

Algebra

The National Council of Teachers of Mathematics recommends that all students learn algebra. They see algebraic competence as an important part of adult life, both on the job and as preparation for postsecondary education.

By viewing algebra as a strand in the curriculum from prekindergarten on, teachers can help students build a solid foundation of understanding and experience as a preparation for more sophisticated work in algebra in the middle grades and high school (NCTM, 2000, p. 36).

Eric Smith (2003) supports this idea by asserting that systematic experience with patterns can build up to an understanding of the idea of function.

Further substantiation for beginning the study of algebra earlier is given by the National Research Council. The shortcomings of traditional school algebra are illustrated by data from the National Assessment of Educational Progress (NAEP). As part of its second mathematics assessment, first-year and second-year algebra students were asked to look at this table and find the value of y when $x = 3$ and when $x = n$.

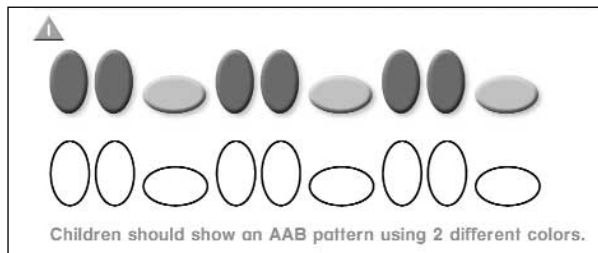
x	1	3	4	7	n
y	8		11	14	

While 69% of first-year algebra students and 81% of second-year algebra students could find the value of y when $x = 3$, only 41% of first-year algebra students and 58% of second-year algebra students could find the value of y when $x = n$. This study points to the need for developing approaches to elementary school mathematics that build to algebraic reasoning earlier (NRC, 2001, p. 260–261).

The authors of *Houghton Mifflin Math* have carefully studied the research on beginning algebra at the elementary level and applied it to the scope and sequence of the algebra strand for kindergarten through grade 6.

Initially, students may describe the regularity in patterns verbally rather than with mathematical symbols. In grades 3–5, they can begin to use variables and algebraic expressions as they describe and extend patterns....By the middle grades, students should be able to understand the relationships among tables, graphs, and symbols and to judge the advantages and disadvantages of each way of representing relationships for particular purposes (NCTM, 2000, p. 37).

In *Houghton Mifflin Math*, a study of patterns begins in kindergarten. In grade 1, patterns are extended to include numbers. By grade 2, students are beginning to use function tables in their work with patterns. In grade 4, students are generalizing functions by using variables, and by grade 6 they are relating tables, graphs, and functions.



Teacher's Edition, grade K, page 32

Practice Find the first number on the chart. Skip count.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Write the missing numbers. Skip count by 2s.

- 8, 10, 12, 14
- 22, _____, _____, 28
- 54, 56, _____, _____, 62
- 64, _____, _____, 70, _____, _____
- 76, _____, _____, 82, _____, _____
- 84, _____, _____, _____, _____, _____
- 90, _____, _____, _____, _____, _____

Student Book, grade 1, page 324

PLAN Make a table to help you find a pattern.

Number of Packs	1	2	3	4	5
Number of Bulbs	3	6	9		

This is a growing pattern.

Student Book, grade 2, page 155

Rule: $8h = e$

Input (h)	Output (e)
1	8
2	16
3	24
4	32

1×8
 2×8
 3×8
 4×8

$8 \times h = e$

Substitute 4 for h . $\rightarrow 8 \times 4 = 32$

Student Book, grade 4, page 126

Lesson 4 Algebra Graph Functions
Objective: Represent functions with graphs.

Learn About It

In Lesson 3, you learned that functions can be represented by words, tables, equations, and ordered pairs. Functions also can be represented by graphs.

When you are given a rule for a function, you can graph the function by making a table of input-output values.

Draw a graph to represent the function $y = x + 5$.

Input x	Output $y = x + 5$	Ordered Pairs (x, y)
-2	$y = (-2) + 5 = 3$	(-2, 3)
-1	$y = (-1) + 5 = 4$	(-1, 4)
0	$y = (0) + 5 = 5$	(0, 5)
1	$y = (1) + 5 = 6$	(1, 6)
2	$y = (2) + 5 = 7$	(2, 7)

1. Make a table of values. Choose x -values that make the values of y easy to find, such as -2, -1, 0, 1, and 2. Write them in numerical order. Substitute each value of x to find the corresponding value of y .

2. Label the horizontal axis with the input values x . Label the vertical axis with the output values y .

3. Plot the ordered pairs. Use a ruler to see if the points lie on a line. If so, draw the line.

The graph of a function is the graph of all points whose coordinates are solutions to the equation representing the function. Note that the points of this graph lie on a straight line. Functions whose points lie along a straight line are called **linear functions**.

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Student Book, grade 6, page 330