



Chapter 8

Algebra

| Year 6 – Algebra (When planning ensure you track back to year 5 for progression) | |
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| <p>National Curriculum Use simple formulae Generate and describe linear number sequences Express missing number problems algebraically Find pairs of numbers that satisfy an equation with two unknowns</p> | <p>Notes and guidance (non-statutory) Pupils should be introduced to the use of symbols and letters to represent variables and unknowns in mathematical situations that they already understand, such as: missing numbers, lengths, coordinates and angles formulae in mathematics and science equivalent expressions (for example, $a + b = b + a$) generalisations of number patterns</p> |
| <p>Key vocab: variable, expression, equations/functions, expanding brackets, coefficient, BIDMAS, rearranging, simplifying, substitution. Key concepts Although only mentioned formally in year 6, children are exposed to algebra from a young age through patterns and sequencing. The use of symbols & letters to represent variables must be introduced in known contexts: lengths, angles etc Inverse can be used for missing number calculations. A letter in algebra stands for ‘whatever number is chosen’, that is, a variable. When a number and a letter are side by side we multiply.</p> | <p>Learning objectives (see overleaf for exemplification)</p> <p>To use simple formula to generate, express and describe: -Linear number sequences -Mathematical formula -Missing number, lengths, coordinates and angles problems -equivalent expressions ($a+b = b + a$)</p> <p>To find pairs of numbers that satisfy an equation with two unknowns To find all possibilities of combinations of two variables.</p> |
| <p>Potential barriers/ misconceptions Pupils do not know the inverse to each operation. Pupils cannot understand that a number can be represented as a letter or symbol. Pupils think that a letter and a number together make a higher digit number e.g. $3n$ is 35 not 3×5. Pupils calculate the value of the same letter differently in one calculation. Pupils are unable to read coordinates. Avoid the fruit salad approach to explaining algebraic statements: $3a+5b$ as 3 apples and 5 bananas– or anything that reinforces the ideas that the letters stand for objects of specific numbers.</p> | <p>Mental maths</p> <p>To express a relationship in symbols to start to use simple formula: - Use symbols to write a formula for the number of months m in years y.</p> <p>- Write a formula for the cost of c chews at $4p$ each.</p> <p>- write a formula for the nth term of this sequence: 3, 6, 9, 12, 15 ...</p> <p>- The perimeter of a rectangle is $2 \times (l+w)$ Where l is the length and w is the width. What is the perimeter if $l=8\text{cm}$ and $b=5\text{cm}$.</p> <p>- The number of bean sticks needed for a row which is m meters long is $2m + 1$. How many bean sticks do you need for a row which is 60 meters long?</p> |
| <p>Example questions Find the value of t $33 - 8t = 15$ Find the value of u $7 + 4u = 70 - 3u$</p> <p>P and q each stand for whole numbers. $P + q = 1000$ p is 150 greater than q. Calculate the numbers p and q.</p> <p>M stands for a whole number greater than 10 and less than 20. N stands for a whole number greater than 2 and less than 10. What is the smallest number that $m \times n$ could be? What is the largest number that $m - n$ could be?</p> <p>K stands for a whole number. $K + 7$ is greater than 100. $K - 7$ is less than 90. Find all numbers that k could be. When m equals 20, what is the value of ten plus three m?</p> <p>Here are five number cards ‘A’ ‘A’ ‘A’ ‘B’ ‘B’ A and B stand for two different whole numbers. The sum of all the numbers on all five cards is 30. What could be the values of A and B?</p> <p>$6(2x + 4) =$ $7(-5 + 2) =$ $3 + 12 \div (4 - 1) \times 2^2 =$ $3(2x - 5y) + 10 = 5 - 2(4x - 2y)$</p> | |

Year 6 - Progression (a combination of these models and images can be used for every objective)

To use simple formula to generate, express and describe linear number sequences.

Sometimes, rather than finding the next number in a linear sequence, you want to find the 41st number, or 110th number, say. Writing out 41 or 110 numbers takes a long time, so you can use a general rule.

The rule for this sequence of numbers is 'add 3 each time'.
1 4 7 10 13 16 ...
 The sequence continues in the same way.
 Mary says,
'No matter how far you go there will never be a multiple of 3 in the sequence'.
 Is she correct?
 Circle Yes or No.
 Explain how you know.

To find the value of any term in a sequence, use the nth term rule

To use simple formula to generate, express and describe mathematical formula

Only like terms can be added or subtracted.

Collect all the like terms together, eg, re-write the expression
 $3g + 2k + 5g + 4k - g$
with all the g s and all the k s together:
 $3g + 5g - g + 2k + 4k$
When you add or subtract terms, keep each term with their + or - sign.

To use simple formula to generate, express and describe missing number, lengths, coordinates and angles problems

Here are some picture frame sizes.

| | | | | |
|--------------|----|----|----|----|
| height in cm | 10 | 12 | 14 | 16 |
| length in cm | 16 | 20 | 24 | 28 |

For each frame, the length is **twice** the height, **subtract 4**.
 What is the **length** of a frame which has a **height** of **36cm**?

In the following part-whole models, find the missing expressions. Then, use your calculator to find the value of each expression when $y = 36$.

To use simple formula to generate, express and describe equivalent expressions ($a+b = b+a$)

Find the value of u in this equation.

$$7 + 4u = 70 - 3u$$

$3 \times a + 4 = 6$
 is the same as
 $3 \times a = 6 - 4$

- inverse relations (e.g. $4 \times 5 = 20$ and $20 \div 5 = 4$)
- associative law $(2 \times 3) \times 4 = 2 \times (3 \times 4)$
- distributive law $39 \times 7 = 30 \times 7 + 9 \times 7$

To find pairs of numbers that satisfy and equation with two unknowns

□ and ○ each stand for a different number.

□ = 34

□ + □ = ○ + ○ + □

What is the value of ○ ?

To find all possibilities of combinations of two variables.

The diagram shows the graph of $y = x - 7$

Write the coordinates of one point on the line **between A and B**

(,)