

Do now on expanding single brackets

1.v Expand and simplify: $3(3v + 4) + 5(3v + 4)$	2.v Expand and simplify: $5(3w + 4) + 6(4w + 2)$	3.v Expand and simplify: $2(4y + 4) + 4(4y + 6)$	4.v Expand and simplify: $3(3q + 3) + 5(2q + 2)$
5.v Expand and simplify: $2(t + 2) + 2(t - 6)$	6.v Expand and simplify: $7(m + 4n) + 3(m - 2n)$	7.v Expand and simplify: $6(e + 6f) + 3(e - 3f)$	8.v Expand and simplify: $2(y + 5) + 5(y - 3)$
9.v Expand and simplify: $7(x - 5) + 4(x - 7)$	10.v Expand and simplify: $6(x^2 - 3y) + 5(x^2 - 3y)$	11.v Expand and simplify: $7(7x + 4) - 3(3x + 8)$	12.v Expand and simplify: $2(16j^2 + 5) - 6(5j^2 + 8)$
13.v Expand and simplify: $8(5g^2 + 2h^2) - 6(5g^2 + 8h^2)$	14.v Expand and simplify: $2(11p + 5q) - 3(7p + 6q)$	15.v Expand and simplify: $6(9f + 4) - 3(8f - 2)$	16.v Expand and simplify: $8(5v + 6w^2) - 5(3v - 7w^2)$

Walt Practice Expanding Brackets


Success Criteria I know how to apply the distributive rule and add like terms

Example 28

Expand: **a** $4(3x + 1)$ **b** $5(7 - 2x)$ **c** $2(3y + 4z)$

<p>a $4(3x + 1)$ = $4 \times 3x + 4 \times 1$ = $12x + 4$</p>	<p>b $5(7 - 2x)$ = $5 \times 7 - 5 \times 2x$ = $35 - 10x$</p>	<p>c $2(3y + 4z)$ = $2 \times 3y + 2 \times 4z$ = $6y + 8z$</p>
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Note that each term inside the bracket is multiplied by the term outside the bracket.



EXERCISE 4J

1 Complete the following expansions:

a $2(x + 5) = 2x + \dots$	b $5(y + 3) = \dots + 15$
c $6(3 + a) = \dots + 6a$	d $7(4 + b) = 28 + \dots$
e $3(z - 4) = 3z - \dots$	f $8(a - 3) = \dots - 24$

2 Expand the following expressions:

a $3(a + 2)$	b $2(x + 5)$	c $5(a - 4)$
d $7(2x - 3)$	e $3(2y + 1)$	f $4(4c - 7)$
g $3(10 - y)$	h $5(2 - x)$	i $2(2 + b)$
j $4(m + n)$	k $4(2a - b)$	l $3(2x + 3y)$

Extension:

Extension:**Example 29**Expand: **a** $2x(3x - 2)$ **b** $3x(2y + 4)$ **c** $(2a - 1)b$

$$\begin{aligned} \mathbf{a} \quad & \overbrace{2x(3x - 2)} \\ &= 2x \times 3x - 2x \times 2 \\ &= 6x^2 - 4x \end{aligned}$$

$$\begin{aligned} \mathbf{b} \quad & \overbrace{3x(2y + 4)} \\ &= 3x \times 2y + 3x \times 4 \\ &= 6xy + 12x \end{aligned}$$

$$\begin{aligned} \mathbf{c} \quad & \overbrace{(2a - 1)b} \\ &= b(2a - 1) \\ &= b \times 2a - b \times 1 \\ &= 2ab - b \end{aligned}$$

3 Expand the following expressions:

a $a(a + 4)$

b $2a(a + 3)$

c $a(a + 6)$

d $y(4y + 10)$

e $3p(2p + 6)$

f $r(r + 2)$

g $z(5 + z)$

h $k(k + 1)$

i $y(1 + y)$

j $5x(3x - 2)$

k $7p(2p - 4)$

l $q(q - 1)$

4 Expand:

a $k(l + 3)$

b $k(l - 1)$

c $k(l + 5)$

d $x(y + 2)$

e $(a + 2)b$

f $(x + 6)y$

g $(k + 7)l$

h $(z - 1)p$

i $5x(2y + 3)$

j $2a(a + c)$

k $4k(k - 2l)$

l $2x(3x - 4y)$

5 Use the distributive law to expand:

a $3(z + 2)$

b $3(3z - 2)$

c $10(2z - 3y)$

d $7(x + 3z + 1)$

e $6(2 - 3a - 5b)$

f $4(5z - 2x + 3y)$

g $2a(3x - 4y + 7)$

h $x(5 - 2x + 3y)$

i $2p(3 + x - 2q)$

EXPANDING AND SIMPLIFYING

Now that our use of variables has extended to multiplication of variables, our definitions of **like terms** must be extended.

Terms which contain all the **same variables**, to the **same index**, are called **like terms**.

For example, xy and $3xy$ are like terms, $2z^2y$ and $10yz^2$ are like terms,
but $5x$ and $3x^2$ are *not* like terms, $5xy$ and $7yz$ are *not* like terms.

Example 30

Remove the brackets and then collect like terms for the following expressions:

a $6y + 2(y - 4)$

b $2(2x + 1) + 3(x - 2)$

$$\begin{aligned} \mathbf{a} \quad & 6y + 2(y - 4) \\ & = 6y + 2y - 8 \\ & = 8y - 8 \end{aligned}$$

$$\begin{aligned} \mathbf{b} \quad & 2(2x + 1) + 3(x - 2) \\ & = 4x + 2 + 3x - 6 \\ & = 7x - 4 \end{aligned}$$

A bracket may be removed by multiplying the number outside the bracket by each term inside the bracket.

6 Expand and then simplify by collecting like terms:

a $2 + 3(x + 2)$

b $2 + 5(a + 7)$

c $3(n + 1) + 2(n + 3)$

d $3n + 2(n + 3)$

e $2(x - 6) + 5(x - 1)$

f $8(y - 2) + 3(y + 6)$



Example 31

Expand and then simplify by collecting like terms:

$$2a(a + 5) + 3(a + 4)$$

$$\begin{aligned} & 2a(a + 5) + 3(a + 4) \\ & = 2a \times a + 2a \times 5 + 3 \times a + 3 \times 4 \\ & = 2a^2 + 10a + 3a + 12 \quad \{10a \text{ and } 3a \text{ are like terms}\} \\ & = 2a^2 + 13a + 12 \end{aligned}$$

Like terms have identical variable(s).

7 Expand and then simplify by collecting like terms:

a $m(m + 2) + m(2m + 1)$

b $x(x + 2) - x^2$

c $3a(a + 2) - 2a^2$

d $5x(x + 2) - 2$

e $3a(a + 2) + 5a(a + 1)$

f $4(p + 3q) + 2(p + 2q)$

g $x(x + 3y) + 2x(x + y)$

h $4(3 + 2x) + 4x(x + 1)$



MULTIPLYING BRACKETED QUANTITIES BY NEGATIVES (EXTENSION)

Example 32

Expand: **a** $-3(x + 4)$

b $-(5 - x)$

$$\begin{aligned} \mathbf{a} \quad & -3(x + 4) \\ & = (-3) \times x + (-3) \times 4 \\ & = -3x + (-12) \\ & = -3x - 12 \end{aligned}$$

$$\begin{aligned} \mathbf{b} \quad & -(5 - x) \\ & = -1(5 - x) \\ & = (-1) \times 5 - (-1) \times x \\ & = -5 - (-x) \\ & = -5 + x \\ & = x - 5 \end{aligned}$$

8 Complete the following expansions:

a $-2(x + 5) = -2x - \dots$

b $-2(x - 5) = -2x + \dots$

c $-3(y + 2) = -3y - \dots$

d $-3(y - 2) = -3y + \dots$

e $-(b + 3) = -b - \dots$

f $-(b - 3) = -b + \dots$

g $-4(2m + 3) = \dots - 12$

h $-4(2m - 3) = \dots + 12$

9 Expand:

a $-2(x + 5)$

b $-3(2x + 1)$

c $-3(4 - x)$

d $-6(a + b)$

e $-(x + 6)$

f $-(x - 3)$

g $-(5 + x)$

h $-(5 - x)$

i $-5(x + 1)$

j $-4(3 + x)$

k $-(3b - 2)$

l $-2(5 - c)$

Example 33Expand and simplify: **a** $3(x + 2) - 5(3 - x)$ **b** $x(3x - 4) - 2x(x + 1)$

$$\begin{aligned}
 \mathbf{a} \quad & 3(x + 2) - 5(3 - x) \\
 & = 3 \times x + 3 \times 2 + (-5) \times 3 - (-5) \times x \\
 & = 3x + 6 - 15 - (-5x) \\
 & = 3x + 6 - 15 + 5x \\
 & = 8x - 9
 \end{aligned}$$

In practice you may not include all of these steps.



$$\begin{aligned}
 \mathbf{b} \quad & x(3x - 4) - 2x(x + 1) \\
 & = x \times 3x - x \times 4 + (-2x) \times x + (-2x) \times 1 \\
 & = 3x^2 - 4x - 2x^2 - 2x \\
 & = x^2 - 6x
 \end{aligned}$$

10 Expand and simplify:

a $3(x + 2) - 2(x + 1)$

c $3(x - 2) - 2(x + 2)$

e $5(y + 2) - 2(y - 3)$

b $4(x - 7) - 2(3 - x)$

d $3(y - 4) - 2(y + 3)$

f $6(b - 3) - 3(b - 1)$

11 Expand and simplify:

a $x(x + 4) - x(x + 2)$

c $-(x + 6) - 2(x + 1)$

e $-a(a + 2) - 2a(1 - a)$

b $x(2x - 1) - x(7 - x)$

d $-2(x - 1) - 3(5 - x)$

f $-(11 - a) - 2(a + 6)$

Answers

1. v $24v + 32$	2. v $39w + 32$	3. v $24y + 32$	4. v $19q + 19$
5. v $4t - 8$	6. v $10m + 22n$	7. v $9e + 27f$	8. v $7y - 5$
9. v $11x - 63$	10. v $11x^2 - 33y$	11. v $40x + 4$	12. v $2j^2 - 38$
13. v $10g^2 - 32h^2$	14. v $1p - 8q$	15. v $30f + 30$	16. v $25v + 83w^2$

- 1 a 10 b $5y$ c 18 d $7b$ e 12 f $8a$
- 2 a $3a+6$ b $2x+10$ c $5a-20$ d $14x-21$
 e $6y+3$ f $16c-28$ g $30-3y$ h $10-5x$
 i $4+2b$ j $4m+4n$ k $8a-4b$ l $6x+9y$
- 3 a a^2+4a b $2a^2+6a$ c a^2+6a
 d $4y^2+10y$ e $6p^2+18p$ f r^2+2r
 g $5z+z^2$ h k^2+k i $y+y^2$ j $15x^2-10x$
 k $14p^2-28p$ l q^2-q
- 4 a $kl+3k$ b $kl-k$ c $kl+5k$ d $xy+2x$
 e $ab+2b$ f $xy+6y$ g $kl+7l$ h $pz-p$
 i $10xy+15x$ j $2a^2+2ac$ k $4k^2-8kl$
 l $6x^2-8xy$
- 5 a $3z+6$ b $9z-6$ c $20z-30y$
 d $7x+21z+7$ e $12-18a-30b$
 f $20z-8x+12y$ g $6ax-8ay+14a$
 h $5x-2x^2+3xy$ i $6p+2px-4pq$
- 6 a $3x+8$ b $5a+37$ c $5n+9$ d $5n+6$
 e $7x-17$ f $11y+2$
- 7 a $3m^2+3m$ b $2x$ c a^2+6a
 d $5x^2+10x-2$ e $8a^2+11a$ f $6p+16q$
 g $3x^2+5xy$ h $4x^2+12x+12$
- 8 a 10 b 10 c 6 d 6 e 3 f 3 g $-8m$
 h $-8m$
- 9 a $-2x-10$ b $-6x-3$ c $-12+3x$
 d $-6a-6b$ e $-x-6$ f $-x+3$
 g $-5-x$ h $-5+x$ i $-5x-5$
 j $-12-4x$ k $-3b+2$ l $-10+2c$
- 10 a $x+4$ b $6x-34$ c $x-10$ d $y-18$
 e $3y+16$ f $3b-15$
- 11 a $2x$ b $3x^2-8x$ c $-3x-8$ d $x-13$
 e a^2-4a f $-a-23$