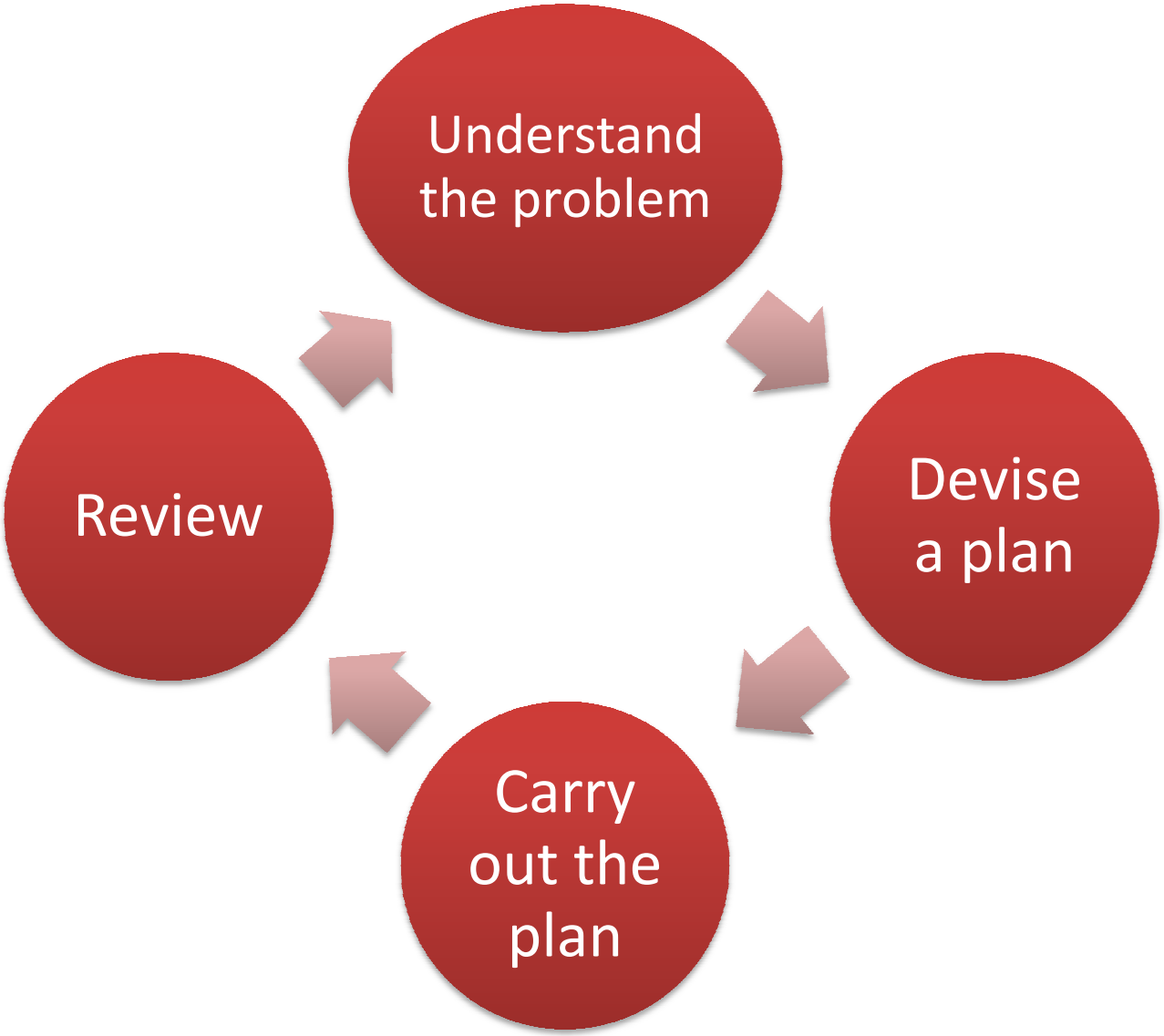
Phases of Problem Solving



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Understand the problem

Can you state the problem in your own words?

What are you trying to find or do?

What information can you obtain from the problem?

What information, if any, is missing or not needed?

What are the unknowns?
What are the conditions?

Have you read the problem carefully?

What are you being asked to find out?

Have you highlighted the important pieces of information?

How will you use each piece of information?

What topics might this be to do with?

Can you explain the problem to somebody else?

Do they understand what you have said?

What will a good answer to this problem look like?

What will it tell you?

How will it be presented?

Have you seen anything similar before?

What clues have you got?

What facts are you given?

How could these be used?

What different things need to be done?

Which do you do first?

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Devise a plan (1)

Make a table

What information will you put in the table?

How do you know what order to fill it in?

What goes in each column?

Draw a diagram

What do you want to show in the diagram?

What do you draw first on the diagram? What then?

How will you label the different parts?

Trial and improvement
(Guess and check)

What are you going to vary?

How do you choose your starting value?

How will you check how good your guess is?

How will you adjust your guess?

How close do you need to be?
How accurate must your answer be?

List all the possibilities

Where do you start?

How do you decide what comes next?

How will you set out your list of possibilities?

How will you know that you have included all possibilities?

How will you avoid any repeats?

How do you know when you have reached the end?

Simplify the problem

What is making the problem difficult?

Can you make a similar problem that involves fewer items or uses simpler numbers?

What is the simplest similar problem that you can find?

Can you solve the simpler problem?

Now try some slightly more complicated ones

How are the solutions to the simpler problems related? Is there a pattern?

Can you use the same method for the original problem?

Can you explain what you are going to do to somebody else?
Do they have any questions for you?

How will you record what you are going to do?

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Devise a plan (2)

Look for a pattern

Are your results arranged in a logical order so that patterns are easier to spot?

Which variable are you looking at?

What's the same and what's different about each result?

Could there be more than one rule that fits the pattern?

Can you predict what the next one will be?
Try it out to check that your rule is correct.

Work backwards

What will the finished solution to the problem look like?

What single step could have led to this final solution?

What might the stage before this have looked like?

How far back can you go?
Can you get to a stage that you know how to solve?

Are any other final steps possible?
Do any of these lead to a better solution?

Work systematically

What things can be changed?

What are you going to change first?

How will you change it?
And how will you change it after that?

What possibilities are there now that you have made this change?

How do you know that you have recorded all the different possibilities?

What possibilities are there when you change the first variable again?

How do you know that you haven't missed any possibilities out?

Use an equation

What are the unknowns in your problem?

What is the relationship between them in English?

Which will you choose as the main variable?
What letter will you use for it?

How is each value related to this variable?

Can you write an equation that shows the relationship between the variables?

Can you solve your equation?

How can you check your solution?

Consider similar problems

Does this look like anything that you have seen before?

What strategies have you tried before?

Which of these were successful?

Would they work for this problem?

How will you record what you are going to do?

Can you explain what you are going to do to somebody else?
Do they have any questions for you?

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Carry out your plan

Check each step as you go

- How do you know that it is right?
- Are you heading in the right direction towards the solution?
- Have you missed out any stages along the way?
- Are you keeping to the requirements given in the problem?
- Explain what you are doing to somebody else.
  Ask them to check your working.
  Do they agree with what you have done?

Keep an accurate record as you go

- What are you writing down?
- Are you showing the working for each step?
- Will other people be able to follow what you have done?
- Do your notes make sense? To you? To others?

Are you keeping to your plan?

- Does it seem to be working?
- Have you had to change your method or strategy?
- Why did you change your approach?
- What have you changed? Why is this likely to be more successful?

Found a solution?

- Have you checked that it works?
- Does it fit all the conditions of the problem?
- Are any other solutions possible? How do you know?
- Could you have used a different method? Would this have led to the same answer?

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Review

Check your final answer

- Does your answer work?
- How do you know that it is correct?
- Is the level of accuracy appropriate to the question? Have you given a sensible number of significant figures?
- Did you need to use all the information given to you in the question?
- Does it matter if you haven't used some of the original information?

Interpret your solution

- Does it make sense in the context of the problem?
- Does it fit the conditions of the problem?
- What does your solution mean?
- Does your solution seem reasonable?
- Does it match what you thought a good answer would look like?
- How will you present your solution? Does there need to be some explanation as well as the answer?

Check for other answers

- Are there any other answers?
- How do you know you have found all possible solutions?
- Do other people get the same solution? Did they use the same method? Which method is better? Why?

Review your strategy

- Did your strategy work?
- Was it efficient?
- Would any other strategies have worked?
- What were the drawbacks of your method?
- What was it about the problem that made this a good strategy to use?
- In what other situations would this be a good strategy to use?

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