5th GRADE

GRADE LEVEL OVERVIEW

Sample Mathematics Learning Plan

Big Idea(s)/ Topic(s)

- Understand place value
- Extend division to 2-digit divisors, integrate decimal fractions into the place value system and develop understanding of operations with decimals to hundredths, and develop fluency with whole number and decimal operations

Standard(s) Alignment

MGSE5.OA.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

MGSE.5.OA.2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. For example, express the calculation “add 8 and 7, then multiply by 2” as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.

Diagnostic Assessment

In this diagnostic assessment task, students will solve problems and interpret expressions involving grouping symbols. Administer these assessment probes to collect data on each student’s thinking and understanding of the big ideas.

Operations and Algebraic Thinking Diagnostic Assessment

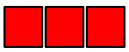
Instructional Design

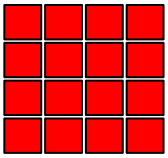
Engage

Visual Mathematics: Orders of Operation

1. Provide students with the expression 3 + 4 × 4 (write on the board or provide a handout with the expression typed out). Have students start by laying down 3 tiles. Then, have students add a 4-by-4 array. Ask: How many tiles are shown in the model?
2. Have students show 3 + 4 using a different color of tile for each addend. Then, have the students build an array to show this quantity times four. Ask: How many tiles are shown in the model?
3. Have the students discuss the two models they constructed. Students should then discuss and journal how the two models are different. Have students write an expression to represent each model. Have students discuss what order the operations in each expression were evaluated. Students will then discuss why this order was necessary versus solving from left to right in the way that we read.

- **Synchronous**: Complete during a classroom discussion or virtual classroom meeting. If completing virtually, students can follow along using virtual tile manipulatives. If the virtual platform allows, provide opportunities for students to share their models.
- **Asynchronous:** Students may complete this task using virtual tiles or drawings. Create a video modeling the first 2 steps. Ask students to share their drawing/models along with a written response explaining how the models are different and an expression to represent each model. Allow students to share responses and provide feedback to their peers within the virtual platform/classroom. Provide feedback to individual student responses and highlight multiple strategies used by students.
- **Unplugged/ Offline**: Students will need colored pencils or crayons to draw the tiles. Provide students with a document that explains the problem and explains each step. You may need to provide an example like the one below.
    - For example: 3 + 4 × 4

First: Draw 3 tiles or squares 

Second: Draw a 4-by-4 array 

Third: How many tiles are shown in your model? **19**

Explore

Modeling with Mathematics/Collaborative Group Work

1. Task in groups of 4: Jay brought some juice boxes to soccer practice to share with his teammates. He had 3 single boxes and 4 multi-packs. There are 6 single boxes in each multi-pack. To determine how many boxes of juice Jay brought to practice,

   evaluate $3 + 4 \times 6$.

2. Introduce the problem. Then have students do the activity to solve the problem. Distribute color tiles, paper, and pencils to students. Have students discuss possible solutions and the order in which solutions were evaluated. Explain that the order of operations provides rules for evaluating expressions without a context. In contextual problems, the context determines the order, like in the problem we just solved. Ask students……should these be a rule?

- **Synchronous**: Complete during a classroom discussion or small group virtual classroom meeting. If completed virtually allow students to use virtual tile manipulatives.
- **Asynchronous**: Students will complete the task individually. Utilizing video or e-document with recorded voice over, explain orders of operation and the task. Students can respond in math journals or e-document. Allow students to share responses and provide feedback to their peers within the virtual platform/classroom. Provide feedback to individual student responses and highlight multiple strategies used by students.
    - Digital Format Suggestions:
        - **Flipgrid:** Flipgrid is a video discussion platform that is perfect to use in the pre-k -12 learning environment. Click this link to learn how to create a Flipgrid
        - **VoiceThread:** VoiceThread allows students to voiceover slides and add multimedia tools within the slide. It is perfect for fifth grade and allows students to explain their thinking. Click this link to learn how to create a VoiceThread.
        - **Microsoft OneNote**: OneNote Classroom allows students to create interactive journals to share with teachers. There are collaboration tabs that allow peers to work together and private spaces for conferencing with the teacher. Click this link to learn how to use Class OneNote
- **Unplugged/ Offline**: Students will complete the task individually. Provide the task in written form. Ask students to explain their thinking with drawings and text. Provide feedback to student work.

Incorporating the 8 Standards for Mathematical Practice: Trick Answers

In this task, students analyze a mock work sample to demonstrate and explain their understanding of the order of operations.

TASK: Students should use the student recording sheet to critique the answers on Sasha's homework. They should be allowed to share their thinking and discuss why Sasha might have missed the answer.

- **Synchronous:** Provide students with the Trick Answer Recording sheet on paper or virtually through your learning management system. Complete during a classroom discussion or virtual classroom meeting. Provide students with feedback and answer questions while they complete the task.
- **Asynchronous/Unplugged/Offline**: Provide students with the Trick Answer Recording sheet on paper or virtually through your learning management system. After students submit their work, provide written feedback and intervention activities when needed.

Apply

In math, order of operations helps you find the correct value for an expression. Order of operations matters in daily life, too. For instance, if you put your shoes on before your pants, you'll have a tough time getting dress. While cooking, if you don't follow the proper order of operations, you'll end up with a kitchen catastrophe. Use your knowledge of order of operations to conduct the learning task below.

Learning Task

Fifth grade students at Utopia Elementary School are investigating hunger and poverty in the community, across the nation, and globally, in order to educate other members of the community and transform food preparation into meaningful activities to benefit the community. After investigating the need in the community, the students work closely with a chef at a local food bank to prepare a meal to serve a group of families in need. Describe the specific steps necessary to prepare the meal. Remember to include the importance of order of operations and how this applies to meal preparation. Please remember to include why order is important.

Engage learners in an investigative, student-centered service-learning project to address the scenario above (or a similar scenario developed by the learner) including five components:

- ***Investigation:*** Teachers and students investigate the community/world problems that they might potentially address. The investigation should involve a research and mapping activity. This can be completed collaboratively, in both synchronous and asynchronous environments.
- ***Planning and Preparation:*** Teachers, students, and community members should be engaged to plan the learning and service activities. The student should work with the teacher to address the administrative issues needed for a successful project.
- ***Action:*** The "heart" of the project involves engaging in the meaningful service experience that will help students develop important knowledge, skills, and attitudes, and will benefit the community. These service experiences can be conducted virtually.

- ***Reflection:*** Activities that help students understand the service-learning experience and think about its meaning and connection to them, their society, and what they have learned in school.
- ***Demonstration/Celebration:*** The final experience when students, community participants and others publicly share what they have learned, celebrate the results of the service-learning project, and look ahead to the future. Assessment is part of all activities to ensure that the learning and development that occur through service-learning can be measured, and to help diagnose student needs, provide feedback, and improve instruction.

- **Synchronous:** Provide students with the opportunity to work collaboratively to brainstorm and create a plan for investigation. Students can also work together on completing the project. Have students complete the steps of designing the service-learning project during a classroom discussion or virtual classroom meeting. Provide students feedback and answer questions while they complete the task.
- **Asynchronous/Unplugged/Offline**: Provide students with the scenario and problem on paper or virtually through your learning management system. After students submit their work, provide written feedback and intervention activities when needed.

Reflect

Provide students with the following prompt:

Choose a task that has 3 or more steps, such as brushing teeth, taking a shower or putting on clothes. Write the steps of the tasks in order. Then, rewrite the task in a different order. How has the task changed? Why is order important?

- **Synchronous**: Provide a prompt for students to respond in an exit out the door or online message forum (so students can view other responses).
- **Asynchronous**: Provide students with the prompt in your learning management system. Allow students to share responses and provide feedback to their peers. Provide feedback to individual student responses and highlight multiple solutions.
- **Unplugged/ Offline**: Encourage students to provide a written explanation to the prompt. Provide written feedback.

Evidence of Student Success

Ask students the following questions to gauge their understanding of the content.

FORMATIVE ASSESSMENT QUESTIONS

- Why did you multiply first (for 3 + 4 x 6 in the task)?
- What will you do to try to figure out if the answer given is correct?
- How will you demonstrate that it is correct?
- What will you do to try to figure out if the answer given is correct?
- How will you demonstrate that it is correct?
- How will you convince Sasha when you think her answer is incorrect?
- How can you explain your math reasoning clearly to your peers and teachers?
- What strategies are you using to analyze the given problems?
- What cues are you using to recognize the correct order of operations?

Student Learning Supports

At all grades, the mathematics big ideas encourage students to reason mathematically, to evaluate mathematical arguments both formally and informally, to use the language of mathematics to communicate ideas and information precisely, and to make connections among mathematical topics and to other disciplines. The following strategies are intended to support students who are struggling to progress towards this goal:

- ***Conceptual Processing:*** Utilize the Concrete-Representational-Abstract instructional sequence to support students in making connections among mathematical ideas, facts and skills, and reflecting upon and refining one's own understanding of relationships, generalizations and connections.
- ***Language:*** Strategically select language routines to support students in describing strategies, explaining their reasoning, justifying solutions and making persuasive arguments.
- ***Visual-Spatial Processing:*** Provide opportunities for students to engage with visual representations and manipulatives (virtual or concrete) as they solve problems, explore concepts, and communicate ideas.
- ***Organization:*** Teach problem-solving strategies and problem types such as CGI Problem Types in order to support students in figuring out how to get started, carrying out a meaningful sequence of steps while solving problems, keeping track of the information from prior steps, monitoring their own progress and adjusting strategies accordingly.
- ***Memory:*** Focus on conceptual strategies and patterns for computation, providing a scaffold for students who struggle with basic facts and carrying out written algorithms.

Extension

- To explore the complexities of order of operations, have students create and solve their own numerical expressions and defend their solutions in writing.
- Give students a number and ask them to create complex expressions equivalent to the number.
- Encourage students to continually expand the expression as shown below:

  17

  10 + 7

  (2 x 5) + 7

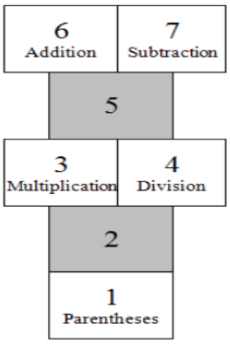
  [2 x (30 ÷ 6)] + 7

  [2 x (15 x 2 ÷ 6)] + 7
- Create an expression from a real-life situation involving more than one operation.

Intervention

- Provide more opportunities for students to explore order of operations using color tiles
- Help students who lack background knowledge in understanding these concepts by limiting the number of operations and introducing them one at a time.
- Teach students to group operations using the parentheses, even when they are not included in the original problem.
- For example, if they see this problem 6 + 5 x 10 – 4 ÷ 2
  - They can rewrite it like this: 6 + (5 x 10) – (4 ÷ 2)
  - In this way, the parentheses guide their work.
- Focus on using order of operations through contextual problems, where students write expressions based on the actions in the problem. Discuss student solutions and determine why that order works for that problem. Once students make sense of how to write expressions for various contexts, then you can discuss the conventional use of the order of operations for naked computations.
    - ***Example:*** Kevin bought two 8-packs of juice boxes, three 6-packs of cola, and four 2-liter bottles of root-beer. He dropped two of the 2-liter bottles and the two bottles busted spilling root-beer all over the driveway. All other drinks were left in the grocery bags. Write an equation to show how many drinks Kevin had in the grocery bags when he got home?
      - 2 x 8 + 3 x 6 + 4 x 1 – 2 x 1 = 36 drinks

- Using a Hopscotch board like the one shown is one way to help students remember the order of operations. Remembering the rules of Hopscotch, one lands with both feet on squares 3 & 4 and 6 & 7. This is used as a reminder to students that multiplication and division computed in the order in which they appear in the problem, left to right. The same is true for addition and subtraction, which is also performed in the order of appearance, left to right.



- Have students design their own Hopscotch board either using chalk on the sidewalk or driveway OR using scotch tape on the floor. Have them practice using the Hopscotch game and describe each step whenever their feet land on specific squares.

Engaging Families

- http://www.nzmaths.co.nz/resource/four-fours-challenge

  This link provides teachers with some additional, student-centered lessons to develop the concept of order of operations.

- Study Jams on Order of Operation

  Learn the order of operations through song and practice your skills with online quizzes.

- Khan Academy Order of Operations

  Video tutorials and virtual guided practice orders of operation. Student accounts are free, but not necessary to access practice questions and tutorials.