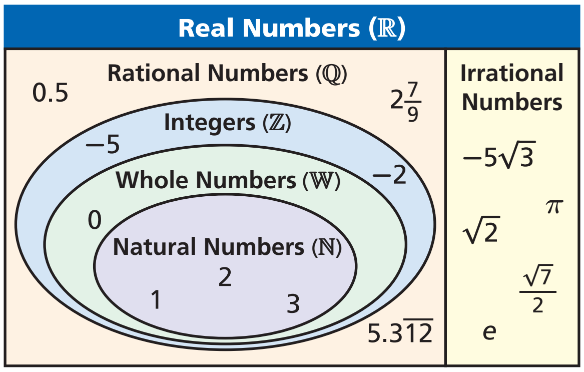
Section Overview

Professional Development

Sets of Numbers — *Lesson 1-1*

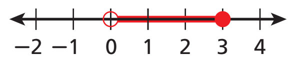
Why? Understanding subsets of real numbers and ways to express them is critical in the study of algebra.

Subsets of Real Numbers



Sets of Numbers

Number Line:



Words: real numbers greater than 0 and less than or equal to 3

Interval Notation: (0, 3]

Set-Builder Notation: $\{x \mid 0 < x \leq 3\}$

Properties of Real Numbers — *Lessons 1-2, 1-3*

Why? Knowing the properties of real numbers helps students simplify expressions and calculate more quickly.

Property	Example
Additive Identity Property	$5 + 0 = 5$
Mutiplicative Identity Property	$5 \cdot 1 = 5$
Additive Inverse Property	$3 + (-3) = 0$
Mutiplicative Inverse Property	$\frac{3}{5} \cdot \frac{5}{3} = 1$
Distributive Property	$3(4 + 5) = 3(4) + 3(5)$

Property	Example
Closure Property	$7.4 + 3.2 = 10.6 \in \mathbb{R}$
Commutative Property	$3 + 2 = 2 + 3$
Associative Property	$2(3 \cdot 4) = (2 \cdot 3)4$
Product Property of Square Roots	$\sqrt{2} \cdot \sqrt{8} = \sqrt{16} = 4$
Quotient Property of Square Roots	$\sqrt{\frac{4}{9}} = \frac{\sqrt{4}}{\sqrt{9}} = \frac{2}{3}$

Simplifying Algebraic Expressions — *Lessons 1-4, 1-5*

Why? Simplifying and evaluating expressions are essential algebra skills.

Evaluating and Simplifying Expressions

Evaluate $x^2 + 2x$ for $x = 3$.

$$x^2 + 2x$$
$$(3)^2 + 2(3)$$
$$15$$

Simplify by using properties of exponents.

$$\left(\frac{ab^4}{b^7}\right)^2 = \frac{a^2b^8}{b^{14}} = \frac{a^2}{b^6}$$

Simplify by combining like terms.

$$3x^2 + 2x^2 = 5x^2$$

Scientific notation: **Simplify** $\frac{2.3 \times 10^{-6}}{4.6 \times 10^{-2}}$.

$$\frac{2.3 \times 10^{-6}}{4.6 \times 10^{-2}} = 0.5 \times 10^{-4} = 5.0 \times 10^{-5}$$

Section Overview

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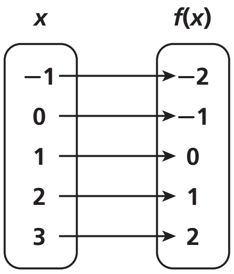
Functions — *Lessons 1-6, 1-7*

Why? Functions describe the relationship between a set of input values and a set of output values. They can be represented in several ways.

Mapping Diagram



Table

x	−1	0	1	2	3
$f(x)$	−2	−1	0	1	2

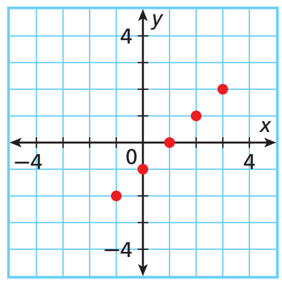
Ordered Pairs

(−1, −2) (0, −1), (1, 0), (2, 1), (3, 2)

Function Notation

$f(x) = x - 1$

Graph



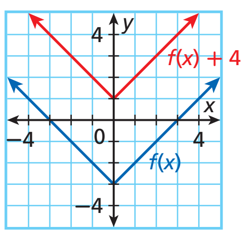
Functions associate each element in a **domain** with exactly one element in a **range.**

Transformations and Parent Functions — *Lessons 1-8, 1-9*

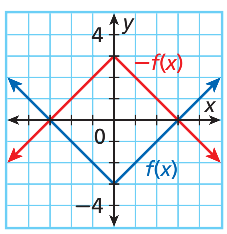
Why? Identifying parent functions and their transformations helps students classify and make generalizations about functions.

The graphs of points or functions can be **transformed** in several ways.

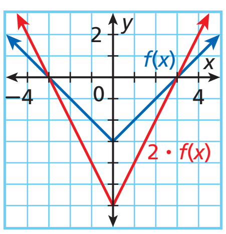
Translation



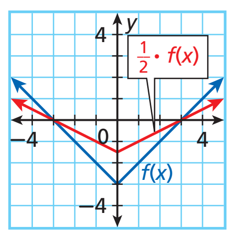
Reflection



Stretch



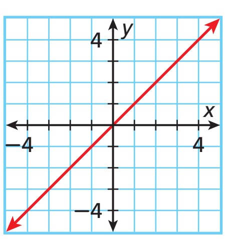
Compression



Functions can be grouped based on their **parent functions.** Some parent functions follow:

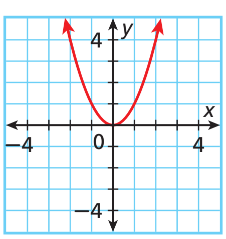
Linear Function

$f(x) = x$



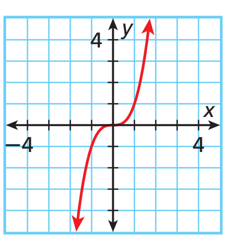
Quadratic Function

$f(x) = x^2$



Cubic Function

$f(x) = x^3$



Square-Root Function

$f(x) = \sqrt{x}$