MATHEMATICAL PRACTICES

EXPLORATION
- Conjecturing/making a prediction
- Guessing and checking
- Trying an easier problem
- Looking for patterns
- Thinking in reverse/doing-undoing

ORIENTING AND ORGANIZING
- Figuring out what the question is asking
- Creating smaller problems to be solved
- Establishing the *known* and the *unknown* in the problem
- Asking, What kind of problem is it? What is similar or different about this problem?

GENERALIZING
- Representing a mathematical relationship in more general terms (e.g., representing a rule or relationship using symbols, words, a graph)

Generalizing involves looking for rules and relationships and asking:
- What steps am I doing over and and over again?
- What is changing?
- Do I have enough information to let me predict what will happen?
- Can I describe the steps I've been doing without using specific inputs?
- Does my rule only work for [odd numbers]?

REPRESENTING
Representing is part of both exploration (How can I make sense of this for myself?) and communication and justification (How can I explain/show/convince other people?). It involves
- Drawing a picture or a diagram
- Visualizing
- Making a model
- Using symbols
- Verbalizing or putting into words
- Rewording the problem

CHECKING FOR APPROPRIATENESS AND REASONABLENESS
- Does my answer make sense in the context of the problem?
- Does my answer make sense in terms of my previous knowledge?

CONNECTING, EXTENDING, RECONCILING

- Will this rule work for other [numbers]?
- Can I use this process for a more general case?
- When is this rule true? Is it *always* true?
- For what [systems of numbers] or [kinds of figures] does it hold?
- Does previously held knowledge need to change?

USING APPROPRIATE MATHEMATICAL LANGUAGE

- Creating and using definitions
- Using mathematically precise and appropriate language
- Using symbols correctly and appropriately
- Having an awareness of mathematical conventions

JUSTIFYING

Justifying requires explaining, convincing, and proving, asking such questions as:

- Why does it work?
- How *sure* am I? Am I convinced?
- How can I represent the problem in such a way to make it convincing?
- What previously established knowledge do I draw on in making my case?
- What terms will I have to define in order to communicate my argument to others?
- Are explanations and proofs sufficiently convincing?

Adapted from Boaler-Humphreys, *Connecting Mathematical Ideas*, pp. 101-103