Chapter 1 — Parent Guide
From Patterns to Algebra

What is algebra? Algebra is the mathematical language used to interpret and represent patterns in numbers by using variables, expressions, and equations. Your child already has a general knowledge of these topics from previous grades.

So, why should your child study algebra? Algebra is an essential tool used in business, science, and computer science worlds. This course will help your child to think logically and abstractly. People who have a solid understanding of algebra can generally expect to excel in college and in their jobs.

Homework will be an important element in this course. Students can learn only so much mathematics by watching and listening in class. Students must practice it themselves. Homework builds on the lesson content presented in class, and each lesson builds on the previous lesson. So, besides helping the student master the content learned in class, homework serves as an ongoing review.

Students who do daily homework naturally perform better on tests than those who do not make it a priority. Also, students with parents who take an interest in their mathematical studies tend to do better in mathematics.

Chapter 1 begins with a study of patterns in sequences and how to represent them by using algebraic expressions and equations. Then, your child will use the universal order of operations to evaluate other algebraic expressions and equations.

Starting with Lesson 1.4, the chapter focuses on graphs, which are a visual representation of how two variables relate to one another. Finally, your child will make generalizations about the information represented in graphs.

The following brief discussion activity will enable you to show an interest in your child's learning as well as monitor your child's progress. You can use the following as a guide for one of the lesson activities in this chapter.

PROBLEM FOR DISCUSSION (See textbook page 11)

Suppose that while you are on vacation you want to rent a mountain bike and the cost is $3 per hour plus a $20 fee. You will be charged a full hour for any part of an hour. You estimate you will need the bike for 4 or 5 hours.

1. Compare the computations for both 4 and 5 hours. How will they differ? How will they be the same?

The $20 flat fee will not change since it is constant. For both computations you multiply the amount of time by $3 and then add $20 to get the total amount. The computations differ depending on the amount of time you plan to rent the bikes.

2. Suppose you want to compute the cost for several other amounts of time. How can writing an algebraic expression help you?

Using an expression is a systematic way of representing the problem. Once you have an expression you can quickly substitute in the value of the unknown, or *variable*, and obtain your answer. The variable for this problem is time. Then you can compare your answers to determine which time will best fit your needs.

3. Discuss how to write an algebraic expression to represent the computations for this problem. Ask how an algebraic expression differs from an equation.

You can write an algebraic expression by replacing words with numbers, letters, and symbols. Look for typical key words to help you determine which symbol to use. For instance,

Key Word		Symbol
is	refers to	=
plus	refers to	+
increased by	refers to	+
taken from	refers to	−
minus	refers to	−
times	refers to	×
into	refers to	÷
divided by	refers to	÷

Assign any letter to the variable. A variable means that the value may vary depending on the situation.

Referring back to the original problem, let *h* represent the number of hours that you plan to rent the bike. So, to write the expression consider the problem statement:

$3	per	hour	plus	$20
↓	↓	↓	↓	↓
3	×	*h*	+	20

The expression can be written as $3h + 20$.

An equation is two algebraic expressions separated by an equal sign.

The problem statement reads, "The cost is $3 per hour plus a $20 fee", so, if you assign a variable for the cost, *C*, then the equation is:

$$C = 3h + 20$$

4. Discuss how to use an equation to compute the cost.

Use the equation, $C = 3h + 20$, to find the cost of renting a bike for the time you desire. Substitute a value for the variable, *h*, and solve the equation for the cost, *C*.

So, if you wanted to rent the bike for 5 hours, let $h = 5$, and solve for *C*.

$$C = 3h + 20 \quad \text{let } h = 5$$

$$C = 3(5) + 20$$

$$C = 15 + 20$$

$$C = 35$$

So, it will cost $35 to rent the bike for 5 hours.

Homework is an important element in Algebra 1. Students can learn only so much mathematics by watching and listening in class. Students must practice it themselves. Homework builds on the lesson content presented in class, and each lesson builds on the previous lesson. So, besides helping the student master the content learned in class, homework serves as an ongoing review.

The following are complete worked out solutions to selected exercises in the student textbook. These solutions are provided to you so that you can help your child with their homework. Your child's classroom notes, example problems in the text, and these worked out solutions are all useful tools to help you and your child work through their assignment.

Chapter 1 - Solutions to Selected Exercises from the Student Textbook

Lesson 1.1

12.

Sequence	100	94	88	82	76	[70]	[64]	[58]
First differences		−6	−6	−6	−6	−6	−6	−6

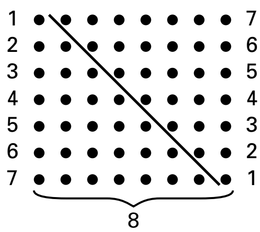
15.

Sequence	30	31	35	42	52	[65]	[81]	[100]
First differences		1	4	7	10	13	16	19
Second differences			3	3	3	3	3	3

20.

Sequence	[2]	[9]	[19]	[32]	[48]
First differences		7	10	13	16
Second differences			3	3	3

26.



The sum is $\frac{7 \cdot 8}{2} = 28$.

Lesson 1.2

10.

x	1	2	3	4	5
$4x$	4	8	12	16	20

17.

g	1	2	3	4	5
$9g - 4$	5	14	23	32	41

24. $3x + 17 = 56$
Try $x = 13$.
$3(13) + 17 = 56$
13 is the correct number. $x = 13$

28. $5p - 10 = 50$
Try $p = 12$.
$5(12) - 10 = 50$
12 is the correct number. $x = 12$

33. 10 pencils at 20 cents each cost $10(20) = 200$ cents, or \$2.00.

37. Let t equal the number of tickets. The equation is $9t = 135$.

Try $t = 10$.
$9(10) = 90$
10 is too small.
Try a larger number.

Try $t = 20$.
$9(20) = 180$
20 is too large.
Try a smaller number.

Try $t = 15$.
$9(15) = 135$
15 is the correct number.

You can buy 15 tickets.

41. Enter 15 and repeatedly add 10.
The 20th term is 205.

Lesson 1.3

13.
$$\begin{aligned}\frac{4+6}{2} - \frac{6-4}{2} &= \frac{10}{2} - \frac{2}{2} \\ &= 5 - 1 \\ &= 4\end{aligned}$$

24.
$$\begin{aligned}157 - 29 + 23 \cdot 9 &= 157 - 29 + 207 \\ &= 335\end{aligned}$$

39.
$$\begin{aligned}4[(3 + 2 \cdot 3) - 5] + 7 &= 4(9 - 5) + 7 \\ &= 4(4) + 7 \\ &= 16 + 7 \\ &= 23\end{aligned}$$

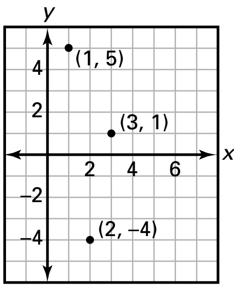
43. $59 - 4 \cdot (6 - 4) = 51$

68. $\text{THI} = 0.4(t + s) + 15$

a. $t = 80$, $s = 65$, $\text{THI} = 0.4(80 + 65) + 15 = 0.4(145) + 15 = 73$
The THI is 73.

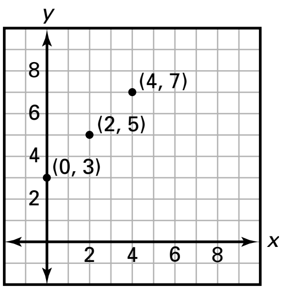
Lesson 1.4

25.



The points do not lie on a straight line.

27.



The points lie on a straight line.

48.

x	$4x - 3$	y
1	$4 \cdot 1 - 3$	1
2	$4 \cdot 2 - 3$	5
3	$4 \cdot 3 - 3$	9
4	$4 \cdot 4 - 3$	13
5	$4 \cdot 5 - 3$	17

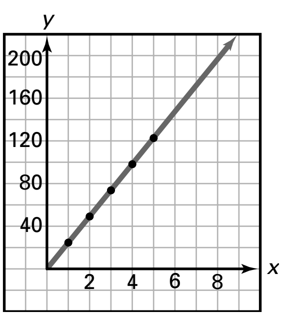
58. $y = -7 - x$

x	-5	-7
y	-2	0

60.

Time (hours)	1	2	3	4	5
Distance (miles)	24.5	49	73.5	98	122.5

The ordered pairs are (1, 24.5), (2, 49), (3, 73.5), (4, 98), and (5, 122.5).



From the graph it appears that the bicyclist would travel about 195 miles in 8 hours.
(The exact answer is 196 miles.)

Lesson 1.5

10.

0	1	2	3	4	5	6
60	180	300	420	540	660	880

120 120 120 120 120 120

The equation is $y = 120x + 60$.

14.

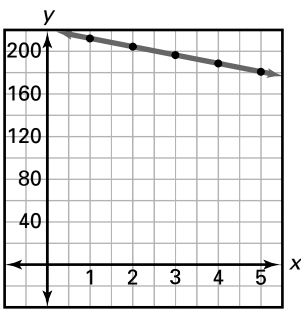
0	1	2	3	4	5	6
250	240	230	220	210	200	190

-10 -10 -10 -10 -10 -10

The equation is $y = 250 - 10x$.

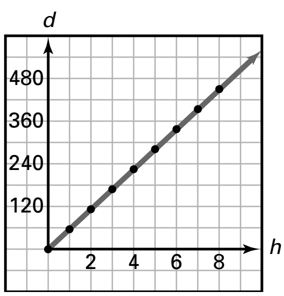
18. $y = 220 - 7x$

x	1	2	3	4	5
y	213	206	199	192	185



32. $d = 58h$

h, hours	0	1	2	3	4	5	6	7	8
d, miles	0	58	116	174	232	290	348	406	464

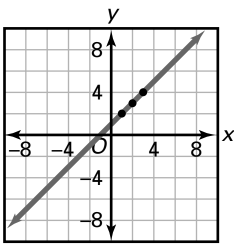


If the family drove for 10 hours, they could travel 580 miles.

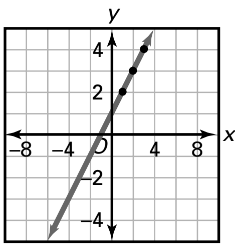
Lesson 1.6

8. little to none

10. Graph 1



Graph 2



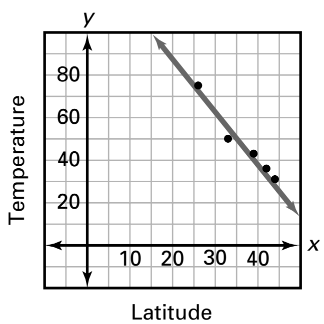
a. Graph 2 is steeper than Graph 1.

b. The y-axis of Graph 2 ranges from -4 to 4, while all the other axes range from -8 to 8.

c. The scale on the y-axis of Graph 2 is "stretched out" compared to Graph 1. This makes the distance between the plotted points appear greater, and hence changes the steepness of the line connecting them.

d. No, the scale does not affect the correlation. The comparison of whether the variables are increasing or decreasing does not change when the scale changes.

12.



There is a strong negative correlation.