Name:__________________________ **Date:_________________________**

Math 8H Lesson 7 Prime Factorizations

1. Prime the Prime Factorization of each number below. Then indicate whether if it is a perfect square or perfect cube, neither, or both:

24	800	864
1800	648	210
5040	3136	2744
$N = 2^2 \times 50 \times 5$	$N = 64 \times 25 \times 49$	$N = 30 \times 45 \times 40$

2. Given each pair of numbers in their prime factorization, find the GCF and LCM

25 & 45	$N_1 = 2^2 \times 3^3$ & $N_2 = 2^3 \times 5^2$
$N_2 = 2^3 \times 5 \times 7$ & $N_2 = 2 \times 3^4 \times 5^2$	$N_1 = 2^3 \times 4 \times 6$ & $N_2 = 10^2 \times 8$

$N_1 = a^2b^{13}c^{15}$ & $N_2 = a^5b^8c^{11}d^5$	$N_1 = 2^7$ & $N_2 = 3^5$

3. Use the prime factorization to find the number of factors:

$2^4 \times 3^2 \times 5^2 =$	$3^4 \times 5^3 \times 11^8 =$
20124	4500
$2^3 \times 3^4 \times 36 =$	$3^5 \times 7^{11} \times 21$
$N = 8^2 \times 3^4 \times 15^2$	$N = 12^3 \times 20^3$

4. How do you tell if a number is a perfect square or cube by looking at the prime factorization:

5. Find the lowest value of N such that the square root will become a positive integer:

a) $\sqrt{2^3 5^1 7^2 N}$ b) $\sqrt{4^2 7^2 5^2 N}$ c) $\sqrt{3^4 5^3 12N}$

d) $\sqrt{38412N}$ e) $\sqrt{13992N}$ f) $\sqrt{664(N-1)}$

6. Find the lowest value of N such that the integer will have the indicated the indicated number of factors:

a) $2^3 3^N \quad (8\ factors)$ b) $(8)\times 27N$ (48 factors) c) $2^3 3^4 N^2 \quad (56\ factors)$

7. Two positive integers have a GCF of $2\times 3\times 5$ and a LCM of $2^3 \times 3^4 \times 5\times 7$. If one of the numbers is 210, find the other number.

8. Find the smallest number N, such that $2^3 3^4 N^2$ has 56 factors.

9. Two numbers are "*relatively prime*" if they do not share any common factors other than 1. How many positive integers less than or equal to 40 are relatively prime to 40?

10. Challenge: Suppose there are 1000 lockers and 1000 people. The first person opens all the lockers; the second person closes every second locker; the third person changes the state of every third locker [ie: if it's open, he closes it or if it's closed, he opens it]. This process continues, where the nth person changes the state of every nth locker. After all 1000 people have gone through, how many lockers are open?