

## Background:

These lessons are geared for adults who have struggled with the procedures/rules associated with addition, subtraction, multiplication, and division with natural numbers, fractions, and decimals. These lessons are aimed at getting the students to see a “why” behind all procedural rules. This is motivated by our belief that adults (who have not yet learned the basic procedures for addition, subtraction, multiplication, and division) would not benefit from the same mathematical instruction that they have seen for their previous 10, 20, 30+ years of schooling.

These lessons involve participation with the mathematics and are aimed to have 2 – 3 students interacting with one another for the majority of each lesson. Each lesson covers one topic.

An aim of each lesson is to first get the students interacting with the mathematical topic at hand. This interaction uses a manipulative, base-ten blocks or fraction strips. After the idea is developed through interaction, then the students are asked “how do we write what we have just experienced/developed?”. It is through this writing where the procedural rules are developed by the students. This reinforces to the students that mathematical procedures are not just rules that they have to memorize. The procedures/rules are reasons that portray meaning and communicate to whomever is reading the writing.

Intermixed within each lesson are whole class discussions. There are many different reasons as to the purpose of whole class discussions: they could be moments where we re-collect and make sure that everyone is at similar place in understanding before moving on, they could be for sharing out different viewpoints on a topic, voicing student voices, etc.

The role of the teacher is to guide the classroom and to make sure that no one student is struggling too much or too little. The instructor should be walking around the classroom hearing, observing, and thinking about what the students are saying mathematically. There are two points in the class where the instructor leads the class discussion. This is because we were at a time crunch and could not afford the time for student discovery of the idea (i.e. the partial product algorithm for multiplication).

The course that these lessons were written for is only 3-weeks long. The course meets 4 times a week for 2 hours each day (12 classes, 24 hours of class time). There are two lessons within each class period (each lesson is written for a 55-minute with a 5-minute break between lessons). Within each lesson plan, you will find student notes, instructor notes, and homework for the students.

The homework has solutions that is intended to be given to the student. Each homework has about 5 questions (not long). It is geared towards practice outside of the classroom, where the practice is more traditional procedural problems like students would see on standardized tests. It was our belief that the students should have the answers to the homework so that they can have reinforcement of their work, without having to wait to see if they were correct. We also believe that if this homework was to be a part of their grade, that the students should still have access to the solutions. Copying is the first, basic step of learning. It is our belief that if a student is copying the homework solutions, then that student is still participating in their level of learning outside of class and should be credited for learning/participating.

Order of Lesson Plans:

1. Place Value Using Base-Ten Blocks
2. Addition of Natural Numbers
3. Subtraction of Natural Numbers (focus on English words for subtraction and how they differ in meaning)
4. Subtraction Algorithm
5. Multiplication of Natural Numbers
6. Partial-Products Algorithm for Multiplication
7. Division of Natural Numbers (focuses on two ways of partitioning for division)
8. Algorithm for Long Division
9. Equivalent Fractions
10. Addition of Fractions
11. Subtraction of Fractions
12. Multiplication of Fractions
13. Division of Fractions
14. Numbers Lines and Base 10
15. Addition of Decimals
16. Subtraction of Decimals
17. Multiplication of Decimal Numbers
18. Division of Decimals