

Student Guide

Questions 1–6 (SG pp. 208–210)

1.\* Doubling Machine

Input	Output
25	50
7	14
14	28
15	30
100	200
50	100
2.5	5
$N$	$2 \times N$

2.\* Mystery Machine

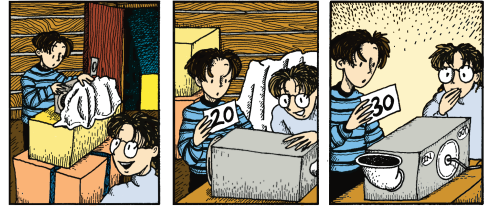
Input	Output
10	20
20	30
5	15
17	27
35	45
25	35
0	10
29	39
$N$	$N + 10$

- It adds 10 to the input number.
- Subtract 10 from the output number.

- Irma and Luis tried the doubling machine on lots of numbers. They put their results in a table like the one below. Make a table like this one and fill in the blank spaces.

Doubling Machine

Input	Output
25	50
7	14
14	
	30
100	
	100
	5
$N$	$2 \times N$



Luis: Say, Irma, I found another machine over here, but I can't read the label.  
 Irma: Let's try it out and see if it works.  
 Luis: I put in 10 and out came 20.  
 Irma: It looks like another doubling machine. Let's put in 20.  
 Luis: 30 came out, so it can't be doubling.

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- Make a table like the one below, and fill in the missing entries.

Mystery Machine

Input	Output
10	20
20	30
5	15
17	27
	45
25	
0	
	39
$N$	



- What does the mystery machine do? There are many ways to answer this question. You can write the answer in words: The mystery machine is an "add ten machine."

You can write the answer in symbols. If we use  $N$  to stand for the input number, then:

$$N + 10 = \text{Output}$$

- If you are given an output number, how can you find the input number?

The doubling machine and the mystery machine that Irma and Luis found in the attic were similar: for every number that went into the machine, an output number came out. One machine followed the doubling rule and the other followed the "add 10" rule to get the output number.

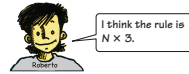
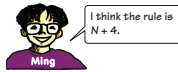
In mathematics, a rule that gives an output for every input is called a **function**. The first machine used the doubling function. The second machine used the "add ten" function.

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\*Answers and/or discussion are included in the lesson.

5. Look at the function table below. The students in Mrs. Dewey's class are trying to find the rule.

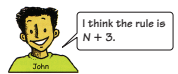
Input	Output
1	3
2	6
5	15
6	18
10	30
$N$	



- A. Test each student's rule. Do you agree with Jackie, Ming, or Roberto? Why or why not?
- B. Choose three input numbers, then find the three output numbers using the rule you found in Question 5A.

6. The students in Mrs. Dewey's class are trying to find the rule for the function table below.

Input	Output
2	5
3	6
5	8
10	13
$N$	



- A. Test each student's rule. Do you agree with Shannon or John? Why or why not?
- B. Choose three input numbers, then find the three output numbers using the rule you found in Question 6A.

Use the *Function Tables* pages in your *Student Activity Book* to practice working with functions.

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- 5. A.\* I agree with Roberto because if you multiply every input number by 3 you get the output number.
- B.\* Answers will vary.
- 6. A. I agree with John because when I tried Shannon's rule with 2, then  $2 \times 2$  did not equal 5. But, John's rule worked for all the input numbers.
- B. Answers will vary.

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\*Answers and/or discussion are included in the lesson.

Student Activity Book

Questions 1–9 (SAB pp. 169–172)

1.

Input	Output
12	7
11	6
10	5
9	4
8	3
7	2
6	1
5	0
Answers will vary.	
$N$	$N - 5$

Rule: Subtract 5 from the input.

2.

Input	Output
1	5
2	15
3	25
4	35
6	55
15	145
21	205
100	995
Answers will vary.	
$N$	$10 \times N - 5$

Rule: Multiply the input by 10 and subtract 5

- 3.\* No, the rule cannot be  $N + 4$  because if you add 4 to 3 you don't get 9 in the second row. The rule is 3 times the input or  $3 \times N$ .

Name \_\_\_\_\_ Date \_\_\_\_\_

Function Tables

Fill in the missing values in the function tables below. Choose your own input for the blank row. Then find the output. Find or check the rule in the last row. Describe the rule in words below each table.

1.

Input	Output
12	7
11	
	5
9	
	3
6	
	2
	0
$N$	$N - 5$

Rule:

2.

Input	Output
1	5
2	15
3	25
4	35
	55
15	
	205
100	
$N$	$10 \times N - 5$

Rule:

3. Study the table to the right. John says the rule cannot be  $N + 4$  or the input plus 4. Do you agree with John? Why or why not?

If not, what is the rule?

Input	Output
2	6
3	9
10	30
$N$	$N + 4$

Rule:

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\*Answers and/or discussion are included in the lesson.

Name \_\_\_\_\_ Date \_\_\_\_\_

4.

Input	Output
1	5
2	10
3	15
4	
	25
10	
	500
$N$	

Rule: \_\_\_\_\_

5.

Input	Output
1	7
2	12
3	17
4	
	27
10	
	502
$N$	

Rule: \_\_\_\_\_

6.

Input	Output
2	8
4	16
5	20
	40
20	
	100
$N$	

Rule: \_\_\_\_\_

7.

Input	Output
2	6
4	14
5	18
10	38
20	
	98
100	
$N$	

Rule: \_\_\_\_\_

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4.

Input	Output
1	5
2	10
3	15
4	20
5	25
6	30
10	50
100	500
Answers will vary.	
$N$	$5 \times N$

Rule: Multiply the input times 5

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5.

Input	Output
1	7
2	12
3	17
4	22
5	27
10	52
100	502
Answers will vary.	
$N$	$5 \times N + 2$

Rule: Multiply the input times 5 and add 2

6.

Input	Output
2	8
4	16
5	20
10	40
20	80
25	100
Answers will vary.	
$N$	$4 \times N$

Rule: Multiply the input times 4

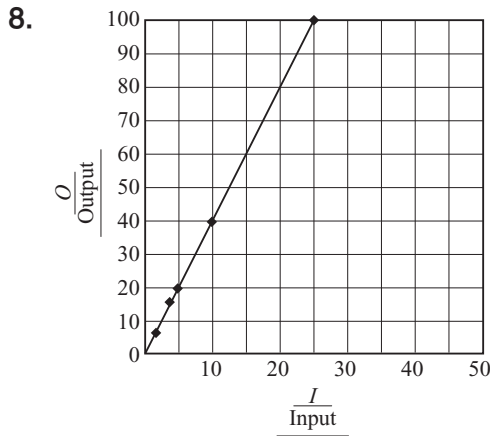
7.

Input	Output
2	6
4	14
5	18
10	38
20	78
25	98
100	398
$N$	$4 \times N - 2$

Rule: Multiply the input times 4 and subtract 2

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Student Activity Book



The points form a straight line that goes up to the right.

9.\* A.

$D$ Drop Ht in cm	$B$ Bounce Ht in cm
50	25
100	50
150	75
$D$	$D \div 2$

- B. The bounce height is half the drop height or the drop height is twice the bounce height.
- C. 100 cm
- D.  $B = D \div 2$

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Name \_\_\_\_\_ Date \_\_\_\_\_

8. Graph the data in Question 6. Describe the pattern in the graph.

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Play the *Guess My Rule* game in the *Student Guide* with a partner.

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Name \_\_\_\_\_ Date \_\_\_\_\_

9. Professor Peabody collected the following data for a tennis ball in a Bouncing Ball Experiment. He did three trials and found the mean. Then he graphed his data.

D Drop Height (in cm)	B Bounce Height (in cm)			
	Trial 1	Trial 2	Trial 3	Mean
40	21	20	22	21
80	39	38	40	39
120	61	65	60	62

D Drop Height (in cm)	B Bounce Height (in cm)
50	
100	75
D	

A. Complete the function table using Professor Peabody's Drop Heights for input and Bounce Heights for output. Use the graph.

B. Look for a pattern in the data. Describe the pattern in words.

C. Use your pattern to predict the bounce height when the drop height is 200 cm ( $D = 200$  cm).

D. Show the pattern in symbols in the last line of the table.

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\*Answers and/or discussion are included in the lesson.

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**Homework (SAB pp. 173–174)**

**Questions 1–6**

Name \_\_\_\_\_ Date \_\_\_\_\_



Find the missing values in the function tables below. Find or check the rule in the last row. Describe the rule in words below each table.

1.

Input	Output
3	10
10	
	27
53	
	200
	1000
100	
$N$	$N + 7$

Rule: \_\_\_\_\_

2.

Input	Output
1	30
2	
3	
4	
5	
10	120
	100
$N$	$10 \times N + 20$

Rule: \_\_\_\_\_

3.

Input	Output
1	12
2	24
3	
4	48
5	
10	
	240
$N$	

Rule: \_\_\_\_\_

4.

Input	Output
20	41
15	31
10	
	11
0	
2	5
	101
$N$	

Rule: \_\_\_\_\_

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I.

Input	Output
3	10
10	17
20	27
53	60
193	200
993	1000
100	107
$N$	$N + 7$

Rule: Add 7

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2.

Input	Output
1	30
2	40
3	50
4	60
5	70
10	120
8	100
$N$	$10 \times N + 20$

Rule: Multiply by 10 and add 20

3.

Input	Output
1	12
2	24
3	36
4	48
5	60
10	120
20	240
$N$	$N \times 12$

Rule: Multiply by 12

4.

Input	Output
20	41
15	31
10	21
5	11
0	1
2	5
50	101
$N$	$2 \times N + 1$

Rule: Multiply by 2 and add 1

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**5–6.** Answers will vary.


Name \_\_\_\_\_ Date \_\_\_\_\_

5. Fill in the input and output columns using your own rule. Write the rule in symbols in the last row.

Input	Output
$N$	

6. Play *Guess My Rule* with a family member.

Input	Output
$N$	



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