Grade 6 Math

Date: oct.17

Sam made the following input/output machine with two operations.

x y

input	output
40	70
41	72
42	74
43	76

In $\boxed{X2}$ $\boxed{-10}$ $\Rightarrow$ output

In = 40   Out = 70

40 $\boxed{X2}$
   80    $\boxed{-10}$

Identify the numbers and the operations in the machine.

Input $\boxed{X2}$ output Input $\boxed{-10}$ output
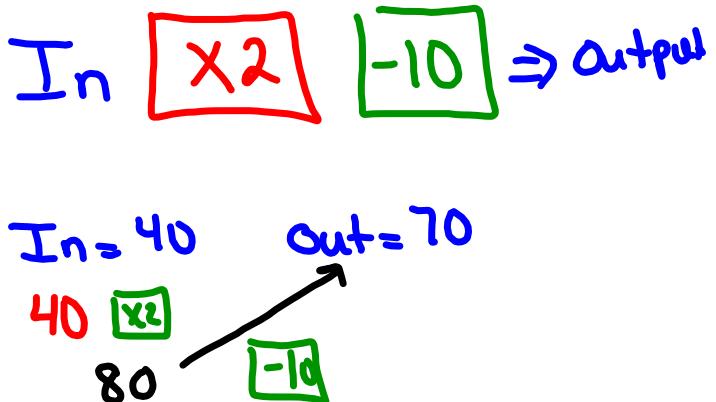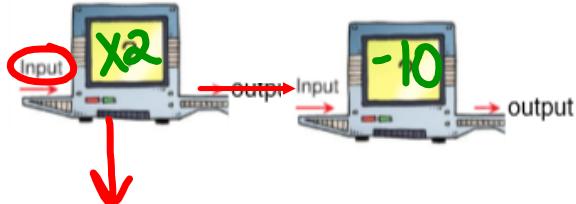
Can you write the pattern rule that relates the input to the output?

$\rightarrow$ Multiply Input by 2 then subtract 10 to get the output.

Can you write an expression using "n" for input

$n \times 2 - 10$

OR

$2n - 10$

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1cd,2cd,4b,5bcd

Homework Solutions

1)

c)

Input	Output
2	20
4	40
6	60
8	80
10	100
12	120
14	140
16	160

d)

Input	Output
500	485
450	435
400	385
350	335
300	285
250	250
200	185
150	150

$$\frac{\Delta y}{\Delta x} = \frac{20}{2} = 10$$

$$\underline{\quad} n \overset{+}{\underset{-}{}} \underline{\quad}$$

$$10n$$

for in=2

$$\underline{10} \times 2$$
$$20$$

So

$$10n$$

Pattern Rule for input to output is to multiply input by 10 to get output

$$\frac{\Delta y}{\Delta x} = \frac{50}{50} = 1$$

$$\downarrow$$
$$1 \times n$$

Check
For in=500 Out = 485

$$1 \times 500$$
$$\underbrace{}_{500}$$ must subtract 15 to get 485

In − 15
or
n − 15

Pattern Rule is to Subtract 15 from each input to get output.

2) a)

In	Out
1	2
2	5
3	8
4	11
5	14
6	17
7	20
8	23

In $\times 3$ -1 = output

Check
In = 1   Out = 2

In $\times 3$
1   $\times 3$
   3   -1

In = 10   Out = ?

In $\times 3$ -1
10   $\times 3$ -1
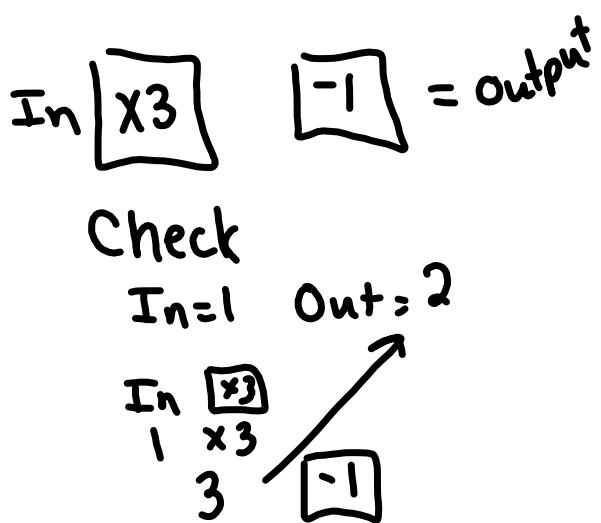
30
-1
= 29

2b)

In	Out
1	9
2	14
3	19
4	24
5	29
6	34
7	39
8	44

$\boxed{5}$

$In \boxed{\times 5} \quad \boxed{+4} = output$

Check

In = 1   Out = 9

$In \boxed{\times 5}$
$\times 5$
5
$\boxed{+4}$

In = 10   Out = ?

$In \boxed{\times 5} \boxed{+4}$

10 $\boxed{\times 5}$ $\boxed{+4}$

50   $\boxed{+4}$

54

2c)

In	Out
3	17
4	21
5	25
6	29
7	33
8	37
9	41
10	45

④

In ×4 +5 = output

Check   In=3 out=17

In ×4
↓
3 ×4
   12   +5
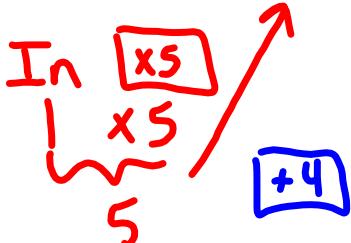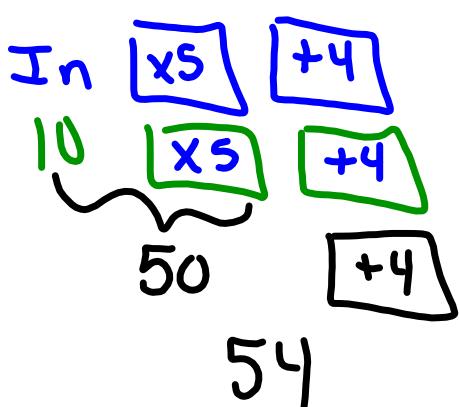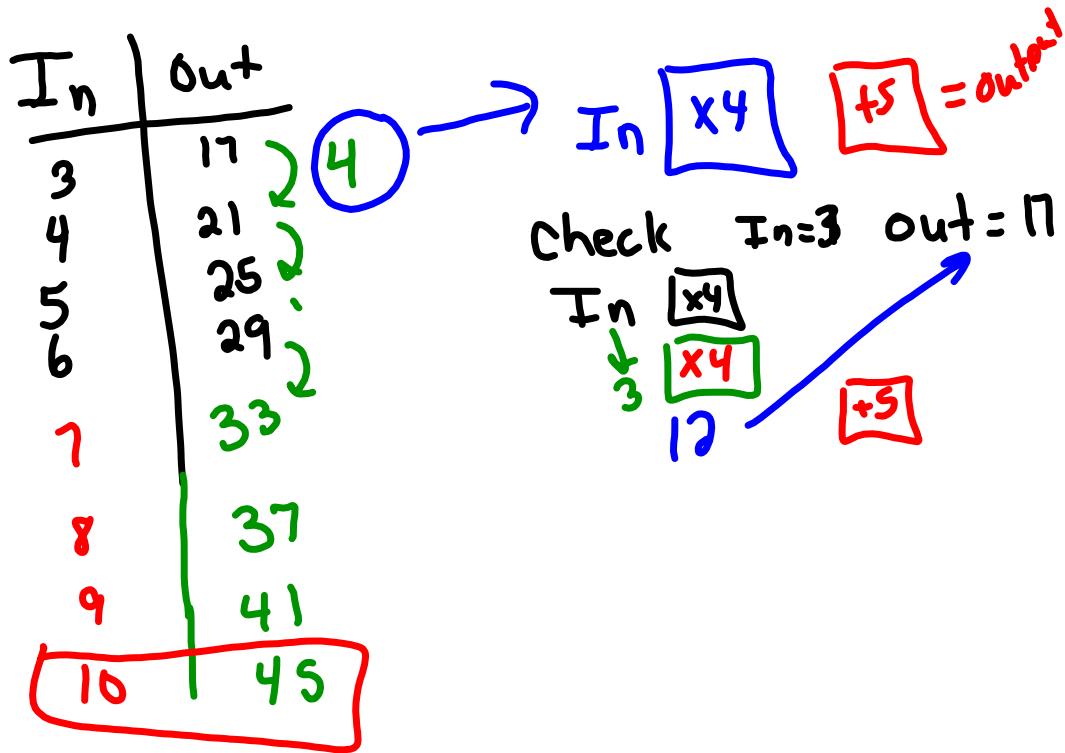
Pg 14-15
1cd,2cd,4b,5bcd

Homework Solutions

2)

c)

Input	Output
3	3
4	5
5	7
6	9
7	11
8	13
9	15
10	17

$2 \times n$

d)

Input	Output
4	17
5	21
6	25
7	29
8	33
9	37
10	41
11	45

Suggest
$4n$

Check
for In=3, out=3
But
$2 \times \underline{3}$ So
6 need to Subtract
 3 to get
 Output

$2n - 3$

Pattern Rule
→ multiply input by 2 then
Subtract 3 to get output.

Check if In=4
 Out = 17

$4 \times \underline{n}$
4×4
 16 Not 17
 So add
 1

$4n + 1$

→ **Pattern Rule**
multiply input by 4
then add 1 to get
Output.

Identify the numbers and the operations in the machine. (2 operations)
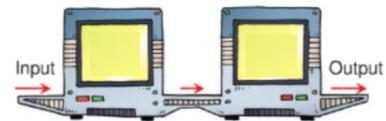
Input → Output

Input	Output
5	14
6	17
7	20
8	23

Write the pattern rule that relates the input to the output.

Class work/Homework

If you need more

Page 14-15
#2d
#4a

#5bcd
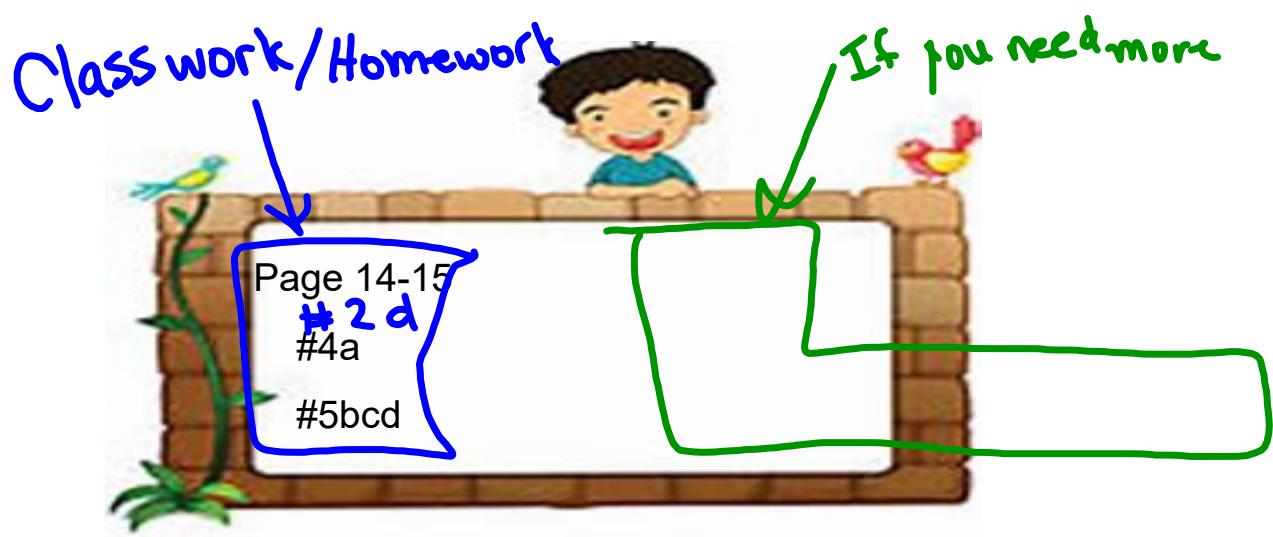
Think of a pattern rule then design your own table and get your partner to write the pattern rule for your table.

Pg 14-15
1ab,2ab,4a,5bcd

Homework Solutions

4. Each table shows the input and output from a machine with two operations.
→ Find the pattern rule that relates the input to the output.
   • Use the pattern rule to find the missing numbers in the table.
   • Use the patterns in the columns to check your answers.
   • Predict the output when the input is 40. Check your prediction.

a)

Input	Output
5	21
6	24
7	27
8 ?	30
9	?33
10	?36

+3 increa by 3

+1 +1 +1

→ As input goes up by 1, the output goes up by 3.

$5 \boxed{\times 3} + \square = 21$

$15 + \square = 21$

↑ 6

[X3] [+6]

$40 \times 3 +6$
120
126

+6
+6

If input is 40, then Output is 126.

5. You may need Colour Tiles or counters, and dot paper.
   ✗ Use tiles, counters, or pictures to show the relationship in this table. Record your work.
   b) Write a pattern rule that relates the input to the output.
   c) Predict the output when the input is 9. Extend your pictures to check.
   d) Which input has an output of 28? Describe the strategy you used to find out.

Input	Output
1	6
2	8
3	10
4	12

+1 +2

$2n \stackrel{+}{=} \_$

a) As Input increases by 1, the output increases by 2.

$2n + \square = 6$
$2(1) + \square = 6$
$2 + \square = 6$
↑ 4

$2n + 4$

c) Input 9

$2(n) + 4$
$= 2(9) + 4$
$= \underbrace{18}_{} + 4$
$= 22$

When input is 9 the output is 22.

d) Output is 28

$2n + 4 = out$
← use reverse

Out $-4 \div 2$
$(28 - 4) \div 2$
$24 \div 2$
6

Homework Solutions

4. Each table shows the input and output from a machine with two operations.
   - Find the pattern rule that relates the input to the output.
   - Use the pattern rule to find the missing numbers in the table.
   - Use the patterns in the columns to check your answers.
   - Predict the output when the input is 40. Check your prediction.

b)

Input	Output
0	1
5	2
10	3
? 15	4
20	?
25	?

Input is increasing by 5 each time   +5

+1 Output is increasing by 1 each time

$\frac{1}{5}n \pm \_\_$?

LIKE DIVIDE BY 5

CHECK FOR CONSTANT

$0 \div 5 = 0$ not 1 so must add 1
$5 \div 5 = 1$ not 2 so must add 1

÷5   +1

$40 \div 5$ +1
  8   +1
      9

If input is 40, then Output is 9

5. You may need Colour Tiles or counters, and dot paper.
   ✗ Use tiles, counters, or pictures to show the relationship in this table. Record your work.
   b) Write a pattern rule that relates the input to the output.
   c) Predict the output when the input is 9. Extend your pictures to check.
   d) Which input has an output of 28? Describe the strategy you used to find out.

Input	Output
1	6
2	8
3	10
4	12

+1   +2

$2n \pm \_\_$

b) As Input increases by 1, the output increases by 2

$2n + \square = 6$
$2(1) + \square = 6$
$2 + \square = 6$
        4

$2n + 4$

c) Input 9

$2(n) + 4$
$= 2(9) + 4$
$= 18 + 4$
$= 22$

When input is 9 the output is 22

d) Output is 28

$2n + 4 = out$ ← use reverse

$Out - 4 \div 2$
$(28 - 4) \div 2$
   24   $\div 2$
      6

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Explore

Abi made an Input/Output machine that uses two operations.

Here is a table for Abi's machine.

Find out what the machine does to each input number.

Input ? ? Output

Show and Share

Explain the strategy you used to solve the problem.
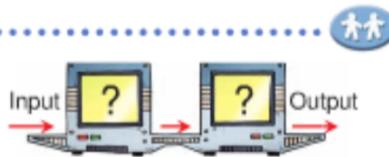
Input	Output
15	6
5	4
20	7
25	8
10	5

Practice

Choose one of the

Strategies

1. Design an Input/Output machine for each table below.
   How did you decide which operations to use?

a)

Input	Output
2	7
4	15
6	23
8	31

b)

Input	Output
3	10
6	19
9	28
12	37

Reflect

Choose one part of question 1.
Explain how you used a pattern to solve it.