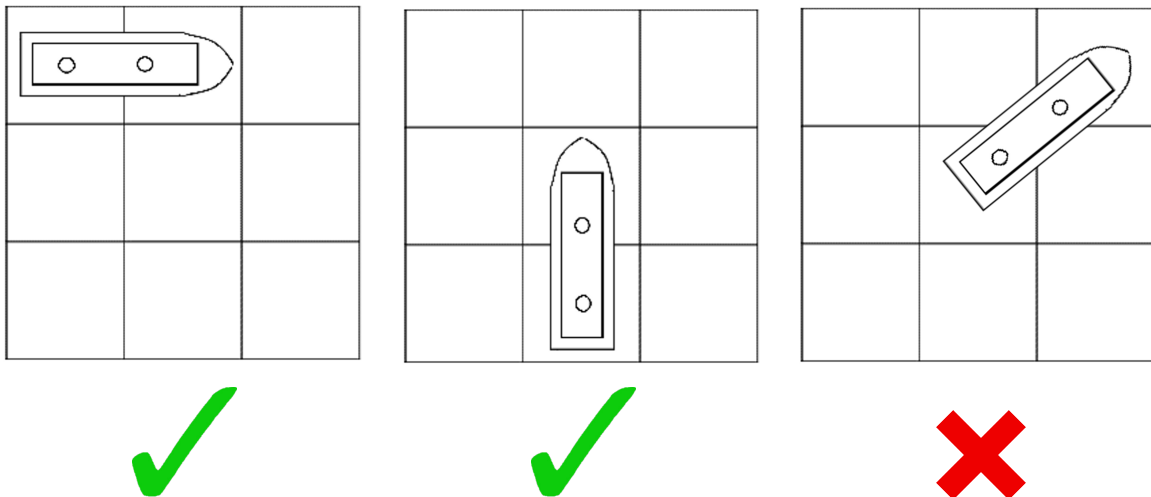


# Front Page of Booklet

# Rules of Battleships

- 2 players, each with a grid and battleships.
- Both players place their battleships somewhere in their grid, without showing each other.

Boats can be horizontal or vertical, but not diagonal!



- Players take turns guessing where their oppositions battleships are.
- After each guess, you must say whether it was a **HIT** or a **MISS**.

*"Is your battleship in C3?" "HIT!"*

- A ship sinks when it has been **HIT** in all squares.
- The player who sinks all of their opponents battleships is the winner!

Cut out the templates of the battleships provided.

Place only your **small** battleship somewhere in the provided grid. This ship should only be in 2 squares.

With the person next to you, play a game of battleships while **counting the number of guesses** it takes for you to sink their ship.

	A	B	C
1			
2			
3			

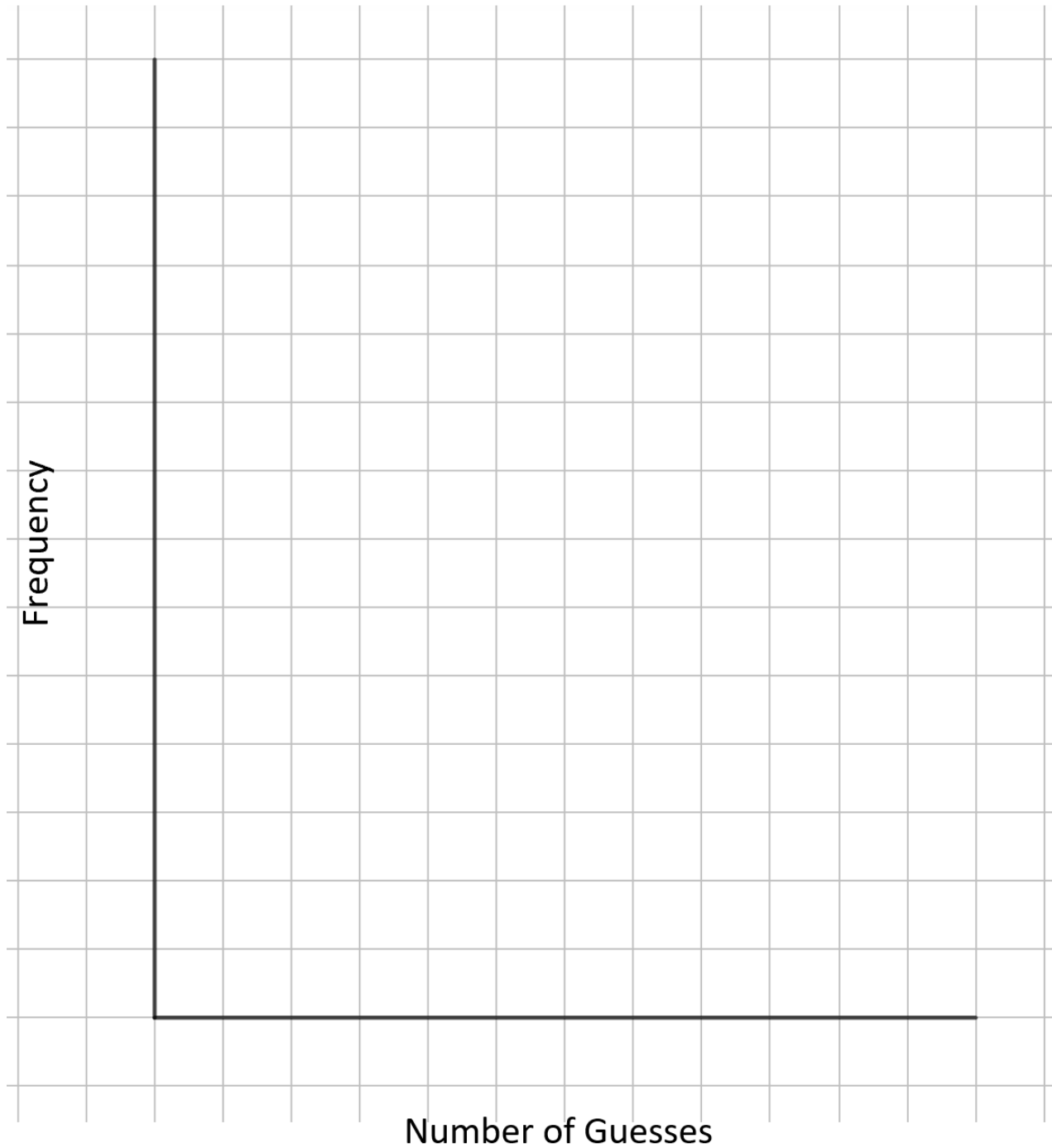
How many guesses did it take?

What did everyone else in the class get?

Make a **frequency table** with your classes results!

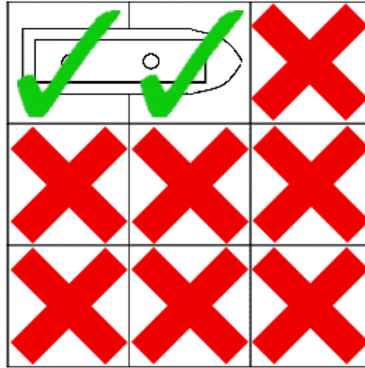
Number of guesses	Frequency (tally)	Frequency (number)
1		
2		
3		
4		
5		
6		
7		
8		
9		

Draw a **bar chart** of this frequency table.



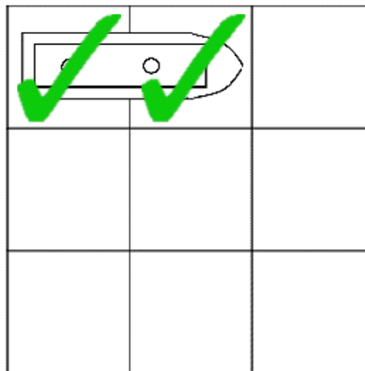
What was the most common number of guesses?

The most possible number of guesses is 9. This would mean the player had guessed all other squares, before finally sinking the boat in the last square.



The least possible number of guesses is 2, as the boat lies on 2 squares. This would mean a player got two HITs on their first two guesses.

This is called a **perfect game**.

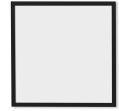


I wonder if there's a method of playing battleships that is most likely to produce a perfect game?

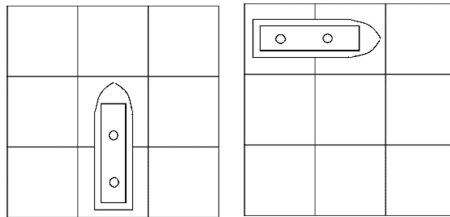
Does each square on the grid have an equal chance of being a HIT?

Let's investigate...

How many different positions can the boat be in?



For example, two possible positions are:

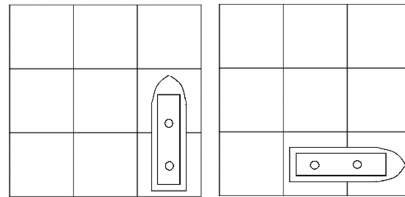


(It may help to use the small battleship and place it in different squares on the grid)

	A	B	C
1			
2			
3			

In each square, fill in the number of ways a battleship can be positioned in it.

For example, in square C3 a battleship can be positioned 2 different ways:



A B C

1			
2			
3			2

Out of \_\_\_\_\_ possible positions, the battleship is in A2 in \_\_\_\_\_ of them.

This means that the likelihood of a HIT if you choose A2 is \_\_\_\_\_ out of \_\_\_\_\_.

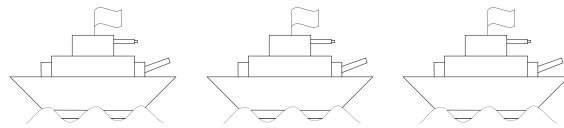
Which square is most likely to be a HIT? \_\_\_\_\_



Now we've learnt that all squares do not have equal probability of containing a battleship.


Some squares are more likely to be a HIT than others.



Using this technique, we can tell which squares are the best ones to pick when playing battleships!



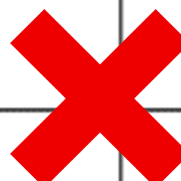
Let's say you already guessed a square, and it was a MISS.

**Repeat the process: Write in each square the number of ways battleships can be positioned in it.**

	A	B	C
1		2	
2			
3			

	A	B	C
1			1
2			
3			

Now let's use a bigger grid.

	A	B	C	D
1				
2				
3				
4				