Maths - Year 6

Pattern and Algebra 4: Using symbols and letters for variables and unknowns

Key Vocabulary

Term	One of the numbers in a sequence.
Equation	A statement that the values of two mathematical expressions are equal (indicated by the sign =).
Expression	A combination of numbers, variables and function e.g. 2n + 6
Algebra	The part of mathematics in which letters and other general symbols are used to represent numbers and quantities in formulae and equations.
Equivalent	Different ways of representing the same value.
Inverse	The reverse or the opposite.
Factor	A number that divides into another number exactly.
Multiple	The product of two whole numbers larger than one, e.g. 15 is a multiple of 3 and of 5.
Prime number	A whole number with exactly two different factors, which are 1 and itself.
Prime factor	The smallest parts a composite number can be divided into, e.g. the prime factors of 12 are 2, 2 and 3, because 2 x 2 x 3 = 12.
Composite number	Any positive whole number that is not a prime number.
Commutative property	When adding or multiplying 2 numbers, the answer will be the same no matter which order the numbers are in.
Associative property	When adding or multiplying, the answer will be the same no matter how the numbers are grouped, e.g. 2 + 3 + 5 = 5 + 3 + 2 and 2 x 3 x 5 = 5 x 3 x 2

Mathematical Skills

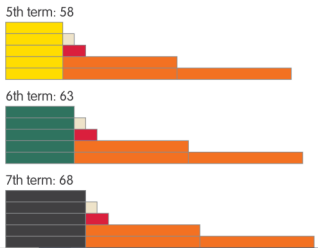
- Identify the term-to-term rule in a linear sequence, e.g. in the sequence 38, 43, 48, 53, … the term-to-term rule is 'add 5'.
- Describe a rule for finding the general term of a linear sequence and express this with an algebraic expression, e.g. 5n + 33.
- Explain algebraically how 'think of a number' problems work.
- Explain the general relationship between an 'input' (x) and an 'output' (y) for a particular function (e.g. for a function described by y = 3x, y is always three times x, x is always one third of y).
- Identify a missing input or output for a given function machine, and a missing instruction, e.g. '× 3' for a given set of inputs and outputs.
- Write an equation to show the general relationship between input and output for a given function, represented as x and y respectively, e.g. y = 3x.
- Use tests of divisibility to sort numbers.
- Describe the commutative properties of adding and of multiplying in general terms, including algebraically,
e.g. a + b = b + a, ab = ba.
- Explain why adding and multiplying are commutative, while subtracting and dividing are not.

Mathematical Methods

- Investigating rules and generalising with algebra e.g. finding the total from a starting point on a 100 square including the starting number, the two numbers to its right and the two numbers below it.

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
31	32	33	34	35	36	37	38	39	40

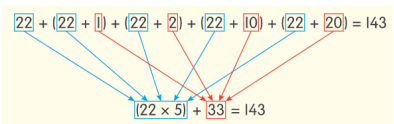
Starting number	Calculation	Result
1	1 + 2 + 3 + 11 + 21	38
2	2 + 3 + 4 + 12 + 22	43
3	3 + 4 + 5 + 13 + 23	48
4	4 + 5 + 6 + 14 + 24	53
5	5 + 6 + 7 + 15 + 25	58
6	6 + 7 + 8 + 16 + 26	63
7	7 + 8 + 9 + 17 + 27	68
8	8 + 9 + 10 + 18 + 28	73

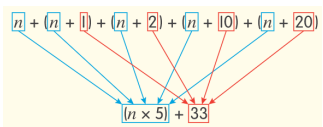


5th term:
5 + (5 + 1) + (5 + 2) + (5 + 10) + (5 + 20) = 58

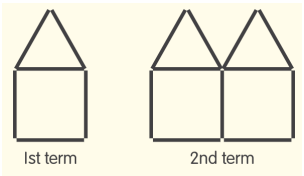
6th term:
6 + (6 + 1) + (6 + 2) + (6 + 10) + (6 + 20) = 63

7th term:
7 + (7 + 1) + (7 + 2) + (7 + 10) + (7 + 20) = 68

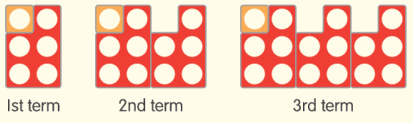




- Generalising about linear sequences using symbols and letters e.g. creating a general rule for the growing pattern.



Term number	1	2	3	4	5	6	7	8
Number of sticks	6	11	16	21	26	31	36	41



1st term: $1 + (5 \times 1) = 6$
or 1st term: $(1 \times 5) + 1 = 6$

2nd term: $1 + (5 \times 2) = 11$
or 2nd term: $(2 \times 5) + 1 = 11$

3rd term: $1 + (5 \times 3) = 16$
or 3rd term: $(3 \times 5) + 1 = 16$

10th term: $1 + (5 \times 10) = 51$
or 10th term: $(10 \times 5) + 1 = 51$

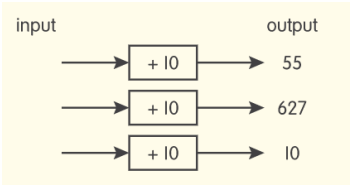
$1 + 5n$, $5n + 1$, $(n \times 5) + 1$

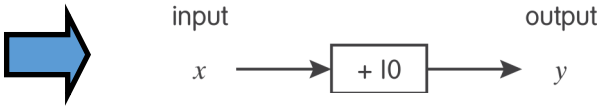
- Generalising about 'think of a number' problems e.g.

Think of a number.
Double it.
Add 100.
Halve the result.
Take away the number you first thought of.
Your answer is 50.

Think of a number.	x	x
Double it.	x x	$2x$
Add 100.	x x 100	$2x + 100$
Halve the result.	x 50	$(2x \div 2) + (100 \div 2) = x + 50$
Take away the number you first thought of.	50	$x + 50 - x = 50$

- Using symbols to describe function machines.





- Generalising about divisibility

Number	5059	5179	5307	5402	5608
Divisible by	(prime)	(prime)	3	2	2

Number	5107	5235	5336	5409	5625
Divisible by	(prime)	3, 5	2	3, 9	3, 5, 9

Number	5171	5273	5340	5454	5735
Divisible by	(prime)	(prime)	2, 3, 5, 10	2, 3, 9	5

- Expressing general laws of arithmetic e.g.

$4 \times 6 = 24$
$6 \times 4 = 24$
$24 \div 6 = 4$ or $\frac{24}{6} = 4$
$24 \div 4 = 6$ or $\frac{24}{4} = 6$

$ab = c$
$ba = c$
$c \div b = a$ or $\frac{c}{b} = a$
$c \div a = b$ or $\frac{c}{a} = b$

Can you..?

- Identify the general rule for this growing pattern. Can you use letters or symbols to show this rule?