The Locker Problem

One hundred students are assigned lockers 1-100. All lockers are closed to start. The first student walks by and opens all the lockers. The second student then walks by and closes all lockers that are multiples of 2. The third student then walks by and changes the status of all lockers that are multiples of 3 (if it was open, the student closes it, and if it was closed, the student opens it). The fourth student then walks by and changes the status of all lockers that are multiples of 4. This pattern continues with all 100 students.

1. After all 100 students have passed by the lockers, which lockers will be left open?

2. Explain how you knew those lockers would be left open.

3. How many lockers, and which ones, were touched exactly twice? Explain how you know.

4. Which students touched both locker 36 and 48? How do you know?

5. Which locker was switched the most times? How do you know?

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