KS2
Algebra

TEACHING PACK

- 19 supporting resources
- Introductory activities, main teaching points, plenaries, assessment opportunities, extension ideas and home learning tasks
- Linked to the year 6 programme of study for maths

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Contents

Section 1: The algebra you know – missing number problems

Section 2: Problem solving and reasoning with algebra

Section 3: Using algebra with measure

Section 4: Using algebra with geometry

Section 5: Taking algebra further

Section 6: Answers

Finding your way around the curriculum pack

This pack is intended to introduce children in Year 6 to algebra. It is presented in 5 sections, each supported by a variety of teaching suggestions and resources. It can be used as a structured sequence of lessons or as a collection of ideas and resources for the teacher to dip into as and when appropriate. The pack is aimed at a mixed ability cohort but it is worth noting that some concepts and activities are designed to challenge your high achievers.

There are 5 key areas covered in this pack:

- **The algebra you know – missing number problems**

- **Problem solving and reasoning with algebra**

- **Using algebra with measure**

- **Using algebra with geometry**

- **Taking algebra further**

Sections comprise:

- **Starters and light bites** – for those times when you only have a few minutes

- **Mains** – if you have 30 minutes or more

- **Puddings** – for when you still have room for more

- **Extra helpings** – extension ideas for those with an appetite for algebra

- **Doggie bags** – home-learning opportunities

Sections also include opportunities to get outside and enjoy some algebra alfresco!

Answers are at the back of the pack.

We've included links to each separate resource referenced in the pack so that you can access the resources directly on www.teachitprimary.co.uk. We've also included the file number for each original resource – just pop this into Teachit Primary's search engine. Lots of the resources in this pack are Word documents, but we've also included links to PowerPoints. Please log in first in order to access any of these resources on Teachit Primary.

We hope you enjoy using this pack. If you have any questions, please get in touch: email support@teachit.co.uk or call us on 01225 788851. Alternatively, you might like to give some feedback for other Teachit Primary members – you can do this by adding a comment on the Algebra KS2 page on Teachit Primary (please log in to access this).

Curriculum coverage and mapping

Activities in this teaching pack meet the following requirements in the 2014 National Curriculum.

Key stage 2: Algebra

Statutory requirements

Pupils should be taught to:

1. express missing number problems algebraically

2. use simple formulae expressed in words

3. generate and describe linear number sequences

4. find pairs of numbers that satisfy number sentences involving two unknowns

5. enumerate all possibilities of combinations of two variables

6. recognise when it is possible to use formulae for area and volume of shapes.

Statutory requirements as set out above and where they are addressed in the pack:

Main teaching aspect	1	2	3	4	5	6
Section 1: Missing number problems						
Section 2: Reasoning and problem-solving						
Section 3: Using algebra in measure						
Section 4: Using algebra in geometry						
Section 5: Taking algebra further						

Section 3: Using algebra with measure

(Statutory requirements covered: 1, 2, 5 and 6)

Purpose: Children should understand that we can use algebraic formulae to express measures such as perimeter, area and volume.

Starters and light bites:

- What am I doing? Express the rule in words for finding the perimeter of a rectangle (i.e. length plus length plus width plus width). Ask children to guess what it is you are calculating. Repeat this with the rule for calculating area, then volume. Each time, ask children to identify which rule you are expressing. Can children find a way to express these rules algebraically?

- Alfresco algebra! Using two sets of two sticks or straws (ensuring the sticks/straws in each set are of similar length), create a rectangle. Explain to children that you are going to give them the perimeter of the rectangle and chalk the formula $2a + 2b$ = 20cm next to it. Ask children to calculate the values of a and b. Repeat this with the area of a rectangle, giving the formula as $c \times d$ = 32 cm^2. Challenge the children to create their own shapes with sticks, chalking the formula and perimeter or area next to them for others to solve.

Mains:

- Best digested after the first of the *starters and light bites*, ask children to consider the rules for calculating perimeter, area and volume then ask them to express these rules as formulae. Resource 23484: Calculating perimeter using algebra and resource 23348: Calculating area and volume using algebra all provide specific examples and tasks to support this activity.

- Explain that, as the government's crack maths team, children are required to solve some equations to help with an important mission. Their first challenge is to identify the secret room they have been assigned to work in! The floor of the room measures 12 m x 6 m. However, it is not a rectangle! What shape could it be? Once children have identified the room as being a parallelogram, tell them that the base of the parallelogram is 12 m and the height is 5 m. Ask children to use the formula for the area of a parallelogram (base x height) and to explain why the formula works. Then explain that next door to their secret room is another room of the same shape with an area of 24 cm^2. What could the height and base dimensions of this room be? Resource 23532: Measurement mission is a fun pencil and paper task based upon the same principle.

- Using straws or sticks of the same size, ask children to make a 1 x 1 square and to work out the perimeter and the area. Record the answers. Ask them to add a straw or stick to each side and repeat the calculations, recording the answers. Continue adding a straw or stick

to each side until you have created four or five squares. Now ask children to look at the pattern and predict the perimeter and area of a square of 25 x 25.

Puddings:

- Do they fit? A set of five picture frames all have lengths that are twice their height less three. Write this as a formula. Calculate the lengths of the five frames with heights 10cm, 12cm, 14cm, 16cm and 18cm, work out their perimeters and draw them to scale.

- Calculate the area of the same set of five picture frames, with lengths that are twice their height less three. Write this as a formula and calculate the areas of the five frames with the heights 5cm, 6cm, 7cm, 8cm and 9cm.

- A set of five boxes have lengths that are twice their height less three and widths that are their height less two. Write the formula and calculate the areas of the five boxes with heights 5cm, 6cm, 7cm, 8cm and 9cm.

Extra helpings:

- Ask the children: If a picture frame has a length twice its height and has been made with a piece of wood measuring 114 cm, what is the length of the picture frame?

- For those pupils who need an additional challenge, resource 23535: Find the formula – a study in area, is an investigation into area which will really get the grey matter working!

Doggie bag:

- Ask children to draw a plan of the ground floor of their home with approximate measurements for each room. Can they use the formula for calculating area to find the (approximate) total area of the ground floor of their home?

Resources contained within Section 3

What is the perimeter of this rectangle?

2 cm

6 cm

Click to reveal

Move on

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How did you calculate the perimeter?

Click to reveal

Move on

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How could you calculate the perimeter of this rectangle?

b

a

Click to reveal

Move on

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Can you find a simpler way of expressing the formula
$P = a + a + b + b$?

Click to reveal

Or if you're really on the ball…

Click to reveal

Move on

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Can you calculate the perimeter of this triangle?

4 cm   3 cm

6 cm

How did you calculate it? How could you express that as a formula?

Click to reveal

Click to reveal

Move on

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Can you calculate the perimeter of this regular pentagon?

3 cm

Click to reveal

Move on

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Can you find a simpler way of expressing the formula
$P = a + a + a + a + a$?

Click to reveal

Or if you're a true algebra ace….

Click to reveal

Move on

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Try writing a formula for calculating the perimeter of one of these shapes. Share your formula with a partner and see if they can identify the shape you chose.

End

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PPT

To access this resource please **log in** to the **Teachit Primary website** and type **23348** into the search bar.

What is the area of this rectangle?

3 cm

6 cm

Click to reveal

Move on

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How did you calculate the area?

Click to reveal

Move on

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How would you calculate the area of this rectangle?

b

a

Click to reveal

Move on

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Now write a formula for finding the area of this shape:

b

a

Click to reveal

Move on

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Can you write a formula for finding the area of this shape?

a

a

Click to reveal

Move on

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What is the rule for calculating the area of a triangle?

Click to reveal

Move on

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Here's a challenge! How would you express the rule for calculating the area of a triangle as a formula?

Hint: use b to indicate base and h to indicate height

Click to reveal

Move on

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Now let's think about volume. What is the volume of this shape?

5 cm

6 cm

12 cm

Click to reveal

Move on

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How did you calculate the volume of the cuboid?

Click to reveal

Move on

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Convert your rule into a formula for calculating the volume of this cuboid.

c

b

a

Move on

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The final challenge! Can you find the formula for the volume of this shape? Express it in its simplest form.

End

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Name: .... Date: ....

Fiendish felon Baron Blackheart has stolen six crates of explosives from a top secret unit and hidden them in one of four possible locations. As one of the government's algebra aces, you have been given a mission. You must use the information you have to identify the hiding place and recover the crates before they can be used as part of Blackheart's latest evil plan. Good luck!

You know that each crate is identical in size and has a base area of 12m² (all the dimensions are in whole metres). You know that the crates cannot be stacked on top of one another and that they must be arranged with no space to spare. What are the possible dimensions of each crate?

Calculate the total base area required for the 6 crates and make a diagram of each of the ways the crates could be arranged.

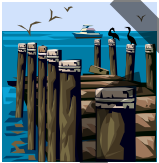You discover a scrap of paper on which with some of the dimensions of the possible hiding locations are written. Unfortunately it is not all legible.

Write a formula to express the rule for calculating the area of rectangles:

....

Use your formula to complete the table.

Location		Dimensions	Area (A)
Cave on a tropical island		L =24 m W = 4	
Hut in the heart of a black forest		L =18 m W = 6m	
Chamber inside a dormant volcano		L = 4m W = 18 m	
Abandoned container by the docks		L = 2 m W = 38 m	

Write a memo to your superiors identifying which of the 4 hiding places Baron Blackheart must be using and how the crates must be arranged. Explain your workings.

The crates must be hidden in location ....

....

....

....

....

Name: .... Date: ....

You are going to use your knowledge of calculating the area of simple 2D shapes to help you write formulae for further shapes.

Write out the formula for calculating the area of a **square**:

....

Write out the formula for calculating the area of a **rectangle**:

....

Write out the formula for calculating the area of a **triangle**:

....
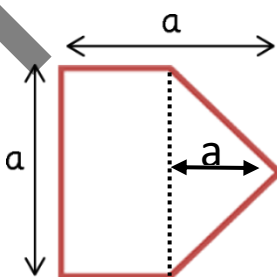
Now write out a formula for calculating the area of the shapes below.

Pssst! Try splitting each shape up into triangles, squares or rectangles and using these to build up your formula.

The formula is ....

because ....

....

....
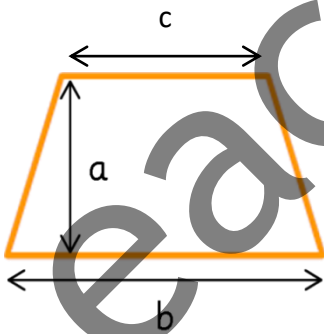
The formula is ....

because ....

....

....

Name: ....   Date: ....
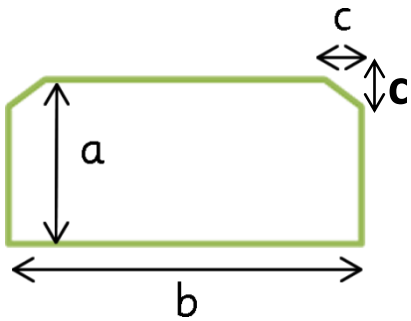
This time try to think about the shape as a regular shape and then think about what you can take away to create the new shape.
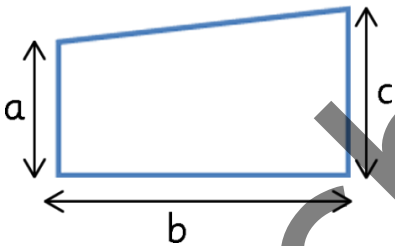
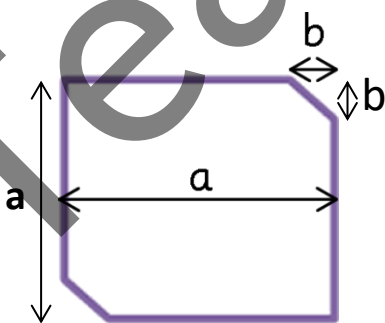The formula is ....

because ....

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The formula is ....

because ....

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The formula is ....

because ....

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