CCP6124 – OOPDS

ASSIGNMENT REPORT

ASSIGNMENT GROUP: GROUP F

GROUP MEMBERS:

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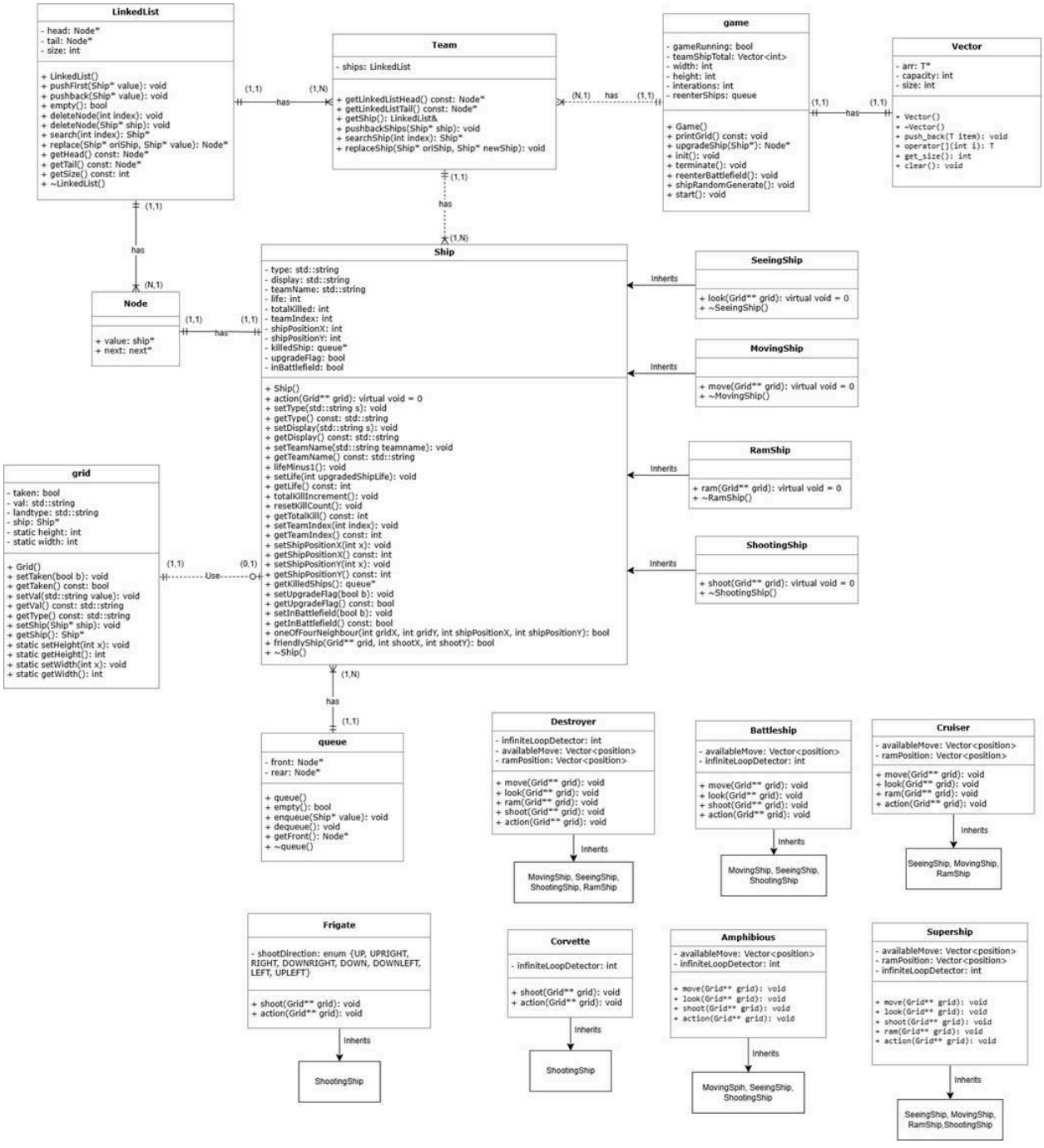
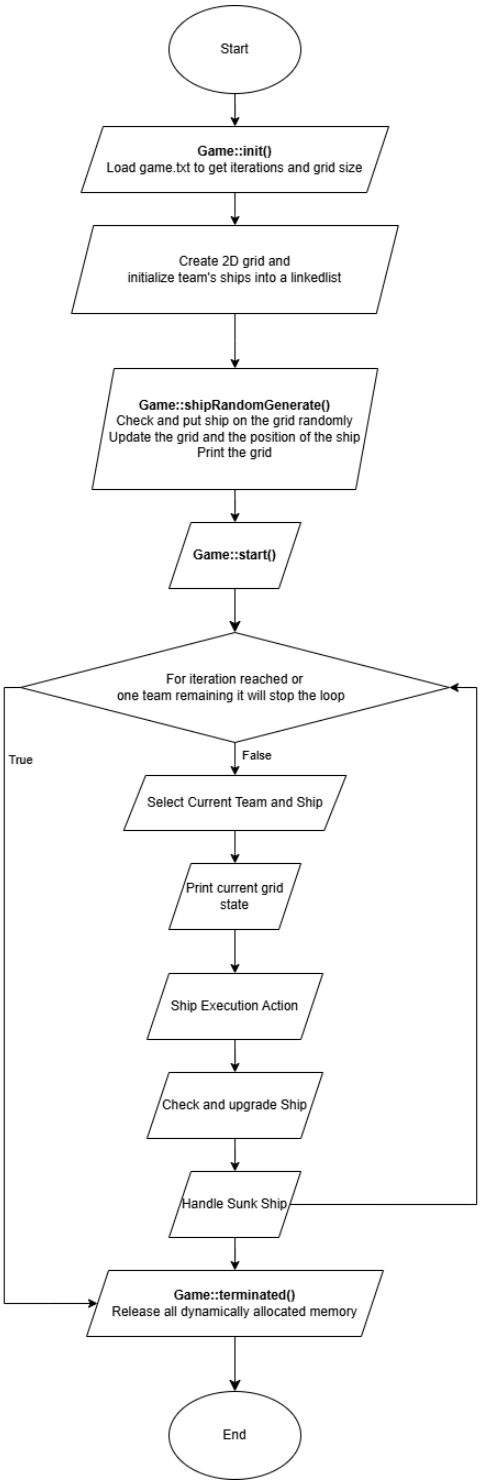
Date:7/2/2025

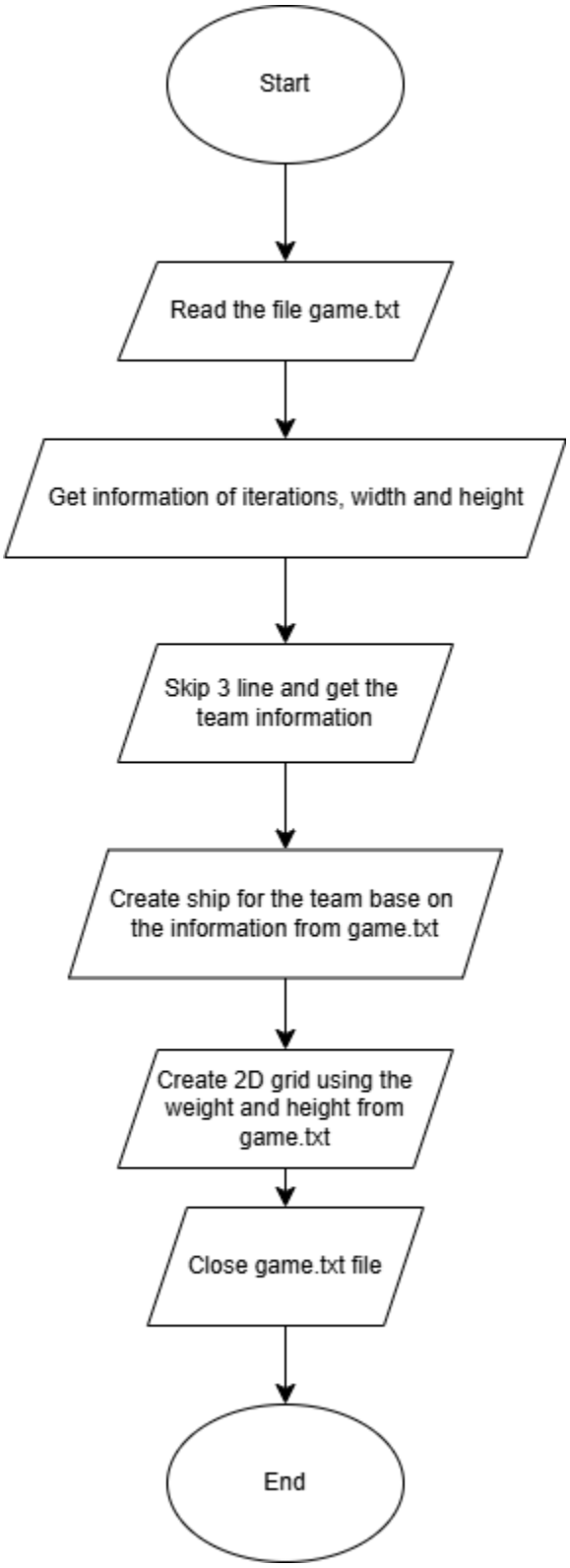
1. Class Diagram



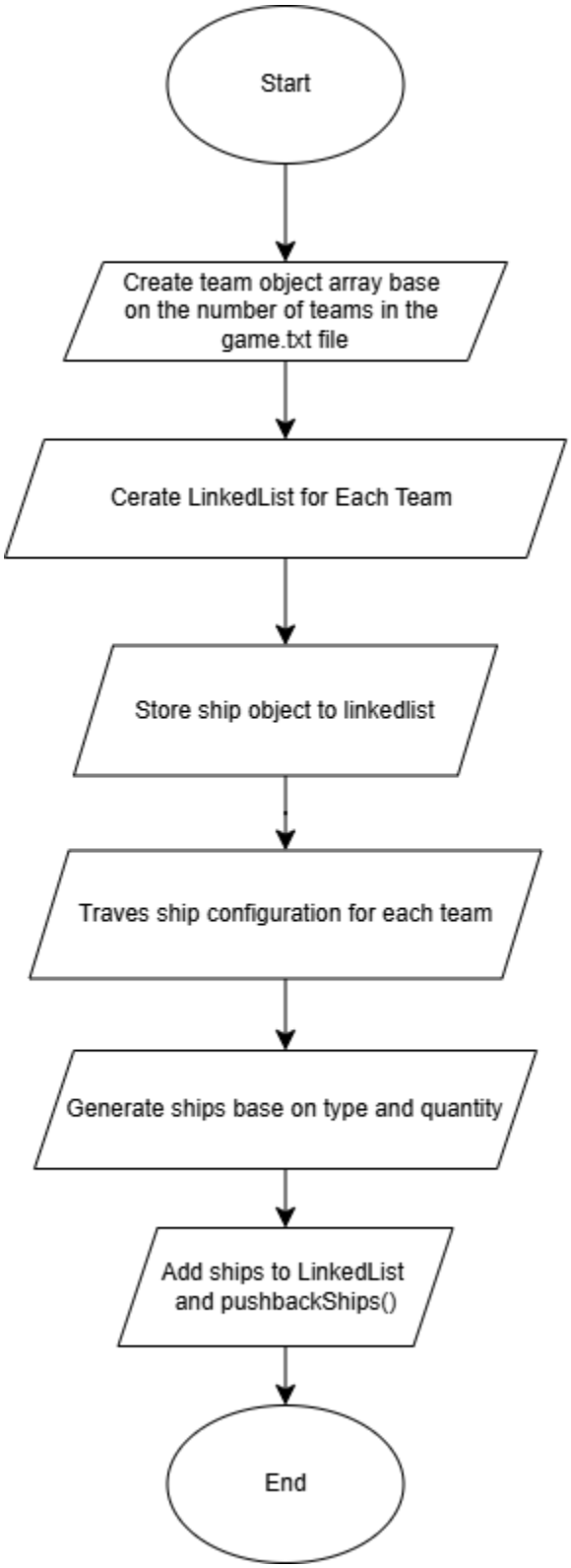
2. General Activity Diagram



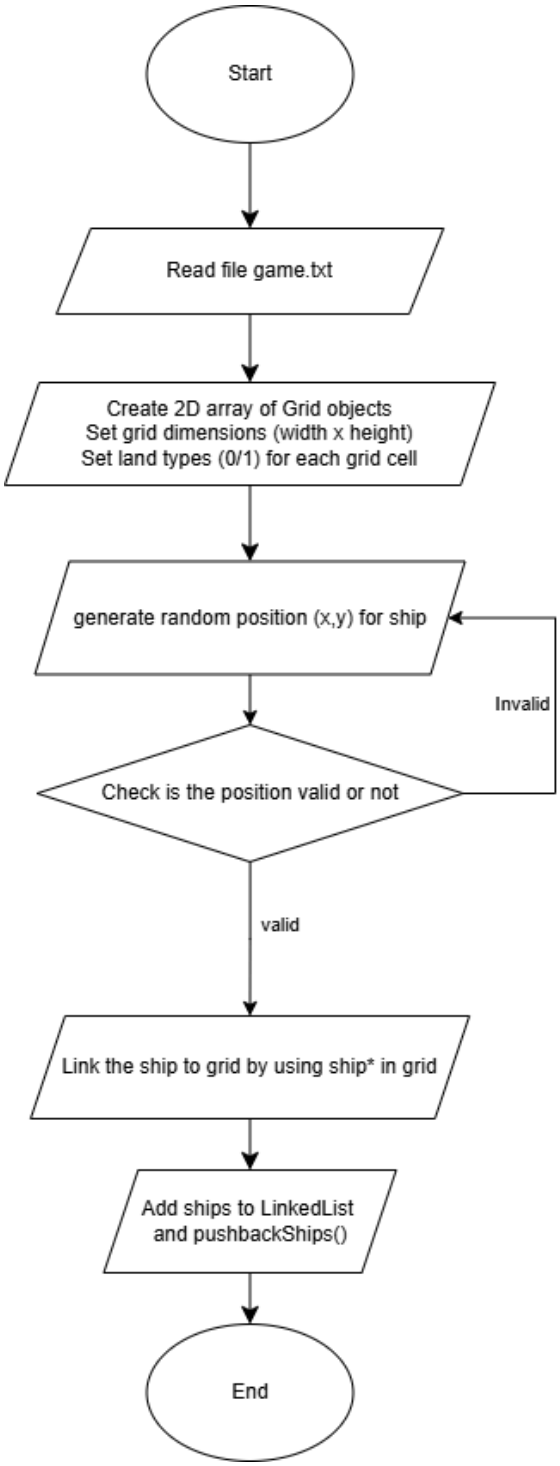
3. File reading and initial simulation settings



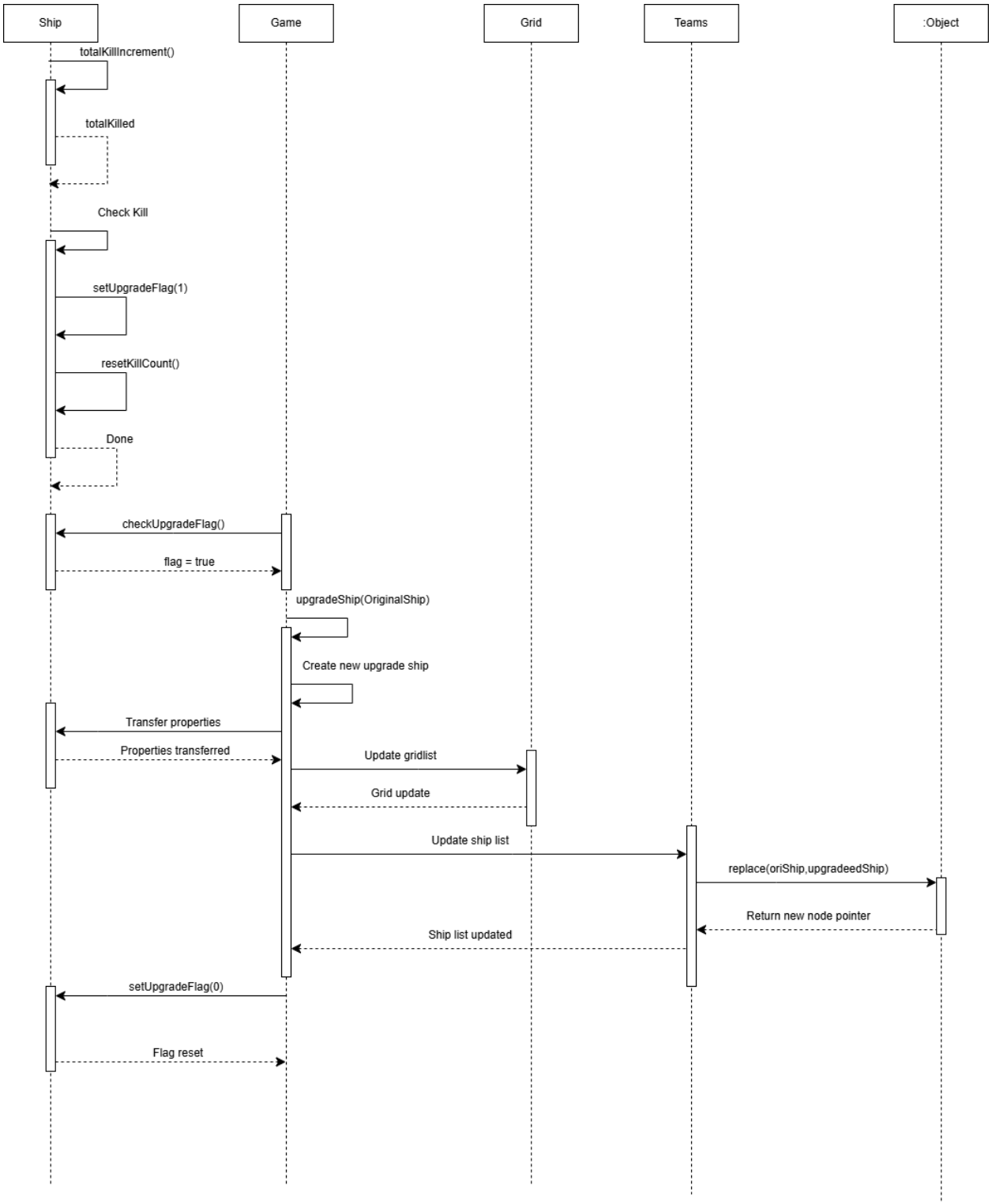
4. How the concept of teams is implemented.



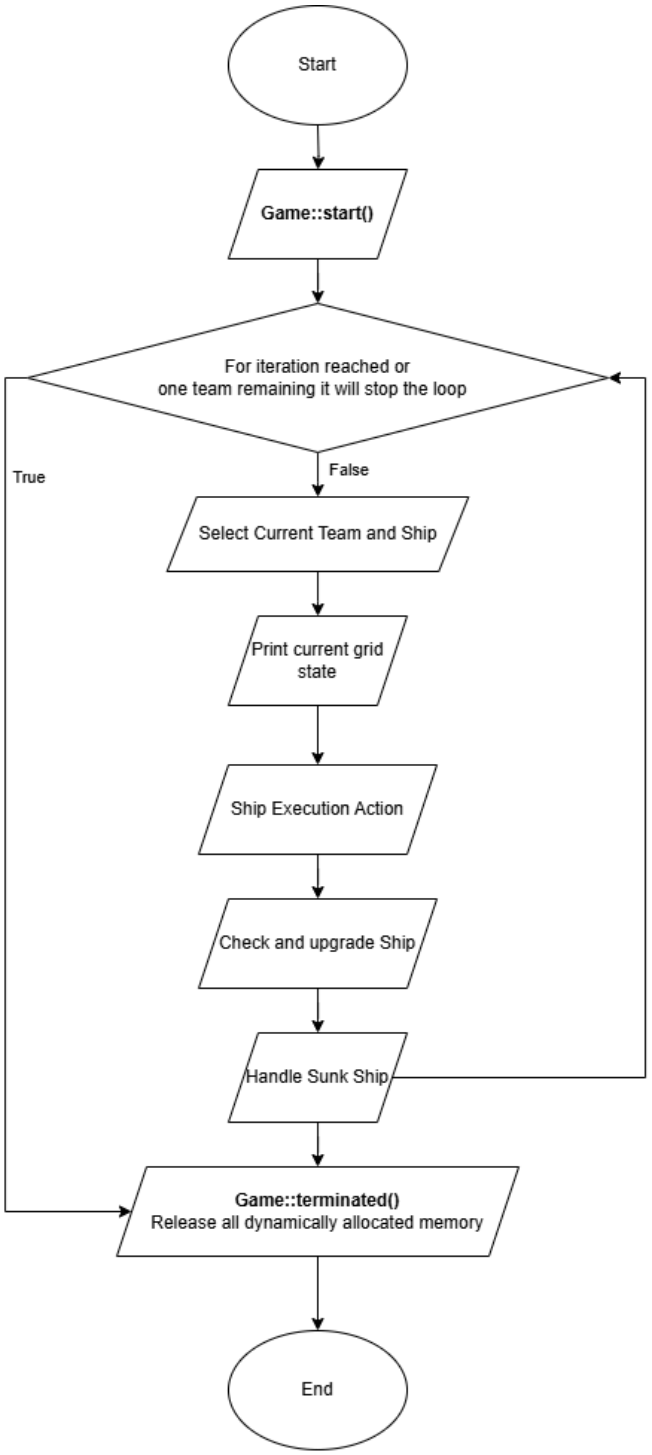
5. How the battlefield is implemented and linked to the ships.



6. How the upgrade is done



7. How the main simulation loop is performed



8. Explain how polymorphism is used in the assignment

```
class SeeingShip : virtual public Ship
{
public:
    virtual void look(Grid** grid) = 0;
    virtual ~SeeingShip() {}
};

class MovingShip : virtual public Ship
{
public:
    virtual void move(Grid** grid) = 0;
    virtual ~MovingShip() {}
};

class ShootingShip : virtual public Ship
{
public:
    virtual void shoot(Grid** grid) = 0;
    virtual ~ShootingShip() {}
};

class RamShip : virtual public Ship
{
public:
    virtual void ram(Grid** grid) = 0;
    virtual ~RamShip() {}
};
```

There's a base class called Ship, and it's inherited by actions of the ship. Every ship class has their own virtual function.

9. Explain how inheritance is used in the assignment

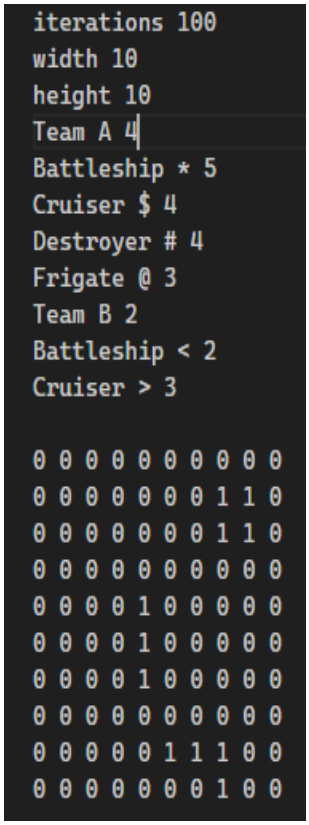
```
class Ship
{
    std::string type;
    std::string display;
    std::string teamName;
    int life;
    int totalKilled;
    int teamIndex;
    int shipPositionX;
    int shipPositionY;
    queue* killedShip;
    bool upgradeFlag;
    bool inBattlefield;
public:
    Ship();
    virtual void action(Grid** grid) = 0;
```

```
class Battleship : public MovingShip, public SeeingShip, public ShootingShip
{
    struct position {
        int x;
        int y;
    };
    Vector<position> availableMove;
    int infiniteLoopDetector = 0;
    public:
        void move(Grid** grid);
        void look(Grid** grid);
        void shoot(Grid** grid);
        void action(Grid** grid);
};
```

For every ship type, we inherit based on what the ship type does. Since in ship class, action is a virtual function,therefore, for every ship type we need to have an action function which calls all methods of the inherited class.

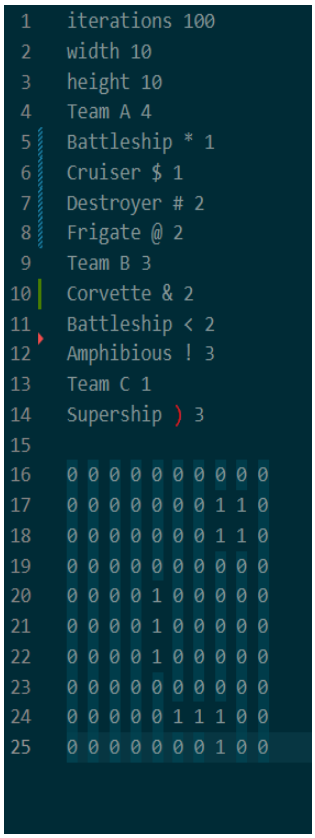
10. At least 3 sample ".txt" files for testing your assignment

game1.txt



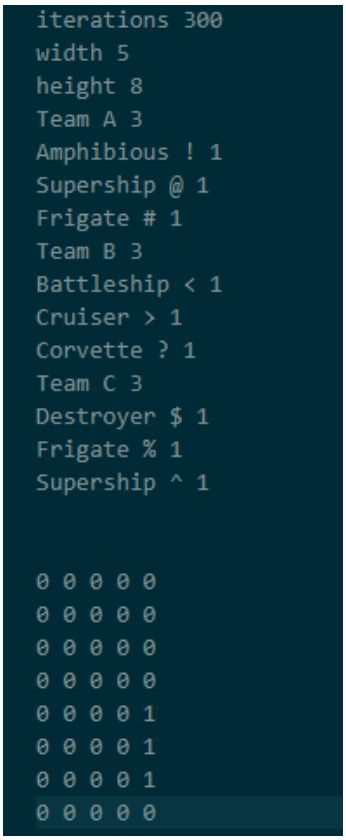
```
iterations 100
width 10
height 10
Team A 4
Battleship * 5
Cruiser $ 4
Destroyer # 4
Frigate @ 3
Team B 2
Battleship < 2
Cruiser > 3

0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 1 0
0 0 0 0 0 0 0 1 1 0
0 0 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 0 0 0
0 0 0 0 1 0 0 0 0 0
0 0 0 0 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 1 1 1 0 0
0 0 0 0 0 0 0 1 0 0
```

game2.txt



```
1   iterations 100
2   width 10
3   height 10
4   Team A 4
5   Battleship * 1
6   Cruiser $ 1
7   Destroyer # 2
8   Frigate @ 2
9   Team B 3
10  Corvette & 2
11  Battleship < 2
12  Amphibious ! 3
13  Team C 1
14  Supership ) 3
15
16  0 0 0 0 0 0 0 0 0 0
17  0 0 0 0 0 0 0 1 1 0
18  0 0 0 0 0 0 0 1 1 0
19  0 0 0 0 0 0 0 0 0 0
20  0 0 0 0 1 0 0 0 0 0
21  0 0 0 0 1 0 0 0 0 0
22  0 0 0 0 1 0 0 0 0 0
23  0 0 0 0 0 0 0 0 0 0
24  0 0 0 0 0 1 1 1 0 0
25  0 0 0 0 0 0 0 1 0 0
```

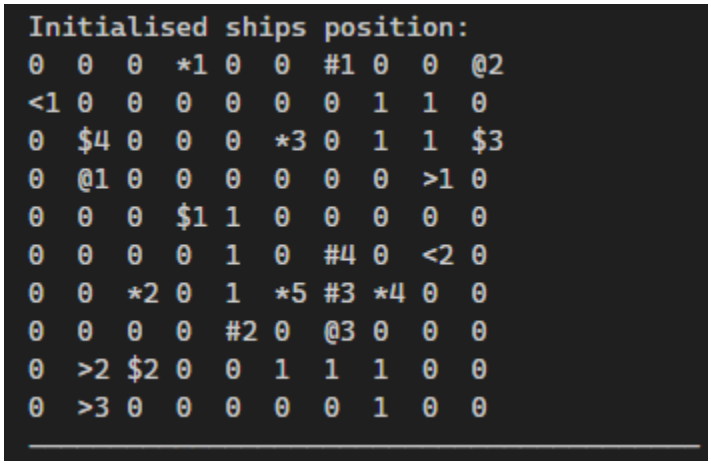
game3.txt



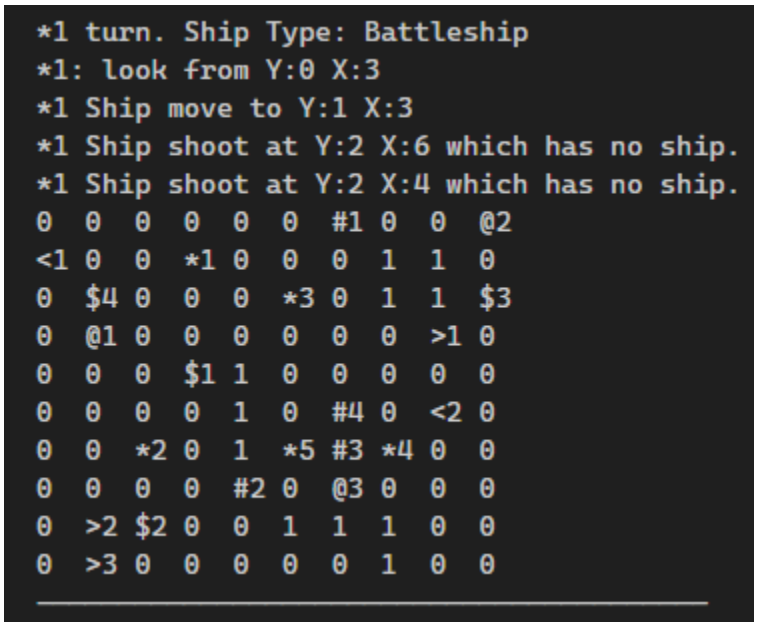
```
iterations 300
width 5
height 8
Team A 3
Amphibious ! 1
Supership @ 1
Frigate # 1
Team B 3
Battleship < 1
Cruiser > 1
Corvette ? 1
Team C 3
Destroyer $ 1
Frigate % 1
Supership ^ 1


0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
0 0 0 0 1
0 0 0 0 1
0 0 0 0 1
0 0 0 0 0
```

11. Screenshots of the first 10 turns of each run using the 3 test text files.

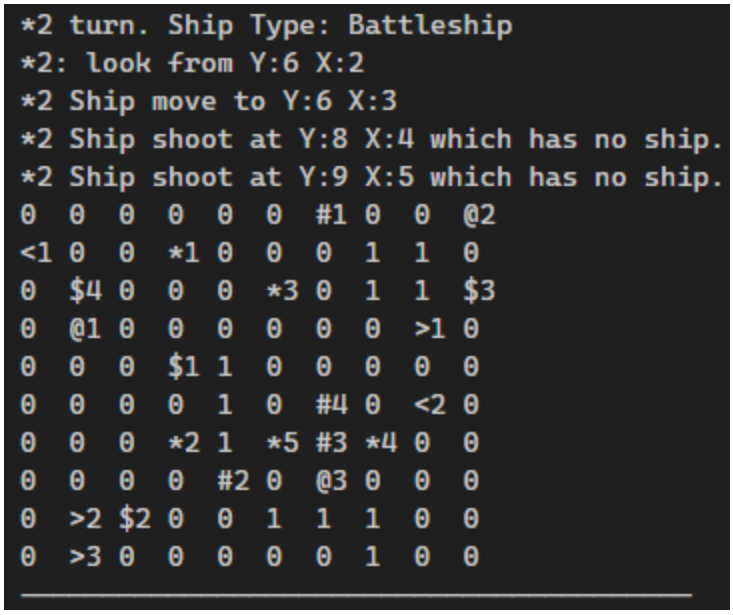
game1.txt



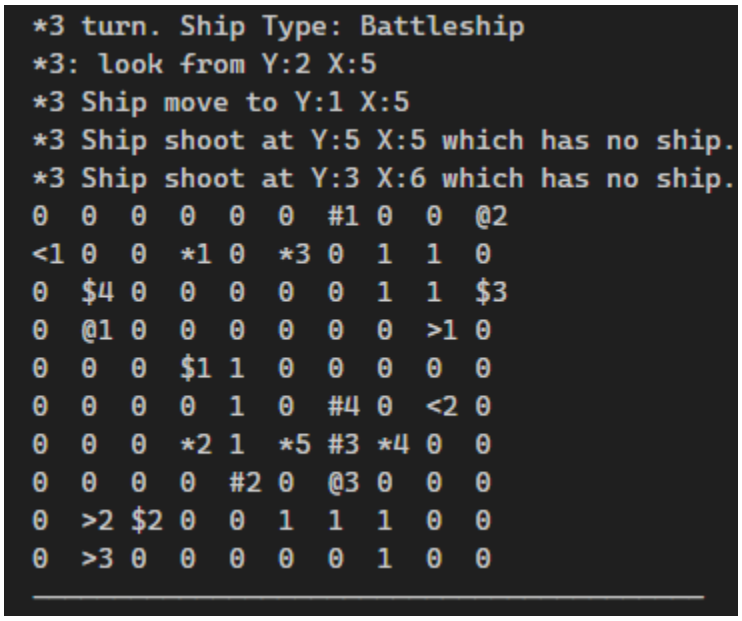
After assigned random positions to ships, display the initialised grid.



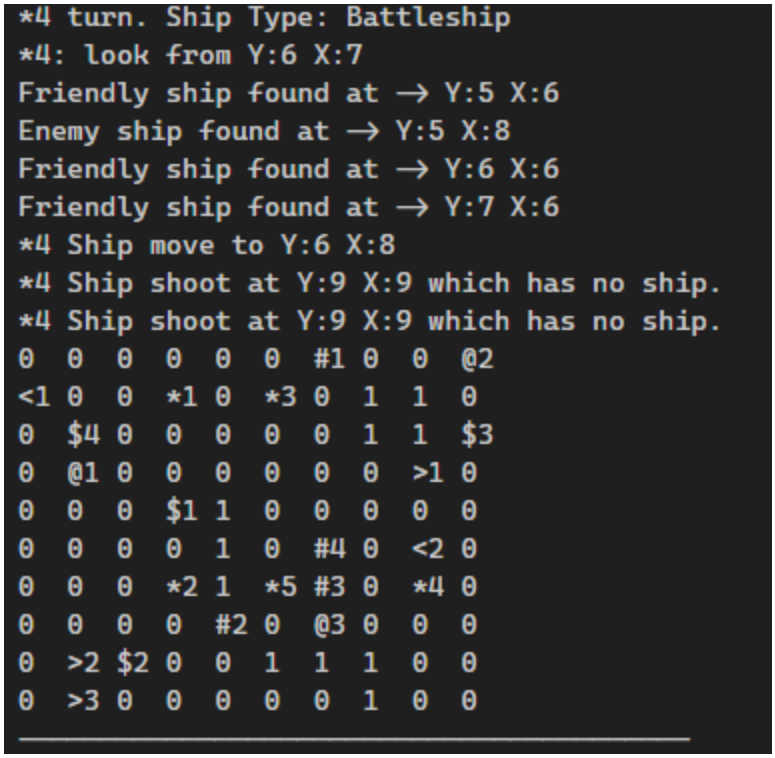
Starts with Team A first ship, Battleship look -> move -> shoot randomly (x+y <= 5) and x & y is positive random generate number.



Second battleship in team A.



Third battleship in team A.



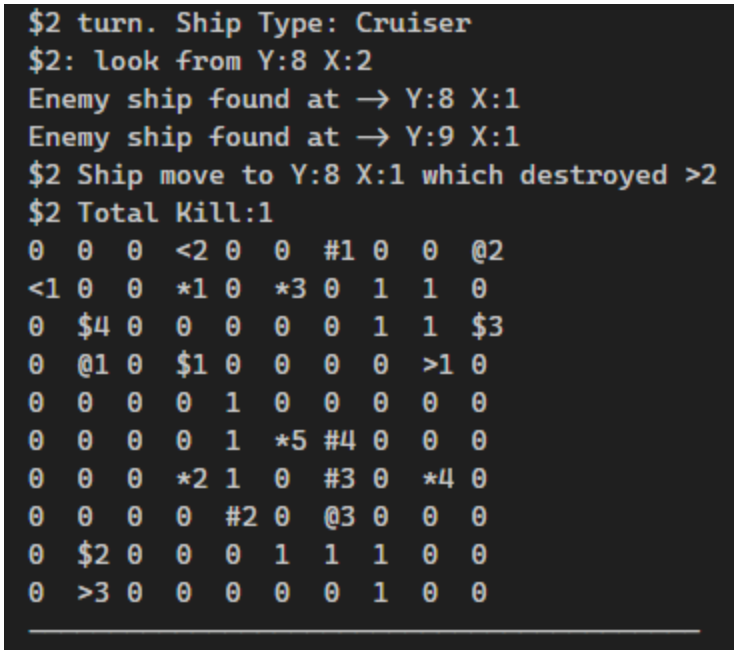
Fourth battleship in team A. This time, when the battleship looked around itself it found 3 friendship(#4,#3,@3) and 1 enemy ship(<2). And move to the right side, then shoot.

```
*5 turn. Ship Type: Battleship
*5: look from Y:6 X:5
Friendly ship found at → Y:5 X:6
Friendly ship found at → Y:6 X:6
Friendly ship found at → Y:7 X:4
Friendly ship found at → Y:7 X:6
*5 Ship move to Y:5 X:5
*5 Ship shoot at Y:6 X:5 which has no ship.
*5 Ship shoot at Y:5 X:8 which destroyed <2
*5 Total Kill:1
0  0  0  0  0  0  #1 0  0  @2
<1 0  0  *1 0  *3 0  1  1  0
0  $4 0  0  0  0  0  1  1  $3
0  @1 0  0  0  0  0  0  >1 0
0  0  0  $1 1  0  0  0  0  0
0  0  0  0  1  *5 #4 0  0  0
0  0  0  *2 1  0  #3 0  *4 0
0  0  0  0  #2 0  @3 0  0  0
0  >2 $2 0  0  1  1  1  0  0
0  >3 0  0  0  0  0  1  0  0
```

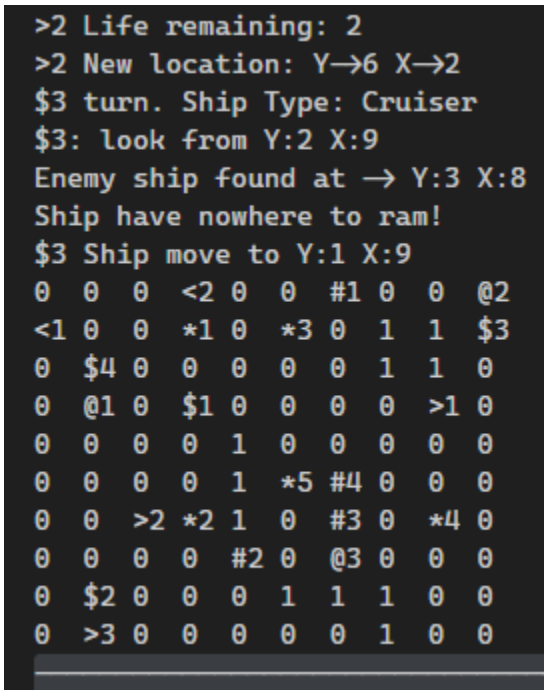
Fifth battleship in Team A, looked, found 4 friendly ships, moved up a place, and this time, it shot <2, <2 disappeared from the grid waiting for the next round to re-enter the battlefield. Kill of *5 incremented.

```
<2 Life remaining: 2
<2 New location: Y→0 X→3
$1 turn. Ship Type: Cruiser
$1: look from Y:4 X:3
Ship have nowhere to ram!
$1 Ship move to Y:3 X:3
0  0  0  <2 0  0  #1 0  0  @2
<1 0  0  *1 0  *3 0  1  1  0
0  $4 0  0  0  0  0  1  1  $3
0  @1 0  $1 0  0  0  0  >1 0
0  0  0  0  1  0  0  0  0  0
0  0  0  0  1  *5 #4 0  0  0
0  0  0  *2 1  0  #3 0  *4 0
0  0  0  0  #2 0  @3 0  0  0
0  >2 $2 0  0  1  1  1  0  0
0  >3 0  0  0  0  0  1  0  0
```

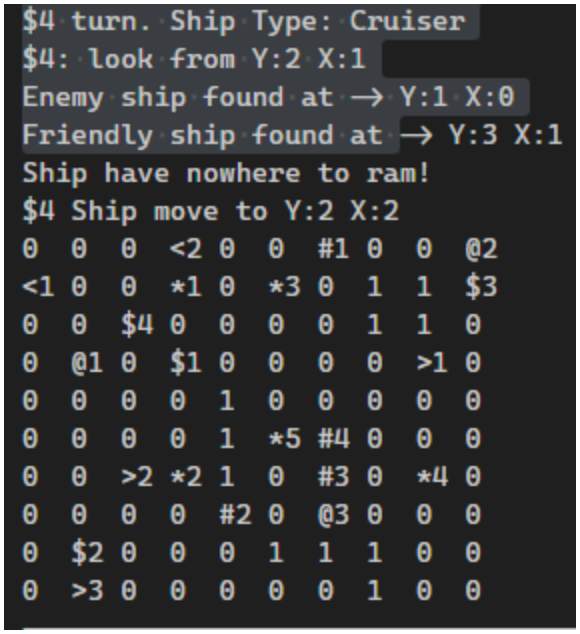
<2 reentered battlefield to (Y=0 X= 3) while life minus 1. Then its Team A first cruiser turned, it looked and found no enemy ship, therefore nowhere to ram. If there was nowhere to ram, it moved in a random direction.



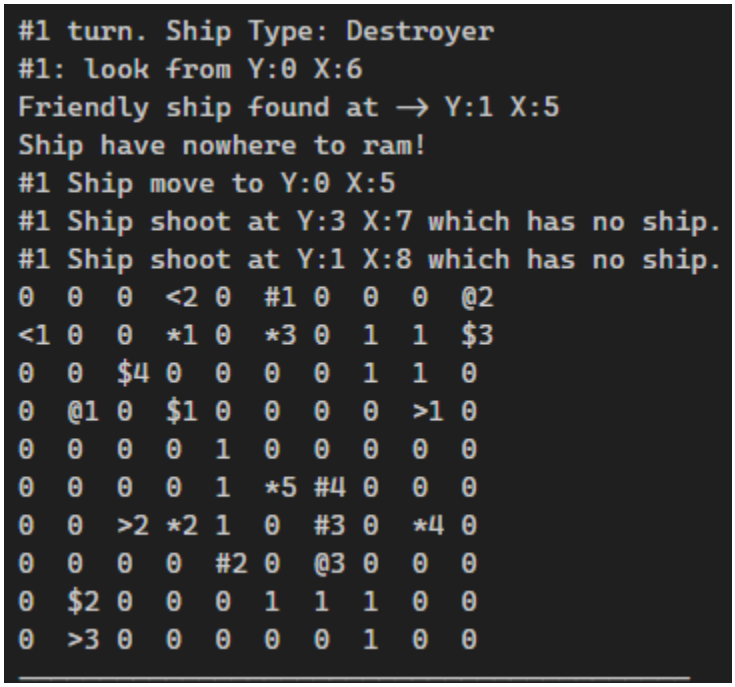
Team A second cruiser turned, looked and found two enemy ships, therefore it rammed the left enemy's ship since it can't ram a corner ship and killed >2.



>2 re-entered the battlefield, Team A third cruiser turned, looked and found no enemy ship, so it moved randomly (upward).

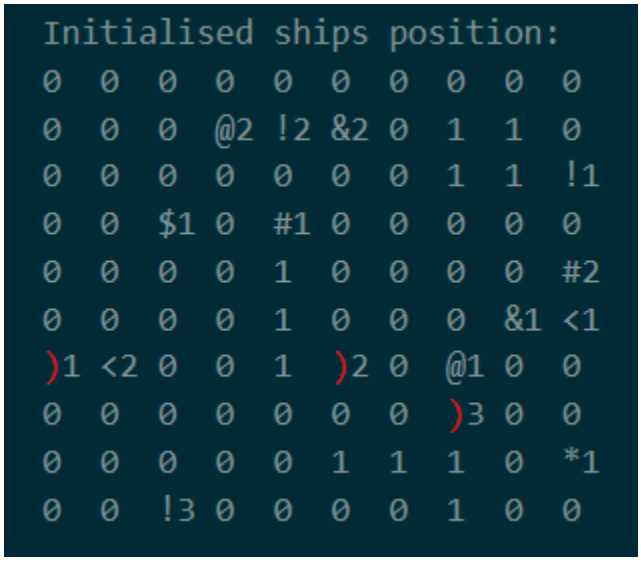


Team A fourth cruiser turned, looked and found a friendly and enemy ship but it got nowhere to ram since the enemy ship is on the upper left (ship can only ram up,down,left,right). If there was nowhere to ram, it moved in a random direction (right).

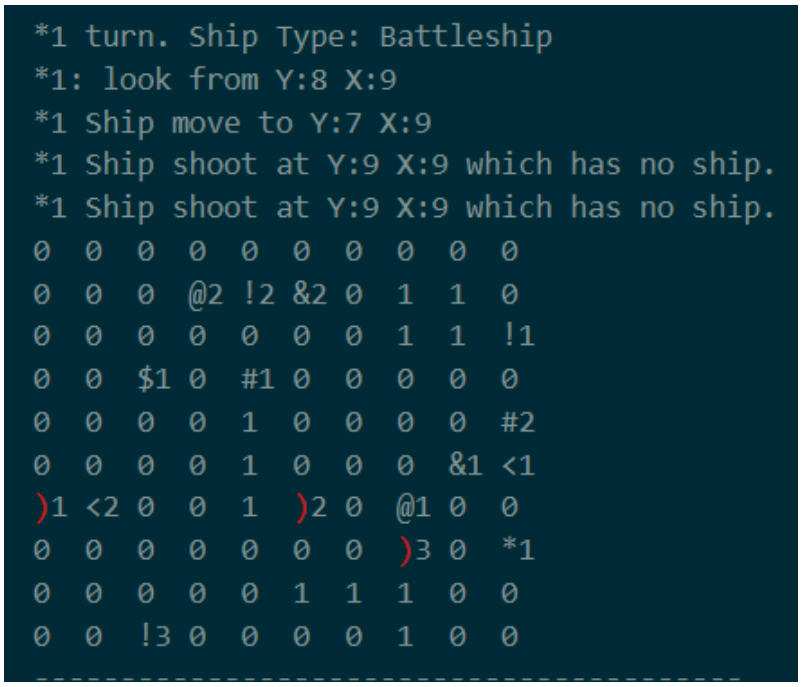


Team A first destroyer turned, looked and found a friendly ship, moved randomly, and shot randomly (x+y <= 5) two times.

Game2.txt



assigned random positions to ships, displaying the initialised grid.



First, team A battleship *1 starts at Y:8 X:9. Then battleship *1 move to Y:7 X:9. *1 ship shoots at Y:9 X:9 twice which has no ship.

```
28   ----------------------------------------
29   $1 turn. Ship Type: Cruiser
30   $1: look from Y:3 X:2
31   Ship have nowhere to ram!
32   $1 Ship move to Y:3 X:1
33   0  0  0  0  0  0  0  0  0  0
34   0  0  0  @2 !2 &2 0  1  1  0
35   0  0  0  0  0  0  0  1  1  !1
36   0  $1 0  0  #1 0  0  0  0  0
37   0  0  0  0  1  0  0  0  0  #2
38   0  0  0  0  1  0  0  0  &1 <1
39   )1 <2 0  0  1  )2 0  @1 0  0
40   0  0  0  0  0  0  0  )3 0  *1
41   0  0  0  0  0  1  1  1  0  0
42   0  0  !3 0  0  0  0  1  0  0
43   ----------------------------------------
```

Now is Team A Cruiser$1 turn, $1 from Y:3 X:2, $1 move to Y:3 X:1

```
#1 turn. Ship Type: Destroyer
#1: look from Y:3 X:4
Ship have nowhere to ram!
#1 Ship move to Y:3 X:3
#1 Ship shoot at Y:6 X:5 which destroyed )2
#1 Total Kill:1
#1 Ship shoot at Y:5 X:3 which has no ship.
0  0  0  0  0  0  0  0  0  0
0  0  0  @2 !2 &2 0  1  1  0
0  0  0  0  0  0  0  1  1  !1
0  $1 0  #1 0  0  0  0  0  0
0  0  0  0  1  0  0  0  0  #2
0  0  0  0  1  0  0  0  &1 <1
)1 <2 0  0  1  0  0  @1 0  0
0  0  0  0  0  0  0  )3 0  *1
0  0  0  0  0  1  1  1  0  0
0  0  !3 0  0  0  0  1  0  0
----------------------------------------
```

Now is Team A Destroyer #1 turn. #1 from Y:3 X:4, #1 move to Y:3 X:3 and shoot at Y:6 X:5 (x+y <=5) and destroyed)2. Right now Destroyer #1 total kill is 1. It Shoot second shot at Y:5 X:3 which has no ship

```
)2 Life remaining: 2
)2 New location: Y->8 X->2
#2 turn. Ship Type: Destroyer
#2: look from Y:4 X:9
Enemy ship found at -> Y:5 X:8
Enemy ship found at -> Y:5 X:9
#2 Ship move to Y:5 X:9 which destroyed <1
#2 Total Kill:1
#2 Ship shoot at Y:9 X:9 which has no ship.
#2 Ship shoot at Y:8 X:9 which has no ship.
0  0  0  0  0  0  0  0  0  0
0  0  0  @2 !2 &2 0  1  1  0
0  0  0  0  0  0  0  1  1  !1
0  $1 0  #1 0  0  0  0  0  0
0  0  0  0  1  0  0  0  0  0
0  0  0  0  1  0  0  0  &1 #2
)1 <2 0  0  1  0  0  @1 0  0
0  0  0  0  0  0  0  )3 0  *1
0  0  )2 0  0  1  1  1  0  0
0  0  !3 0  0  0  0  1  0  0
```

)2 reentered battlefield to (Y=8 X= 2) while life minus 1, now is Team A Destroyer #2 turns. #2 from Y:4 X:9. Looked and found two enemy ships, therefore it rammed the bottom ship since it can't ram a corner ship and killed >2. #2 total kill is 1. Then #2 shoot at Y:9 X:9 and Y:8 X:9 which both has no ship.

```
<1 Life remaining: 2
<1 New location: Y->9 X->1
@1 turn. Ship Type: Frigate
@1: From Y:6 X:7
@1 Ship shoot UP at Y:5 X:7 which has no ship.
0  0  0  0  0  0  0  0  0  0
0  0  0  @2 !2 &2 0  1  1  0
0  0  0  0  0  0  0  1  1  !1
0  $1 0  #1 0  0  0  0  0  0
0  0  0  0  1  0  0  0  0  0
0  0  0  0  1  0  0  0  &1 #2
)1 <2 0  0  1  0  0  @1 0  0
0  0  0  0  0  0  0  )3 0  *1
0  0  )2 0  0  1  1  1  0  0
0  <1 !3 0  0  0  0  1  0  0
```

<1 reentered battlefield to(Y=9 X=1), now is Team A Frigate @1 turn. @1 from Y:6 X:7. @1 shoot at Y:5 X:7 starting upward. Next @1 turns, @1 will shoot at Y:5 X:8 following clockwise.

```
@2 turn. Ship Type: Frigate
@2: From Y:1 X:3
@2 Ship shoot UP at Y:0 X:3 which has no ship.
0  0  0  0  0  0  0  0  0  0
0  0  0  @2 !2 &2 0  1  1  0
0  0  0  0  0  0  0  1  1  !1
0  $1 0  #1 0  0  0  0  0  0
0  0  0  0  1  0  0  0  0  0
0  0  0  0  1  0  0  0  &1 #2
)1 <2 0  0  1  0  0  @1 0  0
0  0  0  0  0  0  0  )3 0  *1
0  0  )2 0  0  1  1  1  0  0
0  <1 !3 0  0  0  0  1  0  0
----------------------------------------
```

Now is Team A Frigate @2 turn. @2 from Y:1 X:3. @2 shoot at Y:0 X:3 which has no ship.

```
----------------------------------------
&1 turn. Ship Type: Corvette
&1: From Y:5 X:8
&1 Ship shoot at Y:6 X:9 which has no ship.
0  0  0  0  0  0  0  0  0  0
0  0  0  @2 !2 &2 0  1  1  0
0  0  0  0  0  0  0  1  1  !1
0  $1 0  #1 0  0  0  0  0  0
0  0  0  0  1  0  0  0  0  0
0  0  0  0  1  0  0  0  &1 #2
)1 <2 0  0  1  0  0  @1 0  0
0  0  0  0  0  0  0  )3 0  *1
0  0  )2 0  0  1  1  1  0  0
0  <1 !3 0  0  0  0  1  0  0
----------------------------------------
```

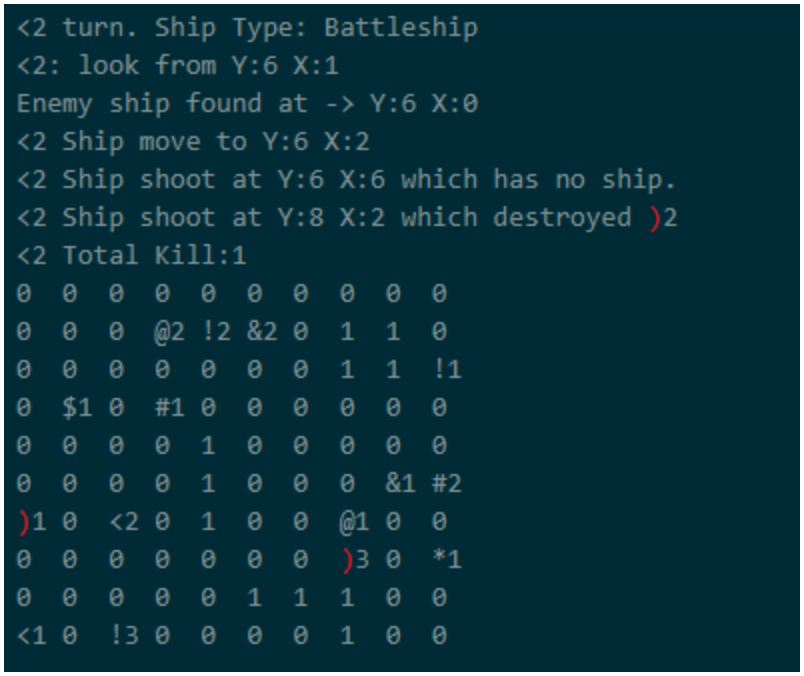
Now is Team B Corvette &1 turn. &1 from Y:5 X:8. &1 shoot at Y:6 X:9 which has no ship

```
&2 turn. Ship Type: Corvette
&2: From Y:1 X:5
&2 Ship shoot at Y:0 X:4 which has no ship.
0  0  0  0  0  0  0  0  0  0
0  0  0  @2 !2 &2 0  1  1  0
0  0  0  0  0  0  0  1  1  !1
0  $1 0  #1 0  0  0  0  0  0
0  0  0  0  1  0  0  0  0  0
0  0  0  0  1  0  0  0  &1 #2
)1 <2 0  0  1  0  0  @1 0  0
0  0  0  0  0  0  0  )3 0  *1
0  0  )2 0  0  1  1  1  0  0
0  <1 !3 0  0  0  0  1  0  0
```

Now is Team B corvette &2 turn. It from Y:1 X:5 and &2 shoot at Y:0 X:4 which has no ship

```
<1 turn. Ship Type: Battleship
<1: look from Y:9 X:1
Enemy ship found at -> Y:8 X:2
Friendly ship found at -> Y:9 X:2
<1 Ship move to Y:9 X:0
<1 Ship shoot at Y:9 X:3 which has no ship.
<1 Ship shoot at Y:9 X:3 which has no ship.
0  0  0  0  0  0  0  0  0  0
0  0  0  @2 !2 &2 0  1  1  0
0  0  0  0  0  0  0  1  1  !1
0  $1 0  #1 0  0  0  0  0  0
0  0  0  0  1  0  0  0  0  0
0  0  0  0  1  0  0  0  &1 #2
)1 <2 0  0  1  0  0  @1 0  0
0  0  0  0  0  0  0  )3 0  *1
0  0  )2 0  0  1  1  1  0  0
<1 0  !3 0  0  0  0  1  0  0
```

Now is Team B battleship <1 turn. <1 from Y:9 X:1, then <1 found friendly ship at Y:9 X:2 (which is !3). <1 move to Y:9 X:0 and shoot at Y:9 X:3 twice which has no ship.



Now is Team B Battleship <2 turn. <2 from Y:6 X:1. It found enemy ship at Y:6 X:0 (which is)1). Then <2 move to Y:6 X:2 . <2 shoot at Y:6 X:6 which has no ship and shoot at Y:8 X:2 destroyed)2. <2 total kill is 1.

Game3.txt

```
Initialised ships position:
0  0  0  0  0
0  <1 0  0  0
>1 0  %1 ?1 $1
#1 0  0  0  0
0  0  0  0  1
0  0  !1 0  1
0  0  0  0  1
0  @1 ^1 0  0
-----------------------------------
```

assigned random positions to ships, displaying the initialised grid.

```
----------------------------------------
!1 turn. Ship Type: Amphibious
!1: look from Y:5 X:2
!1 Ship move to Y:4 X:2
!1 Ship shoot at Y:5 X:2 which has no ship.
!1 Ship shoot at Y:4 X:3 which has no ship.
0  0  0  0  0
0  <1 0  0  0
>1 0  %1 ?1 $1
#1 0  0  0  0
0  0  !1 0  1
0  0  0  0  1
0  0  0  0  1
0  @1 ^1 0  0
----------------------------------------
```

Now is Team A Amphibious !1 turn. !1 from Y:5 X:2. !1 move to Y:4 X:2. !1 shoot at Y:5 X:2 and Y:4 X:3 which has no ship.

```
@1 turn. Ship Type: Supership
@1: look from Y:7 X:1
Enemy ship found at -> Y:7 X:2
@1 Ship move to Y:7 X:2 which destroyed ^1
@1 Total Kill:1
@1 Ship shoot at Y:0 X:1 which has no ship.
@1 Ship shoot at Y:1 X:1 which destroyed <1
@1 Total Kill:2
@1 Ship shoot at Y:1 X:0 which has no ship.
0  0  0  0  0
0  0  0  0  0
>1 0  %1 ?1 $1
#1 0  0  0  0
0  0  !1 0  1
0  0  0  0  1
0  0  0  0  1
0  0  @1 0  0
----------------------------------------
```

Now is Team A Supership @1 turn. @1 from Y:7 X:1. @1 looked around itself and found the enemy ship at Y:7 X:2 which is (^1) .Therefore it rammed the right enemy's ship now @1 at Y:7 X:2 and total kill = 1. Since Supership shoots any point of the grid. @1 shoot at Y:0 X:1, Y:! X:1 and Y:1 X:0, @1 destroyed <1 when @1 shoot at Y:1 X:1. Total kill @1 = 2.

```
^1 Life remaining: 2
^1 New location: Y->5 X->2
<1 Life remaining: 2
<1 New location: Y->7 X->1
#1 turn. Ship Type: Frigate
#1: From Y:3 X:0
#1 Ship shoot UP at Y:2 X:0 which destroyed >1
#1 Total Kill:1
0  0  0  0  0
0  0  0  0  0
0  0  %1 ?1 $1
#1 0  0  0  0
0  0  !1 0  1
0  0  ^1 0  1
0  0  0  0  1
0  <1 @1 0  0
----------------------------------------
```

^1 and <1 reentered battlefield to (Y=5 X= 2) and (Y=7 X=1) while their life was both minus 1. Now is team A Frigate #1 turn. #1 from Y:3 X:0. #1 shoot up at Y:2 X:0 which destroyed >1, total kill #1 =1. If #1 shoots a total of 2 more other ships, it will be upgraded to Corvette. #1 next round will shoot at Y:2X:1.

```
>1 Life remaining: 2
>1 New location: Y->1 X->1
<1 turn. Ship Type: Battleship
<1: look from Y:7 X:1
Enemy ship found at -> Y:7 X:2
<1 Ship move to Y:6 X:1
<1 Ship shoot at Y:6 X:2 which has no ship.
<1 Ship shoot at Y:7 X:3 which has no ship.
0  0  0  0  0
0  >1 0  0  0
0  0  %1 ?1 $1
#1 0  0  0  0
0  0  !1 0  1
0  0  ^1 0  1
0  <1 0  0  1
0  0  @1 0  0
----------------------------------------
```

>1 reentered the battlefield to (Y=1 X= 1). Now is Team B battleship <1 turn. <1 from Y:7 X:1 and it looked and found an enemy ship at Y:7 X:2 (which is @1). Then <1 shoot at Y:6 X:2 and Y:7 X:3 which has no ships.

```
>1 turn. Ship Type: Cruiser
>1: look from Y:1 X:1
Enemy ship found at -> Y:2 X:2
Ship have nowhere to ram!
>1 Ship move to Y:1 X:2
0  0  0  0  0
0  0  >1 0  0
0  0  %1 ?1 $1
#1 0  0  0  0
0  0  !1 0  1
0  0  ^1 0  1
0  <1 0  0  1
0  0  @1 0  0
----------------------------------------
```

Now it is Team B Cruiser >1 turn. >1 from Y:1 X:1 and it looked and found enemy ship at Y:2 X:2 due to ship can't ram the corner ship therefore nowhere to ram. >1 move to Y:1 X:2.

```
?1 turn. Ship Type: Corvette
?1: From Y:2 X:3
?1 Ship shoot at Y:3 X:2 which has no ship.
0  0  0  0  0
0  0  >1 0  0
0  0  %1 ?1 $1
#1 0  0  0  0
0  0  !1 0  1
0  0  ^1 0  1
0  <1 0  0  1
0  0  @1 0  0
```

Now is Team B Corvette ?1 turn. From Y:2 X:3 Then it shoots at Y:3 X:2 which has no ship.

```
$1 turn. Ship Type: Destroyer
$1: look from Y:2 X:4
Enemy ship found at -> Y:2 X:3
$1 Ship move to Y:2 X:3 which destroyed ?1
$1 Total Kill:1
$1 Ship shoot at Y:5 X:4 which has no ship.
$1 Ship shoot at Y:6 X:3 which has no ship.
0  0  0  0  0
0  0  >1 0  0
0  0  %1 $1 0
#1 0  0  0  0
0  0  !1 0  1
0  0  ^1 0  1
0  <1 0  0  1
0  0  @1 0  0
```

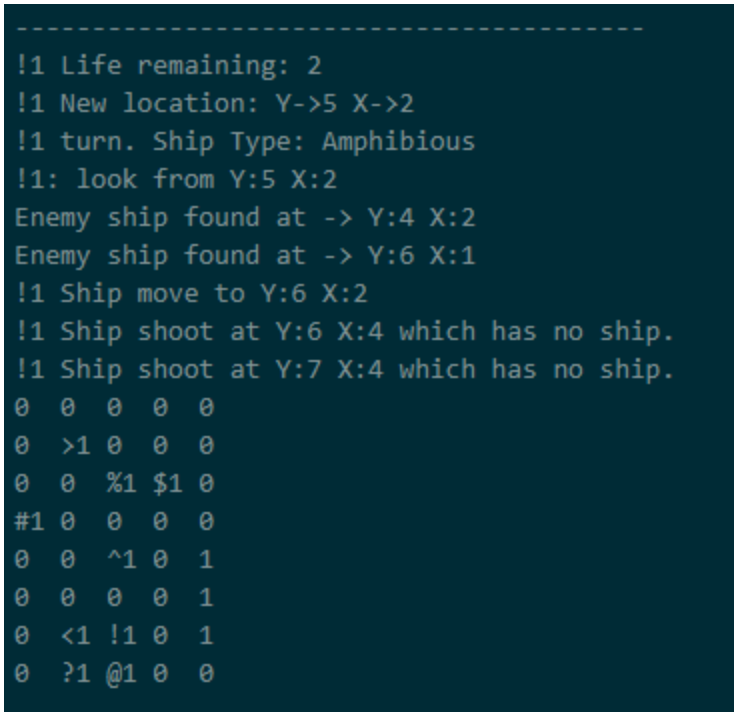
Now is Team C Destroyer $1 turn. From Y:2 X:4, it looked around and found an enemy at Y:2 X:3 (which is ?1). Therefore it rammed the right enemy's ship and now $1 is at Y:2 X:3 and total kill=1. $1 shoot at Y:5 X:4 and Y:6 X:3 which has no ship.

```
?1 Life remaining: 2
?1 New location: Y->7 X->1
%1 turn. Ship Type: Frigate
%1: From Y:2 X:2
%1 Ship shoot UP at Y:1 X:2 which destroyed >1
%1 Total Kill:1
0  0  0  0  0
0  0  0  0  0
0  0  %1 $1 0
#1 0  0  0  0
0  0  !1 0  1
0  0  ^1 0  1
0  <1 0  0  1
0  ?1 @1 0  0
```

?1 reentered battlefield to (Y=7 X=1). Now is Team C Frigate %1 turn. From Y:2 X:2. It shoot up at Y:1 X:2 and destroyed >1. Total kill %1 = 1.

```
----------------------------------------
>1 Life remaining: 1
>1 New location: Y->1 X->1
^1 turn. Ship Type: Supership
^1: look from Y:5 X:2
Enemy ship found at -> Y:4 X:2
Enemy ship found at -> Y:6 X:1
^1 Ship move to Y:4 X:2 which destroyed !1
^1 Total Kill:1
^1 Ship shoot at Y:5 X:2 which has no ship.
^1 Ship shoot at Y:6 X:0 which has no ship.
^1 Ship shoot at Y:0 X:3 which has no ship.
0  0  0  0  0
0  >1 0  0  0
0  0  %1 $1 0
#1 0  0  0  0
0  0  ^1 0  1
0  0  0  0  1
0  <1 0  0  1
0  ?1 @1 0  0
----------------------------------------
```

>1 reentered battlefield at (Y=1 X=1) and only remaining 1 life. Now is Team C supership ^1 turn. ^1 from Y:5 X:2 and it looked around and found two enemy ships (!1, <1). Therefore it rammed the top enemy's ship, and destroyed !1 and total kill ^1 =1. ^1 shoot at Y:5 X:2, Y:6 X:0 and Y:0 X:3 which has no ship.



!1 reentered the battlefield at (Y=5 X=2). Now is Team A Amphibious !1 turn. !1 looked around and found two enemy ships which are <1 and ?1. Then !1 shoot at Y:6 X:4 and Y:7 X:4 which has no ship.