CSIT113
Problem Solving

Workshop

Week 3

Jugs of water…

- You have two jugs, one capable of holding 3L, the other capable of holding 5L.
- What volumes of liquid can you obtain just using those two jugs?
- What difference does it make if we have a large reservoir that we can store liquid in?
- What strategy is appropriate here?
- What if we change the numbers?

Stamps…

- A post office has lots of 3c and 5c stamps.
  - (Okay it’s an old post office!).
- What postage values can the post office handle?
- How is this different from the water?
- What strategy is appropriate here?
- Can you find a pattern?
  - Can you prove something?
- What if we change the numbers here?

Weights…

- You have an old fashioned balance scale.
- I also have 5 weights, each an integer number of kg.
- I need to be able to weigh objects to the nearest kg.
- What are the most useful weights I can have?
- What is the largest object I can weigh?

Row and Column Exchanges

Can one transform the left table into the right table by exchanging its rows and columns?

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

12	10	11	9
16	14	5	13
8	6	7	15
4	2	3	1

Remaining Number

The first 50 natural numbers—1, 2, . . . , 50—are written on a board. You have to apply the following operation 49 times: select two of the numbers on the board, a and b, write the absolute value of their difference $|a - b|$ on the board, and then erase both a and b. Determine all possible values of the remaining number that can be obtained in this manner.