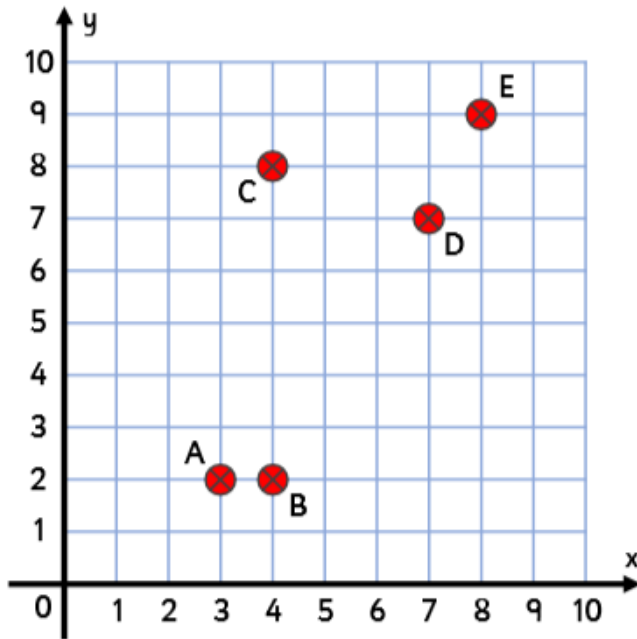




Takanori needs to prepare for the *Shipwreckers* Grand Tournament. Last year he came second to his greatest rival, Brenda 'Bullseye' Baird. This year he is going to beat her any way he can. That is his plan, at least. He needs to come up with his tactics and practise his moves. He has been making plans on his laptop for weeks.

'RIKU!' Takanori shouts. His little brother has been playing around with Takanori's things again! Riku has written over one of Takanori's *Shipwreckers* plans!

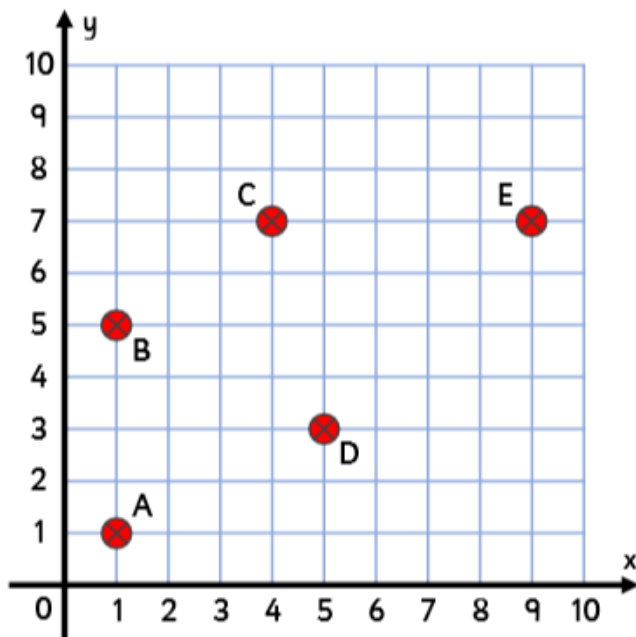


Shot Plan #6	
Shot A:	(3, 2)
Shot B:	(4, 2)
Shot C:	(4, 9)
Shot D:	(7, 7)
Shot E:	(9, 8)

Takanori had written his plan on the paper but Riku has scribbled it out and written what *he* thinks are the right coordinates.

1. Compare the shots marked on the grid to the coordinates written on the paper. Find and explain the mistakes Riku has made when writing down the coordinates.

Takanori corrects his brother's mistakes. Now it is time to come up with another shot plan. Takanori wants to make sure he can remember the plan so he can use it in the tournament. He marks the shots on a *Shipwreckers* grid. After that, he comes up with rules to help him remember the coordinates.



Shot Plan #7 Rules

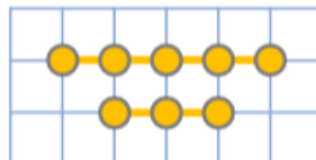
Coordinates must have:

- Odd numbers only
- No multiples of 3

2. Do the shots marked on the grid have coordinates which match Takanori's rules? If he has made any errors, explain them.

Takanori now needs to think about where he will place his ships on the grid. He wants to make sure they are well spread out so that Brenda will not be able to hit them easily.

He starts by thinking about placing just two ships. He needs to think of a rule which will spread them out as much as possible. *Shipwreckers* ships are marked as lines and circles. Here are the two ships he is using (they can be placed either horizontally or vertically on a *Shipwreckers* grid) and the ideas he has had for rules:



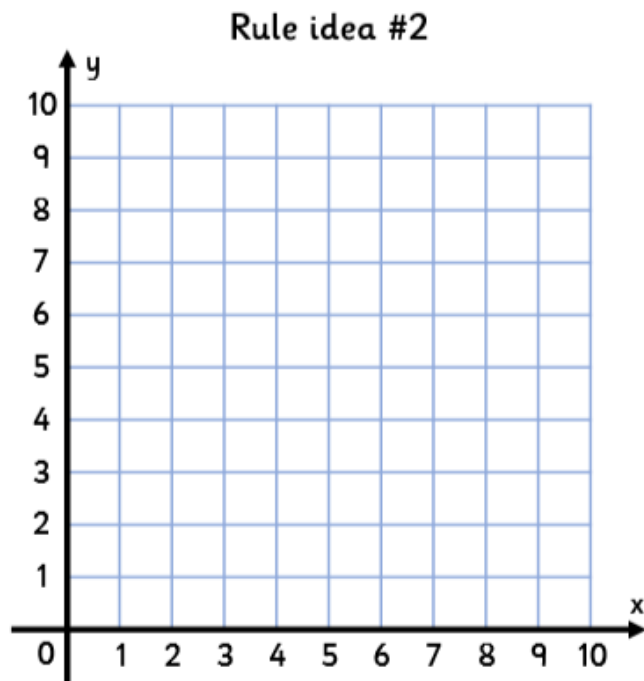
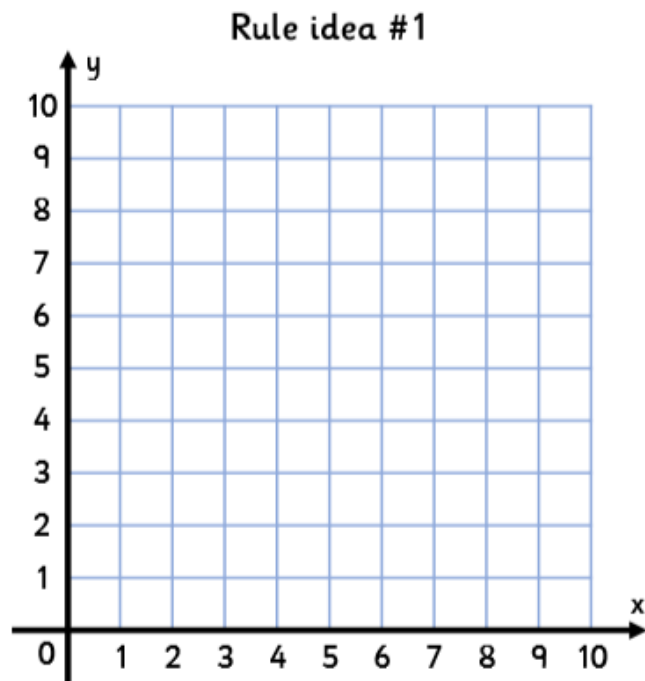
Rule idea #1

'All y-axis coordinates must be a multiple of 4.'

Rule idea #2

'All x-axis coordinates must be a multiple of 3.'

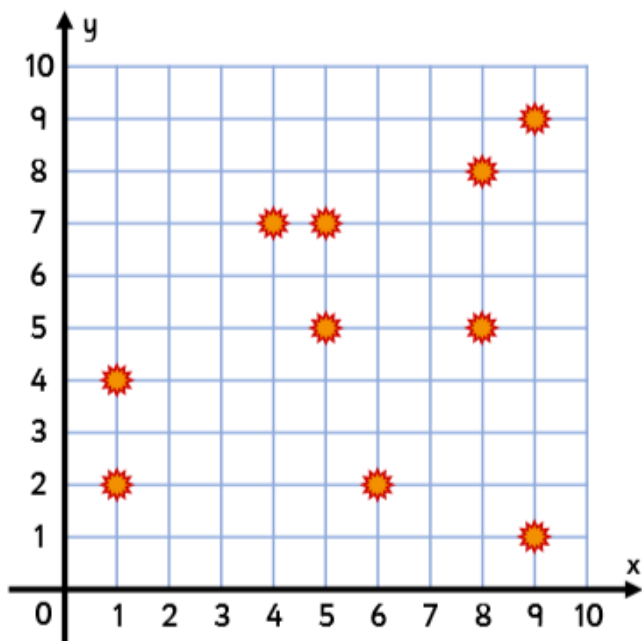
3. Draw two ships on each grid, as far apart as the rules allow. Which rule will let Takanori place his ships the furthest apart?



--	--

Takanori now wants to find 'safe zones' which avoid Brenda's favourite shots.

4. Plot the coordinates on the grid and join them up with lines to mark each zone. Which set of coordinates marks out a zone where none of Brenda's shots land?



Safe Zone ideas

Set A: (2,9) (4,9) (5,8) (3,6)

Set B: (7,9) (10,10) (10,8) (8,6)

Set C: (1,1) (2,3) (8,4) (4,1)

Set ____ marks out a 'safe zone' where none of Brenda's shots land.

It is now the day of the Grand Tournament! Takanori's first opponent is Jason 'Just Missed' Johnson. The game is very close. Jason has five shots left to sink Takanori's ships. It's time to say the coordinates he is shooting at. He must hit with every shot!



Jason 'Just Missed' Johnson

The first shot will hit (4,5).

Translate the first shot 3 left and 1 up to find where the second shot hits.

Translate the second shot 6 right and 4 down to find where the third shot hits.

Translate the third shot 2 left and 6 up to find where the fourth shot hits.

Translate the fourth shot 4 right and 2 down to find where the final shot hits.

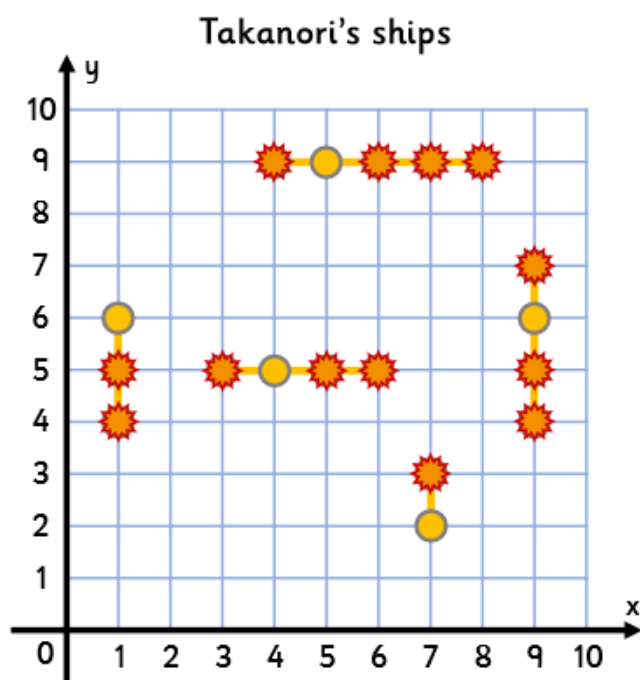
Takanori and Jason's computers work out the coordinates that Jason's shots hit...

ERROR

RESULTS DO NOT MATCH

The two computers have found different coordinates! That is not right! The tournament referees come to look at Jason's shots and Takanori's ship grid.

5. Look at the shots Jason said. Look at Takanori's ship grid. Look at the coordinates on each computer. Has either player's computer got the coordinates right? Do all of Takanori's ships get sunk?



Player: Jason

(4,5) (1,6) (7,2)
(5,9) (9,6)

Player: Takanori

(4,5) (1,6) (7,2)
(5,8) (8,6)

There seems to be all sorts of errors with the computers at the tournament!

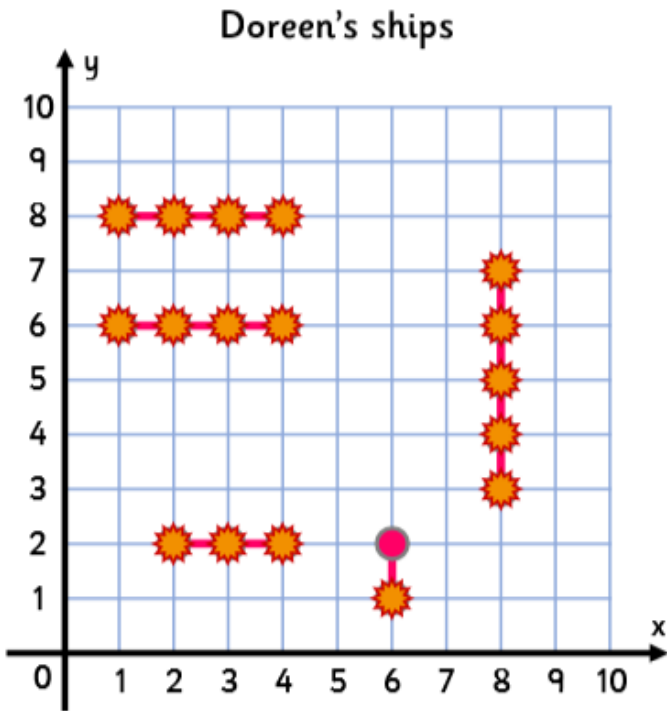
In his next game, Takanori plays Doreen ‘Direct Hit’ Dillinger. He says his final five shots to try and sink Doreen’s last ship but the computer only records the coordinates of the last shot he takes! The referees have to work backwards to find where the other shots hit.



Takanori

I can't remember where my first shot hit.
I do remember that I translated the first shot 4 left and 2 down to find where the second shot hit.
I translated the second shot 6 right and 5 up to find where the third shot hit.
I translated the third shot 2 left and 7 down to find where the fourth shot hit.
I translated the fourth shot 3 right and 1 down to find where the fifth shot hit and that was at (9,1).

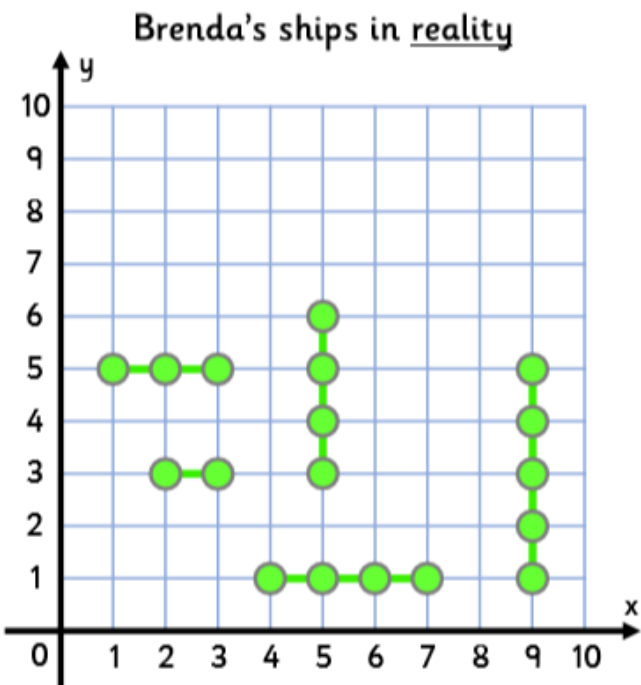
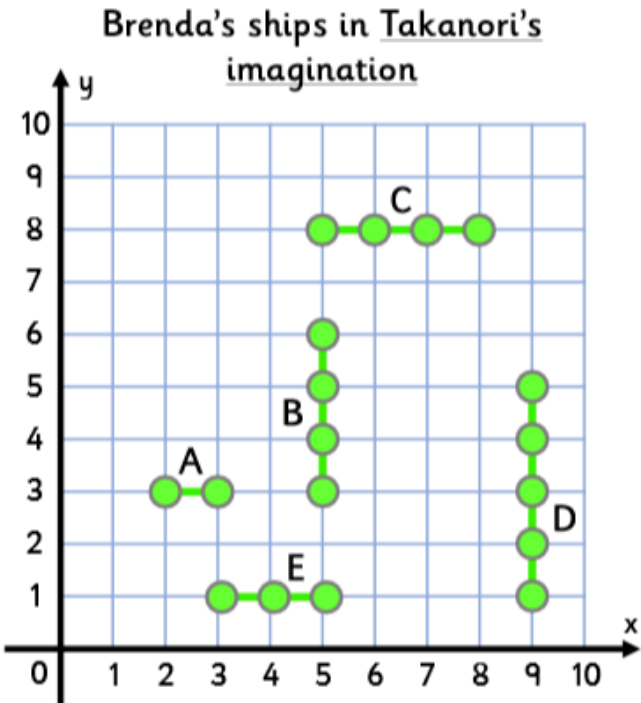
6. Use Doreen’s ship grid and Takanori’s description to fill in the table with the coordinates of Takanori’s shots. Does Takanori sink all of Doreen’s ships?



Shot 1	
Shot 2	
Shot 3	
Shot 4	
Shot 5	(9,1)

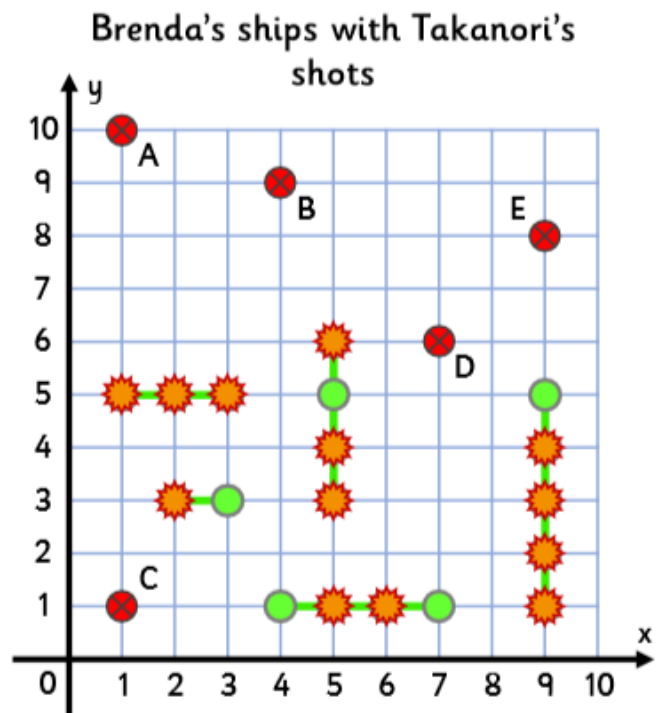
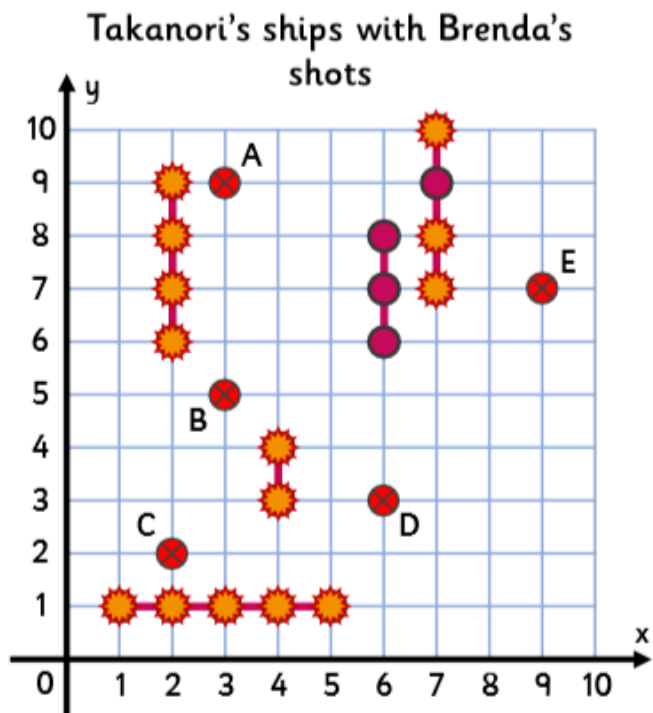
Takanori has beaten Jason and Doreen and is now in the final! His opponent is his biggest rival and the reigning champion. It's Brenda! Takanori has been practising for this match for a whole year!

The first thing Takanori has to do is guess where Brenda has placed her ships on her *Shipwreckers* grid. He imagines her grid.



7. Look at the placement of Brenda's ships in Takanori's imagination and in reality. Describe the translations that would need to occur for Takanori's imagined grid to match Brenda's actual grid.

A little while later, the end of the game is in sight! In the final turn of a championship game, players get the chance to change their last shots. Both Brenda and Takanori decide to change where they hit! It all comes down to this!



8. Using the numbers below, complete each player's translations so that all of Takanori's shots hit Brenda's ships and two of Brenda's shots miss!

9, 8, 7, 6, 5, 4, 3, 1

Brenda's shot translations

Shot A: 3 right, 3 down

Shot B: ____ right, 4 up

Shot C: 4 right, ____ up

Shot D: 1 right, ____ up

Shot E: ____ left, 1 up

Takanori's shot translations

Shot A: 6 right, ____ down

Shot B: ____ right, 4 down

Shot C: ____ right, 4 up

Shot D: 4 left, 3 down

Shot E: 5 left, ____ down

Boom! Bang! Bang! Crash! Kaboom!

Takanori's five shots smash into Brenda's ships, sinking them all! Some of Brenda's shots splash harmlessly into the water, missing Takanori's ships. Takanori has won! He is the *Shipwreckers* Grand Champion!