Do now on expanding single brackets

1.ʊ Expand and simplify: 3(3v + 4) + 5(3v + 4)	**2.ʊ** Expand and simplify: 5(3w + 4) + 6(4w + 2)	**3.ʊ** Expand and simplify: 2(4y + 4) + 4(4y + 6)	**4.ʊ** Expand and simplify: 3(3q + 3) + 5(2q + 2)
5.ʊ Expand and simplify: 2(t + 2) + 2(t - 6)	**6.ʊ** Expand and simplify: 7(m + 4n) + 3(m - 2n)	**7.ʊ** Expand and simplify: 6(e + 6f) + 3(e - 3f)	**8.ʊ** Expand and simplify: 2(y + 5) + 5(y - 3)
9.ʊ Expand and simplify: 7(x - 5) + 4(x - 7)	**10.ʊ** Expand and simplify: 6(x² - 3y) + 5(x² - 3y)	**11.ʊ** Expand and simplify: 7(7x + 4) - 3(3x + 8)	**12.ʊ** Expand and simplify: 2(16j² + 5) - 6(5j² + 8)
13.ʊ Expand and simplify: 8(5g² + 2h²) - 6(5g² + 8h²)	**14.ʊ** Expand and simplify: 2(11p + 5q) - 3(7p + 6q)	**15.ʊ** Expand and simplify: 6(9f + 4) - 3(8f - 2)	**16.ʊ** Expand and simplify: 8(5v + 6w²) - 5(3v - 7w²)

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** $2(3y + 4z)$

a $4(3x + 1)$
  $= 4 \times 3x + 4 \times 1$
  $= 12x + 4$

b $5(7 - 2x)$
  $= 5 \times 7 - 5 \times 2x$
  $= 35 - 10x$

c $2(3y + 4z)$
  $= 2 \times 3y + 2 \times 4z$
  $= 6y + 8z$

Note that each term inside the bracket is multiplied by the term outside the bracket.

EXERCISE 4J

1 Complete the following expansions:

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

2 Expand the following expressions:

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

Extension:

Example 29

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

a　$2x(3x-2)$
$= 2x \times 3x - 2x \times 2$
$= 6x^2 - 4x$

b　$3x(2y+4)$
$= 3x \times 2y + 3x \times 4$
$= 6xy + 12x$

c　$(2a-1)b$
$= b(2a-1)$
$= b \times 2a - b \times 1$
$= 2ab - b$

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

  a $6y + 2(y - 4)$
      $= 6y + 2y - 8$
      $= 8y - 8$

  b $2(2x + 1) + 3(x - 2)$
      $= 4x + 2 + 3x - 6$
      $= 7x - 4$

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

  $2a(a + 5) + 3(a + 4)$
  $= 2a \times a + 2a \times 5 + 3 \times a + 3 \times 4$
  $= 2a^2 + 10a + 3a + 12$ {$10a$ and $3a$ are like terms}
  $= 2a^2 + 13a + 12$

> 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** $^-(5-x)$

a $^-3(x+4)$
$= (^-3) \times x + (^-3) \times 4$
$= {}^-3x + (^-12)$
$= {}^-3x - 12$

b $^-(5-x)$
$= {}^-1(5-x)$
$= (^-1) \times 5 - (^-1) \times x$
$= {}^-5 - (^-x)$
$= {}^-5 + x$
$= x - 5$

8 Complete the following expansions:

a $^-2(x+5) = {}^-2x - ....$

b $^-2(x-5) = {}^-2x + ...$

c $^-3(y+2) = {}^-3y - ....$

d $^-3(y-2) = -3y + ...$

e $^-(b+3) = {}^-b - ....$

f $^-(b-3) = {}^-b + ...$

g $^-4(2m+3) = ... - 12$

h $^-4(2m-3) = ... + 12$

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 $^-2(5-c)$

10 Expand and simplify:

a $3(x + 2) - 2(x + 1)$ b $4(x - 7) - 2(3 - x)$
c $3(x - 2) - 2(x + 2)$ d $3(y - 4) - 2(y + 3)$
e $5(y + 2) - 2(y - 3)$ f $6(b - 3) - 3(b - 1)$

11 Expand and simplify:

a $x(x + 4) - x(x + 2)$ b $x(2x - 1) - x(7 - x)$
c $^-(x + 6) - 2(x + 1)$ d $^-2(x - 1) - 3(5 - x)$
e $^-a(a + 2) - 2a(1 - a)$ f $^-(11 - a) - 2(a + 6)$

Answers

1.ʊ	2.ʊ	3.ʊ	4.ʊ
24v + 32	39w + 32	24y + 32	19q + 19

5.ʊ	6.ʊ	7.ʊ	8.ʊ
4t - 8	10m + 22n	9e + 27f	7y - 5

9.ʊ	10.ʊ	11.ʊ	12.ʊ
11x - 63	11x² - 33y	40x + 4	2j² - 38

13.ʊ	14.ʊ	15.ʊ	16.ʊ
10g² - 32h²	1p - 8q	30f + 30	25v + 83w²

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** $^-a-23$