

The Math Pact

The Book at a Glance

Consider this book your handbook and go-to guide for ensuring equitable, coherent instruction across grades, schools, and your district. You'll find a number of features throughout the book to aid you in your journey creating a Mathematics Whole School Agreement (MWSA).

FIGURE 2.1 • WORDS THAT EXPIRE IN HIGH SCHOOL

Words that expire	Expiration details	MWSA-suggested alternatives
General		
"Show your steps"	When students are told that they have to "show their steps," it leads them to think of all mathematics as algorithms.	Instead, we recommend saying "Explain your thinking," as this phrase is inclusive of multiple options of the possible mathematical representations (e.g., concrete models, illustrations, words, graphs, symbols) and multiple strategy options.
Numbers		
Reading a multidigit whole number such as 123 as either "one, two, three" or "one hundred and twenty-three"	Reading a number by its digits only does not promote the understanding of the number's magnitude. When the word <i>and</i> is inserted, it implies that the number consists of a whole and a part, as in a decimal or fraction.	123 should be read as "one hundred twenty-three." The same is true for other multidigit whole numbers—no <i>and</i> . Meaning must be developed from the start, and there is no place value meaning given by calling out digits. However, the word <i>and</i> can be stated when you are reading a number that has a decimal point (as in 2.45 being read as "two and forty-five hundredths" or \$9.26 as "nine dollars and twenty-six cents") or a mixed number such as $3\frac{1}{2}$, read as "three and one half." When people in the media read a multidigit whole number and say, for example, for the year 2021, "twenty, twenty-one" or "two thousand and twenty-one," we hope your students catch those and say "No <i>and</i> !"
Saying the division problem didn't work out evenly or exactly	Saying an odd number can't be divided by 2 evenly or 21 can't be divided exactly by 5 is erroneous. Both numbers can be divided into equal groups, just not without a fractional component.	Instead, we suggest you say the problem didn't result in a whole-number answer. You can also say that a number divides into another number without a remainder. Integers can be divided exactly by 2 or 5 or any number. What is being stated with this preferred language is that the number can't be divided by a given divisor with a remainder of 0.
Saying rounding down (or up) when talking about rounding numbers	Students often think you only either round up or round down. But sometimes the number stays the same; for example, when looking at	Just use rounding.

In-depth charts will help you find a consistent approach to preferred and precise mathematical language, notation, representations, rules, and generalizations that will help clarify students' mathematics understanding.

FIGURE 5.3 • RULES THAT EXPIRE COMMONLY USED IN HIGH SCHOOL AND SUGGESTED ALTERNATIVES

Rule that expires	Expiration details	Suggested alternatives
Number		
The absolute value of a number is just the number. Absolute value is like a magic hat: Whatever you put in comes out positive.	When finding the absolute value of a number, students are sometimes told that the absolute value is just the number with a positive sign. If the number is positive, it stays positive, and if it is negative, you simply drop the negative sign. For example, $-5 \rightarrow 5$. This approach might seem harmless but causes confusion when students soon encounter $- -5 $. They will be unsure how the absolute value could be negative. This rule can cause further confusion when solving absolute value equations.	Focus on the definition of absolute value (i.e., its distance from 0 on a number line), and use that language consistently (and require students to use it) when discussing absolute value.

WHAT ARE RTEs?

RTEs are a deeply rooted tradition in mathematics education, a means to teach a procedure or strategy in a way that the teacher believes makes the learning easy and fast or helps students remember. Sometimes RTEs are used with the best of intentions as an attempt to make learning “fun.” However, let’s be clear: RTEs are harmful in the long term and should not be used. We authors learned this the hard way by teaching these rules in our classrooms only to regret it later when we taught other courses or learned more mathematics content. RTEs might temporarily seem to help in the short run, but in the long run they support the myth that mathematics

Rules that expire: Tricks, shortcuts, or rules that are used in mathematics that immediately or later fall apart or do not promote mathematical understanding.

is a set of disconnected tricks and shortcuts, is magical, or at worst is incomprehensible. The basic premise of RTEs is to teach for convenience or speed, and the subsequent initial appearance of student success fuels the continuance of teaching these rules.

In other words, being able to apply RTEs by rote may get students through the next problem, quiz, test, or high-stakes assessment, making it seem as though there is deep conceptual understanding (or a strong reason to teach this way) when often there is not. Then, when that appearance of success leads us to believe that students understand more than they do, we use the RTEs again. In essence, the use of the “trick” or the “shortcut” becomes a self-fulfilling prophecy. Instead, we should teach for the future mathematics we know is coming and emphasize enduring understanding and long-term utility. Instruction that fosters students’ depth of understanding builds procedural fluency from conceptual understanding (as described in NCTM, 2014b). Smith et al. (2017) state,

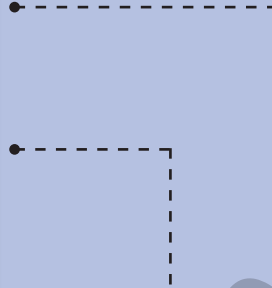
Throughout their mathematical experiences, students should be able to select procedures that are appropriate for a mathematical situation, implement those procedures effectively and efficiently,

CORE MWSA IDEA

Even actions we take as teachers that seem well-meaning can be harmful in the long run!

CORE MWSA IDEA

Teaching for understanding and long-term utility prepares students to become adults who are mathematically literate.



Throughout the book, find definitions of key terms and notes on core MWSA ideas.

Reflection tasks help you consider how key ideas relate to your own instruction.



REFLECTION

CONSTRUCTION ZONE REVISITED—NOTATION WALL

Now that you have a math word wall, consider these questions:

- What notation should be there for students’ reference?
- What have students learned lately that needs to be reinforced?
- What prior knowledge is it important to refresh for upcoming lessons?
- As with vocabulary and phrases, how can you combine visuals with definitions to support your learners’ use and understanding of these symbols?

Use this template to map out your additional ideas.



