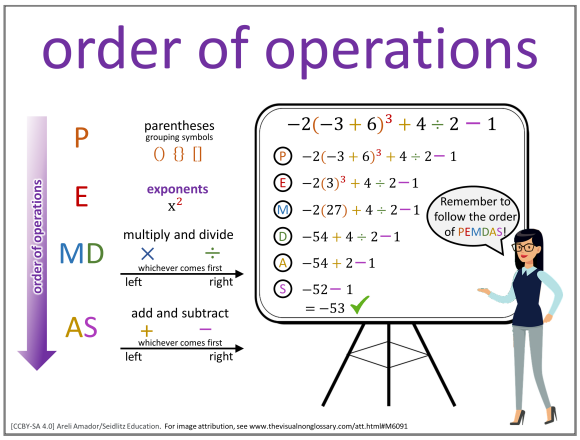
Teacher Guide for the Lesson on **order of operations**



Standard:
6.7(A)

Content Objective:
We can simplify numerical **expressions** using the **order of operations**, including parentheses and **exponents**.

Language Objective: Answer the following question in complete sentences using the sentence stem and the key vocabulary of the lesson:

> $(2x(3-4))^2+6$ has two sets of parentheses. How would you use the **order of operations** to simplify an **expression** like this?
>
> *I would use the **order of operations** to simplify an **expression** with two sets of parentheses by...*

Other key vocabulary: expression

By studying this visual, students might:

Notice	Wonder
• There is one set of parentheses	• What happens first, the parentheses or the exponent?
• The result inside parentheses is raised to a power of 3	• Why is −2 outside the parentheses?
• There's a negative number multiplied in front: −2	• Does the exponent apply to everything or just the number inside?
• There are multiple operations: addition, division, subtraction	• Can I do addition before division?

• The steps are labeled with P, E, M, D, A, S	• What does PEMDAS stand for?

EXTENDING THE DISCUSSION

- After randomly calling on students, if there is anything from this list that was not mentioned, then ask the class, "Did anyone notice...?"
- After students have shared what they notice, ask the class, "Did anyone wonder...?" using the suggestions above or anything else you might think is interesting or relevant to the lesson.

Structured Conversation Prompts

OBSERVATIONAL	RELATIONAL	INFERENTIAL
What is **order of operations**? The **order of operations** is...	How is the **order of operations** related to an **expression** The **order of operations** is related to an **expression** because...	$(2x(3-4))^2+6$ has two sets of parentheses. How would you use the **order of operations** to simplify an **expression** like this? I would use the **order of operations** to simplify an **expression** with two sets of parentheses by...

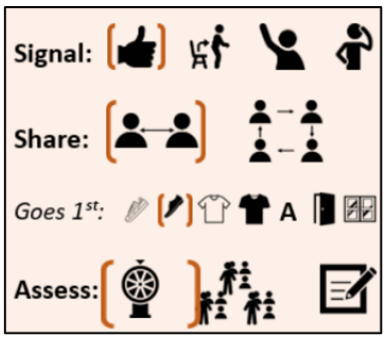
Example Student Responses to the Observational Question

Low-Level	High-Level
The **order of operations** is the way you solve math problems step by step so you get the right answer.	The **order of operations** is the set of rules that tells you which math **operations** to do first when solving a problem with parentheses, **exponents**, multiplication, division, addition, and subtraction.

RESPONDING TO RESPONSES

Emphasize and celebrate each student's use of the key vocabulary to support a culture of "no wrong answers."

STRUCTURING STUDENT CONVERSATIONS



Have students list observations from the visual as a warm-up, then use the Q-SSS-A process to guide small-group conversations. In the slide decks, brackets can be moved to prepare the structured conversation. In the example to the right, students will be instructed: Q-SSS-A.

- To put a thumb up, then lower their hand when they are ready to answer the question
- To share with their elbow/shoulder partner, and that the student with the darkest shoe will share first
- That they will be randomly called on after the conversation

Here is an example of structuring a conversation with Q-SSS-A.

Note: the inferential question is the same as the language objective. It is recommended that students answer the inferential question in a small-group discussion before answering it individually as the closure or exit ticket of the lesson.

Structured Reading

READING PURPOSE	PAT LIST	POST-READING DISCUSSION
The purpose for reading is to learn how the **order of operations** helps us solve **expressions** step by step.	• Parentheses and how they are used • When exponents are solved • The order of multiplication, division, addition, and subtraction • Words that explain why the order matters • Steps that change the value of the expression	Why is it important to follow the **order of operations** when evaluating **expressions**? *It is important to follow the **order of operations** when evaluating **expressions** because...*

STRUCTURING THE READING

Communicate the purpose of reading to the students and instruct them to make a note every time they see something on the PAT ("Pay Attention To") list. How you have students note items on the PAT list is up to you. This could include:

- Putting an asterisk in the margin
- Underlining text that supports the PAT list
- Putting a comment in the margin

Follow the reading with the post-reading discussion. Structure this discussion using the Q-SSS-A process just like the structured conversations in this lesson.

Note: you might find the relational question is better discussed before or after the reading. This depends on whether the relational question is directly related to the reading or might make connections across units.

DIFFERENTIATING THE READING

You will notice that three different reading passages are provided with this lesson. Look at the shapes in the top-left of each passage to determine the grade level.

BELOW GRADE LEVEL	ON GRADE LEVEL	ABOVE GRADE LEVEL
		
Triangle is bottom-left	*Square is bottom-left*	*Circle is bottom-left*

In a class with students at diverse reading level proficiencies, you can give the appropriate reading passage to different students, while having all students follow the same PAT list and post-reading discussion.