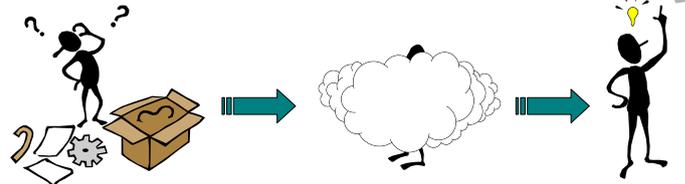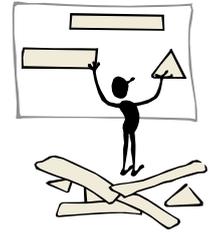# Problem Solving

What is a "problem"?

A problem is a question for which neither the answer nor the method of solution are immediately obvious. In other words, you have a problem if you haven't already been taught a straightforward algorithm (i.e. "recipe") for how to answer the question.

Tips and observations about problem solving

- **Understanding the problem:**
  - may need several readings of the question.
  - may need the information in the question reorganised into tables or graphs or translated into a diagram in order for sense to be made of it (e.g. a social worker might draw a diagram indicating the relationships and dynamics of the relationships between the people who are having an important impact on their client's life).
  - may need you to start actually trying to solve the problem! (Trying a few things and seeing what happens can lead to insights into what a question is actually asking!)

- **Solving the problem:**
  - identify and collect relevant information and/or formulas which might be useful in solving the problem.
    - Relevant information could be things given in the problem, such as contextual factors which need to be taken into account or factors in a case or medical history, or additional information not given in the problem but which is needed to address the problem.
  - where relevant, consider first the full range of possible solution options, then use a process of elimination to decide which is the best to pursue in this instance (cf. a doctor considering which of several treatment options would be best for a particular patient). Give yourself time to come up with a range of solution options: first ideas are often not the best ideas.
  - don't be too hasty! Make sure you consider all relevant factors before deciding on a solution.
  - may require the trialling of several different solution approaches before you hit on the right one.
    - *So, try to see failed/incorrect solution methods as* learning experiences *and perhaps* clues to where the correct answer or approach might lie *rather than indications of a lack of intelligence or ability on your part!*
    - *Also, don't just stare at a problem and hope the answer will just pop into your head – put pen to paper and try out a few things!*

> The difficulty many novices face is *not* that they *don't* have the requisite knowledge, but that they have trouble *identifying and activating* the relevant knowledge that they *do* have. Thus in many courses it is useful to have a formula or fact sheet next to you when working on problems and to first review key concepts and theories from the course before tackling problems.

- **If a problem seems unsolvable:**
  - try reframing it (remember the problem of the slow lift being reframed as a problem of people getting bored while waiting for it).
  - check that you aren't making any unnecessarily restrictive assumptions (remember the nine dots problem).
  - try a different method or approach.
  - try tackling a simpler similar problem to see if that gives you any insights into solving the more complex problem.
  - put it aside and try again another day – you may need to "clear your mind" so you can approach the problem from a different angle.
  - seek help – while there's value in struggling with things yourself, sometimes you just don't know enough to solve your problem.
    - *Remember though, that problem solving success is often just as much about perseverance as it is about knowledge and skill* – so don't give up too quickly! (Recall that Einstein took several years to finally figure out the full details of his general theory of relativity.)

- **Once you have a solution:**
  - check that it seems reasonable;
  - review what was finally successful to see if you can learn any general principles about how to effectively approach such problems from what you experienced.

- **Problem solving abilities**, like any other abilities, can only be improved through sufficiently regular, reflective practice (i.e. you not only *do* problems, but also think about *how* you do them: what are the best strategies?).
  - But being able to solve problems also depends on you having a rich, well-organised body of relevant domain knowledge, so to improve your capacity to solve problems in your field, *keep learning* and *organise* that knowledge.

Further Reading
D. Perkins (2000), *The Eureka Effect: The Art and Logic of Breakthrough Thinking*, New York: W W Norton and Co.

The Learning Hub, Student Services, *The University of Queensland*

What can you do to improve your problem solving skills in your discipline?

Area to improve	Yes	No	Ways you will achieve this
Spend more time initially identifying and reviewing the content knowledge and theories needed to tackle a given problem.	❏	❏	
Better organise the content knowledge needed for problem solving.	❏	❏	
Work on more effective initial problem representations (e.g. diagrams, mind maps, tables etc.).	❏	❏	
Reflect regularly on problem solving approaches to identify effective and ineffective strategies.	❏	❏	
Work to improve the basic skills and understanding needed for problem solving in my discipline.	❏	❏	
Make sure all relevant factors are taken into account when deciding on problem solutions.	❏	❏	
Do more problems to develop greater proficiency and flexibility. (Where will you find these problems?)	❏	❏	