JAVA Programming Practice
PA#2 Battleship

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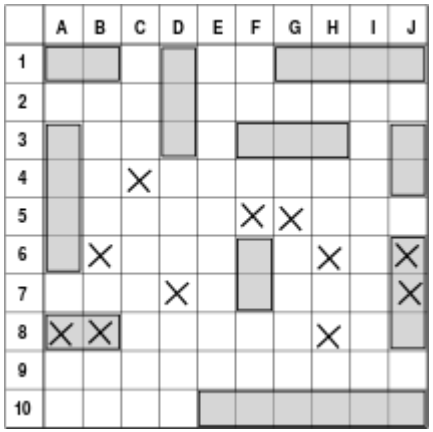
- **Battleship game**
  - 10 X 10 squares in the grid (Sea)
  - Each player secretly places own ships
  - Players bomb a target coordinate in turn
    - Opponent player tells “hit” or “miss”
    - When hit, opponent also tells the type of ship
  - Battleships table

Type of Ship	Size	#Ships
Aircraft Carrier	6	1
Battleship	4	2
Submarine	3	2
Destroyer	3	1
Patrol Boat	2	4



Computer's Board

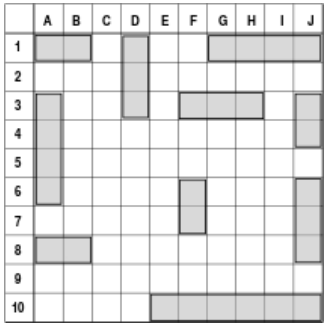
- **Computer positions ships and you bomb t hem with a given number of bombs**
- **Initialize the board**
  - Get input from the external file, or
  - Randomly initialize battleships on board
    - Coordinates are A-J and 1-10.
    - Use the size and the quantity of ships in Battleships table.
- **Secretly place ships either horizontally or vertically without overlaps or touching**
  - Need at least one space between ships

Bombing Battleships

- **Player sets bombing targets and computer te lls “hit” or “miss”**
  - Miss: Mark the bombs with ‘X’
  - Hit: Mark ‘X’ + specify the type of ship in lower case
    - E.g., Xp – hit on Patrol Boat, Xa – hit on Aircraft Carrier
- **Player will be given N bombs**
- **Player inputs the target coordinates N times interactively, reviewing the results (hit / miss)**
- **Show the score at the end of the program**
  - Score = ∑(the size of ship for each hit)

Display the Board

※ '□' means a space



```
   A  B  C  D  E  F  G  H  I  J
   -  -  -  -  -  -  -  -  -  -
1  | P  P     S              B  B  B  B
2  |          S
3  | B        S     D  D  D        P
4  | B                             P
5  | B
6  | B                 P           S
7  |                   P           S
8  | P  P                          S
9  |
10 |                   A  A  A  A  A  A
```

```
□□□□□A□□B□□C□□D□□E□□F□□G□□H□□I□□J□□
□□□□□-□□-□□-□□-□□-□□-□□-□□-□□-□□-□□
1□□|□P□□P□□□□□S□□□□□□□□B□□B□□B□□B□□
2□□|□□□□□□□□□□S□□□□□□□□□□□□□□□□□□□
3□□|□B□□□□□□□□S□□□□□D□□D□□D□□□□□P□□
4□□|□B□□□□□□□□□□□□□□□□□□□□□□□□□P□□
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10□|□□□□□□□□□□□□□□A□□A□□A□□A□□A□□A□□
```
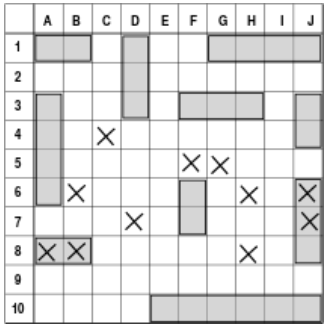
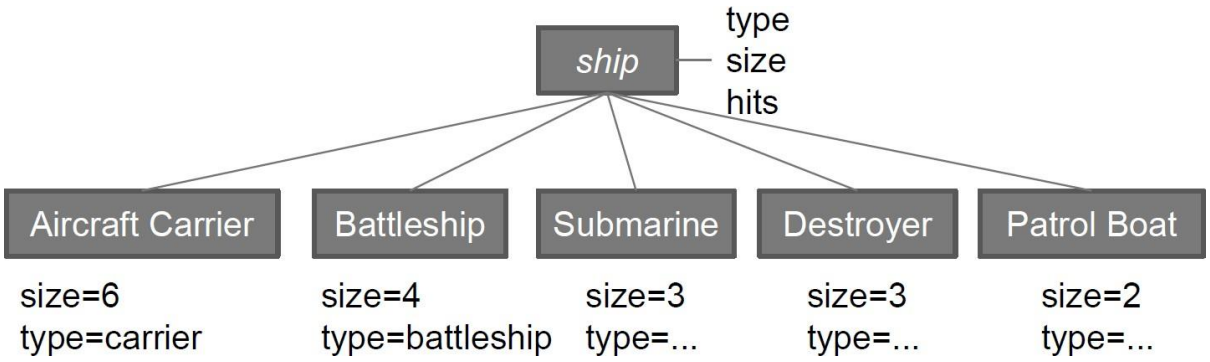



```
   A  B  C  D  E  F  G  H  I  J
   -  -  -  -  -  -  -  -  -  -
1  | P  P     S              B  B  B  B
2  |          S
3  | B        S     D  D  D        P
4  | B     X                       P
5  | B                 X  X
6  | B  X              P     X     Xs
7  |          X        P           Xs
8  | Xp Xp                   X     S
9  |
10 |                   A  A  A  A  A  A
```

```
□□□□□A□□B□□C□□D□□E□□F□□G□□H□□I□□J□□
□□□□□-□□-□□-□□-□□-□□-□□-□□-□□-□□-□□
1□□|□P□□P□□□□□S□□□□□□□□B□□B□□B□□B□□
2□□|□□□□□□□□□□S□□□□□□□□□□□□□□□□□□□
3□□|□B□□□□□□□□S□□□□□D□□D□□D□□□□□P□□
4□□|□B□□□□□X□□□□□□□□□□□□□□□□□□□P□□
5□□|□B□□□□□□□□□□□□□□□X□□X□□□□□□□□□□
6□□|□B□□X□□□□□□□□□□□□P□□□□□□X□□□□□Xs□
7□□|□□□□□□□□□□□X□□□□□P□□□□□□□□□□Xs□
8□□|□Xp□Xp□□□□□□□□□□□□□□□□X□□□□□S□□
9□□|□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
10□|□□□□□□□□□□□□□□A□□A□□A□□A□□A□□A□□
```

Data Structures

- **Ships defined with inheritance**
  - Use it freely (ex. Calculating score, placing the ship s, …)



Program Flow

- **Get inputs when the program starts**
  - The number of bombs
    - If not a positive integer, exit program with the exception
      - Exception name: BombInputException
  - Program mode
    - ‘d’ or ‘D’: Debug mode // ‘r’ or ‘R’: Release mode
    - If input is not the one of above (d, D, r, R), exit program wi th the exception
      - Exception name: ModeInputException
  - The name of the board input file
    - Details in the next slide

Program Flow

- **Get inputs when the program starts**
  - The name of the board input file
    - Input file format: 10 x 10 (Dimensions of the board)
      - Ships: A/B/S/D/P Blank (No ship): ‘ ’
      - Ex)

BOARD

```
    A  B  C  D  E  F  G  H  I  J
    -  -  -  -  -  -  -  -  -  -
1   | P  P     S           B  B  B  B
2   |          S
3   | B        S     D  D  D        P
4   | B                              P
5   | B
6   | B                 P            S
7   |                   P            S
8   | P  P                           S
9   |
10  |                   A  A  A  A  A  A
```

FILE

```
PP S  BBBB↲
   S↲
B  S DDD P↲
B        P↲
B↲
B    P   S↲
     P   S↲
PP       S↲
↲
    AAAAAA↲
```

    - If the input file does not exist, make your own board randomly

Program Flow

- **Get inputs when the program starts**
  - Ex)

```
10 d input_board.txt
```

```
The number of bombs: 10 // Program mode: Debug mode
The name of the board input file: input_board.txt
```

```
20 r input file with space.txt
```

```
The number of bombs: 20 // Program mode: Release mode
The name of the board input file: input file with space.txt
```

Program Flow

- **Debug Mode**
  - Display board before every step
  - Green: input / Black: output
  - Get coordinate for every step
    - Alphabet + Number
      - Ex) C4, A8, D10, …

```
     A  B  C  D  E  F  G  H  I  J
     -  -  -  -  -  -  -  -  -  -
1  | P  P     S           B  B  B  B
2  |          S
3  | B        S     D  D  D     P
4  | B                            P
5  | B
6  | B              P             S
7  |              P               S
8  | P  P                         S
9  |
10 |                 A  A  A  A  A  A
C4
Miss
     A  B  C  D  E  F  G  H  I  J
     -  -  -  -  -  -  -  -  -  -
1  | P  P     S           B  B  B  B
2  |          S
3  | B        S     D  D  D     P
4  | B     X                      P
5  | B
6  | B              P             S
7  |              P               S
8  | P  P                         S
9  |
10 |                 A  A  A  A  A  A
A8
Hit P
     A  B  C  D  E  F  G  H  I  J
     -  -  -  -  -  -  -  -  -  -
1  | P  P     S           B  B  B  B
2  |          S
3  | B        S     D  D  D     P
4  | B     X                      P
5  | B
6  | B              P             S
7  |              P               S
8  | Xp P                         S
9  |
10 |                 A  A  A  A  A  A
```

Program Flow

- **Debug Mode**
  - If miss
    - Print Miss
  - If hit
    - Print Hit + Ship_type
      - Ex) Hit P
        Hit A

```
     A  B  C  D  E  F  G  H  I  J
     -  -  -  -  -  -  -  -  -  -
1  | P  P     S           B  B  B  B
2  |          S
3  | B        S     D  D  D        P
4  | B                             P
5  | B
6  | B              P              S
7  |              P                 S
8  | P  P                          S
9  |
10 |              A  A  A  A  A  A
C4
Miss
     A  B  C  D  E  F  G  H  I  J
     -  -  -  -  -  -  -  -  -  -
1  | P  P     S           B  B  B  B
2  |          S
3  | B        S     D  D  D        P
4  | B     X                       P
5  | B
6  | B              P              S
7  |              P                 S
8  | P  P                          S
9  |
10 |              A  A  A  A  A  A
A8
Hit P
     A  B  C  D  E  F  G  H  I  J
     -  -  -  -  -  -  -  -  -  -
1  | P  P     S           B  B  B  B
2  |          S
3  | B        S     D  D  D        P
4  | B     X                       P
5  | B
6  | B              P              S
7  |              P                 S
8  | Xp P                          S
9  |
10 |              A  A  A  A  A  A
```

Program Flow

- **Debug Mode**
  - If all bombs are used (Game end)
    - Print the final board
    - Then print Score + Final_score
      - Ex) Score 10
    - Exit the program
  - If shot at already shot coordinate
    - Throw the exception
      - Exception name: HitException
      - Print Try again
      - **Continue the game**

```
J7
Hit S
     A  B  C  D  E  F  G  H  I  J
     -  -  -  -  -  -  -  -  -  -
1   | P  P     S        B  B  B  B
2   |          S
3   | B        S     D  D  D     P
4   | B     X                    P
5   | B              X  X
6   | B  X           P     X     Xs
7   |          X     P           Xs
8   | Xp Xp                 X     S
9   |
10  |              A  A  A  A  A  A
Score 10
```

```
C10
Miss
     A  B  C  D  E  F  G  H  I  J
     -  -  -  -  -  -  -  -  -  -
1   | P  P     S        B  B  B  B
2   |          S
3   | B        S     D  D  D     P
4   | B                          P
5   | B
6   | B              P           Xs
7   |              P             S
8   | Xp Xp                      S
9   |
10  |        X     A  A  A  A  A  A
C10
Try again
```

Program Flow

- **Release Mode**
  - Same with Debug mode, EXCEPT for displaying board before every step
    - Do not print board during the game, but print board when game ends

```
C4
Miss
A8
Hit P
B8
Hit P
B6
Miss
D7
Miss
F5
Miss
G5
Miss
H6
Miss
H8
Miss
J6
Hit S
J7
Hit S
     A  B  C  D  E  F  G  H  I  J
     -  -  -  -  -  -  -  -  -  -
1  | P  P     S        B  B  B  B
2  |          S
3  | B        S     D  D  D     P
4  | B     X                    P
5  | B              X  X
6  | B  X           P     X     Xs
7  |          X     P           Xs
8  | Xp Xp                 X     S
9  |
10 |             A  A  A  A  A  A
Score 10
```

More information

- **Submission deadline**
  - ~5/25 11:59 PM
  - Submit PA2.java on iCampus