Objective : Multiplying algebraic expressions

ضرب المقادير الجبرية

Multiplying Algebraic Expressions

Distributive Law

قانون التوزيع

The **distributive law** for real numbers states that

$$a(b \pm c) = ab \pm ac$$

$$(a \pm b)c = ac \pm bc$$

for any real numbers a, b, and c.

$2(x-3) = 2x-6$

Quick Example

$2(x - 3)$ is *not* equal to $2x - 3$ but is equal to $2x - 2(3) = 2x - 6$.

Example:

Expand the following:

1. $a(3+t) = 3a + at$
2. $2(4t - 3k) = 8t - 6k$
3. $5(n + 3p) = 5n + 15p$
4. $2(4x + 5) = 8x + 10$
5. $2(3x - 4) = 6x - 8$
6. $6(2k + 3) = 12k + 18$

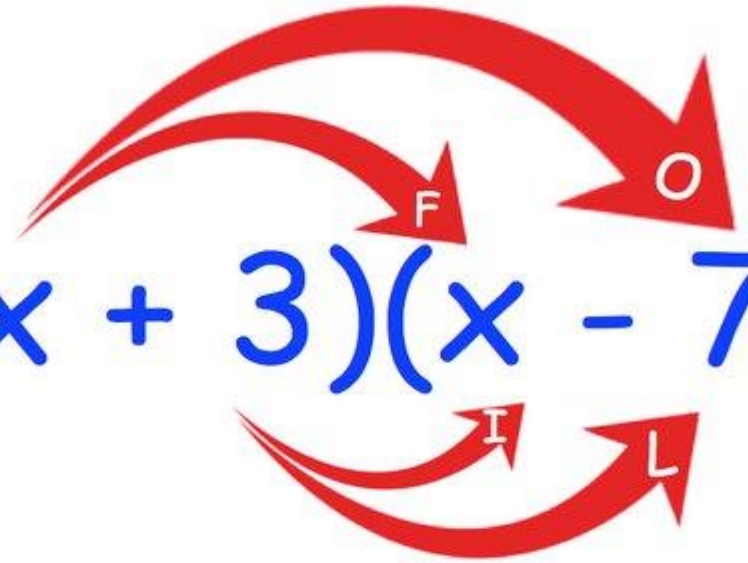
Corbett maths

Expanding Two Brackets

To expand two brackets... use FOIL

First
Outer
Inner
Last

Expand: $(x + 3)(x - 7)$



$= x^2 - 7x + 3x - 21$

$= x^2 - 4x - 21$

x times x = x^2
x times -7 = -7x
3 times x = 3x
3 times -7 = -21

Expand and Simplify:

$$(a + 4)(a + 2)$$

$$= a^2 + 2a + 4a + 8$$

Like Terms

$$= \boxed{a^2 + 6a + 8}$$

Expanding Brackets - Example

Expand the Binomial: **(m + 4) (m + 1)**

$(m + 4)(m + 1) =$ 

$m \times m + m \times 1 + 4 \times m + 4 \times 1$

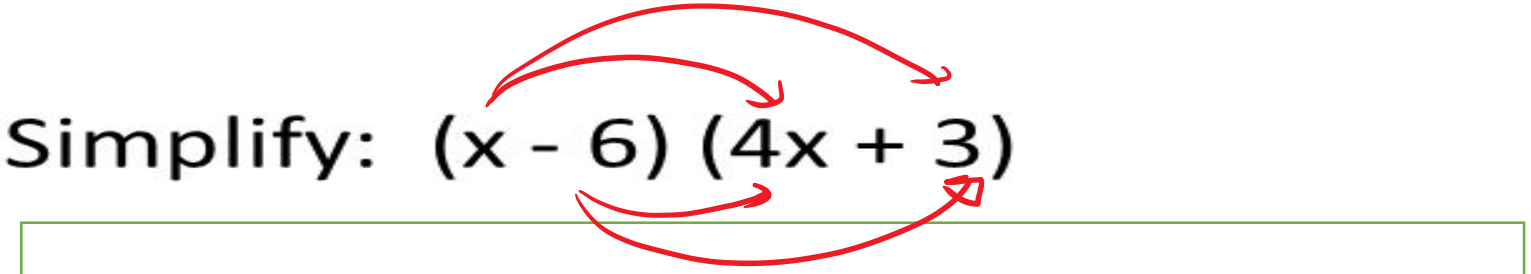
$= m^2 + m + 4m + 4$

$= \mathbf{m^2 + 5m + 4}$ ✓

Simplify by Combining the Like Term items.

Using the distributive property to find the product of two binomials.

Simplify: $(x - 6)(4x + 3)$



Like Terms

$4x^2 + 3x - 24x - 18$

$4x^2 - 21x - 18$

Example: Expand and Simplify:

Linking Method - FOIL

FOIL stands for:

F - First
O - Outside
I - Inside
L - Last

$(x+2)(x-10)$

$x^2 - 10x + 2x - 20$

$x^2 - 8x - 20$

Expanding Brackets

Video Tut: 'Expanding Double Brackets (Advanced)'

Expand and simplify...

$$(5x+2)^2$$

$$(5x+2)(5x+2)$$

$$25x^2 + 10x + 10x + 4$$

$$25x^2 + 20x + 4$$

Expand and Simplify:

① $(x-1)(3x+4) =$

② $(7m+5)(3+m) =$

③ $(b-8)^2 =$

④ $(n+10)^2 =$

answer

Expand and Simplify: answer

① $(x-1)(3x+4) = 3x^2+4x-3x-4$

$= \boxed{3x^2+x-4}$

② $(7m+5)(3+m) = 21m+7m^2+15+5m$

$= \boxed{26m+7m^2+15}$

Expand and Simplify: answer

③ $(b-8)^2 = (b-8)(b-8)$

$= b^2 - 8b - 8b + 64$

$= b^2 - 16b + 64$

④ $(n+10)^2 = (n+10) * (n+10)$

$= n^2 + 10n + 10n + 100$

$= n^2 + 20n + 100$

Think

$$(x^2+3)(2x^3-5) =$$

$$= 2x^5 - 5x^2 + 6x^3 - 15$$

stop

Remember

$x^2 * 2*x^3$

$= 2x^5$

Think

$(7m-3)(7m+3) =$

$= 49m^2 + 21m - 21m - 9$

Like Term

$= \boxed{49m^2 - 9}$

stop

$21m - 21m$

$= 0 * m$

$= 0$

Special Cases

$$(a+b)^2 = a^2 + 2ab + b^2 \quad \ldots (1)$$

$$(a-b)^2 = a^2 - 2ab + b^2 \quad \ldots (2)$$

$$(a+b)(a-b) = a^2 - b^2 \quad \ldots (3)$$

Special Binomial Products to Memorize

- When a **binomial** is **squared**, the result **is** always a "**perfect square trinomial**"

  $(a + b)^2 = a^2 + 2ab + b^2$

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

- Both of these can be summarized as a formula:
  - **Square** the **first** term
  - **Multiply 2 times first** term **times second** term
  - **Square** the **last** term

$$(3x+2)^2 = 9x^2 + 12x + 4$$

$$(4x-5)^2 = 16x^2 - 40x + 25$$

➤ Square of a Sum

مربع المجموع

The square of (a + b) is equal to the square of the first term (a), plus twice the product of the first and second terms (a, b), plus the square of the second term (b).

1

$$(a+b)^2 = a^2 + 2ab + b^2$$

$$(a+b)(a+b)$$

$$(a)(a) + (a)(b) + (b)(a) + (b)(b)$$

$$a^2 + 2ab + b^2$$

$$(a+b)^2 = a^2 + 2ab + b^2$$

1 $(3k+5)^2$

$$(a+b)^2 = a^2 + 2ab + b^2$$ قانونُ مربعِ مجموعِ حدَّين

$$(3k+5)^2 = (3k)^2 + (2 \times 3k \times 5) + (5)^2$$ $a = 3k, b = 5$

$$= 9k^2 + 30k + 25$$ أبسطُ

2 $(y^2+3)^2$

قانونُ مربعِ مجموعِ حدَّين

$$(a+b)^2 = a^2 + 2ab + b^2$$

$a = y^2, b = 3$

$$(y^2+3)^2 = (y^2)^2 + (2 \times y^2 \times 3) + 3^2$$

أبسطُ

$$= y^4 + 6y^2 + 9$$

(2)

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

مربع لفرق

Square of a difference

$$(a-b)^2 = [a+(-b)]^2 = (a)^2 + 2(a)(-b) + (b)^2$$

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

مربعُ مجموعِ حدَّينِ

أبسطُ

1 $(2h - z)^2$

$$(a-b)^2 = a^2 - 2ab + b^2$$ قانونُ مربعِ الفرقِ بَيْنَ حدَّينِ

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

$$= 4h^2 - 4hz + z^2$$ أبسطُ

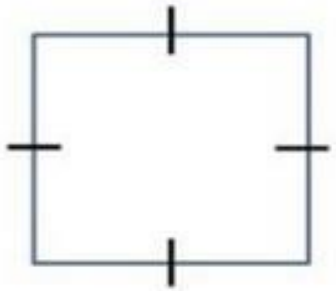
2 $(6-5y^3)^2$

$$(a-b)^2 = a^2 - 2ab + b^2$$ قانونُ مربعِ الفرقِ بَيْنَ حدَّينِ

$$(6-5y^3)^2 = (6)^2 - (2\times6\times5y^3) + (5y^3)^2$$ $a = 6, b = 5y^3$

$$= 36 - 60y^3 + 25y^6$$ أبسطُ

What is the area of the following shape?



a) $x^2 + 25$
b) $x^2 + 10x + 25$
c) $4x + 20$
d) not enough info

answer $A_{\square} = (\text{Sidelength})^2 = (x+5)^2 = x^2 + 10x + 25$ ★ b

3

مفهومٌ أساسيٌّ

ضربُ مجموعِ حدّينِ في الفرقِ بينَهُما

- **بالكلماتِ:** ناتجُ ضربِ $(a+b)(a-b)$ يساوي مربعَ a مطروحًا مِنْهُ مربعُ b.

- **بالرموزِ:** $(a+b)(a-b)=a^2-b^2$

Sum * difference

الفرق * المجموع

مثال 3 أجدُ ناتجَ كلٍّ ممّا يأتي:

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

قانونُ ضربِ مجموعِ حدَّينِ في الفرقِ بينَهُما

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

أعوضُ $a = 2c, b = 3$

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

أبسطُ

$$= 4c^2 - 9$$

2 $(4x^2 + d^5)(4x^2 - d^5)$

$$(a+b)(a-b) = a^2 - b^2$$ قانونُ مربعِ مجموعِ حدَّينِ

$$(4x^2 + d^5)(4x^2 - d^5) = (4x^2)^2 - (d^5)^2$$ $a = y^2, b = 3$

$$= 16x^4 - d^{10}$$ أبسطُ

Determine whether this statement is true or false, explain your answer

Think …

$$(3x-4)^2 = 9x^2 - 12x + 16$$

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

False,

$(3x-4)^2 = (3x)^2 - 2*3x*4 + (4)^2$

$= 9x^2 - 24x + 16$

The End