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Problem Solving

(Polya's Principles – S.O.L.V.E. Thought Process)

READ

Study the Problem

Highlight the question.

Answer the question,

"What is the problem asking me to find?"

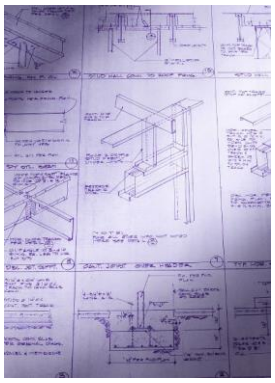
Organize the Facts

Identify each fact.

Eliminate unnecessary facts.

List all necessary facts.

Plan



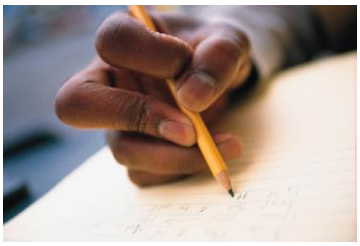
Line up a Plan

Choose an operation and/or strategy.

Tell in words how you are going to solve the problem.

Do not use numbers in this step.

Do



Verify your Plan with Action

Estimate your answer.

Carry out your plan.

Look Back

Examine your Answer

Does your answer make sense?

Is your answer reasonable?

Is your answer accurate?

Write your answer in a complete sentence.

Baltimore County Public Schools, Office of Mathematics PreK-12
Adapted from *Algebraic Thinking*, National Training Network

SOLVE it!

Write the problem

Read: Study the problem
What is the problem asking me to find?

Read: Organize the facts
List the facts I need to solve the problem.

Plan: Line up a plan
Check the strategy(ies) I will use.

- ❑ Act it out
- ❑ Draw a Picture
- ❑ Make a List
- ❑ Make a Table/Graph
- ❑ Look for a Pattern
- ❑ Try, Check, Revise
- ❑ Write an Equation
- ❑ Use Reasoning
- ❑ Work Backwards
- ❑ Solve a Simpler Problem

Check the operation(s) I will use.

- ❑ Addition
- ❑ Subtraction
- ❑ Multiplication
- ❑ Division

Do: Verify the solution
Find the solution to the problem by showing all steps.

Look Back: Evalute
Check to see if my solution is…

Reasonable

Accurate

Problem Solving Standard (PSSM, NCTM 2000)
Instructional programs from prekindergarten through grade 12 should enable all students to-

- build new mathematical knowledge through problem solving;
- solve problems that arise in mathematics and in other contexts;
- apply and adapt a variety of appropriate strategies to solve problems;
- monitor and reflect on the process of mathematical problem solving

Mathematical Practices (CCSS, 2010)
1 Make sense of problems and persevere in solving them.
Mathematically proficient students

Read: S, O

- start by explaining to themselves the meaning of a problem and looking for entry points to its solution.
- analyze givens, constraints, relationships, and goals.

Plan: L

- make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt.
- consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution.
- monitor and evaluate their progress and change course if necessary.
- *Older students might, depending on the context of the problem,* transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need.

Do: V

- explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends.
- *Younger students might rely on* using concrete objects or pictures to help conceptualize and solve a problem.

Look Back: E

- check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?"
- understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Resources

Principles and Standards, (NCTM, 2000)
S.O.L.V.E. videos, National Training Network, http://www.ntnmath.com/

Improving Mathematical Problem Solving in Grades 4 Through 8
WHAT WORKS CLEARINGHOUSE, May 2012
http://ies.ed.gov/ncee/wwc/pdf/practice_guides/mps_pg_052212.pdf
http://ies.ed.gov/ncee/wwc/practiceguide.aspx?sid=16 (supporting videos)

Assisting Students Struggling with Mathematics: Response to Intervention (RtI) for Elementary and Middle Schools (WHAT WORKS CLEARINGHOUSE, April 2009, http://www.rti4success.org/sites/default/files/rti_math_pg_042109.pdf)