

Hat games

There is a traditional type of puzzle in maths where you try to work out who is wearing a red or a blue hat. We are going to simulate some of these puzzles using Post It notes and coins.

Each game needs a master who randomly chooses which hats to put on the players without them seeing.

Game 1	
Players	2
Equipment	1 red hat, 1 blue hat
Set up	The master puts the two hats randomly on the two players.
Aim	Can each player guess their colour hat correctly at the same time? Or if not, in some order?

Game 2	
Players	3
Equipment	2 blue hats, 1 red hat
Set up	The master puts the three hats randomly on the three players.
Aim	Can each player guess their colour hat correctly at the same time? Or if not, in some order?

Game 3	
Players	3
Equipment	2 blue hats, 2 red hats
Set up	The master puts three hats randomly on the three players leaving one spare that no one can see.
Aim	Can each player guess their colour hat correctly at the same time? Or if not, in some order?

Game 4	
Players	3
Equipment	3 red hats and 3 blue hats
Set up	The master puts three hats randomly on the three players leaving three spare that no one can see.
Aim	Can each player guess their colour hat correctly at the same time? Or if not, in some order?

Imagine in a round of Game 4, everyone looked at each other and said "I can see at least one red hat" and then everyone said "I don't know my hat colour". Can you work out everyone's hat colour?

For the next set of games, you will play at the front of the class after working out a **strategy in advance**. You can't communicate once the hats have been placed, you can only guess your hat colour.

For each game imagine there are lots of red and blue hats available. You could practice your strategies by tossing coins – heads and tails instead of red and blue.

Game 1	
Players	2
Set up	The master puts the two hats randomly on the two players.
Aim	Both players guess their hat colour simultaneously – winning if at least one is correct. Can you find a 100% winning strategy, or at least maximise your chance of winning?

Game 2	
Players	3
Set up	The master puts the three hats randomly on the three players.
Aim	All 3 players guess their hat colour simultaneously – winning if at least one is correct. Can you find a 100% winning strategy, or at least maximise your chance of winning?

Game 3	
Players	3
Set up	The master puts the three hats randomly on the three players.
Aim	All 3 players simultaneously either guess their hat colour or pass. They lose if they all pass or there are any incorrect guesses. Can you find a 100% winning strategy, or at least maximise your chance of winning?

Game 4	
Players	4
Set up	Make a line. The master puts a hat on each person so that each person can see all the colours in front of them. Starting from the back, each person guesses a colour out loud.
Aim	Can you find a 100% winning strategy, or at least maximise the number of people who can guess correctly?