



**THIRD SPACE
LEARNING**

Math Intervention Pack

Combining like terms

Grade 6

How To Use This Resource

1. Title Slide

Use this slide to activate prior knowledge needed for lesson. Students should be encouraged to initially attempt the question presented independently.

2. Prior Learning

Use this slide to review the knowledge that will be required to be successful in this lesson. If students feel confident on the prior learning section of the Title Slide then this slide can be skipped

3. Let's Learn

Use this slide to introduce the concept. Tutors should work with the student to explore the concept together, usually using diagrams to support understanding.

4. Follow Me + Your Turn

The tutor should work through the follow me slide, modeling the process and explaining their thinking out loud.

Students should use the your turn slide as an opportunity to work through a question similar to the follow me questions. They should apply the method modeled by the tutor in the follow me slide. Students should be encouraged to explain their thinking out loud.

5. You Do

Students should work through a range of questions that build in complexity.

Tutors can offer support but students should initially be encouraged to attempt these questions independently.

6. Go Further

Use this slide to allow students to apply their understanding to a more challenging question in an unfamiliar context.

How To Use This Resource

7. Support for Slides

The support slide is used to support students during the lesson. In the tutor notes, there will be guidance as to when to use the support slide.

8. Check Your Understanding

Tutors should use this slide to assess the student's knowledge and whether or not they have mastered the concept within the lesson.

Standard

6.EE.A.3 - Apply the properties of operations to generate equivalent expressions. For example, apply the distributive property to the expression $3(2 + x)$ to produce the equivalent expression $6 + 3x$; apply the distributive property to the expression $24x + 18y$ to produce the equivalent expression $6(4x + 3y)$; apply properties of operations to $y + y + y$ to produce the equivalent expression $3y$.

Key Mathematical Ideas

1. Understand and expand terms (ex. $4y = y + y + y + y$).
2. Understand and combine positive and negative like terms (ex. $4r - 3r = r$).
3. Understand and explain why terms that are not like cannot be combined (eg. $5t + 5y \neq 10ty$).

Overview

Terminology

- **Term:** A number, variable or a group of numbers and variables being multiplied together.
- **Variable:** A symbol that stands for an unknown number or any number in a specified set.

2.2) Sentence stems:

- These are like terms because,
- These are unlike terms because,
- There are _____ positive terms and _____ negative terms.

Overview

Common Misconceptions

Common Misconceptions	Tutoring Strategies	Checks for Understanding
Grouping unlike terms. For example, Writing $5c + 4d$ as $9cd$.	Use the models shown throughout the lesson to help students understand why unlike terms cannot be combined.	Have students explain the difference between unlike terms.
Incorrectly grouping positive and negative terms. For example, Writing $-6x + 7x$ as $13x$.	Use the models shown throughout the lesson to help students understand how to combine positive and negative terms.	Have students explain how they combined positive and negative terms.
Not knowing that terms like $4d$ show multiplication, but instead thinking they just show digits - 4 in the tens and d in the ones.	Once an expression has been simplified, ask students what each term represents.	Ask students to give a real world situation for the expression. OR Ask students to represent the expression with a model and explain the connection between the model and the expression.

Title Slide

If students...

- get both sections correct:
 - start at You do
- miss the learning goal section only:
 - start at Let's Learn
- miss the prior learning section:
 - start at Prior :earning

Prior Learning

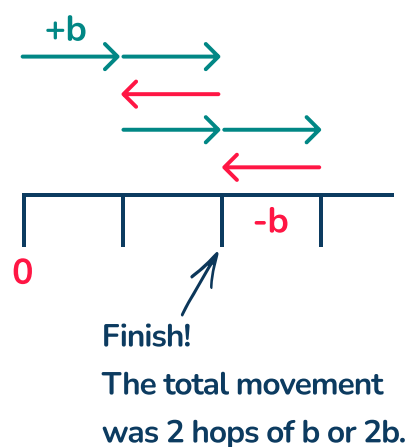
If stuck

- Give students the answer, to complete an equation. Then ask the student to describe how the model represents both parts of the equation.
- Use a number line on the Classroom tools slide to model + and – movements.

Let's Learn

If stuck

- Explain to students that when multiplying by a variable, we do not use the multiplication symbol.
- Model each positive or negative term (as shown in the Support slide).
- Use a number line on the Classroom tools slide to model $+$ and $-$ movements.
For example,



Questions

- a) How many variables are there in the expression? (There are four positive a variables.)
- a) How does the expression show repeated addition? (a is being added over and over again.)
- a) Why is $4a$ equal to the expression? ($4a$ is four times a or 4 groups of a . This is equal to adding a four times.)
- b) What is the value of $b - b$? Explain. (0, because any number subtracted from itself is always 0 – you start with the same thing being taken away, so nothing is left.)
- b) Why does the simplified expression have fewer variable b 's than the original expression? (Because, when we simplified, some of the b 's were subtracted.)
- c) What does the term $5c$ represent? (It means 5 times c or 5 groups of positive c .)
- c) What does the term $2c$ represent? (It means 2 times c or 2 groups of positive c .)
- c) What does the term $7c$ represent? (It means 7 times c or 7 groups of positive c . This is the result of combining 5 groups of c , and 2 groups of c .)

- d) What does the term $8d$ represent? (It means 8 times d or 8 groups of positive d .)
- d) What does the term $-3d$ represent? (It means 3 times $-d$ or 3 groups of negative d .)

NOTE: It can also be interpreted as “subtracting 3 groups of positive d .”

Watch out for

- Students who combine unlike terms.
- Students who do not pay attention to whether terms are positive or negative.

Answers

- a) $4a$
- b) $2b$
- c) $7c$
- d) $5d$

Follow me

Modeling prompts

- Discuss what the terms are like and how to find the total number of terms.
- Model how to combine the like terms by an explanation or a model.
- Write the simplified expression. Discuss when to use $+$ or $-$ sign.
- Explain why an expression cannot be simplified further.

Answers

- 1) $3m + 5m = 8m$
- $8n - 4n = 4n$
- $3m + 8n + 5m - 4n = 8m - 4n$

Your turn

If stuck

- Use similar guidance given in the Follow Me modeling prompts.
- Complete Support slide together to practice modeling the expressions.
- Use a number line on the Classroom tools slide to model + and – movements.

Questions

- 2) Which terms are like? (The terms with variable a s and the terms with variable b s.)
- 2) What does the term $9a$ represent? (It means 9 times a or 9 groups of positive a .)
- 2) What does the term $-5a$ represent? (It means 5 times $-a$ or 5 groups of negative a .)

NOTE: It can also be interpreted as “subtracting 5 groups of positive a .”

- 2) Why is $9a - 5a = 4a$? (Answers will vary. Example answer: Since there are 9 positives a s, when you take away 5 positive a s, there are 4 positive a s left.)
- 2) What does the term $2b$ represent? (It means 2 times b or 2 groups of positive b .)
- 2) What does the term $3b$ represent? (It means 3 times b or 3 groups of positive b .)
- 2) Why can we not combine $4a$ and $5b$? (Because they are not like terms - they have different variables, which can be defined as different values, making them not equal.)

Watch out for

- Students who combine unlike terms.
- Students who do not pay attention to whether terms are positive or negative.

Answers

- 2) $9a - 5a = 4a$
- $2b + 3b = 5b$
- $9a + 2b - 5a + 3b = 4a + 5b$

You do

If stuck

- Remind students that we write one d as d , not $1d$.
- Model each positive or negative term (as shown in the Support slide).
- Use a number line on the Classroom tools slide to model $+$ and $-$ movements.

Questions

- a) **Which terms are like?** (All terms, since they all have variable d .)
- a) **What does the term d represent?** (It means 1 times d or 1 group of positive d .)
- a) **What does the term $-3d$ represent?** (It means 3 times $-d$ or 3 groups of negative d .)

NOTE: It can also be interpreted as “subtracting 3 groups of positive d .”

- a) **Why is $4d + d - 3d$ equal to $2d$?** (Answers will vary. Example answer: If you add $4d$ and d , you get $5d$, which is 5 groups of positive d . Then you subtract $3d$, from that which leaves 2 groups of positive d .)
- b) **Which terms are like?** (The terms with variable h 's and the terms with variable g 's.)
- b) **What does the term $-2h$ represent?** (It means 2 times $-h$ or 2 groups of negative h .)

NOTE: It can also be interpreted as “subtracting 2 groups of positive h .”

- b) **What does the term $-3g$ represent?** (It means 3 times $-g$ or 3 groups of negative g .)

NOTE: It can also be interpreted as “subtracting 3 groups of positive g .”

- b) **Why can we not combine h and $-g$?** (Because they are not like terms - they have different variables, which can be defined as different values, making them not equal.)
- c) **Which terms are like?** (The terms with variable a 's and the terms with variable c 's. The term with b and the term without a variable do not have any like terms.)
- c) **What does the term $10a$ represent?** (It means 10 times a or 10 groups of positive a .)
- c) **What does the term -2 represent?** (Negative 2 or subtract 2.)
- c) **Why does the simplified expression still have four terms?** (Because none of the terms are like, we cannot combine any of them further.)

Watch out for

- Students who combine unlike terms.
- Students who do not pay attention to whether terms are positive or negative.

Answers

- a) $2d$
- b) $h - g$
- c) $7a + 8b + c - 2$

Go further

If stuck

- Give the problem more context. Tell students that this is a special shaped garden and that they need to find how much fencing it needs.
- Trace the outline of the outside of the shape, discussing each side length as you trace.

Questions

- How did you find the perimeter of a shape? (By adding all the sides together, by writing an expression and combining the like terms.)
- How do you know when an expression is fully simplified? (When all the like terms have been combined.)

Watch out for

- Students who get frustrated - remind them it is a challenge and provide support with the suggestions above.

Answers

- $10x + 8y$

Support for Slide(s)

If stuck

- Use a number line on the Classroom tools slide to model + and – movements, instead of drawing each term and creating zero pairs.

Questions

- How does the model show $a - 2a + 3a$? (There is a positive a , two negative a s and three positive a s.)
- Why do $+a$ and $-a$ create a zero pair? (Since the variable a represents the same value, combine a positive number with the same amount of a negative number creates zero. We can also think about it as $a - a = 0$.)
- a, b, c) How can you model each term in the expression? (Answer shown on side image.)

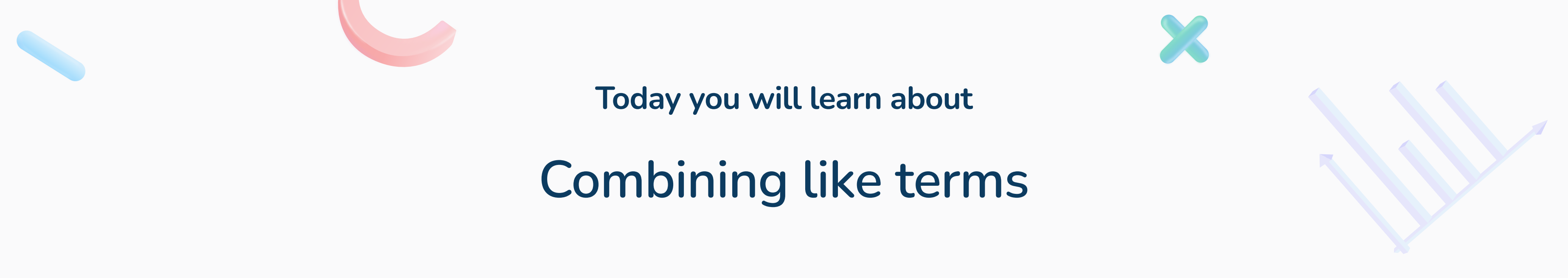
Answers

- a) $4a + 2b + 3a + 4b = 7a + 6b$
- b) $5a + 2b - 3a - b = 2a + b$
- c) $7a - 4b - 5a - 3b = 2a - 7b$

Assessment question:

Correct answer:

$$6a + 2b$$



Today you will learn about

Combining like terms



Learning Goal

Simplify the expressions by combining the like terms.

a $g + g + g + g = \dots\dots\dots$

b $t + y + t - y + y + y = \dots\dots\dots$

c $8x + 9e + 3x - e = \dots\dots\dots$

Prior Learning

Complete the equations.

a $6 + 6 + 6 + 6 = 6 \times \dots\dots\dots$

b $7 + 7 + 7 + 7 - 7 - 7 = 7 \times \dots\dots\dots$

c $4 + 9 + 9 + 4 + 4 = 4 \times \dots\dots\dots + 9 \times \dots\dots\dots$

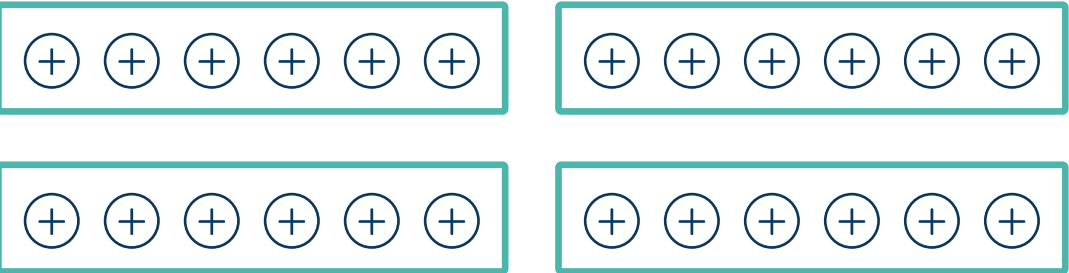


Prior learning

We can simplify expressions with repeated addition and subtraction.

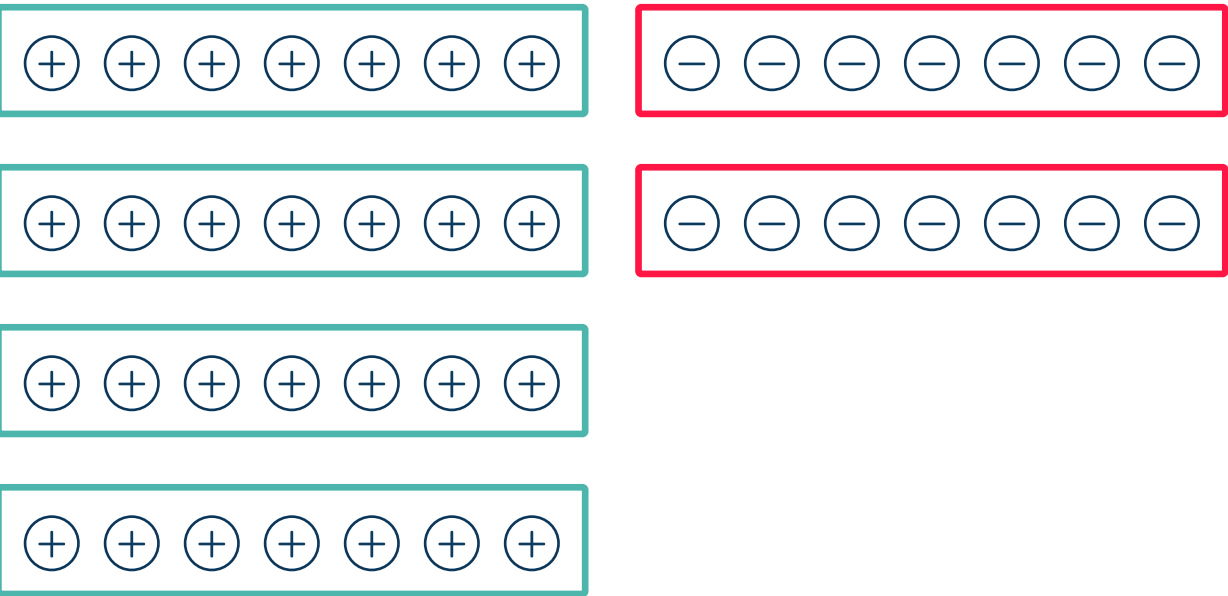
a

$6 + 6 + 6 + 6 = 6 \times \dots\dots\dots$



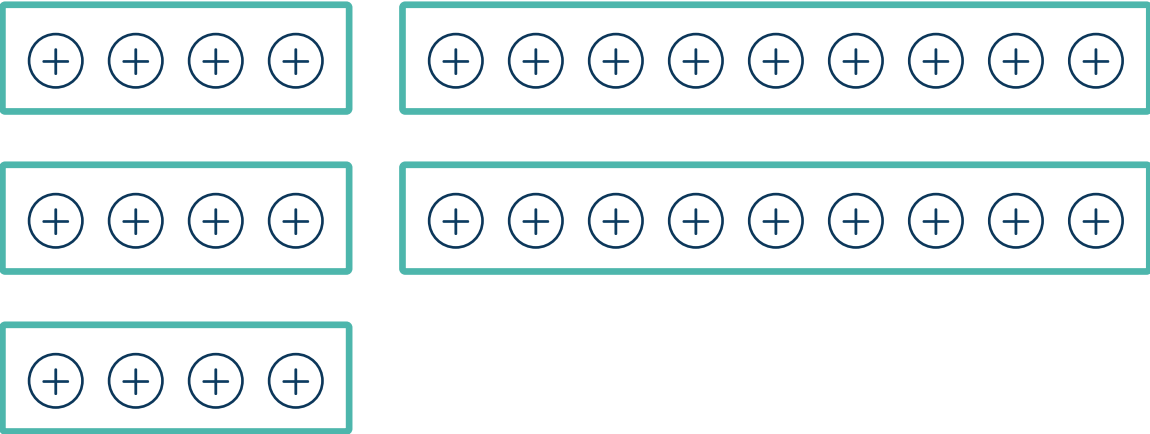
b

$7 + 7 + 7 + 7 - 7 - 7 = 7 \times \dots\dots\dots$



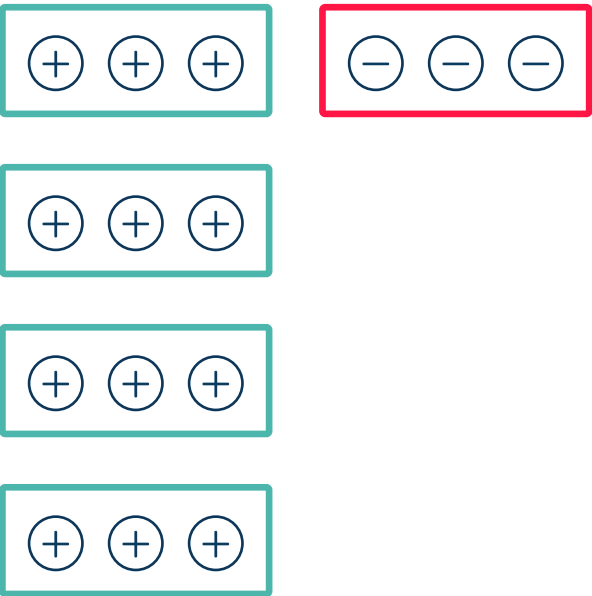
c

$4 + 9 + 9 + 4 + 4 = 4 \times \dots\dots\dots + 9 \times \dots\dots\dots$



d

$3 + 3 - 3 + 3 + 3 = 3 \times \dots\dots\dots$



A positive and negative value combined form a zero pair.

Let's learn

A **ratio** is used to compare quantities.
It tells us how much of one quantity there is to another quantity.

a How many a 's are there?

$$a + a + a + a = \dots\dots\dots$$

b How many b 's are there?

$$b + b - b + b + b - b = \dots\dots\dots$$

c How many c 's are there?

$$5c + 2c = \dots\dots\dots$$

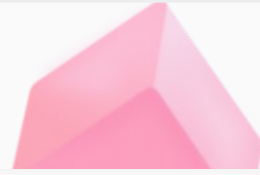
d How many d 's are there?

$$8d - 3d = \dots\dots\dots$$

A **term** is a number, variable or a group of numbers and variables being multiplied together.



Follow me



Let's look at examples with unlike terms.

1 Simplify: $3m + 8n + 5m - 4n$

Combine the m 's:

..... =

Combine the n 's:

..... =

Write the simplified expression:

.....



Your turn



2 Simplify: $9a + 2b - 5a + 3b$

Combine the a 's:

..... =

Combine the b 's:

..... =

Write the simplified expression:

.....

Unlike terms have different variables, and cannot be combined.

a Simplify: $4d + d - 3d$

.....

b Simplify: $3h + 2g - 2h - 3g$

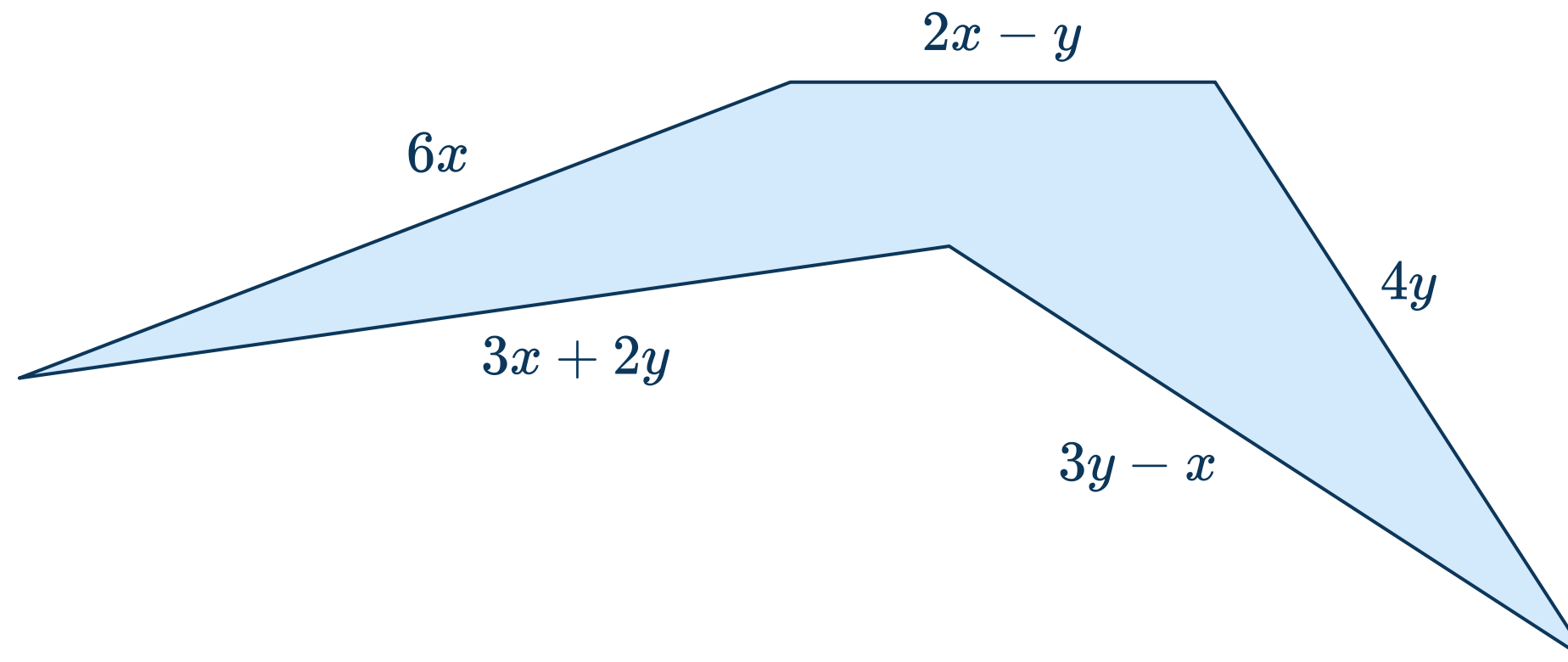
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c Simplify: $10a + 8b - 8c - 3a + 9c - 2$

.....

Go further

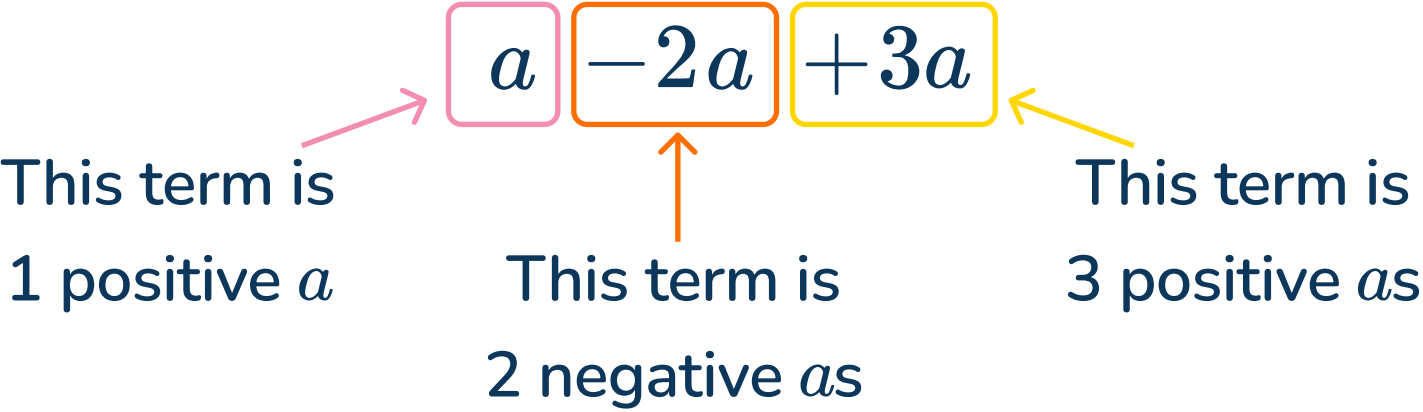
Express the total perimeter of the following shape in terms of x and y :



.....

Each term is either positive or negative.

We can tell by the symbol in front of the term.



Draw a model of each term and then use the model to combine like terms.

$$\begin{array}{c} + a \quad \textcircled{-a + a} \\ \textcircled{-a + a} \\ + a \end{array}$$

Grouping a positive and a negative together creates the value

Grouping 1 positive a , 2 negative as , and 3 positive as equals

a $4a + 2b + 3a + 4b = \dots\dots\dots$

b $5a + 2b - 3a - b = \dots\dots\dots$

c $7a - 4b - 5a - 3b = \dots\dots\dots$

Check your understanding

Simplify the expression by combining the like terms.

$$a - b + 5a + 3b = \dots\dots\dots$$

Why do I need to try this question on my own first?




- To show your tutor what you understand
- To give you more practice
- To show your teacher how you are doing



[illegible][illegible][illegible]

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-  Aligned to your state's standards
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“We just had our first session and it went great! The kids really liked it and felt like they were learning! One even said he finally felt like math was making sense.”



Michelle Craig, Instructional Coach,
Sherwood Forest Elementary, Washington

Speak to us

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