Notes for Lesson 4-6: Arithmetic Sequences

4-6.1 - Identifying arithmetic sequences

Vocabulary:
- Sequence - a list of numbers that often form a pattern
- Term - an element or number in the sequence
- Arithmetic sequence - a sequence whose successive terms differ by the same nonzero number or common difference
- Common difference - in an arithmetic sequence, the nonzero constant difference of any term and the previous term

A sequence is a list of numbers that forms a pattern such as 3, 6, 9, 12 … and each number within the sequence is called a term.

If the pattern involves adding or subtracting the same number every time to get to the next term then it is called an arithmetic sequence and the common number to be added or subtracted if the common difference (d).

Examples: Tell if each is an arithmetic sequence and if so find the common difference.

A. 12, 8, 4, 0, … Yes, $d = -4$
B. 1, 4, 9, 16, … No
C. $-22, -13, -4, 5, \ldots$ yes, $d = +9$

4-6.2 - Finding the nth term of an arithmetic sequence

To find the nth (specific) term of a sequence with a common difference you can use the formula $a_n = a_1 + (n-1)d$ where $a_n$ is the term that you are looking for, $a_1$ is the first term in the sequence and $d$ is the common difference of the sequence.

Examples:

A. find the 22nd term: 5, 2, −1, −4, ...

   The common difference is −3, the first term is 5 so,
   $a_{22} = 5 + (22 - 1)(-3)$
   $a_{22} = 5 + 21(-3)$
   $a_{22} = 5 - 63$ The 22nd term is −58
   $a_{22} = -58$
B. Find the 15th term if \( a_1 = 7 \) and \( d = 3 \)

\[
a_{15} = 7 + (15-1)(3) \\
= 7 + 14(3) \\
= 7 + 42 \\
= 49 \\
\]
The 15th term is 49

C. 18th term: \( a_1 = -2; \) \( d = -3 \)

\[
a_{18} = -2 + (18-1)(-3) \\
= -2 + 17(-3) \\
= -2 - 51 \\
= -53 \\
\]
The 18th term is -53

4-6.3 - Application

The odometer on a car read 60,473. Every day the car is driven 54 miles. What is the odometer reading 20 days later.

\[
a_1 = 60,473 \quad d = 54 \quad \text{you will need the 21st term as the first is actually on day zero} \\
\]

\[
a_{21} = 60473 + (21-1)(54) \\
= 60473 + 20(54) \\
= 60473 + 1080 \\
= 61553 \\
\]

Practice B #'s 1, 3, 5, 7, 9, 11