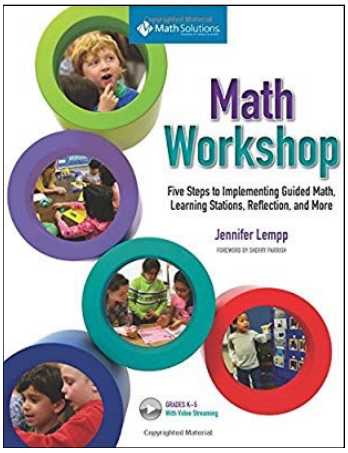
Math Workshop: Setting the Foundations K - 2

Presented by Jen Barker

DEC 2020 - October 1st, 2018
Surrey, B.C. 3:30 p.m. - 5:00 p.m.



LRS#179550

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How would you solve the question:

Math Workshop is:

1. students **doing** most of the math
2. students making **choices**
3. students enthusiastically talking about their mathematical t**hinking and reasoning** with each other
4. **teachers facilitating, clarifying, connecting, monitoring, and collecting data** as students solve problems
5. students working **collaboratively**
6. students **persevering** with challenging math tasks
7. teachers working with **small groups and/or individual students**

Three Math Workshop Structures: An Overview

TASK AND SHARE		FOCUS LESSON, GUIDED MATH, AND LEARNING STATIONS			GUIDED MATH AND LEARNING STATIONS		
5–10 minutes	NUMBER SENSE ROUTINE An engaging, accessible, purposeful routine to begin your math class that promotes a community of positive mathematics discussion and thinking.	5–10 minutes	NUMBER SENSE ROUTINE An engaging, accessible, purposeful routine to begin your math class that promotes a community of positive mathematics discussion and thinking.		5–10 minutes	NUMBER SENSE ROUTINE An engaging, accessible, purposeful routine to begin your math class that promotes a community of positive mathematics discussion and thinking.	
30 minutes	MATH TASK A problem-solving task that students work on in small groups. The teacher circulates and probes student thinking through questions. The task typically has multiple entry points, allowing for all students to have access to the problem.	15 minutes	FOCUS LESSON A well-planned, whole-group lesson focused on the day's learning target and accessible to all levels of learners.		45 minutes	GUIDED MATH Small-group instruction that allows the teacher to support and learn more about students' understandings and misconceptions. In this structure, the focus lesson is addressed in guided math groups and is differentiated for each group.	LEARNING STATIONS Activities in which students engage in meaningful mathematics and are provided with purposeful choices.
		30 minutes	GUIDED MATH Small-group instruction that allows the teacher to support and learn more about students' understandings and misconceptions.	LEARNING STATIONS Activities in which students engage in meaningful mathematics and are provided with purposeful choices.			
20–25 minutes	TASK SHARE WITH STUDENT REFLECTION A math share in which students come together as a whole class and discuss the various strategies they used to solve the problem. Students ask questions, clarify their thinking, modify their work, and add to their collection of strategies.	5–10 minutes	STUDENT REFLECTION A deliberate and meaningful time for students to consider new learning.		5–10 minutes	STUDENT REFLECTION A deliberate and meaningful time for students to consider new learning.	

Task and Share:
This is powerful when introducing a new concept and should be used numerous times throughout a unit. Through this approach teachers will see what strategies students are using and students will see there are multiple approaches to a problem. The teacher is responsible for anticipating strategies, monitoring, selecting, and sequencing the strategies students use. Teachers will intentionally ask questions to assist students in seeing the connections between strategies.

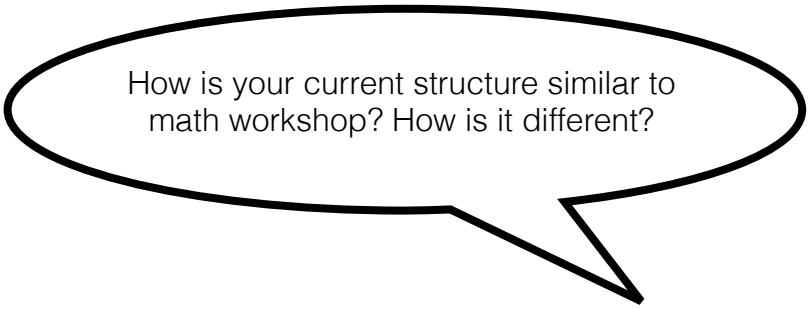
Rich tasks have:
- context
- multiple entry points
- allow different ways to solve them
- require mathematical thinking

- Margie Pierce List of Rich Tasks https://docs.google.com/spreadsheets/d/1yGaZy9g8X0HHFuWMBQkF14pVStu_SIBnbZSkxo9nWPI/edit#gid=0
- Rich Tasks list created by the BC Provincial Numeracy Project Team https://www.dropbox.com/s/sc6h24ii69hacoz/Rich%20Tasks_Problems%20copy.docx?dl=0

Focus Lesson:
A focus lesson is also called a mini-lesson because it is short and specific. This is a great structure to use to introduce a learning station. It can also be used when introducing a new concept. Teachers should ask themselves "For how many students is this lesson appropriate?" as this approach should only be used when it is appropriate for the majority of your students. Use the focus lesson as a time to explore rather than tell. Students should be doing more talking than the teacher.

Guided Math and Learning Stations:
This structure is best used in two scenarios:

- when a whole-class focus lesson has already been done on the mathematical topic
- when you have gathered formative assessment (observations, talking points, pre-assessment) and know that your learners have different needs; therefore, in speaking to the whole-class you would impact a small portion of students. Instead, students can practice the concept at the learning stations, and the teacher can work with small guided groups, providing "just-right" instruction.



What is the role of the teacher?

1. Teacher as *Facilitator*
   - talking less and asking more
   - asking effective questions to make thinking visible

2. Teacher as *Clarifier and Connector*
   - providing appropriate vocabulary
   - anticipate and sequence student solutions to foster connections
   - assisting students in making connections between concrete, pictorial, and symbolic representations
   - ask thoughtful questions

3. Teacher as *Monitor*
   - *observe and note who is engaged/passive*
   - *use active participation strategies to hear more voices*

4. Teacher as *Data Collector*
   - *work to find out our students' strengths, challenges and interests*
   - *record anecdotal notes and use these to inform instruction*
   - *collect and share photos, videos, and other documentation*

CLASSROOM ARRANGMENT

A place to start together
A place for learning stations
A place for guided math
A place to end together

What needs to change in your classroom arrangement to accommodate the three types of places for math workshop?

What learning opportunities encourage:

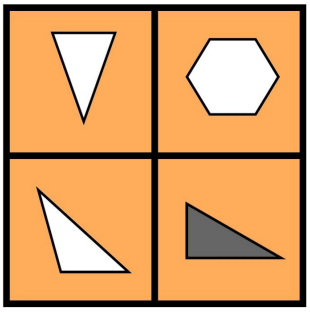
- risk taking
- value thinking processes
- understand mistakes are part of learning
- collaboration
- communication
- perseverance
- value creativity
- peak curiosity

Using Number Routines to Develop Community

Which One Doesn't Belong:

Potential learning intentions:

- Focuses attention on attributes of number and number relationships
- Engages students in problem solving
- Encourages using Mathematical vocabulary



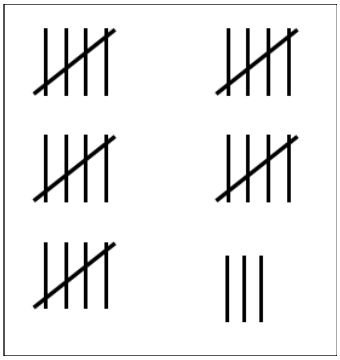
Show the image and let the students discuss.

Guiding Questions:
What do you notice?
What makes all the items alike?

What makes them different?
Which one doesn't belong?
Can you share your reasoning to justify your answer?

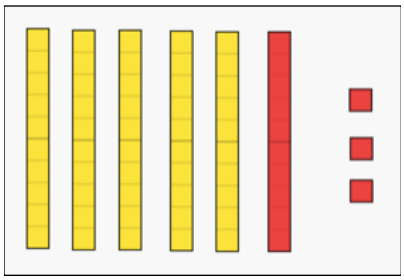
Website: http://wodb.ca/index.html
Twitter Hashtag: #wodb https://twitter.com/search?q=%23wodb&src=typd

Quick Image Number Talks:



Quick Image number talks involve pictures of quantities, usually organized in a particular way to encourage students to subtilize and/or use spatial sense of quantities. The teacher shows the image for a few seconds and then asks "How many _____?" It is important not to show the images for more than few seconds, as doing so provides opportunity for students to count by ones. Students must mentally structure the amounts in efficient ways.

Next the teacher facilitates the discussion about the quantity. Teachers can help students to link the pictorial and symbolic representation of the quantities by recording how the student saw the quantities and using descriptions including numerals and equations.



CONTENT that can be explored includes:
- Perceptual and Conceptual Subtilizing
- Estimation
- Counting - one-to-one correspondence, cardinality, counting sequence, skip counting
- Place Value
- Numbers - quantity, number language (the words we use to say how many things there are), numeration (how we write how many things there are)
- Decomposing and Recomposing
- Additive and Multiplicative thinking

Items you can use:
- fingers
- dots
- 5 and 10 frames
- money
- tally marks
- base ten blocks
- rekenreks
- shapes partitioned (fractions)

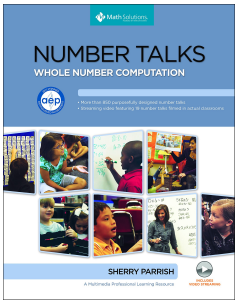
For Virtual Apps that you can Screenshot on your computer: https://www.mathlearningcenter.org/resources/apps

How Many?

A “How Many” conversation occurs around a photo that provides multiple ways to interpret different quantities (e.g., One pair of shoes, two shoes, one box, 10 holes, etc.) These photos help focus attention on the units being counted. After a child shares how many they see, it is important to ask the students “How do you know” or “How could we check?” to discover their thinking.

Not only is “What counts as one?” an important question, its answer changes based on your perspective, and so it offers opportunities for ***play***. Children like to play; they need to play. Children find numbers wonderful, delightful, interesting and fun. Numbers constitute a playground for children’s minds?
- Christopher Danielson (2017)
Author of website: https://talkingmathwithkids.com/

Number Talks With Equations or Number Strings:



LRS #171347

Number Talks are a valuable teaching strategy that should be used BOTH with the whole class and in small guided math groups.
Some of the potential learning intentions:

- Develop multiple strategies (Mental Math) for Decomposing
- Develop the ability to compute with flexibility, accuracy and efficiency

Keep it short - no longer than 10 - 15 minutes and a few times a week. Be intentional - choose a related sequence of images or equations. Be sure to give the students lots of practice with the same kinds of problems. It is about the students noticing/discovering strategies that make sense to them. We do not “teach” the strategies. When a student shares a strategy, we name it and nurture it.

- Online visual tools including the math rack (rekenrek) and ten frames through https://www.mathlearningcenter.org/resources/apps
- Dot arrangements or Real life images of groups of items (arrays) http://ntimages.weebly.com/photos.html

Guiding Questions:
Who would like to share their thinking? How many do you see?How do you see them? Does anyone see them differently? Is there an equation you could use to describe how you saw it?

Video Examples:
Addition Number Talk 16 + 15 = http://bit.ly/additionnumbertalk

ROUTINES AND PROCEDURES

Questions to consider:

- **Where do students go?**
  - Do students need to stay where the station is located? Or can they take the materials to another place in the room?
  - Where and how do they get the materials they need?
  - How do they clean up?

- **Who can students works with?**

Working with a partner

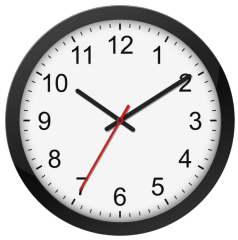
- Option One: They choose partners or work by themselves
- Option Two: Teacher selects their learning partner but make changes from day to day, or weekly

Working with a small group

- Option One: Teacher determines the groups
- Option Two: groups are determined by individual student station selection

NOTE: Do NOT ability group! Guided Math small group names are NEVER posted anywhere visible in your room. Additionally the Guided Math groups should be FLEXIBLE.

Guided Math Groups - Three Types:



Readiness Groupings
- students who have a similar strength or need
- groups based on collected formative assessment

Heterogeneous Groupings
- combines strengths, struggles, learning styles, interests
- everyone benefits
- we are more likely to get a variety of strategies
- students learn from each other

Random Groupings:
- call the table playing “Make Ten”
- great for data collection

Teachers pull these groups as needed and NOT based on the Learning Station rotations. Additionally, teachers will want to work one-on-one with some students. The amount of time teachers work with groups depends on needs. It could vary from 5 - 15 minutes.

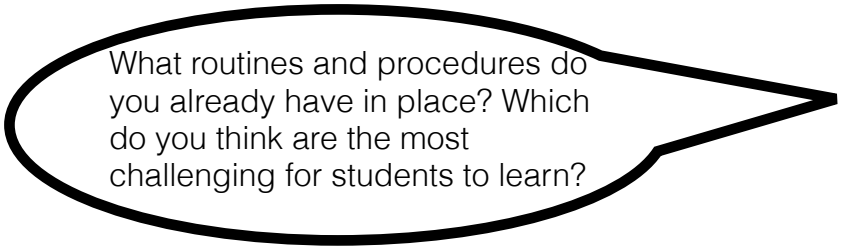
- **What can students do?**
  - What are the options for Learning Stations? Can students choose their station?
  - What are the benefits of choice?
  - If needed, where do students record their work?
  - What system will you use? (Jen will send you Blackline Masters of these)

    - **Math Menu** - Most often used in Kindergarten. Teacher places images of the stations in the boxes with a short heading. Students colour each box as they complete the station. Students choose their stations and groups are determined by the student choices.
    - **Pocket Chart** - Place cards with images and/or titles of the stations on the left. Next make a card for each student. These could include names and student pictures. Consider placing students at the station you want them to do first. Then once they complete that station, they can choose their next station.
    - **Must Do/Can Do** - Allows teachers to determine what must be done. Must do's can be adjusted based on students' needs. Groups are determined by the choices students make.
    - **Math Menu** - With a partner students can make choices or they can make choices individually. Number sense activities could be the appetizers. Activities that correspond to the current unit of student could be the main entree and activities that allow the students to spiral back to previously taught concepts could be the dessert choices.
    - **Tic-Tac-Toe** - This is beneficial to provide differentiation. Learning stations could differ by readiness, interest, and learner profiles. For example, all activities in the first row might address number sense and computations. Second row might have activities around the current unit of study. Third row might be on concepts you want to revisit. Then each column could be differentiated by level of rigour.

- **How long do I do it?**
  - Some learning stations may take less time than other… how will you plan for this?
  - What is a reasonable amount of time for one rotation? 15 minutes or ?
  - Timed Rotations or Open Choice - there are pros/cons to both. See PPT for chart.

- **What do I do if I have a question?**
  - When can you ask the teacher?
  - What do you do when the teacher is busy? (e.g., Three before me, sticky notes on desk)

- **What do I do if I am finished?**
  - Are there extensions for each learning station?
  - How do you move to another station? How do students clean up?
  - What will transitions look and sound like?



Learning Stations:

What are they?
Learning Stations often called Numeracy Centres, Math Stations, or Daily Math Investigations are mathematical activities designed for individuals, partners, and/or small groups of students. These activities are inviting, engaging and assist students in developing Mathematical understanding. Numeracy Centres are one component of balanced numeracy. It is a supplement to whole class instruction.

Why are they important?
- Students need daily opportunities to engage with mathematical ideas in purposeful and playful ways.
- They provide time for authentic, independent practice that connects to what they have learned through whole class quality instruction.
- Students need opportunities to develop the core and curricular competencies. Through the 'doing' of the mathematics, students will be building their confidence, seeing themselves as mathematicians, and seeing the connection of mathematics to their world.
- They give students choice, which increases motivation and fosters a positive disposition towards Mathematics.
- They give teachers an opportunity to meet with students one-on-one or in small groups to provide explicit instruction, engage in guided math, and/or have conferences.
- They allow students to revisit concepts. Learning takes patience and time.

What to think about?
- Is the experience going to **ACTIVELY ENGAGE** your students?
- Are there entry points for **ALL** students?
- Can the experience be **DIFFERENTIATED** so each student can work to their fullest potential?
- Are there opportunities for the students to make **CHOICES?**
- Are they activities **PURPOSEFUL** as well as **PLAYFUL?**
- Are there opportunities for **COLLABORATION?**
- Have you woven in your students' **INTERESTS?**
- Are you providing opportunities for students to revisit/ **SPRIAL** concepts throughout the year?
- How will I be **RESPONSIVE** to misconception and gaps of understanding?
- How will I record **OBSERVATIONS?**
- What **QUESTIONS** will I ask to move the learning forward?
- How will I provide opportunities for **STUDENT REFLECTION AND CONNECTION?**
- How will I **COMMUNICATE STUDENT LEARNING?**

What to do?
Determine where your students are at mathematically.Think about what are the students' strengths, stretches, and what is needed to move their learning forward. Next create five or six centres to meet their needs. Think about incorporating centres based on the time of the year, student interests, and different mathematical concepts (e.g., not all patterning centres). Teach these centres (e.g., model how to use the materials, take turn, clean-up). Give them a try and make observations. Modify the centres if needed.

What to look for?
What are the important math concepts my students need to know? Are the students demonstrating their understanding?
Are my students able to reflect on their learning and can they articulate this?
What questions will I ask to nudge learning forward?

Games

- Guided Math has created and shares many games http://www.guided-math-adventures.com/?page_id=125
- Box Cars and One-Eyed Jacks https://www.boxcarsandoneeyedjacks.com/product-category/math/
- Addition and Subtraction games created by Sandra Ball https://startingwiththebeginning.wordpress.com/building-a-foundation/
- Multiplication Games http://bit.ly/multiplicationfactgames

Visual Scaffolding Fact Cards
- Addition, Subtraction, and Multiplication Scaffolding Cards http://bit.ly/additionscaffoldingcards
- Multiplication Subtizing Cards http://bit.ly/multiplicationsubitizing
- Ten Frame Multiplication visual cards http://bit.ly/tenframemultiplicationcards

Playful Provocations

Places to get ideas:
- Primary Daily Math Investigations https://startingwiththebeginning.wordpress.com/daily-math-investigations/
- Intermediate Daily Math Investigations created by Selina Millar http://bit.ly/intermediateinvestigations
- Janice Novakowski Reggio-Inspired Mathematics http://janicenovkam.typepad.com/reggioinspired_mathematic/
- Daily Math Investigations K - 2 created by Jen Barker, Jen Tammen, and Kristen Pennington http://www.meaningfulmathmoments.com/daily-math-investigations-numeracy-centres.html
- Patterning, Number Concepts, Fractions, Multiplication provocations can be found on my site under the "Instructional Ideas" http://www.meaningfulmathmoments.com/instructional-ideas.html Scroll down to the concept you are looking for.

Open Ended Questions

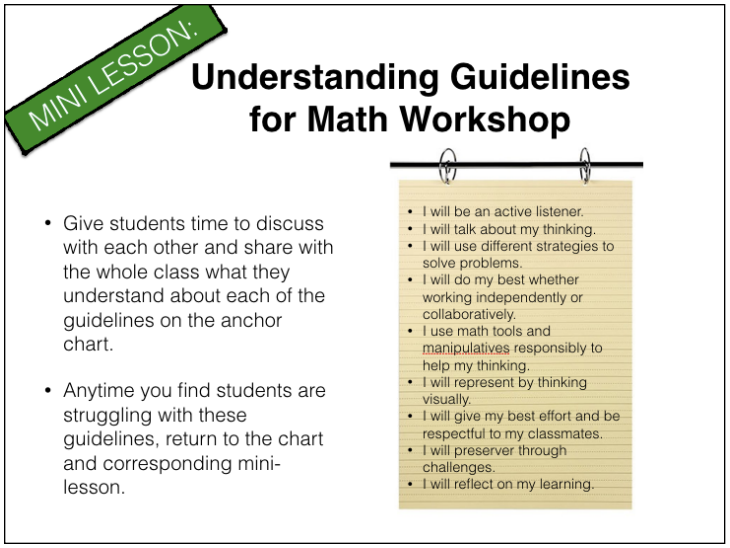
Questions that not only have different strategies but also could have different answers.

- www.onetwoinfinity.ca/presentations/AMElemNov.pdf
- Marian Small's Open Questions http://www.rubiconpublishing.com/shop/?pa_focus=numeracy

The Open Questions for the Number Strand are correlated to the WCNP (BC Curriculum). The other strands are available but they are aligned to the Ontario curriculum, not BC. Number Strand K - 3 LRS #173627 and Grades 4 - 6 LRS #173628 and Grades 7 - 9 LRS #173629

The next few weeks:

- Establish and practice routines and procedures
- Build by developing your expectations with your students through mini-lessons
- Begin with one learning station
- Teach one Number Routine and do it well

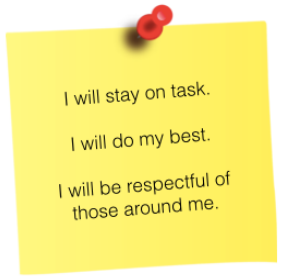


MINI LESSON:

Working Independently

Through practiced independent work, students gain confidence in their own math ability.

- Think about a time that you worked independently. What did it look like? What are some ways you represented your thinking? How were your classmates acting that helped you to work independently?
- Have students brainstorm ideas, then share ideas with a partner. Have the partner share each other's ideas, not their own.
- Add to anchor chart **I will do my best work whether working collaboratively or independently.**



C Communication

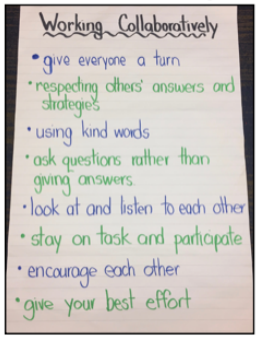
PS Personal & Social

MINI LESSON:

Working Collaboratively

Working together helps students clarify their thinking, share their thought process, respect others' thinking, deepen their understanding, stay focused, and justify math solutions.

- Provide stickies for students to brainstorm what it looks and sounds like.
- Create an anchor chart called "Working Collaboratively"
- Provide a problem for students to work on in collaborative groups and have them practice expectations and reflect on how it went.



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MINI LESSON:

Representing Your Thinking

Drawing pictures is a problem solving strategy. Sometimes drawing pictures helps us to represent our math thinking and make sense of the question. Pictures help us visualize and can represent numbers.

- Today, as we learn about _____, practice drawing pictures to represent your math thinking. Share a problem with students and have them draw pictures to represent their mathematical thinking .
- Add to anchor chart **I will represent my thinking visually when it is helpful.**

C Communication

T Thinking

MINI LESSON:

Being an Active Listener

It is important not just to listen to the teacher but also to each other.

- What is an "active listener"? Brainstorm what it looks and sounds like?
- Ask for someone to volunteer to share aloud in front of the class a favourite thing they like to do. Using talk moves have ensure that the students have actively listened to their classmate.
- Begin an anchor chart called "Guidelines for Math Workshop" and add **I will be an active listener**.

T Thinking

C Communication

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C Communication

T Thinking

MINI LESSON:

Reflecting and Sharing

Reflecting on what we've learned is key in everything we do. It can be done formally and informally.

- Provide an open ended problem. Anticipate the ways students will solve. Monitor and determine a sequence you will ask students to share. The sequencing you determine is intentional so that you can assist students in making connections between strategies, etc.
- Ask students to reflect upon the learning experience.
- Begin an anchor chart called Guidelines for Math Workshop. Add **I will reflect on my learning.**

T Thinking

PS Personal & Social

MINI LESSON:

Using Manipulatives

Manipulatives are items that help children construct understanding. They also assist children in representing their thinking. It is tempting to play with manipulatives but when used responsibly they can help you learn.

- Provide students with a manipulative and ask them to take 5 min to explore. As them what they notice, what they wonder, and how they think they could use the manipulative.
- Add to anchor chart **I will use tools and manipulatives responsibly to help my thinking.**

T Thinking

PS Personal & Social

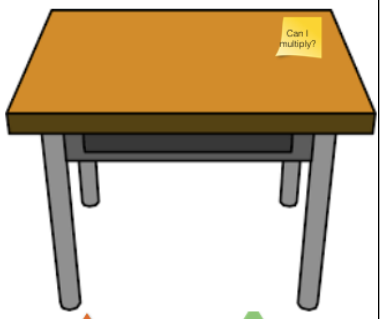
C Communication

MINI LESSON:

Asking Questions

We want to promote an environment where students feel free to ask questions, challenge one another, and look for justification for answers. We also want to promote perseverance and avoid asking for help before giving our best effort.

- Provide students with a problem. Ask them to solve it themselves. Use sticky notes to write down any questions you have. "Park" your questions on the corner of your desk for now. In the end, check your questions to see if you answered them on your own. For the unanswered questions, check with a friend. Walk around the room and review the questions. Select and share strong examples of good questions.
- Add to anchor chart **I will persevere through challenges and believe in myself.**



C Communication

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