IGCSE
Chapter 14
Linear programming

Graphing an inequality

You can represent an inequality on a graph.
There are some important rules to follow.

- If the inequality is **≥** or **≤** the boundary line for the region is shown by a **solid** line.
- If the inequality is **>** or **<** the boundary line for the region is shown as **a broken (dashed)** line.
- You are expected to shade the **unwanted** region. (This will leave the required region clear.)
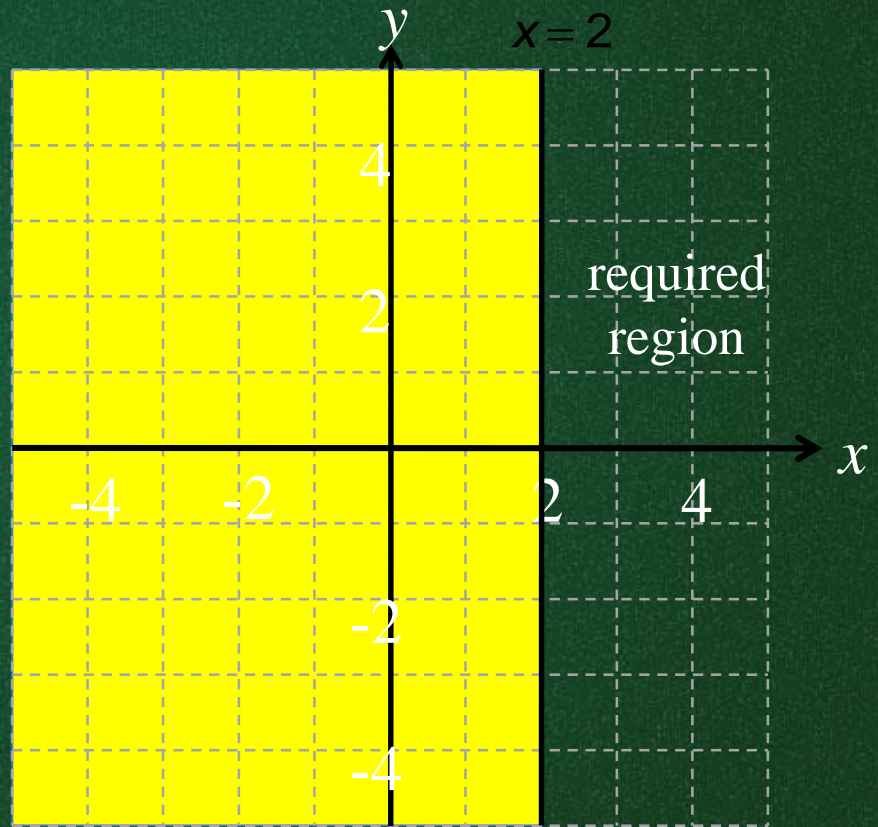
Example 1: Show the region $x \geq 2$ on a graph. Leave the required region unshaded.

First draw the boundary line $x = 2$.

The line will be **solid** because of the $\geq$ symbol.

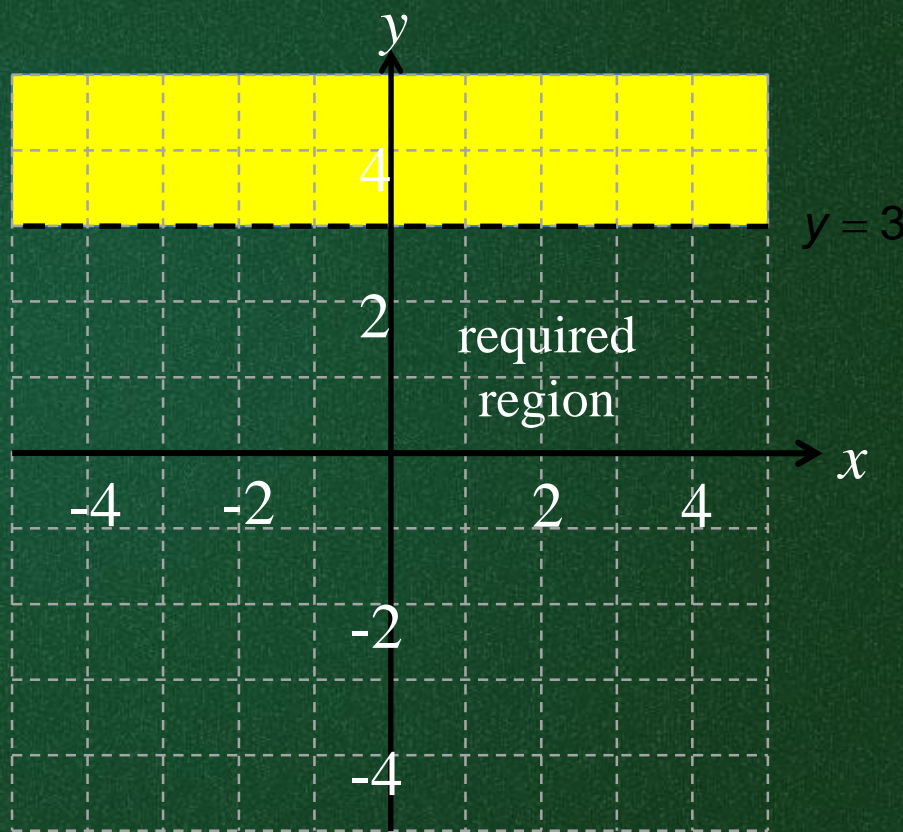Remember to shade the **unwanted** region.

Example 2: Show the region $y < 3$ on a graph. Leave the required region unshaded.

First draw the boundary line $y = 3$.

The line will be **dashed** because of the $<$ symbol.

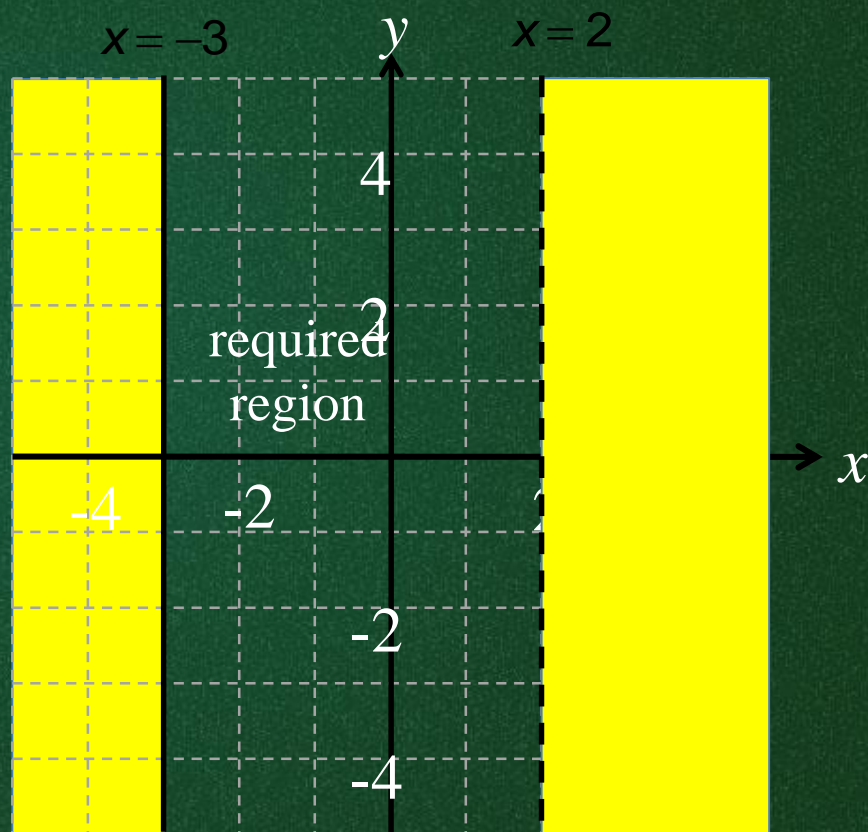Remember to shade the **unwanted** region.

$y = 3$

required region

Example 3: Show the region -3 ≤ x < 2 on a graph. Leave the required region unshaded.

First draw the boundary lines x = -3 and x = 2.

The line x = -3 will be **solid** because of the ≤ symbol.

The line x = 2 will be **dashed** because of the < symbol.

Remember to shade the **unwanted** regions.

$x = -3$ y $x = 2$

required region

4

2

-4   -2   2 x

-2

-4

The following steps are taken:

• Choose a point at random which does not lie on the line

• Substitute those values of x and y into the inequality

• If the inequality holds true, then the region in which the point lies satisfies the inequality and can therefore be shaded.

Note that in some questions the region which satisfies the inequality is left **unshaded**, while in others it is **shaded**. You will therefore need to read the question carefully to see which is required.
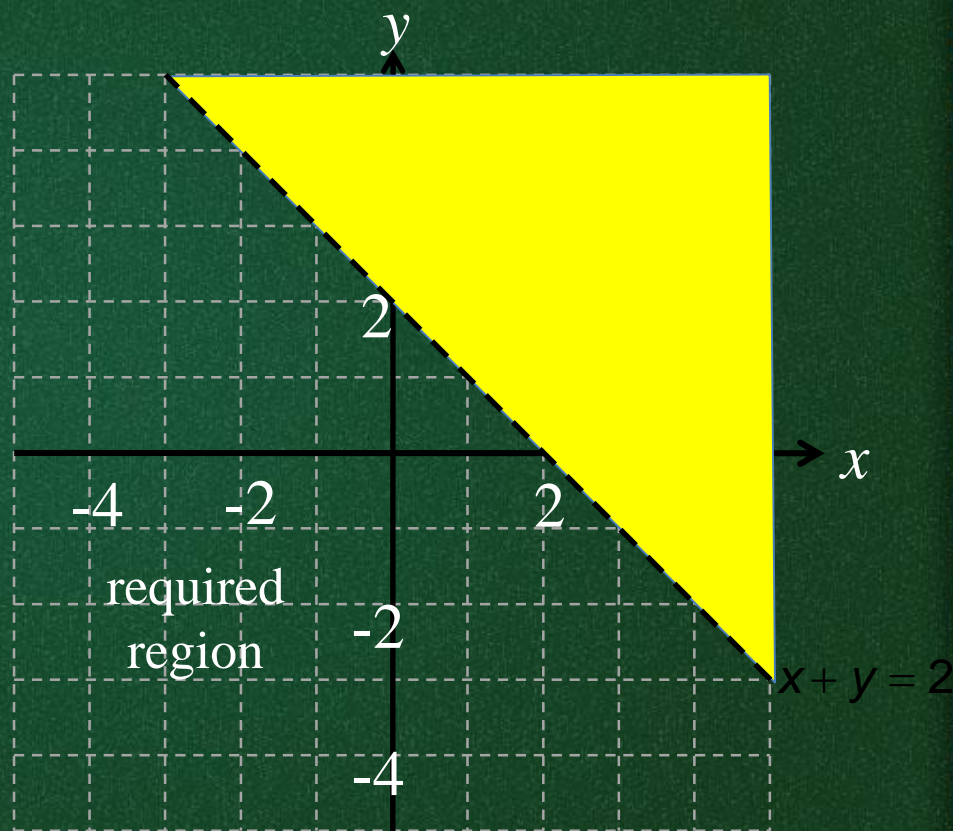
Example 4: Show the region $x + y < 2$ on a graph. Leave the required region unshaded.

First draw the boundary line $x + y = 2$.

x	0	2
y	2	0

The line will be **dashed** because of the $<$ symbol.

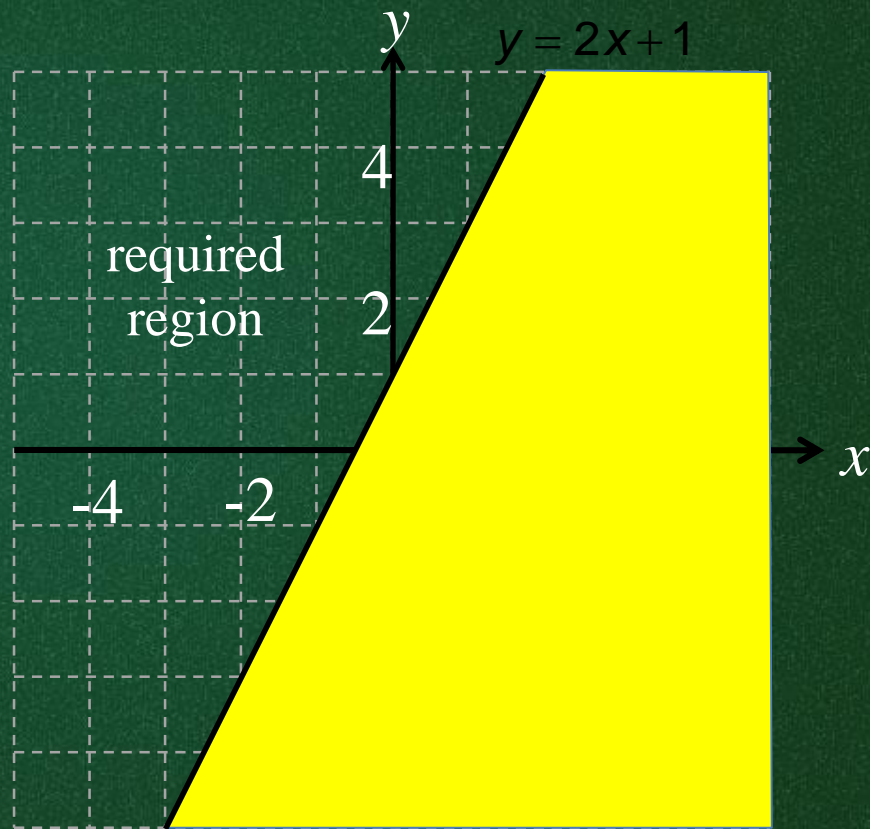Remember to shade the **unwanted** region.

Example 5 Show the region $y \geq 2x + 1$ on a graph. Leave the required region unshaded.

First draw the boundary line $y = 2x + 1$.

x	0	1	2
y	1	3	5

The line will be **solid** because of the $\geq$ symbol.

Remember to shade the **unwanted** region.

$y = 2x + 1$

required region

Exercise 14.2

1 By drawing appropriate axes, shade the region which satisfies each of the following inequalities:

   a $y > 2$ b $x < 3$ c $y \leqslant 4$

   d $x \geqslant -1$ e $y > 2x + 1$ f $y \leqslant x - 3$

2 By drawing appropriate axes, leave unshaded the region which satisfies each of the following inequalities:

   a $y \geqslant -x$ b $y \leqslant 2 - x$ c $x \leqslant y - 3$

   d $x + y \geqslant 4$ e $2x - y \geqslant 3$ f $2y - x < 4$