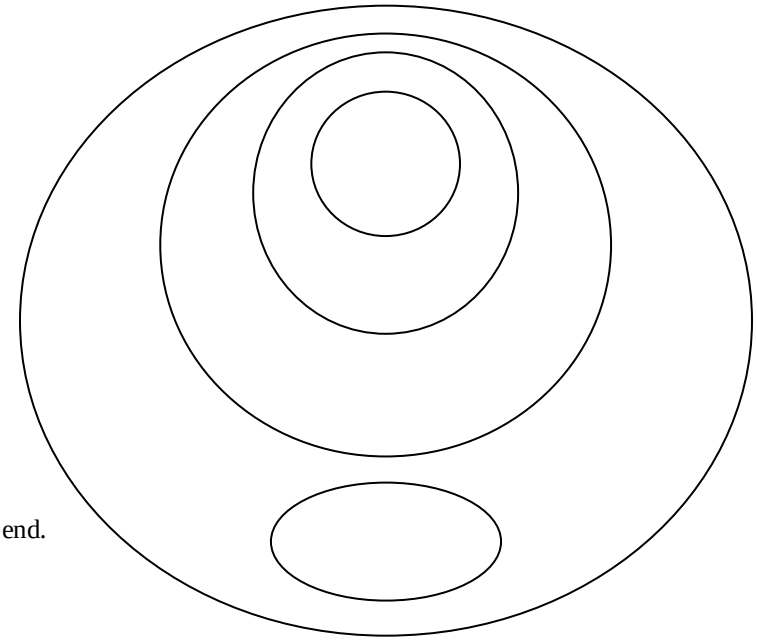
P.1 REAL NUMBERS

Learning Targets for P1
1. Describe an interval on the number line using inequalities
2. Describe an interval on the number line using interval notation (closed vs. open)
3. Switch between interval notation and inequality notation
4. Simplify exponential expressions
5. Identify Algebraic Properties (Commutative, Associative, Distributive, Identity, Inverse)

Types of Numbers



Natural (Counting) Numbers: ($\mathbb{N}$)

1, 2, 3, 4, …

Integers: ($\mathbb{Z}$)

…, –3, –2, –1, 0, 1, 2, 3, …

Rational Numbers: ($\mathbb{Q}$)

ALL fractions
ALL decimals that
a) repeat or
b) end

Irrational Numbers: … no symbol ($\mathbb{R} - \mathbb{Q}$)

Decimals that do NOT repeat AND do NOT end.

Real Numbers: ($\mathbb{R}$)

ALL Rational and Irrational Numbers

Inequalities and Intervals

Example 1: Graph the following on a number line:

a) $x \geq -2$ b) $5 < x$ c) $x > -8$

d) $-5 \leq x < 2$ e) $7 < x \leq 12$

Interval notation is another way to describe intervals instead of using an inequality.
The ends of an interval are either OPEN or CLOSED. Use a *one-sided parenthesis* to indicate the end of the interval *is open* and a *bracket* to indicate the end of the interval *is closed*.

Example 2: Fill in the blank

An _____ interval is used when the endpoint IS NOT included.

A _____ interval is used when the endpoint IS included.

Example 3: Go back to the last example and write the interval notation for *a – e*.

Example 4: Graph the following and write the corresponding inequality.

a) $(3, 5]$ b) $[-12, \infty)$ c) $(-\infty, 7)$

Example 5: Use words to describe each of the intervals in the last example.

a) b) c)

Example 6: Use interval notation AND inequality notation to describe each interval on the x – axes below.

Example 7: Use both inequality and interval notation to describe the set of numbers. Define any variables used.

a) My teacher is at least 25 years old.

b) A grade of *A* in PreCalculus varies between 89.5% and 100%, including both these values.

Simplifying Expressions with Exponents

Example 8: Identify the base in each of the following expressions.

a) -4^2 b) $(-4)^2$ c) $(-3)^3$ d) -3^3

e) $2x+1^2$ f) $(2x+1)^2$

Example 9: Simplify each of the expressions in the last example.

Properties of Exponents

1. $u^m u^n =$
2. $\frac{u^m}{u^n} =$
3. $u^0 =$
4. $u^{-m} =$
5. $(uv)^m =$
6. $(u^m)^n =$
7. $\left(\frac{u}{v}\right)^m =$

Example 10: Simplify each of the following expressions.

a) $2x^{-1}$ b) $\left(\frac{3}{xy}\right)^{-2}$ c) $\left(\frac{3a^2b}{2a^3b}\right)\left(\frac{4b^3}{a^4b^2}\right)$ d) $\frac{\left(x^{-2}y^3\right)^{-2}}{\left(y^5x^{-2}\right)^{-1}}$

Properties of Algebra

Commutative Property

Associative Property

Inverse Property

Identity Property

Distributive Property

Example 11: Complete the group activities on page 11, #45 and #46.

Using the Distributive Property

Example 12: Simplify each expression.

a) $\left(4xy + 2x^3\right)ax^2$

b) $3a\left(2a + 5b\right)$

Many times we need to undo the distributive property. This is the beginning of factoring. When you undo the distributive property, we say you have **factored out the greatest common factor**.

Example 13: Factor out the GCF from each expression.

a) $3x^2 - 6xy$

b) $15x^3 - 12x^2 + 9x$