Name:_____

Year 7 Unit 6 Student Booklet

Expressions

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

6.7 Expanding brackets

6.8 Expanding and collecting

6.9 Algebraic factors

6.10 Factorising



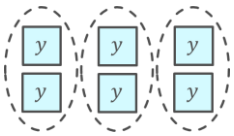
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Simplifying (multiplication)

In algebra, we write expressions in their **simplest form.**

If we have more than one letter in our expression, it is conventional to write the variables (letters) in alphabetical order.

Simplify $3 \times 2y$



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

$= 3 \times 2 \times y$

$= 6 \times y$

$= 6y$

simplest form

Simplify $2s \times 5r$

$= 2 \times s \times 5 \times r$

$= 2 \times 5 \times s \times r$

$= 10 \times s \times r$

$= 10 \times sr$

$= 10sr$

$= 10rs$

simplest form

Build

1. Fill in the gaps.
The first one has been done for you.

a) $6 \times 3h$
$= 6 \times 3 \times h$
$= 18 \times h$
$= 18h$

b) $3 \times 5r$
$= 3 \times 5 \times r$
$= 15 \times r$
$= \ldots\ldots$

c) $4 \times 6s$
$= 4 \times 6 \times s$
$= \ldots\ldots \times s$
$= \ldots\ldots$

d) $2 \times 9t$
$= 2 \times 9 \times t$
$= \ldots\ldots \times \ldots\ldots$
$= \ldots\ldots$

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

f) $5 \times 11p$
$=$

2. Fill in the gaps.
The first one has been done for you.

a) $3a \times 5$
$= 3 \times a \times 5$
$= 3 \times 5 \times a$
$= 15 \times a$
$= 15a$

b) $4b \times 2$
$= 4 \times b \times 2$
$= 4 \times \ldots \times b$
$= \ldots \times b$
$= 8b$

c) $7c \times 3$
$= 7 \times c \times \ldots$
$= 7 \times 3 \times c$
$= \ldots \times c$
$= \ldots\ldots$

d) $6d \times 2$
$= 6 \times d \times 2$
$= 6 \times 2 \times \ldots$
$= \ldots \times \ldots$
$= \ldots\ldots$

e) $9e \times 5$
$= \ldots \times e \times 5$
$= 9 \times \ldots \times e$
$= \ldots \times \ldots$
$= \ldots\ldots$

f) $10i \times 2$
$= \ldots \times \ldots \times \ldots$
$= \ldots \times \ldots \times \ldots$
$= \ldots \times \ldots$
$= \ldots\ldots$

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Build – continued

3. Fill in the gaps.
The first one has been done for you.

a) $6b \times 4a$
$= 6 \times b \times 4 \times a$
$= 6 \times 4 \times b \times a$
$= 24 \times b \times a$
$= 24\ b\ a$
$= 24ab$

b) $2f \times 7e$
$= 2 \times f \times 7 \times e$
$= 2 \times \ldots \times f \times e$
$= 14 \times f \times e$
$= 14\ f\ e$
$= \ldots\ldots$

c) $3z \times 5y$
$= 3 \times \mathrm{z} \times 5 \times y$
$= 3 \times \ldots \times \ldots \times y$
$= \ldots \times \mathrm{z} \times y$
$= 15\ z\ y$
$= \ldots\ldots$

d) $6i \times 2h$
$= 6 \times \ldots \times \ldots \times h$
$= 6 \times \ldots \times \ldots \times h$
$= 12 \times i \times h$
$= \ldots\ i\ h$
$= \ldots\ldots$

e) $3d \times 7c$
$= \ldots \times \ldots \times \ldots \times \mathrm{c}$
$= 3 \times \ldots \times \ldots \times \ldots$
$= 21 \times \ldots \times c$
$= \ldots\ d\ c$
$= \ldots\ldots$

f) $2b \times 5a$
$= \ldots \times \ldots \times \ \ldots \times \ldots$
$= \ldots \times \ldots \times \ \ldots \times \ldots$
$= \ldots \times \ldots \times \ldots$
$= \ldots\ \ \ldots$
$= \ldots\ldots$

Practise

4. Simplify these expressions using correct algebraic conventions.

a) $3 \times 2r$ b) $7 \times 4e$ c) $8 \times 2h$ d) $5t \times 7$

e) $9i \times 4$ f) $9 \times -6x$ g) $3s \times -4$ h) $-3 \times -4p$

i) $-5 \times 5n$ j) $-8 \times -8e$ k) $2q \times -12$ l) $-1t \times -9$

5. Simplify these expressions using correct algebraic conventions.

a) $5t \times 6u$ b) $4p \times 7q$ c) $-2e \times 6f$ d) $-3t \times 9u$

e) $5y \times 7x$ f) $9u \times 7i$ g) $3e \times 9f$ h) $5y \times -5z$

i) $-4r \times 8q$ j) $-4u \times -3t$

6. Two students are simplifying the expression below.

$4h \times 5d$

Katherine



My answer is $9dh$.

My answer is $20hd$.

Marva



a) Explain the mistake each student has made.

b) What is the correct answer?

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Practise - continued

7. A range of expressions have been expanded to show all the operators. There is one incorrect expanded expression within each group.

Find and circle the one incorrect expanded expression.
The first one has been done for you.

	Expressions		Expanded expressions
		i.	$6 + y + 3 + z$
a)	$6y \times 3z$	ii.	$6 \times y \times 3 \times z$
		iii.	$3 \times z \times 6 \times y$
		i.	$7 \times b \times 2 \times a$
b)	$7b \times 2a$	ii.	$7 \times 2 \times a \times b$
		iii.	$7 + b \times 2 + a$
		i.	$g \times 4 \times l \times 3$
c)	$4g \times 3l$	ii.	$43 \times g \times l$
		iii.	$4 \times 3 \times g \times l$
		i.	$9 \times y \times -2 \times z$
d)	$9z \times -2y$	ii.	$9 \times -2 \times z \times y$
		iii.	$9 \times \mathrm{z} \times 2 \times y$

8. Write and simplify an expression to represent.

a) I think of a number and multiply it by 5. I then multiply it by 4.

b) I think of a number and multiply it by 7. I then multiply it by 3.

c) 5 times my number multiplied by 6.

d) The product of 12 times my number and 2.

e) 3 lots of 9 lots of my number.

f) 6 lots of double my number.

9. Write and simplify an expression to represent.

a) There are x sweets in a packet.
There are 5 packets in a box.
I have 4 boxes.
How many sweets do I have?

b) y children have 2 dogs each.
Each dog has 3 toys.
How many toys are there altogether?

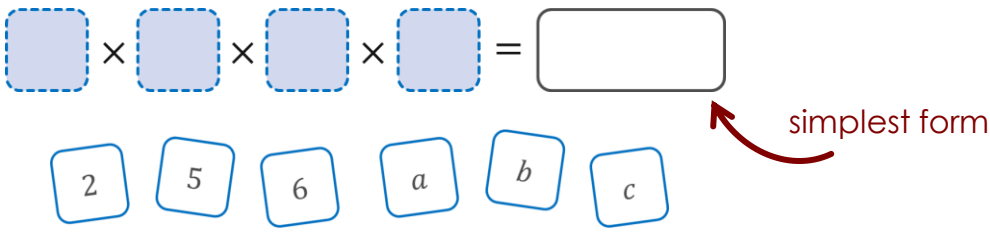
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Practise - continued

9. c) A car has four wheels.
There are z cars in a car park.
There are 5 times as many cars on the road.
How many wheels are on the road?

d) A cinema tickets costs £a.
Five families go to the cinema together.
Each family has four people in it.
How much do the tickets cost altogether?

10. An expression has parts missing.



a) Use the cards to fill in the gaps and write the resulting expression in its simplest form. For example: $2 \times a \times b \times c = 2abc$

b) Use the cards to create more expressions. Can you find four different simplified expressions?

Extend

11. Simplify these expressions using correct algebraic conventions.

a) $15b \times 6f$ b) $14r \times 7p$ c) $-13e \times 9s$

d) $31h \times -9a$ e) $-52z \times -11y$ f) $-14w \times 48j$

g) $i \times -8j$ h) $-9g \times k$ i) $-a \times -3b$

12. Xavier and Yasmin are comparing how long they work.

a) How many seconds are there in an hour?

b) How many seconds are there in x hours?

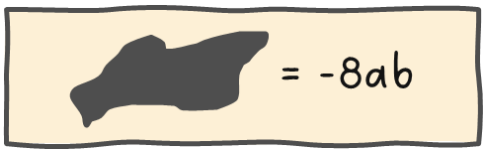
c) Xavier works for y hours.
How many seconds does he work for in terms of y?
Give your answer in the simplest form.

d) Yasmin works for four times as long as Xavier.
How many seconds does Yasmin work for in terms of y?
Give your answer in the simplest form.

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Extend - continued

13. Declan has been simplifying expressions. He has smudged his work.





Declan

a) What might the question have been?

b) How many different questions can you write that can be simplified to $-8ab$?

c) What if there are more than two multiplication signs?

d) What if other operators can be used?

14. a) Match the expression to its simplified expression.

$4r \times -3e$	$-15er$
$5e \times 3r$	$15er$
$-4 \times -3er$	$-12er$
$15r \times -e$	$12er$

b) Write four other algebraic expressions that simplify to $15er$.
You can use positive and negative values.

$\square \times \square = 15er$

$\square \times \square = 15er$

$\square \times \square = 15er$

$\square \times \square = 15er$

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Extend - continued

15. Katherine has a part time job.
She is paid £5 for each hour she works.

a) How much money does she earn if she works for 3 hours?

b) How much money does she earn if she works for 3 hours a day for 5 days?

c) How much money does she earn in 6 weeks if she works for 3 hours a day for 5 days a week?

For the following parts, write all expressions in their simplest form.

d) How much money does she earn in x weeks if she works for 3 hours a day for 5 days a week?

e) How much money does she earn in x weeks if she works for y hours a day for 5 days a week?

f) How much money does she earn in x weeks if she works for y hours a day for z days a week?

g) Zaki earns £a an hour in a different job.
We don't know how many hours he works in a day or how many days he works in a week.

Write an expression to show how much money he makes in a year, explaining what the letters you are using represent.

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