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6.1 Introduction to algebra
6.2 Simplifying (multiplication)
6.3 Simplifying (indices)
6.4 Substitution
6.5 Substitution (indices)
6.6 Collecting like terms
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Unit 6: Expressions

Lesson 2: Simplifying (multiplication)

Mathematics
Mastery

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Y7U6L2: Simplifying (multiplication)

Big idea: In algebra, it is a convention to write expressions in their simplest form.

Learning objectives

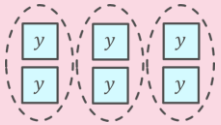
- Understand it is a convention to write expressions in simplest form
- Understand it is a convention to write letters in expressions in alphabetical order
- Be able to simplify an algebraic expression involving multiplication with one or more variables

Key representations

Algebra tiles



Arrays



Curly brackets

$$= \underbrace{3 \times 2} \times y$$
$$= \underbrace{6} \times y$$
$$= \underbrace{6y}$$

Common misconception

Without deep understanding that $5t$ means $5 \times t$ students sometimes add rather than multiply coefficients e.g. $2 \times 3r = 5r$.

In this lesson we use representations and the language of 'lots of' to support students. E.g. $5t$ means '5 lots of t' and '$2 \times 3r$' means '2 lots of $3r$' or '2 lots of 3 lots of r'.

Prior learning

Y7U5L4: Multiplying negative numbers

Y7U6L1: Introduction to algebra

Evaluate -2×3

Write $r \times 5$ using correct algebraic notation.

Key Concepts

$3 \times 2y$ is the same as $3 \times 2 \times y$, or "3 lots of 2 lots of y".

In algebra, we write expressions in their simplest form.

We can rearrange expressions involving multiplication to group the numbers and the letters together.

When there is more than one variable (letter), it is a convention to write them in alphabetical order.

Leading to

Y7U6L3: Simplification (indices)

Simplify:

$2q^6 \times q^2$

$2n^5 \times 5n^3$

Examples

Fill in the gaps:

$9 \times 3r = \ldots \times \ldots \times \ldots$

Fill in the gaps:

$4b \times 2 =$
$4 \times \ldots \times 2$ or $4 \times \ldots \times b$

Simplify $2s \times 5r$

$$= 2 \times s \times 5 \times r$$
$$= \underbrace{2 \times 5} \times s \times r$$
$$= \underbrace{10} \times \underbrace{s \times r}$$
$$= \underbrace{10 \times sr}$$
$$= 10sr$$
$$= 10rs$$

What is the simplest form of this expression?

$4d \times 3c$

$= 12cd$

Lesson Overview

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L2: Simplifying (multiplication)

Last lesson

1. Write an expression that represents "I think of a number and subtract 8".

Last week

2. Work out

$$-11 \times -6$$

Last term

3. Write the number **fifty thousand, four hundred** in figures.

Last year

4. Order the amounts of money, starting with the smallest.

$72p$ £2.70 £0.27 £7.20 £2.07

5. Esther says that $8 \div (4 \div 2)$ is the same as $(8 \div 4) \div 2$.
Is she correct? Explain your answer.

Do Now

L2: Simplifying (multiplication)

ANSWERS

Do Now

Last lesson

1. Write an expression that represents "I think of a number and subtract 8".

$n - 8$

Last week

2. Work out

-11×-6

66

Last term

3. Write the number **fifty thousand, four hundred** in figures.

$50\,400$

Last year

4. Order the amounts of money, starting with the smallest.

$£0.27 \quad 72p \quad £2.07 \quad £2.70 \quad £7.20$

5. Esther says that $8 \div (4 \div 2)$ is the same as $(8 \div 4) \div 2$.
Is she correct? Explain your answer.

No. Division is not associative so changing how we group the numbers changes the answer.

Simplifying (multiplication)

Each expression has a value of 24 or -24.
Sort the expressions into the table.

24	-24

-3×8

6×-4

-2×12

24×1

-8×-3

$6 \times 2 \times 2$

Extension prompt

Retrieve



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24	-24
-8×-3	-3×8
$6 \times 2 \times 2$	6×-4
24×1	-2×12

Different expressions that have a value of 24 and -24 are: $\square \times \square$

- $2 \times 12 = 24$
- $3 \times 8 = 24$
- $6 \times 4 = 24$
- $-1 \times -24 = 24$
- $-2 \times -12 = 24$
- $-4 \times -6 = 24$
- $-1 \times 24 = -24$
- $-4 \times 6 = -24$
- $1 \times -24 = -24$
- $2 \times -12 = -24$
- $3 \times -8 = -24$
- $4 \times -6 = -24$

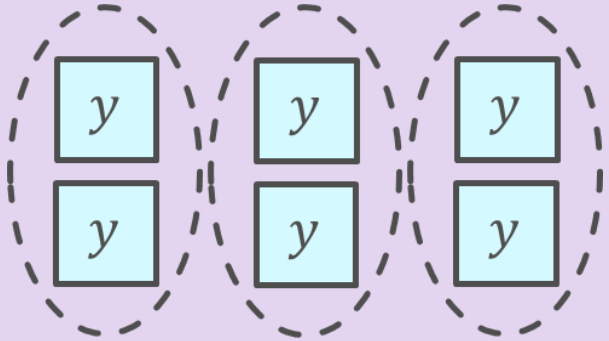
These expressions use integers. Did you find any that involve decimals?

Retrieve - ANSWERS

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In algebra, we write expressions in their **simplest form**.
We can be asked to **simplify** an expression.

Simplify $3 \times 2y$



$$= \underbrace{3 \times 2} \times y$$

$$= 6 \times y$$

$$= 6y \leftarrow \text{simplest form}$$



$3 \times 2y$ means
3 lots of 2 lots of y.

Binh

Key Learning

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If we have more than one variable in our expression, it is a convention to write them in alphabetical order.

Simplify $2s \times 5r$

$$
\begin{aligned}
&= 2 \times s \times 5 \times r \\
&= 2 \times 5 \times s \times r \\
&= 10 \times s \times r \\
&= 10 \times sr \\
&= 10sr \\
&= 10rs
\end{aligned}
$$

simplest form



Multiplication is commutative so we can rearrange the expression.

$10sr = 10rs$



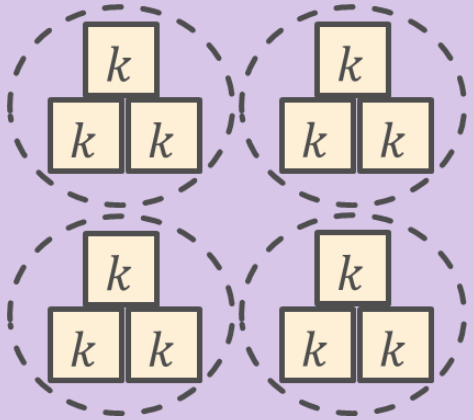
Key Learning

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I do

Simplify

$4 \times 3k$





$4 \times 3k$ is
4 lots of $3k$
or 4 lots of 3 lots of k.

I do

Simplify

$3q \times -4p$

Model

compare

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Quick Check

Marva has simplified an expression.

Is the expression written using correct mathematical convention?



Marva

My answer is $16ba$.

A

Yes

B

No

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Marva has simplified an expression.

Is the expression written using correct mathematical convention?



Marva

My answer is $16ba$.

A

Yes

B

No

Quick Check

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Quick Check

Which expression is the same as $7e \times 2s$?

A

$7 \times e \times 2 \times s$

B

$7 + e \times 2 + s$

C

$72 \times e \times s$

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Quick Check

Which expression is the same as $7e \times 2s$?

A

$7 \times e \times 2 \times s$

B

$7 + e \times 2 + s$

C

$72 \times e \times s$

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Quick Check

What is the simplest form of this expression?

$$4 \times -3c$$

A

$-43c$

B

$-7c$

C

$-12c$

D

$1c$

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Quick Check

What is the simplest form of this expression?

$$4 \times -3c$$

A

$-43c$

B

$-7c$

C

$-12c$

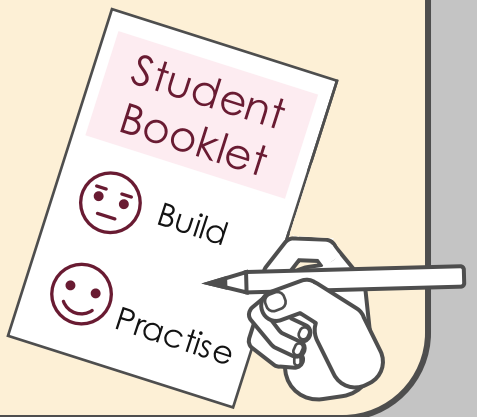
D

$1c$

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Simplify

$3q \times 5p$



Ready to Practise?

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The Maths Mastery students are simplifying this expression:

$$2t \times 9s$$



Cala

$2t \times 9s = 18ts$

$2t \times 9s = 29st$



Declan

Explain the mistake each student has made.
What is the correct answer using correct algebraic conventions?

Extension prompt

Talk Task

spot the mistake

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$2t \times 9s$

coefficients (numbers)



Cala

$2t \times 9s = 18ts$

$2t \times 9s = 29st$



Declan

Cala has forgotten to write the variables (letters) in alphabetical order.

Declan hasn't multiplied the coefficients. Instead, he has put them together to create a two-digit number.

The correct answer is $18st$

$2t \times 9s$ is the same as:

- $2 \times t \times 9 \times s$
- $9 \times t \times 2 \times s$
- $2 \times s \times 9 \times t$
- $9 \times s \times 2 \times t$
- $2 \times 9 \times s \times t$
- $2 \times 9 \times t \times s$
- $9 \times 2 \times s \times t$
- $9 \times 2 \times t \times s$
- $t \times s \times 2 \times 9$
- $s \times t \times 9 \times 2$
- $2s \times 9t$
- $9t \times 2s$

Talk Task - ANSWERS

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1) Simplify these expressions using correct mathematical notation:

a) $a \times 3$

b) $2 \times 6k$

c) $4g \times d$

d) $2a \times 5c$

e) $3e \times -4d$

f) $-8p \times -2m$

Exit Ticket

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1) Simplify these expressions using correct mathematical notation:

a) $a \times 3$ $3a$

b) $2 \times 6k$ $12k$

c) $4g \times d$ $4dg$

d) $2a \times 5c$ $10ac$

e) $3e \times -4d$ $-12de$

f) $-8p \times -2m$ $16mp$

Exit Ticket - ANSWERS

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