

Lesson 4 – Simplifying Expressions (Addition/Subtraction)

Starter

Answer these questions without a calculator:

1) $5 - 8$

2) $-2 + 7$

3) $3 - - 6$

4) $8 + - 4$

5) $2 + - 5$

6) $2 + -4$

7) $4 - 6$

Starter Answers

1) -3

2) 5

3) 9

4) 4

5) -3

6) -2

7) -2

Consider the calculation: $6 + 6 + 6 + 6$

We could re-write this as: 4×6

Similarly, if we had the expression: $x + x + x + x$

We could re-write this as: $4 \times x$

Or, even better: $4x$

We can do this because we are adding the **same amount** each time.

Consider this calculation: $2 \times 6 + 3 \times 6$

We could re-write this as: 5×6

Similarly, if we had the expression: $2x + 3x$

$$= 2 \times x + 3 \times x$$

We could re-write this as: $5 \times x$

Or, even better: $5x$

When each term involves the same amount (like $2x$ and $3x$ both involve x), we call these **like terms**. If we have like terms, we can **collect them together** and **simplify** the expression.

What happens when we don't have like terms?

Consider the calculation: $2 \times 6 + 3 \times 4$

We can't simplify this calculation any further like we did above as we are multiplying different amounts.

Similarly, if we had: $2x + 3y$

We can't simplify this any further because x and y may be different amounts.

Example 1

Decide whether each pair are like terms or not. Then write down the sum of the two terms.

Term 1	Term 2	Like terms?	Sum
x	$2x$		
$4y$	$5y$		
a	b		
xy	$2xy$		
x^2	x		
ab	ba		

Answer

Term 1	Term 2	Like terms?	Sum
x	$2x$	Yes	$3x$
$4y$	$5y$	Yes	$9y$
a	b	No	$a + b$
xy	$2xy$	Yes	$3xy$
x^2	x	No	$x^2 + x$
ab	ba	Yes	$2ab$

ab the same as ba because multiplication is commutative, meaning we can do it in any order

Example 2

Simplify each of these expressions by collecting like terms

- 1) $x + x + x + x + x$
- 2) $6y - 4y$
- 3) $2a - 5a + 7a$
- 4) $3ab + 4ba$
- 5) $x^2 + x^2$

Answers

- 1) $5x$
- 2) $2y$
- 3) $4a$
- 4) $7ab$ or $7ba$ (both of these would mean the same thing since $a \times b = b \times a$)
- 5) $2x^2$

Example 3

Simplify each of these expressions by collecting like terms

1) $2a + 5b + 7a + 6b$

We have two different types of like term, a 's and b 's.

Highlight the like terms in two different colours:

$$2a + 5b + 7a + 6b$$

We include the sign in front of the number as this tells you whether to add or subtract.

$$2a + 7a = 9a$$

$$5b + 6b = 11b$$

So, the answer is $9a + 11b$

2) $3x + 4x^2 + 7 + x^2 + 9x + 2$

This time we have three different types of like term:

$$3x + 4x^2 + 7 + x^2 + 9x + 2$$

$$3x + 9x = 12x$$

$$4x^2 + x^2 = 5x^2$$

$$7 + 2 = 9$$

So the answer is $5x^2 + 12x + 9$

Since addition is commutative, we can write this in any order. For example, we could write this as $12x + 9 + 5x^2$ instead.

3) $5c + 2d - 3c + 4d$

Highlight the like terms, including the sign before the number:

$$5c + 2d - 3c + 4d$$

$$5c - 3c = 2c$$

$$2d + 4d = 6d$$

So, the answer is $2c + 6d$

4) $8x - 4y - 11x + 7y$

Highlight the like terms including the sign before the number:

$$8x - 4y - 11x + 7y$$

$$8x - 11x = -3x$$

$$-4y + 7y = 3y$$

So, the answer is $-3x + 3y$.

We could also write this as $3y - 3x$.

Your go

Simplify these expressions

1) $5a + 8b + 2a + 9b$

2) $3x + 4x + 6y + 7 + 2y + 8$

3) $6t + 4p - 3t - p$

4) $3w - 6v - 7w - 2v$

5) $-5x - 7y - 3x - 8y$

Answers

1) $7a + 17b$

2) $7x + 8y + 15$

3) $3t + 3p$

4) $-4w - 8v$

5) $-8x - 15y$

Example 4

Simplify these expressions

1) $3ab + 4a^2b + 7ba + 5a^2b$

Highlight the like terms:

$$3ab + 4a^2b + 7ba + 5a^2b$$

$$3ab + 7ba = 10ab$$

$$4a^2b + 5a^2b = 9a^2b$$

So the answer is $10ab + 9a^2b$

We could also write this as $9a^2b + 10ab$

2) $8x^2y + 3xy^2 + 2x^2y^2 + x^2y + 2xy^2$

Highlight the like terms:

$$8x^2y + 3xy^2 + 2x^2y^2 + x^2y + 2xy^2$$

$$8x^2y + x^2y = 9x^2y$$

$$3xy^2 + 2xy^2 = 5xy^2$$

So the answer is $9x^2y + 5xy^2 + 2x^2y^2$