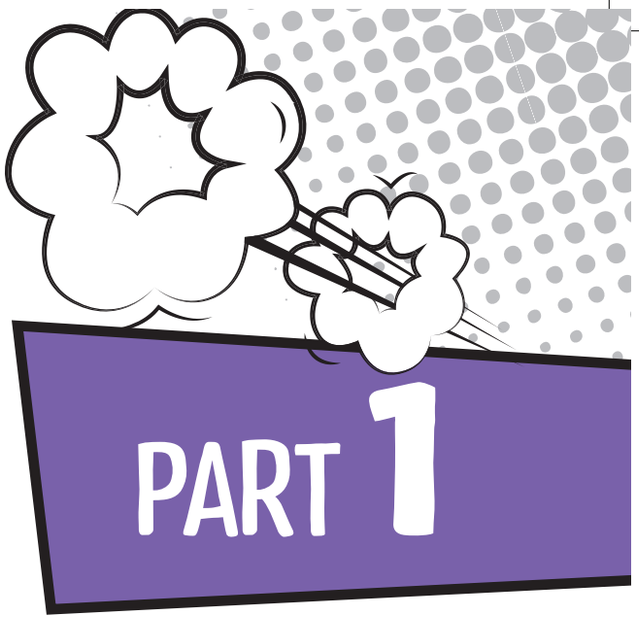


WHY JUMP-START ROUTINES?

THE FIRST FEW MINUTES OF MATHEMATICS CLASS

The start of an elementary mathematics class varies greatly from classroom to classroom, grade to grade, and school to school. It might be a mad rush to get our students settled as they come into the room in the morning, from recess, or from related arts. It might be a blurred start as we change topics from science or social studies to mathematics. It might be the first few minutes of our instructional day, or it might be the last hour of our day. Regardless of how or when it begins, the first few minutes of our mathematics class has the potential to shape the entire lesson by setting tone and purpose.

The first few minutes are an opportunity for us to capture the attention of our students and prepare them for the lesson ahead. These opening minutes are also the time when our students' brains are freshest. They tend to remember more of what we teach or do during this segment than any other time of the learning episode (Sousa, 2007). That is why it is such a critical time for us to help students shed their distractions, capture their attention, and jump-start their brains. Engaging students immediately will increase the likelihood that they'll stay engaged and motivated to learn throughout the lesson.

However, we don't always take advantage of those precious first few minutes. We have felt obligated to meet the long-held traditions about how mathematics class *must* begin. We have come to find that the activities instead undermine our goals and the productive beliefs we have about teaching and learning mathematics. First and foremost, we have all experienced our instructional time being hijacked by

opening calendar rituals, traditional warm-ups, and homework review. It is difficult to keep each of these from going beyond the allotted time. We have had them unravel, becoming unwanted mini-lessons disconnected from the intended objective because we want to help our students. These opening activities also often focus on the goal of getting right answers. They cause us to begin class by setting the tone that mathematics is the pursuit of answers.

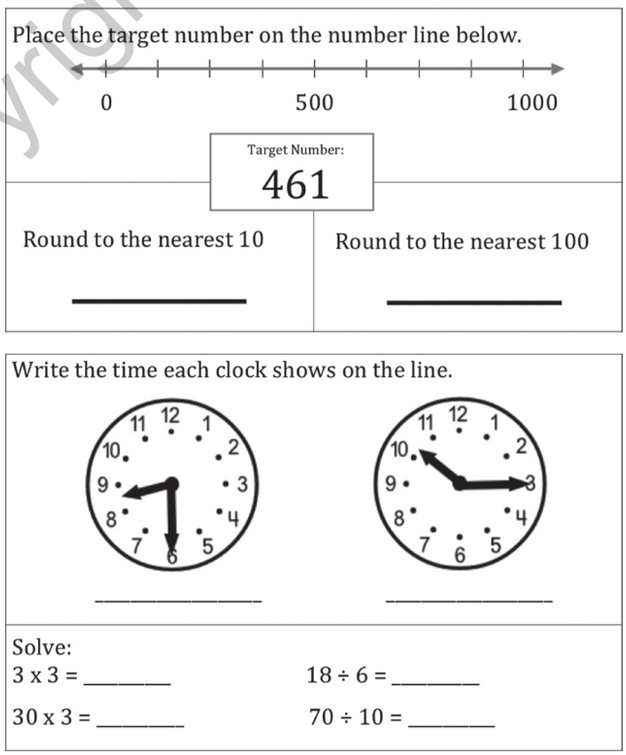
Ineffective Calendar Rituals

Calendar rituals are daily ceremonies made up of a series of actions carried out in a specific order. Often, students complete patterns, graph observations about weather, and categorize numbers in a variety of ways. The intent is to revisit certain mathematics concepts over and over again so that they are understood well. But, we find that these calendar rituals quickly become mindless actions. Our students' engagement quickly wanes. Their thinking and reasoning fall behind process and procedure as they complete the tasks mechanically. Mathematics becomes an experience grounded in compliance and completion rather than being rich and dynamic. But, what if it didn't?

Traditional Warm-ups

Unfortunately, the first five minutes of most classes are often spent on logistical or low-level cognitive tasks such as taking attendance, reviewing homework, or completing problems that are identical to homework problems assigned the night before. While the goal may be to tap into prior learning, such problems are usually rote in nature and ask students to perform simple tasks that often stress procedure and *correctness*. A traditional 3rd grade warm-up might look like this:

Figure 1.1



Positioning warm-ups like these as the first *instructional* tasks presents challenges. It signals to students that mathematics is the pursuit of low-level answers and procedures. It suggests that mathematics is a collection of semi-connected ideas and steps. Students may infer that you value these sorts of problems more than others. Why else would you start with them? These problems tell your students that you need them to consistently review ideas because you aren't confident or convinced that they have mastered the skills within them. These warm-ups may fail to take advantage of the moments in which your students' brains are most ready to learn. The most problematic aspect of these warm-ups may be that they fail to set the stage for engagement and discussion.

We know from experience that great lessons begin with a strong start. Many, if not all, of us would agree that the opening minutes of class have the potential to ignite engagement and take advantage of our students' brains being ready to learn. Conversely, a start to class that drags or is uninteresting can sabotage the rest of the period. The traditional warm-up often sets the stage for the latter. But, what if it didn't?

The Problem With Going Over Homework

The effect of homework is muddied. Practice does contribute to achievement. But, who is practicing when elementary homework is completed? Are students completing the homework independently? Do all students have the same resources at home? Is traditional, worksheet-based homework good for young students in general?

Cooper notes that some suggest a link between homework and achievement (Cooper, 2006). However, he also notes that "these results suggest little or no relationship between homework and achievement for elementary school students." According to two studies of middle school and high school mathematics classrooms, 15 to 20 percent of class time tends to be spent reviewing homework (Grouws, Tarr, Sears, & Ross, 2010; Otten, Herbel-Eisenmann, & Cirillo, 2012). One could argue that elementary classrooms see a similar rate. This book is written with the fundamental belief that reviewing homework for any significant time of class is an ineffective way to begin class.

Reviewing homework is another unwritten obligation for planning mathematics class. For a long time, it was thought of as how math should start or something that should be done right after a warm-up. But, it is not a requirement for effective mathematics instruction (NCTM, 2014). In fact, it can contribute to the opposite of effective mathematics instruction. So why is going over homework problematic?

- Certain items within an assignment may be poorly written or uniquely complicated. Time and effort spent to help students *fix it* is wasted.
- Homework should be practice of mastered skills and concepts. If those skills aren't well understood, an ad-hoc mini-lesson comes about diverting instructional time for the intentionally planned lesson.
- Students might not complete homework independently. Time spent in class to go over work completed with parents is counterintuitive. These students may have no better understanding than their classmates but their *work* shows otherwise.
- Some students don't have access to resources at home to complete their homework so there is nothing to go over. Incompleteness of homework means that class time dedicated to reviewing it is already compromised.

The bottom line is we can use brief homework assignments appropriately to reinforce existing knowledge and keep student skills fresh. In doing so, we shouldn't need much, if any, class time to go over it. Instead, we can use that time more productively. We can take back the time lost to rote warm-ups and homework review by starting math class with number sense and reasoning routines. We can engage students and foster their curiosity and creative thinking at the immediate start of class.

OPPORTUNITIES FOR BETTER ENGAGEMENT AND HIGH-QUALITY PRACTICE

Jump-start routines may be best used to help you take back the power of the first few minutes of mathematics class. But, these routines can naturally complement other parts of your class as well. They can help you think about alternatives to other challenges you face. Those challenges include the large collection of practice sheets and busywork provided by your textbook programs. You might swap out some games and centers that don't fulfill your intentions with number sense routines. You might be looking for better ways to help your students realize fluency. Or, you might simply need to build a larger collection of engaging activities because you don't have enough. You might worry that adding in jump-start routines is just another thing to do in an already crowded lesson. But, the below outlines some activities you might consider replacing, making room for these opportunities for better engagement and high-quality practice.

Replacing Busy Work and Drill and Kill

Concerns about mathematics class are not relegated to the first minutes of class. The amount of time we lost to busy work is equally problematic. Practice of skills and concepts is needed. But, practice has the potential to become nothing more than a *time filler*. Our experiences as students as well as the mathematics programs we use frame practice as student workbooks or worksheets. These activities embody all that is meant by *drill and kill*. If we overuse these, our students might begin to see practice and even the purpose of mathematics as compliance and completion. These practices may kill the joy of mathematics causing many students to fall out of love with math.

A greater hazard for most, if not all, of these practice sheets is that they focus on narrow, procedural approaches to mathematics. They don't allow for much critical thinking or reasoning. Discussion is unnecessary, and if it does occur, it is about how something was completed rather than why. There isn't much to think or talk about when the prompts are basic facts, telling time, or rounding such as shown in Figure 1.1 on page 2. Instead, jump-start routines can take the place of some of the more traditional openers in ways that benefit students more than homework review or practice sheets. These routines might also do well to limit, if not supplant, mundane practice as well.

As Alternatives to Games and Centers

Games and centers can be a good way to practice mathematics. Games engage students. They develop strategic thinking and reasoning. But without accountability, students end up being semi-engaged with games talking about random things between lackadaisical engagement. Games can be challenging and undesirable for students

who aren't competitive. Like games, centers provide opportunities for worthwhile practice but can be problematic when accountability and feedback are lacking. To be clear, games and centers are good for our students. But, we can complement their use with other engaging practices that offer more accountability, richer discussions, and better feedback. These routines are those worthy complements.

As Different Approaches to Fluency

Students who are fluent are efficient, flexible, and accurate (National Research Council, 2001). Fluency extends beyond basic facts. Students can become fluent with multi-digit computation, fraction comparison, estimation, procedure, and a host of other skills and concepts. As we know, traditional approaches to fact fluency, including games and flash card practice, come up short. Often, these activities don't enable the rich discussions we strive for in our mathematics classes. But, it is difficult for us to find worthy replacements for these activities. Jump-start routines can help solve this problem.

As Part of a Robust, Diverse Collection of Engagement Resources

Number Talks (Parrish, 2010) and online routines such as Which One Doesn't Belong (Wyborney, 2018) and Splat (Wyborney, 2018) are also great choices for filling the fluency practice void. These routines help develop computational fluency, reasoning, and decomposition. But, there is so much more we want our students to practice. And, it can be challenging to maintain our students' interest and engagement if these are our only options over 180 days of mathematics instruction. We need a robust collection of activities that are similarly interesting. We need other activities for other important ideas like counting, magnitude, and estimation. Jump-start routines are the perfect complement.

JUMP-START ROUTINES: NEW WARM-UPS FOR A NEW ERA

The routines in this book are designed to *jump-start* mathematics class. They are new warm-ups for a new era. They are the perfect tool for practicing critical skills and concepts. They are engaging opportunities for students to work with and discuss interesting prompts. The routines are designed to develop students' reasoning and/or sense making. They aim at improving students' number sense. They are a makeover for the beginning and traditional practice activities so that students have access to meaningful, engaging, quality practice. These routines can repair or instill mathematics confidence in our students.

These routines are:

- practical and easy for you to implement each day;
- meant for the first five to seven minutes of class;
- flexible for use in place of other practice activities;
- thinking exercises meant to ignite thinking and reasoning skills;
- open and flexible in nature; and
- modifiable to work with almost any content at any grade level.

These routines create an environment in which the Common Core State Standards for Mathematics (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010) come to life. Though specific practices are linked to each routine throughout the book (listed as **MP**), in general students will:

1. make sense of problems and persevere;
2. reason abstractly and quantitatively;
3. construct viable arguments and critique the reasoning of others;
4. model with mathematics;
5. use appropriate tools strategically;
6. attend to precision;
7. look for and make use of structure; and
8. look for and express regularity in repeated reasoning.

What Is Meant by Routine?

A routine is an activity that is done, well, routinely. It has a definitive shape and structure. It offers a consistent process so that students can focus on substance rather than sequence steps. Routines become a habit that maximize opportunity. You can easily adjust and customize a routine for any classroom or grade level. There are a wide variety of routines for instruction. There are routines in language arts for phonics and fluency. There are routines for behavior management. There are even other routines in mathematics, including routines for solving problems, reasoning, and discussion. The number routines presented here are for reasoning and number sense.

What Is a Number Routine?

The number routines presented here are structures for talking about numbers, number concepts, and number sense. These routines afford students opportunity to play with numbers. They are flexible yet intentional. They target specific components of number sense. These routines intend to engage students in discussion. They are meaningful practice. In some schools or districts, routines may be recognized as *math talks*.

Routines Support Reasoning in Mathematics

Reasoning can be thought of as the process of drawing conclusions based on evidence or stated assumptions. Although reasoning is an important part of all disciplines, it plays a special and fundamental role in mathematics. In middle and high school mathematics, reasoning is often understood as engaging in *formal reasoning*, or formulating proofs, in which students are drawing conclusions logically deduced from assumptions and definitions. However, mathematical reasoning can take many forms, ranging from informal explanation and justification to formal deduction, as well as inductive observations. Reasoning begins in the earliest grades. It starts with explorations, various conjectures, false starts, and partial explanations before there is ever a result.

Reasoning is compromised as students accept rule and procedure without investigation of *why?* They then practice these rules and procedures so much that the mathematics and reasoning within them fades away. Their task-at-hand becomes

nothing more than completing a collection of problems or steps. Over time, they generalize that *this* is what it means to do mathematics.

Today, technology makes it possible to solve or complete most any calculation quickly. But, how do students know that the result is reasonable? How do they know that a solution displayed on a calculator, tablet, or phone is correct? Determining reasonableness is a collection of abilities and skills, which are much different from procedural calculation. These skills include critical thinking, reasoning, problem solving, and communicating. In fact, these more complex skills are more desirable by Fortune 500 companies than those skills, such as calculation, that were once considered desirable (Boaler, 2015).

Number routines proposed here help students develop complex, essential skills through daily, engaging activities that represent quality practice. The strategies, approaches, and reasoning that they develop during these routines will serve them for a lifetime of everyday mathematics.

Routines Improve Number Sense and Fluency

The National Council of Teachers of Mathematics identifies five components of number sense including number meaning, number relationships, number magnitude, operations involving numbers, and referents for numbers and quantities (NCTM, 2000). Fennell and Landis (1994) describe number sense as "an awareness and understanding about what numbers are, their relationships, their magnitude, the relative effect of operating on numbers, including the use of mental mathematics and estimation" (p. 187). Students with number sense understand relationships between numbers. They estimate. They make use of the properties of operations. They manipulate. Fennell and Landis also describe number sense as "the foundation from which all other mathematical concepts and ideas arise" (p. 188). And, every mathematics teacher relates to their noting that "students with number sense show a good intuition about numbers and their relationships" (p. 187).

Fluency is much more than the quick recall of basic facts. Fluency is being accurate, efficient, and flexible with thinking and computation (National Research Council, 2001). Students show it when they add up or subtract to find the difference between two numbers. They show it when they think about 109 + 43 as 110 + 42. They might show it through their ease of effort when completing a procedure. But, we should also help them pursue it as mental mathematics.

Fluency is more than memorization. We are fluent in all sorts of things that we didn't memorize how to do. For example, we might think of fluency when we think about driving a car. Yet, we don't memorize how to drive a car. Instead, we learn the concept, the rules, and the patterns. We practice and practice. We understand what it means to drive in a variety of places and contexts from parking lots and freeways to sunny days and snow storms. Like driving, fluency with reading, golfing, or doing mathematics is grounded in understanding and rich, diverse practice.

There is likely no correlation between the number of problems on a page and the level of one's fluency or number sense. Students don't develop these skills by completing a certain quantity of problems. Instead, teachers can help students develop them through rich, engaging problems and tasks, through exposure to others' sense and reasoning, and with sound understanding and lots of opportunity for meaningful practice. Routines can be part of that opportunity.

Number sense and fluency extend far beyond whole numbers and basic facts to fractions, decimals, ratio, percent, and much more. Most, if not all, mathematics teachers would identify number sense and fluency as two of the things that matter most. They might also identify them as two of the biggest challenges their students face in mathematics. Because of this, number sense and fluency are the targets of every routine within this book.

Routines Help Fluency Develop Over Time

The mathematical *big ideas* the routines support in this book are critical. They involve concepts and essential skills having to do with counting, magnitude, estimation, and operation sense. Students cannot truly develop or fully understand these ideas in a single unit of study or just a week or two of instruction. Mastery evolves. Students develop mastery over long periods, through frequent use and application in varied situations. They develop mastery through discussion and through brief, consistent, engaging, and meaningful practice. Daily routines enable students to develop, practice, and reinforce understanding of essential skills and concepts over time.

In his book *Outliers*, Malcolm Gladwell suggests that a person needs 10,000 hours of deliberate practice to master something (Gladwell, 2008). Though one might argue the exact amount of time, it is logical that the more people do something—the more they practice and experience something—the better they can understand and apply it. Consider playing an instrument. Passing a written test about the parts of the instrument, the way to hold it, and the meaning of recorded notes doesn't mean someone is proficient with the instrument. Instead, it shows that they understand how the instrument works and the basics of how music is recorded on paper. Their ability to play the instrument, and to play it well, is improved and enhanced as they play it more and more.

This analogy could be applied to number sense and reasoning. The theory here is that with foundational understanding and frequent, plentiful opportunities to practice, students can develop noticeable sense of number, reasoning, and justification. One might note that 10,000 hours seems impossible with limited instructional time and considerable skills and concepts already identified in your curriculum. However, with routines such as these presented, students can achieve a grand amount of *hours on the road* in just a few minutes a day. Consider this, students could access 11,700 minutes of number sense practice through five minutes a day, for 180 days (in a school year), over a 13-year school career. That's 195 hours—or more than one instructional year—for just number sense and reasoning!

Routines Satisfy the Need for Quality Practice

Quality practice is not defined by the number of problems students complete, the speed at which they calculate or recall, nor the number of hours they spend doing mathematics. It is defined by what students do and how they are engaged. Quality practice should engage students in thinking. We mean for the routines in this book to provide quality practice. They offer unique, engaging, and diverse experiences that will help students develop their thinking skills. They are not repetitive nor mundane. They are not mindless drills. These routines provide the quality practice that can help our students perform better in class, outside the mathematics classroom, and even better on standardized tests.

Routines Improve Performance and Achievement

Data from 13 million students who took PISA tests showed that the lowest achieving students worldwide were those who used a memorization strategy (Boaler, 2015, May 7). Simply, thinking and making connections improves student success on standardized tests. Mental computation and estimation can improve students' speed and overall performance. This makes most sense when we consider that test makers design distractors to mimic students' most common computational errors. It makes sense students who estimate, discount possibilities, make decisions about reasonable answers, will reconsider their solutions when choices don't match solutions. Routines that develop reasoning and number sense help students gain confidence, practice thinking, and likely improve overall performance on standardized assessments.

Routines Prevent or Rehabilitate Number Pluckers, Pluggers, and Crunchers

One might say that traditional mathematics instruction has created a *bunch of pluckers*. These pluckers are students who pluck key words or numbers from problems without thinking. It has created *pluggers* who plug numbers into formulas and equations without thinking. It has created *crunchers* who crunch numbers and blindly rely on the results as being correct. The creation of these pluckers, pluggers, and crunchers doesn't happen by accident. It happens when students don't fully understand mathematics concepts. It happens when they are introduced to steps and procedures for generating answers or completing the exercises. It isn't always the result of years of experience. Pluckers and pluggers can begin to appear in early elementary grades.

Success can be fleeting for many, if not all, of the pluckers, pluggers, and crunchers. Their ability to complete a procedure without understanding can, and often is, lost without considerable practice and maintenance. Even then, proficiency can fade. Yet understanding is not lost. When students understand concepts, connect them to procedures, refine their understanding, and transfer it to new situations they show that they never lose it. Routines build on their conceptual understanding, allow students to connect ideas, refine them, and transfer them to new situations. Routines build number sense and fluency. Routines can rehabilitate these students so that they rely on their own thinking instead of or in addition to someone else's rules and procedures.

Routines Encourage a Growth Mindset

The idea of consistent, engaging practice to develop students' number sense and reasoning promotes other prominent ideas about teaching and learning. One of those is a growth mindset. A growth mindset is an approach to teaching mathematics that emphasizes that mindset is more important than initial ability in determining the progress students can make in their mathematical understanding. Students with a growth mindset will make better progress than those with a fixed mindset. Having a growth mindset means:

- believing that talents can be developed and great abilities can be built over time;
- viewing mistakes as an opportunity to develop understanding;
- being resilient;
- believing that effort creates success; and
- thinking about how one learns.

Carol Dweck's work establishes that a growth mindset benefits students by empowering them to develop skills through dedication and hard work. To do this, we must provide them with worthwhile opportunities to engage in and discuss reasoning. Daily routines to work with interesting activities, to build number sense, and to improve reasoning about number and operation naturally complements the facets of a growth mindset. Routines reinforce that students' ability can be developed through continued practice and effort. They help students build confidence. They can undercut any students' notion that their mathematics ability is fixed.

Routines Honor and Leverage Errors

A growth mindset is grounded in making and honoring mistakes. Honoring mistakes is much more than saying that it's ok to make a mistake in class. Honoring mistakes means that mistakes are explored. As Jo Boaler notes, mistakes help grow our brains (Boaler, 2015). Routines are an opportunity for students to reason and make mistakes when doing so. Discussion about reasoning and mistakes help students advance their understanding. As teachers facilitate discussions during routines, it is critical to pursue not only accurate and efficient reasoning but flawed reasoning as well. Exploring students' reasoning and errors tells students that mistakes are more than ok. It tells them that mistakes are valued.

Many people know, it is more powerful to find one's own mistake rather than being told that one is incorrect. During discussion with partners and the class as a whole, students have the opportunity to explain their thinking and thus catch their own mistake. In some cases, exposure to others' reasoning and even others' errors helps students better understand their own reasoning and misconceptions. This can happen at any point during a math class. Starting with a routine built on reasoning and discussion increases, if not guarantees, the likelihood of discussion and exploration of errors or misconceptions.

Routines Actively Develop Confidence

Blindly applying rules to mathematics without understanding can undermine a student's confidence (Van de Walle, 2019) as they rely on disconnected steps without understanding. Stalled fluency erodes confidence. Perceptions of failure associated with making mistakes in mathematics or perceptions of *not having a math gene* damage student confidence. Infrequent, disengaging, or disconnected practice challenge confidence. Yet, jump-start routines can counter each of these challenges and in time enhance students' confidence in themselves and mathematics in general.

IMPLEMENTING JUMP-START ROUTINES

These routines are intended as practical ideas for jump-starting your mathematics class. You can modify them to work with any number concept and most any mathematics concept in general. You can adjust them to fit any amount of time you allocate to begin mathematics class. You can use them with any level of student proficiency in mathematics or any level of student experience with routines. As you implement them, routines become a rich opportunity for meaningful discourse in mathematics and windows into student thinking.

Routines That Are Ready-For-Use

The routines provided throughout the book are ready-for-use. You'll find examples of specific numbers, operations, or concepts along with implementation guidance. These are followed by variations and ideas for how the content might be modified to meet the needs of all elementary content. Each routine is available as a downloadable set of PowerPoint slides.

All routines can be downloaded for your use at **resources.corwin.com/jumpstartroutines/elementary**

Each can be edited or modified as needed for any classroom. You can copy the slides so that a routine can be extended to the number types or concepts you want to focus on.

Flexible Use

The routines presented here are intended to support high-quality mathematics instruction. There are no specific requirements. You can adjust the time allotted to a routine for all sorts of needs. You can adjust the number of prompts. You can use any routine, in any order, on any day. We offer ideas for using and adjusting routines throughout this book, but there are likely many other ways to adjust a routine. Simply, you can modify any routine however you see fit.

Timing of Routines: How Long? When?

You can manage how long routines last by adjusting the number of questions you ask or the number of student approaches you investigate. You can limit the number of problems or situations that students encounter. You can modify the complexity of the mathematics you present. You can cut or extend the amount of time students have to share their thinking with partners. Essentially, you control the amount of time allocated to your routine. A guide for facilitating a routine might be:

- Students work with the prompt independently (about one minute).
- Students discuss their reasoning with a partner or triad (about two minutes).
- Teacher facilitates class discussion about strategies and reasoning (about three to four minutes).

That said, here are a couple of basic guidelines:

1. These routines are intended to be quick, engaging activities that foster number sense and reasoning. Typically, they should be no more than a few minutes. Most days they should last about five to seven minutes. Other days, they may be a bit more than five minutes. Occasionally, the discussion may be so vibrant and engaging that you find your class spending 10 minutes with the routine. The latter may not be ideal due to time and schedule challenges. However, it's important to note that it may happen from time to time. It's also important to note that these rich discussions are exactly what you want for your students and so spending a few minutes more with them shouldn't be thought of as time lost or wasted.
2. Routines are likely best situated at the beginning of the mathematics class. You can establish protocols for students to enter class and prepare for the

opening routine. In this way, they naturally replace mundane warmups or review of homework. However, you can flexibly position routines throughout the class as well. In longer classes (75 minutes or more), you may decide that they are best used in the middle of the block as an opportunity for rekindling students' energy and engagement. In other cases, you may find that routines can be useful when offered at the end of the class. If you select the end of class, you must be sure to close instruction for the period early enough for the routine to take place. There is an obvious challenge of running out of time when planning for routines at the end of class.

3. Routines may take longer at first. For some students, this is the first time they are consistently challenged to think about mathematics in their own way. For others, discussing their reasoning may be problematic. For you, facilitating and investigating without lingering too long will take some practice. A routine will become more fluid the more you use it. You might experience a *time bump* each instance in which you introduce a new routine. It's important to keep in mind that you control the first minutes of mathematics class. You can extend or limit prompts and discussion to meet the needs of your students and/or the timelines of their lessons.

Which Routines to Use?

There is a selection of varied routines offered here for use in the classroom. There is no suggestion of which to use, when to use it, or how to order the routines. There is no requirement for length of use or timing within the quarter or semester. The recommendation is to use routines that are most comfortable to facilitate and most interesting for your students to investigate. You should select a routine and use it for a few days or weeks before moving to another. You may circle back to the first routine after students have experienced other routines. It's important to remember that any routine can become stale with too much use. You can make subtle adjustments to the routine to keep it fresh. Even so, it will be wise to change out routines as needed.

The Routines At-A-Glance section on page 18–19 offers a table of routines that notes a brief description of the routine and its *purpose*. The purposes connect with aspects of number sense from basic counting strategies, to magnitude of number, number relationships, decomposition, estimation, and operational sense. Regardless of purpose, you can adjust a routine to accommodate the type and size of numbers students have been exposed to. Likewise, Appendix A is a handy look at how each routine meets various purposes and Standards for Mathematical Practice.

Every class is different, and so, it is difficult to say which routines are *best* to begin with. That being said, *Math Yapper* and *Picture It* are two routines that every student can access with minimal proficiency with skills or concepts. These two routines are also attractive options because they are very interesting and highly engaging. Other routines in the first 11 are also good places for you to begin as they feature foundational concepts of counting, number, number relationships, and decomposition.

PLAN FOR THE ROUTINE

While you should focus most of your planning energy on the core skill and concepts of the main lesson, you can incorporate short warm-up routines easily because they are designed for low-intensity planning. They are designed to be

replicated with minimal change to develop student number sense and reasoning. You should be able to change out skills and concepts within the routine with little effort. However, there are some things to keep in mind when selecting and planning the routine.

Select the Routine and the Content or Concepts

Obviously, you need to know how to facilitate the routine. You must understand the basic tenets of the routine. You must also select skills and concepts that are appropriate for your students. You must decide if you want to feature whole numbers or operations. You will need to determine if your students need help with operational sense or more general number sense. Experience informs this. But, you also might take cues from class discussion, student work, or test results about what topics and ideas need to be developed. Armed with this information, you can prepare the routine.

- Routines for Foundations of Counting: These routines develop ideas about counting. The routines have students count, estimate, and represent counting. These routines can be modified for skip-counting, counting with fractions, and counting with decimals.
- Routines for Magnitude and Context of Number: These routines develop students' sense of magnitude and the meaning of numbers in context. Students estimate and reason about quantity in these routines.
- Routines for Number Relationships: These routines develop a diverse collection of ideas about numbers. They investigate decomposition and representation of numbers, including number lines.
- Routines for Operational Sense and Estimation: These routines examine patterns and relationships within operations. These routines also highlight estimation of operations to determine reasonableness of solutions.

Scaffolding to Support Routines

Routines are intended to be mental mathematics activities. Students should have background understanding for these quality opportunities to practice mathematics. You can provide tools to support students as needed. At the least, you and your students can use tools to support discussion and confirm accuracy of calculations and reasoning. Tools you might consider providing include:

- calculators for students to confirm accurate calculations and explore patterns;
- number charts for students to confirm accurate calculations and explore patterns;
- fact charts for students to make accurate calculations when recall isn't fully established;
- base 10 models, including but not limited to base 10 blocks and 10 frames, to anchor student understanding and support justifications;
- anchor charts for students to access so that they can be reminded of learned strategies, relationships, or representations; and
- personal dry erase boards, sticky notes, or journals for students to record their thinking and to use to support them when communicating ideas.

Other ways you can support student success is to identify and target numbers that students can work with well. Students learning about three-digit numbers may be best served by using routines that featured two-digit numbers. Routines are not intended as tools of first instruction.

Anchor References and Tools

Student reasoning and conversation can be buoyed by anchor references during routines. These references are tools or charts that help them make sense of concepts, confirm accuracy of their calculations, or frame their arguments. These tools might be anchor charts that can be referenced during discussion. For example, an anchor chart that reinforces decomposition of addends might be referred to as students talk about how they found compatible addends in the routine *Make It Friendly* (page 76). Other tools such as personal 10 frames can help students represent combinations of 10 or how to use 10 when adding or subtracting.

Students might have personal tools. Personal hundred charts, addition charts, multiplication charts, or calculators can support accuracy. They may be used for students who are still mastering basic facts or in cases where students are developing proficiency with adding two-digit numbers. These accuracy tools may be needed for two important reasons. First, and most obviously, they help provide checks and balances to ensure accuracy when counting and computing. They also help some students access the rich activities that these routines are. Brains are challenged to do two complex things at once. The reasoning needed for these routines competes with the need to calculate. These tools can alleviate some of that challenge. As students' accuracy and precision grows, you can begin to limit or remove these tools. Even so, they should always be available to confirm that strategies and approaches are accurate.

Other personal tools might include paper and pencil or personal white boards or lapboards. These tools are fine for students to jot down ideas, sketch models of problems, and so on. However, routines are intended to develop students' fluency and mental mathematics skills. Providing these tools sends messages that counter the intent. Instead of making these tools available initially, you might choose to direct your students to them when you misjudged the numbers, concepts, or reasoning in a routine and students need support to work through it.

Anchor charts can be extended beyond concepts. They might also capture vocabulary and sentence starters to help students make arguments or rebut classmates. Vocabulary anchor charts might be situated near the projection of the routine so that statements can be made with precise mathematical language. Keep in mind that posting the charts alone will not ensure that students use the language. Instead, you can revoice student statements and inject the accurate vocabulary while referring to the chart.

Vocabulary charts can be complemented with sentence starter posters. Sentence starters are familiar tools in elementary schools. They help students make clear statements. They help students think about how to begin their declarations. They also help students respond to statements of classmates and their teachers. There is no one set of starters that is better than another. Below are some helpful examples. You might edit these prompts, add to them, or eliminate some altogether. Help starters include:

I think that ____ because ...

I decided that ...

I chose ____ because ...

I agree with ___ because ...

I disagree with ___ because ...

I think ___'s idea will always work because ...

The pattern I noticed was ...

My thinking will always work because ...

I want to change my answer because ...

Listen for charts are anchor charts that help students determine what to listen for in someone's argument. They might be single words or indicators such as *clarity, vocabulary*, or *make sense*. Listen for charts might also be questions or prompts that ask the listener questions such as *is the argument clear, are math words being used*, or *does the idea make sense*? These listen for charts also help students think about what they might say before they say it.

It is important to keep a few things in mind about anchor references you or your students use during routines or instruction in general. First and foremost, students need explicit instruction about these charts and the tools. Students must understand how the mathematics tools work. Students should discuss when it is a good idea to use a tool or refer to a chart. And, anchor charts about concepts or discussion techniques should be developed *with* students instead of simply displayed *to* students.

How to Structure the Conversation

Jump-start routines intend to develop number sense and reasoning. Developing reasoning and number sense is not done in isolation. It is not the sole result of endless hours of practice or drill and kill. Our thinking about numbers is developed by the exposure to and exchange of ideas. Exchanges are student to student, student to teacher, and of course teacher to student. They are discussion and conversation.

Routines and the conversations within them should take on a familiar structure so that the endeavor becomes, well, routine. Prompts are posed. Students engage in the prompt. Students share ideas with partners so that all have an opportunity to talk. Then, a group conversation is had. During that time, every student does not have to share out. You don't have to explore every strategy. You don't have to discuss every solution.

You make choices about what to explore, where to linger, and when to move on during the debrief. You facilitate discussion. You ask questions. From time to time, you will have to insert an idea or strategy. However, routines aren't intended to be mini-lessons or mini-lectures on a procedure that students are to carry out and practice. Conversation during routines is an opportunity for meaningful discourse.

How to Set the Stage for Meaningful Discourse

Because discussion is such a critical component of the routines in this book, Smith and Stein's five practices for orchestrating productive discussions naturally outline how we can plan for routines. These practices remind us to anticipate, monitor, select, sequence, and connect (Smith & Stein, 2018).

1. *Anticipate What Students Might Do During the Routine*

Anticipating what students might do helps you consider how you will respond intentionally rather than randomly. Considering student ideas and misconceptions can also help you think about other prompts you might pose through the routine in subsequent days. You can start anticipating simply by thinking about how you would find the solution to the prompt. Throughout this book, you will find routines with particular skills and concepts, many of which share some of the reasoning and solutions your students may offer.

2. *Monitor Student Discussions During the Routine*

Monitor means that you listen to students as they work on a problem or discuss their thinking, particularly when discussing them with a partner or small group. Granted, it is unlikely that you can listen to every student conversation. However, you can be strategic about the discussions we monitor. You may monitor the discussion of targeted concerns. You may monitor discussions of students that have shown inconsistent performance with a specific skill or concept. You may plan to monitor different groups on different days to balance whose conversations you listen to and focus on.

3. *Select Strategy and Reasoning to Promote During the Routine*

As with discussions during your core lesson, you have to be careful not to randomly select students for discussion during routines. A random selection may compromise the discussion. Anticipating what students might do or think during the routine can help you think about the conversations or ideas that you want to listen for when monitoring. This coupled with considering the strategies, reasoning, or possible misconceptions that we want to highlight can help us select students for sharing during whole group discussion of the routine.

4. *Sequence Ideas During the Routine*

Strategies and ideas should be sequenced during discussion to advance student understanding. Sequencing may be most challenging during a routine. In fact, careful, deliberate sequencing of ideas during a routine may be impossible due to the time constraints or inability to monitor every discussion in the short amount of time. We may be able to offset some of the sequencing challenge with our questions. To do this, we can pose questions that help students make connections between strategies, reflect on efficiency, and make use of structure and patterns within prompts. These questions might include:

- How is ____'s strategy similar to ____'s?
- How is ___'s strategy different than ___'s?
- How does this idea connect to something we have discussed recently?
- Will this approach always work?
- If we think about efficiency, how do these strategies compare?
- What patterns do you notice in the expressions?
- How did you use patterns to help you find your solution?

5. *Connect Strategies and Concepts During the Routine*

Your questions during routines should help students connect solution paths or varied reasoning. Your questions should help students see connections between concepts. You should also help students make connections between numbers, operations, and representations. You may even make decisions on the fly to extend student reasoning to new situations or problems through your questions. We offer questions

for each routine in this book to support and guide you in facilitating discussion and connecting strategies, skills, or concepts.

PRACTICAL ADVICE FOR ROUTINES

Routines can be a component of your instruction that should require very little preparation. They should be both useful and practical. You should use them in ways that complement who you are as a teacher, what you value in mathematics, and what your students need. We note some important advice for working with routines below.

Modify, Modify, Modify

Routines work with any skill or concept. You can change the content to match the needs of your students. Change it to meet a specific purpose. Modify how the routine functions. There are ideas presented here about how a routine should unfold, but this is only a guide. Consistently monitor how students interact with the routine. Compare their work with the intent. Adjust or modify as needed.

Identify or Create the Content or Topics

Identifying or creating the content for the routines may be the most complicated aspect of routines. The topics should be those that students need to further develop or refine. There are many examples and modifications offered throughout this book to ease that challenge. Yet, there are other resources for creating examples. The prime resource is your students themselves. Having students create the number prompts may offer added benefit as it gives them an opportunity for thinking deeply about the identified concept. You can have students write or create routine situations as a homework assignment. You might also have students create routine situations as independent work once they have completed an in-class assignment. Keep in mind that students should work with a routine before creating prompts or problems for it. Also keep in mind that students can design quite creative, complicated, or unique situations.

Use Routines Formatively

Routines are a good way to formatively assess students. They can help you determine student perspectives and reasoning. They can help you monitor student proficiency with skills and concepts that they previously learned. They might help you determine specific types of numbers and operations that you might reteach or revisit through mini-lessons and other activities.

Be Committed and Creative

It's possible that the first few times you use a routine you find the activity to be clunky. This is natural. Try to give the routine some time before cutting ties with it. You can also reflect on how you can make it better or how you might modify the content or process to improve its effectiveness. Be mindful, too, that reasoning, communicating about reasoning, and working with mathematics mentally may be new to your students. Because of this, it may take some time for them to get comfortable with a routine. As noted, you can creatively adjust or modify the routine to best meet the needs of your students and your style of instruction.