



Grade 6 Math
Date: Oct 8, 2019



1) Check the data in the table. The pattern rule that relates the input to the output is multiply input by 4 then subtract 3.

a) Identify any output numbers that are incorrect.

b) Correct the table.

show work

c) Write 2 more input and output numbers

x4 -3

input	output
3	9 ✓
4	13 ✓
8	29
10	38 37
13	49
15	57

In = 3

$$3 \begin{array}{|l} \boxed{\times 4} \\ \hline 12 \\ \boxed{-3} \\ \hline 9 \end{array}$$

In = 4

$$4 \begin{array}{|l} \boxed{\times 4} \\ \hline 16 \\ \boxed{-3} \\ \hline 13 \end{array}$$

In = 8

$$8 \begin{array}{|l} \boxed{\times 4} \\ \hline 32 \\ \boxed{-3} \\ \hline 29 \end{array}$$

In = 10

$$10 \begin{array}{|l} \boxed{\times 4} \\ \hline 40 \\ \boxed{-3} \\ \hline 37 \end{array}$$

In = 13

$$13 \begin{array}{|l} \boxed{\times 4} \\ \hline = 52 \\ \boxed{-3} \\ \hline = 49 \end{array}$$

In = 15

$$15 \begin{array}{|l} \boxed{\times 4} \\ \hline = 60 \\ \boxed{-3} \\ \hline = 57 \end{array}$$

Homework Solutions

#5, #6, #7, #8, #9

5. Copy and complete this table.
The pattern rule that relates the input to the output is:
Divide the input by 3, then subtract 2.
a) Write the pattern rule for the input.
b) Write the pattern rule for the output.

Input	Output
30	8
60	18
90	26
120	38
150	48

- 5a) Start at 6. Add 30 each time
 $30 \div 3 - 2$ $60 \div 3 - 2$ $90 \div 3 - 2$
 $10 - 2$ $20 - 2$ $30 - 2$
 8 18 28
- 5b) Start at 8. Add 10 each time.
 $120 \div 3 - 2$ $150 \div 3 - 2$
 $40 - 2$ $50 - 2$
 38 48

6. The pattern rule that relates the input to the output is:
Add 4 to the input. Then divide by 2.
Check the data in the Input/Output table.
Identify any output numbers that are incorrect.
How do you know they are incorrect?
Show your work.

Input	Output
4	4
8	6
16	10
26	15
30	17

6. I applied the pattern rule to each input number.
In the output column, 2, 4, and 19 are incorrect.
They should be 4, 6, and 17.
 $4 + 4 = 8; 8 \div 2 = 4$
 $8 + 4 = 12; 12 \div 2 = 6$
 $16 + 4 = 20; 20 \div 2 = 10$
 $26 + 4 = 30; 30 \div 2 = 15$
 $30 + 4 = 34; 34 \div 2 = 17$

7. The pattern rule that relates the input to the output is:
Divide the input by 6, then add 5.
a) Check the data in the Input/Output table.
Identify any output numbers that are incorrect. How do you know they are incorrect?
b) Correct the table.
c) Write 3 more input and output numbers for this pattern rule.
Show your work.

Input	Output
6	6
12	7
30	10
42	2
54	16

check
 $6 \div 6 + 5$ $12 \div 6 + 5$
 $1 + 5$ $2 + 5$
 6 7
 $30 \div 6 + 5$ $42 \div 6 + 5$
 $5 + 5$ $7 + 5$
 10 12
 $54 \div 6 + 5$
 $9 + 5$
 14

7. a) I applied the pattern rule to each input number.
 $6 \div 6 = 1; 1 + 5 = 6$
 $12 \div 6 = 2; 2 + 5 = 7$
 $30 \div 6 = 5; 5 + 5 = 10$
 $42 \div 6 = 7; 7 + 5 = 12$
 $54 \div 6 = 9; 9 + 5 = 14$
 Outputs 2 and 16 are incorrect.
 b) They should be 12 and 14.

Input	Calculation	Output
18	$18 \div 6 = 3; 3 + 5 = 8$	8
24	$24 \div 6 = 4; 4 + 5 = 9$	9
36	$36 \div 6 = 6; 6 + 5 = 11$	11

8. The pattern rule that relates the input to the output is:
Multiply the input by 4. Then subtract 3.
Find the missing numbers in the table.
How can you check your answers?

Input	Output
3	9
6	? 21
9	? 33
12	45
15	? 67

$6 \times 4 - 3$ $9 \times 4 - 3$ $15 \times 4 - 3$
 $24 - 3$ $36 - 3$ $60 - 3$
 21 33 57

8. I checked my answers by looking for the pattern in the output column. The pattern rule is: Start at 9. Add 12 each time. All the output numbers fit the pattern.

- TIP 9. The pattern rule that relates the input to the output is:
Add 5 to the input. Then multiply by 3.
Find the missing numbers in the table.
What strategies did you use?

Input	Output
2	21
5	? 36
? 8	39
11	? 48
? 14	57
? 17	66

$(n+5) \times 3$
 $(2+5) \times 3$ $(5+5) \times 3$ $(11+5) \times 3$
 7×3 10×3 16×3
 21 30 48

9. When I was given the input number, I used the pattern rule:
Add 5. Then multiply by 3. When I was given the output number, I used the inverse operations and worked backward: I divided by 3, then subtracted 5.

0. Answers will vary. For example:
a) I drew an Input/Output machine with $\times 4$ in the first screen and $+ 3$ in the second screen.

Input	Output
5	23
10	43
15	63
20	83
25	103

- c) Students share their work.

FLECT: There are 1000 mm in 1 m. So, to convert millimetres to metres, I divide by 1000. The machine would take the input number (in millimetres) and divide it by 1000 to get the output number (in metres). The machine would contain one operation: $\div 1000$

given output do reverse
divide by 3 and subtract 5
 $39 \div 3 - 5$ $57 \div 3 - 5$
 $13 - 5$ $19 - 5$
 8 14
 $66 \div 3 - 5$
 $22 - 5$
 17

Copy the input/output machine (rule)

show work

The pattern rule that relates the input to the output is:

Divide the input by 3, then add 2.

Find the missing numbers in the table.

	Input	Output
	3	3
+3	6	? 4
+3	9	? 5
+3	12	6
+3	15	7 ?
+3	? 18	8

$$6 \div 3 = 2 \quad 2 + 2 = 4$$

How can you check your answers?

$$15 \div 3 = 5 \quad 5 + 2 = 7$$

$$9 \div 3 = 3 \quad 3 + 2 = 5$$

Expressions

Expressions can be represented using algebra

Algebra involves

x - a letter called a variable that represents numbers (input values)

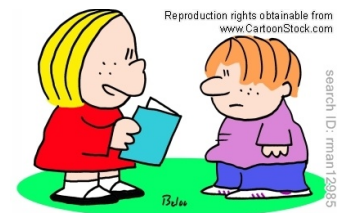
$3x$ - coefficient which is a number in front of a variable

$+2$
 -2 - constant which is a number that is added or subtracted

So when we say multiply an input by 3 and add 2 it can be represented with an algebraic expression

Let "n" represent the input

$$3 \times n + 2$$



"Algebra is like arithmetic,
only X-rated."

You try

Write the expression that relates that pattern:

let "n" represent a number

1. A number doubles and subtracts 1 $\rightarrow \begin{matrix} n \times 2 - 1 \\ \text{or} \\ 2 \times n - 1 \end{matrix}$
2. A number doubles and adds 10 $n \times 2 + 10$
3. A number is five times as much $5 \times n$
4. A number triples and divides by 3 $3 \times n \div 3$
5. A number divides 15 and adds 3

$$\frac{15}{n} + 3$$

or

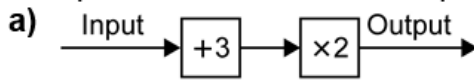
$$15 \div n + 3$$

Class/Homework

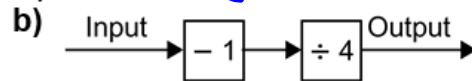
Quiz tomorrow

Extra Practice

1. Complete the table for each Input/Output machine. (Show work)



Input	Output
1	
3	
5	
7	
9	



Input	Output
1	
5	
9	
13	
17	

2. Make a chart for the following using the below inputs

a) Subtract 4, then multiply by 3.

b) Multiply by 3, then subtract 4.

SHOW WORK

Input	Output
5	
6	
7	
8	
9	

3. Complete this table.

The pattern rule that relates the input to the output is:

Subtract 3 from the input.

a) Write the pattern rule for the input.

b) Write the pattern rule for the output.

Input Output

20

25

30

35

40

Expressions

Match each expression to its answer. Show your work on a separate piece of paper.

$$(7 \times 2) + 3 \qquad 64$$

$$8^2 = 8 \times 8 \qquad 100$$

$$18 - (2 + 1) \times 3 \qquad 8$$

$$4 + 12 \div 3 \qquad 17$$

$$5^2 \times (11 - 7) \qquad 9$$

Choose the correct numerical expression for each written statement.

1. the product of eight and six

a) $8 + 6$ b) 8×6 c) $8 - 6$ d) $8 \div 6$

2. the quotient of 20 and four

a) $20 + 4$ b) 20×4 c) $20 - 4$ d) $20 \div 4$

3. three times the difference between four and two

a) $4 - 2 \times 3$ b) $3 \times 4 - 2$ c) $3 \times (4 - 2)$ d) $3 - (4 \times 2)$

4. five less than double 14

a) $(14 \times 2) - 5$ b) $14^2 - 5$ c) $14 - 5$ d) $14 \times (5 - 2)$

5. six times the sum of 14 and eight squared

a) $8^2 \times 6 + 14$ b) $6 \times (14 + 8)$ c) $6 \times 14 + 8^2$ d) $6 \times (14 + 8^2)$

Write an expression to solve each word problem. Use additional paper to show your work.

1. Tina lines up all her gummy bears and sees that she has the product of six and two. Then her brother gives her two more. How many gummy bears does she have now?

2. A cookie recipe makes 24 cookies. Jaio made 11 less than double the recipe. How many cookies did she make?

3. Ahmed is collecting feathers. He finds two white feathers at the park and three white feathers at home. At the zoo, he finds four times as many blue feathers as all of his white feathers. How many blue feathers did he find at the zoo?

Practice

Class/homework

1 For each Input/Output machine:

- Copy and complete the table.
- Write the pattern rule that relates the input to the output.
- Write the pattern rule for the input.
- Write the pattern rule for the output.

Input	Output
1	
2	
3	
4	
5	

a)



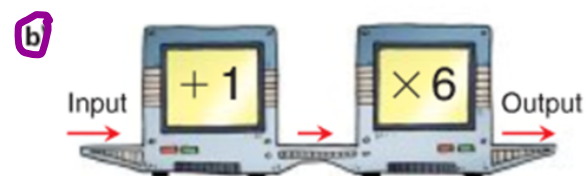
b)



2. For each Input/Output machine:

- Copy and complete the table.
- Write the pattern rule that relates the input to the output.
- Write the pattern rule for the input.
- Write the pattern rule for the output.

Input	Output
2	
4	
6	
8	
10	



3. Look at question 2 and your tables.
 - a) How are the Input/Output machines the same?
How are they different?
 - b) How do the output numbers from the two machines compare? Explain.
 - c) Is it possible to get more than one output number
for each input? How do you know?

4. Copy and complete this table.
The pattern rule that relates the input to the output is:
Divide the input by 6.
a) Write the pattern rule for the input.
b) Write the pattern rule for the output.

Input	Output
36	
42	
48	
54	
60	

5. Copy and complete this table.
The pattern rule that relates the input to the output is:
Divide the input by 3, then subtract 2.
- a) Write the pattern rule for the input.
 - b) Write the pattern rule for the output.

Input	Output
30	
60	
90	
120	
150	

6. The pattern rule that relates the input to the output is:
Add 4 to the input. Then divide by 2.
Check the data in the Input/Output table.
Identify any output numbers that are incorrect.
How do you know they are incorrect?
Show your work.

Input	Output
4	2
8	4
16	10
26	15
30	19



7. The pattern rule that relates the input to the output is:

Divide the input by 6, then add 5.

- a) Check the data in the Input/Output table. Identify any output numbers that are incorrect. How do you know they are incorrect?
 - b) Correct the table.
 - c) Write 3 more input and output numbers for this pattern rule.
- Show your work.

Input	Output
6	6
12	7
30	10
42	2
54	15

8. The pattern rule that relates the input to the output is:
Multiply the input by 4. Then subtract 3.
Find the missing numbers in the table.
How can you check your answers?

Input	Output
3	9
6	?
9	?
12	45
15	?



9. The pattern rule that relates the input to the output is:

Add 5 to the input. Then multiply by 3.

Find the missing numbers in the table.

What strategies did you use?



Input	Output
2	21
5	?
?	39
11	?
?	57
?	66

10. a) Draw an Input/Output machine with two operations.
Choose two numbers and two operations for your machine.
- b) Choose 5 input numbers.
Find the output numbers.
- c) Erase 2 input numbers and 2 output numbers.
Each row must have at least one number.
Trade tables with a classmate.
Trade pattern rules that relate the input to the output.
Find your classmate's missing numbers.

Reflect

Suppose you want to make an Input/Output machine to convert millimetres to metres.
Describe what your machine would look like.

ASSESSMENT FOR LEARNING	
What to Look For	What to Do If You Don't See It
<p>Conceptual Understanding</p> <ul style="list-style-type: none"> ✓ Students explain that an Input/Output machine is used to create a pattern. <p>Procedural Knowledge</p> <ul style="list-style-type: none"> ✓ Students can identify, extend, and create patterns with Input/Output machines. ✓ Students can identify erroneous data in a table of input and output numbers. ✓ Students can describe the pattern within each column of a table of values. ✓ Students can generate values in one column of a table of values given values in the other column and a pattern rule. 	<p>Check Further</p> <p>As students work, ask:</p> <ul style="list-style-type: none"> • What are the differences in consecutive input numbers? • What are the differences in consecutive output numbers? • How can you use these differences to write pattern rules for the input and output numbers? • How can you use the pattern rules to extend the table? <p>Adjust Instruction</p> <p>Students who have difficulty identifying number patterns may benefit from creating their own patterns. Have students work independently to create and extend different types of number patterns. They can trade patterns with a classmate, and identify each other's patterns.</p>