Objective(s):

a. To practice problem solving.
b. Learn how to use recursion, memoization, and dynamic programming (DP) to solve problems.

Create package Lab07\pack.

Task 1 Equal Subsets

Given a list of integers, determine if you can divide it into two subsets where the sum of both subsets is the same. Implement **EqualSubsets.java** with these methods:

- public static boolean canPartition_Recurse(int [] arr)
- public static boolean canPartition_Memoiz(int [] arr)
- public static boolean canPartition_DP(int [] arr)

Example1:

Input -> {1, 5, 11, 5}

Output -> true

Example2:

Input -> {1, 5, 3}

Output -> false

```
static void task_01() {
    int[] a = {1,5,11,5};
    int[] b = {1,5,30};
    int[] c = {1,2,3,5};
    EqualsSubsets sol = new EqualsSubsets();
    System.out.println( sol.canPartition_Recurse(a) );
    System.out.println( sol.canPartition_Memoiz(a) );
    System.out.println( sol.canPartition_DP(a) );
    System.out.println( sol.canPartition_Recurse(b) );
    System.out.println( sol.canPartition_Memoiz(b) );
    System.out.println( sol.canPartition_DP(b) );
    System.out.println( sol.canPartition_Recurse(c) );
    System.out.println( sol.canPartition_Memoiz(c) );
    System.out.println( sol.canPartition_DP(c) );
}
```

Task 2 Grid Paths with Obstacles

A robot starts at the top-left corner of a grid and wants to reach the bottom-right.

- The robot can only move right or down.

- 1 = obstacle, 0 = open space.

- Robot cannot step on obstacles.

Implement **GridPaths.java** with the method

- public int numberOfPaths(int [][] grid)

```
static void task_02() {
    int [][] grid = {  {0,0,0,0},
                       {0,1,0,0},
                       {0,0,0,1},
                       {1,0,0,0} };
    GridPaths sol = new GridPaths();
    System.out.println("number of paths: " + sol.numberOfPaths(grid) );
}
```

```
--- grid paths ---
number of paths: 3
```

Task 3 Complixity Analysis on Recursion (Do not use master method)

3.1 Show time complexity of $T(n) = 2T(n/2) + n$

3.2 $T(n) = T(n - 1) + 1$

Submission:

EqualSubsets_XXYYYY.java, GridPaths_XXYYYY.java and this .pdf file.

Due date: TBA