UNIT 1

STUDENT BOOK 1 LESSON

Input/Output Machines

Quick Review

At Home At School

This is an **Input/Output machine**.
It can be used to make a growing pattern.

Each input is multiplied by 9 to get the output.
If you input 1, the output is 9.
If you input 2, the output is 18.

Input	Output
1	9
2	18
3	27
4	36
5	45

The pattern rule for the output is:

Start at 9. Add 9 each time.

Try These

1. Complete the table of values for each Input/Output machine.

a)

Input	Output
17	
16	
15	
14	
13	
12	
11	

b)

Input	Output
40	
36	
32	
28	
24	
20	
16	

2. Look at the tables of values in question 1. Write the pattern rule for each group of terms.

a) the output numbers in part a) _____

b) the input numbers in part b) _____

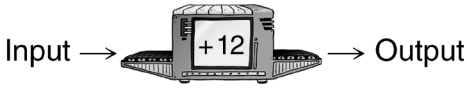
Practice

1. Complete the table of values for each Input/Output machine.

a)

Input	Output
93	
90	
87	
84	
81	

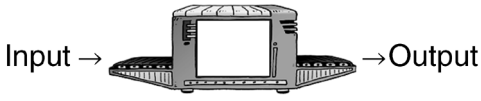
b)



Input	Output
305	
310	
315	
320	
325	

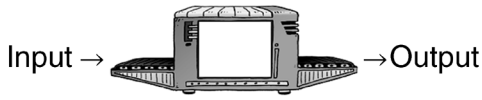
2. Look at the tables of values. Write the number and the operation in each machine.

a)



Input	Output
840	42
800	40
760	38
720	36
680	34

b)



Input	Output
11	143
20	260
29	377
38	494
47	611

Stretch Your Thinking

The table of values shows the Input/Output from a machine.

Input	Output
3456	1152
3531	1177
3606	1202
3681	1227
3756	1252

a) Write the number and operation for the machine. _____

b) Write the pattern rule for the input numbers.

_____

c) Write the pattern rule for the output numbers. _____

UNIT 1

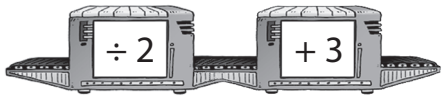
STUDENT BOOK 2 LESSON

Patterns from Tables

Quick Review

At Home At School

This Input/Output machine divides each input by 2, then adds 3.



The pattern rule that relates the input to the output is: Divide the input by 2. Then add 3.

We can use this rule to predict the output for any input.
For an input of 70, the output is:
$70 \div 2 + 3 = 38$

Input	Output
20	13
30	18
40	23
50	28
60	33

Try These

1. Each table of values shows the input and output from a machine with 1 operation. Write the number and the operation in each machine.

a)

Input	Output
2	4
4	8
6	12
8	16
10	20

b)

Input	Output
24	6
20	5
16	4
12	3
8	2

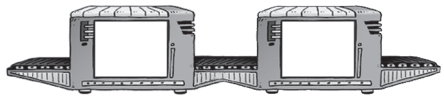
2. Write the pattern rule that relates the input to the output for each table of values in question 1.

a) _____

b) _____

Practice

1. Each table shows the input and output from a machine with 2 operations.



For each table, write the numbers and the operations in the machine.

a)

Input	Output
4	25
5	32
6	39
7	46

_____

b)

Input	Output
50	20
55	22
60	24
65	26

_____

c)

Input	Output
7	26
8	28
9	30
10	32

_____

2. Write the pattern rule that relates the input to the output for each table in question 1.

a) _____

b) _____

c) _____

3. This table shows the input and output from a machine with 2 operations.

Input	Output
25	15
30	18
35	21

a) Write the numbers and the operations in the machine.

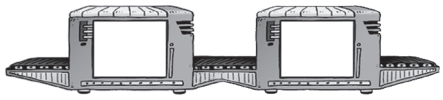
_____

b) Write the next 3 input and output numbers.

c) Predict the output when the input is 100.

_____

Stretch Your Thinking



The first 5 input numbers for the machine are:
2527, 2577, 2627, 2677, and 2727.
The first 5 output numbers for the machine are:
5061, 5161, 5261, 5361, and 5461.
Write the numbers and the operations in the machine.

UNIT 1

STUDENT BOOK 4 LESSON

Using Variables to Describe Patterns

Quick Review

At Home At School

The pattern rule for the output is:
Start at 5. Add 2 each time.
This suggests the input numbers are multiplied by 2.

Multiply input 3 by 2: $3 \times 2 = 6$
To get output 9, add 3.
The pattern rule that relates the input to the output is: Multiply by 2. Then add 3.

We can use a variable in an expression to represent this rule.
Let the letter n represent any input number.
Then, the expression $2n + 3$ relates the input to the output.

Input	Output
1	5
2	7
3	9
4	11
5	13

Input	Output
1	$2 \times 1 + 3 = 5$
2	$2 \times 2 + 3 = 7$
3	$2 \times 3 + 3 = 9$
4	$2 \times 4 + 3 = 11$
5	$2 \times 5 + 3 = 13$
⋮	⋮
n	$2 \times n + 3$

Try These

1. Complete each table of values, then write an expression that relates the input to the output.

a)

Input	Output
1	3
2	8
3	13
4	18
5	23
6	
7	
8	
9	

b)

Input	Output
1	9
2	14
3	19
4	24
5	29
6	
7	

c)

Input	Output
0	4
1	10
2	16
3	22
4	28
5	

Practice

1. Here is a pattern of triangles.

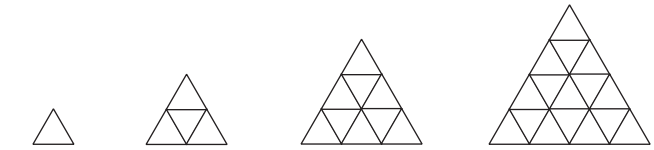


Figure 1 Figure 2 Figure 3 Figure 4

a) Complete the table.

b) Write the pattern rule.

_____

c) Write an expression for the pattern.

_____

d) Find the number of triangles in the 8th figure.

_____

Figure	Number of Triangles
1	
2	
3	
4	

2. For each table of values, write an expression to represent the pattern.

a)

Input	Output
1	1
2	5
3	9
4	13

_____

b)

Input	Output
2	4
3	9
4	14
5	19

_____

Stretch Your Thinking

a) Use the expression $7n + 10$ to complete the table.

b) Write and solve a story problem that matches the pattern.

Number	Amount ($)
0	
1	
2	
3	
4	

_____

_____

_____