

# Problem Solving Strategy Shuffle



The Positive Engagement Project

THE POSITIVE ENGAGEMENT PROJECT

Making a difference...not a dollar.

# Problem Solving Strategy **Shuffle**

There are numerous approaches to solving problems in mathematics. **Problem Solving Strategy Shuffle** is set up as a way to give all types of mathematicians a fun way of using different problem solving strategies to help them demonstrate their understanding of math concepts.

In general, the evidence suggests that teaching a combination of problem solving techniques is the most effective. There are a number of strategies that may be used in solving math problems. Teaching students how to use the different strategies when they work in mathematics will provide them with the greater ability to deal with the variety of math problems that they will encounter. Here is a list of the problem solving strategies in **Problem Solving Strategy Shuffle**:

Act It Out  
Build It  
Draw A Picture  
Estimate  
Guess And Check  
Look For A Pattern  
Make A Graph  
Make An Organized List  
Mental Math (Decomposing, Splitting, Jumps of Ten)  
Number Sentences  
Solve A Simpler Problem  
Work Backwards

## What is Problem Solving Strategies Shuffle and how does it work?

The nice thing about **Problem Solving Strategy Shuffle** is that you can use AS MANY or AS FEW of the problem strategy cards as you like. If you are a 1<sup>st</sup> grade teacher, you may want to focus on five or six of the cards in the shuffle. On the other hand, if you are an upper grade teacher, you may want to use all of them; it's totally up to you!

After you have introduced a number of the problem strategy skills, give the groups, or pairs, a set of problem solving strategy cards. If you are working on five problem solving strategies, let's say *build it*, *estimate*, *look for a pattern*, *mental math*, and *work backwards*, you would have a pile of cards of those strategies (more than one of each card, so it truly is a shuffle of problem solving strategies). Have the students shuffle the cards and place them face down in a pile in the middle of the table.

The idea of **Problem Solving Strategy Shuffle** is to create opportunities for our students to think about math differently. We want our students to recognize that there is more than one way to solve a problem. Too many times, kids find one way to solve a problem and rely primarily on that strategy. The problem is that the real world requires us to use many different strategies to solve problems.

When providing the class with a problem, you can have different groups of students selecting cards from **Problem Solving Strategy Shuffle** to determine how they are to solve that problem. One group

may have to draw a picture, while another group looks for a pattern. Then you can have each group share out their solution and justify why they are correct. This allows the class to see different methods for solving the same problem. You can incorporate some math talks and have the students discuss which method they liked best and why.

One feature of mathematical understanding in the Common Core is the ability to justify, in a way appropriate to the student's mathematical experience, why a particular mathematical statement is true or where a mathematical rule comes from. There is a world of difference between a student who can summon a mnemonic device to solve a problem and a student who can explain where the mnemonic comes from. The goal is to get our students to explain why they are using a certain strategy, not to just use it. **Problem Solving Strategy Shuffle** offers students multiple viewpoints to solving the same problem and it forces our students to think in ways that they would not choose if given the choice.

You can use the strategy cards whole or small group, with partners, or individually (but we prefer when the students are interacting with other students). Before you can set your kids off to use the cards from **Problem Solving Strategy Shuffle**, it is imperative that you introduce each skill and strategy and give your students many examples of what you are looking for. We have included a large (8 ½ by 11 inch) version of the strategy card so you can show it to your class as

you introduce the skill. It is an exact representation of the smaller version used in **Problem Solving Strategy Shuffle**.

We will go through each of the strategy cards one at a time and give you examples of what it could look like in your classroom. Before we do that, let's use this sample math problem involving integers as the basis for all of the activities in **Problem Solving Strategy Shuffle**.

**Q:** The sum of 2 consecutive odd numbers is 92.  
What are the two integers?

**A:** 45 and 47

## Problem Solving Strategy Shuffle Card Act It Out

To *Act It Out* is a strategy when students move around while they are trying to solve a problem. It allows them to develop visual images of both the data in the problem and the solution process. By taking an active role in finding the solution, students are more likely to remember the process they used and be able to use it again for solving similar problems. The dramatizations need not be elaborate. This strategy is especially helpful when the problem solver wants to visualize relationships.

The goal of the Act It Out card is to get students to physically work with the problem at hand. Students could have two separate students represent the consecutive odd numbers from our sample problem. Another student could represent the sum of 92. The students then are responsible to verbally come up with what the two odd integers are and why they think they are correct.

### Act It Out



Move around with your group/partner and try to act out the problem and the solution.

# Act It Out



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## Act It Out

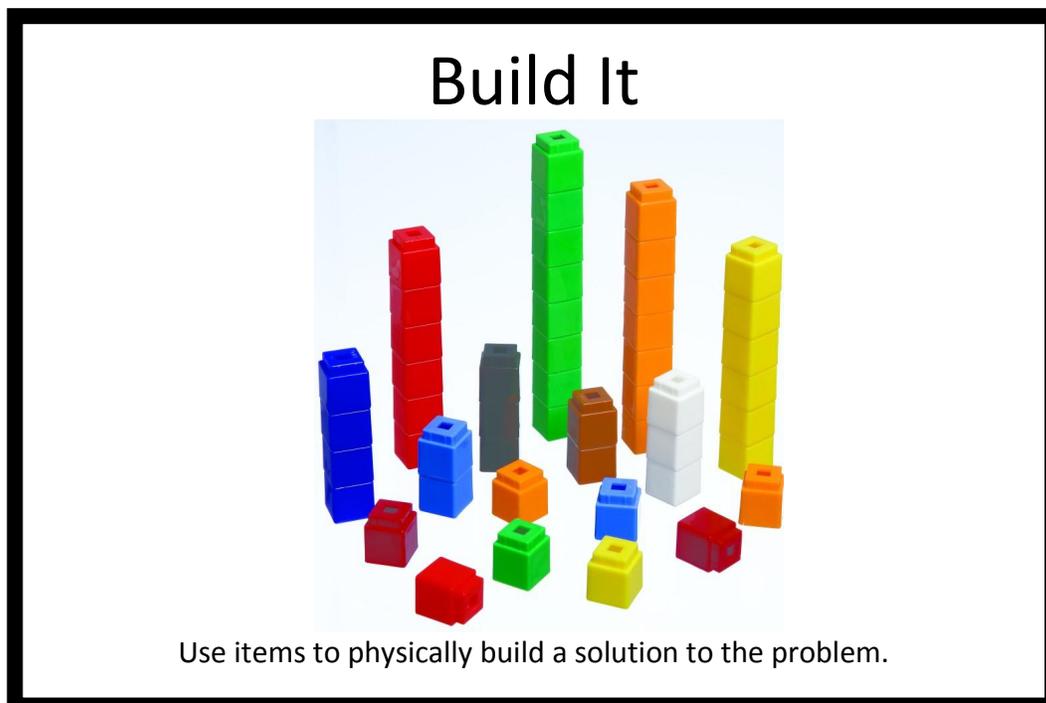


Move around with your group/partner and try to act out the problem and the solution.

## Problem Solving Strategy Shuffle Card Build It

*Build It* is a strategy where students use visuals or manipulatives to help them visualize the problem at hand. Students can use objects exactly as described in the problem, or they might use items that represent the people or objects. This strategy is especially helpful when the problem solver wants to visualize relationships.

The goal of the Build It card is to get students to create physical models to help them visualize the problem. Students can use any variety of materials to help them build a solution to their problem. In the example of the two odd integers adding up to 92, students can build the two numbers to physically show both odd integers and that they add up to 92. The students then are responsible to verbally come up with what the two odd integers are and why they think they are correct.



# Build It



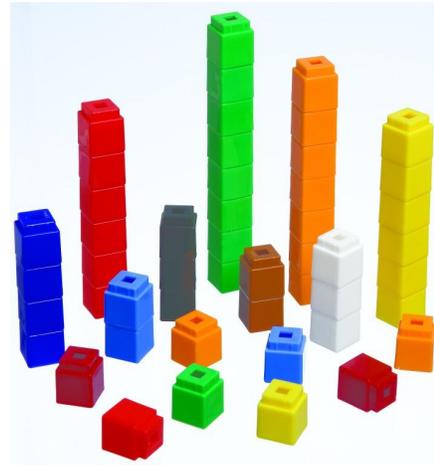
Use items to physically build a solution to the problem.

# Build It



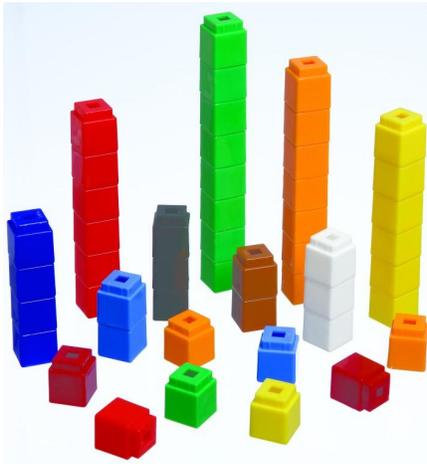
Use items to physically build a solution to the problem.

# Build It



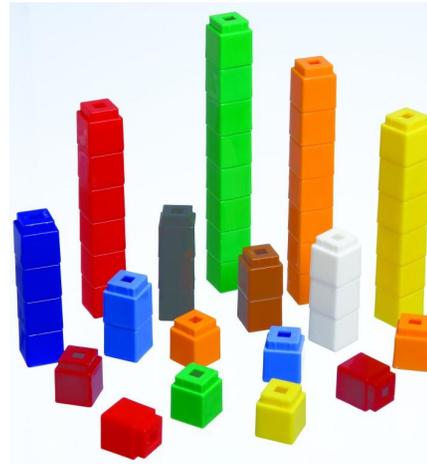
Use items to physically build a solution to the problem.

# Build It



Use items to physically build a solution to the problem.

# Build It



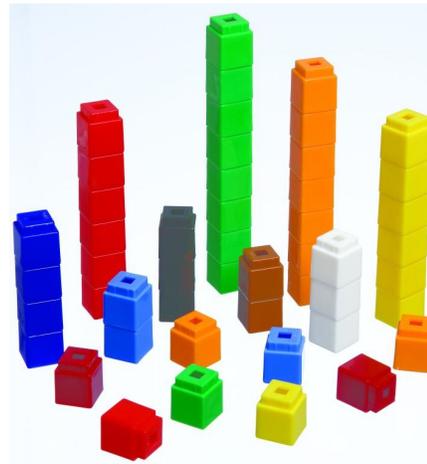
Use items to physically build a solution to the problem.

# Build It



Use items to physically build a solution to the problem.

# Build It

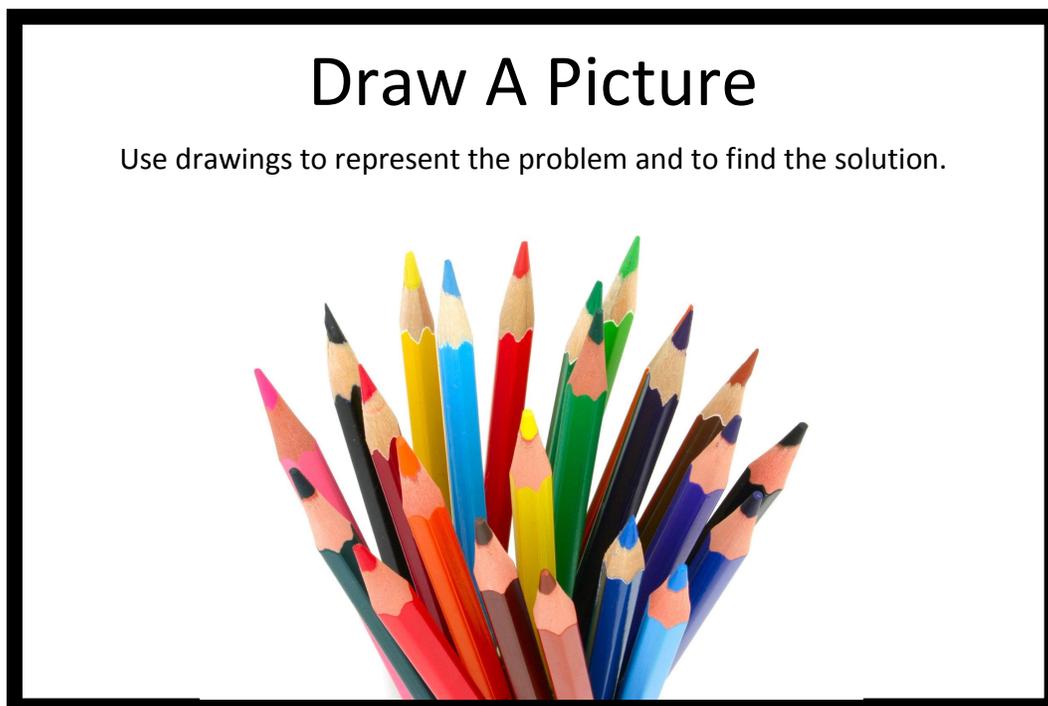


Use items to physically build a solution to the problem.

## Problem Solving Strategy Shuffle Card Draw A Picture

Drawings can help students visualize problem situations. *Draw A Picture* is a strategy that incorporates the use of drawing pictures to represent the problem. This strategy is especially helpful when the problem solver wants to visualize relationships.

The goal of the Draw A Picture card is to get students to create a picture, or series of pictures, to help them visualize the problem. Students can draw any type of picture, or pictures, to help them build a solution to their problem. In the example of the two odd integers adding up to 92, students can make drawings representing the two numbers to visually show both odd integers and that they add up to 92. The students then are responsible to verbally come up with what the two odd integers are and why they think they are correct.



# Draw A Picture

Use drawings to represent the problem and to find the solution.



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## Problem Solving Strategy Shuffle Card Estimate

When estimating for problem-solving, students try out the calculations from an educated guess by rounding up or down to determine a possible solution to the problem. Because some students *Estimate* in their head, while others estimate on paper, it is probably a good idea to have your students use paper and pencil, so they can share out as a group. This way, you will know who needs more instruction.

The goal of the Estimate card is to get students to decide on the best path for solving the problem. They are deciding on how to set up the problem and which operations are necessary. Students can individually make their guesses and then come together or as a group, or openly discuss how they can attack the problem. In the example of the two odd integers adding up to 92, students can start by making a logical guess of which number is the half point of 92. From there, they can incorporate their knowledge of odd integers and addition to come up with the solution. Students are then responsible to verbally come up with what the two odd integers are and why they think they are correct.

### Estimate



Form an educated guess by rounding up or down to determine a possible solution to the problem.

# Estimate



Form an educated guess by rounding up or down to determine a possible solution to the problem.

# Estimate



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# Estimate



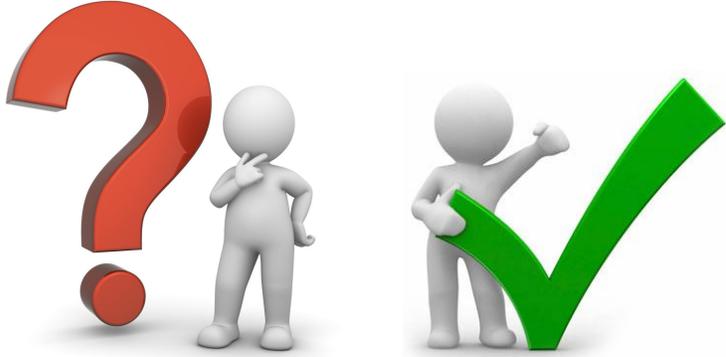
Form an educated guess by rounding up or down to determine a possible solution to the problem.

## Problem Solving Strategy Shuffle Card Guess And Check

The *Guess And Check* strategy for problem solving can be helpful for many types of problems. When using this strategy, students are encouraged to make a reasonable guess, check the guess and revise the guess if necessary. By repeating this process a student can arrive at a correct answer that has been checked. Using this strategy does not always yield a correct solution immediately, causing students to persevere, but it provides information that can be used to better understand the problem and may suggest the use of another strategy.

The goal of the Guess And Check card is to get students to solve mathematical problems by guessing the answer and then checking that the guess fits the conditions of the problem. In the example of the two odd integers adding up to 92, students can start by making a logical guess of two random consecutive odd integers and see how close they are to equaling 92. From there, they can incorporate their knowledge of odd integers and addition to come up with the solution. Students are then responsible to verbally come up with what the two odd integers are and why they think they are correct.

### Guess And Check



Make a reasonable guess, check the guess and revise the guess if necessary.

# Guess And Check



Make a reasonable guess, check the guess and revise the guess if necessary.

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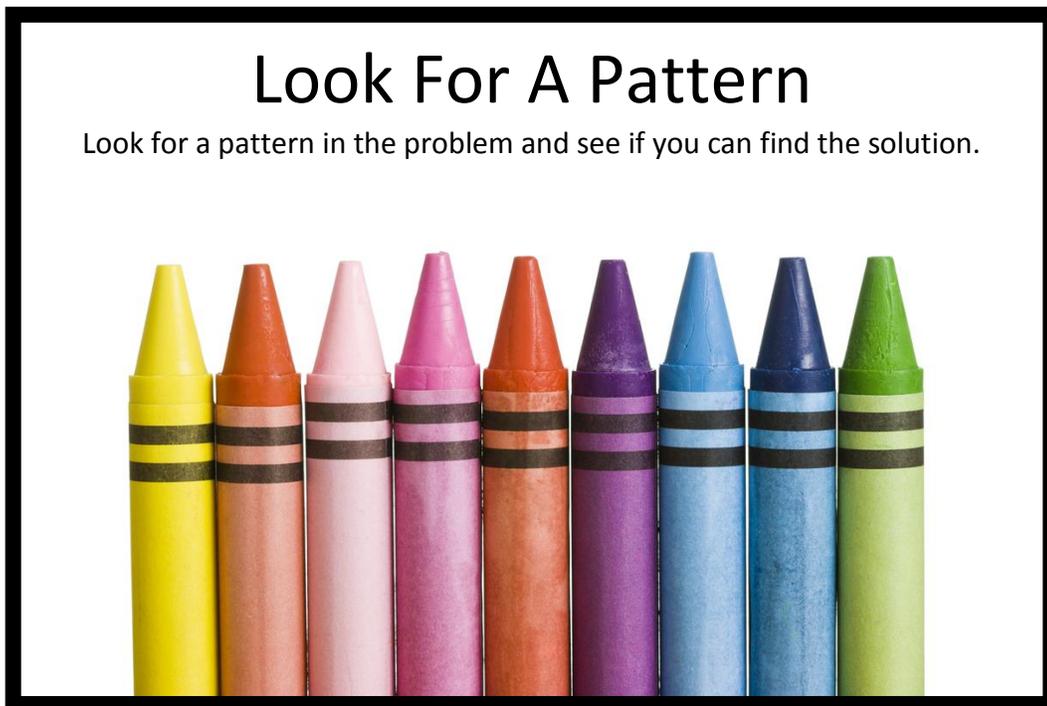


Make a reasonable guess, check the guess and revise the guess if necessary.

## Problem Solving Strategy Card Look For A Pattern

When students use the *Look For A Pattern* problem-solving strategy, they are required to analyze patterns in data and make predictions and generalizations based on their analysis. They then must check the generalization against the information in the problem and possibly make a prediction from, or extension of, the given information. A pattern is a regular, systematic repetition. Looking for patterns is a very important strategy for problem solving and is used to solve many different kinds of problems. Making a number table often reveals patterns, and for this reason it is frequently used in conjunction with this strategy.

The goal of the Look For A Pattern card is to get students to solve mathematical problems by analyzing patterns within the problem. In the example of the two odd integers adding up to 92, students can start by making a table of possible ways to make 92. From the table, they can then look at only the odd integers and base their solution from there. Students are then responsible to verbally come up with what the two odd integers are and why they think they are correct.



# Look For A Pattern

Look for a pattern in the problem and see if you can find the solution.



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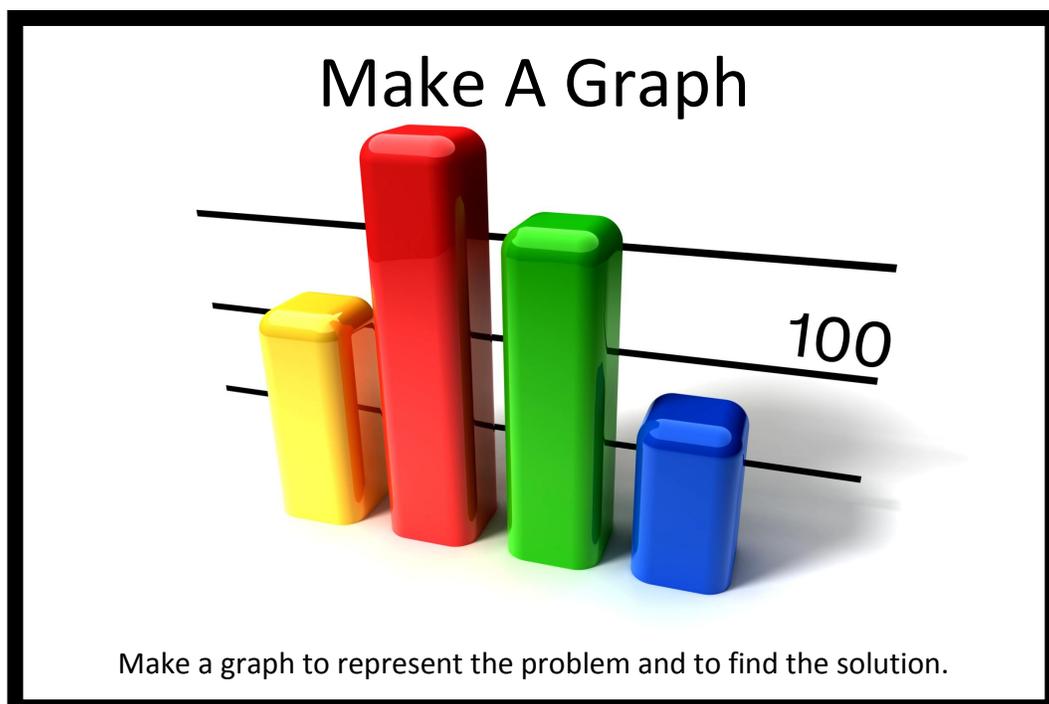
Look for a pattern in the problem and see if you can find the solution.



## Problem Solving Strategy Shuffle Card Make A Graph

Much like drawings, graphs can help students visualize problem situations. *Make A Graph* is a strategy that incorporates the use of different types of graphs to represent the problem and solution. Students will need to have a good understanding of different graphs and their functions. Of all of the strategies in this packet, this may be the most difficult one for students to use. This strategy is especially helpful when the problem solver wants to visualize relationships.

The goal of the Make A Graph card is to get students to create a graph to help them visualize the problem. Students can use any type of graph to help them build a solution to their problem. In the example of the two odd integers adding up to 92, students can create a pie chart, where the whole represents 92. The two parts of the pie chart could represent the two odd integers that make up the 92. The students then are responsible to verbally come up with what the two odd integers are and why they think they are correct.



Make a graph to represent the problem and to find the solution.



# Make A Graph



Make a graph to represent the problem and to find the solution.

# Make A Graph



Make a graph to represent the problem and to find the solution.

# Make A Graph



Make a graph to represent the problem and to find the solution.

# Make A Graph



Make a graph to represent the problem and to find the solution.

# Make A Graph



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# Make A Graph



Make a graph to represent the problem and to find the solution.

# Make A Graph



Make a graph to represent the problem and to find the solution.

## Problem Solving Strategy Shuffle Card Make An Organized List

*Make An Organized List* is a problem solving strategy which allows students to organize the data and visually consider their options when answering a problem. This strategy also allows the student to discover relationships and patterns among data. In the attempt to produce an organized list, students will likely encounter frequent and repeated patterns.

Much like looking for patterns in problems, the goal of the Make An Organized List card is to get students to solve mathematical problems by analyzing patterns within the problem and listing the information. In the example of the two odd integers adding up to 92, students can start by making an organized list of possible ways to make 92. From the list, they can then narrow their focus to the odd integers and base their solution from there. Students are then responsible to verbally come up with what the two odd integers are and why they think they are correct.

### Make An Organized List

Letter Grade	Number
A (90–100)	
B (80–89)	
C (70–79)	
D (60–69)	
F (below 60)	

Make an organized list to represent the problem and to find the solution.



# Make An Organized List

Letter Grade	Number
A (90–100)	<i>    </i>
B (80–89)	<i>    </i>
C (70–79)	<i>    </i>
D (60–69)	<i>  </i>
F (below 60)	

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Make an organized list to represent the problem and to find the solution.

## Problem Solving Strategy Shuffle Card Mental Math (decomposing, splitting, jumps of ten)

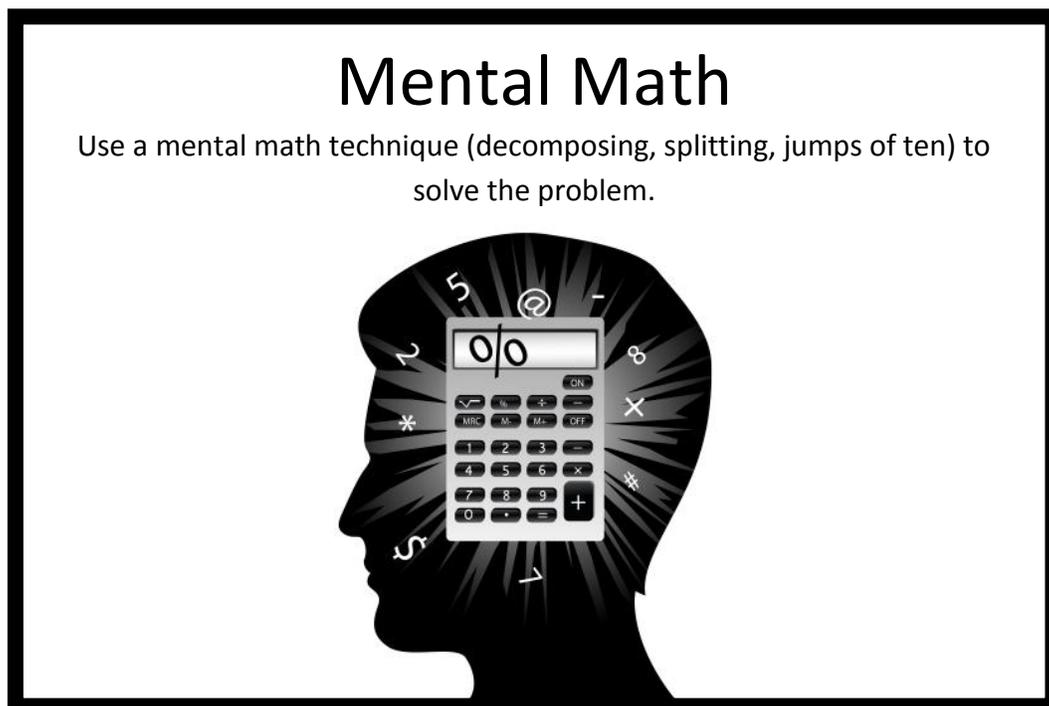
*Mental Math* is more of a tool than a problem solving strategy, but irrelevant of its exact title, it is an excellent way to stimulate number sense for our students. In other words, one becomes more familiar with how numbers interact, which is very important, because math is something that builds on itself. If our students don't have a good grasp on how numbers interact, then more complicated math will seem like more of a challenge. In the modern world of computers and calculators, mental math skills are more important, rather than less. Here are just a few examples:

Decomposing: breaking numbers apart, almost like expanded form.

Splitting: breaking numbers apart in any way to see the relationship of the number.

Jumps of Ten: using a mental number line by jumping ten spots at a time.

The goal of the Mental Math card is to get students to use mental math techniques to solve the problem. Students can choose any method they like to help them come up with the solution. In the example of the two odd integers adding up to 92, students can use the splitting technique and break 92 into 40, 40, 10, and 2. The students then are responsible to verbally come up with what the two odd integers are and why they think they are correct.



# Mental Math

Use a mental math technique (decomposing, splitting, jumps of ten) to solve the problem.



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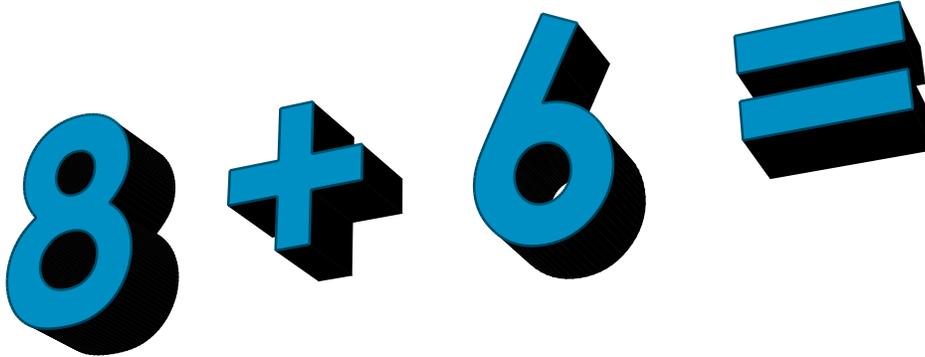


## Problem Solving Strategy Shuffle Card Number Sentences

The *Number Sentences* problem solving strategy helps students organize the information within a math problem. It's a way of showing the relationship between the known facts and the unknown in the problem. This strategy encourages students to see different word math problems as number sentences.

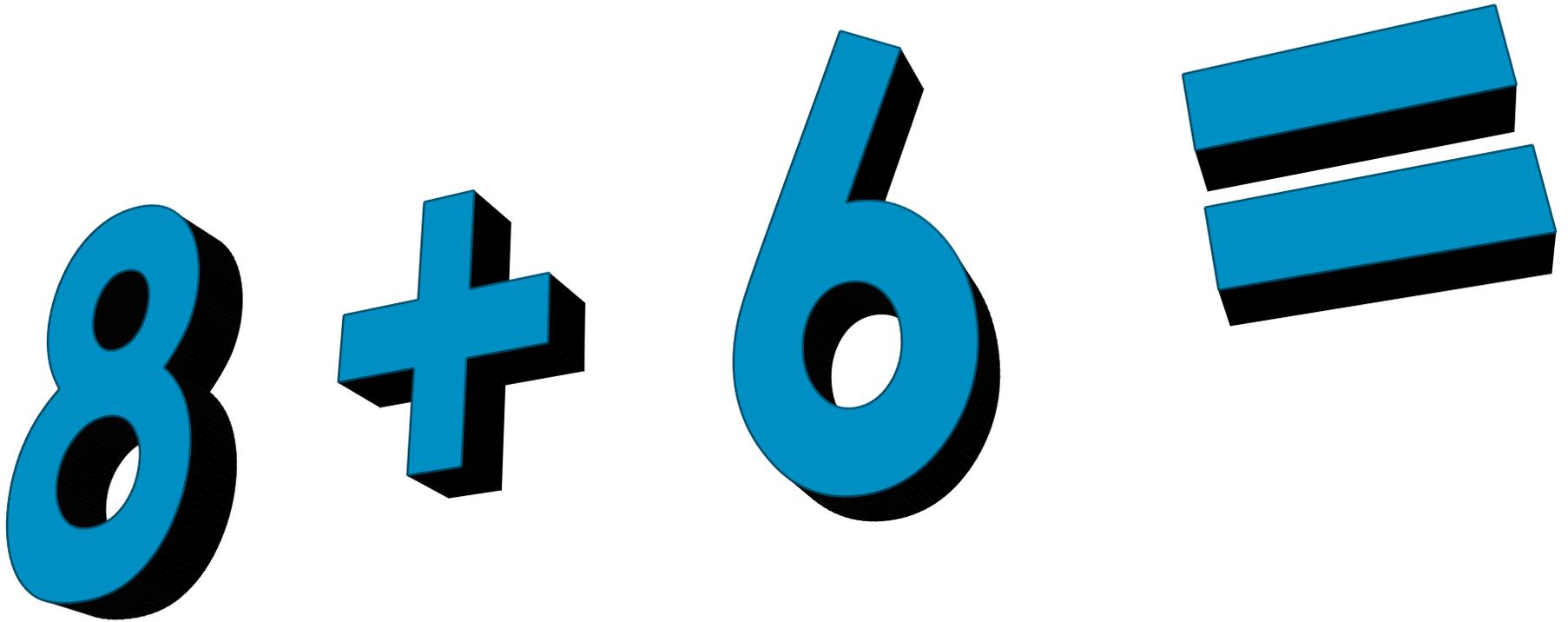
The goal of the Number Sentences card is to get students to solve mathematical problems by writing out a number sentence showing the problem. In the example of the two odd integers adding up to 92, students can write out the problem showing  $A + B = 92$ . Depending on the age of the students, they can use a formula to help them get started on the solution. Ultimately, students will need to construct a number sentence that accurately shows the two addends and the sum of 92. Students are then responsible to verbally come up with what the two odd integers are and why they think they are correct.

### Number Sentences

Write a number sentence (or sentences) to find the solution.

# Number Sentences



Write a number sentence (or sentences) to find the solution.

## Number Sentences

A 3D blue number sentence: 8 + 6 =

Write a number sentence (or sentences) to find the solution.

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A 3D blue number sentence: 8 + 6 =

Write a number sentence (or sentences) to find the solution.

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A 3D blue number sentence: 8 + 6 =

Write a number sentence (or sentences) to find the solution.

## Number Sentences

A 3D blue number sentence: 8 + 6 =

Write a number sentence (or sentences) to find the solution.

## Problem Solving Strategy Shuffle Card Solve A Simpler Problem

The problem solving strategy to *Solve A Simpler Problem* most often is used in conjunction with other strategies. Writing a simpler problem is one way of simplifying the problem-solving process. Rewording the problem, using smaller numbers or using a more familiar problem setting may lead to an understanding of the solution strategy to be used. Many problems may be divided into simpler problems to be combined to yield a solution. Sometimes a problem is too complex to solve in one step. When this happens, it is often useful to simplify the problem by dividing it into cases and solving each one separately.

The goal of the Solve A Simpler Problem card is to get students to solve mathematical problems by using what they know and simplifying problem. In the example of the two odd integers adding up to 92, students can use the sum of 9. This could give the students an idea of where to start for the digit in the tens place (40s or 50s). Students are then responsible to verbally come up with what the two odd integers are and why they think they are correct.

### Solve A Simpler Problem



Reword the problem, possibly using smaller numbers, to find the solution.

# Solve A Simpler Problem



Reword the problem, possibly using smaller numbers, to find the solution.



## Problem Solving Strategy Shuffle Card Work Backwards

*Working Backwards* is the problem solving strategy of undoing key elements in the problem in order to find a solution. To solve these problems it is usually necessary to start with the answer and work methodically backwards to fill in the missing information. This strategy is extremely useful in dealing with a situation or a sequence of events. Students begin at the end, with the final action, and work through the process in reverse order to establish what happened in the original situation.

The goal of the Work Backwards card is to get students to undo key elements in the problem. In the example of the two odd integers adding up to 92, students start at 92 and work backwards to find the two odd integers that can be added to form the sum. For example, students can subtract a number from 92 to try to find the partner number needed to solve the problem. The students then are responsible to verbally come up with what the two odd integers are and why they think they are correct.

### Work Backwards



Start with the answer and work backwards to fill in the missing information.

# Work Backwards

backward



Start with the answer and work backwards to fill in the missing information.

# Work Backwards

backwards



Start with the answer and work backwards to fill in the missing information.

# Work Backwards

backwards



Start with the answer and work backwards to fill in the missing information.

# Work Backwards

backwards



Start with the answer and work backwards to fill in the missing information.

# Work Backwards

backwards



Start with the answer and work backwards to fill in the missing information.

# Work Backwards

backwards



Start with the answer and work backwards to fill in the missing information.

# Work Backwards

backwards



Start with the answer and work backwards to fill in the missing information.