Math 230 Session 38 **Practice with Difference Equations**

1. **Consider the sequence: 2, 4, 6, 8, …**

   a. **The first term is _____.** **We will denote this by $a_1 = 2$.**
   b. **The second term is ____. We will denote this by $a_2 =$ ____.**
   c. **The third term is _____. We will denote this by $a_3 =$ ____.**
   d. **The fourth term is the third term plus ____. We write $a_4 = a_3 +$ ____.**
      So, $a_4 =$ ____.
   e. **The fifth term is the fourth term plus ____. We write $a_5 = a_4 +$ ____.**
      So, $a_5 =$ ____.
   f. **$a_6 = a_5 +$ ____ = ____.**
   g. **The next term in the sequence is always the current term plus ____.**
   h. **The nth term is the (n-1)st term plus ____.**
   i. **$a_n = a_{n-1} +$ ____.** ***(This is called a difference equation.)***
   j. **We could have said, the current term is the previous term plus ____.**
   k. **The (n+1)st term is the nth term plus ____.**
   l. **$a_{n+1} = a_n +$ ____.** ***(This is also a difference equation.)***

   This sequence can be defined by recursion via a difference equation:
   $a_1 = 2$ and,
   $a_n = a_{n-1} + 2$ for $n \geq 2$
   or equivalently, by
   $a_1 = 2$ and,
   $a_{n+1} = a_n + 2$ for $n \geq 1$.

   This sequence can also be defined explicitly by the functional equation $a_n = 2n$.

2. **Consider the sequence in the following table.**

n	1	2	3	4	5	6	7
b_n	3	8	13	18	23		

   a. Complete the table.

   b. Define the sequence recursively using a difference equation.

   c. Define the sequence explicitly using a functional equation.

3. **Consider the sequence in the following table.**

n	0	1	2	3	4	5	6	7	8
c_n	5	7	13	23	37	55			

a. Complete the table.

b. Define the sequence recursively using a difference equation.

c. Define the sequence explicitly using a functional equation.

4. **Consider the sequence in the following table.**

n	0	1	2	3	4	5	6	7	8
d_n	32	40	50	62.5	78.1	97.7			

a. **Assume that the values of d_n are rounded to the nearest 0.1 and complete the table.**

b. **Define the sequence recursively using a difference equation.**

c. **Define the sequence explicitly using a functional equation.**