

# Algebraic Relationships

Name: \_\_\_\_\_

1.

Meredith was given the following expression to simplify as a homework assignment. She simplified the expression this way:

$$\begin{aligned} &4 + 3[10 - 2(6 - 3)] \div 3 \\ &= 4 + 3[10 - 2(3)] \div 3 \\ &= 4 + 3[8(3)] \div 3 \\ &= 4 + 3[24] \div 3 \\ &= 4 + 72 \div 3 \\ &= 4 + 24 \\ &= 28 \end{aligned}$$

Meredith's older sister says this is wrong. Do you agree? If so, describe Meredith's error and fix it.

2.

Use the rule  $y = 3x$  to complete the table. Tell how you determined the numbers in the y-column.

| x | y |
|---|---|
| 1 |   |
| 2 |   |
| 3 |   |
| 4 |   |
| 5 |   |

Suppose the numbers 18 and 27 were added to the y column. What numbers would go in the x column to continue the rule? Explain your thinking.

3.

There were 35 people watching the dolphins at the zoo. Four groups of 3 people joined them, and 5 people left. After that, 3 groups of 2 people left, and 3 more people came. To find how many people are at the dolphin exhibit now, simplify this expression:

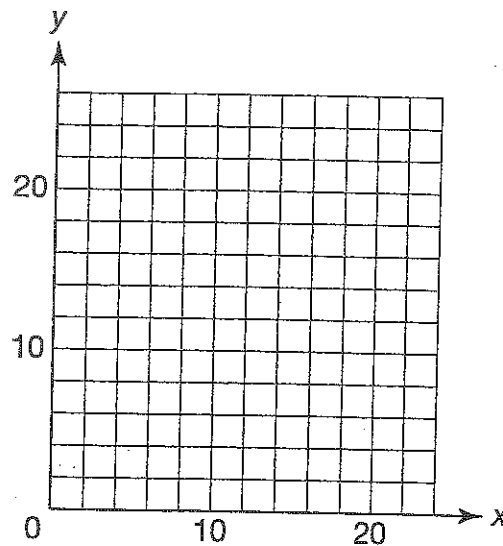
$$35 + (4 \times 3) - 5 - (3 \times 2) + 3$$

Show your steps. How do you know your answer is reasonable? Use a separate sheet of paper to solve.

4.

Use the rule  $y = x + 6$  to complete the table. Then graph your results. Tell how you determined the numbers in the  $y$  column of the table and how you graphed the points.

| $x$ | $y$ |
|-----|-----|
| 6   |     |
| 8   |     |
| 12  |     |
| 16  |     |



5.

Six people got onto a bus at the first stop. At each of the next four stops, 10 people got on and 5 people got off the bus. The number of people still on the bus is given by this expression:

$$4 \times (10 - 5) + 6$$

Eve says 26 people are still on the bus. Alyssa says 41 people are still on the bus. Who is correct? Tell how you know, and explain the meaning of the quantity inside the parentheses.

6.

Johnny wrote an expression to find the number of math problems he needs to work on today. He simplified the expression this way:

$$\begin{aligned} & (18 - 6) \div (3 + 3) + 9 \\ & = 18 - 6 \div 3 + 3 + 9 \\ & = 18 - 2 + 3 + 9 \\ & = 16 + 3 + 9 \\ & = 19 + 9 \\ & = 28 \end{aligned}$$

Johnny's friend Simone says this is wrong. Describe Johnny's error and fix it. **Show your work** on a separate sheet of paper.

7.

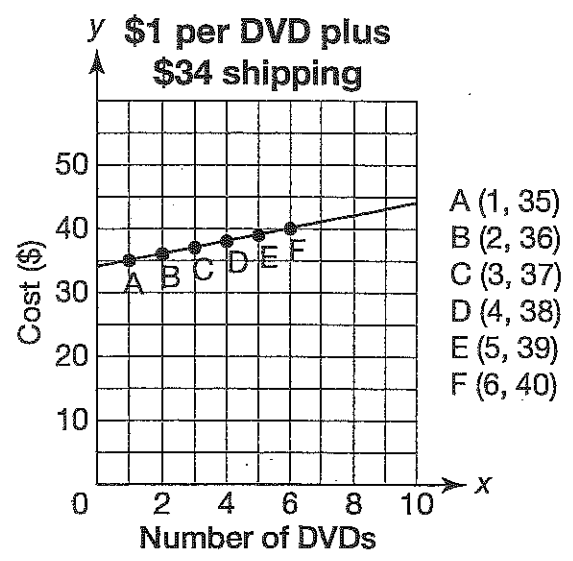
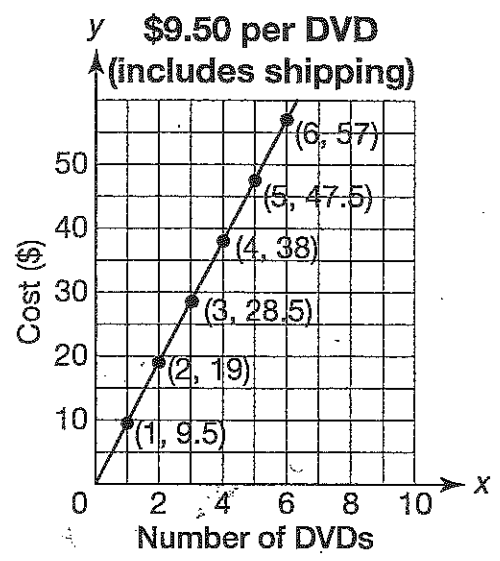
Yuri's teacher asks him to find the patterns in the tables below. Look at Table 1 and Table 2. Write an equation to describe the rule for each pattern, using  $x$  and  $y$ . Did both of your equations use the same operation? Why or why not?

| x | y  |
|---|----|
| 5 | 10 |
| 6 | 12 |
| 7 | 14 |
| 8 | 16 |
| 9 | 18 |

| x  | y  |
|----|----|
| 5  | 10 |
| 7  | 12 |
| 9  | 14 |
| 11 | 16 |
| 13 | 18 |

8.

Seiko can buy used DVDs for \$9.50 per DVD (which includes shipping) or \$1.00 per DVD plus a flat rate of \$34.00 for shipping.

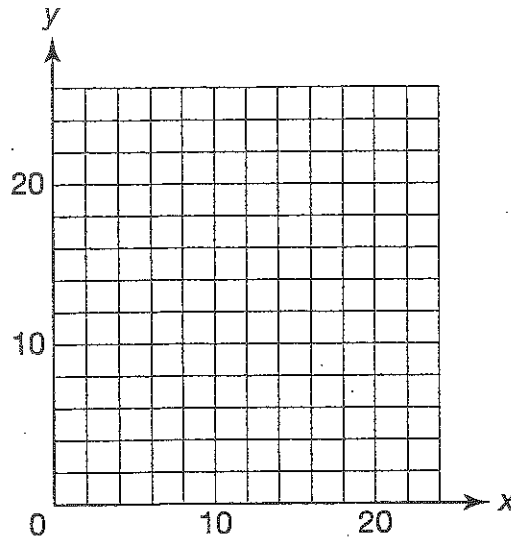


Determine whether these graphs represent additive or multiplicative patterns. What features of each graph show that your answer is correct? Write an equation to describe the rule for each pattern.

9.

Use the rule  $y = 2x$  to complete the table. Then graph your results. Tell how you determined the numbers in the y column and how you graphed the points.

| x  | y |
|----|---|
| 4  |   |
| 6  |   |
| 8  |   |
| 10 |   |



10.

Use the rule  $y = x + 5$  to complete the table. Tell how you determined the numbers in the y-column.

| x | y |
|---|---|
| 0 | 5 |
| 1 |   |
| 2 |   |
| 3 |   |
| 4 |   |

Suppose the numbers 10 and 20 were added to the y column. What numbers would go in the x column to continue the rule? Explain your thinking.

11.

Andrew set out 6 sets of 4 buckets. He saw that 9 of the buckets were damaged, and he took them away. He divided 90 seashells evenly among the buckets. He decides to continue to collect 90 shells and divide them among the buckets a total of 4 times. The expression shows the number of shells in each bucket.

$$[90 \div (6 \times 4 - 9)] \times 4$$

How many shells are in each bucket? Describe the steps needed to simplify the expression. *Show your work on a*

*separate sheet of paper.*