

Vats Grade 8 Algebraic Expressions Clarification

CCSSM: Grade 8

DOMAIN: Functions

Cluster: Use functions to model relationships between quantities.

Standard: 8.F.4: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

Clarification of Math Discussion Terms

An arithmetic **SEQUENCE** of numbers is a set of numbers for which the difference between two consecutive numbers is constant. Each number in the sequence is called a **TERM**.

Sets of multiples are examples of arithmetic sequences. Also a set of numbers such as 1, 5, 9, 13, 17, 21, ... is an example of an arithmetic sequence; the common difference between the terms is four.

An arithmetic sequence can be represented by a **RULE**, sometimes called a **FUNCTION RULE**, such as $y = mx + b$, where y represents a number in the sequence, m represents the common difference between the terms, x represents any whole number, and b represents the value of y when x is zero. For the sequence: 1, 5, 9, 13, 17, 21, ... the rule would be $y = 4x + 1$.

A function rule such as $y = 4x + 1$ is sometimes used to generate a **FUNCTION TABLE**:

| | | | | | | |
|----------|---|---|---|----|----|----|
| x | 0 | 1 | 2 | 3 | 4 | 5 |
| y | 1 | 5 | 9 | 13 | 17 | 21 |

In the function table, the values of y represent the terms of the sequence.

In the rule $y = 4x + 1$,

- the number 4 is called the **COEFFICIENT** of x ; it is the constant difference between the terms of the sequence.
- the number 1 is called the **CONSTANT**; it is the value of y when x is 0.

Classroom Example 1

What is the next number in this sequence: 2, 5, 8, 11, 14, 17, ...?

The common difference is 3, so the next number is $17 + 3$ or 20.

What is the rule for this sequence: 2, 10, 18, 26, 34, ...

The rule is $y = 8x + 2$. The common difference between the terms is 8; therefore the coefficient of x is 8. The starting value for the sequence is 2; therefore the constant is 2. It is the value of y when x is 0.

Classroom Example 2

Complete the table for the sequence represented by the rule: $y = 4x + 5$.

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

The completed table is:

| | | | | | | |
|-----|---|---|----|----|----|----|
| x | 0 | 1 | 2 | 3 | 4 | 5 |
| y | 5 | 9 | 13 | 18 | 23 | 28 |

The Math in the Puzzle



In the Vats puzzle, players must select the number of moves an arm in the vat must make in order to open the gate for the avatar to enter the vat. Players must also select the number of moves the arm must make for the player to be able to capture the yellow dinosaur eggs, while also avoiding the green monster.

In this screen shot, the avatar is located in Vat A with 7 landing spots. A player would have to "mix" 6 times in order to move the rod 6 units (clockwise) and collect the dinosaur egg.



From that point the player could mix 2 times to open the gate to the bridge between the Vat A and Vat B.

In subsequent levels of the puzzle, the player must look ahead to Vat B, and choose a number that will open both the gate to the bridge from Vat A to Vat B, while at the same time opening the gate from the bridge into Vat B. The player can mix 16 times, thus opening both the gates. The sequence for Vat A is 2, 9, 16, ... (adding 7 each time) and the sequence for Vat B is 7, 16, 25, ... (adding 9 each time.) The first number the two sequences have in common is 16. When the bridge is “electrified” (glowing green,) the player must open both gates at the same time in order to use the bridge.