Simplifying expressions

- Simplifying expressions by collecting like terms
- Expanding expressions involving brackets
- Writing expressions using index notation
- The order of operations for expressions involving indices

Keywords

You should know

explanation 1a | explanation 1b | explanation 1c | online

1 Look at the terms in the box.

$5xy$	$6x$	$-7x^2$	$4y$	-1
$4x$	9	$-10y$	$-yx$	xy^2

Write down all the terms in the box that are like each term below.

a $2x$ **b** $-3xy$ **c** $2x^2$ **d** -8 **e** y **f** y^2

2 Simplify these expressions where possible. Collect like terms.

a $4h + t - 3h + 5t$

b $a + 8b + 10 + 5a - 3$

c $5m - 3n + 8 - m + n + 1 + n$

d $3q + 8 - p + 3 - 6q - 11 + 2p$

e $m + 6n - m + n - 5 + 6n + 3m$

f $x - 7y + y^2 - 3 - 2x^2 + 6z$

g $-a + 7b - ab + 4ab - b + 1$

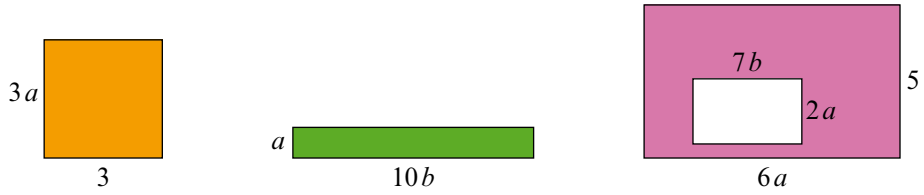
h $2m - 3n + 2 - m + n + 1 + 2n$

3 Write three different expressions that simplify to $3x + 7y - 6$.

4 Eric has three rectangular cards. One of them has a hole cut out.

a Write down an expression for the area of each card.

b What is the total area of the three cards? Simplify your answer.



5 Copy and complete the expressions.

a $5a + b + 4 - \square + 6b + \square = 3a + \square + 5$

b $4t - u + t - v - \square = \square - 9u - v$

c $p + 7q - 7 - q + \square - \square = 12p + \square - 8$

d $a + 3b - 2 + 4a - \square + 1 = \square - 3b - \square$

e $-v - 3 + 2w + 1 + \square - \square = 3v + \square - 6$

f $2x + y - 3 + 5x - \square + \square = 7x + 6$

6 Simplify these expressions.

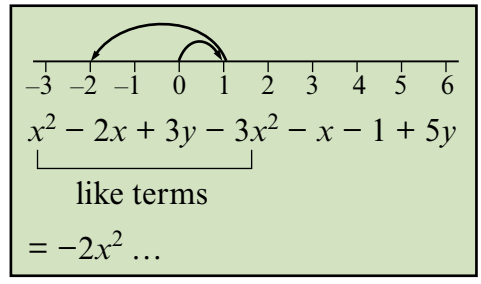
a $5x^2 + y^2 - 2x + y - x^2 - 8y^2 + x + 4y$

b $x^2 + 5y^2 - 5 + x + 3 - 4x^2 + 5x - 10$

c $4x - 8y + 2xy - x + 5y - 7x - 8yx + 3x$

d $5x + y^2 - 2x + y - x^2 - 8y^2 + x + 4y$

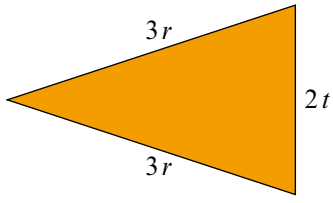
e $6a + b - 4ab + 2a + 7ba - 10b + 2$



7 Write three different expressions that simplify to $2x^2 - 3x + 9$.

8 Write an expression for the perimeter of each shape as simply as possible.

a



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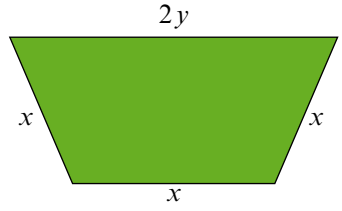

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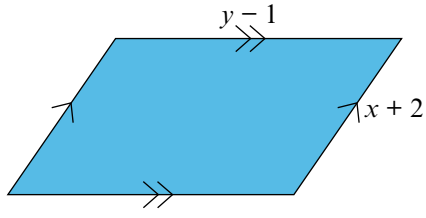

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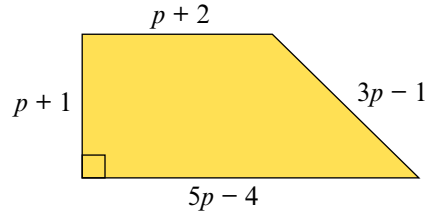


explanation 2a | explanation 2b

9 Expand the brackets.

a $3(2a + b)$ **b** $5(m - 6n)$ **c** $2(x - 3y)$ **d** $12(4a + 3b)$

e $a(3a + 4)$ **f** $x(10 - x)$ **g** $p(q - 7p - 1)$ **h** $y(1 - 4y - 3x)$

i $4t(2 - 5t)$ **j** $8u(3u - 10)$ **k** $9v(u - 2v + 4)$ **l** $3x(2 + 6x - 7x^2)$

10 Expand the brackets and simplify where possible.

a $5(x - 2y) + 3xy$ **b** $4(a + 2b) - 3a$

c $8(3a - b) + 2(4a + 3b)$ **d** $6(a + 2b) + 4(a - 5b)$

e $9(2 - b) + (7 - b)$ **f** $x(x - y) + y(x - y)$

explanation 3 | online

11 Expand the brackets.

a $-2(3 - 5t)$ **b** $-4(3 + 5t)$

c $-y(3y - 10)$ **d** $-p(2q - 5p)$

e $-x(1 - x)$ **f** $-a(2a - b + 3)$

g $-8n(2 - m + 3n)$ **h** $-5m(2 + 7m - m^2)$

$-3(1 - 2x)$
$= -3 \times 1 + (-3) \times (-2x)$
$= -3 + 6x$

12 Expand the brackets and simplify.

a $2(3x + 1) - 5(x + 1)$ **b** $10a - 3(2a + 5b)$

c $2a - (4a - 3b)$ **d** $6 - (2t - 1)$

e $2(3m - n) - (4m + 3n)$ **f** $4a(2a + 1) - 3a(a - 2)$

g $2(4x + y) + 3(2x - 9y)$ **h** $5a(a - 3) - a(2a + 7)$

13 Aled has 13 CDs. Beth has $3y$ fewer CDs than Aled. Ciaran has $7xy$ CDs.

a How many CDs do Aled and Beth have altogether?

b For each CD that Aled and Beth have, Ciaran gives them another $2x$ CDs.

i How many CDs does Ciaran give them?

ii How many CDs does Ciaran have left? Simplify your expression.

14 Copy and complete.

a $\square(3 - 2t) = 15 - \square$

b $4(7 + \square) = \square + 12b$

c $8(\square + \square) = 8x + 24y$

d $\square(2 - 5t) = 6t - \square$

e $\square(x - 6) = 2x^2 - \square$

f $\square(n - 2m) = n^2 - \square$

g $\square(2x - 7) = -8x + \square$

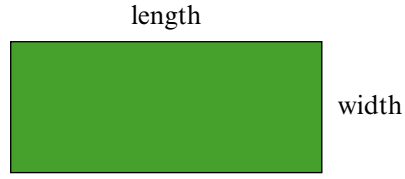
h $\square(4x - 3) = \square + 15x$

i $\square(m + 6n) = \square - 6mn$

j $\square(x - 3y) = \square + 6y$

15 The area of a rectangle is $(2x^2 + 4x)\,\text{cm}^2$

Find its length and width for each of these perimeters.



a $(6x + 8)$ cm **b** $(6x + 4)$ cm

explanation 4a explanation 4b

16 Write these expressions as simply as possible using index notation.

a $y \times y \times y$

b $r \times r \times r \times r$

c $p \times p \times p \times p \times p$

d $t \times t \times u \times u \times u$

e $y \times y \times y \times z$

f $a \times a \times b \times b \times c \times c$

g $m \times n \times n \times p \times p \times p$

h $t \times u \times t \times u \times t$

i $m \times p \times n \times m \times p$

17 Write these in full. The first one has been done for you.

a $t^2 = t \times t$

b f^2g

c b^3d^2

d y^4z^3

e $a^2b^2c^3$

f mn^3p^2

18 **a** Write these in full.

i $y^2 \times y^3$

ii $a \times a^5$

iii $p^3 \times p \times p^2$

b Write the expressions in part **a** as simply as possible using index notation.

c Copy and complete these expressions. Use your answers to part **b** to help.

i $x^n \times x^m = x^{\square}$

ii $z \times z^k = z^{\square}$

iii $q^a \times q^b \times q = q^{\square}$

19 Simplify.

a $2 \times a \times 3 \times a \times 4 \times a$

b $7 \times a \times 2 \times a \times a \times a$

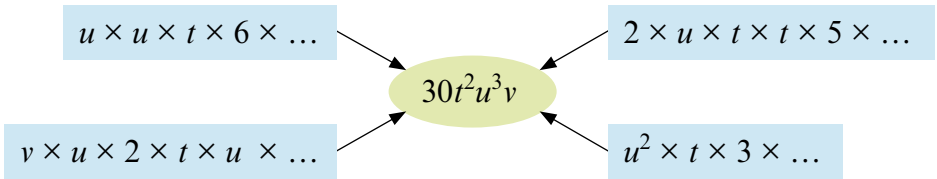
c $2 \times n \times n \times m \times n \times m$

d $5 \times n \times m \times n \times m \times m \times 3$

e $6 \times y^3 \times 2 \times y$

f $2 \times m \times m \times 6 \times n \times m^2 \times 4 \times m$

20 Complete these expressions so that they all simplify to $30t^2u^3v$.



explanation 5a | explanation 5b | explanation 5c | online

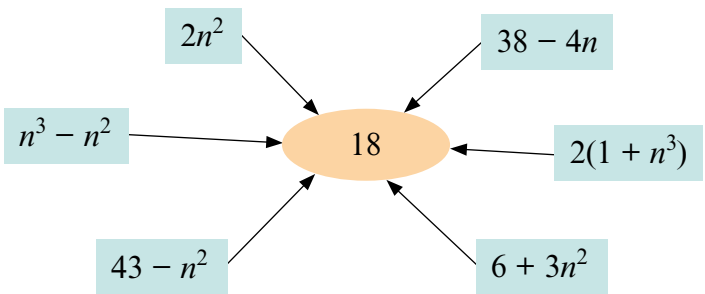
21 $m = 4$ and $v = 5$. Work out the value of each expression.
Which expressions have the same value?

$30 - 2v$ $(3m)^2$ $2m^2 - 12$ $(v - m)(v + m)$ $2vm^2$

$4 + 3mv$ $v^2 - m^2$ $3(30 - mv)$ $8(v^2 - 5)$

22 Which values of n make each algebraic expression equal to 18?

In each case, n is a positive whole number less than 10.



23 Look at this statement.

$(p + q)^2 = p^2 + q^2$

Is the statement always true, never true or sometimes true?

Use different values of p and q to explain your answer.