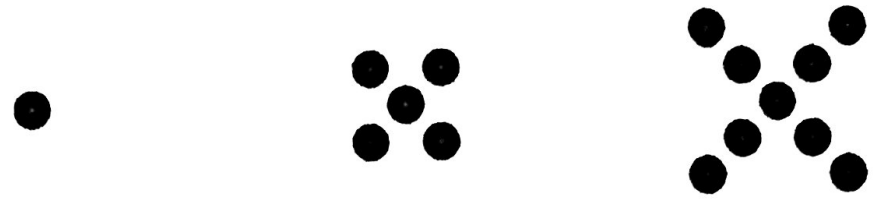
11.1 Arithmetic Sequences



Phase 1 Phase 2 Phase 3

1) Describe the pattern that is happening per phase with the diagram above.

Adding 4 dots each time

2) How many dots will there be at phase 4? How many dots will there be at phase 10? What about phase 26?

Phase 4: 9 + 4 = 13 dots

3) Write an equation the describes the pattern.

$y = 1 + 4(x-1)$, $y = 4x - 3$

Sequence: Ordered pattern of numbers

Explicit Formula: Formula that you can plug in directly to find any term

Recursive Definition: Formula based on previous term

Notation

a_n	nth term ex: a_2 is 2nd term	a_{n-1}	Previous term

4) Use the explicit formula to find the first 6 terms of the sequence.

a) $a_n = 3n - 2$

n	1	2	3	4	5	6
a_n	1	4	7	10	13	16

3(1)-2 3(3)-2

b) $a_n = \frac{1}{2}n^3 - 1$

n	1	2	3	4	5	6
a_n						

We will be concentrating on two different sequences in this course. The first is an **ARITHMETIC SEQUENCE.** In an arithmetic sequence, the difference between 2 consecutive terms is always the same number. (For example, in the sequence 10, 16, 22, 28, 34, ... the common difference is 6). You can build an arithmetic sequence by adding the same number to each term.

ARITHMETIC SEQUENCES	
Recursive Definition	**Explicit Formula**
$a_n = a_{n-1} + d$ d = common difference (what you add each time) *need to define a_1	$a_n = a_1 + d(n-1)$

5) Determine if the sequence below is an arithmetic sequence. If it is find the common difference.

a) 3, 6, 9, 12, 15, ...

$a_1 = 3$

$d = 3$

b) $-26, -39, -42, -56, -59, \ldots$

Not arithmetic

6) Write the explicit formula and recursive definition for each sequence. Then find the 100th term in the sequence.

a) 6, 11, 16, ...

$a_1 = 6$

$d = 5$

Recursive: $a_n = a_{n-1} + 5$, $a_1 = 6$

Explicit: $a_n = 6 + 5(n-1)$

b) 17, -3, ...

$a_1 = 17$

$d = -20$

R: $a_n = a_{n-1} - 20$, $a_1 = 17$

E: $a_n = 17 - 20(n-1)$

$a_{100} = 17 - 20(100-1)$

$= 17 - 20(99)$

$= -1963$

7) Find the missing terms of the arithmetic sequence. Then write the explicit formula and recursive definition for each sequence.

a) -15, -7, 1, ...

8 8

16

b) 25, 7.5, -10, -27, -44.5 ...

-35

-17.5 -17.5

a) 100, 94, 88, 82, ... ?

-18

-6 -6 -6

b) 80, 95, 110, 125, ... ?

45

15 15 15

8) The numbers of seats in a section of an arena form an arithmetic sequence. Row 1 had 14 seats and row 2 has 16 seats.

a) Find how many seats are in row 7.

$a_1 = 14$, $d = 2$

$a_n = 14 + 2(n-1)$

$a_7 = 14 + 2(7-1) = 26$

b) If the last row in the section has 42 seats. How many rows are in the section?

$42 = 14 + 2(n-1)$

$\frac{28}{2} = \frac{2(n-1)}{2}$

$14 = n - 1$

$n = 15$ rows

9) A student deposits the same amount of money into her bank account each week. At the end of the 2nd week she has $30 and at the end of the third week she has $45 in her account. How much will she have in her account at the end of the ninth week? How much will she have at the end of the year?

a) Write the explicit formula for the sequence. Then write a linear equation that represents the situation.

b) How are the two equations connected? Feel free to graph to help you.