Removing brackets 2

Introduction

In this leaflet we show the correct procedure for writing expressions of the form $(a+b)(c+d)$ in an alternative form without brackets.

1. Expressions of the form $(a+b)(c+d)$

In the expression $(a+b)(c+d)$ it is intended that each term in the first bracket multiplies each term in the second.

$$(a+b)(c+d) = ac + bc + ad + bd$$

Example
Removing the brackets from $(5+a)(2+b)$ gives

$$5 \times 2 \ + \ a \times 2 \ + \ 5 \times b \ + \ a \times b$$

which simplifies to

$$10 + 2a + 5b + ab$$

.

Example
Removing the brackets from $(x+6)(x+2)$ gives

$$x \times x \ + \ 6 \times x \ + \ x \times 2 \ + \ 6 \times 2$$

which equals

$$x^2 + 6x + 2x + 12$$

which simplifies to

$$x^2 + 8x + 12$$

Example
Removing the brackets from $(x+7)(x-3)$ gives

$$x \times x \ + \ 7 \times x \ + \ x \times -3 \ + \ 7 \times -3$$

which equals

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

which simplifies to

$$x^2 + 4x - 21$$

Example
Removing the brackets from $(2x + 3)(x + 4)$ gives

$$2x \times x \ + \ 3 \times x \ + \ 2x \times 4 \ + \ 3 \times 4$$

which equals

$$2x^2 + 3x + 8x + 12$$

which simplifies to

$$2x^2 + 11x + 12$$

Occasionally you will need to square a bracketed expression. This can lead to errors. Study the following example.

Example
Remove the brackets from $(x + 1)^2$.

Solution
You need to be clear that when a quantity is squared it is multiplied by itself. So

$$(x + 1)^2 \qquad \text{means} \qquad (x + 1)(x + 1)$$

Then removing the brackets gives

$$x \times x \ + \ 1 \times x \ + \ x \times 1 \ + \ 1 \times 1$$

which equals

$$x^2 + x + x + 1$$

which simplifies to

$$x^2 + 2x + 1$$

Note that $(x + 1)^2$ is not equal to $x^2 + 1$, and more generally $(x + y)^2$ is not equal to $x^2 + y^2$.

Exercises
Remove the brackets from each of the following expressions simplifying your answers where appropriate.

1. a) $(x + 2)(x + 3)$, b) $(x - 4)(x + 1)$, c) $(x - 1)^2$, d) $(3x + 1)(2x - 4)$.
2. a) $(2x - 7)(x - 1)$, b) $(x + 5)(3x - 1)$, c) $(2x + 1)^2$, d) $(x - 3)^2$.

Answers
1. a) $x^2 + 5x + 6$, b) $x^2 - 3x - 4$, c) $x^2 - 2x + 1$, d) $6x^2 - 10x - 4$.
2. a) $2x^2 - 9x + 7$, b) $3x^2 + 14x - 5$, c) $4x^2 + 4x + 1$, d) $x^2 - 6x + 9$.