2-STEP FUNCTION MACHINES (NUMBER)

BUILDING BLOCKS

NAME _____ CLASS _____ DATE _____

KEY IDEA

Forwards: do the operation. Backwards: do the inverse operation.



1 Find the output.

a) 3 → × 5 → ☐ b) 8 → + 9 → ☐

c) 15 → − 6 → ☐ d) 18 → ÷ 2 → ☐

2 Find the input.

a) ☐ → + 7 → 12 b) ☐ → × 4 → 24

c) ☐ → − 3 → 8 d) ☐ → ÷ 5 → 2

3 Do the steps in order. Write the answer after each step.

a) Start with 3. × 2 ☐ + 1 ☐

b) Start with 10. − 4 ☐ × 3 ☐

c) Start with 20. ÷ 4 ☐ + 6 ☐

4 Work out. Remember: brackets first.

a) $(2 + 3) \times 4 =$ ☐ b) $2 + 3 \times 4 =$ ☐ c) $(10 - 4) \times 2 =$ ☐

5 a) I think of a number and double it. I get 18. What is my number? ☐

b) I think of a number and subtract 9. I get 6. What is my number? ☐

6 I think of a number. I add 2, then I double it. I get 10. Work backwards, undoing the last step first.

$10 \div 2 =$ ☐ $- 2 =$ ☐ My number is ☐

2-STEP FUNCTION MACHINES (NUMBER)

SUPPORT

NAME _____ CLASS _____ DATE _____

KEY IDEA

The output of the first step is the input of the second step.

5 → × 3 → + 6 → 21

5 × 3 = 15, 15 + 6 = 21

Backwards: inverses in reverse order.

21 – 6 = 15, 15 ÷ 3 = 5

1 Find the output.

a) 4 → × 2 → + 3 → ☐

b) 10 → – 4 → × 5 → ☐

c) 7 → + 3 → ÷ 2 → ☐

d) 3 → × 4 → – 2 → ☐

2 Find the input. Work backwards.

a) ☐ → × 2 → + 1 → 9

b) ☐ → + 3 → × 2 → 16

c) ☐ → × 5 → – 3 → 17

d) ☐ → ÷ 2 → + 4 → 10

3 Find the output of each machine when the input is 2.

2 → × 3 → + 6 → ☐

2 → + 6 → × 3 → ☐

Does the order of the steps matter? Explain.

.....

4 I think of a number. I multiply it by 3. Then I add 4. My answer is 19. Fill in the machine and find my number.

☐ → ☐ → ☐ → 19

5 Complete the table for this machine.

input → × 2 → + 1 → output

input	output
1	
2	
5	
	21

6 I think of a number. I subtract 5, then multiply by 2. I get 14. What is my number?

☐

2-STEP FUNCTION MACHINES (NUMBER)

CORE

NAME _____ CLASS _____ DATE _____

KEY IDEA

Forwards: apply the operations in order, left to right. Backwards: start with the output and apply the inverse operations in reverse order. Check by putting your input back in.

1 Find the output. You may use a calculator.

a) 6 → × 4 → − 9 → ☐

b) 2.5 → + 1.5 → × 6 → ☐

c) −3 → × 2 → + 10 → ☐

d) 50 → ÷ 10 → − 8 → ☐

e) 9 → square → + 1 → ☐

f) 8 → − 2 → ÷ 4 → ☐

2 Find the input.

a) ☐ → × 3 → + 7 → 22

b) ☐ → − 4 → × 5 → 35

c) ☐ → ÷ 2 → − 6 → 3

d) ☐ → + 2.5 → × 2 → 13

e) ☐ → × 4 → + 10 → 2

f) ☐ → square → − 1 → 48

3 I think of a number. I subtract 7 and then multiply by 3. My answer is 36. Draw a function machine and find my number.

☐ → ☐ → ☐ → 36

my number = ☐

4 Alex is finding the input for this machine.

☐ → × 2 → + 6 → 20

He writes: 20 ÷ 2 = 10, 10 − 6 = 4, so the input is 4.

Explain Alex's mistake and find the correct input.

5 Complete the table for this machine.

input → ÷ 4 → + 3 → output

input	output
8	
2	
−4	
	10
	0

2-STEP FUNCTION MACHINES (NUMBER)

GREATER DEPTH

NAME _____ CLASS _____ DATE _____

1 Find the missing operations.

a) 4 → × 3 → ☐ → 10 **b)** 6 → ☐ → + 5 → 8

c) Find two different ways to complete this machine.

5 → ☐ → ☐ → 20 5 → ☐ → ☐ → 20

2 **a)** Find two 2-step machines where the output always equals the input.

☐ → ☐ → ☐ → ☐ ☐ → ☐ → ☐ → ☐

b) Find a 2-step machine where the output equals the input only when the input is 4.

4 → ☐ → ☐ → 4

3 Is each statement always, sometimes or never true? Circle your answer.

If it is sometimes true, give an example of when it is true and when it is not.

a) Swapping the order of the two steps changes the output. ALWAYS SOMETIMES NEVER

b) A 2-step machine can be replaced by a 1-step machine. ALWAYS SOMETIMES NEVER

c) "× 2 then + 6" gives the same output as "+ 3 then × 2". ALWAYS SOMETIMES NEVER

d) To find the input, do the inverses in the same order. ALWAYS SOMETIMES NEVER

4 The same number goes into both machines. The outputs are equal.

☐ → × 2 → + 10 → ☐ ☐ → × 4 → − 2 → ☐

input = ☐ **output =** ☐

CHALLENGE

5 **a)** Ana thinks of a number, adds 4, then multiplies by 5. She gets 65. ☐

b) Ben thinks of a number, multiplies by 5, then adds 4. He gets 65. ☐

c) Is there a number that would give the same answer using Ana's steps and Ben's steps? Explain.