2.4


## 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.

$$
(a+b)(c+d)=a c+b c+a d+b d
$$

## 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

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

## Example

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

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

which equals

$$
x^{2}+6 x+2 x+12
$$

which simplifies to

$$
x^{2}+8 x+12
$$

## Example

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

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

which equals

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

which simplifies to

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

## Example

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

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

which equals

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

which simplifies to

$$
2 x^{2}+11 x+12
$$

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

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

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

$$
x^{2}+2 x+1
$$

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

Answers

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