Solutions

Chapter 12: Project: Choosing the best algorithm

Defining, page 90

1

Table 12.1

pine cone	Numbers of spirals in each direction are two Fibonacci numbers.
sunflower plant	Numbers of spirals in the pattern of seeds on head of flower in each direction are always Fibonacci numbers, depending on the slope of the spiral chosen. See http://momath.org/home/fibonacci-numbers-of-sunflower-seed-spirals/
golden rectangle	Ratio of two Fibonacci numbers approaches the ratio of the sides of the golden rectangle and is more accurate the higher the numbers are in the sequence. Approximately 1.61803398875.
nautilus shell	When golden rectangle is dissected to form a square, the remaining rectangle is another golden rectangle, and so on. A spiral drawn through these divisions forms the shape of the nautilus shell.
Parthenon	Ratio of width to height is golden ration when viewed from front.

2

Table 12.2

Index	0	1	2	3	4	5	6	7	8	9	10
Fibonacci number	0	1	1	2	3	5	8	13	21	34	55

Designing, pages 91–2

7 No time delay

Table 12.3

Index	28	29	30
Fibonacci(index)	317811	514229	832040

Implementing, pages 92–3

6 Google Sheets is slower than Excel. Do you know why?

Table 12.4

Index	21	22	23
Fibonacci(index)	10946	17711	28657
Time taken (sec)	*Results will vary*	*Results will vary*	*Results will vary*

Evaluating, pages 93–4

2   Recursion uses less code, is more mathematically elegant but is difficult to design and difficult to test. Iteration uses more code, is less mathematically beautiful but is easier to design and test.