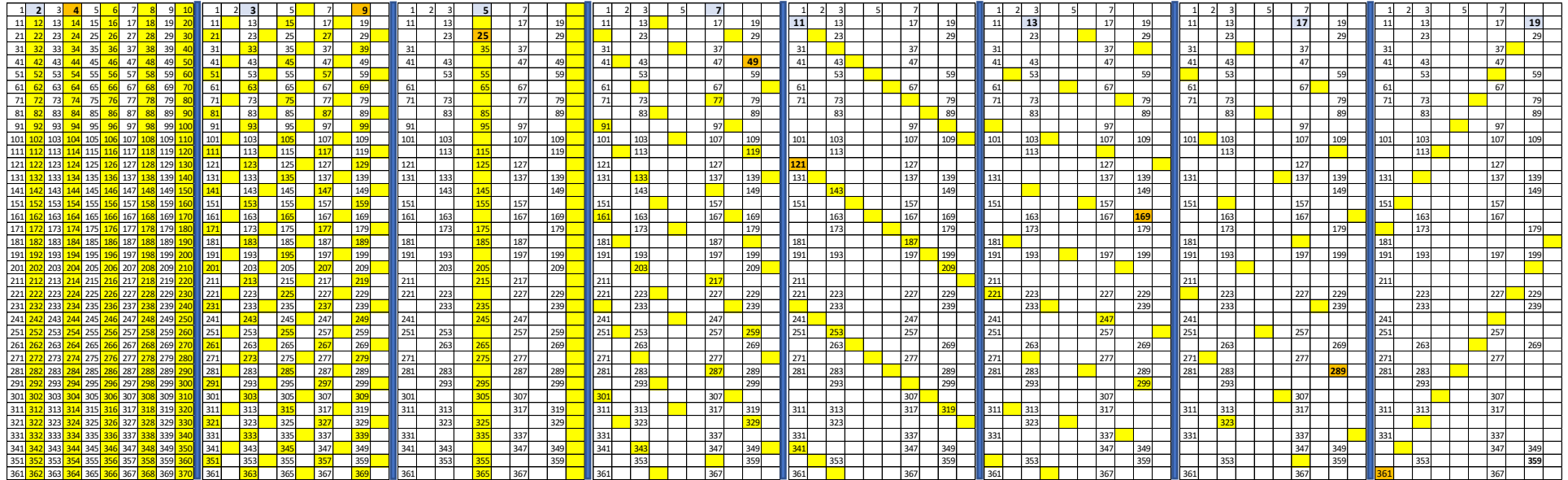


Identifying prime numbers using the ancient Sieve of Eratosthenes (from the 3rd century BC)



-	2	3	5	7		
11	13	17	19			
		23				
31				37		
41		43		47		
		53				59
61				67		
71		73		79		
		83				89
				97		
101		103		107		109
		113				
131				127		139
				137		149
151				157		
		163		167		179
181						179
191		193		197		199
211				227		229
		233				239
241						
251		263				269
271				277		
281		283		287		289
		293				299
301				307		309
311		313		317		319
321				323		329
331		333		337		339
341		343		347		349
351				353		359
361		363		367		369

The Greek mathematician Eratosthenes proposed a simple mechanism for finding prime numbers. *Primes are numbers that cannot be obtained as the product of two smaller numbers.* If a number can be expressed that way, it is a *composite* number. The 8 panels above show the first 8 iterations of the sieve and the images below show the results: there are 73 primes less than 370 (370 was chosen because some graphics in the Cardioid file use images with up to 361 vertices (note that $361 = 19^2$)).

The Sieve works by systematically eliminating composite numbers using the composite patterns **highlighted** in each panel.

The first panel highlights all numbers which are multiples of 2. These numbers are removed (except for 2) in Panel 2 which highlights all multiples of the next number, 3. These are removed in Panel 3 and all multiples of next remaining number, 5, are highlighted. Each time we remove highlighted numbers (except for the first) we then highlight multiples of the next remaining number. This number is the next prime. The tables to left and right show the results based on the first 8 primes.

The general pattern in each panel is shown in yellow. The first number to be removed is highlighted in **gold**. This number is the square of the prime associated with that panel (since all highlighted composites less than this are multiples of this prime and an (already removed) smaller number).

How can this be extended? Suppose you want to know whether 797 is composite or prime. The square root of 797 is 28.23... . Since this is less than 29, you need only examine the first 9 primes (2, 3, 5, 7, 11, 13, 17, 19, 23). It turns out that it is, indeed, prime (but 799 is composite since $799 = 17 \cdot 47$).

Composites by Panel based on Prime to Delete			Remaining in Sieve	
Panel	Prime	Delete	less number 1	370
1	2	184	even	185
2	3	61	divisible by 3	124
3	5	24	divisible by 5	100
4	7	13	divisible by 7	87
5	11	7	divisible by 11	80
6	13	4	divisible by 13	76
7	17	2	divisible by 17	74
8	19	1	divisible by 19	73

The Panel 1-8 patterns could be extended to find all primes to $529 = 23^2$ since 23 is the 9th prime.