Karel Assignment

Done by

Noor Braik

Hosted by

Dr. Motasem Aldiab

Introduction:

Karel is a very simple robot living in a very simple world. By giving Karel a set of commands, you can direct it to perform certain tasks within its world. In this context we perform dividing a given map into 4 equal chambers or divide them into the maximum possible number of equal chambers (1, 2, or 3, with minimum number of movement and number of beepers.

Links:

GitHub Repository: https://github.com/noor848/Karel_Robot
YouTube link: https://youtu.be/kjnZD-Fl4dE

Tools:

- **IDE - IntelliJ**

- **Sublime Merge – Version control tool**

- **Java 17**

Implementation:

The Implementation done by try and error to get the optimal solution

First of all I set number of beepers 1000 as it mentioned in the assignment, then I counted the dimensions of row and columns of each shape as shown below:

```
public void run() {
    beepers = 0;
    steps = 0;
    setBeepersInBag(1000);
    countRowAndColumn(); // count the row and column
    System.out.println("Row = " + row);
    System.out.println("Column = " + column);
```

I divide the shapes according to its dimensions into two cases and each case has its own cases.

Case 1:

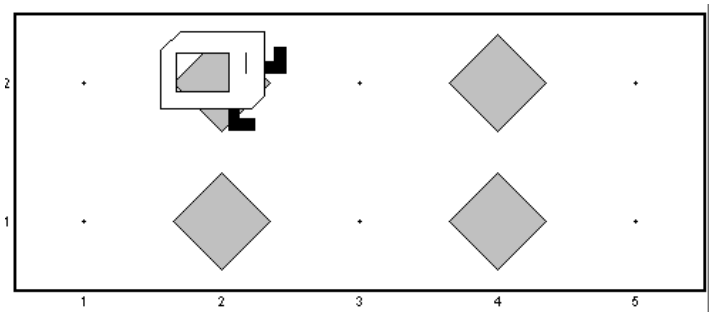
- Row or column less than 4

  Has two conditions when

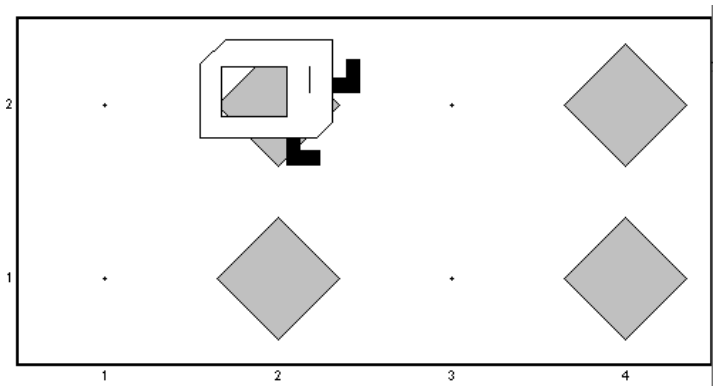
  - dimensions' shape less than 7

```
if (column != 0 && row != 0 && (column * row) > 1) {
    if (row < 4  || column < 4 ){
        if(row <= 7 && column <= 7){
            if (column > row && isEven(column)) divideEvenHorizontalDimensionShape(row, column);
            if (column >= row && isOdd(column)) divideOddHorizontalDimensionShape(row, column);
            if (column < row && isOdd(row)) divideOddVerticalDimension(column, row);
            if (column < row && isEven(row)) divideEvenVerticalDimension(row, column);
        }
```

For odd we divide the grid with a move step and a step with adding a beeper sequentially



For even we divide the grid with a step adding a beeper and a move step sequentially.



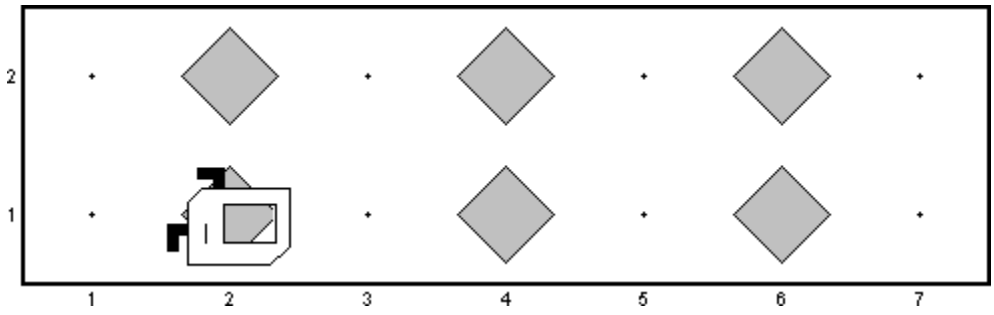
And same things for the vertical shape

- dimensions' shape greater than 7

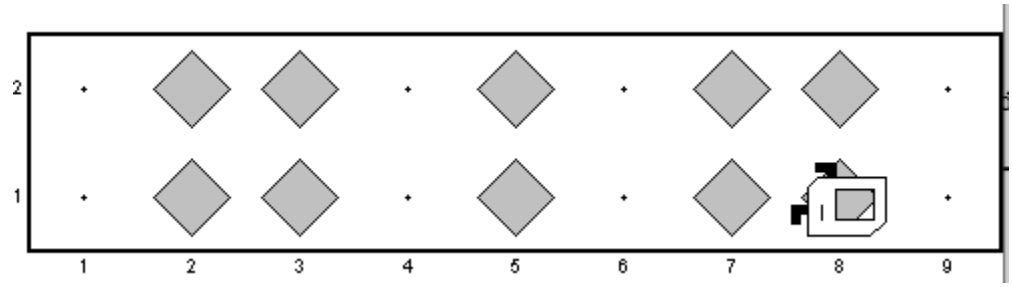
```
else {
    if (column > row) divideHorizontalDimensionShape(row, column);
    else divideVerticalDimensionShape(column, row);
}
```

Note for even parts we need two lines to divide things equally

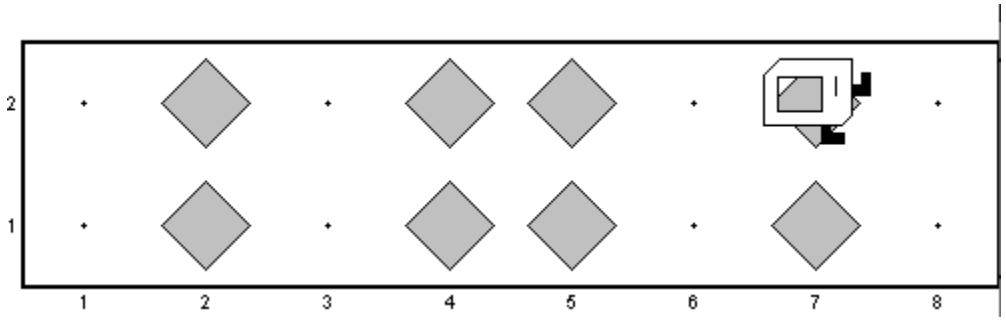
If shape is **odd,** we divide the main shape into halves and each half check if its odd the division would be as shown below:



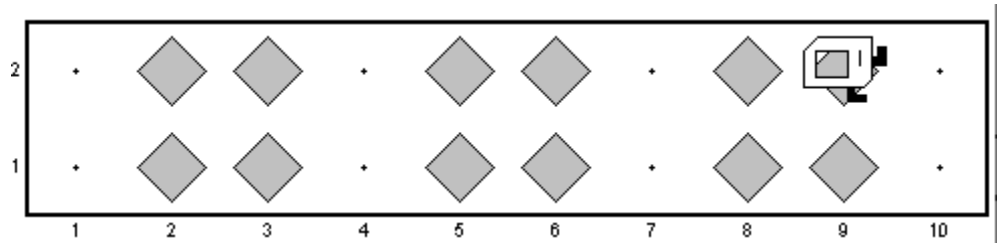
If halves are even the division would be as shown below:



If shape is **even,** we divide the main shape into halves and each half check if its odd the division would be as shown below:



If halves are even the division would be as shown below:



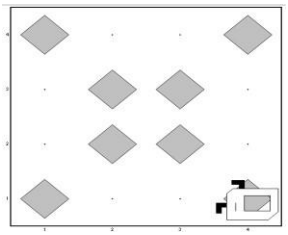
And same things for the vertical shape

Case 2:

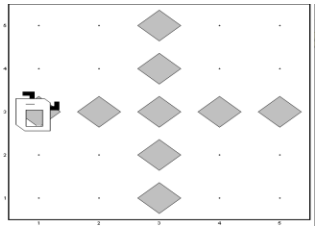
- Row or column greater than 4 or equal

```
else {   /// case row and col >= 4
    if (isEven(column) && isEven(row) && column == row) divideEvenDimensionsSquareShape();
    else if (isEven(column) && isEven(row) && column != row) divideEvenDimensionsRectangleShape(column, row);
    else if (isOdd(column) && isOdd(row)) divideOddDimensionsShape(column, row);
    else {
        if (isOdd(column) && isEven(row)) divideOddColumnEvenRowShape(column, row);
        if (isEven(column) && isOdd(row)) divideEvenColumnOddRowShape(column, row);
    }
}
```

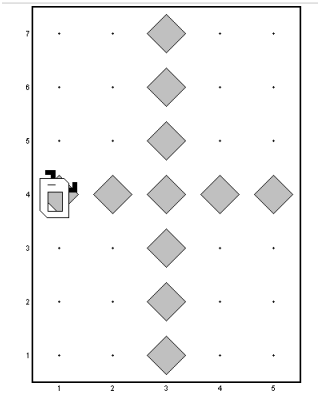
- Even dimensions are equal



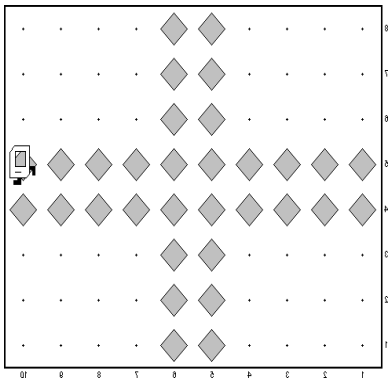
- Odd dimensions are equal



- Odd dimensions not equal

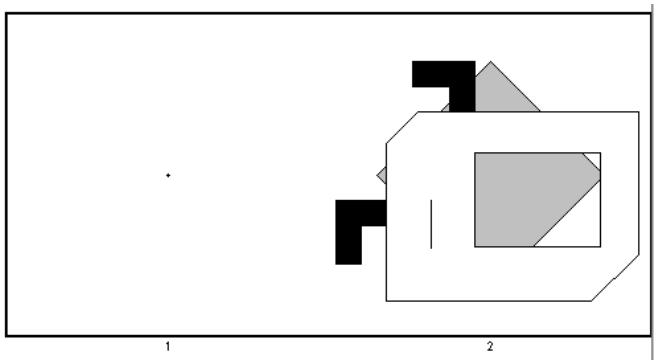


- Even dimensions not equal

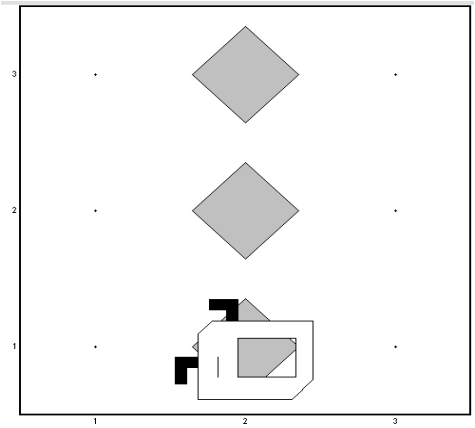
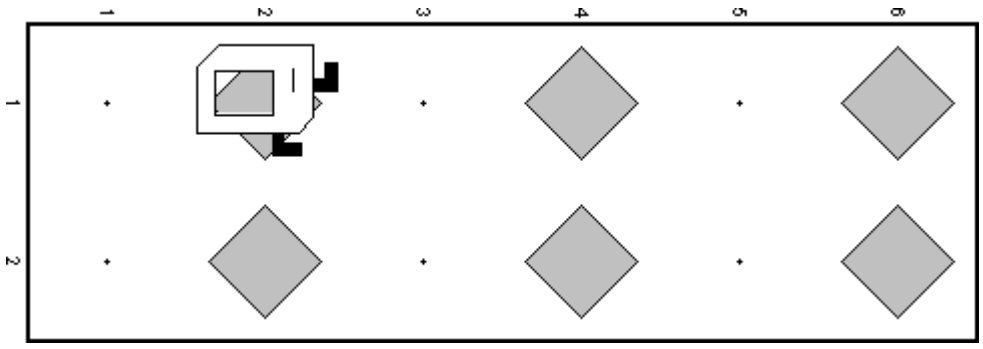


Special cases:

- **One chamber**
  1x1, 1x2 ,2x2



- **Two Chambers**
  columns or row less than 4 and one of them less than 5



- **Three Chambers**
  columns or row less than 4 and one of them less than 7