Redhill Primary Academy

Progression in the teaching of Algebra

Year 1

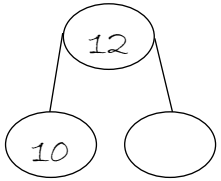
* Read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs
* Represent and use number bonds and related subtraction facts within 20
* Add and subtract one-digit and two-digit numbers to 20, including zero
* Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = – 9.

Pupils understand the order of calculations

(eg: 9+7 = 16; 16–7 = 9; 7 = 16–9)

Pupils use a variety of images to support their understanding

10	
6	4



Pupils understand the concept of the equals symbol

4 + 3 = 5 + 2

Is she right? How do you know? What would the proof

Pupils realise the effect of adding or subtracting 0. This establishes addition and subtraction as related operations.

7 = 0 + 7

7 = 1 + 6

7 = 2 + 5

Pupils use letters to develop the understanding of generality

?	
a	b

z	
y	?

Year 2

* Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100
* Add and subtract numbers (TU + U, TU + T, TU + TU, U + U + U)
* Show that the addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot
* Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems

Use and apply number rules

9 + 7 - ____ = 12

3 + 8 + 7 = ____

Use and apply number reasoning

If 3 + 7 = 10, then can you solve …

33 + ____ = 40

____ + 7 = 80

Choose the correct answer: 19 x 5 = 84 95 93

Why? What is the general rule?

Pupils understand the concept of the equals symbol

Number balances (build equations using numicon, playing cards—Kangaroo maths, balance scales—NRich)

____ + 11 = 25 + 14

____ + 15 = ____ + 12

Pupils are able to make and prove generalisations

(eg: odd + odd + odd = even;

when you add two consecutive numbers the answer is always odd)

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Progression in the teaching of Algebra

Year 3

* Write and calculate mathematical statement for multiplication and division using the multiplication tables they know
* Solve problems, including missing number problems, using number facts/place value/ scaling

Using Related Facts

(5 x 6 = 30, 6 x 5 = 30, 30 ÷ 6 = 5, 30 ÷ 5 = 6)

Applying Related Facts

To do 36 x 5, I need to know 3 x 5. Why?

Finding General Rules

Function ITP/Function Machine

Chains of deduction—what could it be?

(eg: 1 to 6—x6, + 5, x2 + 4)

Pupils use letters to develop the understanding of generality

Cuisennaire: 2 orange = 4 green + 2 pink

(2O = 4G + 2P)

Developing Vocabulary

Unknowns (one outcome)/Variables (could be different answers—changes the outcome by more reasoning)

15 + ____ = 25 - ____

____ x 2 = 20 - ____

What could the variables be?

If one of the unknowns is 4, would could the other be?

Year 4

* Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers
* Recognise and use factor pairs and commutativity in mental calculations (2 x 6 x 5 = 10 x 6 = 60)

Finding Unknowns

12	
n	3

10		
n	n	6

Include : Writing the Expression

How could we do it?

Use bar model to find the value of the O

Each of the following shapes has a value:

The value of the red shapes changes in each of the following problems.
Can you discover its value in each problem, if the values of the shapes are being added together?

(a)  = 25

(b)  = 51

Using Factor Pairs

13 x 12 = 13 x 3 x 4

What pair would be best for working out 17 x 8?

Generalising

12 + ____ = 4 x ____

Chains of deduction—what could it be?

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Progression in the teaching of Algebra

Year 5

* Add and subtract numbers mentally with increasingly large numbers
* Multiply and divide numbers mentally drawing upon known facts
* Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign
* Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes
* Use all four operations to solve problems involving measure

Year 6

*Use simple formulae
*Generate and describe linear number sequences
*Express missing number problems algebraically
*Find pairs of numbers which satisfy an equation with two unknowns
*Enumerate possibilities of combinations of two variables

Satisfying a Rule

A number is a multiple of 4 and is 3 less than a multiple of 5. Find 3 examples.

Explaining Points

Explain … why 4 is a common factor of 24 and 32

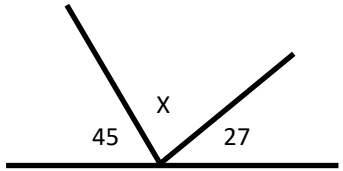
Explain why … $4 \times 35 = 2 \times 2 \times 35$ or $3 \times 270 = 9^2 \times 10$

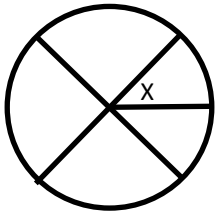
Writing/Solving Algebraic Expressions

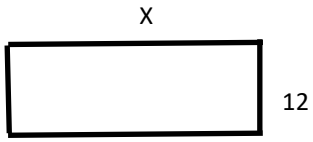
38				
n	n	n	n	6

40		
a	b	25

Solving Measures Problems







Perimeter = 60

Proving Statements

* The only solution is when the missing number is the same : True or False?

$6 \times (\_\_ + \_\_) = \_\_ \times 12$

* Is this always true? $n^2 - n + 11$ = prime number

* Prove it : $2n + 1$ = odd number

* The 2nd number is always twice the 1st one

$(\_\_ \times 12 = 6 \times \_\_)$

USING ALGEBRAIC PROOF

$(a \times 2n = n \times 2a)$ (eg: algebra question—trick of getting same number you started with)

Combination of Two Variables

What is the expression? What could r and w be?

10		
r	r	w

Can you draw a bar model for … $3f + g = 20$

$S + T = 14$; If S is a single digit and T is a two-digit number, what could they be? (4 responses)

$7a + 2b = 40$: Can A ever be odd?

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