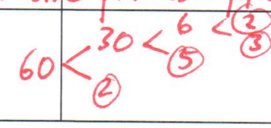
NUMBER THEORY 7

Name: Key **Date:**________ **Period:**______

SECTION 7.5 UNIQUE PRIME FACTORIZATION

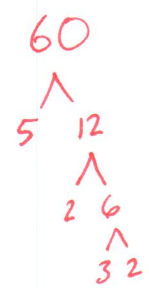
VOCABULARY

DEFINITION	EXAMPLE
Prime factorization: process or result of finding the prime factors of a number	prime factorization of 60 = $\boxed{2^2 \cdot 3 \cdot 5}$
Fundamental Theorem of Arithmetic: If n is an integer $n>1$ then n is prime or can be written as the product of primes $n = p_1 \cdot p_2 \cdot \ldots \cdot p_k$ where p's are primes & $p_1 \leq p_2 \leq \ldots \leq p_k$	$60 = 2 \cdot 2 \cdot 3 \cdot 5$
Tree Diagram: visual way to find the prime factorization of a number	

Big Idea: How can we write integers greater than 1 as a product of prime numbers?

EXAMPLE 1

Find the prime factorization of 60. Show the process of how you find the factorization.



$60 = 2 \cdot 2 \cdot 3 \cdot 5$

$60 = 2^2 \cdot 3 \cdot 5$

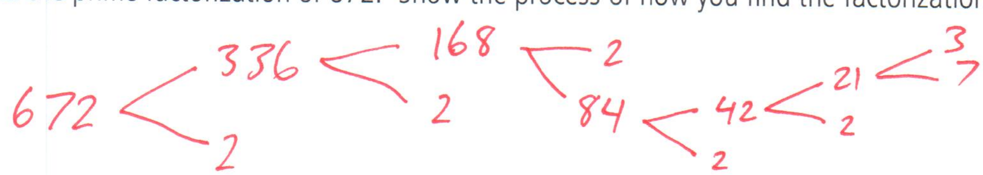
$60 \div 2 = 30$

$30 \div 2 = 15$

$15 \div 3 = 5$

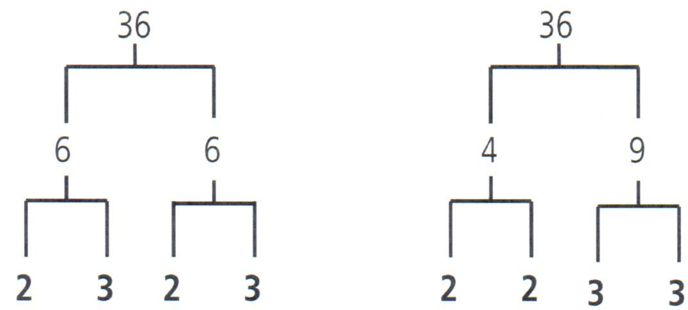
EXAMPLE 2

Find the prime factorization of 672. Show the process of how you find the factorization.



$672 = 2^5 \cdot 3 \cdot 7$

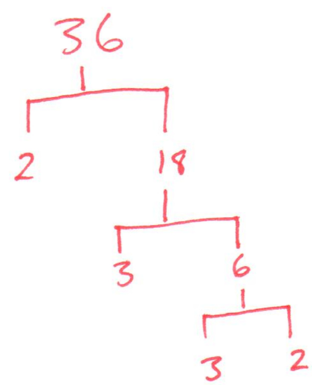
The tree diagram method presents a visual representation of the prime factorization process. For example, two possible factor trees for 36 are:



$36 = 2 \cdot 3 \cdot 2 \cdot 3 = 2^2 \cdot 3^2$

$36 = 2 \cdot 2 \cdot 3 \cdot 3 = 2^2 \cdot 3^2$

Draw another possible factor tree for 36.



To help with prime factoring, here is the divisibility table from section 7.2.

A number is divisible by:	Rule
2	The last digit is 0, 2, 4, 6, or 8.
3	The sum of the digits is divisible by 3.
4	The last two digits form a number that is divisible by 4.
5	The last digit is 0 or 5.
6	The number is divisible by 2 and 3.
8	The last three digits form a number that is divisible by 8.
9	The sum of the digits is divisible by 9.
10	The last digit is 0.

PRACTICE EXERCISES

1. Write the following integers in prime factorization form, using exponents when there are repeated prime factors:

a. 48

2 24

3 8

4 2

2 2

$\boxed{2^4 \cdot 3}$

c. 108

2 54

6 9

3 2 3 3

$\boxed{2^2 3^3}$

b. 252

2 126

2 63

7 9

3 3

$\boxed{2^2 \cdot 3^2 \cdot 7}$

d. 2500

25 100

5 5 25 4

5 5 2 2

$\boxed{2^2 \cdot 5^4}$

2. $42 = 2 \cdot 3 \cdot 7$. List all the factor pairs of 42. Write down any observation that you make about the factor pairs.

1	42
2	21
3	14
6	7

Every factor pair can be broken into the primes 2, 3, and 7.

SUMMARY (What I learned today)