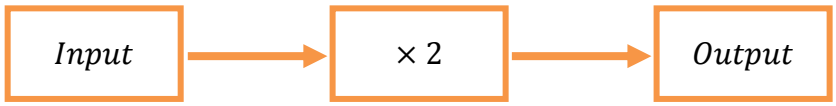
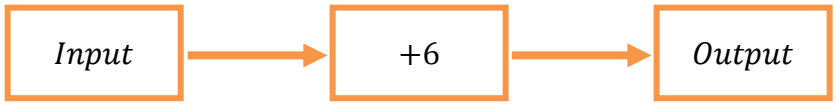
Using a Function Machine

1. Fill in the input/ output table for this function machine.



Input	Output
0	
1	
-3	
0.7	
¼	
53	

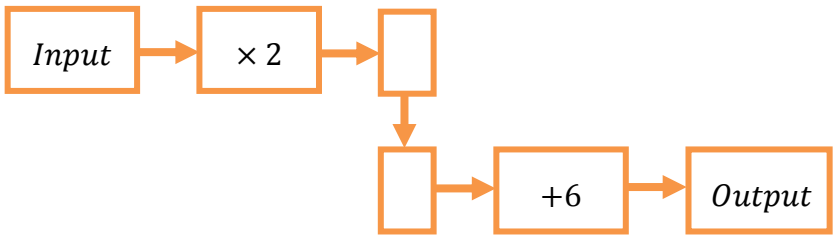
2. Fill in the input/ output table for this function machine.



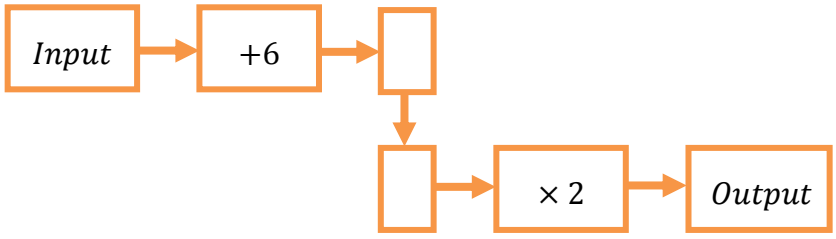
Input	Output
0	
1	
-3	
0.7	
¼	
53	

Combining function machines

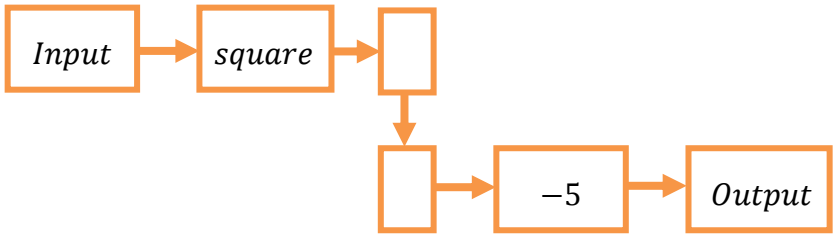
3. If you plug the output of one function machine into a second function machine, you can create a **composite function**. Fill in the input/ output tables for these composite function machines.



Input	Output
0	
1	
-3	
0.7	
¼	
53	

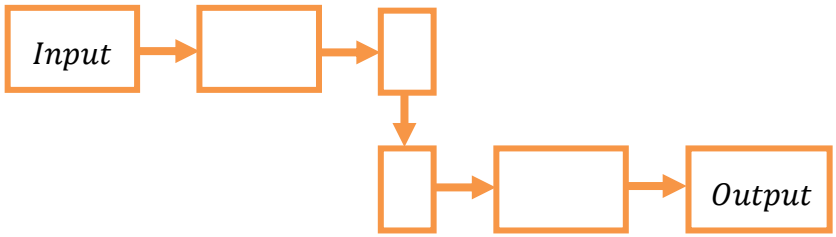


Input	Output
0	
1	
-3	
0.7	
¼	
53	



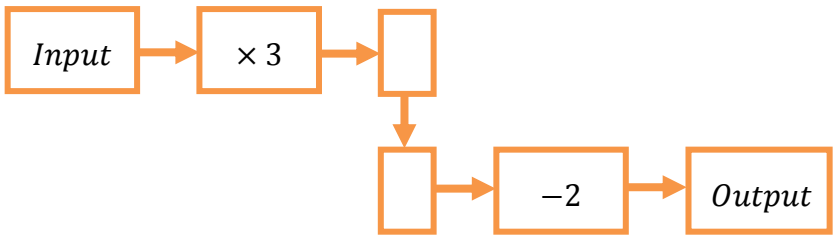
Input	Output
0	
1	
-3	
0.7	
¼	
x	

4. Can you design a composite function machine to go with this input/ output table?



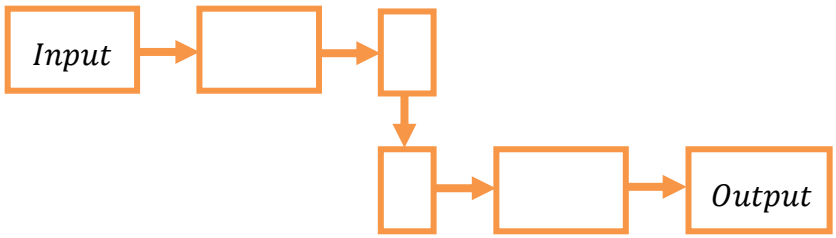
Input	Output
-4	1
-2	2
0	3
2	4
4	5
6	6

5. Try out a few simple inputs for this function and find the corresponding outputs.



Input	Output
x	

6. Can you design a function machine which does the opposite of the machine in question 5? i.e. It's input/ output table should look like the one in question 5 but with the inputs and outputs swapped. This is called an **inverse function**.



Input	Output
x	

7. What happens if you create a composite function machine from machines 5 and 6? Why does this happen? Does it matter which order you connect them in?

8. I have a number of different function machines.

Machine A converts an input of x to an output of 3x.
Machine B converts an input of x to an output of x+4.
Machine C converts an input of x to an output of x/2.
Machine D converts an input of x to an output of x-1.
Machine E converts an input of x to an output of x^2.
Machine F converts an input of x to an output of 5-x.

Complete the input/output tables for the following **composite functions**.

a. Machine A followed by machine B.

Input	Output
-1	
0	
1	
2	
3	
y	

b. Machine B followed by machine A.

Input	Output
-1	
0	
1	
2	
3	
y	

c. Machine C followed by machine D.

Input	Output
-1	
0	
1	
2	
3	
y	

d. Machine E followed by machine A.

Input	Output
-1	
0	
1	
2	
3	
y	

e. Machine C followed by machine F.

Input	Output
-1	
0	
1	
2	
3	
y	

f. Machine B followed by machine E.

Input	Output
-1	
0	
1	
2	
3	
y	

g. Machine F followed by machine C.

Input	Output
y	

h. Machine A followed by machine B followed by machine E.

Input	Output
y	

i. (Make up your own)

Input	Output
y	

9. Complete input/output tables for the **inverse functions** of each of these machines. Use your answers from question 8 to help you.

Machine A converts an input of x to an output of 3x.
Machine B converts an input of x to an output of x+4.
Machine C converts an input of x to an output of x/2.
Machine D converts an input of x to an output of x-1.
Machine E converts an input of x to an output of x^2.
Machine F converts an input of x to an output of 5-x.

a. Inverse of Machine A.

Input	Output
-1	
0	
1	
2	
3	
y	

b. Inverse of Machine B.

Input	Output
-1	
0	
1	
2	
3	
y	

c. Inverse of Machine C.

Input	Output
-1	
0	
1	
2	
3	
y	

d. Inverse of Machine D.

Input	Output
-1	
0	
1	
2	
3	
y	

e. Inverse of Machine F.

Input	Output
-1	
0	
1	
2	
3	
y	

f. Inverse of the composite Machine "A followed by B".

Input	Output
-1	
0	
1	
2	
3	
y	

g. Inverse of the composite Machine "B followed by A".

Input	Output
y	

h. Inverse of the composite Machine "C followed by D".

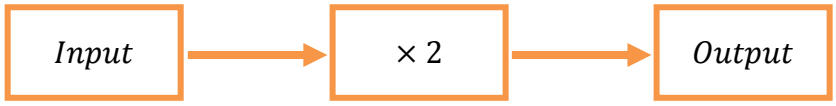
Input	Output
y	

i. (Make up your own)

Input	Output
y	

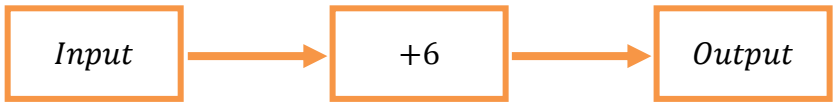
Answers

1. Fill in the input/ output table for this function machine.



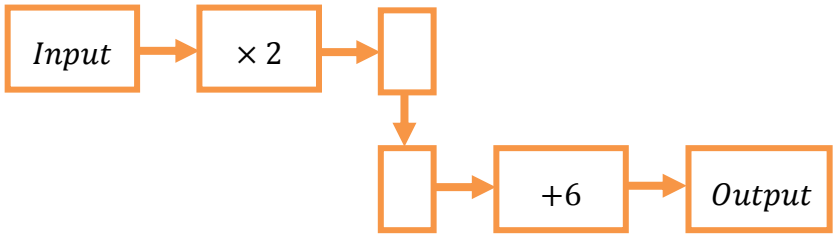
Input	Output
0	0
1	2
-3	-6
0.7	1.4
¼	1/2
53	106

2. Fill in the input/ output table for this function machine.

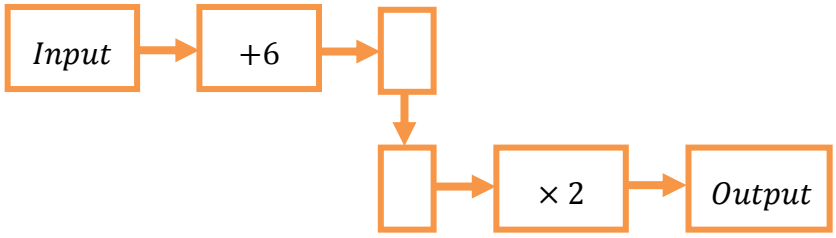


Input	Output
0	6
1	7
-3	3
0.7	6.7
¼	6 ¼
53	59

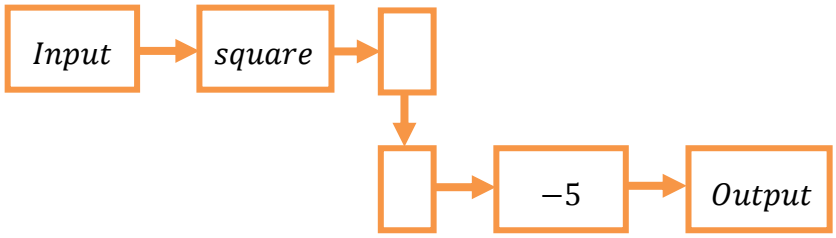
3. If you plug the output of one function machine into a second function machine, you can create a **composite function**. Fill in the input/ output tables for these composite function machines.



Input	Output
0	6
1	8
-3	0
0.7	7.4
¼	6 1/2
53	112

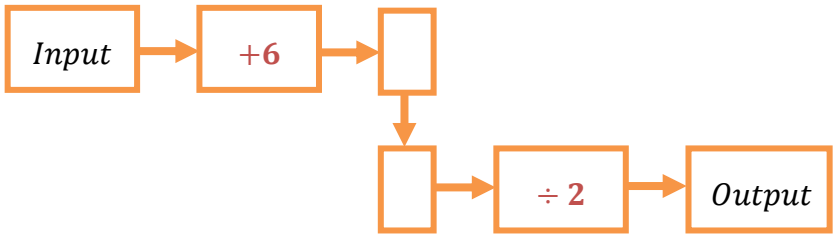


Input	Output
0	12
1	14
-3	6
0.7	13.4
¼	12 1/2
53	118



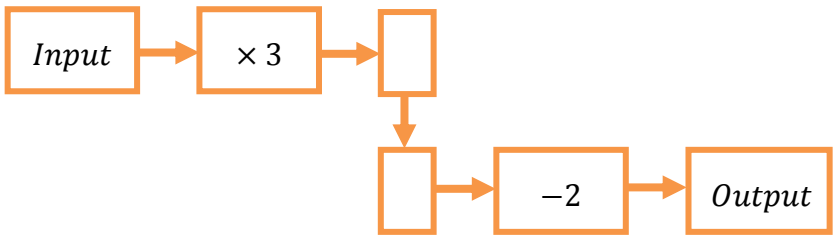
Input	Output
0	-5
1	-4
-3	4
0.7	-4.51
¼	-4 15/16
x	X^2-5

4. Can you design a composite function machine to go with this input/ output table?



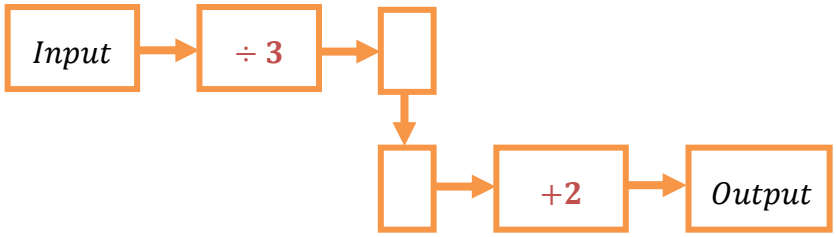
Input	Output
-4	1
-2	2
0	3
2	4
4	5
6	6

5. Try out a few simple inputs for this function and find the corresponding outputs.



Input	Output
x	$3x - 2$

6. Can you design a function machine which does the opposite of the machine in question 5? i.e. It's input/ output table should look like the one in question 5 but with the inputs and outputs swapped. This is called an **inverse function**.



Input	Output
x	$\frac{(x+2)}{3}$

7. What happens if you create a composite function machine from machines 5 and 6? Why does this happen? Does it matter which order you connect them in?

Number stays the same. No.

8. I have a number of different function machines.

Machine A converts an input of x to an output of 3x.
Machine B converts an input of x to an output of x+4.
Machine C converts an input of x to an output of x/2.
Machine D converts an input of x to an output of x-1.
Machine E converts an input of x to an output of x^2.
Machine F converts an input of x to an output of 5-x.

Complete the input/output tables for the following **composite functions**.

a. Machine A followed by machine B.

Input	Output
-1	1
0	4
1	7
2	10
3	13
y	3y+4

b. Machine B followed by machine A.

Input	Output
-1	9
0	12
1	15
2	18
3	21
y	3(y+4)

c. Machine C followed by machine D.

Input	Output
-1	$-1\frac{1}{2}$
0	-1
1	$-\frac{1}{2}$
2	0
3	$\frac{1}{2}$
y	$\frac{y}{2} - 1$

d. Machine E followed by machine A.

Input	Output
-1	3
0	0
1	3
2	12
3	27
y	$3y^2$

e. Machine C followed by machine F.

Input	Output
-1	$5\frac{1}{2}$
0	5
1	$4\frac{1}{2}$
2	4
3	$3\frac{1}{2}$
y	$5 - \frac{y}{2}$

f. Machine B followed by machine E.

Input	Output
-1	9
0	16
1	25
2	36
3	49
y	$(y+4)^2$

g. Machine F followed by machine C.

Input	Output
y	$\frac{(5-y)}{2}$

h. Machine A followed by machine B followed by machine E.

Input	Output
y	$(3y+4)^2$

i. (Make up your own)

Input	Output
y	

9. Complete input/output tables for the **inverse functions** of each of these machines. Use your answers from question 8 to help you.

Machine A converts an input of x to an output of 3x.
Machine B converts an input of x to an output of x+4.
Machine C converts an input of x to an output of x/2.
Machine D converts an input of x to an output of x-1.
Machine E converts an input of x to an output of x^2.
Machine F converts an input of x to an output of 5-x.

a. Inverse of Machine A.

Input	Output
-1	$-\frac{1}{3}$
0	0
1	$\frac{1}{3}$
2	$\frac{2}{3}$
3	1
y	$\frac{y}{3}$

b. Inverse of Machine B.

Input	Output
-1	-5
0	-4
1	-3
2	-2
3	-1
y	y-4

c. Inverse of Machine C.

Input	Output
-1	-2
0	0
1	2
2	4
3	6
y	2y

d. Inverse of Machine D.

Input	Output
-1	0
0	1
1	2
2	3
3	4
y	y+1

e. Inverse of Machine F.

Input	Output
-1	6
0	5
1	4
2	3
3	2
y	5-y

f. Inverse of the composite Machine "A followed by B".

Input	Output
-1	$-\frac{5}{3}$
0	$-\frac{4}{3}$
1	-1
2	$-\frac{2}{3}$
3	$-\frac{1}{3}$
y	$\frac{(y-4)}{3}$

g. Inverse of the composite Machine "B followed by A".

Input	Output
y	$\frac{y}{4-3}$

h. Inverse of the composite Machine "C followed by D".

Input	Output
y	2(y+1)

i. (Make up your own)

Input	Output
y	