

# Week 7 - Algebra

## Forming Equations

### Notes and Guidance

Building on the earlier step of forming expressions, children now use algebraic notation to form one-step equations. They need to know the difference between an expression like  $x + 5$ , which can take different values depending on the value of  $x$ , and an equation like  $x + 5 = 11.2$  where  $x$  is a specific unknown value. This is best introduced using concrete materials e.g. cubes, can be used to represent the unknown values with counters being used to represent known numbers.

### Mathematical Talk

What does the cube represent?  
What do the counters represent?



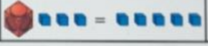
Design your own 'think of a number' problems.

What's the difference between an expression and an equation?

What's the difference between a formula and an equation?

### Varied Fluency

Amir represents a word problem using cubes, counters and algebra.

Words	Concrete	Algebra
I think of a number		$x$
Add 3		$x + 3$
My answer is 5		$x + 3 = 5$

Complete this table using Amir's method.

Words	Concrete	Algebra
I think of a number		
Add 1		
My answer is 8		

A book costs £5 and a magazine costs £ $n$ .  
The total cost of the book and magazine is £8.  
Write this information as an equation.

Write down algebraic equations for these word problems.

- I think of a number, subtract 17, my answer is 20
- I think of a number, multiply it by 5, my answer is 45

### Reasoning and problem solving

Rosie thinks of a number. She adds 7 and divides her answer by 2

Teddy thinks of a number. He multiplies by 3 and subtracts 4

Rosie and Teddy think of the same number.

Rosie's answer is 9  
What is Teddy's answer?

Rosie and Teddy think of the same number again. This time, they both get the same answer.

Use trial and improvement to find the number they were thinking of.

Eva spends 92p on yo-yos and sweets

She buys  $y$  yo-yos costing 11p and  $s$  sweets costing 4p.

Can you write an equation to represent what Eva has bought?

How many yo-yos and sweets could Eva have bought?

Can you write a similar word problem to describe this equation?

$$74 = 15t + 2m$$

## One-step Equations

### Notes and Guidance

Children solve simple one step equations involving the four operations.

Children should explore this through the use of concrete materials such as cubes, counters and cups.

It is recommended that children learn to solve equations using a balancing method using inverse operations.

### Mathematical Talk

Can you make some of your own equations using cups and counters for a friend to solve?

Why do you think the equation is set up on a balance? What does the balance represent? How does this help you solve the equation?

What is the same and what is different about each bar model?

### Varied Fluency

How many counters is each cup worth?  
Write down and solve the equation represented by the diagram.



Solve the equation represented on the scales.  
Can you draw a diagram to go with the next step?



Match each equation to the correct bar model and then solve to find the value of  $x$ .

$$x + 5 = 12$$

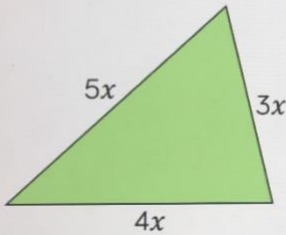
$$3x = 12$$

$$12 = 3 + x$$

$x$	$x$	$x$	
			12
3	$x$		
			12
$x$		5	
			12

## Reasoning and problem solving

The perimeter of the triangle is 216 cm.



Form an equation to show this information.

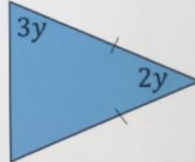
Solve the equation to find the value of  $x$ .

Work out the lengths of the sides of the triangle.

- Hannah is 8 years old
- Jack is 13 years old
- Grandma is  $x + 12$  years old.
- The sum of their ages is 100

Form and solve an equation to work out how old Grandma is.

What is the size of the smallest angle in this isosceles triangle?



How can you check your answer?

## Two-step Equations

### Notes and Guidance

Children progress from solving equations that require one-step to equations that require two steps.

Children should think of each equation as a balance and solve it through doing the same thing to each side of the equation.

This should be introduced using concrete and pictorial methods alongside the abstract notation as shown. Only when secure in their understanding should children try this without the support of bar models or similar representations.

### Mathematical Talk

Why do you have to do the same to each side of the equation?

Why subtract 1? What does this do to the left hand side of the equation?

Does the order the equation is written in matter?

What's the same and what's different about solving the equations  $2x + 1 = 17$  and  $2x - 1 = 17$ ?

### Varied Fluency

Here is each step of an equation represented with concrete resources.

$$\begin{array}{l}
 \text{Two blue cubes and one red dot} = \text{Two red dots} \quad 2x + 1 = 5 \\
 \text{Two blue cubes} = \text{Four red dots} \quad -1 \quad 2x = 4 \\
 \text{One blue cube} = \text{Two red dots} \quad \div 2 \quad x = 2
 \end{array}$$

Use this method to solve:

$$4y + 2 = 6 \quad 9 = 2x + 5 \quad 1 + 5a = 16$$



Here is each step of an equation represented by a bar model. Write the algebraic steps that show the solution of the equation.

Use bar models to solve these equations.

$$3b + 4 = 19 \quad 20 = 4b + 2$$

18

## Reasoning and problem solving

The length of a rectangle is  $2x + 3$   
 The width of the same rectangle is  $x - 2$   
 The perimeter is 17 cm.

Find the area of the rectangle.

Alex has some algebra expression cards.



$$y + 4$$

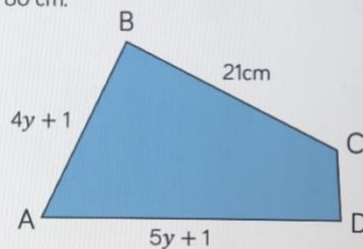
$$2y$$

$$3y - 1$$

The mean of the cards is 19  
 Work out the value of each card.

Here is the quadrilateral ABCD.

The perimeter of the quadrilateral is 80 cm.



AB is the same length as BC.

Find the length of CD.