

If there is a problem you can't solve, then there is an easier problem you can solve: find it.

George Polya

Opportunity is missed by most people because it is dressed in overalls and looks like work.

Thomas Edison

It is the mark of an educated mind to be able to entertain a thought without accepting it.

Aristotle

You must commit to the problem.

“Roll up your sleeves”

“Get your hands dirty.”

Easy problems: you can just "see the answer"

Medium problems: you can see the answer once you engage

Hard problems: you need strategies for coming up with a potential solution, sometimes for even getting started

There are few, if any, objective criteria for deciding whether a given problem is easy, medium or hard.

What is hard for one solver may be easy for another.

What is hard for you under some conditions may be easy for you under different conditions.

Effective:

Believe that problems can be solved through the use of heuristics and careful persistent analysis

Ineffective:

Believe "You either know it or you don't."

Effective:

Active in the problem-solving process: draw figures, make sketches, ask questions of themselves and others.

Ineffective:

Don't seem to understand the level of personal effort needed to solve the problem.

Effective:

Take great care to understand all the facts and relationships accurately.

Ineffective:

Make judgments without checking for accuracy

You need the attributes of **confidence** and **concentration**.

Confidence comes with practice.

Attack a new problem with an optimistic attitude.

Unfortunately, it takes time to acquire these attributes.

You can't turn them on and off at will.

You need to develop a life-long habit.

Engagers typically have a history of success with problem solving.

Dismissers have a history of failure.

You might be an engager for one type of problem, and a dismitter for another.

You can “intervene with yourself” to change your attitude of dismissal.

Many students do significant problem solving for recreation.

Sudoku, computer games, recreational puzzles.

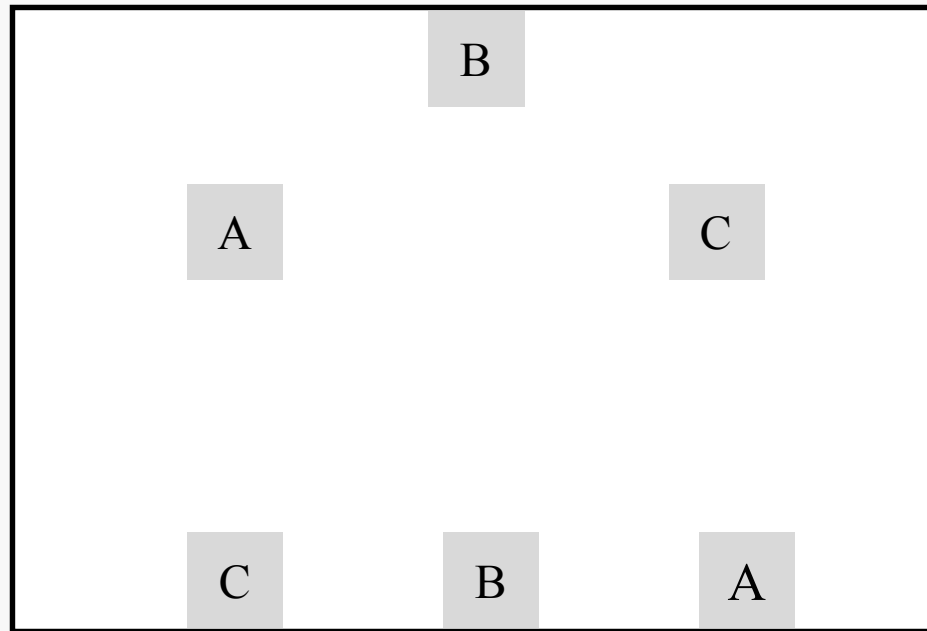
These same students might dismiss math and analytical computer science problems due to a historical lack of success (the mental block).

To be successful in life you will need to find ways to get over any mental blocks you have.

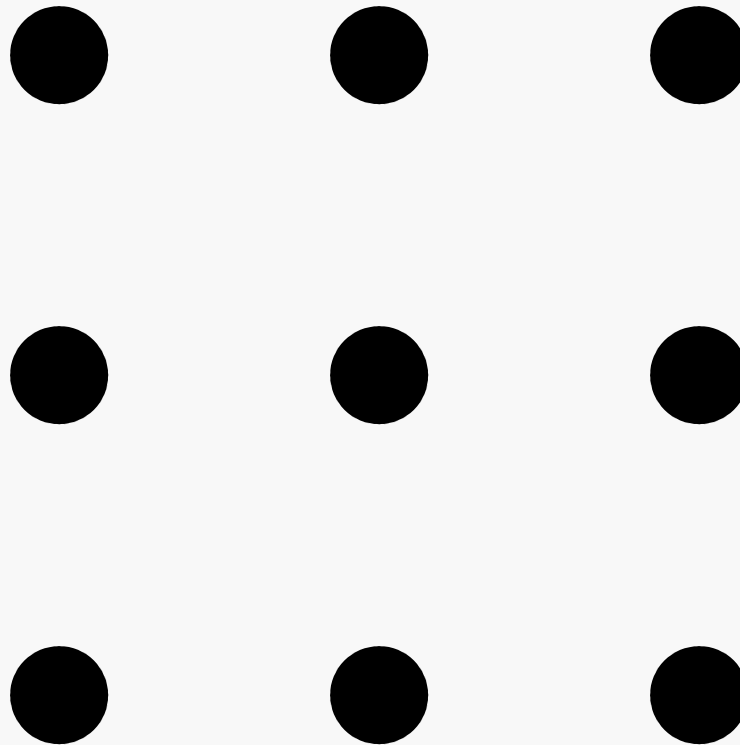
Learn to transfer successful problem-solving strategies from one part of your life to other parts.

Example: Writing is a lot like programming.

Connect each box with its same-letter mate without letting the lines cross or leave the large box.

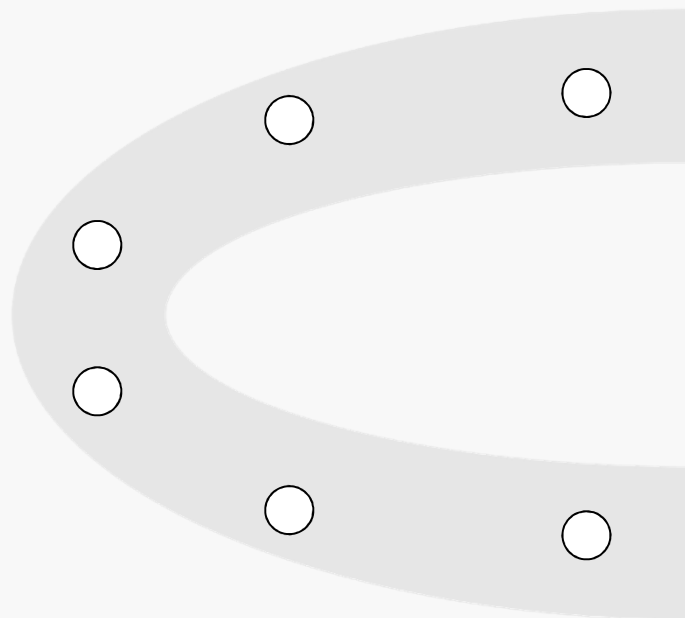


Draw a continuous polygonal line that passes through each circle exactly once – and use the fewest number of line segments you can manage:



The picture below shows a horseshoe with six nail holes.

Can you make two straight cuts that result in six pieces, each containing a single nail hole?

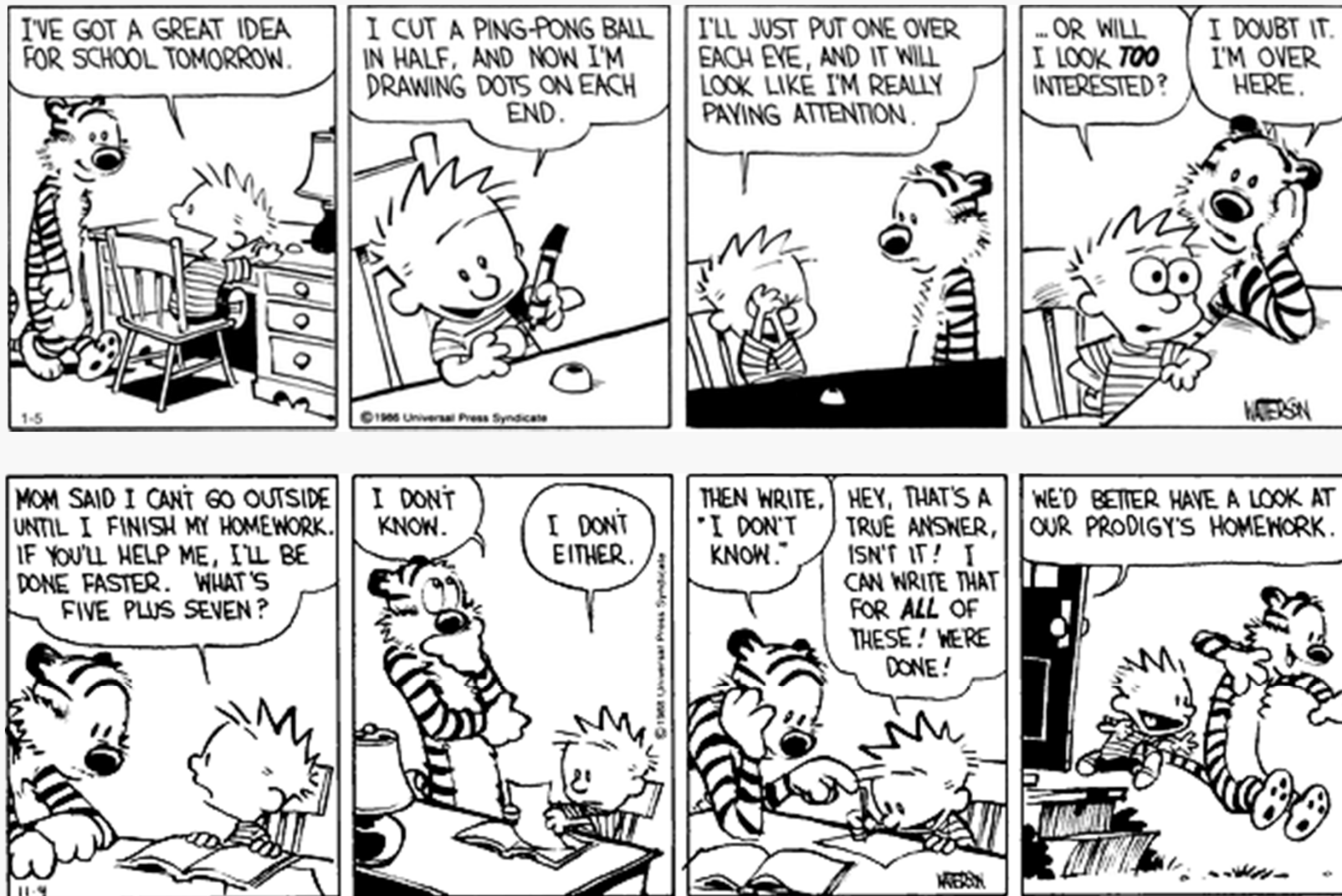


Michalewicz²

Cryptoarithmic problem:

$$\begin{array}{r} A \\ + D \\ \hline D D \end{array}$$

Levine



<http://www.gocomics.com/calvinandhobbes/>

Consider repairing something (a dryer, toaster, etc.).

Dryer example: clean it out.

Table example: look for the loose parts.

Car seat example: reattach the broken spring wire.

“Taking the time”

You **can** screw something up or do something dangerous. But often you are not faced with such a prospect.

Some domains require that you study/practice/build expertise to be effective.

The act of engagement can help you build domain knowledge.

Writing/programming/project procrastination are all familiar behaviors.

Just sit down and write, don't care about the quality to start.

Write whatever part of the document/program appeals. Don't do it start to finish.

Do part of it at a time, over time.

People don't write books, they write sections or pages.

People don't write programs, they write functions, etc.

Set a schedule to work, including milestones, etc.

Commit to someone outside if that helps.

Invent deadlines if you are deadline-driven.

Make the schedule a formal entity, and externalize.

