

KIRTLAND ELEMENTARY SCHOOL

MATH FRAMEWORK

A COGNITIVELY DEVELOPED APPROACH TO
CREATE AN MATHEMATICAL ENVIRONMENT
THAT HONORS EACH INDIVIDUAL'S CONTEXT
AND FOSTERS THEIR IDENTITY AS A PERSON
AND A MATHEMATICIAN

We have redefined math instruction in our district. Kirtland Elementary believes in all learners, and we strive to create a mathematical environment that honors each individual's context and fosters their identity as a person and a mathematician. We have been working to create a mathematical experience that does not simply focus on answers to computational questions. Instead, we have been focused on studying how learners naturally develop an understanding of mathematical ideas and concepts. Using this natural progression, we can design situations in our classrooms with learners, so they can advance in their thinking and efficiency.

We have moved from a teacher-centered, answer-driven environment to a student-centered, process and thinking-driven environment. There is no singular expert in the room delivering content (knowledge) directly to students for them to see and practice indiscriminately. Instead we are trained experts, dedicated to putting young people in situations where learners look for patterns and relationships between the things they already know and the things they are trying to know. Such metacognition creates a mathematician who has conceptual understanding as opposed to rule-based answer getting. Simply following procedures and getting an answer is not akin to getting an answer using mathematics.

Therefore, invented strategies serve a major role in our learner's math understanding. Engaging in productive struggle and having students wrestling with abstract concepts is what drives conceptual understanding for our learners. It is important that strategies are developed by the learners and not given by the teacher or the book. We have made tremendous shifts in recent years, but our goal is to continue that growth and develop students that are mathematical in all areas and well developed. This will be a tremendous asset in their development in, and beliefs about, mathematics.

In this framework, our teachers are facilitators of discussion, skillful designers and content experts. Remember, every time we give our students thinking and strategies, we take from them the opportunity to learn for themselves. With this shift in mathematics and our teaching, our narrative should change to what students can do, rather than what they can't do. We value the importance of students developing their own understanding and not just rotely following formulas. It is their right as students! Kirtland Elementary School believes in this and will support all math teachers becoming masters of instructing according to our framework. It continues to be an amazing exciting time to teach math in Kirtland for both teachers and students!

OUR VISION

We will develop motivated problem solvers that persevere through productive struggle and communicate their mathematical ideas and thinking with others. Students see how math relates to the world within and outside the classroom.

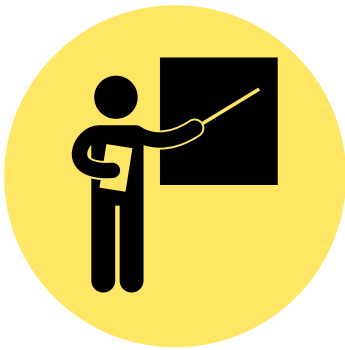


OUR WHY

Students should...

- Have intrinsic motivation to persevere when given a challenge or a problem to solve.
- Have a “why” so they have buy-in and are motivated to work to the best of their ability and even push themselves to further their understanding.
- Understand how math applies to daily life and see its relevance.
- Be flexible and open-minded to different strategies and ways of problem solving.
- Be able to communicate their ideas, listen to others’ ideas, and have productive discussions with others to help make different connections.
- Understand math rather than just memorize facts and formulas.

ROLE OF THE TEACHER



Teachers will...

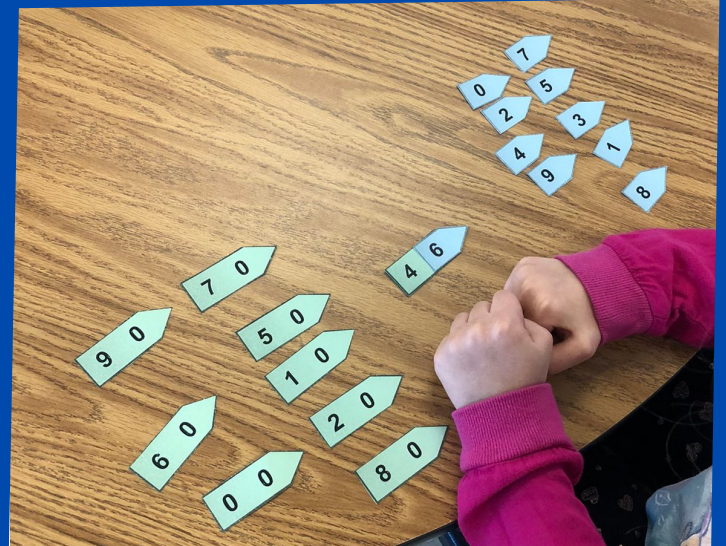
- Help students find the joy in math
- Facilitate and guide math discovery rather than just telling students how to complete work.
- Be flexible and willing to broaden their math philosophy to support what is best for students.
- Step back and give students time to discuss and share ideas.
- Have a framework or scope and sequence so they can be sure all standards are taught and met within their classroom and all others at their grade level.
- Have access to common resources to support the varying needs of their students within the same concept or topic of study. For example, some students may need work that requires a higher level of thought on the topic of addition while others may need more concrete support.



EXPECTATION OF STUDENTS

Students will...

- Persevere when things get hard.
- Problem-solve.
- Share our strategies.
- Agree and disagree, but we will always back it up with our thinking.



COMPONENTS OF A MATH CLASS

1

WARM UP

Students use repetition to develop fluency (flexibility, efficiency, and accuracy) in number sense.

This section will remain consistent throughout the year regardless of the goal of the lesson.

- Counting: counting forwards and backwards by ones, place value counting - counting by 10s forwards and backwards, counting by 100s forwards and backwards, counting multiples of 10 and 100, mid-decade or century, etc
- Structure: building 5, 10, and 20 using 5- and 10-frames, cubes, fingers, Rekenrek, dot cards, show hands

K-2

- COUNTING BY 1'S, 10'S, 100'S FORWARD AND BACKWARD ON AND OFF MULTIPLES ACROSS DECADES, CENTURIES, AND MILLENNIUM.
- STRUCTURE OF 5, 10, 20

3-5

- COUNTING BY 1'S, 10'S, 100'S FORWARD AND BACKWARD ON AND OFF MULTIPLES ACROSS DECADES, CENTURIES, AND MILLENNIUM.
- COUNTING BY FRACTIONAL PARTS. (UNIT FRACTIONS) -EXTENDING THE STRUCTURE OF TEN INTO $\frac{1}{10}$ AND $\frac{1}{100}$
- DECOMPOSING INTO FACTORS
- MULTIPLICATIVE STRUCTURE (USING PATTERNS AND RELATIONSHIPS BETWEEN CHANGES IN THE AMOUNT OF GROUPS AND HOW MANY ARE IN EACH GROUP.)
- SECOND SEMESTER POSSIBLE COUNTING BY MULTIPLES OF 3, 4, 6, 7, 8, 9.
- COUNTING BY DECIMAL PARTS AND BY NON-UNIT FRACTIONS.

IT IS NOT

- NOT LEARNED THROUGH MEMORIZATION
- NOT COMPUTER BASED PRACTICE
- NOT REPETITIVE DRILLING

BUILDING STRATEGIES AND KNOWLEDGE

Students explore computational strategies through discussion. This section will change based on the goal of the lesson. It provides students with a chance to share their knowledge and strategies with the teacher as the facilitator. Sometimes direct instruction will take place at this point in the lesson based on skills and knowledge students need to acquire for the goal of the lesson. These skills will then be applied in the last component of this math framework.

2

WHAT IT IS

- 10-20 MINUTES
- RICH CLASSROOM DISCUSSION
- PRECISE VOCABULARY
- PARTNERSHIPS
- MENTAL AND/OR WRITTEN WORK
- VISUAL THINKING
- CONNECTING IDEAS

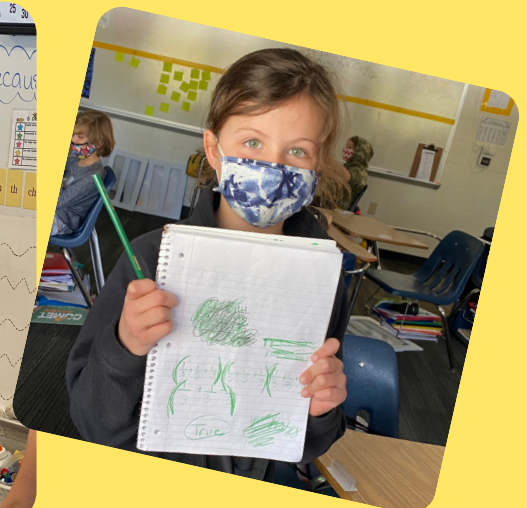
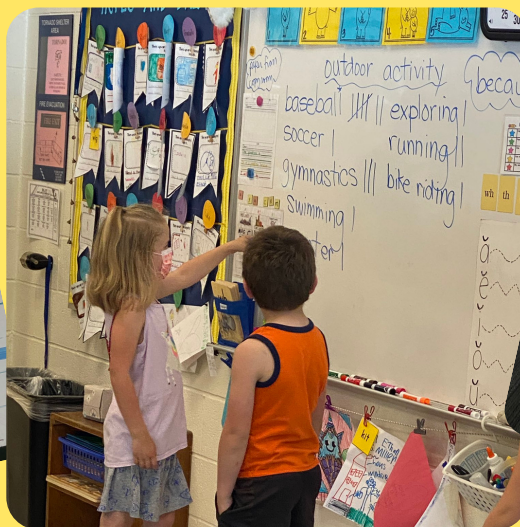
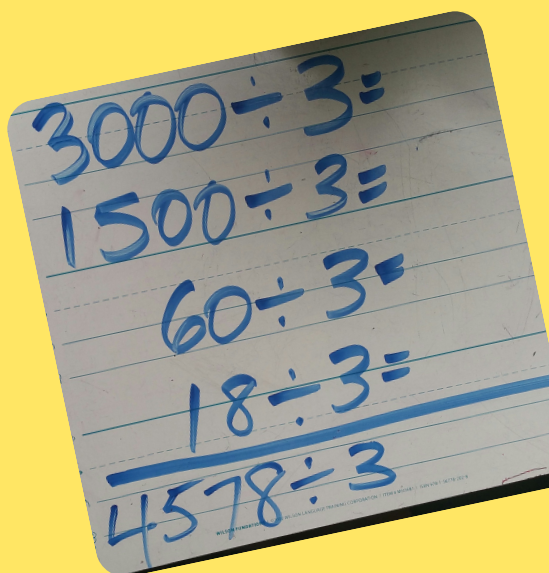
IT IS NOT

- ONLY ABOUT A SOLUTION OR PRODUCT
- FOCUS ONLY ON A CORRECT ANSWER
- WORKSHEETS
- MEMORIZATION
- TEACHING STRATEGIES
- PROMOTION CERTAIN STRATEGIES
- TEACHING ISOLATED SKILLS

NUMBER TALKS

CLASS DISCUSSIONS DON'T GIVE ANSWERS/STRATEGIES OR CONFIRM ANSWERS; ASK STUDENTS TO:

- AGREE/DISAGREE
- ADD-ON
- COMPARE THINKING
- SURFACE DISCREPANCIES
- REVISIT PREVIOUS THINKING



3

APPLICATION AND MODELING MATHEMATICALLY

Students show what they know and use adaptive online programs. (Look into “defining the world with mathematics.”) This section will change based on the goal of the lesson and the needs of students.

WHAT IT IS

- STUDENTS DRIVING THE QUESTIONS TO ANSWER
- SOLVING AND RESEARCHING REAL-WORLD PROBLEMS
- FOCUSING ON PROCESS
- REPRESENTING SITUATIONS WITH MODELS AND EXPRESSIONS.
- RISK-TAKING WITHOUT FEAR OF PENALTY
- STUDENTS PROVING/DISPROVING SOLUTIONS



IT IS NOT

- WORKSHEETS
- I DO, WE DO, YOU DO
- SOLVING FOR A SINGLE ANSWER
- REVIEW OF LEARNED SKILLS

ACTIVITY SUGGESTIONS

- THREE ACT LESSON
- STORY PROBLEMS
- ADAPTIVE PROGRAMS
- ESTI-MYSTERIES
- OPEN MIDDLE
- CLASSROOM GAMES
- PROBLEM-BASED ASSESSMENTS
- ASSESSMENTS (IF NEEDED)*

