Sieve of Eratosthenes

Eratosthenes is credited with being the first person to use a "prime number sieve" to identify prime numbers. His idea can be illustrated using a 100-board:

1. First cross out 1, since it is not prime.
2. Circle 2, and shade the **upper left** corner of all multiples of 2.
3. Circle 3 (which to this point has no markings in its box), and shade the **upper right** corner of all multiples of 3.
4. Circle 5 (which to this point has no markings in its box), and shade the **lower right** corner of all multiples of 5.
5. Circle the next number that to this point has no markings in its box, and shade the **lower left** corner of all multiples of this number.

Now answer the following questions about what you just did.

1. What is the smallest number with no markings in its box? If you marked all of the multiples of this number, would any new numbers receive their *first* mark? (**Do not actually make the marks**, just determine if any new numbers would receive their first mark.)

2. Describe the geometric pattern made by the multiples of 2 (marked in upper left corner) on the 100 board.

3. Describe the geometric pattern made by the multiples of 3 (marked in upper left corner) on the 100 Board.

4. What do the circled numbers represent? What do the unmarked numbers represent? Why?

5. Use your 100-board to determine which primes divide 84. (These numbers are called the prime factors of 84.) Does 84 have any factors that are not prime?

6. How can you identify all the multiples of 6 from the markings on your chart? (**Do not add any additional markings.**)

7. How can you identify all numbers that have both 6 and 7 as factors (divisors) from the markings on your chart? (**Do not add any additional markings.**)

8. Can you tell from the markings on your chart which numbers have 14 for a factor (divisor)? What about 9? What about 20? Explain. (**Do not add any additional markings to your chart.**)

9. Suppose you decided to use the sieve method to find all prime numbers less than 400 using a "400 Board" (with numbers 1 through 400). Multiples of which additional numbers would need to be marked in some way? Explain.

10. Do you think this is a good way to tell if large numbers are prime?

100 Board[1]

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110

[1] Traditionally, 100-boards were used in grade schools to teach basic number facts and counting, and stopped at 100. If you go into an elementary school now, it is likely that the "100-board" will go to 110. Why do you think this change was made?