Preliminaries and Objectives

**Preliminaries**
- Represent data
- Equations of Lines
- Sequences

**Objectives**
- Find values of an arithmetic sequences defined explicitly
- Find values of an arithmetic sequences defined recursively
- Find a recursive formula for an arithmetic sequence
- Find an explicit formula for an arithmetic sequence

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**Constant Growth**

<table>
<thead>
<tr>
<th>Day</th>
<th>Boxes</th>
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<tbody>
<tr>
<td>0</td>
<td>37</td>
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<tr>
<td>1</td>
<td>40</td>
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<tr>
<td>2</td>
<td>43</td>
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<td>3</td>
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- How many boxes are in the warehouse after Day 9?
- After how many days will the warehouse have 100 boxes?
- Can we find a general formula for the number of boxes after Day *n*?

\[ a_n = \text{number of boxes after Day } n \]

- \[ a_1 = 40, \ a_2 = 43, \ a_3 = 46, \ a_4 = 49 \]
- \[ a_{n+1} = a_n + 3, \ a_1 = 40, \ a_0 = 37 \]
- \[ a_{n+1} = a_n + d \]
- \[ a_n = 3n + 37 \]
- \[ y = mx + b \]
### Constant Growth

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How many boxes are in the warehouse after Day 9?

\[
a_9 = 3(9) + 37 = 64
\]

### After how many days will the warehouse have 100 boxes?

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<td>100</td>
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Find \( n \), if \( a_n = 100 \)

\[
100 = 3(n) + 37
\]
\[
100 - 37 = 3n
\]
\[
63 = 3n
\]
\[
\frac{63}{3} = n
\]
\[
21 = n
\]

### Recursive Definition

Let \( a_1 = 9 \) and \( a_{n+1} = a_n + 2 \)

9 11 13 15 17 19 21

### Explicit Definition

Let \( a_n = -5n + 13 \)

8 3 -2 -7 -12 -17 -22
Finding the formulas

Given the arithmetic sequence

\[
\begin{align*}
57 & \quad 54 & \quad 51 & \quad 48 & \quad 45 & \quad 42 & \quad 39 \\
\end{align*}
\]

find a recursive formula and an explicit formula.

Recursive Formula:
\[a_0 = 57, \quad a_{n+1} = a_n - 3\]

Explicit Formula:
\[a_n = -3n + 57\]

Example

If an arithmetic sequence contains the terms \(a_7 = 52\) and \(a_{12} = 82\), find a recursive formula and an explicit formula for \(a_n\).

\[
\begin{array}{cccccccccccc}
10 & 16 & 22 & 28 & 34 & 40 & 46 & 52 & 58 & 64 & 70 & 76 & 82 & \ldots \\
\hline
\end{array}
\]

\[d = \frac{82 - 52}{12 - 7} = 6\]

Recursive definition: \(a_1 = 16; \quad a_{n+1} = a_n + 6\)

Explicit Definition: \(a_n = 6n + 10\)

Recap

- Recursive definition: State the value of \(a_1\) and the recursion \(a_{n+1} = a_n + d\)
- Explicit definition: \(a_n = d(n) + a_0\)