Fibonacci Spirals In Nature

Fibonacci numbers are generated by simply adding the previous two numbers to get the next one. So, the Fibonacci Sequence is:

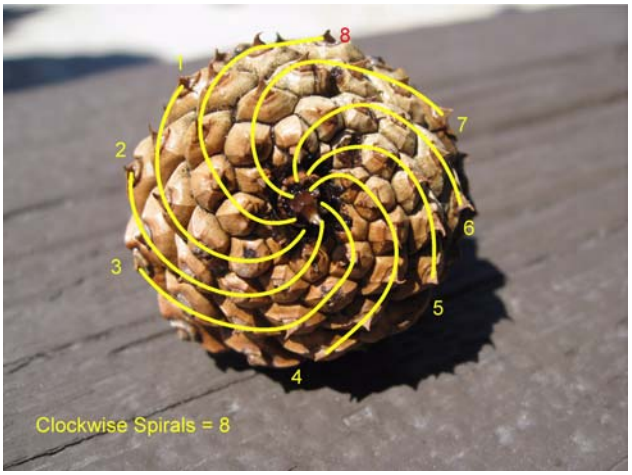
1, 1, 2, 3, 5, 8, 13, 21, 34, 55, . . .

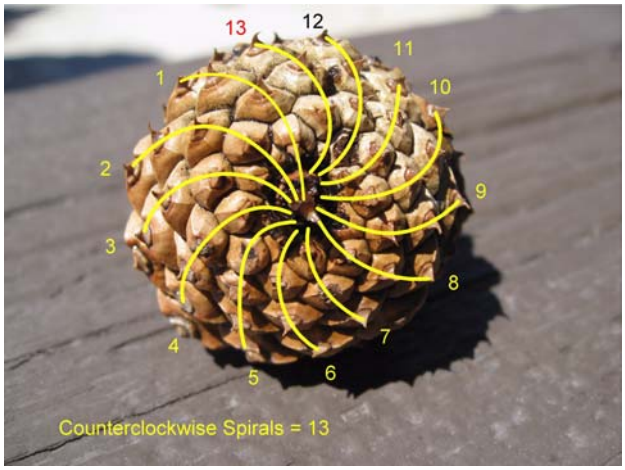
See how it works?

Fibonacci numbers appear in many unexpected ways in nature. We don't know exactly why, but because of the way these numbers are generated, they seem to relate to growth. I mean - systematically building on what has come before – doesn't that seem like growth?

Not all natural things exhibit Fibonacci numbers in their structure, but look at the spiral patterns we find in pictures below. You will see both clockwise and counterclockwise spirals. In an overwhelming number of cases they seem to be sequential Fibonacci numbers.

Pinecones (CW = 8 and CCW = 13)





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Sunflowers (CCW = 21 and CW = 34)

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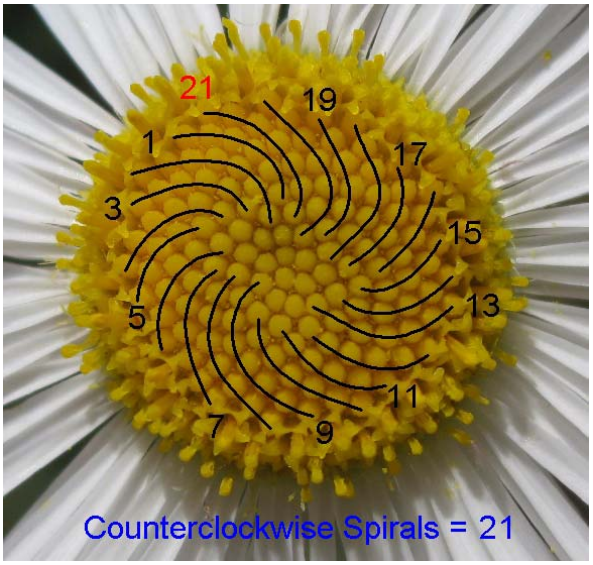
Daisies (CW = 13 and CCW = 21)



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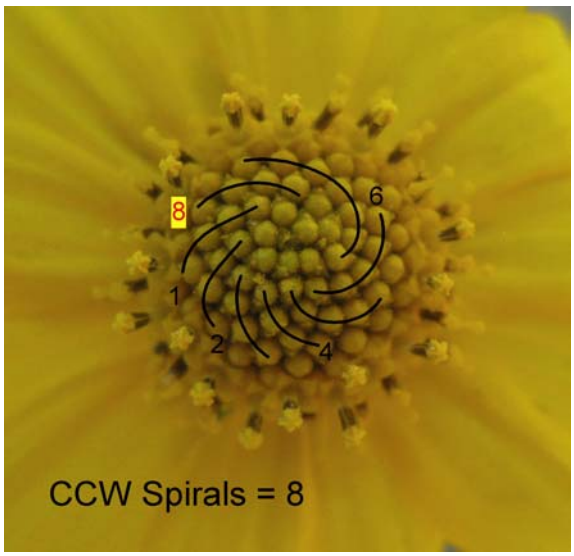
Yellow Flower (CW = 13 and CCW = 8)



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Here's a summary of clockwise and counterclockwise spirals we have found.

Object	Clockwise Spirals (CW)	Counterclockwise Spirals (CCW)
Pinecone	8	13
Sunflower	34	21
Daisy	13	21
Yellow Flower	13	8

Questions

1. For the Pinecone and Daisy the number of CCW spirals was greater, but for the Sunflower and the Yellow Flower the number of CW spirals is greater. For each species will this always be the case?
2. For each species will the numbers be the same or do the numbers get bigger with growth?
3. Go out and find some of these things. Look at them closely. Are one set of spirals (CW or CCW) easier to see than the other?
4. In each case we have seen so far, the number of spirals represent two consecutive Fibonacci numbers. Will that always be the case? Why?