Unit 3: Rational Reasoning Key Standards

M7N1. Students will understand the meaning of positive and negative rational numbers and use them in computation.

a. *Find the absolute value of a number and understand it as a distance from zero on a number line.*

b. *Compare and order rational numbers, including repeating decimals.*

c. *Add, subtract, multiply, and divide positive and negative rational numbers.*

d. *Solve problems using rational numbers.*

Unit 3: Rational Reasoning Key Standards

M7A1. Students will represent and evaluate quantities using algebraic expressions.

a. *Translate verbal phrases to algebraic expressions.*

b. *Simplify and evaluate algebraic expressions, using commutative, associative, and distributive properties as appropriate.*

c. *Add and subtract linear expressions.*

Unit 3: Rational Reasoning Key Standards

M7A2. Students will understand and apply linear equations in one variable.

a. *Given a problem, define a variable, write an equation, solve the equation, and interpret the solution.*

b. *Use the addition and multiplication properties of equality to solve one- and two-step linear equations.*

Unit 3: Rational Reasoning Key Standards

M7A3. Students will understand relationships between two variables

a. Plot points on a coordinate plane.

b. Represent, describe, and analyze relations from tables, graphs, and formulas.

c. Describe how change in one variable affects the other variable.

GPS Math Process Standards

P1. Students will solve problems (using appropriate technology).

a. Build new mathematical knowledge through problem solving.

b. Solve problems that arise in mathematics and in other contexts.

c. Apply and adapt a variety of appropriate strategies to solve problems.

d. Monitor and reflect on the process of mathematical problem solving.

P2. Students will reason and evaluate mathematical arguments.

a. Recognize reasoning and proof as fundamental aspects of mathematics.

b. Make and investigate mathematical conjectures.

c. Develop and evaluate mathematical arguments and proofs.

d. Select and use various types of reasoning and methods of proof.

GPS Math Process Standards

P3. Students will communicate mathematically.

a. Organize and consolidate their mathematical thinking through communication.

b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

c. Analyze and evaluate the mathematical thinking and strategies of others.

d. Use the language of mathematics to express mathematical ideas precisely.

GPS Math Process Standards

P4. Students will make connections among mathematical ideas and to other disciplines.

a. Recognize and use connections among mathematical ideas.

b. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

c. Recognize and apply mathematics in contexts outside of mathematics.

P5. Students will represent mathematics in multiple ways.

a. Create and use representations to organize, record, and communicate mathematical ideas.

b. Select, apply, and translate among mathematical representations to solve problems.

c. Use representations to model and interpret physical, social, and mathematical phenomena.

Unit 3: Rational Reasoning Enduring Understandings

- Negative numbers are used to represent quantities that are less than zero.
- Absolute value is useful in ordering and graphing positive and negative numbers.
- Computation with positive and negative numbers is often necessary to determine relationships between quantities.
- Models, diagrams, manipulatives and patterns are useful in developing and remembering algorithms for computing with positive and negative numbers.
- Properties of real numbers hold for all rational numbers.
- Positive and negative numbers are often used to solve problems in everyday life.

Unit 3: Rational Reasoning Essential Questions

- When are negative numbers used and why are they important?
- Why is it useful for me to know the absolute value of a number?
- What strategies are most useful in helping me develop algorithms for adding, subtracting, multiplying, and dividing positive and negative numbers?
- What properties and conventions do I need to understand in order to simplify and evaluate algebraic expressions?
- Why is graphing on a coordinate plane helpful?

Unit 3: Rational Reasoning Terms & Symbols

- **Absolute Value:** The distance a number is from zero on the number line. Examples: $|-4| = 4$ and $|3| = 3$
- **Associative Property:** In addition or multiplication, the result of the expression will remain the same regardless of grouping. Examples: $a + (b + c) = (a + b) + c$; $a(bc) = (ab)c$
- **Commutative Property:** The sum or product of numbers is the same no matter how the numbers are arranged. Examples: $a + b = b + a$; $ab = ba$
- **Distributive Property:** The sum of two addends multiplied by a number will be the sum of the product of each addend and the number. Example: $a(b + c) = ab + bc$
- **Integers:** The set of whole numbers and their opposites {…-3, -2, -1, 0, 1, 2, 3}

Unit 3: Rational Reasoning Terms & Symbols

- **Natural numbers:** The set of numbers {1, 2, 3, 4, …}. Natural numbers can also be called counting numbers.
- **Negative Numbers:** The set of numbers less than zero.
- **Opposite Numbers:** Two different numbers that have the same absolute value. Example; 4 and -4 are opposite numbers because both have an absolute value of 4.
- **Positive Numbers:** The set of numbers greater than zero.
- **Rational Numbers:** The set of numbers that can be written in the form where a and b are integers and $b \neq 0$
- **Sign:** a symbol that indicates whether a number is positive or negative. Example: in -4, the (-) sign shows this number is read "negative four".
- **Whole numbers:** The set of all natural numbers and the number zero.

Unit 3: Rational Reasoning
Framework Unit Tasks

- What is Your Sign?
- Helicopters and Submarines
- Using the Number Line
- Sums and Products
- Connect the Dots
- Always, Sometimes, Never
- Making a Test
- Working with Integers
- Culminating Task: Poster

ATLANTA PUBLIC SCHOOLS
Making A Difference

Model Lesson
Unit 3: Rational Reasoning

Sums and Products

Pre-lesson Reflective Teacher Questions

- What manipulatives or tools can be used for conceptual modeling?
- What do you already know through pre-assessments or other formative assessments about their misconceptions and/or error patterns related to this concept?
- How do you think they will do?

Unit 3: Rational Reasoning

- Standard: **M7N1. Students will understand the meaning of positive and negative rational numbers and use them in computation.**
  - ***C. Add, subtract, multiply, and divide positive and negative rational numbers.***
- Essential Question: What strategies are most useful in helping me develop algorithms for adding, subtracting, multiplying, and dividing positive and negative numbers?

ATLANTA PUBLIC SCHOOLS
Making A Difference

Opening (Warm-Up)

Explore: Opening (Mini-Review)

Using manipulatives, number lines or any other resource find the sum, product, and difference of these integers:

1. -1, 3

2. 1, 3

3. -1, -3

4. 1, -3

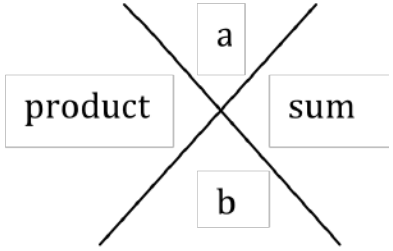
Discuss with your neighbor what you have observed. Try to develop a rule or rules for what you have done.

Explore (Mini-Review)

- Solve the following one-step equations, while working with a partner.

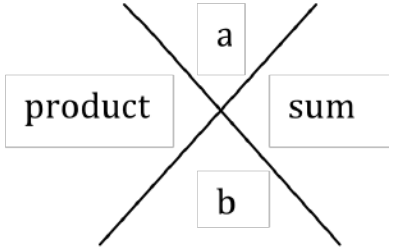
1. $b + 5 = 2$
2. $3 + c = -3$
3. $4 + d = -1$

Explore/Explain: Opening (Mini-Lesson)



Using this model, we will be working with finding and defining models for determining product and sum of integers.

Explore/Explain: Mini-lesson



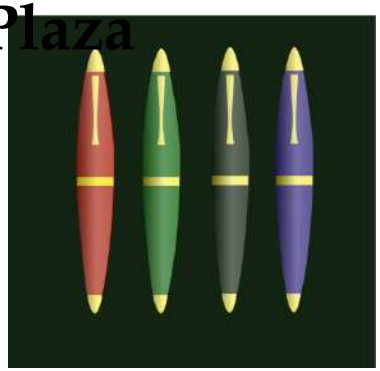
Example 1: a = -2 and b = 3

Find the product and sum.
Show the model used for each.

Elaborate: Station Activities (Work Period)

Teacher Directed

Practice Plaza



The Shop

Sample Choice Board

ATLANTA PUBLIC SCHOOLS
Making A Difference

Singles- 10 Points Each

- Thinking Map: Adding and Subtracting Integers – Flow Map
- Create a graphic organizer (Frayer Model) for the following vocabulary words: integer, absolute value, opposite, rational number.
- Create a graphic organizer (Frayer Model) for the following vocabulary words: integer, absolute value, opposite, rational number.
- First Word (INTEGER)

Doubles-30 points Each

- Complete problems 1 – 20 and 46 – 57 on pages 84 – 85 in textbook.
- Can you Fix It Station (8 Problems)
- What is your Sign-Part I (GPS TASK)
- http://classroom.jc-schools.net/basic/math-integ.html
  Any two games & Audit Reflection Card

Triples- 50 Points Each

- Using the Number Line (GPS TASK)
- Worktext Lesson 2B, C pages 34 and 36.
- Worktext Lesson 2B, C pages 33 and 37.

Homeruns-100 points Each

- **Helicopters and Submarines (GPS TASK)**
- **Making a Test (GPS TASK)**

Things to Consider….

- **1**: **Set rules** for the stations. List expectations. Post or review the lists.
- **2: Set specific time limits**.
- **3**: **Organize and prepare** materials and directions sheet in advance
- **4**: Consider ways for students to self assess (Rubrics, checklist, answer keys,etc.)
- **5:** Incorporate **technology!!!**
- **6**: Make stations **meaningful and realistic**.
- **7**: **Consider assigning students roles** to assist in managing the groups.

Evaluate: Closing

It is time to show what you know…

Today we …

Tomorrow we will…

Evaluate: Closing (Exit Ticket)

- Choose one of the 5 prompts to include in your Math Journal or Thinking Map as your Exit Ticket.

I feel I really understood…	I am unsure about…
I am curious to learn more about….	Today's lesson left me wondering about….
The thing I will remember most about this lesson is ….. because….	I continue to struggle with… because

Post-Lesson Reflective Teacher Questions

- How do you think it went? What did you accomplish today?
- Do you think learners got the concept?
- Did you meet your goals and your student needs?
- As a group, complete the Thinking Map (Tree Map)

Session Reflection Questions

1. Which strategies in this session are you most likely to use?

2. How would you adapt the strategies in this session to suit your needs?

3. What else would you like to know?