

Function Machine

Mission: The makerspace has five mystery machines. Each one follows a secret rule. Feed them inputs, study the table, and write each rule as an expression with a variable.

Big question: How can we write an expression that describes a pattern?

★ Warm-up: What's my rule?

Find the rule for each table.

1→5, 2→6, 3→7 ✓ **Add 4.**

1→3, 2→6, 3→9 ✓ **Multiply by 3.**

Key vocabulary

Expression	Numbers, variables, and operations, like $2n + 1$.
Variable	A letter that stands for a number that can change.
Coefficient	The number multiplied by a variable (the 2 in $2n$).
Evaluate	Find the value by substituting a number for the variable.

1 Box 1

Crack the rule

In the simulator: Type your rule for Machine 1 and test it.

Which expression is Machine 1's rule?

☐ $n + 4$ ☐ $4n$ ☐ $n - 4$ ☐ 4

✓ **$n + 4$**

2 Box 2

Machine 3

In the simulator: Crack Machine 3 and test your rule.

Use the rule: what is the output for $n = 10$?

Answer: _____ ✓ **21**

3 Box 3

Machine 4

In the simulator: Crack Machine 4.

Write Machine 4's rule as an expression.

Look for: Multiplies n by 5; Subtracts 3; at least 1 words

4 Box 4

Spot the coefficient

Machine 4's outputs grow by 5 each time n goes up by 1. What does that tell you?

☐ The rule multiplies n by 5 ☐ The rule adds 5 ☐ The output is always 5

✓ **The rule multiplies n by 5**

5 Box 5

Legend: Machine 5 Legend only

In the simulator: Crack Machine 5.

What is Machine 5's output for $n = 20$?

Answer: _____ ✓ **11**

6 Box 6

Explain your method

Explain how you figured out a machine's rule. Use the words "input" and "output".

Look for: Uses input; Uses output; Describes finding the pattern



Exit ticket: answer the big question in your own words

How can we write an expression that describes a pattern?

Look for: An expression uses a variable (like n) to stand for any input. Look at how the output changes when the input goes up by 1: that is the number multiplied by n . Then check what is added or subtracted. Test your expression on several inputs.



Completion codes

Students see a code like **ABC-I3** when they finish. The first part must match below. The letter is the level (E = Explorer, I = Investigator, L = Legend), and the number at the end is how many stars they earned.

Level	Code starts with
 Explorer	VPT-E
 Investigator	1SI-I
 Legend	1XN-L



Watch for these misconceptions

- " $3x$ means $3 + x$." It means 3 times x .
- "Do the operation you see." Use the inverse operation to undo it.
- "Only change one side of the equation." Whatever you do to one side, do to the other.