

A rubric for problem-solving strategies based upon Polya's stages

	4	3	2	1
<p>Define and understand the Problem</p> <p>Extracting and assimilating information, determines the goal of the problem, and introduces suitable notations when needed.</p>	<p>Shows clear understanding of problem and identifies specific factors that influence the approach to a problem before solving.</p> <p>A level 4 students should be proficient in all previous levels and can reformulate the problem if called upon to do so.</p>	<p>Shows clear understanding of the problem and identifies many specific factors that influence the approach to a problem before solving.</p> <p>At level 3 a student can clearly identify all variables required and separate these from any extraneous information.</p>	<p>Shows partially developed understanding of the problem and identifies a few specific factors that influence the approach to a problem before solving.</p> <p>At level 2 a student should understand the variables and/or information required and use suitable notation</p>	<p>Shows limited understanding of the problem and broader context.</p> <p>At level 1 a student should know what the problem asks them to find i.e. the goal.</p>
<p>Devising a plan or strategy to solve the problem</p> <p>Making a general plan and selecting relevant methods, "heuristics" that might be useful for solving the problem based on the understanding of the problem</p>	<p>At level 4 a student can recognize or classify the structure of the problem. They can consider one or more strategies, coordinate several processes into a strategy. They would demonstrate the ability to invert a process to form a plan and clearly articulate their decision making process (in words or algebraic formula).</p>	<p>At level 3 a student can begin to think about more than one method of solution. They can identify a plan based upon structural aspects of the problem not just keywords and phrases but not always with accuracy.</p> <p>They would be able to coordinate two processes into a strategy and articulate essential components of their strategy.</p>	<p>At level 2 a student can identify a viable strategy especially when keywords are provided and plan is straightforward.</p> <p>Student rarely recognizes the need for multiple solutions however, they can sometimes do so when prompted or when clear their solution is not appropriate.</p>	<p>At level 1 a student will select a strategy without regard to fit. Typically based upon superficial phrases or keywords in the problem.</p> <p>Student does not have ability to consider new strategies even if theirs is clearly not appropriate.</p>

<p>Carry out or execute the the plan</p> <p>Generate a solution</p>	<p>At level 4 a student can recognize the need for multiple paths to carry out the plan. Reasoning or thought is fully developed. They can implement plans with several processes or steps (including inverse processes) and identify accurately at least one correct or workable (frequently creative) solution(s).</p>	<p>At level 3 a student frequently recognizes the need for multiple paths to carry out the plan. Reasoning or thought in carrying out the plan is well developed. They can implement plans with limited number of processes or steps and state one or more accurate potential solution(s).</p>	<p>At level 2 a student does not demonstrate well developed thought or reasoning in carrying out the plan. Sometimes they recognize the need for multiple paths to carry out the plan especially if first attempt fails but they do so with limited proficiency.</p>	<p>At level 1 a student demonstrates minimal thought or reasoning in carrying out the plan. States at most one, frequently incorrect solution. Student does not recognize multiple paths to carry out the plan even when solution appears incorrect.</p>
<p>Looking back - reflection stage</p> <p>Is solution correct?</p> <p>What to do if solution is not correct?</p>	<p>At level 4 a student Always analyzes or synthesizes results from a wide range of perspectives. They can always apply background or context knowledge of the problem when considering appropriateness of the solution(s). They include reasoning behind the evaluation of each options. They can reflect upon solutions to make adjustments in and provide insights about their plan.</p>	<p>At level 3 a student frequently analyzes or synthesizes results from more than one perspective. They frequently apply background or context knowledge of the problem when considering solutions. They include reasoning behind the evaluation of most options, and identify one correct/workable solution. Incorrect solutions lead to reflection and adjustments in planning.</p>	<p>At level 2 a student sometime analyzes or synthesizes results. They sometimes apply background or context knowledge of the problem when considering solutions. They identify partially correct solutions with some reasoning and limited ability to check their answer and if they do so are unable to make adjustments in their planning or execution stages.</p>	<p>At level 1 a student does not analyze or synthesize results. They rarely apply background or context knowledge of the problem when considering solutions. They identify unworkable solutions with little reasoning. They rarely check their solution.</p>