NJSLA Algebra II
Lesson 4: Mathematical Practices

Rationale

- The Standards for Mathematical Practice describe the habits of mind of an excellent math student and describe ways in which students should engage in mathematics as they grow in mathematical maturity and expertise throughout the elementary, middle and high school years.

- The Standards for Mathematical Content are a balanced combination of procedure and understanding. Students who lack understanding of a topic may rely on procedures too heavily. Without a flexible base from which to work, they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, and apply the mathematics to practical situations. They may have difficulty explaining the mathematics accurately to other students. The Standards for Mathematical Practice are designed to provide students with a flexible base to work from and to help students develop the ability to step back for an overview or to change course from a known procedure to find a shortcut.

- The goal of all instruction in mathematics should be to find the points of intersection between the Standards for Mathematical Content and the Standards for Mathematical Practice. The content standards which set an expectation of understanding are potential "points of intersection" between the Standards for Mathematical Content and the Standards for Mathematical Practice.

The Eight Mathematical Practices and Examples

1. **Make sense of problems and persevere in solving them.**

   Mathematically proficient students know that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Students may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" Students listen to other students' strategies and are able to make connections between various methods for a given problem.

2. **Reason abstractly and quantitatively.**

   Mathematically proficient students should recognize that a variable represents a specific quantity. They decontextualize by representing and manipulating symbolic representations of a given situation.

3. **Construct viable arguments and critique the reasoning of others.**

   Mathematically proficient students may construct arguments using stated assumptions, definitions, or previous discoveries. They refine their mathematical communication skills as

they participate in mathematical discussions using specific cases or counterexamples. They make plausible arguments and compare the effectiveness of others' arguments.

4. **Model with mathematics.**

   Mathematically proficient students experiment with representing problem situations in multiple ways, most specifically real world scenarios. Students may model their situations using diagrams, tables, graphs, charts, or formulas. Students should evaluate their results in the context of the situation and reflect on whether their model and their results make sense.

5. **Use appropriate tools strategically.**

   Mathematically proficient students consider the available tools (including estimation and calculators) when solving a problem and decide when certain tools might be helpful.

6. **Attend to precision.**

   Mathematically proficient students develop their communication skills; they try to use clear and precise language in their discussions with others and in their own reasoning. They calculate accurately and efficiently and use clear definitions in their discussions.

7. **Look for and make use of structure.**

   Mathematically proficient students look closely to discover a pattern or structure. Students review their thoughts and shift perspective in their reasoning when necessary. They see complicated things as single objects or composed of several objects, such as algebraic expressions.

8. **Look for and express regularity in repeated reasoning.**

   Mathematically proficient students should notice repetitive actions in computation and look for general methods or shortcut methods. Students continually evaluate their work by asking themselves, "Does this make sense?" and change their thinking when necessary

Goal

- To provide the students with an opportunity to experience problems that models each Mathematical Practice by matching each Mathematical Practice to an appropriate problem.
- To identify items that present the greatest challenge for each student and the class as a whole.

Objective

- Students will understand the eight mathematical practices.
- Students will recognize the relationship between a mathematical practices and a math problem which represents the practice.
- Students will be able to explain each mathematical practice in their own words.

Materials

- Eight Mathematical Practices title cards
- Mathematical Practices Sheet.
- Class Folder Labeled: Lesson 10: Mathematical Practices. (At the end of the lesson, place the class papers in the folder.)

Procedures

- Pass out Eight Mathematical Practice title cards and the Mathematical Practices Sheet.

- Have students work in pairs to determine which mathematical practice or practices apply to each problem and record their answer on their sheet. Have them justify their answer. Make sure students understand they do NOT need to solve the problems, only discuss the method they would use to solve the problem and determine the mathematical practice or practices that apply to the problem.

- Whole group discussion – discuss students' responses. Ask students to share their findings.

Teacher & Teachers' Aide Observations

Be sure to circulate the classroom and monitor students while they are completing the activity.

- Which students are using their time wisely?

- Which students are using mathematical language and vocabulary in their discussion and writings?

- Which students are having difficulty with the task?

Assessment or Check for Understanding

- Whole group discussion to check for understanding. Pay particular attention to the students' correct use of vocabulary and clarity in their explanations.

Follow-Up

- Ask students to create a graffiti wall or word wall with their interpretive descriptions of the Mathematical Practices.

<u>MP1</u> Make sense of problems and persevere in solving them	<u>MP 2</u> Reason abstractly and quantitatively
<u>MP3</u> Construct viable arguments and critique the reasoning of others	<u>MP4</u> Model with mathematics
<u>MP5</u> Use appropriate tools strategically	<u>MP6</u> Attend to precision
<u>MP7</u> Look for and make use of structure	<u>MP8</u> Look for and express regularity in repeated reasoning

Lesson 4: Mathematical Practices

Name_____Mathematical Practices Sheet

Problem 1:
Suppose $a = -3 + 2i$ and $b = 6 - 4i$. What is the value of $a + b$?

Which mathematical practices apply to this problem? Justify your answer.

Problem 2
Solve $\sqrt{x} = x + 1$.

Which mathematical practices apply to this problem? Justify your answer.

Problem 3
Graph the function, $y = |x - 2|$.

Which mathematical practices apply to this problem? Justify your answer.

Problem 4

Which equation has no real solutions?

$x^2 - 4x + 5 = 0$ $\qquad\qquad$ $x^2 + 3x - 4 = 0$ $\qquad\qquad$ $x^2 - 6x - 9 = 0$

Which mathematical practices apply to this problem? Justify your answer.

Problem 5

Rewrite $\dfrac{x^2 - 5x + 7}{x + 3}$ as quotient and remainder.

Which mathematical practices apply to this problem? Justify your answer.

Problem 6

What is the solution to the system below?

$$\begin{cases} 3x - 2y + z = 1 \\ 4x - y - z = 0 \\ x + y = -6 \end{cases}$$

Which mathematical practices apply to this problem? Justify your answer.

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Answer Key

Problem 1:
Content Standard: N.CN.2
MP Standard: 6, 7

Problem 2:
Content Standard: A-REI.3
MP Standard: 7

Problem 3:
Content Standard: F.IF.7b
MP Standard: 1, 5, 6

Problem 4:
Content Standard: A-REI.4b-2
MP Standard: 5, 7

Problem 5:
Content Standard: A-APR-6
MP Standard: 1

Problem 6:
Content Standard: A-REI.6-2
MP Standard: 1, 7