# Lesson 3: Different Types of Sequences

- Let's look at other types of sequences.

## 3.1: Remembering Function Notation

Consider the function $f$ given by $f(n) = 3n - 7$. This function takes an input, multiplies it by 3, then subtracts 7.

Evaluate mentally.

- $f(10)$

- $f(10) - 1$

- $f(10 - 1)$

- $f(5) - f(4)$

## 3.2: Three Sequences

Here are the values of the first 5 terms of 3 sequences:

- $A$: 30, 40, 50, 60, 70, . . .

- $B$: 0, 5, 15, 30, 50, . . .

- $C$: 1, 2, 4, 8, 16, . . .

1. For each sequence, describe a way to produce a new term from the previous term.

2. If the patterns you described continue, which sequence has the second greatest value for the 10$^{th}$ term?

3. Which of these could be geometric sequences? Explain how you know.

**Are you ready for more?**

Elena says that it's not possible to have a sequence of numbers that is *both* arithmetic and geometric. Do you agree with Elena? Explain your reasoning.

## 3.3: Representing a Sequence

Jada and Mai are trying to decide what type of sequence this could be:

| term number | value |
|:---:|:---:|
| 1 | 2 |
| 2 | 6 |
| 5 | 18 |

Jada says: "I think this sequence is geometric because in the value column each row is 3 times the previous row."
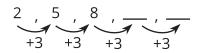
Mai says: "I don't think it is geometric. I graphed it and it doesn't look geometric."

Do you agree with Jada or Mai? Explain or show your reasoning.

## Lesson 3 Summary

Consider the sequence 2, 5, 8, . . . How would you describe how to calculate the next term from the previous?

In this case, each term in this sequence is 3 more than the term before it.

$$2 \underset{+3}{,} 5 \underset{+3}{,} 8 \underset{+3}{,} \underline{\quad} \underset{+3}{,} \underline{\quad}$$

A way to describe this sequence is: the starting term is 2 and the $\text{current term} = \text{previous term} + 3$.

This is an example of an **arithmetic sequence**. An arithmetic sequence is one where the value of each term is the value of the previous term with a constant added. If you know the constant to add, you can use it to find other terms.

For example, each term in this sequence is 3 more than the term before it. To find this constant, sometimes called the *rate of change* or *common difference*, you can subtract consecutive terms. This can also help you decide whether a sequence is arithmetic.

For example, the sequence 3, 6, 12, 24 is not an arithmetic sequence because $6 - 3 \neq 12 - 6 \neq 24 - 12$. But the sequence 100, 80, 60, 40 is because if the differences of consecutive terms are all the same: $80 - 100 = 60 - 80 = 40 - 60 = \text{-}20$. This means that the rate of change is -20 for the sequence 100, 80, 60, 40.

It is important to remember that while the last two lessons have introduced geometric and arithmetic sequences, there are many other sequences that are neither geometric nor arithmetic.