**Nim** is an ancient game with many variations. In each variation, players take turns removing counters from one or more piles.

The variations in which all of the counters begin in one pile are sometimes called "subtraction games."

The Nim variation we play in book 1B starts with 20 counters.
Players are allowed to remove 1, 2, or 3 counters at a time.
The goal is to pick up the last counter.

To discover the winning strategies, it usually helps to think about the end of the game. For example, you've probably noticed that if there are 1, 2, or 3 counters left and it's your turn, you can win by picking up all the counters.
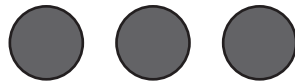
What if there are 4 counters and it's your turn? What can you do?

No matter how many counters you remove, your opponent will always be able to take the remaining counter(s) to win the game.

We've learned something important!

If you can **leave** 4 counters for your opponent, you can always win!

So, if there are 5, 6, or 7 counters left and it's your turn, you should take enough so that your opponent is left with 4 counters.

What if there are 8 counters and it's your turn? What can you do?

Think before you read the answer on the next page.

If there are 8 counters and you remove 1, 2, or 3 counters, you will leave your opponent with 7, 6, or 5 counters.

Your opponent can then take enough counters to leave you with 4. Unless your opponent makes a mistake, you will lose.

We've now found two numbers that are bad when it's your turn: 4 and 8.

But, if you can **leave** 8 counters for your opponent, you can always win!

So, if there are 9, 10, or 11 counters left and it's your turn, you should take enough so that your opponent is left with 8 counters.

What can you do if there are 12 counters and it's your turn?

If there are 12 counters and you remove 1, 2, or 3 counters, you will leave your opponent with 11, 10, or 9 counters.

No matter what you do, your opponent can take enough counters to leave you with 8, and we've already learned that 8 counters is a bad place to be in this game.

We've found three numbers that are bad when it's your turn: 4, 8, and 12.

If you can leave 4, 8, or 12 counters for your opponent, you can always win!

Is there a pattern? What do you think the next "bad" number will be?

In a game that starts with 20 counters, is it better to go first or second?

We talk more about Nim in book 3C, which has its own printable for Nim.

beastacademy.com/pdf/3C/printables/Nim.pdf