

LESSON ORGANIZER

40–50 min

Student Materials

- 2-column charts (PM 19)
- 1-cm grid paper (PM 23)
- triangular dot paper (PM 26)
- square dot paper (PM 25)
- counters
- paper strips

Assessment: Master 1.1 Unit Rubric: Patterns and Equations; Master 1.4 Unit Summary: Patterns and Equations

Sample Solutions

1. a) I applied the pattern rule to each input number. Output numbers 2, 3, 7, and 11 did not match the output numbers I got. They should be 1, 2, 5, and 9.
- b) Start at 5. Add 5 each time.
- c) Start at 0. Add 1 each time.

d)

Input	Output
55	10
60	11
65	12
70	13

2. c)

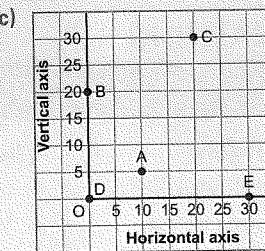
Input	Output
8	14
9	16
10	18
11	20

- d) Multiply the input by 2: $11 \times 2 = 22$
Then subtract 2: $22 - 2 = 20$

3. a)

Number of Teams	Number of Dogs
2	12
3	18
4	24
5	30
6	36

- b) Multiply the number of teams by 6.
- c) Let n represent the number of teams.
- d) $6 \times 13 = 78$; I can check by extending the table.



I chose 1 square represents 5 units because all the coordinates are multiples of 5 and I do not want the grid to be too large.

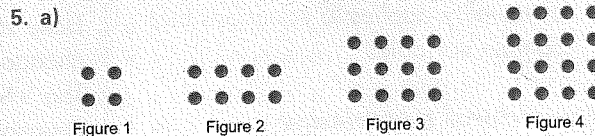


Figure 5 will be a 4×5 rectangle.
Figure 6 will be a 4×6 rectangle.

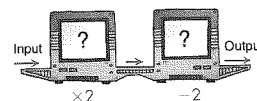
Unit 1 Show What You Know

LESSON

1. The pattern rule that relates the input to the output is: Divide the input by 5, then subtract 1.
 - a) Check the data in the table. Identify any output numbers that are incorrect. How do you know they are incorrect?
 - b) Write the pattern rule for the input.
 - c) Write the pattern rule for the corrected output.
 - d) The pattern continues. Write the next 4 input and output numbers.

Input	Output
5	0
10	② 1
15	③ 2
30	⑦ 5
45	8
50	⑩ 9

2. The table shows the input and output for this machine.



Input	Output
1	0
2	2
3	4
4	6
5	8
6	10
7	12

- a) Identify the numbers and operations in the machine.
 - b) Write a pattern rule that relates the input to the output. Multiply the input by 2. Then subtract 2.
 - c) Choose 4 different input numbers. Find the output for each input.
 - d) Predict the output when the input is 11. Check your prediction. 20
3. In a dogsled race, teams of 6 dogs race to the finish.
 - a) Make a table to show the numbers of dogs in a race when 2, 3, 4, 5, and 6 teams are entered.
 - b) Write a pattern rule that relates the number of dogs to the number of teams entered.
 - c) Write an expression to represent this pattern.
 - d) Use the expression to find the number of dogs when 13 teams are entered. 78 dogs. How can you check your answer?
 4. Draw and label a coordinate grid. Plot each point on the grid. How did you decide which scale to use on the axes?
 - a) A(10, 5)
 - b) B(0, 20)
 - c) C(20, 30)
 - d) D(0, 0)
 - e) E(30, 0)



5. Use dot paper.
- Draw a pattern to model the data in the table. Extend the pattern to Figure 6.
 - Graph the data in the table.
 - Describe the relationship shown on the graph.
 - Write an expression to represent the pattern. $4n$
 - Find the number of shapes in the 21st figure. Which strategy did you use? Why? 84

Figure Number	Number of Shapes
1	4
2	8
3	12
4	16

6. Rewrite each expression using a commutative property.
- 24×3 3×24 b) $121 + 27$ $27 + 121$
 - $46 + 15$ $15 + 46$ d) 9×12 12×9
 - 11×8 8×11 f) $37 + 93$ $93 + 37$

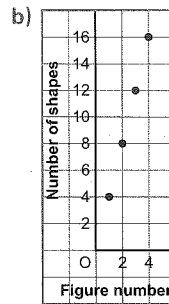
7. For each equation below:
- Model the equation with counters.
 - Use counters to model the preservation of equality. Use a different operation for each equation.
 - Draw diagrams to record your work.
 - Use symbols to record your work.
- $11 - 3 = 8$ $8 + 2 = 8 + 2$
 - $3 \times 1 = 5 - 2$ $3 \times 2 = 3 \times 2$
 - $3 + 4 = 7$ $7 - 4 = 7 - 4$
 - $12 \div 6 = 9 - 7$ $2 + 2 = 2 + 2$

8. For each equation below:
- Apply the preservation of equality. Write an equivalent form of the equation.
 - Use paper strips to check that equality has been preserved.
- Try to use a different operation for each part.
- $4b = 8$ $4b + 3 = 8 + 3$
 - $t = 3$ $t - 2 = 3 - 2$
 - $12 = 6s$ $12 \times 3 = 6s \times 3$
 - $4 = 2s$ $4 \div 2 = 2s \div 2$
- How do you know that equality has been preserved each time?

UNIT 1 Learning Goals

- describe patterns and relationships using graphs and tables
- use equations to represent number relationships
- use relationships within tables of values to solve problems
- identify and plot points in a Cartesian plane
- demonstrate the preservation of equality

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- As the figure number increases by 1, the number of shapes increases by 4.
- Let n represent the figure number.
- I substituted $n = 21$ into the expression. This was the fastest way to find the number of shapes.

7. a)

b)

c)

d)

8. For clarity, only 1 group of 1 is shown on each side.
- I know that equality has been preserved because I did the same thing to both sides of the equation each time. Students' answers should include drawings of paper strips.

ASSESSMENT FOR LEARNING

What to Look For

Conceptual Understanding

- ✓ **Question 2:** Students recognize the pattern rule between 2 columns of numbers in a table of values.
- ✓ **Question 4:** Students can use a scale on a grid when the numbers in an ordered pair are large.
- ✓ **Question 6:** Students can illustrate the commutative properties of addition and multiplication.

Procedural Knowledge

- ✓ **Question 1:** Students can describe the pattern within each column of a table of values.
- ✓ **Question 5:** Students can draw a graph to represent a table of values and describe the relationship shown on a graph.
- ✓ **Questions 7 and 8:** Students can use models to demonstrate and explain the meaning of preservation of equality.

Problem-Solving Skills

- ✓ **Question 3:** Students can write an expression to represent a pattern, then use the expression to solve a problem.