

SOLVING MATHEMATICAL PROBLEMS IN MORE THAN ONE WAY:

A Guide for Middle School Teachers

The Common Core Mathematics Practice Standards call for students to be able to “**construct viable arguments and critique the reasoning of others.**” To reach this objective, students should be given the opportunity to discuss various solution strategies.

Students benefit from generating multiple solution strategies and from hearing the solution strategies of others. These activities help them to learn to approach problems with flexibility, and recognize when a particular strategy is more effective. This can also push students to figure out why certain strategies fit– or do not fit– certain types of mathematical problems. All of this leads to the flexible thinking that mathematics requires.

As you will see, some of the solution strategies reference other solution strategies. Students should be encouraged to use multiple strategies as they are working through problems and make connections between the approaches to highlight how a combination of strategies lead to efficient, effective paths to solutions.

Six Strategies to Approach Problems

Strategy

1

Make an Educated Guess and Check

The guess and check strategy involves guessing to come up with a solution and then checking to see if the guess fits the conditions of the problem. For some problems this may be the only appropriate solution method.

Strategy

2

Use of Visual Representations

Visual representations, such as number lines, pictures, and strip diagrams, are an effective way for students to access abstract and complex mathematical ideas.

Strategy

3

Consider a Simpler Case to Try to Understand the Nature of the Problem

Another strategy students can use is to try to simplify the problem in order to make it easier to solve. The [Locker problem](#) where students have to solve a word problem involving 1,000 lockers can be made simpler by having students start with a simpler case (eg. 10 or 20 lockers) to look for a pattern (Solution Strategy 5).

Strategy

4

Eliminate Possibilities

This solution strategy is connected to Solution Strategy 1 in that students can eliminate possibilities as part of their educated guess and check approach. For example, if a problem mentions a quantity is $\frac{1}{6}$ of an amount, students can use this information to realize that the solution must be a multiple of 6. This strategy can make guessing and checking a much more efficient process.

Strategy

5

Use a Table, Chart, or List to Find a Pattern

Using organizational tools such as charts or tables can help the problem solver simplify problem information to see mathematical patterns that support finding solutions.

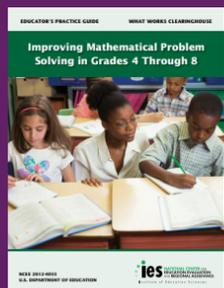
Strategy

6

Using Algebraic Notation (Equations and Expressions)

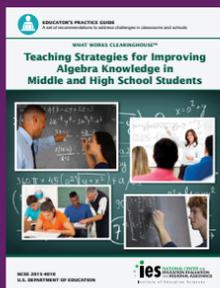
Students can use variables to represent unknowns in the problem to aid in writing an equation that matches the structure of the problem.

Additional Resources



*Improving Mathematical
Problem Solving in Grades
4 Through 8*

[https://ies.ed.gov/ncee/wwc/
PracticeGuide/16](https://ies.ed.gov/ncee/wwc/PracticeGuide/16)



*Teaching Strategies for
Improving Algebra Knowledge
in Middle and High Schools*

[https://ies.ed.gov/ncee/wwc/
practiceguide/20](https://ies.ed.gov/ncee/wwc/practiceguide/20)

NCTM's The Math Forum Classic Problems

http://mathforum.org/dr.math/faq/faq_classic.problems.html

Figure This! Math Challenges for Families

<http://figurethis.nctm.org>

NCSM Problems of the Month

<https://www.mathedleadership.org/ccss/itp/problem.html>

YouCubed

<https://www.youcubed.org/tasks/>



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