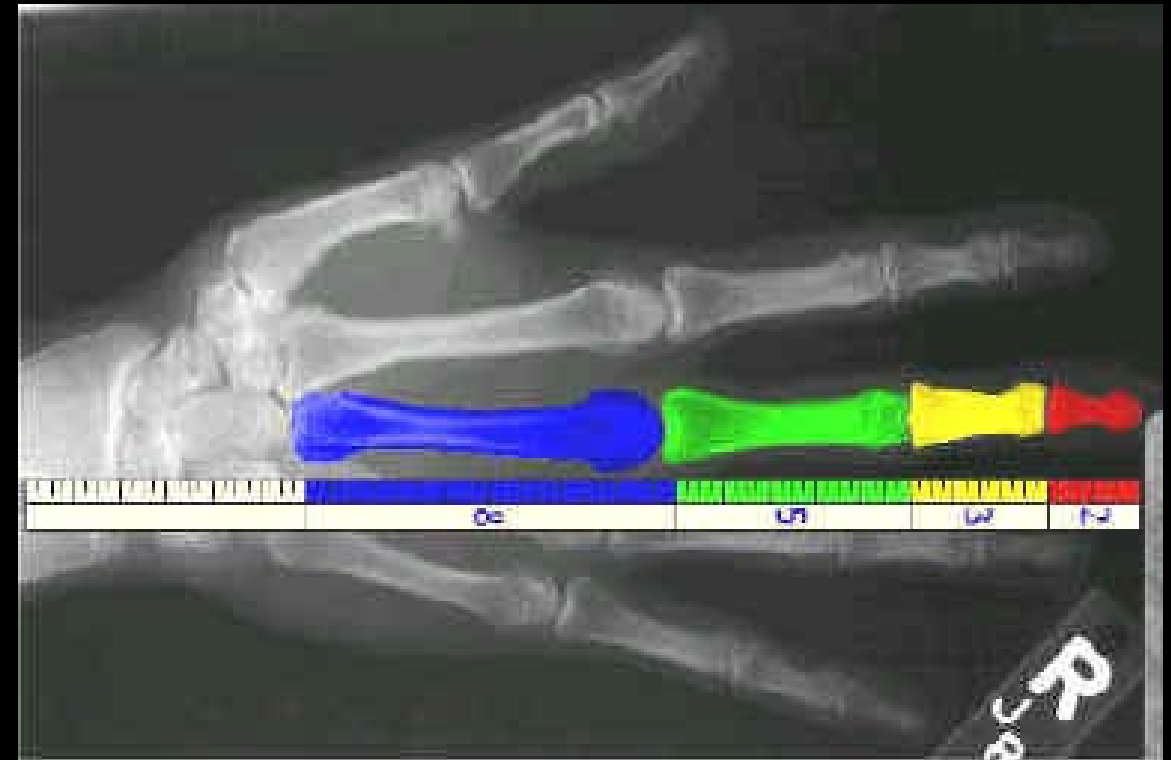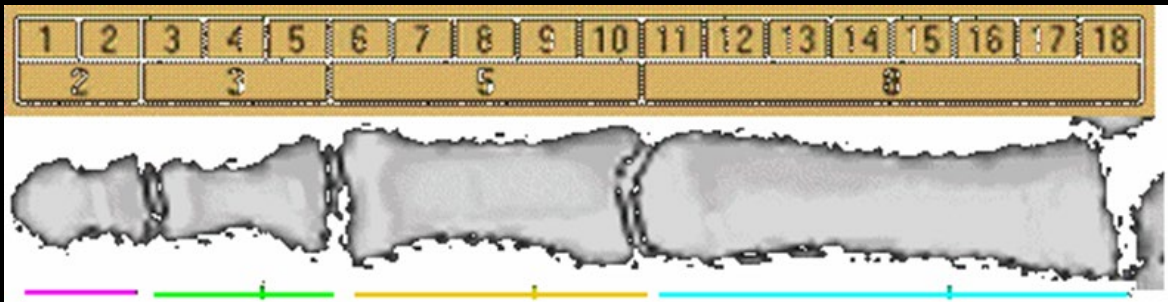
MATH IN NATURE - FIBONACCI SEQUENCE & FINGERS

- We have 8 fingers in total, 5 digits on each hand, 3 bones in each finger, 2 bones in 1 thumb, and 1 thumb on each hand.

MATH IN NATURE – FIBONACCI & FLOWERS

- Many flowers also exhibit the Fibonacci sequence.

The Fibonacci sequence in nature: Flowers
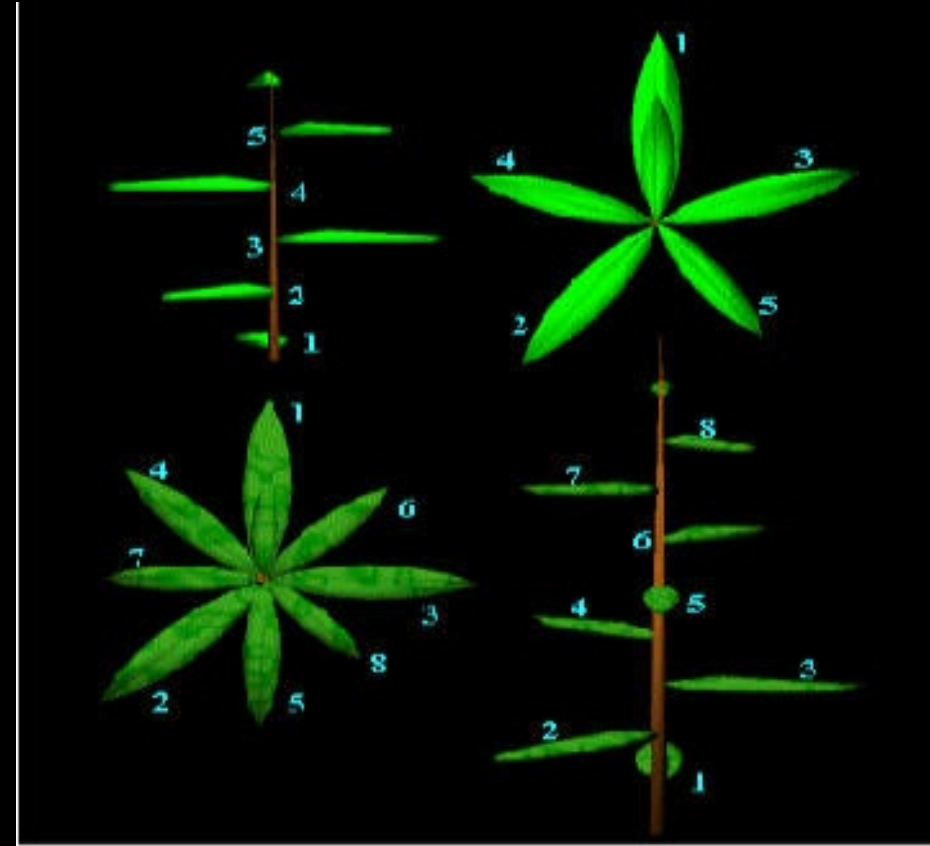
1 Petal

3 Petals

5 Petals

8 Petals

13 Petals

- Leaves will form in such a way to maximize sunlight exposure. Notice how, given this fact, plants seem to exhibit Fibonacci properties.
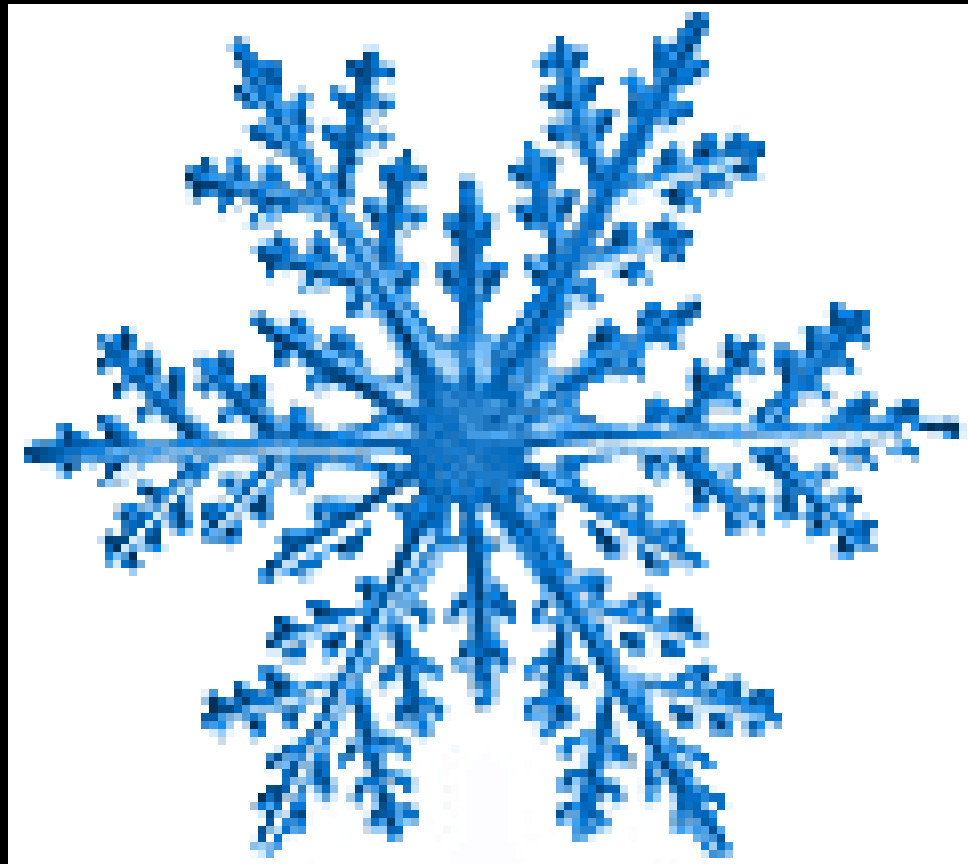
- The human ear forms a Golden spiral.
- A [Fibonacci spiral](#) approximates the golden spiral using quarter-circle arcs inscribed in squares of integer Fibonacci-number side, shown for square sizes 1, 1, 2, 3, 5, 8, 13, 21, and 34.
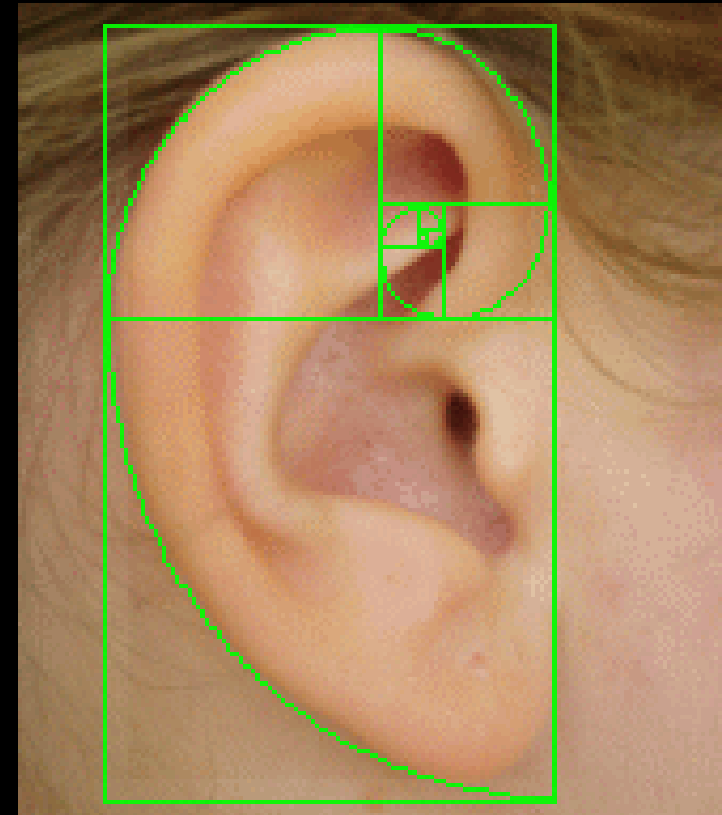
MATH IN NATURE: EXPONENTS & RABBIT BREEDING

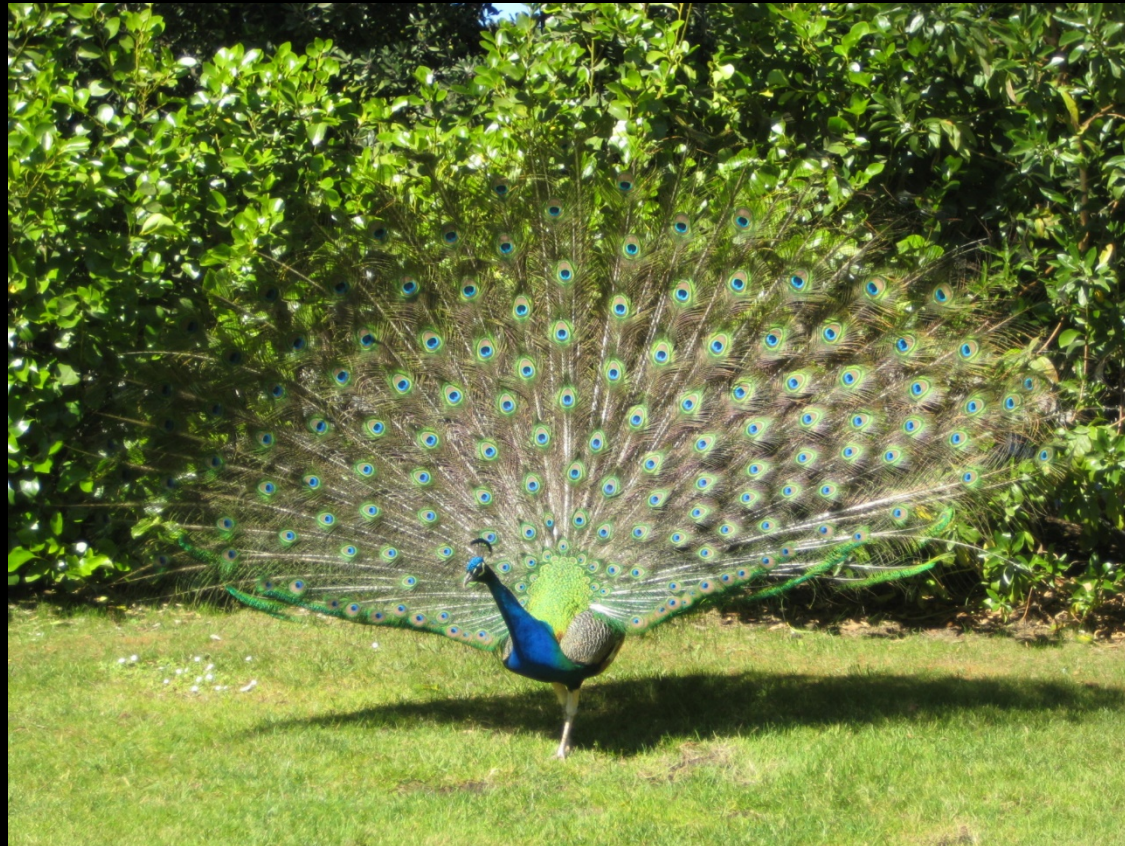# MATH IN NATURE: ROTATIONAL AND LINE SYMMETRY AND SNOWFLAKES

MATH IN NATURE: LINE SYMMETRY AND THE HUMAN FACE

MATH IN NATURE: SYMMETRY AND STARFISH

MATH IN NATURE: SYMMETRY AND PEACOCK

MATH IN NATURE: SYMMETRY AND SPIDER WEBS

MATH IN NATURE: FIBONACCI SEQUENCE AND SUNFLOWERS

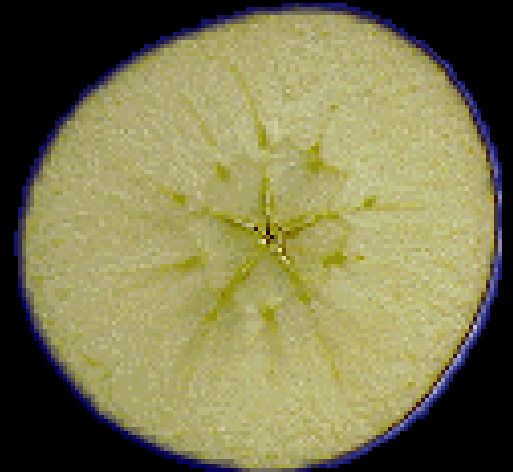# MATH IN NATURE: HONEYCOMBS AND HEXAGONS

MATH IN NATURE – FIBONACCI AND FRUITS

- If you cut a fruit or vegetable, you will often find that the number of sections is a Fibonacci number.

BANANA

APPLE

MATH IN NATURE – PINECONES & FIBONACCI

The image under the green and red spirals is a pinecone. Notice that the spirals follow the shape of the pinecone. Count the green and red spirals. Notice anything?