8 Mathematical Practices (K-12)

1. Make sense of problems and persevere in solving them.
Do students:

- Unpack the problem?
    - Know what the story is?
    - Know what the given quantities are?
    - Know what needs to be found out?
- Use strategies to enter the problem?
    - Use previous similar or simpler problems?
    - Know representations/models that work?
    - Know language needed to understand the problem?
- Recognize relationships in the problem? Relationships needed to solve the problem?
    - Solve a part of the problem needed to solve second part?
    - Recognize relationship between quantities?
        - Look for trends?
- Know what the answer tells them? Know what form the answer should be? Know what units are called for?
- Know if strategies and results make sense?
    - Explain why they are trying a particular strategy?
    - Change course and try a different strategy if not making progress?
    - Use another strategy to verify and explain solution?
- Know what mathematics should be evident in all solutions? See the same mathematics in each representation and solution?

2. Reason abstractly and quantitatively.
Do students:

- Mathematize the problem?
- Represent the problem symbolically?
- Know what properties and reasoning support the solution? Know how the problem can be decomposed and recombined?
- Know what units are needed while solving and reporting the answer?

3. Construct viable arguments and critique the reasoning of others.
Do students:

- Make conjectures?
- Construct their justification? Use objects? Drawings? Diagrams? Examples and counter examples?
- Have opportunities to explain their conclusions and communicate their reasoning with others? Know the language that is needed?
- Have opportunities to ask useful questions to seek clarity? Follow the arguments of others looking for flaws and explaining them?

4. *Model with mathematics.*
Do students:

- Apply the mathematics to the problem?
- Make and recognize assumptions and approximations?
- Understand they may need to make revisions?
- Identify important quantities and the relationships between them?
- Interpret the mathematics in the context of the problem?
- Reflect on the results?
  - Make sense of the solutions?
  - Evaluate model to see if it can be improved?

5. *Use appropriate tools strategically.*
Do students:

- Choose tools to fit the problem and know how to use them?
- Recognize usefulness and limitations of tool?
- Use technological tools to explore and deepen understanding?

6. *Attend to precision.*
Do students:

- Communicate precisely to others?
- Use clear definitions?
- State the meaning of the symbols they use?
- Calculate accurately and precisely?
- Examine their claims and check reasoning?

7. *Look for and make use of structure.*
Do students:

- Recognize the structure of the problem?
  - Patterns (e.g. commutative property)
  - Definitions (e.g. rectangles have 4 sides)
  - Utilize properties
- Decompose and recombine numbers and expressions
- Shift perspective if needed?

8. *Look for and express regularity in repeated reasoning.*
Do students:

- Notice if calculations repeat themselves?
- Look for general methods? Shortcuts?
- Maintain oversight of process and attend to details?
- Evaluate the reasonableness of the results?