Year 8 - Unit 13: Expressions, equations & inequalities

Learning Journey:

Prior Learning
- Solve one- and two-step equations, simplify algebraic expressions and perform the four operations with fractions.
- Understand decimal notation, equivalent fractions and basic index laws.

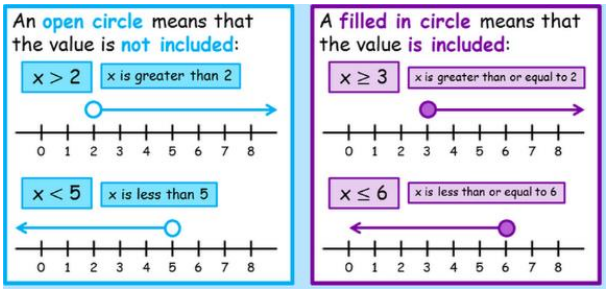
Next Steps
- Solve quadratic expressions and equations using factorisation and algebraic manipulation.
- Apply algebraic reasoning to GCSE topics including functions, graphs and more complex fraction problems.

By the end of this unit, you should be able to:
- Solve and represent linear inequalities, expand double brackets and simplify algebraic fractions.
- Convert fractions to recurring decimals and perform calculations involving fractions and algebraic fractions.

Keywords:

Inequality – A statement comparing values using $<$, $>$, $\leq$ or $\geq$.
Recurring decimal – A decimal with one or more digits that repeat forever.
Double brackets – Two brackets multiplied together.
Algebraic fraction – A fraction containing algebraic expressions.
Factorise – Write an expression as a product of factors.
Reciprocal – The value of 1 divided by a number.

Reading and drawing inequalities on number lines



Solving linear inequalities

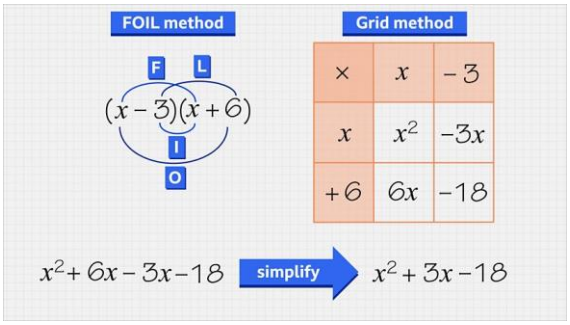
To **solve an inequality** we calculate the values that an unknown variable can be in that inequality.

Multiplying or dividing by a negative number **changes the direction of the inequality.**

Example
$$2x + 1 < 9$$
$$2x < 8$$
$$x < 4$$

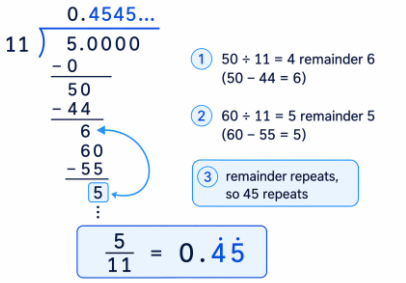
Example
$$1 - 2x < 9$$
$$-2x < 8$$
$$x > -4$$

Expanding double brackets



Converting fractions to recurring decimals

Convert 5/11 to a decimal



Simplifying algebraic fractions by factorising

Example
Simplify $\frac{3t+6}{3t}$.

The numerator of this fraction will factorise as there is a common factor of 3.

This give $\frac{3(t+2)}{3t}$.
Now, there is clearly a common factor of 3
Cancelling this through the fraction gives $\frac{t+2}{t}$.

There are no more common factors in this expression. Note cannot be cancelled as there is no term in the +2 in the numerator.

Adding and subtracting algebraic fractions

In order to add or subtract any fractions, including algebraic fractions, we must ensure that the fractions have a **common denominator**.

Example
$$\frac{5}{a} - \frac{b}{a} = \frac{5-b}{a}$$
The fractions $\frac{5}{a}$ and $\frac{b}{a}$ already have a common denominator a, so we just subtract the numerators.

Example
$$\frac{3}{2a} + \frac{3a}{4b}$$
These fractions **do not** have a common denominator - the first step is to find the LCM of $2a$ and $4b$ and use this as a common denominator.

$\times 2b$ and $\times a$:
$$\frac{6b}{4ab} + \frac{3a^2}{4ab} = \frac{3a^2+6b}{4ab}$$
Once there is a common denominator, add the numerators.