



"A great discovery solves a great problem, but there is a grain of discovery in the solution of any problem. Your problem may be modest; but if it challenges your curiosity and brings into play your inventive facilities, and if you solve it by your own means, you may experience the tension and enjoy the triumph of discovery." George Polya

### FOUR-STEP PROBLEM SOLVING PROCESS

1. \_\_\_\_\_
- Can you state the problem in your own words?
  - What are you trying to find or do?
  - What are the unknowns?
  - What information do you obtain from the problem?
  - What information, if any, is missing or not needed?

2. \_\_\_\_\_
- Find a strategy. Some strategies will work for one type of problem, but not for another *and* many times a problem can be solved in more than one way. Below is a list of possible strategies, but note that the list is by no means complete.

Look for a Pattern	Examine Related Problems	Examine a Simpler Case	Make a Table
Make a Diagram	Write an Equation	Guess and Check	Work Backward
Identify a Subgoal	Use Indirect Reasoning	Use Direct Reasoning	Make a List
Draw a Picture	Do a Simulation	Use a Model	Use a Variable

3. \_\_\_\_\_
- Implement the strategy or strategies in Step 2 and perform any necessary actions or computations.
  - Check each step of the plan as you proceed. This may be intuitive checking or a formal proof of each step.
  - Keep an accurate record of your work.
4. \_\_\_\_\_
- Check the results in the original problem.
  - Interpret the solution in terms of the original problem. Does your answer make sense? Is it reasonable?
  - Determine whether there is another method of finding the solution.
  - If possible, determine other related or more general problems for which the techniques will work.

NOTE THAT THE FOUR-STEP PROCESS DOES NOT GUARANTEE A SOLUTION, BUT IT DOES GIVE YOU THE AMMUNITION TO ATTACK A PROBLEM.

**STRATEGY Look for a Pattern**

**Gauss's Problem:** Find the sum of the first 100 natural numbers.

Understand the Problem:

Plan (Gauss's Plan):



**STRATEGY Guess and Check**

I am thinking of a number. If you double it and add 11, the result is 39. Find my number.

**STRATEGY Working Backward**

Try the above problem again.

**STRATEGY Identify a Subgoal**

**Magic Square:** Arrange the numbers 1-9 in the following square so that each row, column, and diagonal is the same sum.




## TAKE HOME PROBLEMS

### EXAMPLE 1 Look for a Pattern

Find the sum of the first 100 natural EVEN numbers.

**SHOW ALL WORK**

Find the sum of the first 100 natural ODD numbers.

**SHOW ALL WORK**

### EXAMPLE 2 Examine a Simpler Problem

Suppose you could spend \$100 every minute (night and day) for an entire year. How much money in total do you spend?

**SHOW ALL WORK**

**EXAMPLE 3 Write an Equation/Make a Table/Guess and Check**

**SHOW ALL WORK**

Looking out in the backyard, John saw an assortment of boys and dogs. Counting heads, he got 22. Counting feet, he got 68. How many boys and dogs were in the yard?

**EXAMPLE 4 Magic Square:**

4, 6, 8, 10, 12, 14, 16, 18, 20

**SHOW ALL WORK**
