

Four Ingredients to Problem Solving

CAMT 2010

Dave Johnston
Northside ISD, San Antonio
<http://math.ideasite.net>

Warm-Up #1:

When a student says, "I'm stuck," how do you respond?

Warm-Up #2:

You have 90 feet of fencing that will be strung in a straight line. The fence requires a fence post every 5 feet. How many fence posts will be needed?





George Polya's Four-Step Problem Solving Process

- Understand the Problem
- Devise a Plan
- Carry Out the Plan
- Look Back

UPS ✓

- Understand the Problem
- Plan Your Strategy
- Solve the Problem
- Check Your Work

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Work

<p>Understand</p> <ul style="list-style-type: none"> • Read the ENTIRE problem • Underline important information • Cross out distractions • Restate what the problem is asking 	<p>Plan</p> <ul style="list-style-type: none"> • Make a plan to solve the problem • Draw a picture • Make a table • Write a formula • And MORE! 
<p>Solve</p> <ul style="list-style-type: none"> • Do the math • Show your work • Check your math 	<p>Review</p> <ul style="list-style-type: none"> • Did you answer the question? • Does your answer make sense? • Do any other answers work, too? • Check the Units! 

Problem Solving Strategies: Make a Table

A table can help us organize information in a way that makes it easier to answer a question. A table can also be a way to organize our calculations in order to solve a problem. Consider this question:

Farmer Greg raises cows and chickens. He has 15 animals on his farm. The animals have a total of 54 legs. How many cows and how many chickens are on Farmer Greg's farm?

<p>First, list the useful INFORMATION you know:</p> <ul style="list-style-type: none">••••••••	<p>Now, let's PLAN our work:</p>																																													
<p>Next, it is time to work out our SOLUTION:</p> <p>Here is where we build our table.</p> <table border="1" data-bbox="191 1115 824 1848"><thead><tr><th># of Cows</th><th># of Chickens</th><th># of Legs</th></tr></thead><tbody><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></tbody></table>	# of Cows	# of Chickens	# of Legs																																											<p>Finally, we need to LOOK BACK at our solution.</p> <p>Did we answer the question and does our answer make sense?</p>
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On Monday, Abby has read 10 pages in her book, and Bobby has read 20 pages. By Tuesday, Abby has read 25 pages total and Bobby has read 30 pages total. By Wednesday, Abby has read 40 pages total and Bobby has read 40 pages total. If they continue reading at this pace, then by Friday, who will have read more pages, and how many more pages will they have read?

- Facts -

- Abby reads 15 pages everyday
- Bobby reads 10 pages everyday
- Who will read more by Friday.
- \$ By how many?

- Action -

Make a table, How many pages they read each day.

Find answer in table.

- SOLVE -

DAY	Abby	Bobby
MON	10	20
TUE	25	30
WED	40	40
THU	55	50
FRI.	70	60

$$\begin{array}{r} 1 \\ 55 \\ +15 \\ \hline 70 \end{array}$$

- THINK -

Abby read more pages

10 more than Bobby.

Now work with your group members to solve the problem below by creating a table. Be sure to use all four steps of the problem-solving process and explain how you solved your problem.

Alexis has 1200 wildflowers growing in her backyard. She also has a hyperactive puppy in her backyard, and each day, half the flowers are trampled and die. How many flowers will still be alive after 6 days? How many days will it take for less than a dozen flowers to still be alive?

Problem-Solving Strategies

- Draw a picture
- Look for a pattern
- Guess & check
- Act it out
- Make a table
- Work a simpler problem
- Working backward

Working Backward Strategies:

Abrianna makes popcorn balls to give out to Trick-or-Treaters. Abrianna gives out one-fifth of his popcorn balls to the first group, and two popcorn balls to the second. When the next group comes along, they take two-thirds of the remaining popcorn balls. Abrianna then quickly eats the last two popcorn balls and goes to bed early. How many popcorn balls did Abrianna make?

Sabrina sold fireworks last Christmas. The first person who came by bought $\frac{1}{3}$ of her fireworks. The second person bought four. The third person bought $\frac{1}{4}$ of the remaining fireworks. Leslie took the last 15 fireworks home. How many fireworks did Sabrina have to begin with?

Now work with your group members to solve the problem below by creating a table. Be sure to use all four steps of the problem-solving process and explain how you solved your problem.

Lela was trying to leave a plate of cookies for Santa, but people kept nibbling on the treats. First Raquel snuck in and ate 2 cookies. Then Shane quietly pilfered one-fifth of the remaining cookies. Mari figured she was getting a stocking full of coal anyway, so she swiped one-fifth of the cookies left on the plate. Jacob was starving after a night of Christmas caroling, so he gobbled up four cookies. Selena then snacked on one-half of the cookies that were left. Then Celeste took two cookies off of the plate and stored them away for winter. This left only four cookies for Santa, and the jolly old elf left many of Lela presents in his sleigh. How many cookies did Lela originally leave for Kris Kringle?

Sample Problems:

Draw a Picture

- You have 90 feet of fencing that will be strung in a straight line. The fence requires a fence post every 5 feet. How many fence posts will be needed?

Look for a Pattern

- If you cut a pizza six times, what is the most number of pieces (of any shape or size) you can create?

Guess and Check

- Clint has a 4-foot long piece of PVC pipe. He needs to cut the pipe into 2 pieces so that one section is 2 inches shorter than the other.

Act it Out

- What are the dimensions of the rectangle with a perimeter of 20 and the largest possible area?

Make a Table

- Mr. J sends a program to Andy's calculator and it takes one minute for the program to download. Then, Mr. J and Andy both send to program to other students' calculators and those students send the program along again. How many minutes should it take to send the program to everyone in the classroom if there are 30 students?

Work a Simpler Problem

- A 12-sided die is rolled twice. What is the probability a different number appears on each of the rolls?
- Today is Thursday. What day of the week will it be in 100 days?
- In a single-elimination tournament, 64 teams are competing. How many games will be played before a champion is determined?

Working Backward