



# Sample Lesson & Activity

This lesson and activity are meant for reference only and are not to be reproduced in any way.

*Lesson:* A6.8 Arithmetic Sequences

*Activity:* A6.8 Arithmetic Sequence Cards

Because our materials reach thousands of students across several districts, we intentionally make them robust so they can be cut down and tailored to individual students. We never expect a Saga Fellow to cover everything within a lesson. We include an ample number of problems and tutoring strategies so Fellows can pick and choose what works best to meet their students' needs.

Activities are a way for students to dig into the concepts conceptually from a different point of view. Our activities are intentionally more open-ended than our problem sets, with many options for implementing to meet student needs.

## Standards for Math Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.













5. The following numbers are the start of an arithmetic sequence with common difference -20. Find the next four terms in the sequence. Explain how you found your response.

25, 5, ...

-15, -35, -55, -75

The common difference is -20, so if we continue to apply this common difference by subtracting 20 four times, we get -15, -35, -55, and -75.

6. a) The pattern below models a sequence. Find the common difference between the number of rings.

$$d = 1$$

b) Graph the sequence modeled by the pattern.

7. Find the common difference for the sequence represented by each table.

a)

n	1	2	3	4	5
$a_n$	16	15	14	13	12

$$d = -1$$

b)

n	1	2	3	4
$a_n$	$\frac{3}{4}$	$\frac{5}{4}$	$\frac{7}{4}$	$\frac{9}{4}$

$$d = \frac{2}{4} = \frac{1}{2}$$

c)

n	1	2	3	4	5
$a_n$	$2\pi$	$4\pi$	$6\pi$	$8\pi$	$10\pi$

$$d = 2\pi$$

8. Determine the next three terms in the sequence modeled in each figure:

a)

$$a_5 = 20; a_6 = 24; a_7 = 28$$

b)

$$\begin{aligned} a_5 &= 12 \text{ smileys} \\ a_6 &= 14 \text{ smileys} \\ a_7 &= 16 \text{ smileys} \end{aligned}$$

Image sources: Big Ideas Math



## Level 2

9. Barrett says a common difference that's a negative means the sequence is decreasing. Is he correct? If so, explain. If not, give a counter example.

*Yes, Barrett is correct. If the common difference is negative, then we must add a negative number to get from one term to the next term of the sequence, making the numbers decrease.*

10. Find the missing terms in each arithmetic sequence.

a) 26, 35, 44, 53, ...

$$\text{common difference} = \frac{53 - 35}{2} = \frac{18}{2} = 9$$

$$\text{OR } 35 + 2d = 53 \rightarrow d = 9$$

b) 2, 6, 10, 14, ...

$$\text{common difference} = \frac{14 - 2}{3} = \frac{12}{3} = 4$$

$$\text{OR } 2 + 3d = 14 \rightarrow d = 4$$

c) 3, 12, 21, 30, ...

$$\text{common difference} = \frac{21 - 3}{2} = \frac{18}{2} = 9$$

$$\text{OR } 3 + 2d = 21 \rightarrow d = 9$$

d) 3, 9, 15, 21, ...

$$\text{common difference} = \frac{21 - 3}{3} = \frac{18}{3} = 6$$

$$\text{OR } 3 + 3d = 21 \rightarrow d = 6$$

11. Find the 23<sup>rd</sup> term of the sequence:

**19.5, 19.9, 20.3, 20.7, ....**

$$19.9 - 19.5 = 20.3 - 19.5 = 20.7 - 20.3 = 0.4$$

*Arithmetic sequence, common difference = 0.4*

$$a_n = 19.5 + 0.4(n - 1)$$

$$a_{23} = 19.5 + 0.4(23 - 1)$$

$$a_{23} = 28.3$$

12. A molecule of water has two hydrogen atoms and one oxygen atom.

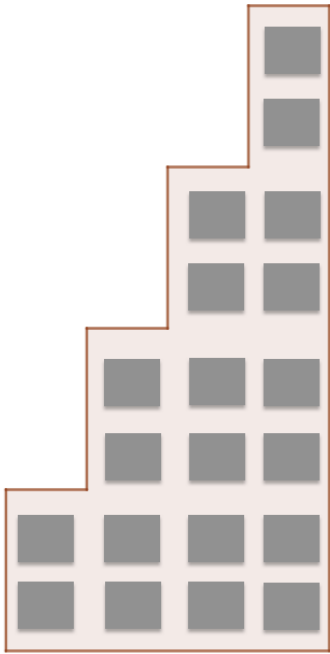
a) Write an equation to model the total number of atoms,  $a$ , based on the number of molecules,  $n$ .

$$a_n = 3 + 3(n - 1) \quad \text{OR} \quad a_n = 3n$$

b) Find the number of atoms in 35 water molecules.

$$a_{35} = 3 + 3(35 - 1) = 3 + 3(34) = 105$$

13. A side of an apartment building is shaped like a staircase. The windows are arranged in columns. How many windows are in the tallest column if the apartment building has 15 columns?



Pattern: 2, 4, 6, 8, ...

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

$$a_{15} = 2 + 2(15 - 1)$$

$$a_{15} = 2 + 2(14)$$

$$a_{15} = 2 + 28$$

$$a_{15} = 30$$

OR

$$a_n = 2n$$

$$a_{15} = 2(15) = 30$$

14. Estephanie just passed her road test and got her driver's license. She works at a movie theater part-time after school and wants to save up to buy her own car. On the first week, she saves \$360 from her paycheck and then each week after, she saves \$200 of her paycheck for her new car. How much money will Estephanie have saved after 12 weeks?

$$a_n = 360 + 200(n - 1)$$

$$a_{12} = 360 + 200(12 - 1)$$

$$a_{12} = 360 + 200(11)$$

$$a_{12} = 360 + 2200$$

$$a_{12} = 2560$$

*Estephanie has \$2,560 saved for her new car after 12 weeks.*

15. Trevor is volunteering with an organization called Rock the Vote to help members of his community register to vote. On the first day, Trevor's team helped 26 community members register and pledge to vote in the upcoming election. Every day after the first, they help 3 more people register and pledge to vote. How many community members will be registered to vote after 25 days?

$$a_1 = 26$$

$$d = 3$$

$$a_n = 26 + 3(n - 1)$$

$$a_{25} = 26 + 3(25 - 1)$$

$$a_{25} = 26 + 3(24)$$

$$a_{25} = 26 + 72$$

$$a_{25} = 98$$

98 community members will be registered to vote after 25 days.

16. Nadia is at her community's winter carnival. She is excited because this year there is a Ferris wheel, drop tower, and bumper cars. There is no fee to enter the carnival. However, it costs \$3.00 for the first ride and then \$1.50 for each additional ride. Nadia has \$20 to spend at the carnival. If Nadia goes on 10 rides, will she have enough money left over to buy funnel cake that costs \$2.50?

$$a_1 = 3$$

$$d = 1.5$$

$$a_n = 3 + 1.5(n - 1)$$

$$a_{10} = 3 + 1.5(10 - 1)$$

$$a_{10} = 3 + 1.5(9)$$

$$a_{10} = 3 + 13.5$$

$$a_{10} = 16.5$$

Nadia will spend \$16.50 after 10 rides.  
 $\$20 - \$16.5 = \$3.50$  so she will have enough money to buy the funnel cake.

17. Matthias solved the following problem as shown. Did he do it correctly? If so, explain his work. If not, explain and correct his error.

Fill in the missing term in the arithmetic sequence  
 2.2, \_\_\_\_\_, 6, ....

$$\frac{2.2 + 6}{2} = \frac{2.8}{2} = 1.4$$

The missing term is 1.4.

Matthias set up the problem correctly using the midpoint formula, because the missing term must be exactly in the middle of 2.2 and 6. However, he incorrectly added 2.2 and 6. His answer should have been:

$$\frac{2.2 + 6}{2} = \frac{8.2}{2} = 4.1$$

We can check our answer by finding the common difference between our three terms:

$$4.1 - 2.2 = 1.9$$

$$6 - 4.1 = 1.9 \checkmark$$

18. Diana says you only need two sequential terms of any arithmetic sequence to be able to write an equation for the sequence. Do you agree or disagree? Explain or show your reasoning.

Diana is right, given that we know that it is an arithmetic sequence. With two sequential terms, we can find the common difference. For example, for the sequence 4, 8, ...  $d = 4$  and  $a_1 = 4$ . However, if we are not told that this is an arithmetic sequence, then the pattern may be to multiply by 2, making the sequence 4, 8, 16, 32, ... Without knowing the type of sequence, we could not write an equation to accurately model it.

19. Determine if each models an arithmetic sequence and explain your reasoning. If it is, write the equation of the sequence the pattern is modeling.

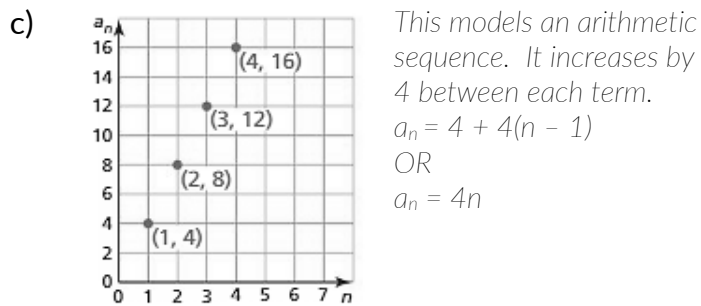
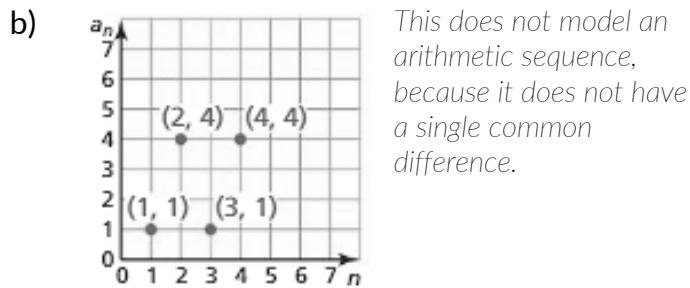
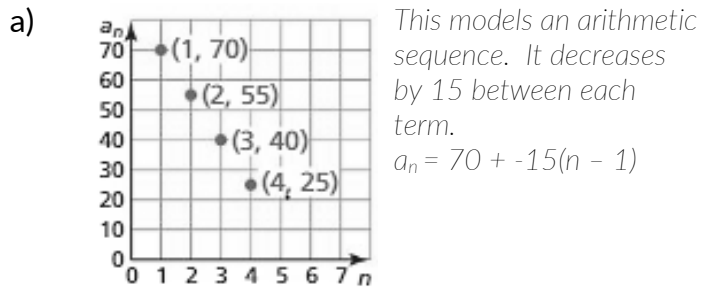
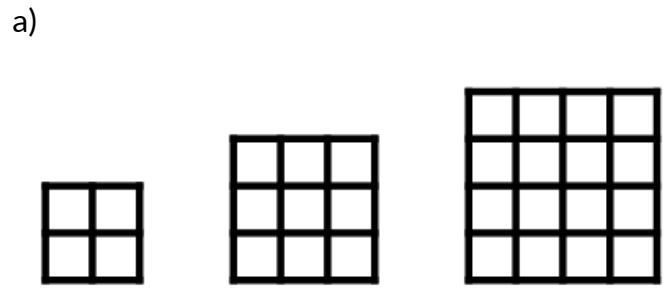
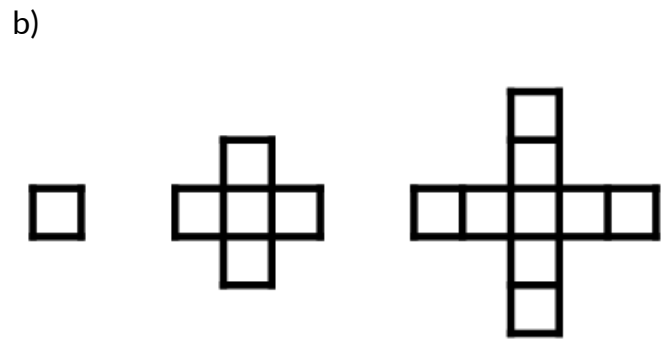


Image sources: Big Ideas Math

20. Determine if each pattern models an arithmetic sequence and explain your reasoning. If it is, write the equation of the sequence the pattern is modeling.



This does not model an arithmetic sequence. Even though we can see that it grows in a predictable manner, there is no common difference. It grows 5 squares, then 7.



This models an arithmetic sequence. It grows by 4 both times.  $a_n = 1 + 4(n - 1)$

### Level 3

21. Jeremiah is using the language learning app Duolingo to try and learn Spanish for fun. During the first week he learns 40 new phrases. After the first week, he learns 25 new phrases per week. How many weeks will it take Jeremiah to learn 3,015 phrases in Spanish?

$$a_1 = 40$$

$$\text{common difference} = 25$$

$$a_n = 40 + 25(n - 1)$$

$$3015 = 40 + 25n - 25$$

$$3015 = 15 + 25n$$

$$3000 = 25n$$

$$120 = n$$

It will take Jeremiah 120 weeks to learn 3,015 phrases.

22. Your school's auditorium has 20 rows total. The first row has 22 seats. The number of seats in each row increases by 6 as you move towards the back of the auditorium. For your graduation, your entire family wants to sit together in the last row.

a) How many family members are you inviting to your graduation?

*Answers will vary.*

b) If 131 seats in the last row of the auditorium are already taken by other families, will your entire family be able to sit together in the last row? Justify your answer.

$$a_1 = 22$$

$$\text{common difference} = 6$$

$$a_n = 22 + 6(n - 1)$$

$$a_{20} = 22 + 6(20 - 1)$$

$$a_{20} = 22 + 6(19)$$

$$a_{20} = 136$$

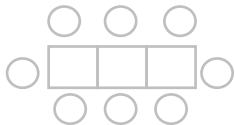
$$136 - 131 = 5 \text{ seats are available in the last row}$$

*Note to Fellows: If students invite 5 or less family members, then their entire family will be able to sit in the last row together.*

23. Gino is planning a big birthday party for his friend Angelina. He needs to rent enough tables for all of the guests. 1 square table seats 4 people. When 2 square tables are pushed together it seats 6 people.

a) How many people would 3 square tables that are pushed together seat? Show or explain your reasoning.

*There are 3 people at each end table and 2 people seated in the middle. 3 tables pushed together seats 8 people.*



b) How many tables would Gino need to push together in order to seat 105 guests at the birthday party?

*Pattern: 4, 6, 8...*

$$a_n = 4 + 2(n - 1)$$

$$105 = 4 + 2n - 2$$

$$105 = 2 + 2n$$

$$103 = 2n$$

$$n = 51.5$$

*Gino needs to rent 52 tables to seat 105 guests*

c) Will there be any extra seats? If so, how many?

$$a_n = 4 + 2(n - 1)$$

$$a_{52} = 4 + 2(52 - 1)$$

$$a_{52} = 4 + 2(51)$$

$$a_{52} = 4 + 102$$

$$a_{52} = 106$$

*There will be 1 extra seat.*

24. Yolanda is trying to become an influencer on Instagram. After the first month, Yolanda will have 30,000 followers. Every month after the first, she gains 1,250 more followers.

a) How many followers will Yolanda have after 6 months?

$$a_1 = 30,000$$

$$d = 1,250$$

$$a_n = 30,000 + 1,250(n - 1)$$

$$a_6 = 30,000 + 1,250(6 - 1)$$

$$a_6 = 30,000 + 1,250(5)$$

$$a_6 = 30,000 + 6,250$$

$$a_6 = 36,250$$

*In 6 months, Yolanda will have 36,250 followers on Instagram.*

b) Yolanda wants to be an influencer for Nike. She needs to have 100,000 Instagram followers before Nike will partner with her. How many months will it take Yolanda to have enough followers to become an influencer for Nike?

$$a_n = 30,000 + 1,250(n - 1)$$

$$100,000 = 30,000 + 1,250(n - 1)$$

$$100,000 = 30,000 + 1,250n - 1,250$$

$$100,000 = 28,750 + 1,250n$$

$$71,250 = 1,250n$$

$$57 = n$$

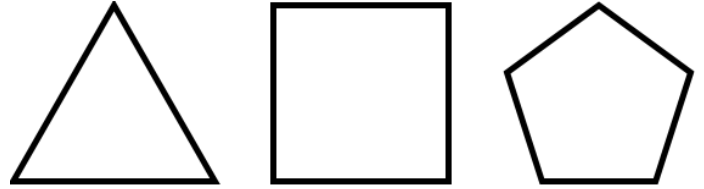
*It will take Yolanda 57 months to have enough followers to become an influencer for Nike.*

25. Create your own arithmetic sequence with a common difference of 4.5. List at least 3 terms. Explain how we know your sequence is an arithmetic sequence.

Answers will vary. Sample response:  
1, 5.5, 10, ...

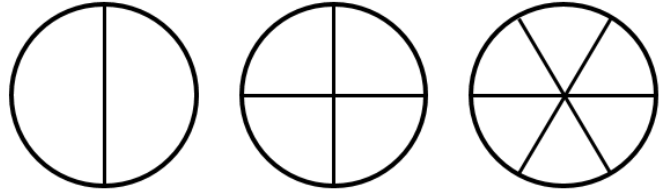
26. Describe the 15<sup>th</sup> figure for each pattern.

a)



Number of Sides =  $3 + 1(n - 1)$ ;  $a_{15} = 3 + 1(15 - 1) = 17$   
The 15<sup>th</sup> figure will be a 17<sup>th</sup> sided regular polygon.

b)



Diameters Drawn =  $1 + 1(n - 1)$ ;  
 $a_{15} = 1 + 1(15 - 1) = 15$   
The 15<sup>th</sup> figure will be a circle with 15 diameters drawn in.

27. This month Juanita listened to 12 new songs on Spotify because she wants to expand her music collection. She decides that she will listen to 15 new songs every month. How long will it take Juanita to listen to at least 500 new songs?

$$a_1 = 12$$

common difference = 15

$$a_n = 12 + 15(n - 1)$$

$$500 = 12 + 15n - 15$$

$$500 = -3 + 15n$$

$$503 = 15n$$

$$33.5 = n$$

It will take Juanita 34 months to listen to at least 500 new songs.

28. Approximately 1.6 million people in the United States do not have regular access to clean drinking water and sanitation necessities such as toilets and showers. However, it takes 1,800 gallons of water to produce 1 pound of beef.

a) Every McDonald's Big Mac uses one-half pound of beef. If one McDonald's restaurant in Washington DC sells 148 Big Macs today and then 175 Big Macs every day after, then how many gallons of water will the McDonald's use after 1 week?

*1,800 gallons per pound of beef*

*1,800(0.5) = 900 gallons per half pound of beef*

*Day 1: 148(900) = 133,200 gallons*

*Common difference: 175(900) = 157,500 gallons*

$$a_n = 133,200 + 157,500(n - 1)$$

$$a_7 = 133,200 + 157,500(7 - 1)$$

$$a_7 = 1,078,200$$

*The McDonald's will use 1,078,200 gallons of water in 1 week.*

b) Across the entire United States, an average of 1.5 million Big Macs are sold every day. How many gallons of water does the U.S. use for Big Macs every day?

*1,500,000(0.5) = 750,000 pounds of beef per day*

*1,800(1,750,000) = 1,350,000,000*

*1.35 billion gallons of water is used for Big Macs every day in the United States.*

c) Are you surprised by your answer to part b)? Do you view the water footprint left by the meat industry as a problem? Explain why or why not.

*Answers will vary.*



29. a) Kiara says that the range of an arithmetic sequence is always going to contain only positive and negative integers. She reasons that since the domain is composed of positive integers and the sequence is increasing or decreasing at a constant rate then the outputs will also be integer values. Is Kiara correct? Explain.

*She is not correct. While the common difference is a constant rate, it is not necessarily an integer value. For example, for the sequence  $a_n = 19.5 + 0.4(n - 1)$ , the domain is positive integers, but the range has decimal values.*

b) Under what conditions would the range be composed only of integers?

*The outputs would be only integers if both the first term and the common difference are also integers.*

30. Over the last ten years the number of inches of snow a town received formed an arithmetic sequence. 21 inches of snow fell 10 years ago and 19 inches fell 9 years ago.

a) What is the common difference?

*Common difference =  $19 - 21 = -2$*

b) Write a formula to model this sequence.

*Answers will vary. Sample response:*

*If we let 10 years ago be represented by  $n = -10$ :*

$$a_n = 21 - 2(n + 10)$$

*Note to Fellow: Students may define  $n$  differently and create other valid formulas. This will affect the work shown in parts c) and d), but will not affect the final answers.*

c) How many inches fell two years ago?

*Two years ago is represented by  $n = -2$ :*

$$a_{-2} = 21 - 2(-2 + 10) = 21 - 2(8) = 21 - 16 = 5$$

*Two years ago, five inches of snow fell.*

d) When will snow stop falling according to this model? What does this tell you about the validity of this model?

$$0 = 21 - 2(n + 10)$$

$$0 = 21 - 2n - 20$$

$$0 = 1 - 2n$$

$$n = \frac{1}{2}$$

*According to the model, snow will stop falling in half a year in the town. This does not seem very likely though, so the model may not be accurate for this situation.*

31. Korina donates the same amount of money each year to help protect the rainforest. At the end of the second year, she has donated enough money to protect 8 acres. At the end of the third year, she has donated enough to protect 12 acres.

a) Does this represent an arithmetic sequence? How do you know?

Yes. We can use the context to conclude that since Korina donates the same amount each year, her money protects the same number of additional acres each year, and the sequence is arithmetic.

b) If Korina created a graph showing years vs number of acres saved, what would the graph look like? Explain how you know.

The graph would be linear, with a slope of 4 and a y-intercept of 0. This makes sense because the number of years and the number of acres saved are proportional. Before she started donating, she saved 0 acres, and each year she donates, she saves 4 more acres.

c) How many acres will her donations protect by the end of the tenth year?

Common difference =  $12 - 8 = 4$

$$a_n = 0 + 4n$$

$$\text{OR } a_n = 4 + 4(n - 1)$$

$$\text{OR } a_n = 8 + 4(n - 2)$$

$$\text{OR } a_n = 12 + 4(n - 3)$$

$$a_{10} = 4(10) = 40 \text{ acres}$$

At the end of her tenth year, she will have saved 40 acres of rainforest.

32. Use the sequences below to answer the questions.

i. 2, 4, 6, 8...

ii. -5, -10, -15, -20...

iii. 7.5, 15, 22.5...

a) Write an equation to model each.

$$i. a_n = 2 + 2(n - 1) = 2n$$

$$ii. a_n = -5 - 5(n - 1) = -5n$$

$$iii. a_n = 7.5 + 7.5(n - 1) = 7.5n$$

b) Zhang correctly says we do not need to know about sequences to model this problem with an equation, although we could. What does he mean by this?

We have learned to model and write linear equations, so we could just write a linear equation to model each set of numbers without the use of the sequence formula.

c) What do you notice about the relationship between the first term and the common difference?

They are the same.

d) What would these sequences have in common if they were graphed?

They all go through the origin and are linear.

e) These arithmetic sequences can be modeled by proportional functions. How would you describe proportional functions?

Proportional functions have a constant rate of change, such that  $f(x)$  will change directly in proportion to the change in  $x$ . The equation can be modeled by  $f(x) = kx$ , where  $k$  is the rate of change. When graphed, they will cross through the origin and are linear.

### Challenge

33. A geometric sequence is an ordered pattern of numbers where a constant is being multiplied by each term to determine the next term. The constant being multiplied by each term in a geometric sequence is called the common ratio.

For example, for the sequence: 2, 4, 8, 16, ...  
The common ratio is 2.

Find the common ratio for each:

a) 3, 9, 27, 81...

*common ratio: 3*

b) 8, -16, 32...

*common ratio: -2*

c) 100, 50, 25...

*common ratio:  $\frac{1}{2}$  or 0.5*

34. Find the missing terms in each geometric sequence. Determine the common ratio.

a) 4, 8, 16, 32, ...

$4r^2 = 16 \rightarrow \text{common ratio} = 2$

b) 3, 6, 12, 24, ...

$3r^2 = 12 \rightarrow \text{common ratio} = 2$

c) 1, 2, 4, 8, ...

$1r^3 = 8 \rightarrow \text{common ratio} = 2$

### Ticket To Leave

1. a) Determine if the sequence is arithmetic. Explain.

5, 10, 15, 20, ...

*It is arithmetic because a constant (5) is begin added to each term.*

b) Determine the 41<sup>st</sup> term using an equation.

$$a_{41} = 5 + 5(41 - 1) = 205$$

2. Determine the next three terms of the sequence modeled in the table below.

n	1	2	3	4	5
$a_n$	25	23.5	22	20.5	19

$$a_6 = 17.5$$

$$a_7 = 16$$

$$a_8 = 14.5$$

b) What is the common difference? How do you know?

$$d = -1.5$$

$$a_2 - a_1 = a_3 - a_2 = a_4 - a_3 = a_5 - a_4 = -1.5$$

3. Fellow's Choice

4. Fellow's Choice

# Arithmetic Sequence Cards Activity

This activity aligns with lesson A6.8 Arithmetic Sequences.

Cut out the card sets. Use as many or as few of the pieces (sequence, table, graph, description, equation, situation) as you would like, depending on the needs of your students.

**Option 1:** Mix all cards together and match the sets. This does not need to include all 6 cards in each set. You could choose to have students only match sequences to graphs. Or sequences to descriptions and situations. If you choose to only use the table, graph, equation, and situation, these cards could be applied to linear equations.

- Which was the hardest piece to match? Which were the easiest to pair up?
- Which situations (scenarios) could continue linearly forever in real life? Which wouldn't? When might they stop being a linear/arithmetic relationship?

**Option 2:** Draw one card from the set and come up with the other pieces. To do this as a team, have partners each pick a different card from a set and come up with the missing pieces. This can be done using teamwork, or done individually and checked as a team after. For example, Eveline picks a table card so she has to find the sequence, graph, description, equation, and situation that go with her table. From the same set of 6 cards, Malone chooses the graph card, so he has to find the sequence, table, description, equation, and situation that match his graph. After completing these, Eveline and Malone compare their answers.

- Which piece should always be identical? *sequence, table, graph, equation*
- Which pieces could vary student to student? *description could vary slightly, situation could vary drastically*

**Option 3:** Look for patterns in the graphs using only the sequence and graph cards.

- How does the first term in the sequence affect the graph?
  - How do you know if the graph starts above or below the x-axis?
- How does the common difference affect the graph?
  - How do you know if the graph slopes up or down?

**Option 4:** Relate the sequence to the equation by using only the sequence and equation cards.

- Based on the sequence, how do we know if the slope,  $m$ , in the equation  $y = mx + b$  should be positive or negative?
- Using the equation  $y = mx + b$ , is the constant  $b$  ever part of the sequence? Explain.
  - How do we determine  $b$  based on the sequence?
- In the equation  $y = mx + b$ , how does the sequence affect the value of  $m$ ? How does it affect the value of  $b$ ?

**Option 5:** Relate all cards by highlighting similar components. This can be done by first sorting the cards into groups of 6, or by using the sets of 6 without cutting the cards apart. Use two different colors to highlight/circle where we see the common difference and first term in each representation. If your students have already covered slope-intercept form of equations, you can also determine where you see the slope and the y-intercept in each representation, using a third color for y-intercept. (Students should determine slope is the same as the common difference, so it does not need a fourth color.)

- Where do we see the first term in each representation?
  - Where is it easiest to locate? hardest? Do you ever have to do a calculation to find it?
- Where do we see the common difference in each representation?
  - Where is it easiest to locate? hardest? Do you ever have to do a calculation to find it?

Sequence

7, 10, 13, 16, 19, ...

Description

Terms increase by 3,  
starting at 7

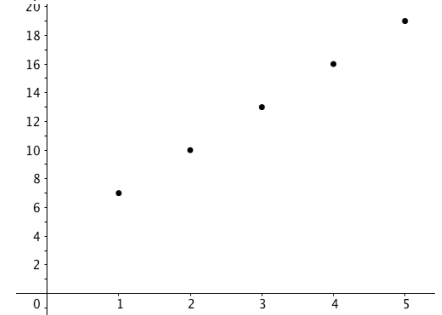
Table

x	y
1	7
2	10
3	13
4	16
5	19

Equation

$$y = 3x + 4$$

Graph



Situation

Miriam earns \$3 a day to feed her neighbor's cat. After the first day she had \$7 in her wallet.

Sequence

4, 7, 10, 13, 16, ...

Description

Terms increase by 3,  
starting at 4

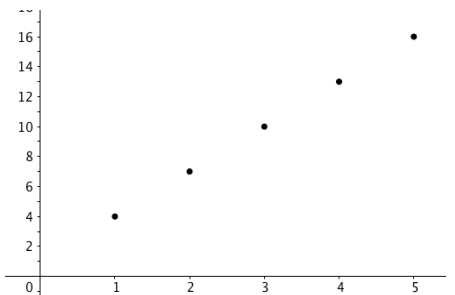
Table

x	y
1	4
2	7
3	10
4	13
5	16

Equation

$$y = 3x + 1$$

Graph



Situation

Balzo earns \$3 per week to mow the grass or rake leaves as a chore. After he collected his money on the first day, he had \$4.

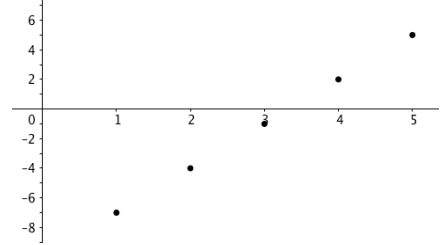
Sequence

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

Table

x	y
1	-7
2	-4
3	-1
4	2
5	5

Graph



Description

Terms increase by 3,  
starting at -7

Equation

$$y = 3x - 10$$

Situation

Jordin earns \$3 each day she walks a neighbor child to school. Before she started walking children to school, she was \$10 in debt to her brother.

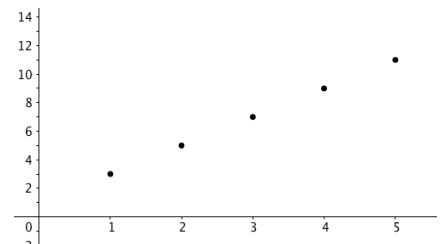
Sequence

3, 5, 7, 9, 11, ...

Table

x	y
1	3
2	5
3	7
4	9
5	11

Graph



Description

Terms increase by 2,  
starting at 3

Equation

$$y = 2x + 1$$

Situation

Lupe likes to travel. Each year she travels to two more states. She started only having visited her state.

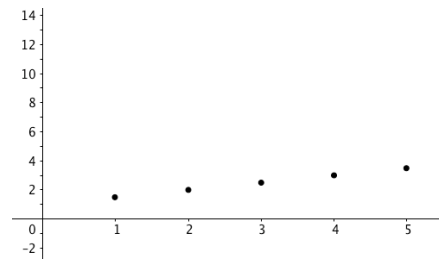
Sequence

$\frac{3}{2}, 2, \frac{5}{2}, 3, \frac{7}{2}, \dots$

Table

x	y
1	1.5
2	2
3	2.5
4	3
5	3.5

Graph



Description

Terms increase by  $\frac{1}{2}$ , starting at 1

Equation

$$y = \frac{1}{2}x + 1$$

Situation

Oscar likes botany so planted a one-inch-tall flower. Each week the flower grew half an inch, so it was 1.5 inches tall after 1 week.

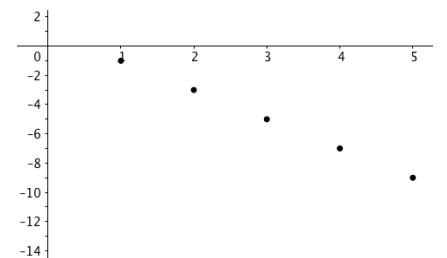
Sequence

$-1, -3, -5, -7, -9, \dots$

Table

x	y
1	-1
2	-3
3	-5
4	-7
5	-9

Graph



Description

Terms decrease by 2, starting at -1

Equation

$$y = -2x + 1$$

Situation

Zenobia's bank account charges her \$2 a day for every day her account balance is under \$10. On the first day she noticed she was charged, she was in debt \$1.

Sequence	Table	Graph												
$\frac{1}{2}, 0, -\frac{1}{2}, -1, -\frac{3}{2}, \dots$	<table border="1"> <tr><th>x</th><th>y</th></tr> <tr><td>1</td><td>0.5</td></tr> <tr><td>2</td><td>0</td></tr> <tr><td>3</td><td>-0.5</td></tr> <tr><td>4</td><td>-1</td></tr> <tr><td>5</td><td>-1.5</td></tr> </table>	x	y	1	0.5	2	0	3	-0.5	4	-1	5	-1.5	
x	y													
1	0.5													
2	0													
3	-0.5													
4	-1													
5	-1.5													
Description	Equation	Situation												
Terms decrease by $\frac{1}{2}$ , starting at $\frac{1}{2}$	$y = -\frac{1}{2}x + 1$	Bashir is playing a game where for every bad move he loses half a point. After his first bad move he has only half a point left, and he continues to make only bad moves.												

**Extension:**

This GeoGebra widget allows students to explore the relationship between the first term, common difference, and the graph of a sequence: <https://www.geogebra.org/m/kpAAYWc4>

## Graphs of arithmetic sequence on a coordinate plane

Use the sliders to change the given variable to fit your arithmetic sequence

	A	B	C
1	term #	term value	
2			
3	1	-8	(1, -8)
4	2	-5	(2, -5)
5	3	-2	(3, -2)
6	4	1	(4, 1)
7	5	4	(5, 4)
8	6	7	(6, 7)
9	7	10	(7, 10)
10	8	13	(8, 13)
11	9	16	(9, 16)
12	10	19	(10, 19)
13	11	22	(11, 22)
14	12	25	(12, 25)
15	13	28	(13, 28)
16	14	31	(14, 31)
17	15	34	(15, 34)
18	16	37	(16, 37)
19	17	40	(17, 40)
20	18	43	(18, 43)
21	19	46	(19, 46)
22	20	49	(20, 49)