

# Secondary mathematics algebra study units

## Unit 5: Collecting like terms





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## Description

This short unit is for individual teachers or groups of teachers in secondary schools who are considering their teaching of algebra. It discusses some stimulating activities to help pupils to practise collecting like terms.

Other units that could be combined with this one, either to create a longer session or to work through in a sequence over time, are:

- Unit 7: Using algebraic reasoning
- Unit 10: Classroom approaches to algebra.

## Study time

20 minutes

## Resources

Each teacher or pair of teachers working together will need:

- a personal notepad
- a copy of **Resource 5a** (which can be found at the end of this unit) and scissors
- a copy of the algebra pages from *The Mathematics overview and learning objectives* PDF, which you can download in A3 or A4 from the Framework for secondary mathematics at [www.standards.dcsf.gov.uk/nationalstrategies](http://www.standards.dcsf.gov.uk/nationalstrategies). Search for the title: 'Mathematics learning objectives'.

It would be helpful to have available a copy of:

- *Teaching Mental Mathematics from Level 5: Algebra*

which you can download from [www.standards.dcsf.gov.uk/nationalstrategies](http://www.standards.dcsf.gov.uk/nationalstrategies); search using the ref 00692-2009PDF-EN-01.

## Collecting like terms

1. Start by considering these questions.
  - In which year groups do pupils in your school learn to simplify or transform linear expressions by collecting like algebraic terms?
  - How does this compare with the yearly teaching programmes of objectives in the revised objectives for mathematics produced by the National Strategies?
2. Spend a few minutes jotting down on your notepad the activities and contexts that you currently use to teach pupils to collect like terms.

If you are working with colleagues, discuss and compare your ideas.

Now consider these two questions.

- Are there any differences in your approaches for pupils in Key Stage 3 and Key Stage 4?
- Are there any differences in your approaches for the most able pupils and pupils who struggle with their learning of mathematics?

3. Cut out and shuffle the cards on **Resource 5a: An algebra loop card game**. Spread out the cards on a flat surface so that you can see them all. Take one of the cards at random and place it to the left of you. Find the answer to the question on this card and place it to the right of the first card to form a line. Carry on until you have used all 18 cards.

This is a self-checking activity in that the last card on the right of the line should link back to the first card on the left.

The activity is one that small groups of pupils can work on collaboratively.

Alternatively, a similar set of cards can be distributed around a whole class to play an 'I have...'; 'What is ...?' loop card or the 'follow me' game. A pupil starts the game by reading the algebraic expression and their question. The pupil with the answer on their card reads it out and then poses the question on their card. Other pupils follow until all cards have been called and the 'loop' has been completed. As pupils play the game, you can write each new expression on the board for everyone to see.

Take a few moments to think about these questions.

- What is the purpose of this kind of activity?
  - What could the advantages be of using an activity like this at the start of a lesson?
  - How could the activity be organised or adapted it to make it suitable for pupils at different levels of attainment?
4. For pupils, this type of matching activity provides mental practice in collecting like terms. Every pupil is involved as they think about each question to see whether the answer matches the expression on their card. The complexity of the expressions can be varied and, where pupils play the game in groups, different sets of cards can be given to different groups.

You can find more examples of short and more sustained activities in *Teaching Mental Mathematics from Level 5: Algebra* (see Resources).

If possible, look at this publication and identify:

- some other mental activities that could help pupils to practise collecting like terms
  - some other algebraic skills that a loop card game or other matching activity could help pupils to practise.
5. To round off, reflect on these questions.
- What have you learned? What action will you take as a result?

Jot down any points to follow up in further study, or other action, and any modifications you will make to your planning or teaching.

If you are studying alone, jot down any points that you want to discuss with your head of department or colleagues.

## Resource 5a: An algebra loop card game

Cut out and shuffle the 18 cards below. Spread out the cards on a flat surface so that you can see them all.

Take one of the cards at random and place it to your left. From the remaining cards, find the answer to the question and place the new card to the right of the first card. Repeat the process, each time placing the new card to the right of the last one, to form a line.

Carry on until you have used all 18 cards. The last card on the right of the line should link back to the first card on the left.

<p>I have <math>3a - b</math> Subtract <math>b</math></p>	<p>I have <math>2a + 4b</math> What is <math>4a</math> more than this?</p>	<p>I have <math>3a - 5b</math> What is <math>4b</math> more than this?</p>
<p>I have <math>6a - 3b</math> What is <b>one-third</b> of this?</p>	<p>I have <math>3a + 4b</math> What is <math>9b</math> less than this?</p>	<p>I have <math>7a - 2b</math> What is <math>a + b</math> less than this?</p>
<p>I have <math>3a + 5b</math> What is <math>a + b</math> less than this?</p>	<p>I have <math>-a - b</math> Add <math>3b</math></p>	<p>I have <math>3a + 3b</math> What is <math>2b</math> more than this?</p>
<p>I have <math>2b</math> What is <math>a + b</math> more than this?</p>	<p>I have <math>2a - b</math> What is <b>double</b> this?</p>	<p>I have <math>2b - a</math> What is <math>a</math> more than this?</p>
<p>I have <math>6a + 4b</math> What is <math>a</math> more than this?</p>	<p>I have <math>7a + 4b</math> Subtract <math>4a</math></p>	<p>I have <math>a + 3b</math> What is <math>2a</math> more than this?</p>
<p>I have <math>-2a - 2b</math> What is <b>half</b> of this?</p>	<p>I have <math>3a - 2b</math> Add <math>4a</math></p>	<p>I have <math>4a - 2b</math> What is <math>6a</math> less than this?</p>

Audience: Local authority staff, National Strategies consultants, secondary mathematics subject leaders, secondary mathematics teachers

Date of issue: 03-2010

Ref: **00138-2010PDF-EN-06**

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