

Tool:	Rulebook for Integers
Category:	Teaching Tool
Urban Specialist:	Bryan Paschal, Anne Stinnett
School Level:	Middle School
Target Audience:	Math Teachers
References:	Max Thompson

Rationale: Strategies to increase comprehension and retention

Description: *The Rulebook* is a step-by-step guide to solve problems or perform calculations. During a typical lesson, the teacher presents a rule with examples and the students write it down in a spiral notebook. Then, when students have questions, I ask them if they have looked at their rulebooks. If they have not checked their rulebooks, I won't help them until they do. If they don't have their rulebooks, I don't answer their questions.

The Rulebook has a lot of advantages. Students have a step-by-step guide to doing problems that they can take home with them. If the rules were written correctly, most parents would be able to understand what the students are doing and might be able to help their children with their homework. Of course, that doesn't guarantee they will help their children.

If a student is absent, he should be able to catch up to the other students by copying another student's rulebook. Then, either you or a student can explain the rule, if necessary. It places the responsibility on the student to find out what we did while they were absent. I never let the students copy from my rulebook simply because I don't want anything to happen to my rulebook.

It provides a record of what you have done in your class. If a parent says that a child has not learned anything this year, simply ask the child to pull out his/her rulebook. You will be surprised how much information you cover in a year. This year, I will probably have around 100 rules kids will have learned. If the parent says you don't do a good job of explaining things, I have the parent or student read the rules we are currently working on. (I try to make the rules very step-by-step so that anyone can understand them.) When the parent sees how easy you make the class, the parent usually gets mad at the kid for being lazy.

If your school standardized *The Rulebook* from grade level to grade level, then kids will learn the same exact steps using the same exact words year after year. Hopefully, it would stick in their brains eventually. They wouldn't get confused because teachers teach things too differently.

I do one rule per page so they are easy to find. Someone suggested doing a table of contents. (I

would if I could ever get organized.) I also make students number the pages of their spiral notebook on the very first day of class. That helps to prevent kids from using the paper in their spiral notebook for something else. I recommend the 120-page spiral notebook to make sure they have enough paper. I never check to see if kids have them. They usually don't forget them more than once because it is a pain to copy a rule or set of rules. If a kid misses a rule on a test, then have them write the rule a certain number of times.

The ideas in my rulebook are all stolen from other teachers. I take no credit for them. I may have even stolen some of the ideas from you. I just try to keep track of what kids tell me their teachers did last year and I add it to my rulebook if it's good. If you have a good idea, feel free to let me know so I can add it. The following is a sample of what the rulebook looks like for an integers unit.

Basics of Integers

Integers is another word for negative and positive numbers.

The "+" sign is used for positive numbers.

The "-" sign is used for negative numbers.

Zero is neither positive nor negative.

A number without a sign is positive. Example: $3 = +3$

The **opposite** of a number is just what it sounds like.

Example: the opposite of -5 is $+5$

The following word list may help you:

<u>Positive</u>	<u>Negative</u>
Above	Below
Gain	Loss
Increase	Decrease
Deposit	Withdrawal

Absolute value means how far a number is from zero. (It's the number without the sign on it.)

$|-6| = 6$ The two lines on each side of negative six are the symbol for absolute value.

Comparing and Ordering Integers (Greater than/Less than)

Comparing Integers

1. Think of where the numbers are on a number line.
2. On a normal number line, left is least.
3. If you are comparing integers, the alligator likes to eat the one that's greater and the least gets left behind.

Insert examples using a number line

Ordering Integers

1. Think of where the numbers are on a number line.
2. On a normal number line, left is least. (The negative side is the least side.)
3. If it's least to greatest, write the numbers down from left to right.
4. Make sure you check to see if it's least to greatest or greatest to least. Don't let them trick you.

Teaching Tip: Use a long piece of kite string and hang it across the front of your room. Take index cards and fold them so they can hang on the string. Write different integers on the index cards. Have students place the cards in the correct location on the string (in order). You can make it a game. Your team scores by placing the number in the right place. This idea also works for comparing and ordering decimals and fractions. It also can be used to study equivalent fractions, decimals, percents, etc.

Adding Integers—The Charge Model a.k.a. drawing pictures

The rule in the book states that if the signs are the same, you add the numbers together and give the answer that sign. If the signs are different, you subtract the smaller number from the larger number and give the answer the sign of the larger number. That's too confusing. Instead, DRAW PICTURES.

1. If the number is positive, write down that many “+” signs.
2. If the number is negative, write down that many “-“ signs.
3. If it’s zero, write down nothing.
4. Positives match up with negatives and cancel each other out. Circle each of these positive and negative pairs.
5. Remember that positives don’t go with positives and negatives don’t do with negatives.
6. What’s left over is the answer.
7. If nothing matches up because they are all positive or all negative, just add them together to get your answer.

Examples:

Insert examples. This is the Charge Model.

Teaching Tip: Every time you refer to adding integers, refer to drawing pictures. Start with small numbers less than ten. Students will develop the rule in the book over time, especially when you give them a problem with big numbers. They will ask if they have to draw the picture for the big numbers. I usually tell them no, but to think about the picture when they are trying to figure out the answer.

Subtracting Integers **(Leave, change, opposite)**

The rule is to change the sign of the second number to its opposite and make it an addition problem. Some will say to add the opposite. That doesn’t always make sense. Instead, remember to do the following:

Leave-change-opposite

1. The first number stays the same
2. The sign in the middle changes from “-“ to “+”
3. The second number becomes its opposite
4. Draw pictures.

Examples:

Insert examples of how to do the problem.

Teaching Tips: Remind students that a number without a sign is positive. Emphasize the LEAVE CHANGE OPPOSITE saying is for subtraction.

Multiplying and Dividing Integers a.k.a. The Rules

1. The rules only work for multiplication and division.
2. When you are multiplying **TWO** numbers:
 - a. If the signs are the same, the answer is positive.
 - i. Positive X Positive = Positive
 - ii. Negative X Negative = Positive
 - b. If the signs are different, the answer is negative.
 - i. Positive X Negative = Negative
 - ii. Negative X Positive = Negative

Another way to think about it:

If a good thing happens to a good person, that's good.

If a bad thing happens to a bad person, that's good.

If a good thing happens to a bad person, that's bad.

If a bad thing happens to a good person, that's good.

Insert examples of how to do problems. On another day, add examples that include what to do when you have three or four numbers to multiply together.

Rules for Taking the Integers Test

Take ten minutes to study the night before the test. It could be the difference between an “A” or a zero.

Remember:

Opposite means opposite

Absolute value means how far from zero (the number without the sign)

Comparing: Use number lines (left is least)

Adding: Draw Pictures

Subtracting: Same, Change, Opposite

Multiply/Divide: The Rules (same=positive, different=negative)

Positive

Above

Gain

Increase

Deposit

Negative

Below

Loss

Decrease

Withdrawal

Note to the teacher: You probably want to do some problems that involve above and below sea level as well as thermometer problems.