Notes for Lesson 4.3 Extension: Arithmetic Sequences

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

If the pattern involve 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,...   yes, d 9

- 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,
        $a_{22} = 5 + (22-1)(-3)$
        $a_{22} = 5 + (21)(-3)$ The 22nd term is -58
        $a_{22} = 5 + -63$
        $a_{22} = -58$

B. Find the 15th term if $a_1 = 7$ and $d = 3$

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

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

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

- **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.

$a_1 = 60,473 \quad d = 54$ you will need the 21st term as the first is actually on day zero

$$a_{21} = 60473 + (21 - 1)(54)$$
$$a_{21} = 60473 + (20)(54)$$
$$a_{21} = 60473 + 1080$$
$$a_{21} = 61553$$