1. Go to the following [linked page](https://www.geogebra.org/m/XNB9QzQK).  Make sure you are able to access it. Enter the roll number in the box and then press the button titled Click.  The problem details will be visible on the screen. Use all other relevant data from the file onproblem [formulations](https://courses.iitm.ac.in/pluginfile.php/344071/mod_assign/intro/problem_set_1.pdf?time=1615455999286). Take a screen shot and print to pdf and attach the screenshot with the submission.

2. Write down expressions for the heads at nodes 1, 2 and 3 in terms of D1, D2, D3. Hint: Head loss across pipes connected in series is equal to sum of individual head losses.

3. Write down expression for the total cost, i.e., sum of costs of links I, II and III.

4. Rewrite the formulation in terms of pressures at nodes  1,2 and 3.

5. Formulate the appropriate optimization problem to minimize the costs while ensuring that the heads at nodes 1, 2 and 3 are greater than the minimum values.

6. At the optimum, what do you expect the values of the head at nodes 1, 2 and 3 to be? Give reasons.  Use this idea to eliminate two pressures so that the objective function is a function of  a single  pressure and there are no constraints.

7. Solve the above optimization problem using your favourite method. If you dont have a favourite method or software, simply vary the pressure in a suitable range and identify the optimal solution. Determine the optimum pressures at nodes 1,2 and 3 and hence diameters of the three pipes.

8. This is obviously not practical, since pipe sizes come in discrete sizes. Find a valid combination of pipes that is as cheap as possible, while satisfying the constraints.

9. submit a neatly formatted pd file, preferably typewritten and named as <rollnumber\_hw1>.pdf

It should contain the screenshot, the optimum continuous diameters, the discrete diameter solution and the pressure values at all nodes.

Eg., if your roll number is CH20D001, name the file as CH20D001.pdf