Formulating Rules for Sequence

September 2021						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

Look for the pattern in the sequence of encircled numbers

The numbers 4, 8, 12, 16, 20, 24, and 28 form a sequence.

A **number sequence** is a list of numbers arranged so that each term follows a specific rule or pattern. Each individual number in the sequence is referred to as a **term.**

If we look at any two consecutive terms among the circled numbers on the calendar, the difference between them is 4. By adding 4 to any term, we get the next number in the sequence. Thus, the rule for the sequence 4, 8, 12, 16, 20, 24 is to add 4 to the preceding term.

Sequence	Rule	Nth term rule	Next three term
a. 3, 6, 9,12,...	Every term after the first is obtained by adding 3 to the number preceding it. (0+3), (3+3), (6+3), (9+3),... or Multiples of three (3×1), (3×2),(3×3), (3×4),...	3n	15, 18, 21
b. 1, 4, 9, 16,...	Multiply the counting numbers by itself or squaring counting numbers.	n^2	25, 36, 49
c. 3, 1, −1, -3,	Every term after the first is obtained by adding (-2) to the number preceding it. 3, [3+(-2)], [1+(-2)], [-1+(-2)], ...	−2(n-1)+3 or 5-2n	−5, −7, -9
d. 2, 3, 4, 5, ..	First term = 1+(1)=2 Second term= 2+(1)=3 Third term = 3+(1)= 4 Fourth Term=4+(1)=5	n+1	6, 7, 8
e. 2, 4, 6, 8, ...	First term= 2 × (1)=2 Second term= 2 × (2)=4 Third term=2 × (3)=6 Fourth term=2 × (4)=8	2 × n or 2n	10, 12, 14

Example: 2: 2, 5, 8, 11, …

$$\begin{array}{ccccccc} & 3 & & 3 & & 3 & \\ 2, & & 5, & & 8, & & 11, \ldots \\ & 5-2 & & 8-5 & & 11-8 & \end{array}$$

Working backwards, you'll notice a pattern where subtracting 3 from a term gives the previous term on the left. Now, try to find a way to generate each term such that the sequence has a common difference of 3.

Using guess-and-check strategy:

Example: 2: 2, 5, 8, 11, …

Let **n** represent a counting number.

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Guess	Check	Conclusion
$3 \times n + 1$	$3 \times 1 + 1 = 4$	This rule is wrong because the first term in the pattern 2, 5, 8, 11 is 2 not 4
$3 \times n - 2$	$3 \times 1 - 2 = 1$	This is also wrong. The first term should be 2 not 1.
$3 \times n - 1$	$3 \times 1 - 1 = 2$	The rule is exact for the first term.
	Let's also check the rule for the other three terms. $3 \times 2 - 1 = 5$ $3 \times 3 - 1 = 8$ $3 \times 4 - 1 = 11$	The rule is also exact for the other three terms.

So the nth for the sequence 2, 5, 8, 11, ... is **$3 \times n - 1$ or $3n - 1$.** In this example, the rule **$3n - 1$** is what we call an **expression.** While **$3n - 1 = 4$** is what we call an **equation.**

Let's take a look at this table:

Expression	Equation
$2 + 5$	$2 + 5 = 7$
$2y - 4$	$2y - 4 = 14$
$14 - 3$	$14 - 3 = 11$
$5n + 6$	$5n + 6 = 26$
$10 \div 2$	$10 \div 2 = 5$

In the table, the first column contains examples of **expressions,** while the second column shows examples of **equations.**

An **expression** is a combination of numbers, variables, or both, along with operation symbols. On the other hand, an **equation** is a mathematical statement that connects the values of two expressions with an **equal sign.**