# HOW TO SOLVE IT

| HOW TO SOLVE IT<br>according to G. Polya | OPTIMIZATION PROBLEMS |
|---|---|
| Understand the problem. | Identify and name all relevant quantities. |
| What is the unknown? | What is to be maximized/minimized? |
| What are the data?<br>(What is given?) | Which quantities are constant? Which are variable?<br>Which variable(s) can you control?<br>Within what limits (endpoints)? |
| What is the condition?<br>(What are the constraints?) | Make a sketch and label it.<br>What relationships constrain the variables? |
| Devise a plan. | Write a formula relating the quantity to be optimized as a function of the variable(s) you can control. If there is more than one variable you can control, write the equation(s) that relate them. Plan to get a function of a single variable and to check endpoints and critical points to find the maximum or minimum. |
| Carry out the plan. | Write the quantity to be optimized as a function of just one variable. Identify the domain over which this variable varies. Find the critical points of the function. Evaluate the function at these points and the endpoints to find the global maximum/minimum. Alternatively, use appropriate calculus tests to locate the optimum. |
| Look back. | Check your solution. |
| Check the result.<br>Can you derive the result differently?<br>Can you use it for some other problem? | Is it reasonable? Test if maximum or minimum!<br>Can you see a better way to get it?<br>Can you learn something from your solution? |