Contents of MPDI's

H. Wu

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Elementary Institute

Part 1: Whole Numbers

The Hindu-Arabic numeral system and place value

The number line

Laws of operations (comm, assoc, and dist laws)

The four algorithms, and their proofs

Estimation.

Part 2: Fractions

Definition of fractions in terms of the number line

Definition of finite decimals as fractions

Equivalent fractions and comparison of fractions

Division interpretation of fractions

The four operations on fractions

Complex fractons and why they are important

Ratio and percent

Rate (constant rate)

Part 3: Number Theory

Divisor, prime, divisibility tests

Euclidean algorithm

Reduction of fractions to simplest form

Basic Reference: H. Wu, *Understanding Numbers in Elementary School Mathematics*, American Mathematical Society, 2011. http://tinyurl.com/ket9cu2

Pre-Algebra Institute

Part 1: Numbers

Review of fractions, especially ratio, percent, and rate

Definition of rational numbers in terms of the number line

Adding and subtracting rational numbers using vectors

Multiplying and dividing rational numbers

Basic inequalities involving rational numbers

Part 2: Experimental Geometry

Freehand drawings

Constructions with ruler and compass

Hands-on activities on translations, rotations, reflections,and dilations

Part 3: Congruence and similarity

Basic definitions (parallel lines, angles,polygons, etc.)

Rotations, reflections, and translations; congruence; SAS, ASA

Dilations, fundamental theorem of similarity

Definition of similarity, angle-angle criterion for similarity

Part 4: Length and area

Concept of geometric measurements

Length, circumference of a circle

Area and π as area of unit disc

Basic Reference: H. Wu, Pre-Algebra,

http://math.berkeley.edu/~wu/Pre-Algebra.pdf

Algebra Institute

Part 1: Use of symbols

Proper use of symbols (need of quantification)

Expressions, equations, and identities

Summation forula for geometric series

Part 2: Linear equations

Linear equations in one variable

Linear equation in two variables: graphs and concept of slope

Fundamental theorem: correspondence of linear equations and lines

Simultaneous equations

Part 3: Functions

Definition and graphs of functions

Linear functions and proportional reasoning

Linear inequalities

Rational exponents and exponential functions

Quadratic functions and the quadratic formula

Basic Reference: H. Wu, Introduction to School Algebra.

http://math.berkeley.edu/~wu/Algebrasummary.pdf