Activity 2: Problem Solving Strategies

## Stepwise refinement

* Getting out of bed and going to school in the morning
  + Get out of bed
    - Wake up
    - Open eyes
    - Sit up
    - Step off of bed
  + Prepare self and items for school
    - Shower, change, and get ready in the bathroom
      * Enter the bathroom
      * Undress self
      * Enter the bathtub
      * Take a shower
      * Dry self
      * Put on clean clothes
      * Brush teeth
      * Comb hair
      * Put all items away
    - Go downstairs to the kitchen and eat
      * Walk down the stairs and into the kitchen
      * Open the fridge
      * Grab milk
      * Open the cupboard
      * Take a spoon, a box of cereal, and a bowl
      * Pour the milk and cereal into the bowl
      * Eat from the bowl with the spoon
      * Put the bowl and spoon into the dishwasher
      * Put the milk in the fridge
      * Put the cereal in the cupboard
    - Pack school bag
      * BRing the schoolbag close to self
      * Grab school books, pencils, erasers, pens, notebooks, and laptop
      * Place all items into the schoolbag
  + Travel to school
    - Exit the house
    - Enter the car
    - Drive to school
      * Start the car
      * Pull out of the driveway
      * Drive down the roads
      * Pull over and stop safely at the school entrance
    - Exit the car
    - Enter the school

## 2. Working backwards

100 km total - 8 km to service station = 92 km from start to station

1x distance already travelled + 3x distance already travelled (or 1x distance needed) = 4x distance travelled

92 km needed / 4x distance travelled = 23 km already travelled

∴ I travelled 23 km before my car broke down.

## 3. Extreme case

**2 men in an airport decide to run from one end of a conveyor belt to the other. One will run on the ground and the other will run on the moving platform. Both can run on their own at the same speed Who will win?**

*If the belt is faster then them:* man on the belt reaches the end quickly, but is unable to step back on without falling off when reversing, and will lose to the man on the ground

*If the belt travels at the same speed as them:* the man on the belt will finish the first half faster, but will be stuck in one spot on the return, and lose to the man on the ground

*If the belt travels slower than them:* the man on the belt will reach the end quicker, but will lose the advantage on the return, and they will tie

∴ The man on the ground will always will, unless the belt is slower than their running speed, in which case a tie will occur.

## 4. Trial and error

### Good use case

A number between 1 and 100 is given. This number when multiplied by itself and divided by 2, gives a value of 32. What is the number?

### Bad use case

A driver is travelling down a highway when a crash occurs in front of him, between a smart car and a semi-truck. The 2 vehicles block the highway completely. There is only time to steer the vehicle, as the brakes won’t work fast enough to help. Which vehicle would the driver prefer to hit?

## 5. Tables and charts

A new town in created in Year 0, with a population of 40 000. In Year 10, the population rises to 70 000. In Year 20, it increases again to 110 000. In Year 30, the population falls to 80 000 due to cyclical plagues. In Year 40, the population recovers to 110 000, and then to 150 000 in Year 50. If the population drops to 120 000 in Year 60 due to the same plague, what is the population in Year 90?

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** | ***0*** | ***10*** | ***20*** | ***30*** | ***40*** | ***50*** | ***60*** | ***70*** | ***80*** | ***90*** |
| **Population (in thousands)** | ***40*** | ***70*** | ***110*** | ***80*** | ***110*** | ***150*** | ***120*** | 150 | 190 | **160** |

∴ The population in Year 90 will be 160 000.