Chapter 3: Factors and Products

BUILDING ON

- Determining factors and multiples of whole numbers to 100
- Identifying prime and composite numbers
- Determining square roots of rational numbers
- Adding and subtracting polynomials
- Multiplying and dividing polynomials by monomials

BIG IDEAS

- Arithmetic operations on polynomials are based on the arithmetic operations on integers, and have similar properties
- Multiplying and factoring are inverse processes, and a rectangle diagram can be used to represent them

3.1 Factors and Multiples of Whole Numbers

Lesson Focus

Determine prime factors, greatest common factors, and least common multiples of whole numbers

Prime Factorization

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Prime factorization – writing a natural number as a **product** of its **prime factors**

$12 = 2 \times 2 \times 3 = 2^2 \times 3$

Prime Factor – a **prime number** that is a **factor** of a number

$26 = \underline{13} \times 2$

Prime Number – a number divisible only by **one** and **itself**

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Factor Tree

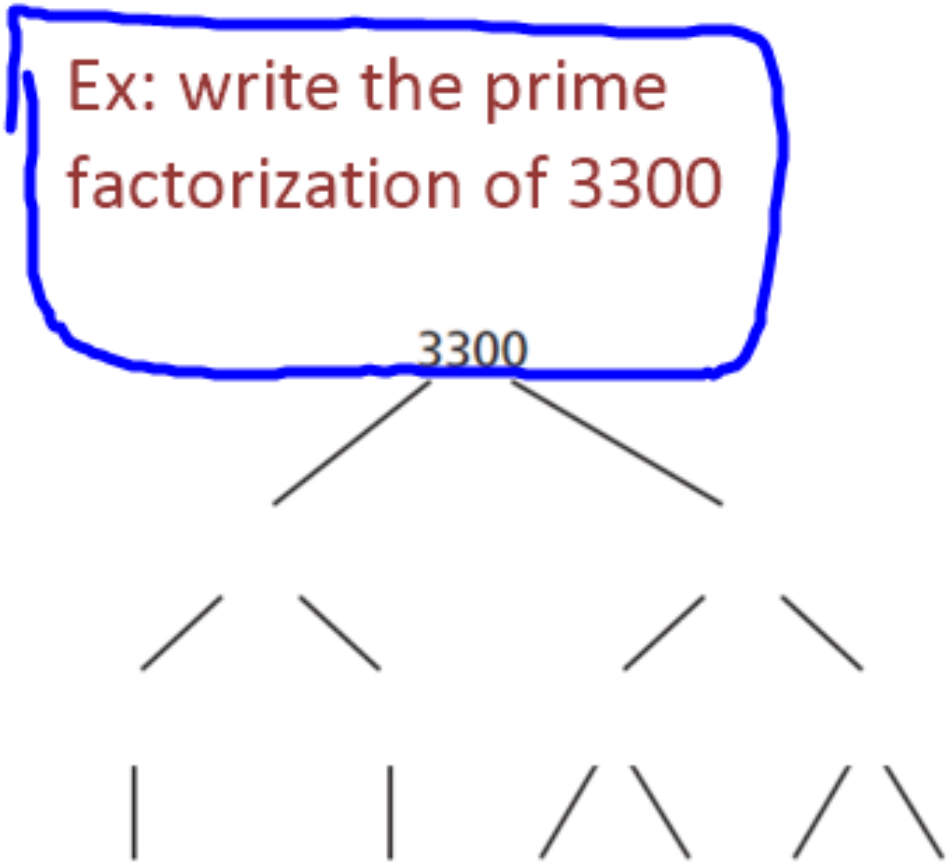
A strategy for **prime factorization** is to make a **factor tree**

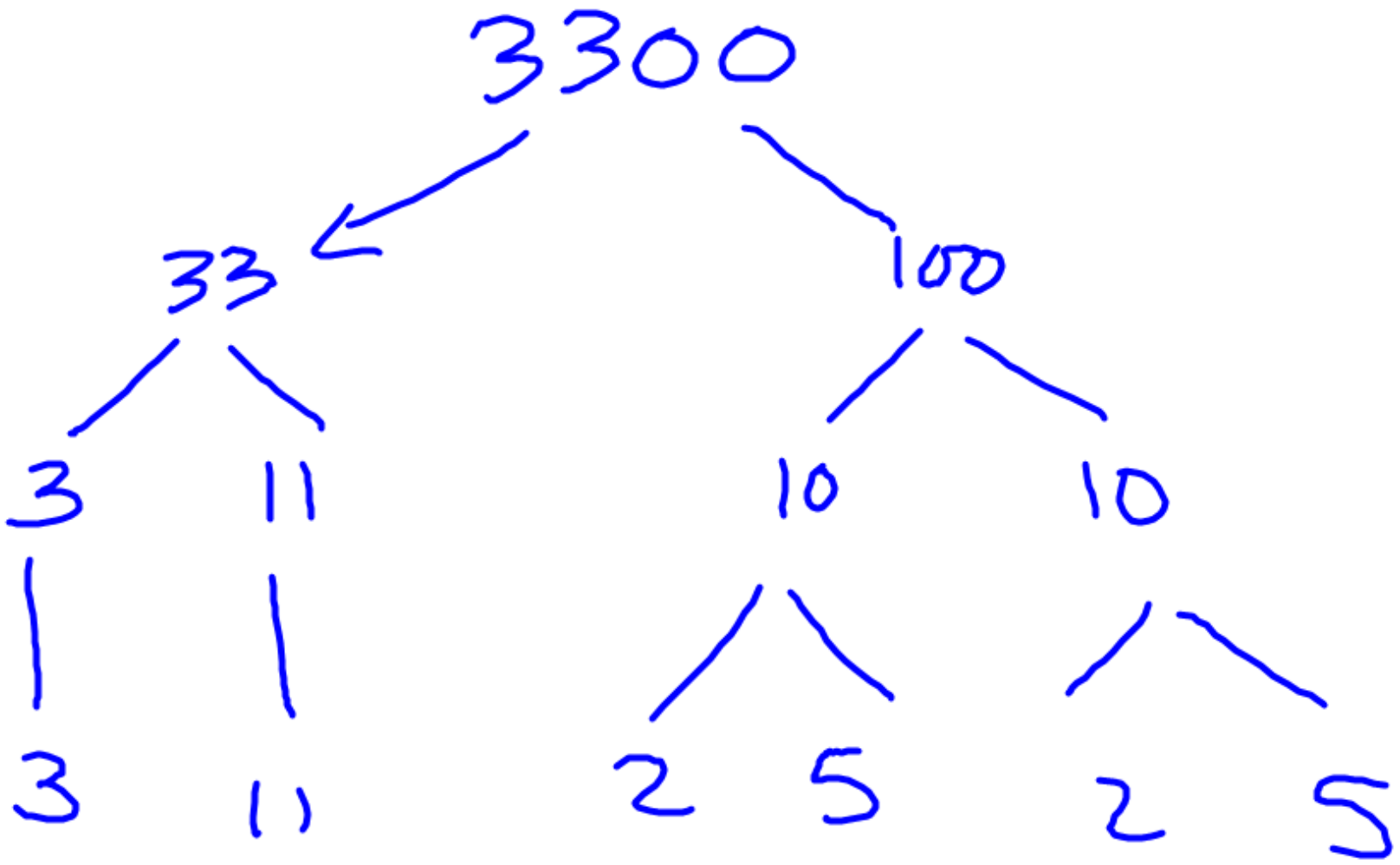
Write the number at the top

Branch down as you **factor** out numbers

Keep factoring out until the bottom is the **prime factors**

Ex: write the prime factorization of 3300





$$3300 = 2^2 \cdot 3 \cdot 5^2 \cdot 11$$

Example

Will every factor tree look the exact same?

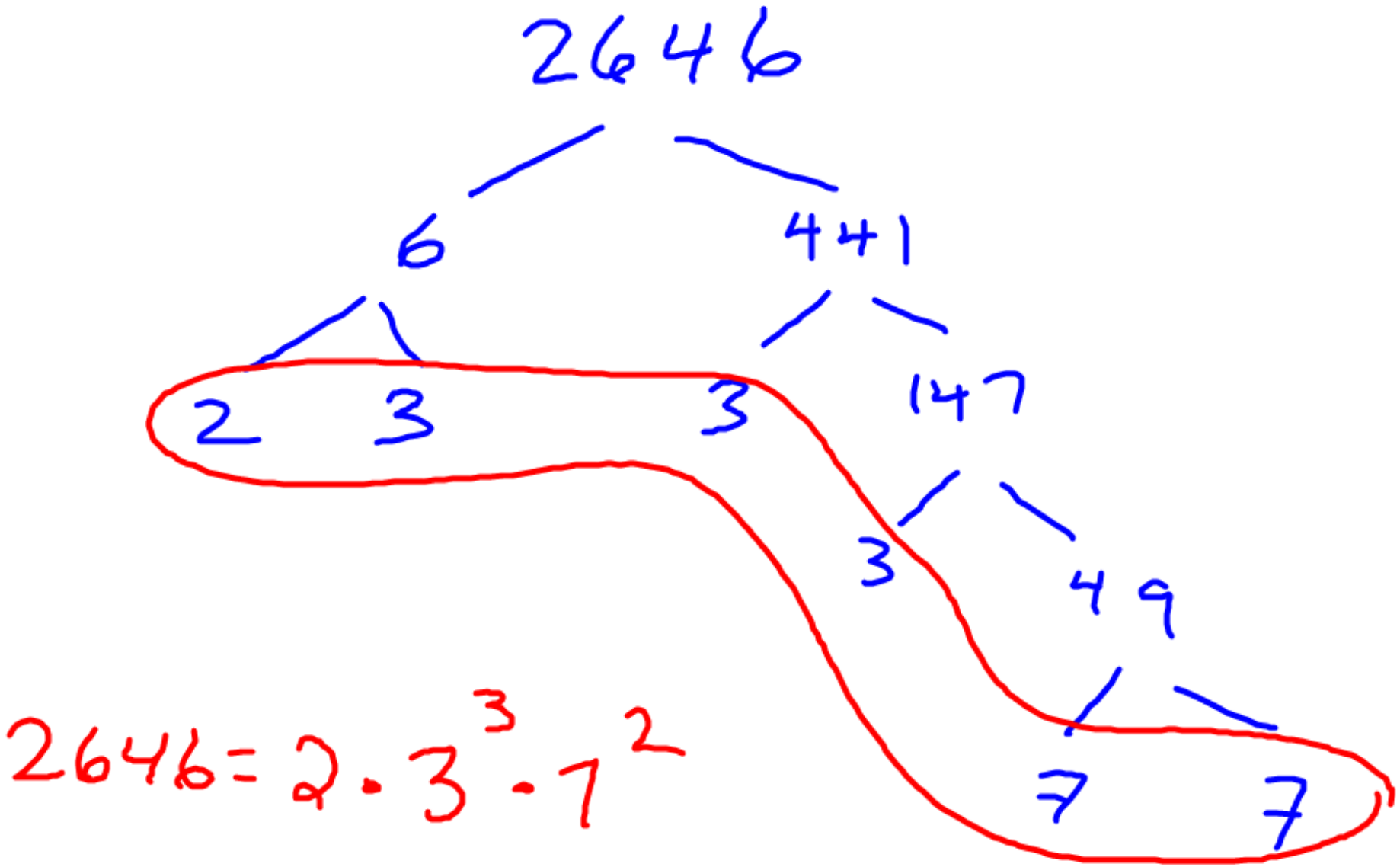
Come up with another factor tree for 3300

Example

Write the prime factorization of 2646.

Write the answer as a product of its prime factors

*Write the answer using **powers***



$2646 = 2 \cdot 3^3 \cdot 7^2$

Greatest Common Factor

For two or more natural numbers we can determine their **greatest common factor (GCF)**

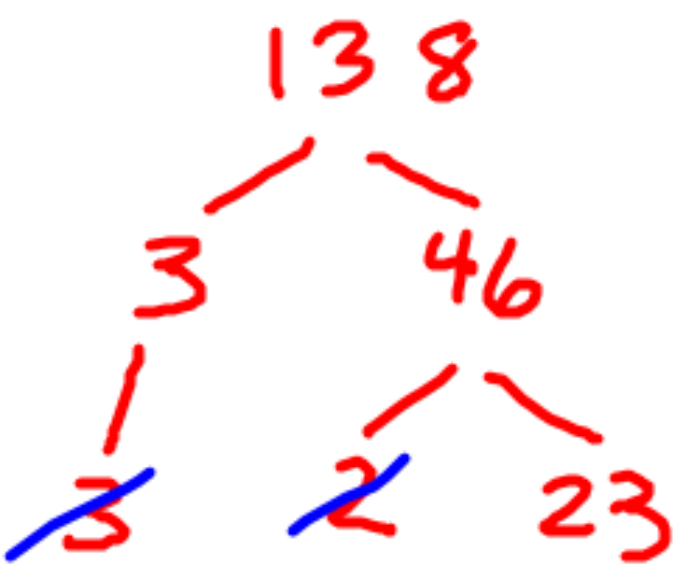
Greatest Common Factor - is the **greatest factor** two or more numbers have in **common**

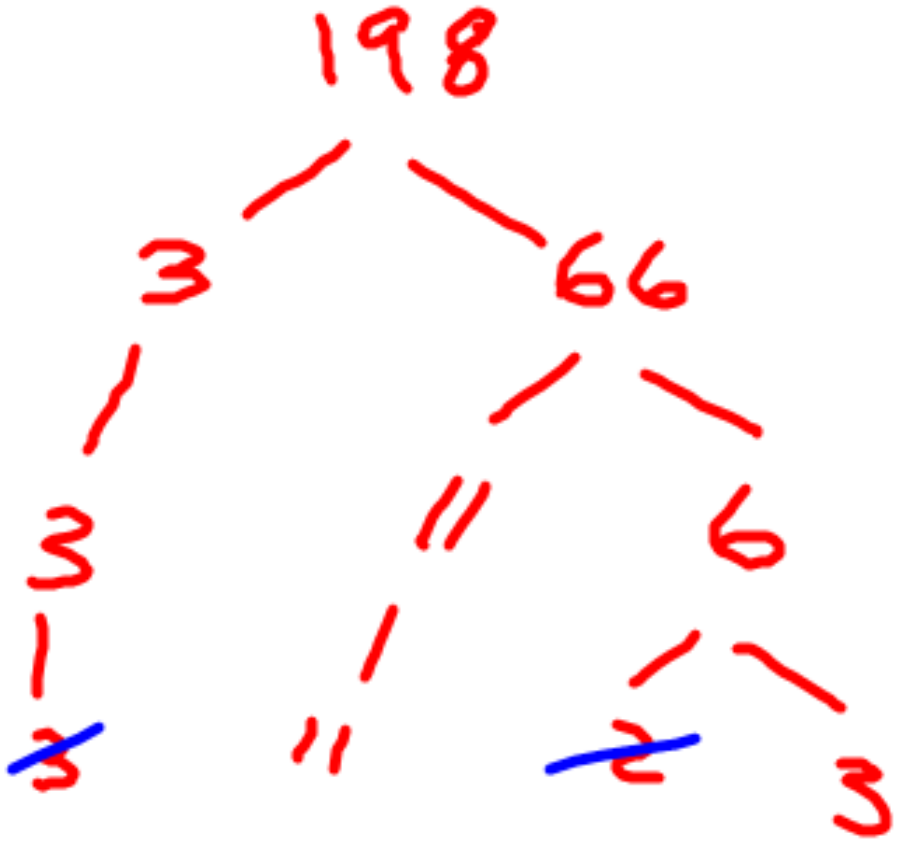
The GCF will be a product of common prime factors

Example

GCF = 2 · 3 = 6

Determine the greatest common factor of 138 and 198.

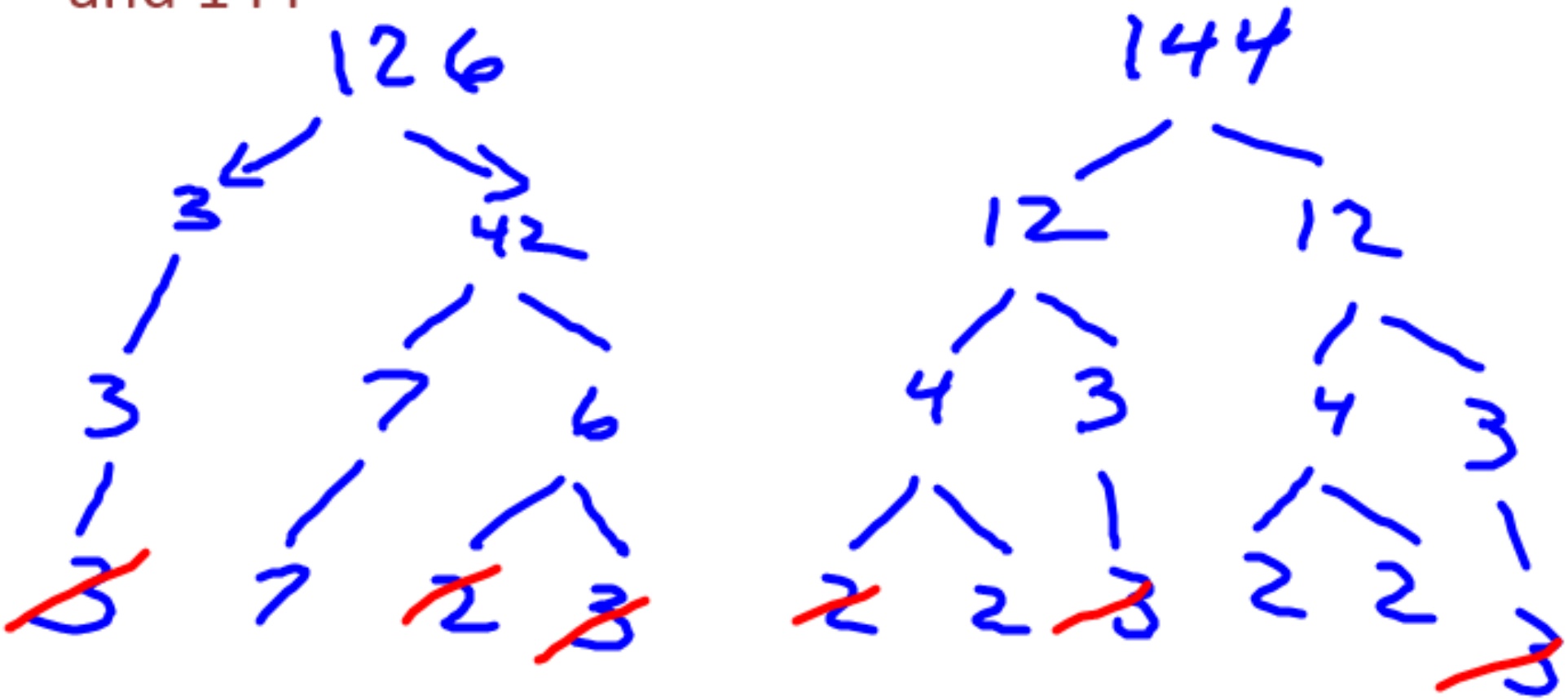




Example – Your Turn

$GCF = 2 \cdot 3^2 = 18$

Determine the greatest common factor of 126 and 144



Example – Your Turn

Determine the greatest common factor of 120, 960 and 1400

Example

- *Use prime factorization to reduce fractions:*

- $\frac{650}{900} = \frac{2 \cdot 5 \cdot 5 \cdot 13}{2 \cdot 2 \cdot 3 \cdot 3 \cdot 5 \cdot 5} = \frac{13}{18}$

- $\frac{1225}{2720}$

Homework

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 # 4, 6, 8, 9a,b, 15a,c,e

Multiples

To generate the multiples of a number, multiply the number by the natural numbers {1, 2, 3, 4…}

Ex: multiples of 9 are:
9, 18, 27, 36, 45, 54…

Ex: what are the multiples of 6?

Least Common Multiple

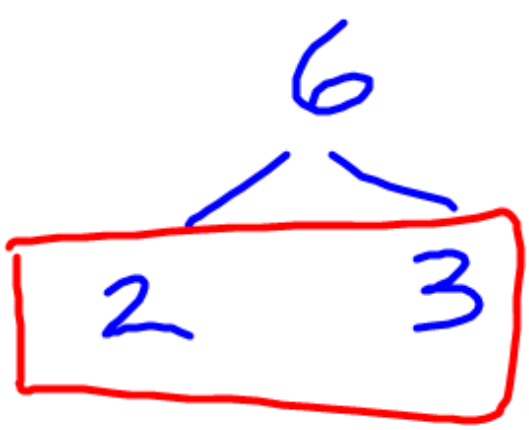
Least common multiple – is the least number that is divisible by each number

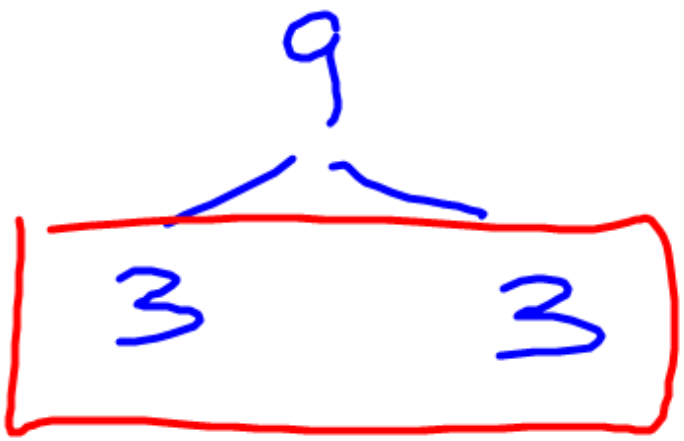
Ex: multiples of 9 are:
9, 18, 27, 36, 45, 54...
Ex: multiples of 6 are:
6, 12, 18, 24, 30, 36...

18 LCM

What is the **least common multiple** of 9 and 6?

LCM of 6 & 9



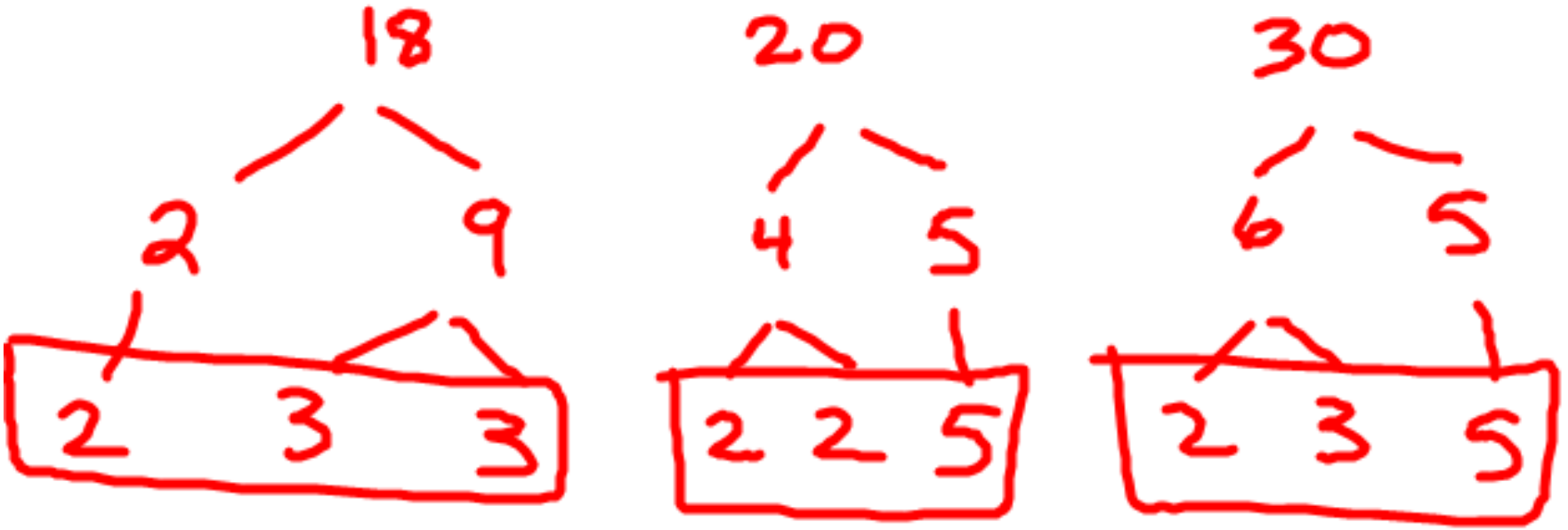


LCM

$2 \cdot 3^2 = 18$

Example

Determine the least common multiple of 18, 20, and 30.



$LCM = 2^2 \cdot 3^2 \cdot 5 = 180$

Least Common Multiple

Is there another way than to just list all the multiples?

YES:

find the prime factorization of each number

Circle the highest power of each prime factor for all groups

Multiply all the highest powers together

Example

Determine the least common multiple of 18, 20, and 30.

Example

Determine the least common multiple of 28, 42, and 63.

$LCM = 2^2 \cdot 3^2 \cdot 7 = 252$

Homework

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 # 3, 10, 11a,b, 16a,c,e,g,