## The modulus symbol

## Introduction

Inequalities often arise in connection with the modulus symbol. This leaflet describes how.

## 1. The modulus symbol

The modulus symbol is sometimes used in conjunction with inequalities. For example, $|x|<1$ means all numbers whose actual size, irrespective of sign, is less than 1 . This means any value between -1 and 1 . Thus

$$
|x|<1 \quad \text { means } \quad-1<x<1
$$

Similarly, $|y|>2$ means all numbers whose actual size, irrespective of sign, is greater than 2 . This means any value greater than 2 and any value less than -2 . Thus

$$
|y|>2 \quad \text { means } \quad y>2 \text { or } y<-2
$$

## Example

Solve the inequality $|2 x+1|<3$.

## Solution

This is equivalent to $-3<2 x+1<3$. We treat both parts of the inequality separately.
First consider

$$
-3<2 x+1
$$

Solving this yields $x>-2$.
Now consider the second part, $2 x+1<3$. Solving this yields $x<1$.
Putting both results together we see that $-2<x<1$ is the required solution.

## Exercises

In each case solve the given inequality.

1. $|3 x|<1$,
2. $|12 y+2|>5$,
3. $|1-y|<3$.

## Answers

1. $-\frac{1}{3}<x<\frac{1}{3}$,
2. $\quad y>\frac{1}{4}$ and $y<-\frac{7}{12}$,
3. $-2<y<4$.
