Skill Check:

Tell whether a correlation is likely in the situation.

If so tell whether there is a casual relationship.

----Time spent babysitting,
and the amount of money earned---

4-6 Arithmetic Sequences

Vocabulary:

1.) Arithmetic Sequence — is an ordered list of numbers in which the difference between each pair of consective terms, or numbers in the list, is the same.

A **sequence** is an ordered list of numbers. Each number in a sequence is called a **term**. Each term a_n has a specific position n in the sequence.

$$5,\quad 10,\quad 15,\quad 20,\quad 25,\ \ldots,\ a_n,\ \ldots$$

1st position — 3rd position — nth position

Ex of Arithmetic sequence using common difference

Example 1: Extending an Arithmetic Sequence

EXAMPLE 1 **Extending an Arithmetic Sequence**

Write the next three terms of the arithmetic sequence.

$-7, -14, -21, -28, \ldots$

SOLUTION

Use a table to organize the terms and find the pattern.

Position	1	2	3	4
Term	−7	−14	−21	−28

+(−7) +(−7) +(−7)

Each term is 7 less than the previous term. So, the common difference is −7.

Add −7 to a term to find the next term.

Position	1	2	3	4	5	6	7
Term	−7	−14	−21	−28	−35	−42	−49

+(−7) +(−7) +(−7)

▶ The next three terms are −35, −42, and −49.

Write the next three terms of the arithmetic sequence.

1. $-12, 0, 12, 24, \ldots$ **2.** $0.2, 0.6, 1, 1.4, \ldots$ **3.** $4, 3\frac{3}{4}, 3\frac{1}{2}, 3\frac{1}{4}, \ldots$

1. 36, 48, 60

2. 1.8, 2.2, 2.6

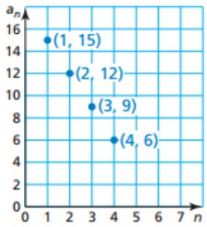
3. $3, 2\frac{3}{4}, 2\frac{1}{2}$

Example 2: Graphing an arithmetic sequence

EXAMPLE 2 **Graphing an Arithmetic Sequence**

Graph the arithmetic sequence 4, 8, 12, 16, ... What do you notice?

Does the graph represent an arithmetic sequence? Explain.



SOLUTION

Make a table to organize the ordered pairs. Then determine whether there is a common difference.

Position, n	1	2	3	4
Term, a_n	15	12	9	6

+(−3) +(−3) +(−3)

Each term is 3 less than the previous term. So, the common difference is −3.

▶ Consecutive terms have a common difference of −3. So, the graph represents t arithmetic sequence 15, 12, 9, 6, ...

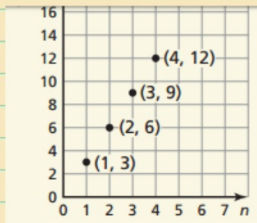
Graph the arithmetic sequence. What do you notice?

4. 3, 6, 9, 12, . . .

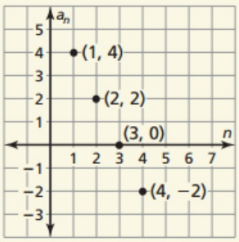
5. 4, 2, 0, −2, . . .

6. 1, 0.8, 0.6, 0.4, . . .

7. Does the graph shown represent an arithmetic sequence? Explain.



The points lie on a line.

5. 

7. no; Consecutive terms do not have a common difference.

Example 4:
Finding the nth Term of an Arithmetic Sequence:

Equation for an Arithmetic Sequence

Let a_n be the nth term of an arithmetic sequence with first term a_1 and common difference d. The nth term is given by

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

EXAMPLE 4 Finding the *n*th Term of an Arithmetic Sequence

Write an equation for the nth term of the arithmetic sequence 14, 11, 8, 5, ... Then find a_{50}.

SOLUTION

The first term is 14, and the common difference is -3.

$a_n = a_1 + (n - 1)d$	Equation for an arithmetic sequence
$a_n = 14 + (n - 1)(-3)$	Substitute 14 for a_1 and -3 for d.
$a_n = -3n + 17$	Simplify.

Use the equation to find the 50th term.

$a_n = -3n + 17$	Write the equation.
$a_{50} = -3(50) + 17$	Substitute 50 for n.
$= -133$	Simplify.

▶ The 50th term of the arithmetic sequence is -133.

EXAMPLE 5 Writing Real-Life Functions

Online bidding for a purse increases by \$5 for each bid after the \$60 initial bid.

Bid number	1	2	3	4
Bid amount	\$60	\$65	\$70	\$75

a. Write a function that represents the arithmetic sequence.

b. Graph the function.

c. The winning bid is \$105. How many bids were there?

SOLUTION

a. The first term is 60, and the common difference is 5.

$f(n) = a_1 + (n - 1)d$ Function for an arithmetic sequence

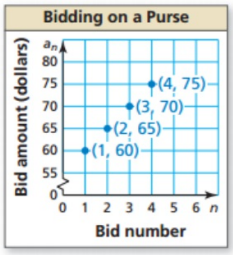
$f(n) = 60 + (n - 1)5$ Substitute 60 for a_1 and 5 for d.

$f(n) = 5n + 55$ Simplify.

▶ The function $f(n) = 5n + 55$ represents the arithmetic sequence.

b. Make a table. Then plot the ordered pairs (n, a_n).

Bid number, n	Bid amount, a_n
1	60
2	65
3	70
4	75



c. Use the function to find the value of n for which $f(n) = 105$.

$f(n) = 5n + 55$ Write the function.

$105 = 5n + 55$ Substitute 105 for $f(n)$.

$10 = n$ Solve for n.

▶ There were 10 bids.

Games	Total cost
1	$7
2	$9
3	$11
4	$13

Monitoring Progress

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11. A carnival charges $2 for each game after you pay a $5 entry fee.

a. Write a function that represents the arithmetic sequence.

b. Graph the function.

c. How many games can you play when you take $29 to the carnival?