Rule Machine Patterns

Use rules to build growing and shrinking number patterns.

4.PFA.1.c · Given a rule, create increasing and decreasing patterns using numbers and input/output tables (including function machines).

Name _____ Date _____

Follow the Rule

A function machine applies its rule to each input independently. To build a sequence recursively, use each output as the next input. Repeatedly adding a positive number makes that sequence increase; repeated subtraction makes it decrease. Subtracting a fixed number from increasing independent inputs can still give increasing outputs.

Worked example

A function machine adds 7. Find the outputs for the inputs shown.

1. Start with input 5.
2. Add 7: 5 + 7 = 12.
3. Use 12 as the next input.
4. Add 7: 12 + 7 = 19.

5 -> 12; 12 -> 19

Function Machine

Input	Rule	Output
5	Add 7	12
12	Add 7	19

1. Practice

Machine rule: add 4. Create an input/output table for inputs 2, 6 and 11.

Input	Output

2. Practice

Start at 26 and subtract 3 repeatedly. Create an input/output table showing four steps, using each output as the next input. Write the resulting sequence.

Input	Output

3. Practice

Machine rule: multiply by 4, then add 2. Find each output: 4 -> ___, 9 -> ___, 13 -> ___.

4. Practice

Pattern: 64, 56, 48, 40, ___. What rule is used? What is the next number?

5. Practice

A machine adds 6. Its outputs are 21, 30, and 42. What were the inputs?

6. Practice

Start at 81. Subtract 9 each time. Is this pattern increasing or decreasing? Write the next three numbers.

7. Apply

At a game club, Nia begins with 18 points. She earns 6 points after each level. Write her total points after levels 1, 2, 3, and 4. Is the pattern increasing or decreasing?

8. Apply

A skate park scoreboard begins at 96 points. Each missed trick subtracts 8 points. Write the score after each of the first 4 missed tricks. What is the score after 4 missed tricks?

9. Challenge

A function machine multiplies an input by 3, then subtracts 4. The output is 62. What was the input? Explain how you know.

What to accept

Accept equivalent rule wording, such as “take away 8” for subtract 8. Accept correct number patterns written with commas, spaces, or arrows.

1. Practice

6, 10, 15

Input	Output
2	6
6	10
11	15

2. Practice

26,23,20,17,14. Each output becomes the next input.

Input	Output
26	23
23	20
20	17
17	14

3. Practice

18, 38, 54

4. Practice

Subtract 8; 32

5. Practice

15, 24, 36

6. Practice

Decreasing; 72, 63, 54

7. Apply

24, 30, 36, 42; increasing

Add 6 points for each level: 18 + 6 = 24, then keep adding 6. The totals increase each time.

8. Apply

88, 80, 72, 64; 64 points

Subtract 8 from 96 for each missed trick. After four subtractions, the score is 64.

9. Challenge

22. Adding 4 to 62 gives 66, and 66 divided by 3 is 22. Check: 22 x 3 = 66, and 66 - 4 = 62.