Mathematical Practice: #1 Make sense of problems and persevere in solving them.

Student Actions:	Teacher Actions:	Open-Ended Questions:
● Feel like a detective or mathematician, look for clues and evidence on how to solve the problem ● Believe they are a mathematician and can solve the problem and understand that mistakes are the way we learn. ● Talk to other students about how they might solve the problem. (Partner, small group, or whole group discussion) ● Think about and tries several ways to solve the problem ● Use a variety of mathematical tools to solve the problem ● Reflect about what the problem is asking ● Write about how they solved the problem ● Listen to other students and may change their own strategy based upon the thinking of others ● Understand other student strategies ● Share their own thinking and solution.	● Create a classroom climate where struggle is expected and that making mistakes are OK. ● Provide students with word problems and real-world scenarios and encourage a variety of tools and strategies. ● Discuss appropriate behavior for respectful dialogue. ● Give students individual think time before discussing with a partner. Set a timer for three minutes for individual think time. ● Frame math challenges that are clear and explicit. ● Check in periodically to check student clarity and thought process. ● If students are stuck, scaffold the problem to a simpler problem. Ask students, how the problems are similar and how they are different. ● Set up structures requiring students to connect different forms of the problem (equation to graph, table, etc.) ● Students share out different strategies for solving the problem.	● What do you know about the problem? ● What is being asked? ● What problems have we solved before like this problem? ● How might talking to _____ help you? ● What might be another way to solve this problem? ● How is _____ strategy like yours? How is it different? ● How might a number line help you? ● How is your graph connected to your equation? ● How does your equation match the problem? ● How might acting out the story help you solve the problem? ● What made you decide to use that strategy? ● What made you choose that operation?

Mathematical Practice: #2 Reason abstractly and quantitatively

Student Actions:	Teacher Actions:	Open-Ended Questions:
- Act out and solve story problems. - Represent the problem with visuals or math tools. - Asks themselves how do these tools represent the problem. - Consistently thinks about how the problem and the solution fit together. - Explains their answers, not just how they arrived at it. - Reflect on their thinking. - Uses references and prior knowledge to solve the problem - Check for patterns or properties of operations they know to solve. - Understands and explains properties: (4 + 3 = 3 + 4) or 42 x 8 = (40 x 8) + (2 x 8) - Use symbols to represent the problem - Visualize what the problem is asking.	- Provide story problems and real-world problems for students to solve. - Encourage use of a variety of tools and strategies. - Manipulatives and other math tools need to be on hand for students to pick up and use at anytime. - Monitor the thinking of the students. - Question students about patterns and properties of operation. - Facilitate discussion about solutions, strategies, patterns, and properties.	- How does your picture/model represent the problem? Where are the 15 chocolate bars? What does this part represent? - Have you solved a problem like this before? What did you do then to model or represent the problem? - How did you know you could break 42 into a 40 and a 2 and then multiply each by 8? - What does the x represent? What does it stand for in the problem? - How might visualizing the problem in your head help you solve the problem? - What patterns do you see? How might that pattern help you figure out for the 20th term? - Why does that strategy make sense to you? - What did _____ say that helped you clarify in your mind the problem?

Mathematical Practice: #3 Construct viable arguments & critique the reasoning of others.

Student Actions:	Teacher Actions:	Open-Ended Questions:
- Use correct math vocabulary when discussing ideas. - Write their understanding of math terms in journals using their words. - Make conjectures and explore if their conjectures are true or false. - Communicate and justify their solutions. - Listen to reasoning of others and ask clarifying questions. - Compare two arguments or solutions. - Question where data comes from. - Question how solutions came about. - Question the reasoning of other students. - Look for and can identify faulty arguments. - Explain flaws in arguments. - Use pictures and tools to prove or disprove an idea. - Listen and read arguments of others.	- Use appropriate strategies for working with vocabulary (McRel Instructional Strategies) - Create a word wall that is developed using student language. - Use anchor charts to focus on conjectures around operations and patterns in our number system. (a + 0 = a) - Focus on non-examples as well as examples with math vocabulary. (Frayer Model) - Provide time to look at solutions that are incorrect. - Facilitate discussions on why incorrect solutions have faulty logic. - Provide time for communication and discussion.	- How can you draw a picture of the math term and describe the math term? - What might be a non-example? - How is your strategy the same or different than _____? - Why do you believe that is always true? - How could you prove that this is true for all cases? - What might be a possible problem with the strategy or solution? - How might their thinking be clarified? - What parts of _____ explanation might need clarifying? - What parts of _____ strategy or solution confuses you? - How might a picture or math tool help you prove your conjecture?

Mathematical Practice: #4 Model with mathematics.

Student Actions:	Teacher Actions:	Open-Ended Questions:
- Apply math concepts to real-world problems (may include community or school problems) - Write equations to go with a story problem. - Take risks and make predictions. - Use estimation as a way of predicting. - Use a variety of math tools and can easily flow between different tools (formulas - graphs - problem - function tables - number lines) - Change course and the tool being used, if it doesn't work for them. - Draw conclusions. - Question if their prediction and/or solution makes sense.	- Provide real-world problems "hooks" for students to solve daily (story problems, school, or community problems) These "hooks" should engage students. - Explicitly connect the equation that matches the real-world problem. Facilitate discussion about what the symbols or variables mean in the equation. "Why are we writing the equation 57 + ___ = 97 - After reading, before solving a problem, have students predict what the answer should be about. What would be a logical answer. Facilitate discussions about what the problem is asking and what might be logical answers. - Provide opportunities for students to go back and forth between different math tools. Function tables, flow charts, Venn diagrams, number lines, 200 charts, etc. should be readily available and students familiar with all the possible tools. - Monitor student work as they solve, asking them if this tool is going to help solve the problem and how. - Require students to make sense of the problem and if the solution is reasonable.	- What questions do you have? What would you like to find out? What information might you need to solve the problem? - How might you represent what the problem is asking? - How does the equation you wrote match the problem? - What tools have we used (number line, function table, etc.) that might help you to organize the information from the problem? - Why do you believe your estimation is a good estimation? - How is this tool/strategy helping you to solve the problem? What else might you try? - What might be a good estimate? Would a larger number or smaller number make more sense? - How might a picture or math tool help you solve the problem?

Mathematical Practice: #5 Use appropriate tools strategically.

Student Actions:	Teacher Actions:	Open-Ended Questions:
- Choose from a variety of mathematical tools that are readily available (unifix cubes, base ten blocks, number lines, tables, etc.) - Choose a tool that will help them best solve the problem and know certain tools will not be helpful. - Use technological tools and understands the effects and limitations of those tools. - Use outside resources to help them solve the problem. - Use technological tools to explore and deepen their understanding of concepts. - Change the tool if the tool does not help reach an accurate solution.	- Provide students with the experience with a variety of tools. - Facilitate discussion regarding the appropriateness of different tools. - Allow students to choose their choice of tools and think outside the box. - Use anchor charts when a new tool is used and when it is used in a different way. - Use virtual manipulatives and other technology tools in the classroom. - Allow students time to explore these virtual tools. - As students solve problems, roam and ask for explanation on how the tools are being used. - Choose students who used different tools to share with the class. Facilitate the discussion.	- How might you represent the problem using your tool choice? - How is this tool helping you to understand and solve the problem? - What tools have we used (number line, function table, etc.) that might help you to organize the information from the problem? - What might be another tool that may help clarify the problem and help you to solve the problem? - How is this tool/strategy helping you to solve the problem? What else might you try? - How did the (function table) help _____ to solve the problem? - How might a picture or math tool help you solve the problem?

Mathematical Practice:#6 Attend to Precision.

Student Actions:	Teacher Actions:	Open-Ended Questions:
- Students talk with other students using correct math vocabulary. - Keep vocabulary journals that allow them to interact with the vocabulary word through pictures, drawings, and their own words. - Use correct terminology and are able to give examples and non-examples. - Play games with vocabulary words. - Use correct labels with word problems. - Use vocabulary words in explanations that help clarify their thinking. - Focus on clarity and accuracy of process of problem solving. - Provide equality problems that require students to understand the equal sign as equality not "the answer" 5 + 7 = ____ + 4	- Intentionally and purposefully use the correct vocabulary terms in your own speech and when describing the world around you. "Please run the perimeter of the gym." - Use the activity "I have, who has" using math vocabulary words. - Provide time for students to keep an interactive dictionary. - Ask students to provide a label when solving word problems. - Allow time daily for students to formulate and explain their ideas to other students, to the class, and to the teacher. - Facilitate the discussions and explanations and use probing questions. - Provide a space for student created word walls that develop throughout the year as the word is introduced. - Use websites, such as SpellCityand Vocabulary Cards.	- How might you explain the problem in another way? - What math words have you learned that might help explain your thinking? - How would you describe the problem in your own words? - What words from your vocabulary journal, anchor chart, or word wall might be helpful to help you describe your thinking? - How do you know? - What are some examples and non-examples of the word? - What mathematical word might we use to describe this process? - How might your vocabulary journal help you explain your thinking? - True or False, does 8 = 0 + 8, how do you know?

Mathematical Practice: #7 Look for and make use of structure.

Student Actions:	Teacher Actions:	Open-Ended Questions:
• Students share strategies and different algorithms with each other and discuss why different algorithms provide the same correct answer. • Look for connections between properties, such as 5 + 3 is the same as 3 + 5, why does this produce the same answer? • Look for patterns in numbers, operations, number of sides, attributes of shapes, side lengths, etc. • Apply a variety of strategies to solve the same problem.	• Intentionally and purposefully help students make connections between different algorithms that incorporate different properties. For example: 52 x 8 is the same as (50x8)+ (2 x 8). • Asking students to explain, show how, show another way, to solve problems. • 2 + 2 + 2 = 6, how does this relate to multiplication? • 10 – 2 - 2 -2 -2 -2, how does this repeated subtraction relate to division? • Allow time daily for students to formulate and explain their ideas to other students, to the class, and to the teacher. • Facilitate the discussions and explanations and use probing questions	• How might you explain the problem in another way? • Why does this strategy work and so does yours? • How are the strategies the same? Why do they both work? • How can you solve the problem using a different operation? • How does repeated addition relate to multiplication? Can you solve the problem using a different method? • What pattern are you noticing? • What might be another way for you to sort? • What are you noticing?

Mathematical Practice:#8 Look for and express regularity in repeated reasoning.

Student Actions:	Teacher Actions:	Open-Ended Questions:
● Engage in similar activities over many weeks through a constructivist approach. Several weeks dividing fractions from a conceptual standpoint. ● Through many exposures of a concept, discover rules on their own without being told to memorize. ● Discover connections between the procedure and the concept.	● Intentionally and purposefully help students make connections between mathematical concepts and procedures. ● Provide real world problems for students to discover rules and procedures through many exposures. Slow down to speed up. ● Purposefully design lessons for students to make connections. Many adding ten, followed by adding nine. What do you notice? ● Discovery lessons ● Allow time daily for students to discover the concepts behind the rules and procedures. ● Pose a variety of similar type problems.	● Explain why that makes sense? ● How would you describe your method to us? How would you explain why it works? ● Does your answer seem reasonable? ● What have you learned about ....? ● How would this work with other numbers? Does it work all the time? How do you know? ● What do you notice when ...?