Chapter 4 Study Guide: Factors and Fractions

4-1 Factors & Monomials

A number is divisible by:

- **2** if its ones digit is even (0, 2, 4, 6, 8)
- **3** if the sum of all the digits is divisible by 3
- **4** if the last two digits are a multiple of 4
- **5** if the ones digit is a 5 or a 0
- **6** if its ones digit is even **AND** the sum of all the digits is divisible by 3
- **9** if the sum of all the digits is a multiple of 9
- **10** if its ones digit is a 0

4-2 Powers & Exponents

$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 2^5$ → exponent

↘ base

The exponent tells you how many times to multiply the base by itself.
SO 2^5 means multiply 2 times itself 5 times: $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

$3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 =$ → expanded form

$3^7 =$ → exponential form

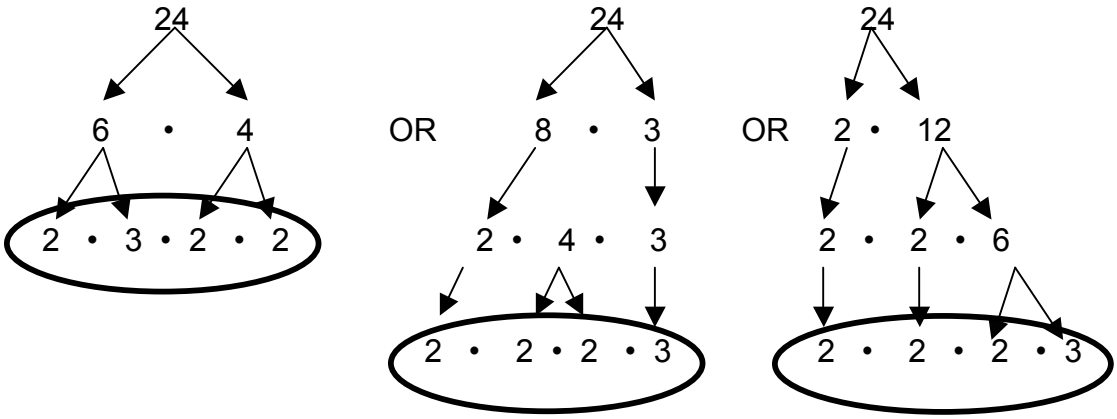
2, 187 → simplify or evaluate

EX: $\mathbf{(-4)^3 =}$ $(-4) \cdot (-4) \cdot (-4) = -64$ **(Remember Negative Rules when evaluating)**

4-3 Prime Factorization

Prime Factorization: when a number has been completely factored down
These prime numbers when multiplied will equal the original number

FACTOR TREE: *** NOTICE: There are many ways to do the problem, but you end with the same answer no matter how you solve the problem!**



The **Prime Factorization** of 24 is $2 \cdot 2 \cdot 2 \cdot 3$
You can write the prime factorization of 24 in **exponential form**: $2^3 \cdot 3$

4-4 Greatest Common Factor

The **Greatest Common Factor (GCF)** of two whole numbers is the **BIGGEST** whole number that is a factor of ***both*** of the numbers.

LIST FACTORS:

List the factors of both numbers. The largest number in both lists is the **GCF**.

24: 1, 2, 3, 4, 6, 8, 12, 24
30: 1, 2, 3, 5, 6, 10, 15, 30

The greatest common factor is 6, because it is the largest factor they have in common.

4-6 Multiplying and Dividing Monomials

Multiplying:

When multiplying powers with the same base, add their exponents.
The base does not change.

EX: $2^4 \cdot 2^3 =$ $(2 \cdot 2 \cdot 2 \cdot 2) \cdot (2 \cdot 2 \cdot 2)$ **SO that is the same as** 2^7

EX: $3^2 + 3^3 =$ $(3 \cdot 3) + (3 \cdot 3 \cdot 3)$ **SO that is NOT the same as** 3^5

Dividing:

When dividing powers with the same base, subtract their exponents.
The base does not change.

EX: $\frac{3^8}{3^3} = \frac{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3}{3 \cdot 3 \cdot 3}$ **or** 3^{8-3} **SO that is the same as** 3^5

4-7 Negative Exponents

A number to a negative exponent can be written as a positive exponent by placing the base and its exponent under 1 in a fraction.

EX: $5^{-8} = \frac{1}{5^8}$ $\qquad (-m)^{-7} = \frac{1}{(-m)^7}$

*Notice that the negative sign with the variable did not change.
Only the negative exponent was changed to a positive exponent.

4-8 Scientific Notation

Scientific notation is a very large or small number expressed as a number greater than one but less than 10 which is then multiplied by a factor of 10. **HINT:** Count how many places you move the decimal point.

A very large number should have a **positive** exponent. **EX: 2,300,000 = 2.3 x 10^6**
A very small number should have a **negative** exponent. **EX: 0.000023 = 2.3 x 10^{-5}**