

## ELEMENTARY MATH CORE COMPONENTS FOR EXCELLENT INSTRUCTION

*How do we develop classrooms where students are making sense of the math?*

The overall goal of schooling is to prepare students for the challenges of tomorrow. As teachers, we must be in the business of developing flexible thinking in our students. We need our students to reason, to make sense of math, to develop new methods, draw connections, and to adapt their learning to new situations. We want to equip our students to solve challenging problems, both in and outside of the math classroom.

To accomplish this, there is a focus of teaching for understanding, which is accomplished through a blend of procedural and conceptual lessons, which is exactly what the Common Core demands. The [Common Core Standards for Mathematical Practice](#), which highlight the attributes of mathematically proficient students, served as the foundation for the development of these components.

These five core components produce students who are able to think, justify, and reason with math. It is only through strong reasoning and understanding that we ensure our students rise to the rigor of the Common Core, are college and career ready upon graduation, and are competitive with their high-performing peers in the global market.

**Where did these components come from? What is this based on? What do these things look like in action?** Check out all of the research and readings that shaped the development of this document on our elementary math hub, [EMath101.com](#). You will also find video examples to illustrate the components in different classrooms.



"The success of the common core is dependent on students having a strong foundation from early grades."

-Jason Zimba, author, Common Core Standards

### Multiple Methods, Representations, and Models

"There is never just one way to solve a problem. I show my work in many different ways."

To ensure students can demonstrate mastery of concepts and apply skills regardless of presentation, there is a use of varied problem types and multiple representations, as well as a push to reason toward solutions in a variety of ways.

- Students have a personal toolkit of strategies for understanding math problems. They represent work with a variety of models, use concrete manipulatives to strengthen understanding, and seek alternative approaches to solving problems.
- Teachers lead students to understand why the math works and what it means. Teachers develop this conceptual understanding in many ways, sometimes through direct instruction and other times through the facilitation of student discovery. At times, this is done through the concrete use of manipulatives (base ten blocks, Cuisenaire Rods, pattern blocks, color counters, real-life objects, etc.), the pictorial use of illustrations of the math (picture, bar model, fraction strip, chart, number line, graph) and the abstract use of numbers (algorithms and word problems). There is not a prescriptive process on when to use each method; methods will vary by concept.

### Emphasis on Number Sense

"I can break numbers apart in my head and solve tricky problems because I understand what they mean and how they go together."

Every number that emerges during a math class, in every lesson, is an opportunity to support the development of number sense.

- Students understand the relationship between and among numbers and operations, decompose and compose numbers with ease, and use number sense to monitor reasonableness of solutions and estimate answers. In doing so, they connect the numbers on the page with the concepts they understand and develop procedural fluency.
- Teachers relentlessly build and reinforce students' number sense by integrating key activities (e.g. mental math, calendar math, number blocks) that develop their comfort with the relative size of numbers, the value of numbers, the sequence of numbers, the base 10 system, and place value. Teachers often connect equivalent values (ex: fractions, decimals, percent) and ask students to use number sense to estimate before solving a problem.

### Real and Meaningful Discourse

"Writing and talking through the math helps me understand it."

Frequent opportunities to communicate thinking and justify responses, often in a collaborative format, help students understand that math isn't a set of discrete skills used to answer simple questions, but a process of reasoning to solve complex problems.

- Students construct and communicate viable arguments and critique the reasoning of others in ways that demonstrate reasoning. They also reflect on their work, pose questions, and initiate mathematical discussion orally and in writing.
- Teachers consistently expect justification to accompany answers. They regularly provide opportunities for students to talk and write about math, persistently ask questions like 'why' and 'how do you know,' and refrain from being the sole source of authority for answers or affirmation.

### Learning Builds on What Students Know

"I understand math because it is all connected."

New math lessons clearly connect to prior lessons and demonstrate relevance to students' lives to build relational understanding.

- Students actively make connections between new content and their existing math and real world knowledge.
- Teachers use every opportunity to connect the learning, inside and outside of the math block (ex: counting off by multiples of 3 in line, exploring patterns in art, and calculating elapsed time in the schedule). Teachers anticipate, diagnose, and activate prior knowledge, and seek to actively build upon that, while highlighting the connection to new material. Teachers consistently get a pulse for in-the-moment understanding using a variety of formative assessment techniques.

### Cultivating Growth Mindset and Team

"I am not afraid to struggle. Working hard makes me smarter." "I work with my team to learn more. I care about them."

Math class fosters a community of learners committed to joyfully preserving through challenging problems independently and in collaboration with their teammates. Students believe they can be successful with mathematics.

- Students take academic risks and embrace challenges in math. Students also demonstrate respect for their teammates and a commitment to collaboration. Students depend on each other throughout class.
- Teachers create a culture that allows for students to learn math through mistakes. There are frequent opportunities for students to work together to tackle problems. The growth mindset in math and strong teamwork is intentionally and explicitly taught, modeled, practiced, reinforced, and consistently celebrated in class.