Apply properties of operations as strategies to multiply and divide rational numbers.

LESSON: THE MASTERMIND

How is DJ Mastermind doing these calculations in his head?

Evaluating an expression exactly as it is written is not always efficient. The properties of operations allow us to manipulate expressions by rearranging and regrouping for easier computing. During *The Mastermind*, DJ Mastermind and his manager, Glam City, are meeting with executives in hopes of saving their tour. They are given financial information about various tours, and DJ Mastermind quickly performs calculations in his head, stunning Glam City and the other executive. They are both wondering, "How in the world is he doing that?" The data provided are images of the speaker phone from which Jen is giving the financial numbers and images of DJ Mastermind saying his calculations.

Download the Detailed Lesson Plan
Available on the Teacher Dashboard

The Math Simulator™

1 Immersion

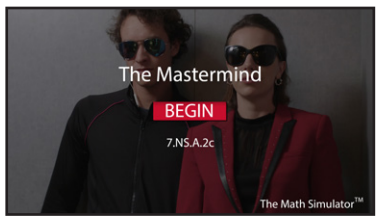
- Play *The Mastermind Immersion* video, whole-class.
- Restate the question: **How is DJ Mastermind doing these calculations in his head?**
- Facilitate classroom discussion; ask students: "What ideas do you have?"

2 Data & Computation

- Print the *Data Artifact*, cut into halves, and distribute to students.
- Allow students work time. Ask students: "Does your answer make sense?"
- Consider using a sharing protocol leading to mathematical insights and/or highlighting misconceptions.
- Allow students to revise their work.

3 Resolution

- Play *The Mastermind Resolution* video, whole-class.
- Prepare and give brief lecture (*Teacher Instruction*).



+ Simulation Trainer (Use student headphones.)

- Assign the *Simulation Trainer*.
- Use protocols that encourage students to help each other.
- Use *Progress Monitoring* to access real-time data for the classroom.
- Provide individual help for students who are not making progress.

Instruction at a Glance

Gladys Graham

Kevin Simpson

Megan LeBleu

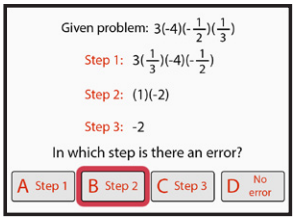
Gladys: Students will benefit from a reference sheet listing the various properties of operations.

Kevin: Give students opportunities to explore using the properties of operations with varying expressions involving multiplication and division of rational numbers. Let them discover for themselves which properties they find helpful.

Megan: Ask that students indicate which property they use at each step, as some properties are so subtle they may not even realize they are using a property. Help students recognize this.

Standard Math Procedures

Ex. Clicker Quiz #4

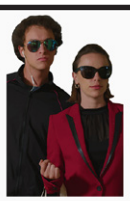


1. Analyze each step.
   - Step 1: Apply commutative property. CORRECT
   - Step 2: Apply associative property. INCORRECT multiplication of -4 and $-\frac{1}{2}$
   - Step 3: Multiply. CORRECT for given numbers.
2. Select the step with an error.
   - B: Step 2

Clicker Quiz

Launch the *Clicker Quiz*, whole-class.

DJ Mastermind spun for 3 days at the Electric Eye Festival. It cost the company $2\frac{1}{3}$ thousand per day.



Which equation shows how DJ Mastermind would calculate this total?

A $4000 + $3000 = $7000
B $6000 + $1000 = $7000
C $3500 + $3500 = $7000
D $5000 + $2000 = $7000

$(-\frac{3}{5})(10)(8)$

Which rearrangement of this expression might be most helpful?

A $(\frac{1}{5})(-3)(10)(8)$
B $(-3)(10)(\frac{8}{5})$
C $(-3)(\frac{10}{5})(8)$

$-7 \cdot -\frac{3}{4}$

Which expression is NOT equivalent to the given expression?

A $(-7 \cdot -3) \div (-7 \cdot 4)$
B $\frac{(-7 \cdot -3)}{4}$
C $(-\frac{7}{4}) \cdot -3$
D $-7 \cdot -3 \cdot \frac{1}{4}$

Given problem: $3(-4)(-\frac{1}{2})(\frac{1}{3})$

Step 1: $3(\frac{1}{3})(-4)(-\frac{1}{2})$

Step 2: (1)(-2)

Step 3: -2

In which step is there an error?

A Step 1
B Step 2
C Step 3
D No error

$(-a)(b)(-\frac{c}{d})(a)(-b)$

Assuming a, b, c and d are positive rational numbers, the product of this expression will be positive.

A True
B False
C Not enough information

$5 \cdot (-3) \div \frac{1}{4} \cdot (-8)$

Which expression is equivalent to the given expression?

A $5 \cdot (-\frac{1}{3}) \div \frac{1}{4} \cdot (-8)$
B $5 \cdot (-3) \cdot 4 \cdot (-8)$
C $5 \cdot (-3) \cdot \frac{1}{4} \cdot (-8)$
D $5 \cdot (-3) \div 4 \cdot (-8)$

Name _____ Date _____ Period _____

THE MASTERMIND

How is DJ Mastermind doing these calculations in his head?

During a meeting discussing the upcoming tour for DJ Mastermind, Jen from Financials gives expense details for two of the events: The Música Por Vida Festival and The Global Love Festival.

DJ Mastermind quickly calculates the totals for both festivals. Glam City and Tammy are still wondering how he is doing this. Show how DJ Mastermind does these calculations.

7.NS.A.2c

About this standard

Apply properties of operations as strategies to multiply and divide rational numbers.

Name _____ Date _____ Period _____

APPLYING THE STANDARD

How might this standard appear on a test?

CHECK OUT MY WORKED EXAMPLE #2

1) Silvana is building a bookshelf out of wood, like the one shown. The wood will be $\frac{5}{8}$ of an inch thick, and the shelves will be 12.5 inches apart. How high will the top of the bookshelf be from the ground?

a) Write an expression that can be used to calculate the height.

_____

b) What is the total height of the bookshelf?

_____

2) Rewrite and evaluate this expression in two different ways.

$8 \cdot \frac{1}{3} \cdot (-4) \cdot 9 \cdot (-\frac{1}{4})$

Method 1	Method 2

3) Rewrite and evaluate this expression in two different ways.

$4 \div \frac{2}{3} \cdot (-8) \cdot \frac{1}{4} \cdot 3 \div (-\frac{1}{2})$

Method 1	Method 2

4) $-6 \cdot (-\frac{1}{4}) \cdot 8 \cdot (-\frac{5}{3}) \cdot a$

a) What value of a could give this expression a value of 10?

b) What value of a could give this expression a value of -30?