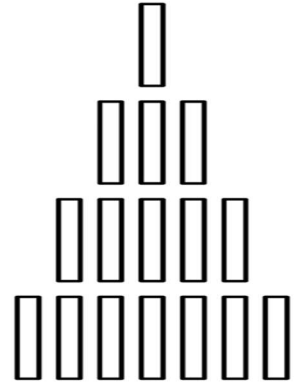


Play to Win

Sheet 1

Exercise 1

- Play 1 game of Nim with a partner, marking or colouring each stick each player removes.
- Play another game and calculate the “Nim sum” for each turn.
- Can you spot any patterns?
- Do you think you’re more likely to win if you go first or second? Why?



Exercise 2—Scenario

Below are the turns that two players take in a game of Nim. In your partners, decide who will be acting out the turns of player 1 and the turns of player 2.

1. Player 1 removes 3 sticks from the 4th row.
 2. Player 2 removes 3 sticks from the 2nd row.
 3. Player 1 removes 2 sticks from the 3rd row.
 4. Player 2 removes 2 sticks from the 4th row.
 5. Player 1 removes 1 stick from the 3rd row.
 6. Player 2 removes 1 stick from the 1st row.
 7. Player 1 removes 1 stick from the 3rd row.
 8. Player 2 removes 1 stick from the 4th row.
 9. Player 1 removes 1 stick from the 4th row.
- Who wins?
 - Calculate the “Nim Sum” for each turn.
 - Can you spot any patterns?
 - How can you use the “Nim Sum” to help you win?
 - After playing this scenario, do you still agree with your answer to part 4 of exercise? Why?

Play to Win

Extension 1

- For the game of Nim you have discussed a pattern and who is likely to win. Now can you find a generalisation about the winner for any number of counters?

Extension 2 (Got It!)

You are now going to play a game similar to 21.

Start with a target of 23.

The first player chooses a number 1 to 4.

Players take turns to add whole numbers from 1 to 4 to the running total.

The player who hits the target of 23 wins.

- Play the game several times.
- Can you find a winning strategy?
- Does it matter who goes first?
- What is the connection between Nim and Got It!?
- Now change the target number, but keep the numbers 1, 2, 3 and 4.
- Does this alter whether it is preferable to go first or second?
- Can you write a mathematical statement to link the target number to the winning player?

Extension 3 (Create)

- Can you create a game like Nim, Got It! Or 21 and create a winning strategy?