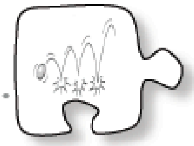

SEQUENCES
AND
EQUIVALENCE
2

Chapter 2 Teacher Guide

Section	Lesson	Days	Lesson Title	Materials	Homework
2.1	2.1.1	2	Representing Exponential Growth	• Lesson 1.1.2A Res. Pg. (optional) • Transparencies and overhead pens • Overhead graphing calculator	2-6 to 2-12 and 2-13 to 2-19
	2.1.2	1	Rebound Ratios	• Bouncy balls • Meter sticks or longer measuring devices • Lesson 1.1.2A Res. Pg. (optional) • Overhead graphing calculator (optional)	2-24 to 2-29
	2.1.3	1	The Bouncing Ball and Exponential Decay	• Bouncy balls • Meter sticks or longer measuring devices • Lesson 1.1.2A Res. Pg. (optional)	2-36 to 2-41
	2.1.4	2	Generating and Investigating Sequences	• Lesson 2.1.4A Res. Pg. • Lesson 2.1.4B Res. Pg. • Lesson 2.1.4C Res. Pg. • Scissors • Tape, stapler, or glue • Markers or colored pencils	2-46 to 2-52 and 2-53 to 2-60
	2.1.5	1	Generalizing Arithmetic Sequences	None	2-71 to 2-77
	2.1.6	1	Using Multipliers to Solve Problems	• Crayons or colored pencils (for use on an optional problem)	2-86 to 2-91
	2.1.7	1	Comparing Sequences and Functions	None	2-98 to 2-105
	2.1.8	1	Sequences that Begin with $n = 1$	• Lesson 2.1.8 Res. Pg. • Transparencies and overhead pens	2-110 to 2-117
2.2	2.2.1	1	Equivalent Expressions	None	2-122 to 2-129
	2.2.2	1	Area Models and Equivalent Expressions	None	2-135 to 2-142
	2.2.3	1	Solving by Rewriting	• Lesson 2.2.3 Res. Pg. (optional)	2-149 to 2-156
Chapter Closure		Varied Format Options			

Total: **13 days plus optional time for Chapter Closure**

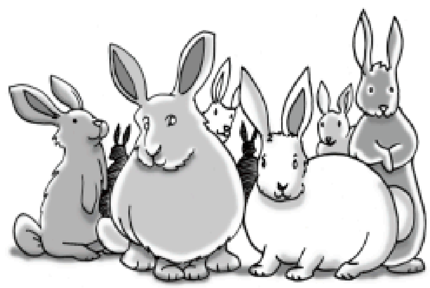
2.1.1 How does the pattern grow?



Representing Exponential Growth

In the last chapter, you began to describe families of functions using multiple representations (especially $x \to y$ tables, graphs, and equations). In this chapter, you will learn about a new family of functions and the type of growth it models.

2-1. MULTIPLYING LIKE BUNNIES



In the book *Of Mice and Men* by John Steinbeck, two good friends named Lenny and George dream of raising rabbits and living off the land. What if their dream came true?

Suppose Lenny and George started with two rabbits that had two babies after one month, and suppose that every month thereafter, each pair of rabbits had two babies.

Your task: With your team, determine how many rabbits Lenny and George would have after one year. Represent this situation with a diagram, table, and rule. What patterns can you find and how can you **generalize** them?

Discussion Points

What **strategies** could help us keep track of the total number of rabbits?

What patterns can we see in the growth of the rabbit population?

How can we use those patterns to write an equation?

How can we predict the total number of rabbits after many months have passed?

Further Guidance

2-2. How can you determine the number of rabbits that will exist at the end of one year? Consider this as you answer the questions below.

a. Draw a diagram to represent how the total number of rabbits is growing each month. How many rabbits will Lenny and George have after three months?

b. As the number of rabbits becomes larger, a diagram becomes too cumbersome to be useful. A table might work better. Organize your information in a table showing the total number of rabbits for the first several months (at least 6 months). What patterns can you find in your table? Use those patterns to write a rule for the relationship between the total number of rabbits and the number of months that have passed since Lenny and George obtained the first pair of rabbits.

Further Guidance section ends here.

2-3. Lenny and George want to raise as many rabbits as possible, so they have a few options to consider. They could start with a larger number of rabbits, or they could raise a breed of rabbits that reproduces faster. How would each of these options change the pattern of growth you observed in the previous problem? Which situation would yield the largest rabbit population after one year?

a. To help answer these questions, model each case below with a table. Then use the patterns in each table to write a rule for each case.

Case 2: Start with 10 rabbits; each pair has 2 babies per month.

Case 3: Start with 2 rabbits; each pair has 4 babies per month.

Case 4: Start with 2 rabbits; each pair has 6 babies per month.

b. Which case would give Lenny and George the most rabbits after one year? **Justify** your answer using a table or rule from part (a).

c. Now make up your own case, stating the initial number of rabbits and the number of babies each pair has per month. Organize your information in a table and write a rule from the pattern you observe in your table. Show how your table is connected to its equation using color-coding, arrows, and any other tools that help you show the connections.

2-4. A NEW FAMILY?

Is the data in "Multiplying Like Bunnies" linear, or is it an example of some other relationship?

a. Look back at the $x \rightarrow y$ tables you created in problem 2-3. What do they all have in common?

b. Graph all four of the equations from problems 2-1 and 2-3 on your graphing calculator. Adjust the viewing window so that all four graphs show up clearly. Then, on paper, sketch the graphs and label each graph with its equation. How would you describe the graphs?

c. Now decide whether the data in the rabbit problem is linear. **Justify** your conclusion.

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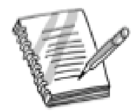
2-5. LEARNING LOG

To represent the growth in number of rabbits in problems 2-1 and 2-3, you discovered a new family of functions that are not linear. Functions in this new family are called **exponential functions**. Throughout this chapter and the next, you will learn more about this special family of functions.

Write a Learning Log entry to record what you have learned so far about exponential functions. For example, what do their graphs look like? What patterns do you observe in their tables? Title this entry "Exponential Functions, Part 1" and include today's date.



MATH NOTES

METHODS AND MEANINGS

Solving Systems, Part I: Substitution

To solve a system of equations algebraically, it is helpful to reduce the system to a single equation with one variable. One way to do this is by **substitution**.

Consider the system at right.

$$10y - 3x = 14$$
$$2x + 4y = -4$$

First, look for the equation that is easiest to solve for x or y. In this case, the second equation will be solved for x. Be sure you understand each step in the solution shown at right.

$$2x + 4y = -4$$
$$2x = -4 - 4y$$
$$x = -2 - 2y$$

Now replace the x in the *other* equation with $(-2 - 2y)$. This is the **substitution** step. Notice that this creates a new equivalent equation that has only one variable.

$$10y - 3(-2 - 2y) = 14$$
$$10y + 6 + 6y = 14$$
$$16y + 6 = 14$$
$$16y = 8$$
$$y = 0.5$$

Next, solve for y. Then find x by substituting the value of y (in this case, 0.5) into either original equation and solve for x.

$$2x + 4(0.5) = -4$$
$$2x + 2 = -4$$
$$2x = -6$$
$$x = -3$$

In this example, the solution is $x = -3$ and $y = 0.5$. This solution can also be written (–3, 0.5).

Note that you could have solved for x in the other equation or for y in the original equation, and then followed the same process.

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Review & Preview

2-6. What if the data for Lenny and George (from problem 2-1) matched the data in each table below? Assuming that the growth of the rabbits multiplies as it did in problem 2-1, complete each of the following tables. Show your thinking or give a brief explanation of how you know what the missing entries are.

a.

Months	Rabbits
0	4
1	12
2	36
3	
4	

b.

Months	Rabbits
0	6
1	
2	24
3	
4	96

2-7. Solve the following systems of equations algebraically. Then graph each system to confirm your solution. If you need help, refer to the Math Notes box in Lesson 2.1.1.

a. $x + y = 3$
$x = 3y - 5$

b. $x - y = -5$
$y = -2x - 4$

2-8. For the function $f(x) = \frac{6}{2x-3}$, find the value of each expression below.

a. $f(1)$ b. $f(0)$ c. $f(-3)$ d. $f(1.5)$

e. What value of x would make $f(x) = 4$?

2-9. Benjamin is taking Algebra 1 and is stuck on the problem shown below. Examine his work so far and help him by showing and explaining the remaining steps.

Original problem: Simplify $(3a^2b)^3$.

He knows that $(3a^2b)^3 = (3a^2b)(3a^2b)(3a^2b)$. Now what?

2-10. Simplify each expression below. Be sure to show your work. (Hint: Use your understanding of the meaning of exponents to expand each expression and then simplify.) Assume that the denominators in parts (b) and (c) are not equal to zero.

a. $(x^3)(x^2)$ b. $\frac{y^5}{y^2}$ c. $\frac{x^3}{x^7}$ d. $(x^2)^3$

2-11. The equation of a line describes the relationship between the x- and y-coordinates of the points on the line.

a. Plot the points $(3, -1)$, $(3, 2)$, and $(3, 4)$ and draw the line that passes through them. State the coordinates of two more points on the line. Then answer this question: What will be true of the coordinates of any other point on this line? Now write an equation that says exactly the same thing. (Do not worry if it is very simple! If it accurately describes all the points on this line, it is correct.)

b. Plot the points $(5, -1)$, $(1, -1)$, and $(-3, -1)$. What is the equation of the line that goes through these points?

c. Choose any three points on the y-axis. What must be the equation of the line that goes through those points?

2-12. Carmel wants to become a "Fraction Master." He has come to you for instruction.

a. Help Carmel by demonstrating and explaining every step necessary to simplify the problem at right. $\frac{2}{9} - \frac{1}{4}$

b. *"Oh no!"* exclaimed Carmel. *"This one is hard!"* Show him every step he needs to simplify the problem at right. (Note that from this point on in the course, you may assume that all values of a variable that would make a denominator zero are excluded.) $\frac{3}{2x} + \frac{4}{xy}$

2-13. Jill is studying a strange bacterium. When she first looks at the bacteria, there are 1000 cells in her sample. The next day, there are 2000 cells. Intrigued, she comes back the next day to find that there are 4000 cells! Create multiple representations (table, graph, and rule) of the function. The inputs are the days that have passed after she first began to study the sample, and the outputs are the numbers of cells of bacteria.

2-14. Write each expression below in a simpler form.

a. $\frac{5^{723}}{5^{721}}$ b. $\frac{3^{300}}{3^{249}}$ c. $\frac{3 \cdot 4^{1001}}{7 \cdot 4^{997}}$ d. $\frac{(6^{54})^{11}}{(6^{49})^{10}}$

2-15. Jackie and Alexandra were working on homework together when Jackie said, *"I got $x = 5$ as the solution, but it looks like you got something different. Which solution is right?"*

$$(x+4)^2 - 2x - 5 = (x-1)^2$$
$$x^2 + 16 - 2x - 5 = x^2 + 1$$
$$16 - 2x - 5 = 1$$
$$11 - 2x = 1$$
$$-2x = -10$$
$$x = 5$$

"I think you made a mistake," said Alexa. Did Jackie make a mistake? Help Jackie figure out whether she made a mistake and, if she did, explain her mistake and show her how to solve the equation correctly. Jackie's work is shown above right.

2-16. Solve each of the following equations.

a. $\frac{m}{6} = \frac{15}{18}$ b. $\frac{\pi}{7} = \frac{a}{4}$

2-17. Write the equation of each line described below.

a. A line with slope -2 and y-intercept 7.

b. A line with slope $-\frac{3}{2}$ and x-intercept $(4, 0)$.

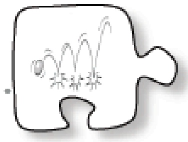
2-18. Perform each operation in part (a) through (d) below.

a. $\frac{m}{4} + \frac{m}{3}$ b. $\frac{x}{2} - \frac{x-1}{2}$

c. $(\frac{8m^2}{x}) \cdot (\frac{y}{mx})$ d. $(\frac{2}{3}) \div (\frac{5}{3})$

2-19. The dartboard shown at right is in the shape of an equilateral triangle. It has a smaller equilateral triangle in the center, which was

2.1.2 How high will it bounce?



Rebound Ratios

In this lesson, you will **investigate** the relationship between the height from which you drop a ball and the height to which it rebounds.

2-20. Many games depend on how a ball bounces. For example, if different basketballs rebounded differently, one basketball would bounce differently off of a backboard than another would, and this could cause basketball players to miss their shots. For this reason, manufacturers have to make balls' bounciness conform to specific standards.

Listed below are "bounciness" standards for different kinds of balls.

- Tennis balls: Must rebound approximately 111 cm when dropped from 200 cm.
- Soccer balls: Must rebound approximately 120 cm when dropped from 200 cm onto a steel plate.
- Basketballs: Must rebound approximately 53.5 inches when dropped from 72 inches onto a wooden floor.
- Squash balls: Must rebound approximately 29.5 inches when dropped from 100 inches onto a steel plate at 70° F.

Discuss with your team how you can measure a ball's bounciness. Which ball listed above is the bounciest? **Justify** your answer.

2-21. THE BOUNCING BALL, Part One

How can you determine if a ball meets expected standards?

Your task: With your team, find the rebound ratio for a ball. Your teacher will provide you with a ball and a measuring device. You will be using the same ball again later, so make sure you can identify which ball your team is using. Before you start your experiment, discuss the following questions with your team.

What do we need to measure?

How should we organize our data?

How can we be confident that our data is accurate?

You should choose one person in your team to be the recorder, one to be the ball dropper, and two to be the spotters. When you are confident that you have a good plan, ask your teacher to come to your team and approve your plan.

2-22. GENERALIZING YOUR DATA

Work with your team to **generalize** by considering parts (a) through (d) below.

a. In problem 2-18, does the height from which the ball is dropped depend on the rebound height, or is it the other way around? With your team, decide which is the independent variable and which is the dependent variable?

b. Graph your results on a full sheet of graph paper. What pattern or trend do you observe in the graph of your data? Do any of the models you have studied so far (linear or exponential functions) seem to fit? If so, which one? Does this make sense? Why or why not?

c. Draw a line that best fits your data. Should this line go through the origin? Why or why not? **Justify** your answer in terms of what the origin represents in the context of this problem.

d. Find an equation for your line.

2-23. What is the rebound ratio for your team's ball? How is the rebound ratio reflected in the graph of your line of best fit? Where is it reflected in the rule for your data? Where is it reflected in your table?

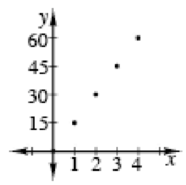
MATH NOTES

METHODS AND MEANINGS

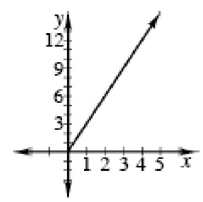
Continuous and Discrete Graphs

When the points on a graph are connected, and it *makes sense* to connect them, the graph is said to be **continuous**. If the graph is not continuous, and is just a sequence of separate points, the graph is called **discrete**. For example, the graph below left represents the cost of buying x shirts, and it is discrete because you can only buy whole numbers of shirts. The graph furthest right represents the cost of buying x gallons of gasoline, and it is continuous because you can buy any non-negative amount of gasoline.

Discrete Graph



Continuous Graph



Review & Preview

2-24. For each table below, find the missing entries and write a rule.

a.

Month (x)	0	1	2	3	4	5	6
Population (y)	2	8	32				

b.

Year (x)	0	1	2	3	4	5	6
Population (y)	5	6	7.2				

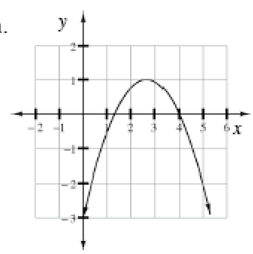
2-25. Solve each system of equations below. If you remember how to do these problems from another course, go ahead and solve them. If you are not sure how to start, refer to the Math Notes boxes in Lessons 2.1.1 and 2.1.3.

a. $y = 3x + 1$
$x + 2y = -5$

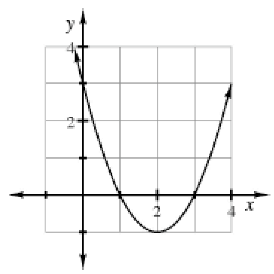
b. $2x + 3y = 9$
$x - 2y = 1$

2-26. Determine the domain and range of each of the following graphs.

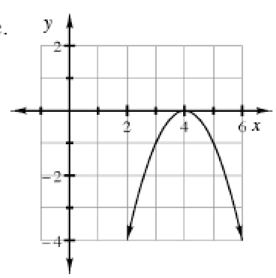
a.



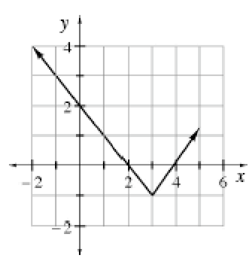
b.



c.



d.



2-27. Solve each of the following systems of equations algebraically. Then confirm your solutions by graphing.

a. $y = 4x + 5$
$y = -2x - 13$

b. $2x + y = 9$
$y = -x + 4$

2-28. Factor each expression below completely.

a. $x^2 - 2x - 63$

b. $2x^2 - 5x - 12$

2-29. Simplify each expression below.

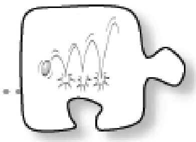
a. $\frac{6x^2y^3}{3xy}$

b. $(mn)^3$

c. $(3mn)^3$

d. $\frac{(3x^2)^2}{3x}$

2.1.3 What is the pattern?



The Bouncing Ball and Exponential Decay

In Lesson 2.1.2, you found that the relationship between the height from which a ball is dropped and its rebound height is determined by a constant. In this lesson, you will explore the mathematical relationship between how many times a ball has bounced and the height of each bounce.

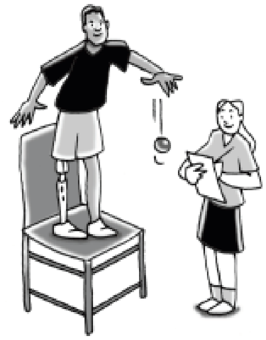
2-30. Consider the work you did in Lesson 2.1.2, in which you found a rebound ratio.

a. What was the rebound ratio for the ball your team used?

b. Did the height you dropped the ball from affect this ratio?

c. If you were to use the same ball again and drop it from *any* height, could you predict its rebound height? Explain.

2-31. THE BOUNCING BALL, Part Two



Imagine that you drop the ball you used in problem 2-21 from a height of 200 cm, but this time you let it bounce repeatedly.

a. As a team, discuss this situation. Then sketch a picture showing what this situation would look like. Your sketch should show a minimum of 6 bounces after you release the ball.

b. Predict your ball's rebound height after each successive bounce if its starting height is 200 cm. Create a table with these predicted heights.

c. What are the independent and dependent variables in this situation?

d. Graph your predicted rebound heights.

e. Should the points on your graph be connected? How can you tell?

2-32. THE BOUNCING BALL, Part Three

Now you will test the accuracy of the predictions you made in problem 2-31.

Your task: Test your predictions by collecting experimental data. Use the same team roles as you used in problem 2-21. Drop your ball, starting from an initial height of 200 cm, and record your data in a table. How do your predicted and measured rebound heights compare?

These suggestions will help you gather accurate data:

- Have a spotter catch the ball just as it reaches the top of its first rebound and have the spotter "freeze" the ball in place.
- Record the first rebound height and then drop the ball again from that new height.
- Catch and "freeze" it again at the second rebound height.
- Repeat this process until you have collected at least six data points (or until the height of the bounce is so small that it is not reasonable to continue).

2-33. What kind of equation is appropriate to model your data? That is, what family of functions do you think would make the best fit? Discuss this with your team and be ready to report and **justify** your choice. Then define variables and write an equation that expresses the rebound height for each bounce.

2-34. If you continued to let your ball bounce uninterrupted, how high would the ball be after 12 bounces? Would the ball ever stop bouncing? Explain your answer in terms of both your experimental data and your equation.

2-35. Notice that your **investigations** of rebound patterns in Lesson 2.1.2 and 2.1.3 involved both a linear and an exponential model. Look back over your work and discuss with your team why each model was appropriate for its specific purpose. Be prepared to share your ideas with the class.

MATH NOTES

METHODS AND MEANINGS

Solving Systems, Part 2: Elimination

In some situations, it may be easier to eliminate one of the variables by adding multiples of the two equations. This process is called **elimination**.

$$10y - 3x = 14$$
$$4y + 2x = -4$$

The first step is to rewrite the equations so that the x and y variables are lined up vertically. Next, decide what number to multiply each equation by in order to make the coefficients of either the x-terms or the y-terms add up to zero. Be sure that you can **justify** each step in the solution.

For example, consider the system above right.

You can eliminate the x-terms by multiplying the top equation by 2 and the bottom equation by 3 and then adding the equations, as shown below.

$$\begin{aligned}
(10y - 3x = 14)\cdot 2 &\rightarrow 20y - 6x = 28 \\
(4y + 2x = -4)\cdot 3 &\rightarrow \underline{12y + 6x = -12} \\
32y &= 16 \quad \text{Adding resulting equations} \\
y &= 0.5 \quad \text{Dividing}
\end{aligned}$$

Finally, substitute 0.5 for y in either original equation:

Thus, the solution to the original system is $(-3,\ 0.5)$.

$$\begin{aligned}
10(0.5) - 3x &= 14 \\
5 - 3x &= 14 \\
-3x &= 9 \\
x &= -3
\end{aligned}$$

Review & Preview

2-36. DeShawna and her team gathered data for their ball and recorded it in the table shown at right.

Drop Height	Rebound Height
150 cm	124 cm
70 cm	58.5 cm
120 cm	99.5 cm
100 cm	82.6 cm
110 cm	92 cm
40 cm	33.4 cm

a. What is the rebound ratio for their ball?

b. Predict how high DeShawna's ball will rebound if it is dropped from 3 meters.

c. Suppose the ball is dropped and you notice that its rebound height is 60 cm. From what height was the ball dropped?

d. Suppose the ball is dropped from a window 200 meters up the Empire State Building. What would you predict the rebound height to be after the first bounce?

e. How high would the ball rebound after the second bounce? After the third bounce?

2-37. Look back at the data given in problem 2-20 that describes the rebound ratio for an approved tennis ball. Suppose you drop a tennis ball from an initial height of 10 feet.

a. How high would it rebound after the first bounce?

b. How high would it rebound after the 12^{th} bounce?

c. How high would it rebound after the n^{th} bounce?

2-38. Solve the following systems of equations algebraically and then confirm your solutions by graphing.

a. $y = 3x - 2$
$4x + 2y = 6$

b. $x = y - 4$
$2x - y = -5$

2-39. Lona received a stamp collection from her grandmother. The collection is in a leather book and currently has 120 stamps. Lona joined a stamp club, which sends her 12 new stamps each month. The stamp book holds a maximum of 500 stamps.

a. Complete the table at right.

b. How many stamps will Lona have after one year?

c. Write an equation to represent the total number of stamps that Lona has in her collection after n months. Let the total be represented by $t(n)$.

Month	Stamps
0	120
1	132
2	
3	
4	
5	

d. Solve your equation for n when $t(n) = 500$. Will Lona be able to fill her book exactly with no stamps remaining? How do you know? When will the book be filled?

2-40. Determine whether the points $A(3, 5)$, $B(-2, 6)$, and $C(-5, 7)$ are on the same line. **Justify** your conclusion algebraically.

2-41. Serena wanted to examine the graphs of the equations below on her graphing calculator. Rewrite each of the equations in **y-form** (when the equation is solved for y) so that she can enter them into the calculator.

a. $5 - (y - 2) = 3x$

b. $5(x + y) = -2$

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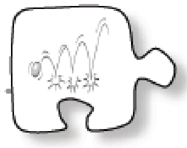
2.1.4 How can I describe a sequence?



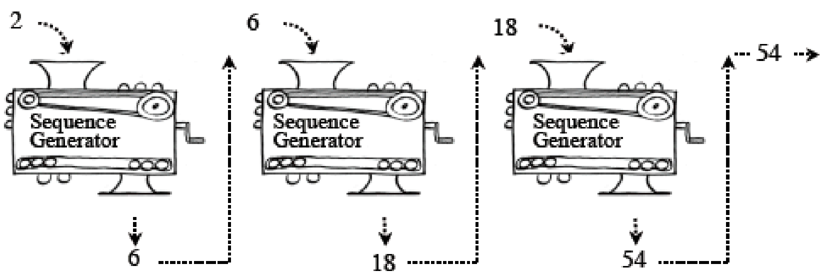
Generating and Investigating Sequences

In the bouncy-ball activity from Lesson 2.1.2, you used multiple representations (a table, a rule, and a graph) to represent a discrete situation involving a bouncing ball. Today you will learn about a new way to represent a discrete pattern, called a sequence.

2-42. Samantha was thinking about George and Lenny and their rabbits. When she listed the number of rabbits George and Lenny could have each month, she ended up with the ordered list below, called a **sequence**.

$$2, 6, 18, 54, \ldots$$

She realized that she could represent this situation using a sequence-generating machine that would generate the number of rabbits each month by doing something to the previous month's number of rabbits. She tested her generator by putting in an **initial value** of 2 (the initial value is the first number of the sequence), and she recorded each output before putting it into the next machine. Below is the diagram she used to explain her idea to her teammates.



a. What does Samantha's sequence generator seem to be doing to each input?

b. What are the next two terms of Samantha's sequence? Show how you got your answer.

c. Assuming that Samantha's sequence generator can work backwards, what term would come before the 2?

d. Samantha decided to use the same sequence generator, but this time she started with an initial value of 5. What are the first four terms of this new sequence?

e. Samantha's teammate, Alex, used the same sequence generator to create a new sequence. *"I won't tell you what I started with, but I will tell you that my third term is 171,"* he said. What was the initial value of Alex's sequence? **Justify** your answer.

2-43. SEQUENCE FAMILIES

Samantha and her teacher have been busy creating new sequence generators and the sequences they produce. Below are the sequences Samantha and her teacher created.

a. $-4, -1, 2, 5, \ldots$

b. $1.5, 3, 6, 12, \ldots$

c. $0, 1, 4, 9, \ldots$

d. $2, 3.5, 5, 6.5, \ldots$

e. $1, 1, 2, 3, 5, 8, \ldots$

f. $9, 7, 5, 3, \ldots$

g. $48, 24, 12, \ldots$

h. $27, 9, 3, 1, \ldots$

i. $8, 2, 0, 2, 8, 18, \ldots$

j. $\frac{5}{4}, \frac{5}{2}, 5, 10, \ldots$

Your teacher will give your team a set of Lesson 2.1.4A Resource Pages with the above sequences on strips so that everyone in your team can see and work with them in the middle of your workspace.

Your task: Working together, organize the sequences into families of similar sequences. Your team will need to decide how many families to make, what common features make the sequences a family, and what characteristics make each family different from the others. Follow the directions below. As you work, use the following questions to help guide your team's discussion.

Discussion Points

How can we describe the pattern?

How does it grow?

What do they have in common?

(1) As a team, sort the sequence strips into groups based on your first glance at the sequences. Remember that you can sort the sequences into more than two families. Which seem to behave similarly? Record your groupings and what they have in common before proceeding.

(2) If one exists, find a sequence generator (growth pattern) for each sequence and write it on the strip. You can express the sequence generator either in symbols or in words. Also record the next three terms in each sequence on the strips. Do your sequence families still make sense? If so, what new information do you have about your sequence families? If not, reorganize the strips and explain how you decided to group them.

(3) Get a set of Lesson 2.1.4B Resource Pages for your team. Then record each sequence in a table. Your table should compare the term number, n, to the value of each term, $t(n)$. This means that your sequence itself is a list of *outputs* of the relationship! Write rules for as many of the $n \rightarrow t(n)$ tables as you can. Attach the table (and rule, if it exists) to the sequence strip it represents. Do your sequence families still make sense? Record any new information or reorganize your sequence families if necessary.

(4) Now graph each sequence on a Lesson 2.1.4C Resource Page. Include as many terms as will fit on the existing set of axes. Be sure to decide whether your graphs should be discrete or continuous. Use color to show the growth between the points on each graph. Attach the graph to the sequence strip it represents. Do your sequence families still make sense? Record any new information and reorganize your sequence families if necessary.

2-44. Choose one of the families of sequences you created in problem 2-43. With your team, write clear summary statements about this family of sequences. Be sure to use multiple representations to **justify** each statement. Be prepared to share your summary statements with the class.

2-45. Some types of sequences have special names, as you will learn in parts (a) and (b) below.

a. When a sequence can be generated by *adding* a constant to each previous term, it is called an **arithmetic sequence**. Which of your sequences from problem 2-43 fall into this family? Should you include the sequence labeled (f) in this family? Why or why not?

b. When a sequence can be generated by *multiplying* a constant times each previous term, it is called a **geometric sequence**. Which of the sequences from problem 2-43 are geometric? Should sequence (h) be in this group? Why or why not?

Review & Preview

2-46. Find the slope of the line you would get if you graphed each sequence listed below and connected the points.

a. 5, 8, 11, 14, …

b. 3, 9, 15, …

c. 26, 21, 16, …

d. 7, 8.5, 10, …

2-47. Throughout this book, key problems have been selected as "checkpoints." Each checkpoint problem is marked with an icon like the one at left. These checkpoint problems are provided so that you can check to be sure you are building algebra skills at the expected level. When you have trouble with checkpoint problems, refer to the review materials and practice problems that are available in the "Checkpoint Materials" section at the back of your book.

This problem is a checkpoint for using the slope-intercept form of a line to solve a system of linear equations. It will be referred to as Checkpoint 1.

a. Solve the system at right by graphing each line and finding the intersection. Then solve the system algebraically to check.

$$x + y = 5$$
$$y = \tfrac{1}{3}x + 1$$

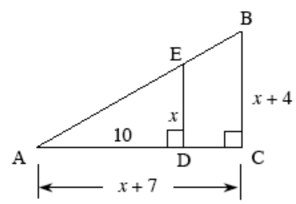
b. Check your answer to part (a) by referring to the Checkpoint 1 materials located at the back of your book.

If you needed help solving this problem correctly, then you need more practice using the slope-intercept form of a line to solve a system of equations. Review the Checkpoint 1 materials and try the practice problems. Also, consider getting help outside of class time. Be sure you know how to write the equations in y-form and know how use the slope and y-intercept to draw graphs efficiently. From this point on, you will be expected to graph and solve systems like this one quickly and easily.

2-48. In the diagram at right, $\Delta ABC \sim \Delta AED$.

a. Solve for x.

b. Find the perimeter of ΔADE.



2-49. Allie is making 8-dozen chocolate-chip muffins for the Food Fair at school. The recipe she is using makes 3-dozen muffins. If the original recipe calls for 16 ounces of chocolate chips, how many ounces of chocolate chips does she need for her new amount? (Allie buys her chocolate chips in bulk and can measure them to the nearest ounce.)

2-50. Solve each equation below.

a. $2-(x+5)=7-2x+3$

b. $(2x+4)(x-3)=0$

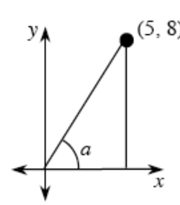
c. $\frac{5x+4}{3}=\frac{2x+1}{5}$

2-51. The area of a square is 225 square centimeters.

a. Make a diagram and list any steps that you would need to do to find the length of the diagonal.

b. What is the length of its diagonal?

2-52. Find $m\angle a$ in the diagram at right. **[57.99°]**



2-53. Refer to sequences (c) and (i) in problem 2-43. How these two sequences similar?

a. Sequences such as those in parts (c) and (i) can be called **quadratic sequences**. Why do you think they are called this?

b. The numbers in the sequence in part (e) from problem 2-43 are called **Fibonacci numbers**. They are named after an Italian mathematician who discovered the sequence while studying how fast rabbits could breed. What is different about this sequence than the other three you discovered?

2-54. Chelsea dropped a bouncy ball off the roof while Nery recorded its rebound height. The table at right shows their data. Note that the 0 in the "Bounce" column represents the starting height.

Bounce	Rebound Height
0	800 cm
1	475 cm
2	290 cm
3	175 cm
4	100 cm
5	60 cm

a. Find a function to model their data. To what family does the function belong? Explain how you know.

b. Show the data as a sequence. Is the sequence arithmetic, geometric, quadratic, or something else? **Justify** your answer.

2-55. For the function $f(x)=\sqrt{3x-2}$, find the value of each expression below.

a. $f(1)$ b. $f(9)$ c. $f(4)$ d. $f(0)$

e. What value of x makes $f(x)=6$?

2-56. When asked to solve $(x-3)(x-2)=0$, Freddie gives the answer "$x=2$." Samara says the answer is $x=3$. Who is correct? **Justify** your answer.

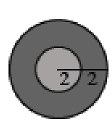
2-57. Find the x- and y-intercepts and the equation of the line of symmetry for the graph of $y=x^2+6x+8$.

2-58. Simplify each expression below.

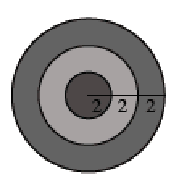
a. $y+0.03y$ b. $z-0.2z$ c. $x+0.002x$

2-59. A dart hits each dartboard below at random. What is the probability that the dart will land in the darkly shaded area?

a.



b.



2-60. A tank contains 8000 liters of water. Each day, half of the water in the tank is removed. How much water will be in the tank at the end of:

a. the 4th day? b. the 8th day?

a. $-4, -1, 2, 5,$ ____, ____, ____

b. $1.5, 3, 6, 12,$ ____, ____, ____

c. $0, 1, 4, 9,$ ____, ____, ____

d. $2, 3.5, 5, 6.5,$ ____, ____, ____

e. $1, 1, 2, 3, 5, 8$ ____, ____, ____

f. 9, 7, 5, 3, ____, ____, ____

g. 48, 24, 12, ____, ____, ____

h. 27, 9, 3, 1, ____, ____, ____

i. 8, 2, 0, 2, 8, 18, ____, ____, ____

j. $\frac{5}{4}, \frac{5}{2}, 5, 10,$ ____, ____, ____ Sequence ____

n	$t(n)$

Sequence ____

n	$t(n)$

Sequence ____

n	$t(n)$

Sequence ____

n	$t(n)$

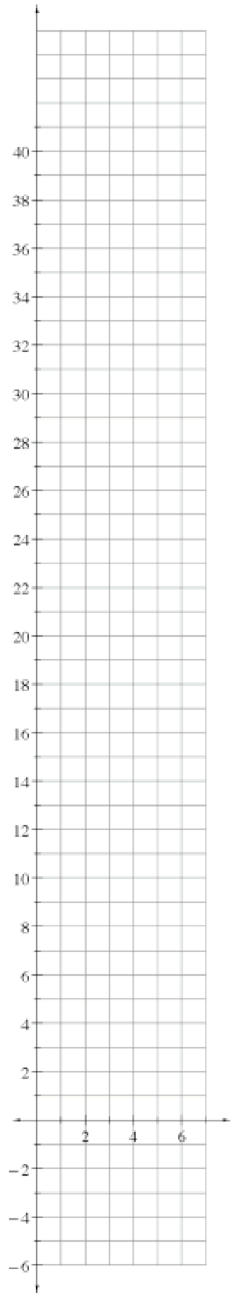
Lesson 2.1.4B Resource Page

Sequence ____

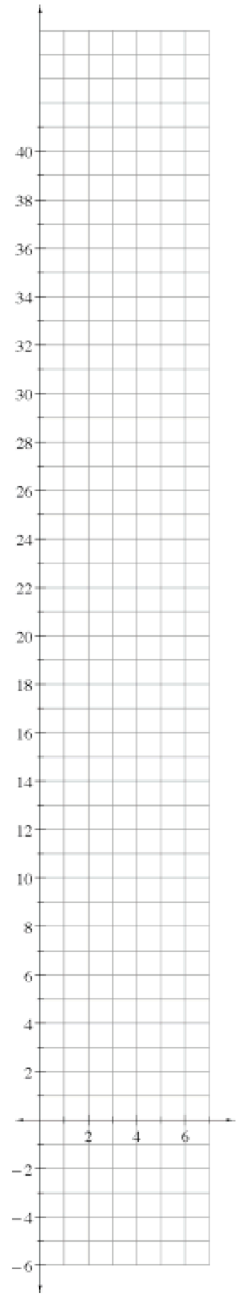
n	$t(n)$

Lesson 2.1.4C Resource Page

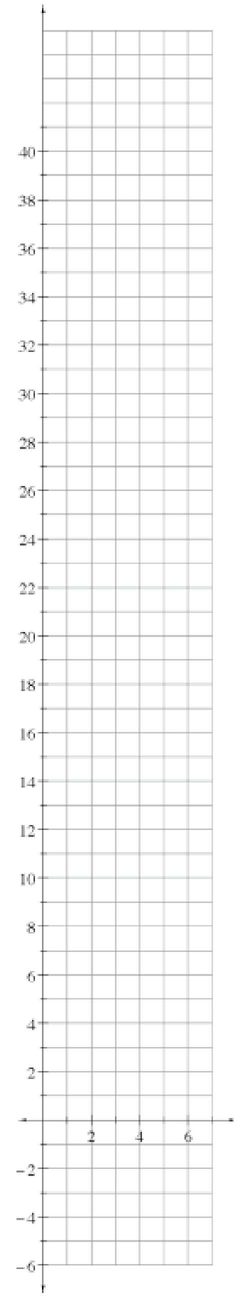
Sequence ____



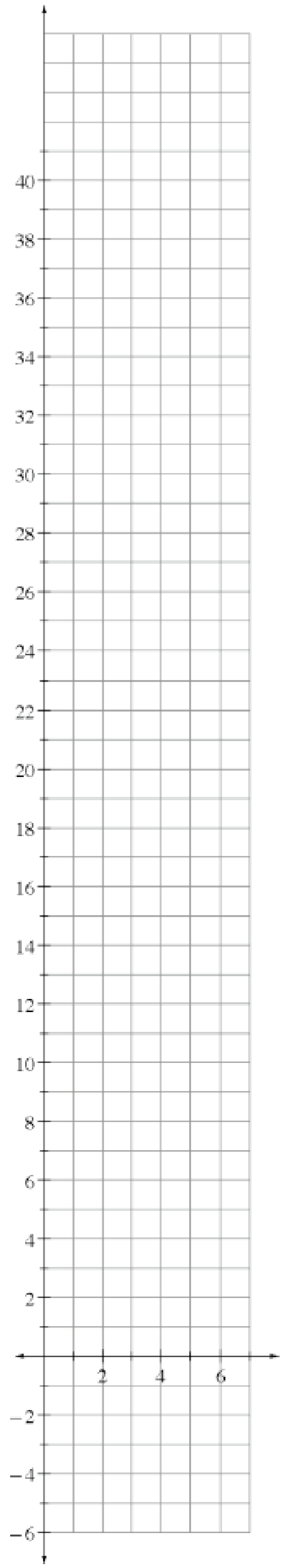
Sequence ____



Sequence ____

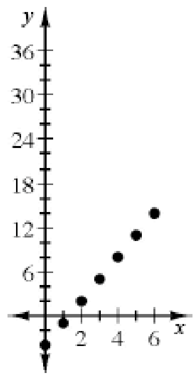


Sequence ____

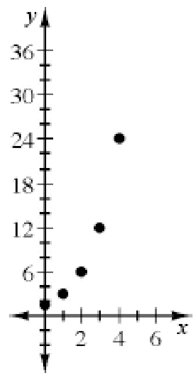


Lesson 2.1.4D Resource Page

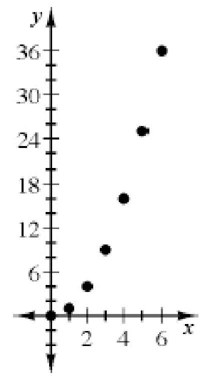
a.



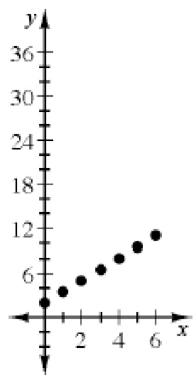
b.



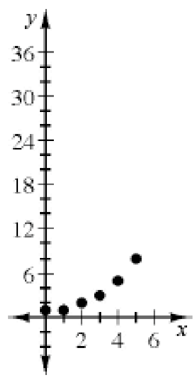
c.



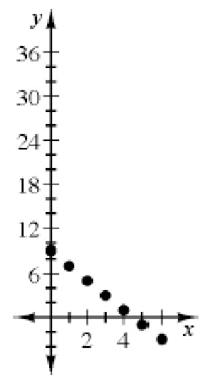
d.



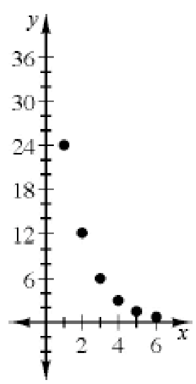
e.



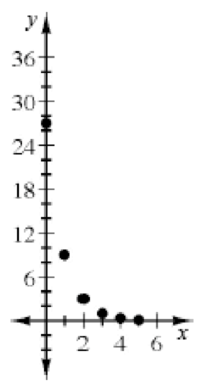
f.



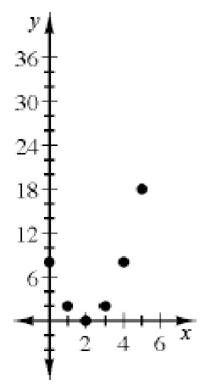
g.



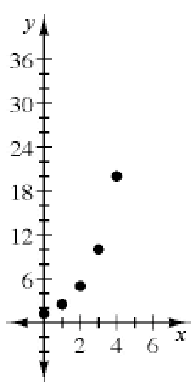
h.



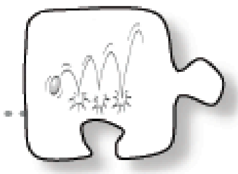
i.



j.



2.1.5 How do arithmetic sequences work?



Generalizing Arithmetic Sequences

In Lesson 2.1.4, you learned how to identify arithmetic and geometric sequences. Today you will solve problems involving arithmetic sequences. Use the questions below to help your team stay focused and start mathematical conversations.

What type of sequence is this? How do we know?

How can we find the rule?

Is there another way to see it?

2-61. LEARNING THE LANGUAGE OF SEQUENCES

Sequences have their own notation and special words and phrases that help describe them, such as "term" and "term number." The questions below will help you learn more of this vocabulary and notation.

Consider the sequence $-9, -5, -1, 3, 7, \ldots$ as you complete parts (a) through (f) below.

a. Is this sequence arithmetic, geometric, or neither? How can you tell?

b. What are the initial value and the generator for the sequence?

c. What is the difference between each term and the term before it? How is this related to the generator? For an arithmetic sequence, this is also known as the **common difference**.

d. Find a rule (beginning $t(n) =$) for the n^{th} term of this sequence. You can assume that for the first term of the sequence, $n = 0$.

e. Graph your rule. Should the graph be continuous or discrete? Why?

f. How is the **common difference** related to the graph of your rule? Why does this make sense?

2-62. Consider the sequence $t(n) = -4, -1, 2, 5, \ldots$

a. Write a rule for $t(n)$.

b. Is it possible for $t(n)$ to equal 42? **Justify** your answer.

c. For the function $f(x) = 3x - 4$, is it possible for $f(x)$ to equal 42? Explain.

d. Explain the difference between $t(n)$ and $f(x)$ that makes your answers to parts (b) and (c) different.

2-63. Trixie wants to create an especially tricky arithmetic sequence. She wants the 5th term of the sequence to equal 11 and the 50th term to equal 371. That is, she wants $t(4) = 11$ and $t(49) = 371$. Is it possible to create an arithmetic sequence to fit her information? If it is possible, find the rule, the initial value $t(0)$, and the common difference for the arithmetic sequence. If it is not possible, explain why not.

2-64. Seven years ago, Kodi found a box of old baseball cards in the garage. Since then, he has added a consistent number of cards to the collection each year. He had 52 cards in the collection after 3 years and now has 108 cards.

a. How many cards were in the original box?

b. Kodi plans to keep the collection for a long time. How many cards will the collection contain 10 years from now?

c. Write a rule that determines the number of cards in the collection after n years. What does each number in your rule represent?

2-65. Trixie now wants an arithmetic sequence with a common difference of -17 and a 16^{th} term of 93. (In other words, $t(15) = 93$.) Is it possible to create an arithmetic sequence to fit her information? If it is possible, find the rule. If it is not possible, explain why not.

2-66. Your favorite radio station, WCPM, is having a contest. The DJ poses a question to the listeners. If the caller answers correctly, he or she wins the prize money. If the caller answers incorrectly, \$20 is added to the prize money and the next caller is eligible to win. The current question is difficult, and no one has won for two days.

a. Lucky you! Fourteen people already called in today with incorrect answers, so when you called (with the right answer, of course) you won \$735! How much was the prize worth at the beginning of the day today?

b. Suppose the contest always starts with \$100. How many people would have to guess incorrectly for the winner to get \$1360?

2-67. Trixie is at it again. This time she wants an arithmetic sequence that has a graph with a slope of 22. She also wants $t(8) = 164$ and the 13^{th} term to have a value of 300. Is it possible to create an arithmetic sequence to fit her information? If it is possible, find the rule. If it is not possible, explain why not.

2-68. Find the rule for each arithmetic sequence represented by the $n \rightarrow t(n)$ tables below.

a.

n	$t(n)$
7	54
3	10
19	186
16	153
40	417

b.

n	$t(n)$
100	10
20	100

2-69. Trixie decided to extend her trickiness to tables. Each $n \rightarrow t(n)$ table below represents an arithmetic sequence. Find expressions for the missing terms and write a rule.

a.

n	$t(n)$
0	$t(0)$
1	7
2	
3	
4	

b.

n	$t(n)$
0	
1	p
2	f

2-70. Trixie exclaimed, *"Hey! Arithmetic sequences are just another name for linear functions."* What do you think? **Justify** your idea based on multiple representations.

Review & Preview

2-71. Determine whether 447 is a term of each sequence below. If so, which term is it?

a. $t(n) = 5n - 3$

b. $t(n) = 24 - 5n$

c. $t(n) = -6 + 3(n-1)$

d. $t(n) = 14 - 3n$

e. $t(n) = -8 - 7(n-1)$

2-72. Choose one of the sequences in problem 2-71 for which you determined that 447 is *not* a term. Write a clear explanation (that an Algebra 1 student would be able to understand) describing how you can be sure that 447 is not a term of the sequence.

2-73. Find the common difference for each sequence listed below. Write an expression for the n^{th} term in each sequence below, keeping in mind that the first term of each sequence is $t(0)$.

a. 4, 7, 10, 13, …

b. 3, 8, 13, …

c. 24, 19, 14, …

d. 7, 9.5, 12, …

2-74. Great Amusements Park has been raising its ticket prices every year, as shown in the table at right.

Year	Price
0	\$50
1	\$55
2	\$60.50
3	\$66.55

a. What will the price of admission be in year 6?

b. Describe how the ticket prices are growing.

2-75. Solve the system at right for m and b.

$$1239 = 94m + b$$
$$810 = 61m + b$$

2-76. Multiply each expression below.

a. $(x+2)(x-7)$

b. $(3m+7)(2m-1)$

c. $(x-3)^2$

d. $(2y+3)(2y-3)$

2-77. Simplify each expression.

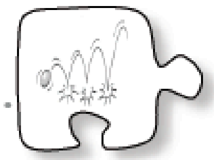
a. $(3x)^2$

b. $2(3x)^2$

c. $\frac{2(3x)^2}{3x^3}$

d. $\frac{2(3x)^2}{(3x)^3}$

2.1.6 How can I use a multiplier?



Using Multipliers to Solve Problems

In the past few lessons, you have **investigated** sequences that grow by adding (arithmetic) and sequences that grow by multiplying (geometric). In today's lesson, you will learn more about growth by multiplication as you use your understanding of geometric sequences and multipliers to solve problems. As you work, use the following questions to move your team's discussion forward:

What type of sequence is this? How do we know?

How can we describe the growth?

How can we be sure that our multiplier is correct?

2-78. Thanks to the millions of teens around the world seeking to be just like their math teachers, industry analysts predict that sales of the new portable MPG (Math Problem Generator) called the πPod will skyrocket!

πPODS SWEEP THE NATION
Millions demand one!

(API) – Teenagers and Hollywood celebrities flocked to an exclusive shop in Beverly Hills, California yesterday, clamoring for the new πPod. The store will have 100 to sell the first week and expects to receive and sell an average of 15% more per week after that.

"I plan to stand in line all night!" said Nelly Hillman. "As soon as I own one, I'll be cooler than everyone else."

Across the globe, millions of fans

a. If sales of πPods continue to increase as described in the article at right, how many πPods will be sold at the store in the 4th week after their release?

b. How many πPods will be sold at the store in the 10th week after their release?

c. If you were to write the number of πPods sold each week as a sequence, would your sequence be arithmetic, geometric, or something else? **Justify** your answer.

d. Write an equation for the number of πPods sold during the n^{th} week, assuming the rate of increase continues. Confirm that your equation is correct by testing it using your results from parts (a) and (b) above.

2-79. The iNod, a new rival to the πPod, is about to be introduced. It is cheaper than the πPod, so more are expected to sell. The manufacturer plans to sell 10,000 in the first week and expects sales to increase by 7% each week.

a. Assuming that the manufacturer's predictions are correct, write an equation for the number of iNods sold during the n^{th} week.

b. What if the expected weekly sales increase were 17% instead of 7%? Now what would the equation be?

c. Oh no! Thanks to the lower price, 10,000 iNods were sold in the first week, but after that, weekly sales actually decreased by 3%. Find the equation that fits the product's actual weekly sales.

d. According to your model, how many weeks will it take for the weekly sales to drop to only one iNod per week?

2-80. In a geometric sequence, the generator is the number that one term is multiplied by to generate the next term. Another name for this number is the **multiplier**.

a. Look back at your work for problem 2-71. What is the multiplier for parts (a), (b), and (c)?

b. What is the multiplier for the sequence 8, 8, 8, 8, … ?

c. Explain what happens to the terms of the sequence when the multiplier is less than 1, but greater than zero. What happens when the multiplier is greater than 1? Add this description to your Learning Log. Title this entry "Multipliers" and add today's date.

2-81. Write an equation for each table below.

a.

n	$t(n)$
0	1600
1	2000
2	2500
3	3125
4	3906.25

b.

n	$t(n)$
0	3906.25
1	3125
2	2500
3	2000
4	1600

c.

n	$t(n)$
0	50
1	72
2	103.68
3	149.2992

d.

n	$t(n)$
0	
1	50
2	
3	72
4	
5	103.68
6	
7	149.2992

e. How are the multipliers for (a) and (b) related, and why?

f. What **strategies** did you use to find the rule for part (d)?

g. In part (d), why is term 2 *not* 61?

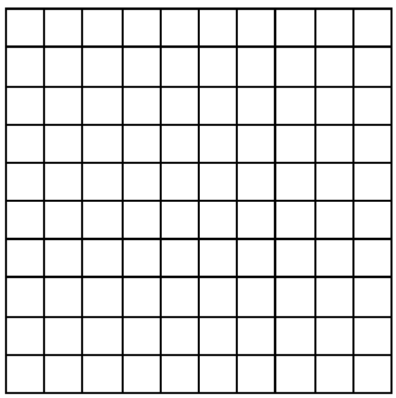
2-82. PERCENTS AS MULTIPLIERS

What a deal! Just deShirts is having a 20%-off sale. Trixie rushes to the store and buys 14 shirts. When the clerk rings up her purchases, Trixie sees that the clerk has added the 5% sales tax first, before taking the discount. She wonders whether she got a good deal at the store's expense or whether she should complain to the manager about being ripped off. Without making any calculations, take a guess. Is Trixie getting a good deal? The next few problems will help you figure it out for sure.

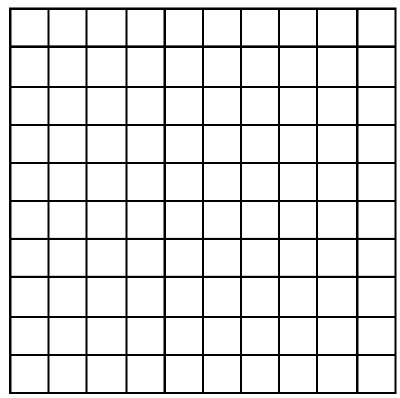
2-83. Karen works for a department store and receives a 20% discount on any purchases that she makes. The department store is having a clearance sale, and every item will be marked 30% off the regular price. Karen has decided to buy the $100 dress she's been wanting. When she includes her employee discount with the sale discount, what is the total discount she will receive? Does it matter what discount she takes first? Use the questions below to help you answer this question.

a. Use the grids like the ones below to picture another way to think about this situation. Using graph paper, create two 10-by-10 grids (as shown below) to represent the $100 price of the dress.

CASE 1: 20% discount first



CASE 2: 30% discount first



b. Use the first grid to represent the 20% discount followed by the 30% discount (Case 1). Use one color to shade the number of squares that represent the first 20% discount. For whatever is left (unshaded), find the 30% discount and use another color to shade the corresponding number of squares to represent this second discount. Then repeat the process (using the other grid) for the discounts in **reverse** order (Case 2).

c. How many squares remain after the first discount in Case 1? In Case 2?

d. How many squares remain after the second discount in Case 1? In Case 2?

e. Explain why these results make sense.

2-84. Suppose that Trixie's shirts cost x dollars in problem 2-82.

a. If x represents the cost, how could you represent the tax? How could you represent the cost plus the tax?

b. How could you represent the discount? How could you represent the cost of the shirt after the discount?

c. Did Trixie get the better deal? **Justify** your reasoning.

2-85. Remember the "Multiplying Like Bunnies" problem at the beginning of this chapter? Your team found the equation $y = 2 \cdot 2^x$ to represent the number of rabbits, y, after x months.

a. Lenny and George now have over 30 million rabbits. How many months have passed?

b. With 30 million rabbits, the bunny farm is getting overcrowded and some of the rabbits are dying from a contagious disease. The rabbits have stopped reproducing, and the disease is reducing the total rabbit population at a rate of about 30% each month. If this continues, then in how many months will the population drop below 100 rabbits?

MATH NOTES

METHODS AND MEANINGS

Arithmetic and Geometric Sequences

An **arithmetic sequence** is a sequence with an addition (or subtraction) generator. The number added to each term to get the next term is called the **common difference**.

A **geometric sequence** is a sequence with a multiplication (or division) generator. The number multiplied by each term to get the next term is called the **common ratio** or the **multiplier**.

Review & Preview

2-86. Convert each percent increase or decrease into a multiplier.

a. 3% increase

b. 25% decrease

c. 13% decrease

d. 2.08% increase

2-87. Mr. C is such a mean teacher! The next time Mathias gets in trouble, Mr. C has designed a special detention for him. Mathias will have to go out into the hall and stand exactly 100 meters away from the exit door and pause for a minute. Then he is allowed to walk exactly halfway to the door and pause for another minute. Then he can again walk exactly half the remaining distance to the door and pause again, and so on. Mr. C says that when Mathias reaches the door he can leave, *unless* he breaks the rules and goes more than halfway, even by a tiny amount. When can Mathias leave? Prove your answer using multiple representations.

2-88. Simplify each expression.

a. $(2m^3)(4m^2)$

b. $\frac{6y^5}{3y^2}$

c. $\frac{-4y^2}{6y^7}$

d. $(-2x^2)^3$

2-89. *Without a calculator*, perform each operation below.

a. $\frac{2}{3}+\frac{1}{4}$

b. $\frac{2}{3}+\frac{x}{4}$

c. $\frac{2}{3}+\frac{1}{x}$

d. $\frac{2}{y}+\frac{3}{x}$

2-90. Factor each expression below.

a. $3y^2+6y$

b. w^2-5w+6

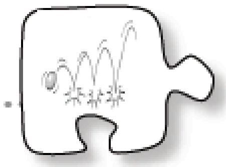
c. x^2-4

d. $9x^2-4$

2-91. Solve the system of equations at right.

$$y=-x-2$$
$$5x-3y=22$$

2.1.7 Is it a function?



Comparing Sequences and Functions

Throughout this chapter, you have been learning about sequences. In Chapter 1, you started to learn about functions. But what is the difference? In this lesson, you will compare and contrast sequences with functions. By the end of the lesson, you will be able to answer these questions:

Is a sequence different from a function?

What is the difference between a sequence $t(n)$ and the function $f(x)$ with the same rule?

2-92. Consider sequence $t(n)$ below.

$$-5, -1, 3, 7, \ldots$$

a. Create multiple representations of the sequence $t(n)$.

b. Is it possible for the equation representing $t(n)$ to equal 400? **Justify** your answer.

c. Create multiple representations of the function $f(x) = 4x - 5$. How are $f(x)$ and $t(n)$ different? How can you show their differences in each of the representations?

d. For the function $f(x) = 4x - 5$, is it possible for $f(x)$ to equal 400? Explain.

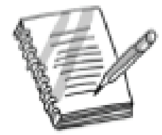
2-93. Let's consider the difference between $t(n) = 2 \cdot 3^n$ and $f(x) = 2 \cdot 3^x$?

a. Is it possible for $t(n)$ to equal 1400? If so, find the value of n that makes $t(n) = 1400$. If not, **justify** why not.

b. Is it possible for $f(x)$ to equal 1400? If so, find the value of x that makes $f(x) = 1400$. Be prepared to share your solving **strategy** with the class.

c. How are the two functions similar? How are they different?

2-94. LEARNING LOG



Is a sequence a function? **Justify** your answer completely. If so, what makes it different from the functions that are usually written in the form $f(x) =$ _________ ? If not, why not? Be prepared to share your ideas with the class. After a class discussion about these questions, answer the questions in your Learning Log. Title this entry "Sequences vs. Functions" and label it with today's date.

2-95. Janine was working on her homework but lost part of it. She knew that one output of $p(r)=2\cdot 5^r$ is 78,000, but she could not remember if $p(r)$ is a sequence or if it's a regular function. With your team, help her figure it out. Be sure to **justify** your decision.

2-96. Solve each of the following equations for x, accurate to the nearest 0.01.

a. $200(0.5)^x = 3.125$

b. $318 = 6 \cdot 3^x$

2-97. Khalil is working with a geometric sequence. He knows that $t(0) = 3$ and that the sum of the first three terms ($t(0)$, $t(1)$, and $t(2)$) is 63. Help him figure out the sequence. Be prepared to share your **strategies** with the class.

Math Notes

Methods and Meanings

Exponential Functions and Multipliers

An **exponential** function has the general form $y = km^x$, where k is the **initial value** and $m > 0$ is the **multiplier**. The graph of an exponential function is **continuous**. Be careful: The independent variable x has to be in the exponent. For example, $y = x^2$ is *not* an exponential equation, even though it has an exponent.

The number by which you multiply a quantity to increase or decrease it by a given percentage is called the **multiplier** for that percentage. For example, the multiplier for an increase of 7% is 1.07. The multiplier for a decrease of 7% is 0.93.

Review & Preview

2-98. Is it possible for the sequence $t(n) = 5 \cdot 2^n$ to have a term with the value of 200? If so, which term is it? If not, **justify** why not.

2-99. Is it possible for the function $f(x) = 5 \cdot 2^x$ to have an output of 200? If so, what input gives this output? If not, **justify** why not.

2-100. Consider the following sequences as you complete parts (a) through (c) below.

Sequence 1	**Sequence 2**	**Sequence 3**
2, 6, …	24, 12, …	1, 5, …

a. Assuming that the sequences above are arithmetic with $t(0)$ as the first term, find the next four terms for each sequence. For each sequence, write an explanation of what you did to get the next term and write a formula for $t(n)$.

b. Would your terms be different if the sequences were geometric? Find the next four terms for each sequence if they are geometric. For each sequence, write an explanation of what you did to get the next term.

c. Create a totally different type of sequence for each pair of values shown above, based on your own rule. Write your rule clearly (using words or algebra) so that someone else will be able to find the next three terms that you want.

2-101. This problem is a checkpoint for solving systems of linear equations in two variables. It will be referred to as Checkpoint 2.

a. Solve the system of linear equations at right.

$$5x - 4y = 7$$
$$6x + 2y = 22$$

b. Check your answer to part (a) by referring to the Checkpoint 2 materials located at the back of your book.

If you needed help solving this system correctly, then you need more practice solving systems of equations in two variables. Review the Checkpoint 2 materials and try the practice problems. Also, consider getting help outside of class time. From this point on, you will be expected to solve systems like this one quickly and easily.

2-102. For the function $g(x) = x^3 + x^2 - 6x$, find the value of each expression below.

a. $g(1)$ b. $g(-1)$ c. $g(-2)$ d. $g(10)$

e. Find at least one value of x for which $g(x) = 0$?

f. If $f(x) = x^2 - x + 3$, find $g(x) - f(x)$.

2-103. Write equations to solve each of the following problems.

a. When the Gleo Retro (a trendy commuter car) is brand new, it costs \$23,500. Each year it loses 15% of its value. What will the car be worth when it is 15 years old?

b. Each year the population of Algeland increases by 12%. The population is currently 14,365,112. What will the population be 20 years from now?

2-104. An arithmetic sequence has $t(8) = 1056$ and $t(13) = 116$. What is $t(5)$?

2-105. Describe the domain of each function or sequence below.

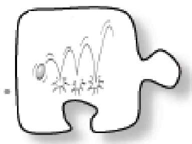
a. The function $f(x) = 3x - 5$.

b. The sequence $t(n) = 3n - 5$.

c. The function $f(x) = \frac{5}{x}$.

d. The sequence $t(n) = \frac{5}{n}$.

2.1.8 What is the rule?



Sequences that Begin with $n = 1$

In this lesson, you will continue to develop your understanding of sequences as you learn to write rules for sequences that begin with terms that are different from the initial value, or the 0^{th} term.

2-106. Seven different sequences are represented below. Work with your team to find a possible rule for each sequence.

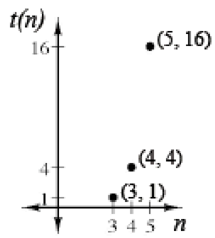
a.

n	$t(n)$
1	14
2	2
3	–10

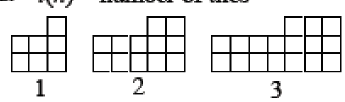
b.

n	$t(n)$
1	6
2	18
3	54

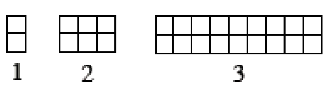
c.



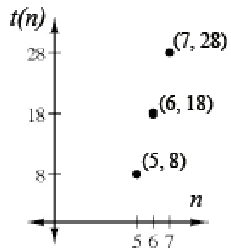
d. $t(n)$ = number of tiles



e. $t(n)$ = number of tiles



f.



g.

n	$t(n)$
1	17
2	12
3	7

2-107. Antonio was doing SAT study problems from his review book, but he got stuck. Below is the problem he had questions about.

> 18. Consider the following arithmetic sequence:
>
> 4, 10, 16, 22, …
>
> a. Find the rule for the sequence.
>
> b. What would be the value of the 10th term in the sequence?

a. Antonio likes to find sequence rules by first organizing the sequence into an $n \rightarrow t(n)$ table. Copy and complete his table for the sequence above. Show how to find the rule for the sequence.

n	$t(n)$

b. Antonio found this rule: $t(n) = 6n + 4$. He used it to determine that $t(10) = 64$. Do you agree?

c. Wait a minute! When Antonio looked in the back of his review book to check his answers, he saw that both of his answers were *different* than the book's. The book said the rule was $t(n) = 6n - 2$ and that $t(10) = 58$. Why do Antonio and the review book disagree?

2-108. Antonio's answers disagree with the review book because he and the book made different assumptions. Study the two tables and notes below.

Antonio

	n	$t(n)$
Initial value →	0	4
	1	10
	2	16
Fourth term = $t(3)$ →	3	22
	n	$t(n) = 6n + 4$

Review Book

	n	$t(n)$
First term →	1	4
	2	10
	3	16
Fourth term = $t(4)$ →	4	22
	n	$t(n) = 6n - 2$

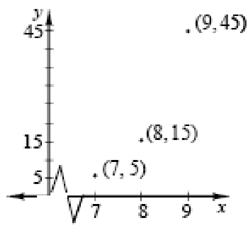
a. With your team, discuss the similarities and differences between the two methods. Be ready to share the advantages and disadvantages of each. Which do you prefer?

b. Although you might prefer to label sequences starting with term number zero for ease in developing an expression, in fact, the standard way to number sequences is to have the initial value be term number one. With your team, show and explain how to find the rule for an arithmetic sequence when the first term is labeled term one instead of zero. Make up your own example to help you explain. If necessary, look back at your work for problem 2-95.

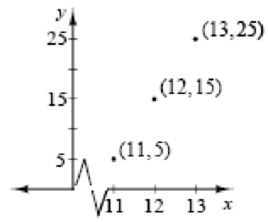
c. Now work with your team to show and explain how to find the rule for a geometric sequence if the first term is labeled term one. Make up your own example to help you explain. Look back at your work for problem 2-95 if necessary.

2-109. What if you do not know the first term? What **strategies** can help you find rules for these sequences?

a.



b.



c. 10, 16, 25.6, …

Term 15

d.

Year	Cost
2000	$100,000
2001	$102,000
2002	$104,000

MATH NOTES

METHODS AND MEANINGS

Sequences

When a **sequence** is written as a list of numbers, the **initial term** is labeled **term number one**, the first term in the sequence. For example, in the sequence below, 3 is term number one, as shown in the $n \rightarrow t(n)$ table that follows.

3, 8, 13, 18, 23, 28, …

This sequence can be represented by the table at the right.

n	1	2	3	4	5	6
$t(n)$	3	8	13	18	23	28

A sequence can also be defined as a function with its domain being the set of positive integers or counting numbers (1, 2, 3, ...). The variable n is often used to denote the term number (starting with 1), and the corresponding term can be denoted $t(n)$. Note that with this understanding, the rule for the sequence above would be $t(n) = 5n - 2$.

Review & Preview

2-110. Toss three coins in the air. Make a list of all possible outcomes and find the probability that:

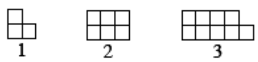
a. All three coins land "heads" up.

b. Two of the coins land "tails" up.

2-111. Kiah and Leah are working on homework problems that involve arithmetic sequences. Kiah wrote down (2, 4) and (3, 5) from one sequence, and Leah had (3, 2) and (0, 3) for a different sequence. Find a rule for each sequence.

2-112. Find a rule for each sequence.

a. $t(n)$=number of tiles



b.

n	$t(n)$
1	7
2	4
3	1

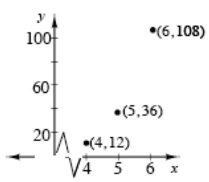
c.

n	$t(n)$
5	–20
6	–10
7	–5

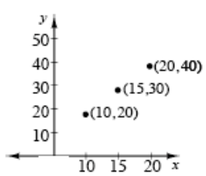
d.

Year	Cost
2	$2000
3	$6000
4	$18000

e.



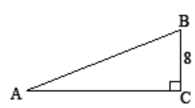
f.



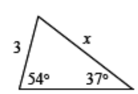
2-113. The right triangle shown below has a height of 8 cm and an area of 60 square cm. Complete parts (a) and (b) below, referring to the Math Notes box in Lesson 1.2.1 for further guidance, if necessary.

a. Find the measure of $\angle A$ to the nearest tenth.

b. Find the perimeter of the triangle.



2-114. Find the value of x in the triangle at right. If you need help getting started, refer to the Math Notes box in Lesson 1.2.1.



2-115. Simplify each expression below.

a. $x(x+2)$

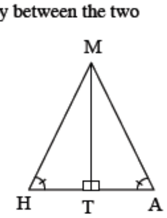
b. $\frac{1}{4}(2x^2y)^3$

c. $6(\frac{5b^3}{2c})^3$

d. $5(x^2+2x+1)-3(2x^2-3x+1)$

2-116. Noah's bowling scores for his last 10 games were 147, 150, 190, 105, 97, 140, 179, 158, 165, and 151. Calculate the mean, median, and mode for Noah's scores. Remember the mean is what people call the average, the median is the middle value (or, if there is an even number of values, it is the number halfway between the two middle values), and the mode is the value that occurs most often.

2-117. Examine the diagram at right. Complete the congruence statement $\Delta MAT \cong \Delta$____ and **justify** your answer.



Lesson 2.1.8 Resource Page

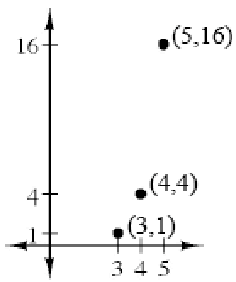
a.

n	$t(n)$
1	14
2	2
3	–10

b.

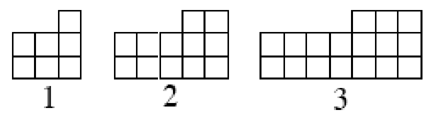
n	$t(n)$
1	6
2	18
3	54

c.



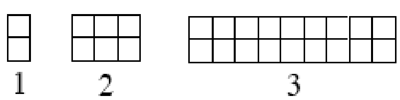
d.

$t(n)$ = number of tiles

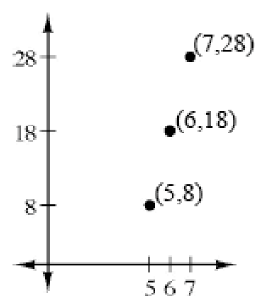


e.

$t(n)$ = number of tiles



f.



g.

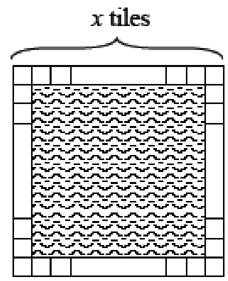
n	$t(n)$
1	17
2	12
3	7

2.2.1 Are they equivalent?

Equivalent Expressions

In Chapter 1, you looked at ways to organize your algebraic thinking using multiple representations. In the first part of this chapter, you used multiple representations to analyze arithmetic and geometric sequences. In this section, you will focus on equations and expressions while experimenting with equivalent expressions and rewriting equations to solve them more easily.

2-118. Kharim is designing a tile border to go around his new square swimming pool. He is not yet sure how big his pool will be, so he is calling the number of tiles that will fit on each side x, as shown in the diagram at right.

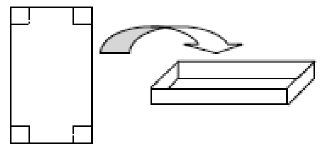


a. How can you write an algebraic expression to represent the total number of tiles Kharim will need for his border? Is there more than one expression you could write? With your team, find as many different expressions as you can to represent the total number of tiles Kharim will need for the border of his pool. Be prepared to share your **strategies** with the class.

b. Find a way to demonstrate algebraically that all of your expressions are **equivalent**, that is, that they have the same value.

c. Explain how you used the Distributive, Associative, and Commutative Properties in part (b).

2-119. Jill and Jerrell were looking back at their work on problem 1-54 ("Analyzing Data from a Geometric Relationship") in Lesson 1.2.1. They had come up with two different expressions for the volume of a paper box made from cutting out squares of dimensions x centimeters by x centimeters. Jill's expression was $(15-2x)(20-2x)x$, and Jerrell's expression was $4x^3-70x^2+300x$.



a. Are Jill's and Jerrell's expressions equivalent? **Justify** your answer.

b. If you have not done so already, find an algebraic method to decide whether their expressions are equivalent. What properties did you use? Be ready to share your **strategy**.

c. Jeremy, who was also in their team, joined in on their conversation. He had yet another expression: $(15-2x)(10-x)2x$. Use a **strategy** from part (b) to decide whether his expression is equivalent to Jill's and/or Jerrell's. Be prepared to share your ideas with the class.

d. Would Jeremy's expression represent the dimensions of the same paper box as Jill's and Jerrell's? Explain.

2-120. For each of the following expressions, find at least three equivalent expressions. Be sure to **justify** how you know they are equivalent.

a. $(x+3)^2 - 4$

b. $(2a^2b^3)^3$

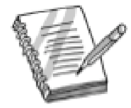
c. $m^2n^5 \cdot mn^4$

d. $(\frac{3p^2q}{q^3})^2$

October 24, 2010

2-121. LEARNING LOG

What does it mean for two expressions to be equivalent? How can you tell if two expressions are equivalent? Answer these questions in your Learning Log. Be sure to include examples to illustrate your ideas. Title this entry "Equivalent Expressions" and label it with today's date.



Review & Preview

2-122. For each of the following expressions, find at least three equivalent expressions. Which do you consider to be the simplest?

a. $(2x-3)^2+5$

b. $(\frac{3x^2y}{x^3})^4$

2-123. Match the expressions on the left with their equivalent expressions on the right. Assume that all variables represent positive values. Be sure to **justify** how you know each pair is equivalent.

a. $\sqrt{4x^2y^4}$	1. $2x\sqrt{y}$
b. $\sqrt{8x^2y}$	2. $2y\sqrt{2x}$
c. $\sqrt{4x^2y}$	3. $2xy^2$
d. $\sqrt{16xy^2}$	4. $2x\sqrt{2y}$
e. $\sqrt{8xy^2}$	5. $4y\sqrt{x}$

2-124. Donnie and Dylan were both working on simplifying the expression at right. The first step of each of their work is shown below. $(\frac{2x^5y^4}{8xy^3})^3$

Donnie: $\frac{8x^{15}y^{12}}{512x^3y^9}$

Dylan: $(\frac{x^4y}{4})^3$

Each of them is convinced that he has started the problem correctly. Has either of them made an error? If so, explain the error completely. If not, explain how they can both be correct and verify that they will get the same, correct solution. Which student's method do you prefer? Why?

2-125. While Jenna was solving the equation $150x+300=600$, she wondered if she could first change the equation to $x+2=4$. What do you think?

a. Solve both equations and verify that they have the same solution.

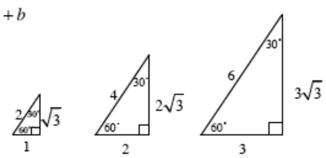
b. What did Jenna do to the equation $150x+300=600$ to change it to $x+2=4$?

c. In the same way, rewrite $60t-120=300$.

2-126. Solve this system for m and b:

$$342 = 23m + b$$
$$147 = 10m + b$$

2-127. Tanika made this sequence of triangles:



a. If the pattern continues, what do you think the next two triangles in the sequence would be?

b. Write a sentence to explain how to find the long leg and hypotenuse if you know the short leg (i.e., if the base is n units long).

2-128. Consider the sequence 3, 9, …

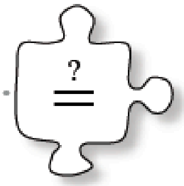
a. Assuming that the sequence is arithmetic with $t(1)$ as the first term, find the next four terms of the sequence and then write a rule for $t(n)$.

b. Assuming that the sequence is geometric with $t(1)$ as the first term, find the next four terms of the sequence and then write a rule for $t(n)$.

c. Create a sequence that begins with 3 that is neither arithmetic nor geometric. For your sequence, write the next four terms and, if you can, write a rule for $t(n)$.

2-129. Classify the triangle with vertices $A(3, 2)$, $B(-2, 0)$, and $C(-1, 4)$ by finding the length of each side. Be sure to consider all possible triangle types. Include sufficient evidence to support your conclusion.

2.2.2 Are they equivalent?



Area Models and Equivalent Expressions

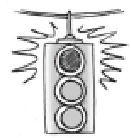
In this lesson, you will continue to think about equivalent expressions. You will use an area model to demonstrate that two expressions are equivalent and to find new ways to write expressions. As you work with your team, use the following questions to help focus your discussion.

How can we be sure they are equivalent?

How would this look in a diagram?

Why is this representation convincing?

2-130. Jonah and Graham are working together. Jonah claims that $(x+y)^2 = x^2 + y^2$. Graham is sure Jonah is wrong, but he cannot figure out how to prove it. Help Graham find as many ways as possible to convince Jonah that he is incorrect. How can he rewrite $(x+y)^2$ correctly?



2-131. How can an area model help relate the expressions $(2x-3)(3x+1)$ and $6x^2-7x-3$?

a. Copy the area diagram at right onto your own paper. With your team, discuss how it can be used to show that these expressions are equivalent.

$+1$	$2x$	-3
$3x$	$6x^2$	$-9x$
	$2x$	-3

b. Use an area model to find an expression equivalent to $(5k-3)(2k-1)$.

c. Use an area model to find an expression equivalent to x^2-3x-4.

d. How does the area model help use the distributive property?

2-132. Use an area model that shows an equivalent expression for each of the following expressions.

a. $(3m-5)^2$

b. $2x^2+5x+2$

c. $(3x-1)(x+2y-4)$

d. $2x^2+x-15$

e. $(x-3)(x+3)$

f. $4x^2-49$

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2-133. With your team, decide whether the following expressions can be represented with a model and rewrite each expression. Be prepared to share your **strategies** with the class.

a. $p(p+3)(2p-1)$

b. $x(x+1)+(3x-5)$

2-134. Copy each area model below and fill in the missing parts. Then write the pairs of equivalent expressions represented by each model. Be prepared to share your reasoning with the class.

a.

	3	
xy		y^2
x		

b.

x^2	
$8x$	
	3

c.

		$-20xy$	
-3	$-6x$		-15
		$-4y$	

d.

x	x^2	
		12

Review & Preview

2-135. Decide whether each of the following pairs of expressions or equations is equivalent for all values of x (or a and b). If they are equivalent, show how you can be sure. If they are not, **justify** your reasoning completely.

a. $(x+3)^2$ and x^2+9

b. $(x+4)^2$ and $x^2+8x+16$

c. $(x+1)(2x-3)$ and $2x^2-x-3$

d. $3(x-4)^2+2$ and $3x^2-24x+50$

e. $(x^3)^4$ and x^7

f. ab^2 and a^2b^2

2-136. Look back at the expressions in problem 2-135 that are not equivalent. For each pair, are there any values of the variable(s) that would make the two expressions equal? **Justify** your reasoning.

2-137. Jenna wants to solve the equation $2000x - 4000 = 8000$.

a. What easier equation could she solve instead that would give her the same solution? (In other words, what equivalent equation has easier numbers to work with?)

b. **Justify** that your equation in part (a) is equivalent to $2000x - 4000 = 8000$ by showing that they have the same solution.

c. Now Jenna wants to solve $\frac{3}{50} - \frac{x}{50} = \frac{7}{50}$. Write and solve an equivalent equation with easier numbers that would give her the same answer.

2-138. Find a rule for each sequence below. Then describe its graph.

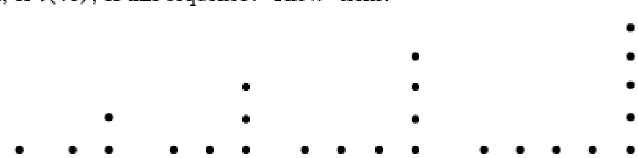
a.

n	$t(n)$
3	8
5	2
7	−4

b.

n	$t(n)$
1	40
2	32
3	25.6

2-139. Given that n is the length of the bottom edge of the backward L-shaped figures below, what sequence is generated by the total number of dots in each figure? What is the 46th term, or $t(46)$, of this sequence? The n^{th} term?



$n =$ 1 2 3 4 5

2-140. For the function $h(x) = -3x^2 - 11x + 4$, find the value of each expression below.

a. $h(0)$ b. $h(2)$ c. $h(-1)$ d. $h(\frac{1}{2})$

e. For what value(s) of x does $h(x) = 0$?

2-141. Find the x-intercepts for the graph of $y - x^2 = 6x$.

2-142. Multiply each pair of functions below to find an expression for $f(x) \cdot g(x)$.

a. $f(x) = 2x$, $g(x) = (x+3)$

b. $f(x) = (x+3)$, $g(x) = (x-5)$

c. $f(x) = (2x+1)$, $g(x) = (x-3)$

d. $f(x) = (x+3)$, $g(x) = (x+3)$

2.2.3 How can I solve it?

Solving by Rewriting

In the past few lessons, you have worked on recognizing and finding equivalent expressions. In this lesson, you will apply these ideas to solve equations. As you work, use the questions below to keep your team's discussion productive and focused.

How can we make it simpler?

Does anyone see another way?

How can we be sure that our answer is correct?

2-143. Graciella was trying to solve the quadratic equation $x^2 + 2.5x - 1.5 = 0$. *"I think I need to use the Quadratic Formula because of the decimals,"* she told Grover. Grover replied, *"I'm sure there's another way! Can't we rewrite this equation so the decimals are gone?"*

a. What is Grover talking about? Rewrite the equation so that it has no decimals.

b. Use your ideas from Lesson 2.2.2 to rewrite your equation again, expressing it as a product.

c. Now solve your new equation. Be sure to check your solution(s) using Graciella's original equation.

2-144. SOLVING BY REWRITING

Rewriting $x^2 + 2.5x - 1.5 = 0$ in problem 2-143 gave you a new, equivalent equation that was much easier to solve. How can each equation or system of equations below be rewritten so that it is easier to solve? With your team, find an equivalent equation or system for each part below. Be sure your new equations have no fractions or decimals and have numbers that are reasonably small. Then solve your new equation or system and check your answer(s) using the original equations.

a. $100x^2 + 100x = 2000$

b. $\frac{1}{2}x^2 + \frac{3}{4}x - \frac{1}{2} = 0$

c. $\frac{2x}{5} + \frac{3}{5} = 1$

d. $\frac{x-3}{x} + \frac{2}{x-1} = \frac{5-x}{x}$

e. $15x + 10y = -20$
$7x - 2y = 24$

f. $\frac{3x+1}{2} + \frac{2y}{3} = -5$
$\frac{2x}{10} - \frac{4y+3}{5} = -4$

2-145. Is $6x + 3y = 12$ equivalent to $y = -2x + 4$? How can you tell using each representation (table, graph, equation)?

2-146. Rewrite each of the following equations so that it is in y-form. Check to be sure your new equation is equivalent to the original equation.

a. $5x - 2y = 8$

b. $xy + 3x = 2$

2-147. Angelica and D'Lee were working on finding roots of two quadratic equations: $y=(x-3)(x-5)$ and $y=2(x-3)(x-5)$. Angelica made an interesting claim: *"Look,"* she said, *"When I solve each of them for* $y=0$*, I get the same solutions. So these equations must be equivalent!"*

D'Lee is not so sure. *"How can they be equivalent if one of the equations has a factor of 2 that the other equation doesn't?"* she asked.

a. Who is correct? Is $y=(x-3)(x-5)$ equivalent to $y=2(x-3)(x-5)$? How can you **justify** your ideas using tables and graphs?

b. Is $0=(x-3)(x-5)$ equivalent to $0=2(x-3)(x-5)$? Again, how can you **justify** your ideas?

2-148. Consider the tile pattern at right.

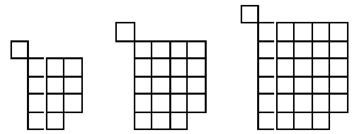


Figure 1 Figure 2 Figure 3

a. Work with your team to describe what the 100th figure would look like. Then find as many different expressions as you can for the area (the number of tiles) in Figure x. Use algebra to **justify** that all of your expressions are equivalent.

b. How can you use your expressions to find out more information about this pattern? Write and solve an equation to determine which figure number has 72 tiles. Do you get different results depending upon which expression you choose to use? Explain.

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Review & Preview

2-149. Rewrite each equation below. Then solve your new equation. Be sure to check your solution using the original equation.

a. $(n+4)+n(n+2)+n=0$ b. $\frac{4}{x}=x+3$

2-150. Decide whether each of the following pairs of expressions or equations are equivalent. If they are, show how you can be sure. If they are not, **justify** your reasoning completely.

a. $(ab)^2$ and a^2b^2 b. $3x-4y=12$ and $y=\frac{3}{4}x-3$

c. $y=2(x-1)+3$ and $y=2x+1$ d. $(a+b)^2$ and a^2+b^2

e. $\frac{x^6}{x^2}$ and x^3 f. $y=3(x-5)+2$ and $y=2x-8$

2-151. Look back at the expressions in problem 2-150 that are not equivalent. Are there any values of the variables that would make them equal? **Justify** your reasoning.

2-152. This problem is a checkpoint for multiplying polynomials. It will be referred to as Checkpoint 3.

Multiply and simplify each expression below.

a. $(x+1)(2x^2-3)$ b. $(x+1)(x^2-2x+3)$

c. $2(x+3)^2$ d. $(x+1)(2x-3)^2$

e. Check your answers to parts (a) through (d) by referring to the Checkpoint 3 materials located at the back of your book.

If you needed help multiplying and simplifying these expressions correctly, then you need more practice with problems like these. Review the Checkpoint 3 materials and try the practice problems. Also, consider getting help outside of class time. From this point on, you will be expected to multiply expressions like these quickly and easily.

2-153. Find the formula for $t(n)$ for the arithmetic sequence in which $t(15)=10$ and $t(63)=106$.

2-154. Jillian's parents bought a house for \$450,000, and the value of the house has been increasing steadily by 3% each year.

a. Find the formula $t(n)$ that represents the value of the house each year.

b. If Jillian's parents sell their house 10 years after they bought it, how much profit will they make? (That is, how much more are they selling it for than they bought it for?) Express your answer as both a dollar amount and a percent of the original purchase price.

2-155. Factor $5x^3y+35x^2y+50xy$ completely. Show every step and explain what you did.

2-156. Consider the sequence 10, 2, …

a. Assuming that the sequence is arithmetic with $t(1)$ as the first term, write the next four terms of the sequence and then write a rule for $t(n)$.

b. Assuming that the sequence is geometric with $t(1)$ as the first term, write the next four terms of the sequence and then write a rule for $t(n)$.

c. Create a totally different sequence that begins 10, 2, … For your sequence, write the next four terms and a rule for $t(n)$.

Lesson 2.2.3 Resource Page

Solutions to equations in problem 2-128:

a. $x = -5, 4$ b. $x = 2,\ y = -5$

c. $x = 2, \frac{1}{2}$ d. $x = 1$

e. $x = 2$ f. $x = -5,\ y = 3$

Solutions to equations in problem 2-128:

a. $x = -5, 4$ b. $x = 2,\ y = -5$

c. $x = 2, \frac{1}{2}$ d. $x = 1$

e. $x = 2$ f. $x = -5,\ y = 3$

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Solutions to equations in problem 2-128:

a. $x = -5, 4$ b. $x = 2,\ y = -5$

c. $x = 2, \frac{1}{2}$ d. $x = 1$

e. $x = 2$ f. $x = -5,\ y = 3$

CL 2-157. Determine if the following sequences are arithmetic, geometric, or neither:

a. $-7, -3, 1, 5, 9, \ldots$

b. $-64, -16, -4, -1, \ldots$

c. $1, 0, 1, 4, 9, \ldots$

d. $0, 2, 4, \ldots$

CL 2-158. Find an equation to represent each table as a sequence with term 1 as its first term.

a.

n	$t(n)$
2	1
5	–8
10	–23
25	

b.

n	$t(n)$
1	6
2	7.2
3	8.64
4	

CL 2-159. Solve the following systems algebraically. What does each solution reveal about the graph of the equations in the system?

a. $x+2y=17$
$x-y=2$

b. $4x+5y=11$
$2x+6y=16$

c. $4x-3y=-10$
$x=\frac{1}{4}y-1$

d. $2x+y=-2x+5$
$3x+2y=2x+3y$

CL 2-160. Solve each equation after first rewriting it in a simpler equivalent form.

a. $3(2x-1)+12=4x-3$

b. $\frac{3x}{7}+\frac{2}{7}=2$

c. $\frac{3}{4}x^2=\frac{5}{4}x+\frac{1}{2}$

d. $4x(x-2)=(2x+1)(2x-3)$

CL 2-161. The following pairs of equations or expressions are equivalent. Show how to transform the first expression into the second.

a. $2x-3y=6$; $y=\frac{2}{3}x-2$

b. $(2x-1)^2$; $4x^2-4x+1$

c. $n(2n+1)(2n-1)$; $4n^3-n$

d. $(\frac{4x^{12}}{-2x^8})$; $-8x^{12}$

e. $10x^2-55x-105$; $5(2x+3)(x-7)$

f. $\sqrt{108}$; $6\sqrt{3}$

CL 2-162. Create multiple representations of each line described below.

a. A line with slope 4 and y-intercept –6.

b. A line with slope $\frac{3}{2}$ that passes through the point $(5, 7)$.

CL 2-163. Describe the domain and range of each function or sequence below.

a. The function $f(x)=(x-2)^2$.

b. The sequence $t(n)=3n-5$.

CL 2-164. Find the x- and y-intercepts of $y=x^2-3x-3$.

CL 2-165. Check your answers using the table at the end of this section. Which problems do you feel confident about? Which problems were hard? Have you worked on problems like these in previous math classes? Use the table to make a list of topics you need to learn more about, and a list of topics you just need to practice more.

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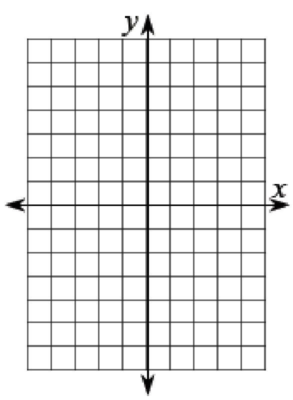
Chapter 2 Closure Resource Page: Sequence vs. Function GO

Use this page to compare and contrast sequences and functions in their multiple representations. How are they similar? How are they different?

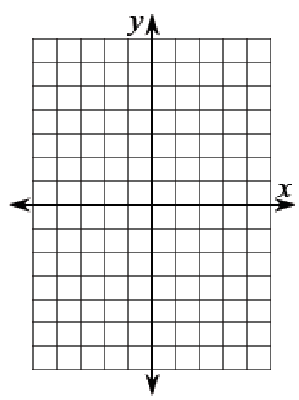
Sequence



Rule:

Situation:

Function



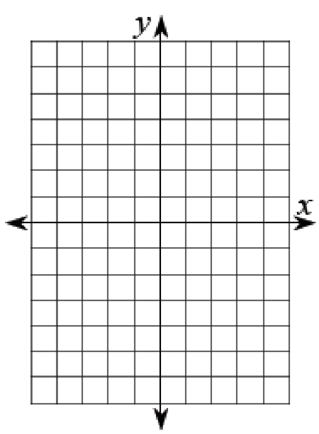
Rule:

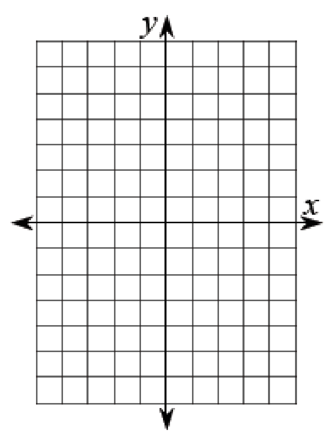
Situation:

Chapter 2 Closure Resource Page: Sequence vs. Function GO

Use this page to compare and contrast sequences and functions in their multiple representations. How are they similar? How are they different?

Sequence	Function





Rule:

Rule:

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Situation: