

Name: \_\_\_\_\_

## UNIT 7 LEARNING GUIDE – SEQUENCES

## INSTRUCTIONS:

Using a pencil, complete the following questions as you work through the related lessons. Show ALL of your work as is explained in the lessons. Do your best and always ask questions if there is anything that you don't understand.

### 7.1 INTRODUCTION TO SEQUENCES

1. Find the common difference in each sequence. *Reminder: When a sequence is decreasing, that means that a negative number is being added to each successive number; therefore, the common difference will be negative.*

Ex. 10, 21, 32, 43, 54, 65 ...

b. 7, 4, 1, -2, -5, -8 ...

**Common difference = 11**

a. 5, 14, 23, 32, 41, 50 ...

c. 75, 25, -25, -75, -125 ...

2. Find the common difference then determine the value of the given term in the arithmetic sequence given. *Reminder: The subscript after  $a$  is the index or counter, referring to the placement of the term in the sequence. Ex.  $a_4$  means the 4<sup>th</sup> term.*

a) 35, 32, 29, 26, ... $a_5 =$	b) _____, -64, -94, -124, -154 $a_1 =$	c) -7, -9, _____, -13, -15 ... $a_3 =$
d) -3, -23, -43, -63, ... $a_6 =$	e) -30, -40, -50, -60, $a_8 =$	f) 9, 14, 19, _____, 29 ... $a_4 =$

## 7.2 ARITHMETIC SEQUENCES

1. Use the sequence below to find the value of  $a_n$ . *Reminder:  $a_n$  is used to denote a general term.*

**16, 11, 6, 1, -4, -9, -14, -19 ...**

**Ex.** Find  $a_n$  when  $n = 3$                        $a_3 = 6$

- a. Find  $a_n$  when  $n = 1$
- b. Find  $a_n$  when  $n = 7$
- c. Find  $a_n$  when  $n = 4$

2. Use the formula for arithmetic sequences to determine the value of each term. *Hint: Rewrite the formula first before solving each problem.*

$$a_n = a_1 + (n - 1)d$$

**Ex.** Find the 16<sup>th</sup> term in the  
sequence 6, 9, 12, 15, 18 ...

$$a_n = a_{16} \quad n = 16 \quad d = 3 \quad a_1 = 6$$

$$a_n = a_1 + (n - 1)d$$

$$a_{16} = 6 + (16 - 1)3$$

$$a_{16} = 6 + (15)3$$

$$a_{16} = 6 + 45$$

$$a_{16} = 51$$

- a. Find the 30<sup>th</sup> term in the sequence 55, 59, 63, 67, 71 ...  
 $a_n = \quad n = \quad d = \quad a_1 =$

- b. Find the 19<sup>th</sup> term in the sequence 109, 100, 91, 82, 73 ...

$$a_n = \quad n = \quad d = \quad a_1 =$$

- c. Find the 24<sup>th</sup> term in the sequence -13, -11, -9, -7, -5 ...

$$a_n = \quad n = \quad d = \quad a_1 =$$

- d. Find the 45<sup>th</sup> term in the sequence 20, 10, 0, -10, -20, -30...

- e. Find the 27<sup>th</sup> term in the sequence -544, -547, -550, -553, -556 ...

3. Write an equation for the  $n^{\text{th}}$  term of the following sequences.

$$a_n = a_1 + (n - 1)d$$

Ex. -8, -6, -4, -2, 0 ...

$$a_n = a_1 + (n - 1)d$$

$$a_1 = -8, \quad d = 2$$

$$a_n = -8 + (n - 1)2$$

a. 40, 55, 70, 85, 100 ...

b. 12, 4, -4, -12, -20 ...

c. -50, -45, -40, -35, -30 ...

4. Use the formula for arithmetic sequences to solve the following problems.

$$a_n = a_1 + (n - 1)d$$

a. If  $a_{32} = 640$  and the common difference is 4, find the first term in the series.

$$a_n = \quad n = \quad d =$$

b. If  $a_{17} = -4$  and the common difference is 6, find the first term in the series.

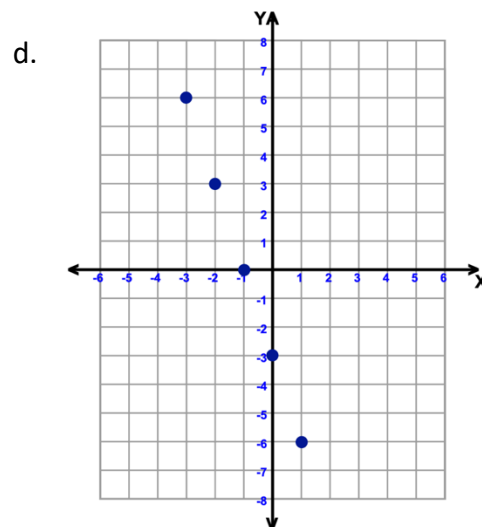
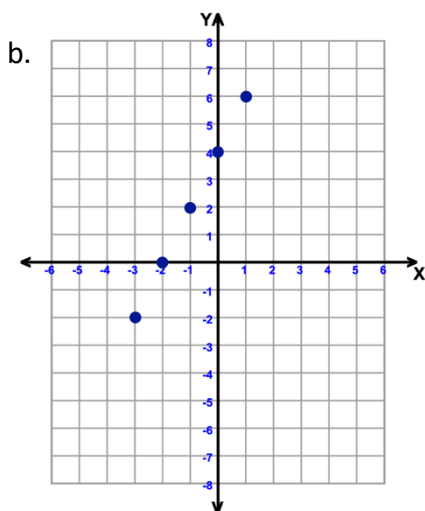
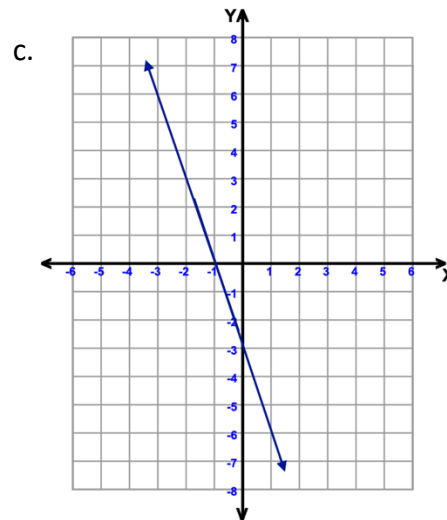
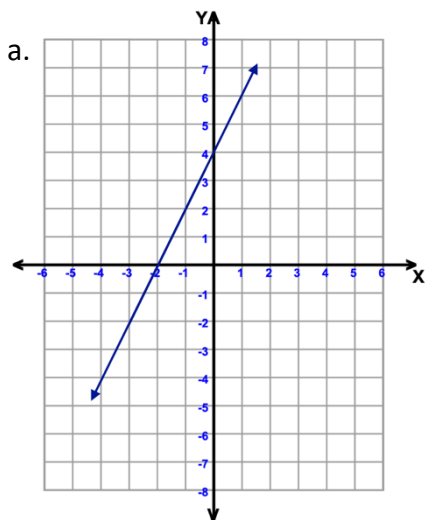
$$a_n = \quad n = \quad d =$$

- c. If  $a_{29} = 1541$  and the common difference is 35, find the first term in the series.
- d. If  $a_{100} = 54.5$  and the common difference is 0.3, find the first term in the series.
5. Solve the following word problems. *Hint: Begin by identifying which term in the arithmetic sequence formula is unknown and identify the value of each known term.*
- a. Liu purchases a new computer for \$929.00. Every year, the value of the computer depreciates by \$78.00. What is the value of the computer 8 years after its purchase (ie. at the start of the ninth year)?
- b. A university student deposits \$500 into a new savings account. He decides to deposit \$40 into this account every **month** from now on. How much will he have deposited in total after 3 years?

- c. A patient is told to lift no more than 2 kg during the first week after her surgery. Every week, she can increase the weight that she lifts by 3 kg. How many weeks after surgery will she be able to work-out and lift 32 kg?
- d. André planted a cedar hedge 15 years ago (currently it's the start of the 16<sup>th</sup> year). The hedge is now 3 metres high. The cedars grew an average of 12 cm per year. How tall were the cedars when he planted them?

### 7.3 ARITHMETIC SEQUENCES & LINEAR RELATIONS

1. Identify each graph as a linear relation or an arithmetic sequence, then determine the equation for each graph. *Reminder: The equation for a linear relation takes the form  $y = mx + b$ , while the equation for an arithmetic sequence takes the form  $a_n = a_1 + (n - 1)d$ .*



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## UNIT 7 – ANSWER KEY

### SECTION 7.1

1. a. 9 b. -3 c. -50
2. a. -3, 23 b. 30, 34 c. -2, 11 d. -20, -103 e. 10, 100 f. 5, 24

### SECTION 7.2

1. a. 16 b. -14 c. 1
2. a. 171 b. -53 c. 33 d. -420 e. -622
3. a.  $a_n = 40 + (n - 1)15$  b.  $a_n = 12 + (n - 1)(-8)$  c.  $a_n = -50 + (n - 1)5$
4. a. 516 b. -100 c. 561 d. 24.8
5. a. \$305 b. \$1940 c. 11 weeks d. 120 cm OR 1.20 m

### SECTION 7.3

1. a. Linear equation,  $y = 2x + 4$  b. Arithmetic sequence,  $a_n = -2 + (n - 1)2$   
c. Linear equation,  $y = -3x - 3$  d. Arithmetic sequence,  $a_n = 6 + (n - 1)(-3)$