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Articulating the what, when, and how of problem solving strategies (Metacognition)

Strategy	**Description**	**When useful**	**Tips:**
Draw a diagram or act it out	Use drawings, manipulatives, etc. to create a model of what is happening in the problem.	Helps to: • visualize a problem • determine the relationships in the problem	• Quick drawings • Objects and pictures are often representative (not literal) • Try a Bar Diagram!!! • Reinforce the use of labels
Make a Table or Chart	Determine the categories involved, record the data provided or generated.	Helps to: • find patterns • clarify order and progression • remove extraneous and repetitive words	• Can use multiple categories (more then 2) • Reinforce the use of labels
Look for a Pattern	Compare the change between events or numbers. Is it predictable? Confirm your pattern against the information given. Does it consistently predict the next event/item/number?	Helps to: • find a consistent sequence • predict next value • develop generalizations of relationships	• Organize information in a table, include categories for sequential change, and variable relationships
Make an Organized List	Begin with one value or combination, only change one thing at a time, record that result, repeat until all possibilities are identified for that item, then begin with next item, repeat. Can also be used to list information in order.	Helps to: • Systematically find all outcomes when combining information • Order and arrange given information	• Notice when order of items matters or not, this determines if you include repeated results or not.
Try, Check, **Revise**	Chose a solution, check to see if it satisfies ALL criteria in the problem, if not, adjust your solution based on your check, repeat until all conditions are met.	Helps to: • Explore possible relationships	• Often you will need to write an equation first • Emphasize that the revision is based on information from prior tries

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Strategy	Description	When useful	Tips:
Make a graph	Identify the values and categories in the problem. Determine which type of graph will best display the information.	Helps to • Create a visual representation of values relative to one another	• Consider the difference between statistical graphs (bar, circle, etc.) and coordinate graphs (shows independent/ dependent relationships) • Often will put information in a table first (esp. for independent/ dependent relationships)
Write an equation	Express actions and quantities in a problem using operations, numbers, and variables. Need to confirm that operation chosen represents what is happening in the problem.	Helps to • Represent relationships in a problem • Explore possible relationships	• Don't grab and go based on key words, need to analyze what the key words indicate in the problem • Often a bar diagram will clearly show the operation(s) needed
Use Reasoning	State what you know, identify what information this infers.	Helps to • Sort through given information • Identify seemly unknown information through logic, elimination, etc.	• Can use "If . . . then" language. • Used with logic puzzles like which person has the cat and lives in the yellow house?
Work Backwards	Organize information into a series of actions (operations or events), identify the end, and use inverse operations/ actions to find the beginning.	Helps to: • Determine beginning when the end and a sequential series are known • Determine initial amount when a final amount is given with relational statements	• A diagram can help track the steps taken • Tables can track "forward" actions and inverse actions • Check your work by substituting your solution at the beginning and applying the identified series of actions in order to get the end given in the problem
Solve a simpler problem	Use smaller, simpler, or fewer numbers or situations to determine the relationships in the problem. Then apply these relationships with the original numbers or situations.	Helps to: • Determine the relationships in the problem without being distracted by difficult numbers • Find a pattern between a few items to then check the pattern with more items	• Choose numbers to substitute that have similar relationships to each other (relative size) • Rather than trying to determine the 10^{th} term, see if a pattern works on the 4^{th} term first.