

Getting Acquainted

Where should I start? Start from the statement of the problem.

What can I do? Visualize the problem as a whole as clearly and as vividly as you can. Do not concern yourself with details for the moment.

What can I gain by doing so? You should understand the problem, familiarize yourself with it, impress its purpose on your mind. The attention bestowed on the problem may also stimulate your memory and prepare for the recollection of relevant points.

Working for Better Understanding

Where should I start? Start again from the statement of the problem. Start when this statement is so clear to you and so well impressed on your mind that you may lose sight of it for a while without fear of losing it altogether.

What can I do? Isolate the principal parts of your problem. The hypothesis and the conclusion are the principal parts of a "problem to prove"; the unknown, the data, and the conditions are the principal parts of a "problem to find." Go through the principal parts of your problem, consider them one by one, consider them in turn, consider them in various combinations, relating each detail to other details and each to the whole of the problem.

What can I gain by doing so? You should prepare and clarify details which are likely to play a role afterwards.

Hunting for the Helpful Idea

Where should I start? Start from the consideration of the principal parts of your problem. Start when these principal parts are distinctly arranged and clearly conceived, thanks to your previous work, and when your memory seems responsive.

What can I do? Consider your problem from various sides and seek contacts with your formerly acquired knowledge.

Consider your problem from various sides. Emphasize different parts, examine different details, examine the same details repeatedly but in different ways, combine the details differently, approach them from different sides. Try to see some new meaning in each detail, some new interpretation of the whole.

Seek contacts with your formerly acquired knowledge. Try to think of what helped you in similar situations in the past. Try to recognize something familiar in what you examine, try to perceive something useful in what you recognize.

What could I perceive? A helpful idea, perhaps a decisive idea that shows you at a glance the way to the very end.

How can an idea be helpful? It shows you the whole of the way or a part of the way; it suggests to you more or less distinctly how you can proceed. Ideas are more or less complete. You are lucky if you have any idea at all.

What can I do with an incomplete idea? You should consider it. If it looks advantageous you should consider it longer. If it looks reliable you should ascertain how far it leads you, and reconsider the situation. The situation has changed, thanks to your helpful idea. Consider the new situation from various sides and seek contacts with your formerly acquired knowledge.

What can I gain by doing so again? You may be lucky and have another idea. Perhaps your next idea will lead you to the solution right away. Perhaps you need a few more helpful ideas after the next. Perhaps you will be led astray by some of your ideas. Nevertheless you should be grateful for all new ideas, also for the lesser ones, also for the hazy ones, also for the supplementary ideas adding some precision to a hazy one, or attempting the correction of a less fortunate one. Even if you do not have any appreciable new ideas for a while you should be grateful if your conception of the problem becomes more complete or more coherent, more homogeneous or better balanced.

Carrying Out the Plan

Where should I start? Start from the lucky idea that led you to the solution. Start when you feel sure of your grasp of the main connection and you feel confident that you can supply the minor details that may be wanting.

What can I do? Make your grasp quite secure. Carry through in detail all the algebraic or geometric operations which you have recognized previously as feasible. Convince yourself of the correctness of each step by formal reasoning, or by intuitive insight, or both ways if you can. If your problem is very complex you may distinguish "great" steps and "small" steps, each great step being composed of several small ones. Check first the great steps, and get down to the smaller ones afterwards.

What can I gain by doing so? A presentation of the solution each step of which is correct beyond doubt.

Looking Back

Where should I start? From the solution, complete and correct in each detail.

What can I do? Consider the solution from various sides and seek contacts with your formerly acquired knowledge.

Consider the details of the solution and try to make them as simple as you can; survey more extensive parts of the solution and try to make them shorter; try to see the whole solution at a glance. Try to modify to their advantage smaller or larger parts of the solution, try to improve the whole solution, to make it intuitive, to fit it into your formerly acquired knowledge as naturally as possible. Scrutinize the method that led you to the solution, try to see its point, and try to make use of it for other problems. Scrutinize the result and try to make use of it for other problems.

What can I gain by doing so? You may find a new and better solution, you may discover new and interesting facts. In any case, if you get into the habit of surveying and scrutinizing your solutions in this way, you will acquire some knowledge well ordered and ready to use, and you will develop your ability of solving problems.

The intelligent problem-solver often asks himself questions similar to those contained in our list. He, perhaps, discovered questions of this sort by himself; or, having heard such a question from somebody, he discovered its proper use by himself. He is possibly not conscious at all that he repeats the same stereotyped question again and again. Or the question is his particular pet; he knows that the question is part of his mental attitude appropriate in such and such a phase of the work, and he summons up the right attitude by asking the right question.

The intelligent problem-solver may find the questions and suggestions of our list useful. He may understand quite well the explanations and examples illustrating a certain question, he may suspect the proper use of the question; but he cannot attain real understanding unless he comes across the procedure that the question tries to provoke in his own work and, by having experienced its usefulness, discovers the proper use of the question for himself.

The intelligent problem-solver should be prepared to ask all questions of the list but he should ask none unless he is prompted to do so by careful consideration of the problem at hand and by his own unprejudiced judgment. In fact, he must recognize by himself whether the present situation is sufficiently similar or not to some other situation in which he saw the question successfully applied.

The intelligent problem-solver tries first of all to understand the problem as fully and as clearly as he can. Yet understanding alone is not enough; he must concentrate upon the problem, he must desire earnestly to obtain its solution. If he cannot summon up real desire for solving the problem he would do better to leave it alone. The open secret of real success is to throw your whole personality into your problem.

