

Some problems, with hints

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1. Small booklets can be made by folding a single sheet of paper several times and then cutting and stapling. I would like to number the pages before making the folds. How do I go about this?

- Understanding the problem.
 - Try folding a sheet of paper several times, then number the pages without cutting, then unfold it again.
 - Now specialise systematically.
 - What do you want to know?
- Planning your approach.
 - How are the page numbers on opposite sides of the paper related?
 - Specialize to a strip of paper so that all folds are parallel.
 - Try and find a general rule which works for any number of folds.
 - How can you communicate to others most effectively? What checks can you offer me so I do not make a mistake?

2. It takes nine days to cross a desert. A messenger must deliver a message to the other side, where no food is available, and then return. One person can carry enough food to last for 12 days. Food may be buried and collected on the way back. There are two messengers ready to set out. How quickly can the message be delivered with neither messenger going short of food?

- Understanding the problem.
 - Clarify what you know and what you want to know.
 - Try a smaller desert (a simpler problem).
 - Introduce a way to record where the messengers are and what has happened to the food.
- Planning your approach.
 - Ten days to cross and return is good going, but not enough!
 - Is there any point in some messengers making more than one trip out?

3. I wish to share 30 identical individual sausages equally among 18 people. What is the minimum number of cuts I need to make? What is the minimum number of pieces I need to create? What about other numbers of sausages and people?

- Understanding the problem.
 - Clarify what you know and what you want to know.
 - Find one way to do it.
 - Is it the best way?
- Planning your approach.
 - The particular question is easy to answer. Generalise to other numbers of people and sausages.
 - Relate the number of cuts to the number of sausages and to the number of people.
 - Try to find a procedure for calculating the minimum number of cuts/pieces.
 - Are you sure that you have a minimum?