Date ______________

Dear Family,

In this chapter, your child will classify real numbers and use their properties, will simplify numeric expressions with squares and square roots, will simplify algebraic expressions, and will learn about functions.

Real numbers can be classified as follows.

Natural Numbers	Also called the counting numbers: 1, 2, 3, …
Whole Numbers	The natural numbers and zero: 0, 1, 2, 3, …
Integers	The whole numbers and their opposites: …, −3, −2, −1, 0, 1, 2, 3, …
Rational Numbers	The integers, and fractions and decimals whose decimal forms either terminate (2.5) or repeat (1.666…)
Irrational Numbers	Fractions and decimals whose decimal forms do not terminate or repeat, including numbers such as π and $\sqrt{7}$

The **additive identity** is 0 because any number plus 0 results in that number.

The **multiplicative identity** is 1 because any number times 1 results in that number.

An inverse yields the identity for that operation when that operation is performed.

The **additive inverse** of 6 is −6 because $6 + (-6) = 0$.

The **multiplicative inverse** of 2 is $\frac{1}{2}$ because $2 \cdot \frac{1}{2} = 1$.

Expressions can include squares and square roots. Knowing these properties will make simplifying expressions easier.

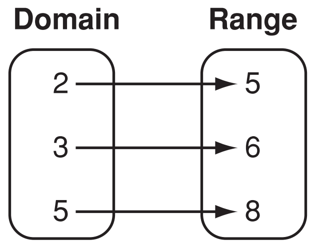
Property	Example
Product Property of Square Roots	$\sqrt{4 \cdot 3} = \sqrt{4} \cdot \sqrt{3}$
Quotient Property of Square Roots	$\sqrt{\frac{4}{16}} = \frac{\sqrt{4}}{\sqrt{16}}$
Zero Exponent Property	$12^0 = 1$
Negative Exponent Property	$\left(\frac{2}{3}\right)^{-2} = \left(\frac{3}{2}\right)^2$
Product of Powers Property	$4^3 \cdot 4^2 = 4^{3+2}$
Quotient of Powers Property	$\frac{3^7}{3^2} = 3^{7-2}$
Power of a Power Property	$(4^3)^2 = (4)^{3 \cdot 2}$
Power of a Product Property	$(3 \cdot 4)^2 = 3^2 \cdot 4^2$
Power of a Quotient Property	$\left(\frac{3}{5}\right)^2 = \frac{3^2}{5^2}$

Students will also learn about relations. A **relation** is a pairing of input and output values. The set of input values is called the **domain** and the set of output values is called the **range**. Relations can be represented as a set of ordered pairs, as a mapping diagram, or as a graph.

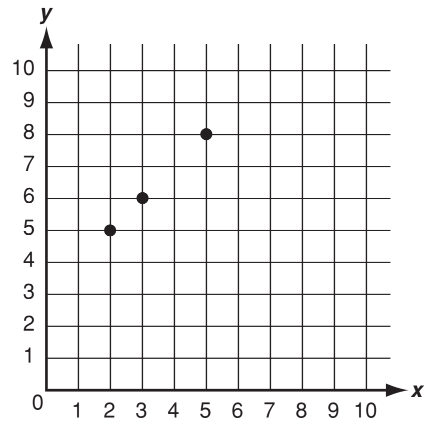
Ordered Pairs

$\{(2, 5), (3, 6), (5, 8)\}$

Mapping Diagram



Graph



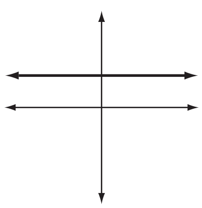
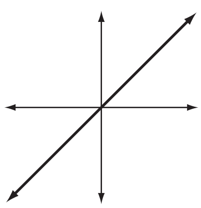
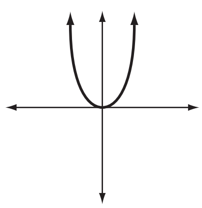
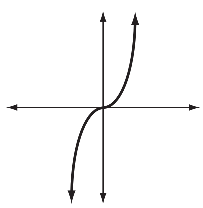
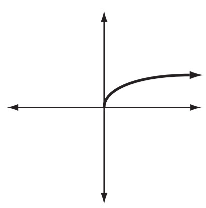
A relation is a **function** if there is only one output for each input. The relation shown above is a function. It has only 3 ordered pairs. Some functions have an infinite number of ordered pairs. These functions can be described by equations.

A function where each output value is 5 less than each input value can be written in either of the following ways.

$y = x - 5$	input: x	output: y
$f(x) = x - 5$	input: x	output: $f(x)$

The second equation is written in **function notation**. The graph of $f(x) = x - 5$ is a line.

Five function families will be explored. The following are the **parent functions**, the simplest of each type of function.

constant	linear	quadratic	cubic	square root
$f(x) = c$	$f(x) = x$	$f(x) = x^2$	$f(x) = x^3$	$f(x) = \sqrt{x}$
				

Many functions are **transformations** of these parent functions. Transformations are translations (slides), reflections (flips), stretches (pulls), and compressions (pushes).

For additional resources, visit go.hrw.com and enter the keyword MB7 Parent.