

# 18. [Expansion]

## Skill 18.1 Expanding brackets in expressions like $2(a + 1)$

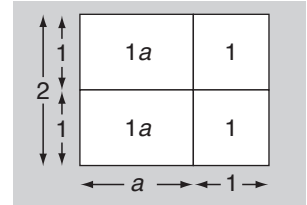
MM5.2 11 22 33 44  
MM10 1 22 33 44

- Multiply the number outside the brackets by every term inside the brackets.
- Keep the sign from inside the brackets.

*Hint: Once you multiply across the brackets the multiplication sign can be left out.*

$$2(a) = 2 \times a = 2a$$

$$2(a + 1) = 2 \times a + 2 \times 1 = 2a + 2$$



**Q.** Expand  $5(2 - b)$

**A.**  $5(2 - b)$   
 $= 5 \times 2 - 5 \times b$   
 $= 10 - 5b$

**a)** Expand  $3(4b - 5)$

$$= 3 \times 4b - 3 \times 5 = 12b - 15$$

**b)** Expand  $2(z + 4)$

$$= 2 \times z + 2 \times 4 = \boxed{\phantom{000}}$$

**c)** Expand  $3(5 + w)$

$$= \dots = \boxed{\phantom{000}}$$

**d)** Expand  $7(n - 2)$

$$= \dots = \boxed{\phantom{000}}$$

**e)** Expand  $9(4 - u)$

$$= \dots = \boxed{\phantom{000}}$$

**f)** Expand  $5(e - 8)$

$$= \dots = \boxed{\phantom{000}}$$

**g)** Expand  $8(1 + 2a)$

$$= \dots = \boxed{\phantom{000}}$$

**h)** Expand  $4(2g - 6)$

$$= \dots = \boxed{\phantom{000}}$$

**i)** Expand  $2(2k - 3)$

$$= \dots = \boxed{\phantom{000}}$$

**j)** Expand  $9(2h + 3)$

$$= \dots = \boxed{\phantom{000}}$$

**k)** Expand  $6(7 - 2c)$

$$= \dots = \boxed{\phantom{000}}$$

**l)** Expand  $8(4x - 5y + 3)$

$$= \dots = \boxed{\phantom{000}}$$

**m)** Expand  $3(4 - 6w + 4x)$

$$= \dots = \boxed{\phantom{000}}$$

**n)** Expand  $2(5 - 7d + 4e)$

$$= \dots = \boxed{\phantom{000}}$$

## Skill 18.2 Expanding brackets in expressions like $a(a + 1)$

MM5.2 11 2 2 3 3 4 4  
MM10 1 1 2 2 3 3 4 4

- Multiply the pronumeral outside the brackets by every term inside the brackets.
  - Keep the sign from inside the brackets.
- Hint: Once you multiply across the brackets the multiplication sign can be left out.*  
 $a(a) = a \times a = a^2$

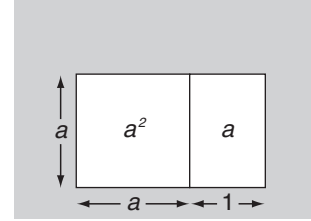
Expand the brackets

Keep the sign

$$a(a + 1) = a \times a + a \times 1$$

$$= a^2 + a$$

The  $\times$  sign can be left out



**Q.** Expand  $k(k - 6)$

**A.**  $k(k - 6)$   
 $= k \times k - k \times 6$   
 $= k^2 - 6k$

**a)** Expand  $a(2 - 2a)$

Expand the brackets

$$= a \times 2 - a \times 2a$$

Keep the sign

$$= 2a - 2a^2$$

**b)** Expand  $e(e + 4)$

$$= e \times e + e \times 4$$

$$= \boxed{\phantom{000}}$$

**c)** Expand  $r(9 + r)$

$$= \dots = \boxed{\phantom{000}}$$

**d)** Expand  $s(5 - s)$

$$= \dots = \boxed{\phantom{000}}$$

**e)** Expand  $d(d + 3)$

$$= \dots = \boxed{\phantom{000}}$$

**f)** Expand  $e(e - 7)$

$$= \dots = \boxed{\phantom{000}}$$

**g)** Expand  $a(1 + 2a)$

$$= \dots = \boxed{\phantom{000}}$$

**h)** Expand  $d(5d + 6)$

$$= \dots = \boxed{\phantom{000}}$$

**i)** Expand  $p(4 + 2p)$

$$= \dots = \boxed{\phantom{000}}$$

**j)** Expand  $z(6 - 6z)$

$$= \dots = \boxed{\phantom{000}}$$

**k)** Expand  $c(2c - 3)$

$$= \dots = \boxed{\phantom{000}}$$

**l)** Expand  $w(4 - 5w)$

$$= \dots = \boxed{\phantom{000}}$$

**m)** Expand  $x(3x - 2y + 7)$

$$= \dots = \boxed{\phantom{000}}$$

**n)** Expand  $t(u - 5 + 9t)$

$$= \dots = \boxed{\phantom{000}}$$

**o)** Expand  $s(7t - 4s - 8)$

$$= \dots = \boxed{\phantom{000}}$$

**p)** Expand  $e(f + 4 - 9e)$

$$= \dots = \boxed{\phantom{000}}$$

### Skill 18.3 Expanding brackets in expressions like $2a(b + 1)$

MM5.2 1 1 2 2 3 3 4 4  
MM10 1 1 2 2 3 3 4 4

- Multiply the term outside the brackets by every term inside the brackets.
- Keep the sign from inside the brackets.

Hint: Once you multiply across the brackets the multiplication sign can be left out.

$$2a(b) = 2 \times a \times b = 2ab$$

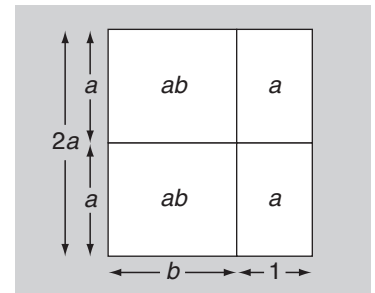
Expand the brackets

$$2a(b + 1) = 2a \times b + 2a \times 1$$

Keep the sign

$$= 2ab + 2a$$

The  $\times$  sign can be left out



**Q.** Expand  $2x(x - 7)$

**A.**  $2x(x - 7)$   
 $= 2x \times x - 2x \times 7$   
 $= 2x^2 - 14x$

**a)** Expand  $2d(3d + 6)$

Expand the brackets

$$= 2d \times 3d + 2d \times 6 = 6d^2 + 12d$$

Keep the sign

**b)** Expand  $3a(a - 5)$

$$= 3a \times a - 3a \times 5 = \boxed{\phantom{000}}$$

**c)** Expand  $5s(2 - 4s)$

$$= \dots = \boxed{\phantom{000}}$$

**d)** Expand  $3y(4y - 3)$

$$= \dots = \boxed{\phantom{000}}$$

**e)** Expand  $3k(5 + 2k)$

$$= \dots = \boxed{\phantom{000}}$$

**f)** Expand  $5g(2g - 4)$

$$= \dots = \boxed{\phantom{000}}$$

**g)** Expand  $4d(2d + 3)$

$$= \dots = \boxed{\phantom{000}}$$

**h)** Expand  $3a(7 + 2a)$

$$= \dots = \boxed{\phantom{000}}$$

**i)** Expand  $9c(4 + 2c)$

$$= \dots = \boxed{\phantom{000}}$$

**j)** Expand  $6h(5h - 2)$

$$= \dots = \boxed{\phantom{000}}$$

**k)** Expand  $3e(7e + 8)$

$$= \dots = \boxed{\phantom{000}}$$

**l)** Expand  $4z(8 - 2z)$

$$= \dots = \boxed{\phantom{000}}$$

**m)** Expand  $2q(6 - 2r)$

$$= \dots = \boxed{\phantom{000}}$$

**n)** Expand  $4i(6j + 4)$

$$= \dots = \boxed{\phantom{000}}$$

**o)** Expand  $7p(4p + q)$

$$= \dots = \boxed{\phantom{000}}$$

**p)** Expand  $5n(m - 5n)$

$$= \dots = \boxed{\phantom{000}}$$

## Skill 18.4 Expanding brackets in expressions like $-2a(b + 1)$

MM5.2 11 27 3 3 44  
MM10 11 2 2 3 3 44

- Multiply the negative term outside the brackets by every term inside the brackets.
  - Use the sign rules:  $++=+$   $--=+$   $+-=-$   $-+=-$  (see skill 9.1, page 91)
- Hint: Once you multiply across the brackets the multiplication sign can be left out.*  
 $-a(b) = -a \times b = -ab$

Expand the brackets

$$\begin{aligned}
 -2a(b + 1) &= -2a \times b + -2a \times 1 \\
 &= -2ab - 2a
 \end{aligned}$$

The  $\times$  sign can be left out

Use the sign rules

**Q.** Expand  $-2(x - 4)$

**A.**  $-2(x - 4)$   
 $= -2 \times x - -2 \times 4$   
 $= -2x + 8$

**a)** Expand  $-5m(m + 4)$

Expand the brackets

$$\begin{aligned}
 &= -5m \times m + -5m \times 4 = -5m^2 - 20m
 \end{aligned}$$

$+-=+$

**b)** Expand  $-4(f + 3)$

$$\begin{aligned}
 &= -4 \times f + -4 \times 3 = \boxed{\phantom{000}}
 \end{aligned}$$

**c)** Expand  $-(b + 9)$

$$\begin{aligned}
 &= \dots\dots\dots = \boxed{\phantom{000}}
 \end{aligned}$$

**d)** Expand  $-3(r + 6)$

$$\begin{aligned}
 &= \dots\dots\dots = \boxed{\phantom{000}}
 \end{aligned}$$

**e)** Expand  $-8a(a - 2)$

$$\begin{aligned}
 &= \dots\dots\dots = \boxed{\phantom{000}}
 \end{aligned}$$

**f)** Expand  $-2w(3 + 4w)$

$$\begin{aligned}
 &= \dots\dots\dots = \boxed{\phantom{000}}
 \end{aligned}$$

**g)** Expand  $-7q(q + 3)$

$$\begin{aligned}
 &= \dots\dots\dots = \boxed{\phantom{000}}
 \end{aligned}$$

**h)** Expand  $-6b(4 - 5b)$

$$\begin{aligned}
 &= \dots\dots\dots = \boxed{\phantom{000}}
 \end{aligned}$$

**i)** Expand  $-2cd(2 - 3d)$

$$\begin{aligned}
 &= \dots\dots\dots = \boxed{\phantom{000}}
 \end{aligned}$$

**j)** Expand  $-tu(5t + 2u)$

$$\begin{aligned}
 &= \dots\dots\dots = \boxed{\phantom{000}}
 \end{aligned}$$

**k)** Expand  $-5jk(8 - 4j)$

$$\begin{aligned}
 &= \dots\dots\dots = \boxed{\phantom{000}}
 \end{aligned}$$

**l)** Expand  $-gh(7g - 3h)$

$$\begin{aligned}
 &= \dots\dots\dots = \boxed{\phantom{000}}
 \end{aligned}$$

**m)** Expand  $-4i(6hi + 2h)$

$$\begin{aligned}
 &= \dots\dots\dots = \boxed{\phantom{000}}
 \end{aligned}$$

**n)** Expand  $-9y(yz + 2z)$

$$\begin{aligned}
 &= \dots\dots\dots = \boxed{\phantom{000}}
 \end{aligned}$$

**o)** Expand  $-2s(8st + 3t)$

$$\begin{aligned}
 &= \dots\dots\dots = \boxed{\phantom{000}}
 \end{aligned}$$

**p)** Expand  $-3m(6mn - 4n)$

$$\begin{aligned}
 &= \dots\dots\dots = \boxed{\phantom{000}}
 \end{aligned}$$

## Skill 18.5 Expanding and evaluating expressions.

MM5.2 11 22 33 44  
MM10 11 22 33 44

- Multiply the term outside the brackets by every term inside the brackets.
- Group like terms. (see skill 16.3, page 165 and skill 16.4, page 166)
- Use the sign rules:  $++=+$   $--=+$   $+-=-$   $-+=-$  (see skill 9.1, page 91)

**Q.** Expand and evaluate  
 $2(ef - 5) + 4(ef + 3)$

**A.**  $2(ef - 5) + 4(ef + 3)$  Expand the brackets  
 $= 2ef - 10 + 4ef + 12$  Group like terms  
 $= 2ef + 4ef - 10 + 12$   
 $= 6ef + 2$

**a)** Expand and evaluate  
 $2(8c + 4) - 7c$  Expand the brackets  
 $= 16c + 8 - 7c$  Group like terms  
 $= 16c - 7c + 8 = \boxed{9c + 8}$

**b)** Expand and evaluate  
 $3(2x + 1) + 4x$   
 $= 6x + 3 + 4x$   
 $= \dots = \boxed{\dots}$

**c)** Expand and evaluate  
 $2(x + 1) - 4x$   
 $= \dots$   
 $= \dots = \boxed{\dots}$

**d)** Expand and evaluate  
 $4s + s(2s - 5)$   
 $= \dots$   
 $= \dots = \boxed{\dots}$

**e)** Expand and evaluate  
 $3p(q - 6) + 4p$   
 $= \dots$   
 $= \dots = \boxed{\dots}$

**f)** Expand and evaluate  
 $5z(y + 3) - 8z$   
 $= \dots$   
 $= \dots = \boxed{\dots}$

**g)** Expand and evaluate  
 $5(hi - 3) - 8(hi + 3)$   
 $= \dots$   
 $= \dots = \boxed{\dots}$

**h)** Expand and evaluate  
 $n(n - 5) + 3(2n + 7)$   
 $= \dots$   
 $= \dots = \boxed{\dots}$

**i)** Expand and evaluate  
 $6(de + 5) - 3(de - 2)$   
 $= \dots$   
 $= \dots = \boxed{\dots}$

**j)** Expand and evaluate  
 $w(w + 4) - 2(4w - 7)$   
 $= \dots$   
 $= \dots = \boxed{\dots}$

**k)** Expand and evaluate  
 $2b(b - 5) - 8(b - 5)$   
 $= \dots$   
 $= \dots = \boxed{\dots}$

**l)** Expand and evaluate  
 $a(bc + 4) - 3(2a + 5)$   
 $= \dots$   
 $= \dots = \boxed{\dots}$

## Skill 18.6 Expanding and evaluating more complex expressions.

MM5.2 11 22 33 44  
MM10 11 22 33 44

- Multiply the term outside the brackets by every term inside the brackets.
- Group like terms. (see skill 16.3, page 165 and skill 16.4, page 166)
- Use the sign rules:  $++=+$   $--=+$   $+-=-$   $-+=-$  (see skill 9.1, page 91)

**Q.** Expand and evaluate  
 $-2(t^2 - u) + 5t(t - 3)$

**A.**  $-2(t^2 - u) + 5t(t - 3)$  Expand the brackets  
 $= -2t^2 + 2u + 5t^2 - 15t$   
 $= -2t^2 + 5t^2 + 2u - 15t$  Group like terms  
 $= 3t^2 + 2u - 15t$

**a)** Expand and evaluate  
 $-4a(a - 2) + 7(a^2 - b)$  Expand the brackets  
 $= -4a^2 + 8a + 7a^2 - 7b$   
 $= -4a^2 + 7a^2 + 8a - 7b = 3a^2 + 8a - 7b$   
Group like terms

**b)** Expand and evaluate  
 $x(2x + 3) - 3(x + 7)$   
 $= 2x^2 + 3x - 3x - 21$   
 $=$    $=$

**c)** Expand and evaluate  
 $3(2t - 4) + t(t - 2)$   
 $=$  .....  
 $=$

**d)** Expand and evaluate  
 $-2s(5s^2 + 3s) + (s - s^2)$   
 $=$  .....  
 $=$

**e)** Expand and evaluate  
 $tu(t - 1) + 8u(t^2 - t)$   
 $=$  .....  
 $=$

**f)** Expand and evaluate  
 $3e(f - e) + 8e(f^2 - e)$   
 $=$  .....  
 $=$

**g)** Expand and evaluate  
 $-6kl(k - 2) - 2l(2k^2 - 2k)$   
 $=$  .....  
 $=$

**h)** Expand and evaluate  
 $-5m(m - 1) + 6(m^2 - 1)$   
 $=$  .....  
 $=$

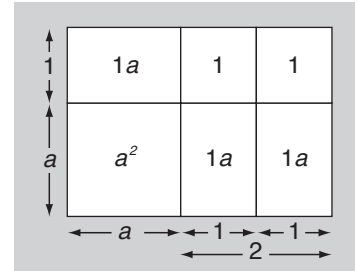
**i)** Expand and evaluate  
 $2pq(p - 6) - 3q(p^2 - 3p)$   
 $=$  .....  
 $=$

**j)** Expand and evaluate  
 $3(r^2 - 4) - 2r(r - 5)$   
 $=$  .....  
 $=$

**k)** Expand and evaluate  
 $-8y(xy - 1) + 4xy(x + 2y)$   
 $=$  .....  
 $=$

**l)** Expand and evaluate  
 $-3(q^2 + q) + 4q(q + 1)$   
 $=$  .....  
 $=$

- Multiply each term inside the first set of brackets by each term inside the second set of brackets.
- Simplify the products.
- Group like terms. (see skill 16.3, page 165 and skill 16.4, page 166)
- Use the sign rules:  $+++ = +$   $--- = +$   $+- = -$   $-+ = -$   
(see skill 9.1, page 91)



Expand the brackets  $(a + 1)(a + 2) = a \times a + a \times 2 + 1 \times a + 1 \times 2$   
 $= a^2 + 2a + a + 2$  (Simplify the products)  
 $= a^2 + 3a + 2$  (Group like terms)

**Q.** Expand and evaluate  $(w - 3)(w - 2)$

Simplify the products

**A.**  $(w - 3)(w - 2)$  (Expand the brackets)  
 $= w \times w + w \times -2 + -3 \times w + -3 \times -2$   
 $= w^2 - 2w - 3w + 6$  (Simplify the products)  
 $= w^2 - 5w + 6$  (Group like terms)

**a)** Expand and evaluate  $(h - 5)(h + 2)$

$= h \times h + h \times 2 + -5 \times h + -5 \times 2$  (Simplify the products)  
 $= h^2 + 2h - 5h - 10 = h^2 - 3h - 10$

**b)** Expand and evaluate  $(x + 3)(x + 1)$

$= x \times x + x \times 1 + 3 \times x + 3 \times 1$   
 $=$    $=$

**c)** Expand and evaluate  $(w + 4)(w - 3)$

$=$    
 $=$

**d)** Expand and evaluate  $(u + 4)(5 - u)$

$=$    
 $=$

**e)** Expand  $(f - 2)(g + 8)$

$=$    
 $=$

**f)** Expand  $(j - 5)(k - 3)$

$=$    
 $=$

**g)** Expand and evaluate  $(2h - 4)(h + 5)$

$=$    
 $=$

**h)** Expand and evaluate  $(r + 6)(3r - 7)$

$=$    
 $=$

**i)** Expand and evaluate  $(3v + 4)(v - 9)$

$=$    
 $=$

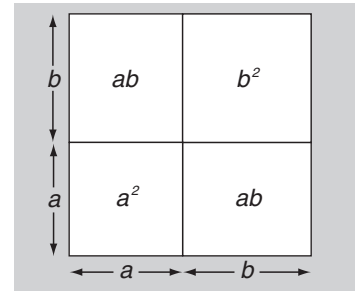
**j)** Expand and evaluate  $(y - 2)(5y - 6)$

$=$    
 $=$

## Skill 18.8 Expanding brackets in binomial squares like $(a + b)^2$

MM5.2 11 22 33 44  
MM10 11 22 33 44

- Multiply each term inside the first set of brackets by each term inside the second set of brackets.
- Simplify the products.
- Group like terms. (see skill 16.3, page 165 and skill 16.4, page 166)



OR

- Substitute values into the binomial square formula  
 $(a + b)^2 = a^2 + 2ab + b^2$  (see skill 17.9, page 177)

Expand the brackets

$$\begin{aligned}
 (a + b)^2 &= (a + b)(a + b) = \overset{\textcircled{1}}{a \times a} + \overset{\textcircled{2}}{a \times b} + \overset{\textcircled{3}}{b \times a} + \overset{\textcircled{4}}{b \times b} \\
 &= \overset{\textcircled{1}}{a^2} + \overset{\textcircled{2}}{ab} + \overset{\textcircled{3}}{ba} + \overset{\textcircled{4}}{b^2} \quad \text{Simplify the products} \\
 &= a^2 + 2ab + b^2 \quad \text{Group like terms}
 \end{aligned}$$

**Q.** Expand and evaluate  
 $(n + 9)^2$

**A.**

$$\begin{aligned}
 (n + 9)^2 &= (n + 9)(n + 9) \\
 &= \overset{\textcircled{1}}{n \times n} + \overset{\textcircled{2}}{n \times 9} + \overset{\textcircled{3}}{9 \times n} + \overset{\textcircled{4}}{9 \times 9} \\
 &= n^2 + 9n + 9n + 81 \\
 &= n^2 + 18n + 81
 \end{aligned}$$

OR

$$\begin{aligned}
 (n + 9)^2 & \text{ Using } a^2 + 2ab + b^2 \\
 & \text{ where } a = n \text{ and } b = 9 \\
 &= n^2 + 2 \times n \times 9 + 9^2 \\
 &= n^2 + 18n + 81
 \end{aligned}$$

**a)** Expand and evaluate  
 $(s + 4)^2$

$a^2 + 2ab + b^2$  where  $a = s$  and  $b = 4$

$$= s^2 + 2 \times s \times 4 + 4^2 = s^2 + 8s + 16$$

**b)** Expand and evaluate  
 $(y + 1)^2$

$$= \dots = \boxed{\phantom{000}}$$

**c)** Expand and evaluate  
 $(h + 2)^2$

$$= \dots = \boxed{\phantom{000}}$$

**d)** Expand and evaluate  
 $(t + 6)^2$

$$= \dots = \boxed{\phantom{000}}$$

**e)** Expand and evaluate  
 $(p + 7)^2$

$$= \dots = \boxed{\phantom{000}}$$

**f)** Expand and evaluate  
 $(m + 5)^2$

$$= \dots = \boxed{\phantom{000}}$$

**g)** Expand and evaluate  
 $(a + 3)^2$

$$= \dots = \boxed{\phantom{000}}$$

**h)** Expand and evaluate  
 $(c + 10)^2 - 75$

$$= \dots = \boxed{\phantom{000}}$$

**i)** Expand and evaluate  
 $(r + 8)^2 + 4$

$$= \dots = \boxed{\phantom{000}}$$

**j)** Expand and evaluate  
 $(g + 3)^2 - 3g$

$$= \dots = \boxed{\phantom{000}}$$

- Multiply each term inside the first set of brackets by each term inside the second set of brackets.
- Simplify the products.
- Group like terms. (see skill 16.3, page 165 and skill 16.4, page 166)

OR

- Substitute values into the perfect square formula  $(a - b)^2 = a^2 - 2ab + b^2$  (see skill 17.9, page 177)

Expand the brackets

$$(a - b)^2 = (a - b)(a - b) = a \times a + a \times -b + -b \times a + -b \times -b$$

$$= a^2 - ab - ba + b^2$$

Simplify the products

$$= a^2 - 2ab + b^2$$

Group like terms

**Q.** Expand and evaluate  $(n - 3)^2$

**A.**  $(n - 3)^2$   
 $= (n - 3)(n - 3)$   
 $= n \times n + n \times -3 + -3 \times n + -3 \times -3$   
 $= n^2 - 3n - 3n + 9$   
 $= n^2 - 6n + 9$

OR  $(n - 3)^2$   
 Using  $a^2 - 2ab + b^2$   
 where  $a = n$  and  $b = 3$   
 $= n^2 - 2 \times n \times 3 + 3^2$   
 $= n^2 - 6n + 9$

**a)** Expand and evaluate  $(s - 4)^2$

$a^2 - 2ab + b^2$  where  $a = s$  and  $b = 4$

$= s^2 - 2 \times s \times 4 + 4^2 = s^2 - 8s + 16$

**b)** Expand and evaluate  $(k - 1)^2$

$=$   
 $=$

**c)** Expand and evaluate  $(m - 2)^2$

$=$   
 $=$

**d)** Expand and evaluate  $(q - 5)^2$

$=$   
 $=$

**e)** Expand and evaluate  $(j - 7)^2$

$=$   
 $=$

**f)** Expand and evaluate  $(e - 9)^2$

$=$   
 $=$

**g)** Expand and evaluate  $(x - 8)^2$

$=$   
 $=$

**h)** Expand and evaluate  $(x - 10)^2 + 15x$

$=$   
 $=$

**i)** Expand and evaluate  $(z - 6)^2 + 8$

$=$   
 $=$

**j)** Expand and evaluate  $(b - 4)^2 - 3b$

$=$   
 $=$