Tidying Up Algebra by Collecting Like Terms

Teacher		**Class**	Year 7
Subject	Maths	**Topic**	Simplifying expressions
Date		**Room**	
Lesson length	60 minutes	**Country**	United Kingdom

Students learn to collect like terms to keep expressions equivalent. They sort counters and simplify expressions on whiteboards.

Curriculum links

- simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms

Learning objectives

- Students will collect like terms to simplify expressions with letters and numbers.
- Students will keep the same value when tidying expressions into equivalent form.

Success criteria

- I can spot like terms in an expression.
- I can simplify to an equivalent expression.

What students already know

Show 3x + 3x on the board for 2 minutes. Ask what it means and what answer they expect, to check adding with letters.

Key words

term	A single part split by + or -. [2]
coefficient	The number in front of a letter. [4]
like terms	Same letters with same powers. [3]
simplify	Make shorter and tidier keeping the same value. [3]

Materials

- red counters
- blue counters
- mini whiteboards
- pens
- projector and Slides 1-12
- printed copies of Worksheet Task B

Before the lesson

- Print copies of Worksheet Task B for pairs
- Test Slide 6 Video clip 1 Corbettmaths collecting like terms 0:00-3:24 with sound
- Set out tubs of red counters for x-terms and blue counters for y-terms
- Check mini whiteboards and pens

Lesson outline

0–8 min **Starter** 8 min · Whole class

To hook interest and recall what terms and like terms mean.

YOU DO

1. Show Slide 1 title and Slide 2 objectives for the lesson.
2. Deliver hook: If I have 3 apples and someone gives me 2 more apples, I have 5 apples. But if they give me 2 bananas instead, I do not have 5 applenanas. So how does that work in algebra?
3. Show Slide 3 key words cards for term, coefficient, like terms and simplify.
4. Ask class to suggest why letters are like fruit types and take 2-3 answers.

STUDENTS DO

1. Listen to objectives and hook.
2. Call out ideas about apples, bananas and letters.
3. Repeat key words with meanings with partner.

Say: In algebra, different letters are like different fruit. We can only count together the ones that are exactly the same. Today we collect like with like to tidy expressions but keep the same value.

Ask: What is a term? (A single part split by + or -. [2]) · Why can we not call 3 apples + 2 bananas 5 applenanas? (They are different types, so they must stay separate.)

Check understanding: Thumbs up if they can say what like terms are in own words; re-teach Slide 3 cards if unsure.

Support: Point to the emoji cards on Slide 3 while saying each meaning slowly. **Stretch:** Ask what plain numbers would be as fruit and why they only join numbers.

Use: Slides 1-3

8–18 min **Teaching** 10 min · Whole class

To recognise like and unlike terms before simplifying.

YOU DO

1. Show Slide 4 Like or not like cards for 3x and 5x, 4y and -3y, 3x and 2y.
2. Ask pairs to vote same or different for each pair and explain why.
3. Show Slide 5 question about 3x + 2y = 5xy and take reasons.
4. Confirm only parts with the same letters raised to the same powers can combine [3].

STUDENTS DO

1. Vote with partner for each Slide 4 pair and say same or different.
2. Discuss Slide 5 statement and share why it is wrong.
3. Write one sentence on mini whiteboards why 3x + 2y stays as it is.

Say: Look at the letters and little powers first. If both match exactly, they are the same family and can join. If the letters are different, or the powers are different, they must stay apart.

Ask: Are 3x and 5x like terms? Why? (Yes, both are x-terms so combine to 8x.) · Are 2x and 3x squared like terms? Why? (No, powers differ so they cannot combine. [9]) · A student says 3x + 2y = 5xy. Are they right? Why? (No, different letters cannot combine, answer stays 3x + 2y. [9])

Check understanding: Mini whiteboards up for why 3x + 2y cannot become 5xy; correct together if many are wrong.

Support: Show same-size bars for x-terms and different-size bars for y-terms to see why they do not merge [4]. **Stretch:** Sort x, x squared, xy and constants and justify each decision.

Use: Slides 4-5

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18–30 min **Modelling** 12 min · Whole class

To model collecting like terms while keeping equivalence.

YOU DO

1. Play Slide 6 Video clip 1 Corbettmaths collecting like terms 0:00-3:24 and ask pupils to spot how x and y groups form.
2. Model 2x + 5y + x - 3y by grouping reds for x and blues for y.
3. Show Slide 7 steps: underline same letters, move with sign, add coefficients, write tidy answer.
4. Count to get 3x + 2y and stress tidy form has the same value [1].

STUDENTS DO

1. Watch video and note how groups are made.
2. Call out coefficients to add as teacher models.
3. Copy steps and worked example into books.

Say: I keep the + or - that sits in front when I move a part. Then I add the numbers in front of the same letter and keep the letter the same. The tidy answer is shorter but worth the same.

Worked example: 2x + 5y + x - 3y = underline 2x and x, underline 5y and -3y. Move together with their sign [15]. 2x + x = 3x. 5y - 3y = 2y. Answer 3x + 2y. [1]

Ask: Which parts are like terms in 2x + 5y + x - 3y? (2x and x are x-terms, 5y and -3y are y-terms. [1]) · What must we move with each term? (The + or - attached in front of it. [15])

Check understanding: Ask class to show on fingers the total for x and for y; remodel adding coefficients if wrong.

Support: Use colour underline for x in red and y in blue so groups are clear. **Stretch:** Ask what would happen if there was also +4 and where it would go.

Use: Slides 6-7, Video clip 1 (0:00–3:24)

30–50 min **Main** 20 min · Pairs

To collect like terms with counters and written practice.

YOU DO

1. Hand out red and blue counters and show Slide 9 task instructions.
2. Remind pairs to circle each letter group in a colour, add each group and keep the letter.
3. Give Worksheet Task B practice questions to simplify by collecting like terms.
4. Circulate, ask pairs to compare if tidy version is shorter but same.

STUDENTS DO

1. Lay out counters for each expression then regroup reds and blues.
2. Draw final counter groups and write simplified expression underneath.
3. Complete Worksheet Task B and compare answers with partner.

Say: Build each expression with counters first, reds together and blues together. Then write it. Add the numbers in each colour group and keep the letter part the same. To simplify is to write it in a more efficient and compact form without affecting the value [3].

Worked example: 5x + 7 + 3x + 8 = x-bars together and number blocks together. 5x + 3x = 8x. 7 + 8 = 15. Answer 8x + 15. [3]

Ask: In 5x + 7 + 3x + 8, which parts join? (5x and 3x join to 8x, 7 and 8 join to 15.) · How do you know you are finished? (No like terms remain uncombined. [4])

Check understanding: Pairs hold up whiteboards for 5x+7+3x+8; reteach grouping if many show wrong total.

Support: Give cards with colour-coded terms already grouped, so pupils only add the coefficients and keep the letter part the same [4].
Stretch: Include plain numbers as a third colour group and explain why numbers only combine with numbers.

Use: Slide 9, Worksheet Task B

50–60 min **Plenary** 10 min · Whole class

To check that simplifying keeps equivalence and fix mistakes.

YOU DO

1. Show Slide 10 big idea: Same value, fewer bits: collect like with like.
2. Run Slide 12 true or false vote for 4b - 2b = 2b, 3x + 2y = 5xy, 5x + 5 - 3x = 2x + 5.
3. Ask pupils to correct false ones and underline what was actually combined.
4. Finish with Slide 11 vote on which sorting trick helped most.

STUDENTS DO

1. Vote true or false with mini cards and explain each vote.
2. Write corrected versions of two false statements.
3. Vote for best sorting trick and set exit ticket answers down.

Say: Tidy means fewer bits but the same value. If letters or powers do not match, we leave them alone. Check your last answer by asking: is anything still able to join?

Worked example: 5x + 5 - 3x = 5x - 3x = 2x, +5 stays. Answer 2x + 5.

Ask: Is 4b - 2b = 2b true? Why? (True, both b-terms, 4 - 2 = 2.) · Is 2x + 3x squared = 5x cubed true? Why? (False, powers differ so they cannot combine. [9])

Check understanding: Exit ticket on whiteboards; if many miss signs, model moving sign again tomorrow.

Support: Display reminder that x means 1x when adding, so x + 3x is 1 + 3 [15]. **Stretch:** Write one tricky false statement for the class to fix.

Use: Slides 10-12

Common mistakes

Mistake	How to spot it	How to fix it
Adding unlike terms as 3x + 2y = 5xy	Answer joins two different letters into one term	Keep different letters separate because only same letters with same powers combine [9].
Missing invisible 1 as x + 3x = 3x	Single x counted as 0 instead of 1	Rewrite x as 1x and add 1 + 3 to get 4x [15].
Combining different powers as 2x + 3x squared = 5x cubed	Powers added together or ignored	Leave x and x squared separate because powers must match to combine [9].

Support

- Give colour-coded term cards already grouped so pupils only add coefficients.

Stretch

- Add plain numbers as third group and squared terms to sort and justify.

For the LSE or teaching assistant

Sit with target pair in main task, prompt reds with reds and blues with blues, check sign moved with term.

Check for understanding

Question	Answer
Simplify 4b - 2b	2b
Simplify 5x + 7 + 3x + 8	8x + 15
Simplify 5x + 5 - 3x	2x + 5

Homework

Complete Worksheet Task D collecting like terms, watching signs and powers.

Sources

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