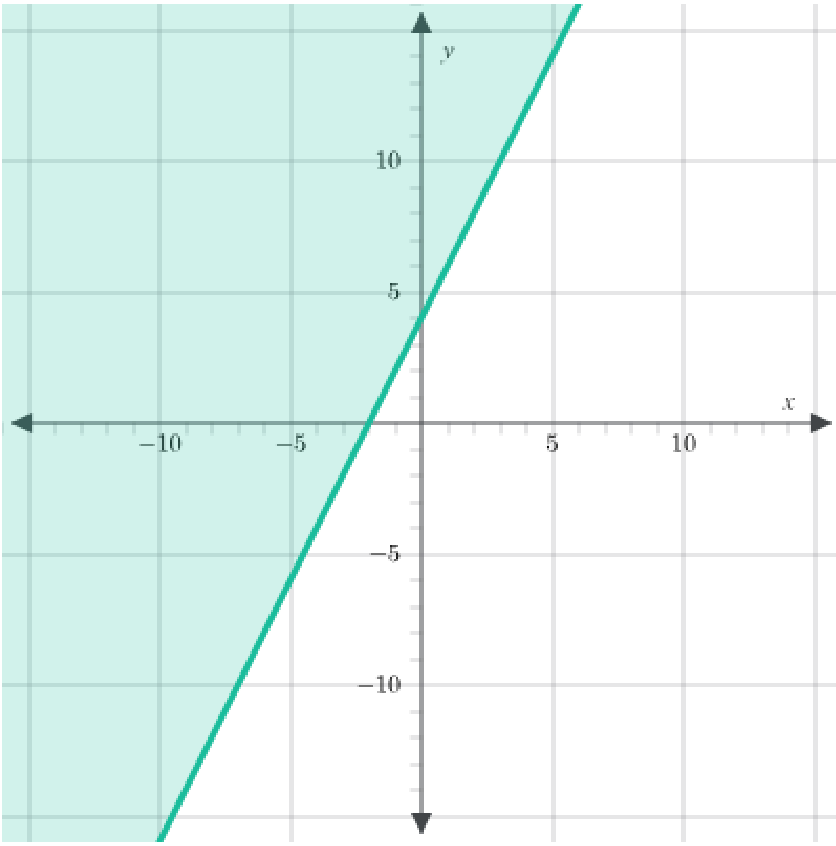
Linear Inequalities

Graphing linear inequalities

The graph of inequality describes the set of all points that satisfy (solutions of) the inequality. For instance, the following graph shows a boundary line and a region. Together they describe the set of points (x,y) that satisfy the inequality $y \geq 2x+4$. We call the region the required region and use a key to indicate which side of the line satisfies the inequality.



To draw an inequality, we start by drawing the inequality as if it were an equation. If the inequality is strict (> or <) we draw a **dashed** line, and if the inequality is not strict (≥ or ≤) we draw a **solid** line. The points on a solid line indicate that they satisfy the inequality, while the points on a dashed line indicate that they don't satisfy the inequality.

Then, we shade the region, above or below the line, depending on the inequality sign.

Many real-world problems involve constraints on a set of resources. These constraints give us a set of possible combinations for the resources, which we call the feasible region.

Any one of these combinations may be viable, but we often consider things like cost of production, or profit to inform us of which exact combination(s) are most suitable to either reduce the cost, or to maximise the profit.

An objective function is a function of the constraint variables, and typically indicates a cost or profit. For instance, let $\underline{x}$ and $\underline{y}$ indicate the amount of flour and sugar in kilograms respectively. If flour costs 1.05 per kg, and sugar costs 1.65 per kg, then the cost, $\underline{z}$, of the ingredients is:

$$\underline{z}=1.05\underline{x}+1.65\underline{y}$$

Linear programming problems involve maximising or minimising an objective function over the feasible region. This section investigates only identifying the objective function.