

2.4.2 Function Machine

Name: _____ Class: _____ Date: _____

KEY WORDS input

<!-- Session 2 native-skill companion -->

Objective

Practise function machine within the labelled native lessons. Public original tasks; locally authored answer guidance.

1 Key knowledge and worked examples

■ Function machines and reversing operations · Foundation

Follow the operations in their stated order. To recover a starting input, undo the final operation first. A table pairs each input with its output. The same starting input must have only one output for the rule to be a function.

$$x \mapsto 2x + 3$$

Input 4 gives $2 \times 4 + 3 = 11$. To find the unknown input for output 11, subtract 3 to get 8 then divide by 2 to get 4. Inputs -1,0,1 give outputs 1,3,5. A table lists each input beside its output; the operations are always performed in the same order.

Reversing the rule does not mean repeating it. The last forward step is the first reverse step. Different operation orders can produce different outputs.

AQA A7 Foundation interprets simple functions as input-output rules. Higher also uses formal inverse and composite function notation in the separate function lesson.

■ Function machines and reversing operations · Higher

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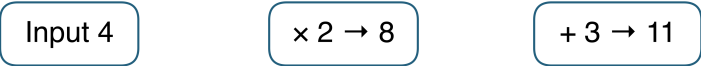
$$x \mapsto 2x + 3$$

Input 4 gives $2 \times 4 + 3 = 11$. To reverse output 11, subtract 3 to get 8 then divide by 2 to get 4. Inputs -1,0,1 give outputs 1,3,5. If a second machine squares its input, passing 4 through the first then the second gives $11^2 = 121$; reversing their order gives $2 \times 16 + 3 = 35$.

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Forward order; reverse by undoing the last step first



Original native-lesson illustration; labels belong to its worked example.

2 Practice

2.1 (Foundation) Find the output of double then add 3 for input 4.

2.2 (Foundation) Find the input producing output 11.

2.3 (Foundation) Find the output for input -1.

3 Exam-style questions

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: Reversing double then add three means subtracting three only.

Solutions

2.1 $2 \times 4 + 3 = 11$.

2.2 Undo $+3$, then undo $\times 2$: $(11-3)/2=4$.

2.3 $2 \times (-1) + 3 = 1$.

3.1 False. The rule maps 4 to 11. Its inverse subtracts 3 and then divides by 2: $(11-3)/2=4$. Subtracting 3 alone gives 8.

Local review guidance: show the chosen method; give the checked result; explain the condition or failed shortcut. This is authored classroom guidance.