# Solving linear inequalities

Monday, 14 January 2019 8:35 am

By the end of the lesson I would hope that you have an understanding of the concepts below which you can apply to a number of complex questions:

- Know what an inequality is
- Know how to express an inequality on a number line
- Know how to solve inequalities

## RECAP:

In previous lessons we have looked at solving linear equations.
This has allowed us to use algebra to find the one solution to a pronumeral.
Sadly, not everything in life has one solution.
Occasionally there are times when we are looking for a range of values.
The problem where the solution would provide a range of values is called in inequality.

## What is an inequality?

You have probably met them before.
These are the main inequalities:

$>$ $<$ $\geq$ $\leq$

$6 > 4$

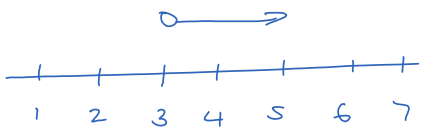
$7 > 6$ $\quad 6 \geq 6$ $\quad 7 \geq 6$

## Expressing inequalities on a number line

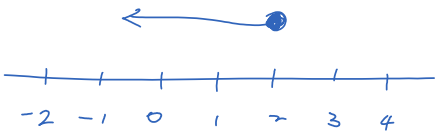
Number lines are so Year 7!
But, they are an important way for use to show inequalities.
Here are some examples ..

**Example:**
Draw a number line to show the solutions to the following inequality:
$x > 3$

$x > 3$




**Example:**
Draw a number line to show the solutions to the following inequality:
$x \leq 2$



**Example:**
Draw a number line to show the solutions to the following inequality:
$-2 \leq x < 3$

$-2 \leq x < 3$




## Solving inequalities

Solving inequalities is actually pretty easy!
We treat the inequality sign as if it's an equals sign. **BUT WE NEVER WRITE IT AS AN EQUALS SIGN!!!**
The rules of algebra apply to inequalities except for one important (and additional) rule ..

**WHEN YOU MULTIPLY OR DIVIDE BY A NEGATIVE NUMBER YOU REVERSE THE INEQUALITY SIGN**

**Example 1:**
Solve the inequality $3x + 2 < 7$

$3x + 2 < 7$
$3x < 7 - 2$
$3x < 5$
$x < \frac{5}{3}$

**Example 2:**
Solve the inequality $4 - 3x \leq 10$

$4 - 3x \leq 10$
$-3x \leq 6$
$x \geq \frac{6}{-3}$
$x \geq -2$

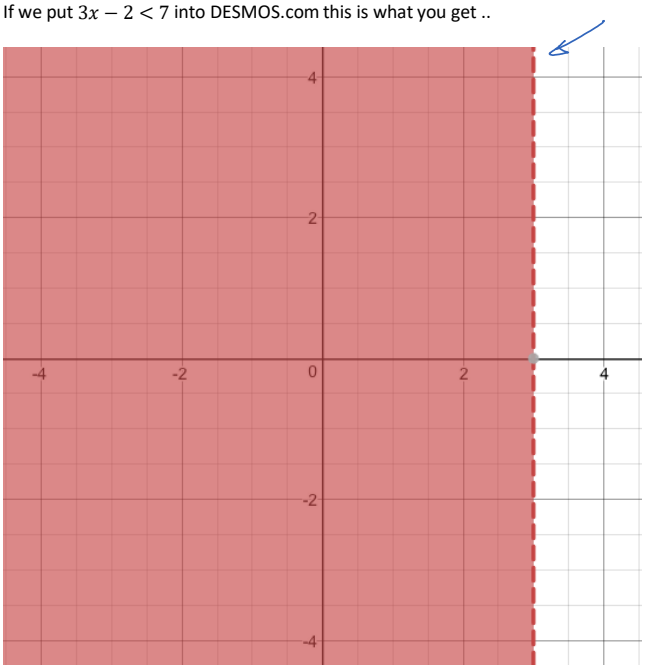
**Example 3:**
Solve the inequality $\frac{3x-1}{4} - \frac{2x+3}{2} < -2$

$\frac{(3x-1)}{4} - \frac{(2x+3)}{2} < -2$
$(3x-1) - 4(2x+3) < -8$
$2(3x-1) - 4(2x+3) < -16$
$6x - 2 - 8x - 12 < -16$
$-2x - 14 < -16$
$-2x < -2$
$x > \frac{-2}{-2}$
$x > 1$

## What do inequalities look like on a graph

All the above equations are effectively straight lines.
The fact there is an inequality now means that rather than describing all the points on a line which meet a specific condition, we are now describing what we call **regions**.

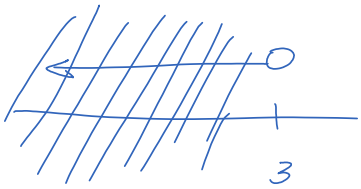
If we put $3x - 2 < 7$ into DESMOS.com this is what you get ..




$3x - 2 < 7$

$3x < 9$

$x < 3$




$x = 3$

## Using the CAS to solve an inequality

This is a CAS course after all!

Use the CAS to find the solution to $\frac{3x-1}{4} - \frac{2x+3}{2} < -2$