

# TPOP PRACTICAL

## ABSTRACT CLASSES, INHERITANCE & DESIGN

### PRACTICAL 11

#### The Game

Battleships is a classic board game played by two players. The idea is to sink all of your opponent's battleships by firing missiles at chosen target squares.

Players begin by choosing where to position their battleships on the board. These positions are kept secret from the player's opponent.

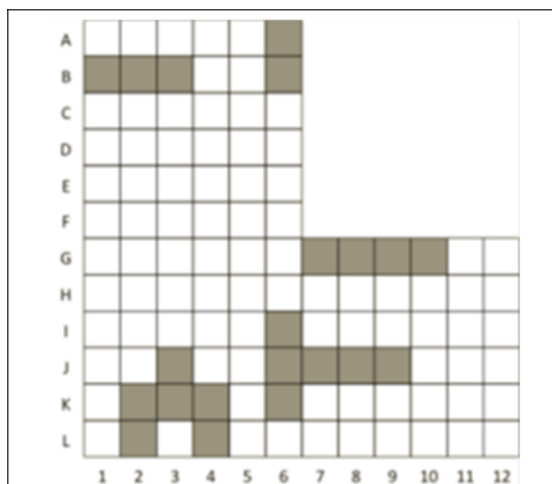


Figure 1: The BattlePi board with a fleet in position.

The game then proceeds by turns. A player calls out the coordinate of a square where they would like to fire a missile. The opponent responds by saying: "Hit" if the square contains a battleship and "Miss" if the square is empty. The other player now takes a turn. Players continue alternately taking turns until a player has sunk all of their opponent's fleet, at which point they are declared the winner.

Players keep track of where they have fired and what the outcome was by marking squares with symbols representing hit or miss.

The original game was played on a square board, however in this challenge we are using an L-shaped board (see Figure 1) and the fleet of battleships is shaped differently (see Figure 2).

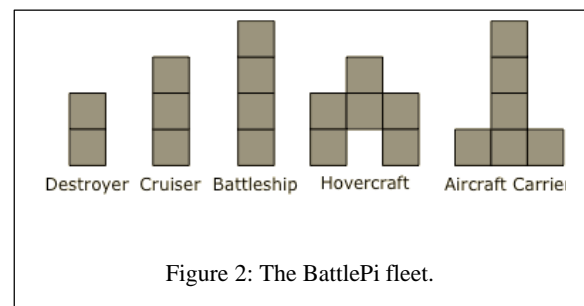


Figure 2: The BattlePi fleet.

#### The Problem

If possible you should try to work in a group of two or three to make full use of Java OOP principle. Once you have decided on the design, each person should work on a different part of the application following the design you have defined. Once all parts have been implemented, integrate all subparts and see if it works. If not why? Is it a design error or an implementation that did not follow the requirements of the design?

## The Design

### *A Game board:*

You should have a game board for a single player that would contains the fleet of a player (him/herself or his/her opponent), and the positions that have been shot at with the corresponding outcome (hit, miss, sunk).

### *A game engine:*

The game engine should be able to ask a player to:

- Deploy his/her fleet
- Choose a move, e.g. where to shoot

In addition the game engine should provide the player with the following information:

- The outcome of his/her move, e.g. miss, hit, sunk.
- The opponent move, e.g. where he/she decided to fire his/her missile.

### *A player:*

A player should be able to interact with the game engine following the requirements above. A player should be able to keep memory of his/her board as well as his/her opponent. A Player should be able to declare he/she has lost, e.g. all fleet is sunk.

### *Ships:*

A ship should be able to tell if it has been missed, hit, or sunk by a shot. It could be placed anywhere on the board as long as it is completely on the board, and does not overlap any other ship. It can be placed in four directions, NORTH, SOUTH, EAST, and WEST.

## Implementation:

To test your design, you may want to start with a simpler game, a 6x6 square grid, using only a fleet of three ships (a destroyer, a cruiser, and a battleship). You should also make a board representation using a String:

```

+-----+
A | . . . . . D |
B | CCC . . D |
C | . . . . . |
D | . . . . . |
E | . . . . . |
F | . . . . . +-----+
G | . . . . . BBBB . . |
H | . . . . . . . . . |
I | . . . . . A . . . . |
J | . . H . . AAAA . . |
K | . H H H . A . . . . |
L | . H . H . . . . . |
+-----+
123456789012

```

Would it be easy to extend your implementation to the full game? Does your design enable it? If you have a good design, the changes should be minimal. You should not need to modify the game engine, you should not need to modify the ships already designed, the change to the game board should be localised.