Review:
NCTM Standards

On-line Workspace

n=f(n) problem

Context

The *Nature* of Problem-solving

What does this mean?

What is a problem vs an exercise?

*ars inveniendi* – the art of discovery

**Heuristics**: Procedure; Processes; a means to discovery

**Strategies**: Fixed; Prescriptive; algorithmic

Compare Strategies with *Formulas*

**Polya’s Work: How to Solve it**
Work of a Mathematician with an interest in creating Problem-Solving
Heuristics

He proposed a 4-fold heuristic for use and analysis of mathematical problem-solving:

1. **Understand the problem:**
   – What is the unknown? What are the data? What is the condition? Write down the different parts of the condition. Is it possible to satisfy the condition?
   – Are there contradictions or redundancies in the problem?
   – Draw a figure if possible!
2. Devise a plan:
– Find the connection between the given and the unknown!
– Have you seen such a problem before or maybe in a slightly different form? Do you know a similar or related problem? Could you use this related example, its result, its method?
– Do you know a theorem or method that could be useful?
– Did you use all the data?
– In case you cannot solve the problem: Find a (simpler) related problem (a more general or more special one or an analogous problem)! Keep one part of the condition and drop another part! How can you vary the problem such that a plan can be found? You may be obliged to consider auxiliary problems or auxiliary variables! Could you restate the problem? Go back to the definitions!

3. Carry out the plan:
– Check whether each step is correct!
– Can you prove the correctness? If not, how to revise the plan?

4. Examine the obtained solution:
– What is the general method or idea?
– Can you use the result or method for some other problem?
– Can you derive the result differently?

Can you observe this structure in your own problem-solving or in others?

Can you recognize common strategies in your work?

Do you have any natural problem-solving strategies?

Do you use heuristics to help you discover more about the problem?

What common mistakes do you make and how do you attend to them? e.g. do you use certain methods to help you be more aware of such common errors with the aim of eliminating them?

Continue to problem-solve and write meta-accounts of your work. Share your work with each other. Do you see any common strategies and errors?