**Problem Solving**

1. Use the stepwise refinement problem solving strategy to simplify the task of “getting out of bed and going to school in the morning.”
2. Use the working backwards problem solving strategy to solve the following problem. You need to drive 100 km to attend a soccer game. Your automobile breaks down after a certain distance. There is an automobile service station 8 km before your destination. If you were to drive three times more than the distance that you have already travelled, you could reach the service station. How far did you travel before your automobile broke down?
3. Research extreme cases to find another example of an extreme case problem with its solution.
4. Give an example of each of following:
   1. when you should use trial and error to solve a problem
   2. when you shouldn't use trial and error to solve a problem
5. Design a problem that could be best solved using a table or chart. Show the solution to this problem.

1. “getting out of bed and going to school in the morning.” can be broken down into these steps

* Getting out of bed
* Getting ready for school
  + Showering and Changing
* Leaving the house to go to school

Getting out of bed can be divided into:

* Turn off alarm
* Wake up
* Go off to the side of the bed and stand
* Stretch
* Make your bed

Getting ready for school can be divided into:

* Wash face
* Shower and change
  + Put out clothes to be used
  + Prepare for shower (towel, lotion, deodorant, etc.)
  + Go in the shower and clean yourself
  + Come out and dry off with the towel
  + Apply lotion and other products
  + Put on clothes
* Make/Eat breakfast
* Prepare/Pack Lunch
* Brush teeth
* Make sure you have everything you intend to bring to school

Leaving the house to go to school can be divided into:

* Put on shoes and other layers or accessories (coat, sweater, hat, etc.)
* Grab bag
* Open the door and head to the bus stop or wait for your ride

2.

* 100km to the soccer game
* 8km before the destination (soccer game) is an automobile service
* Car breaks down at a certain distance (?)
* 3 times the distance you have already travelled will be the distance you need to reach the automobile service
* How far did you travel before the car broke down?

First we would have to find the distance from the starting point to the automobile service

100 - 8 = 92km

From there we know that 3 times our travelled distance will equal 92 as that is the distance to the automobile service

92/3 = 30.6km

Now we know that we have travelled 30.6km before the car broke down.

3. Extreme case

Monty Hall Problem - Monty Hall (a game show host) presents 3 closed doors to a contestant. He promises that behind one door is a new car and behind the other two are goats (obviously, the contestant wants to win the car). The contestant picks a door. Monty says that he will open one of the two remaining doors to reveal a goat (which he does). Then he asks the contestant if she wants to switch doors. Is it still a 50/50 chance?

<https://divisbyzero.com/2011/06/05/extreme-example-and-counterexamples/>

Let’s say you have a deck of cards and you are trying to get an ace of spades. You pick randomly and the game show host removes 50 other cards that aren’t the ace of spades. You card has a 1/52 chance while the other card has a 51/52 chance to be the ace of spades. Considering this the Monty Hall problem gives you a ⅔ chance if you switch and a ⅓ chance if you stay.

4. When trial and error should be used to solve a problem:

When there is a limited number of solutions, and you can have unlimited tries to get it right - ex. A multiple choice problem

When not to use trial and error to solve a problem:

If there are too many options and if you are trying to find the best solution or all solutions. Trial and error is just for finding one solution . You wouldn’t need it when there is a formula. You don’t use it with complex numbers as it is not time efficient. ex. Dealing with decimals.

5. How many hours will a car traveling at 65 miles per hour take to catch up with a car traveling at 55 miles per hour if the slower car starts one hour before the faster car?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 Hour | 2 Hours | 3 Hours | 4 Hours | 5 Hours | 6 Hours | 7 Hours |
| Slower Car | 55 | 110 | 165 | 220 | 275 | 330 | 385 |
| Faster  Car | 0 | 65 | 130 | 195 | 260 | 325 | 390 |

*J option pane*