Inequalities and the Number Line

Four types of inequality

$x < 6$

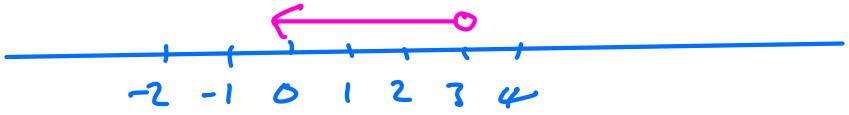
$x \leq 6$

$x > 6$

$x \geq 6$

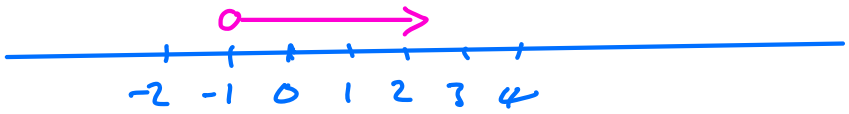
On a number line

$x < 3$

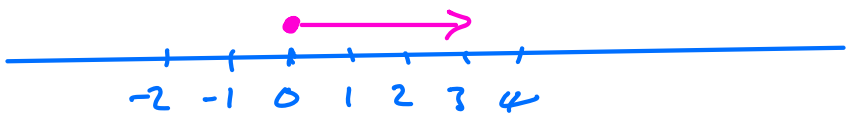


$x \leq 4$

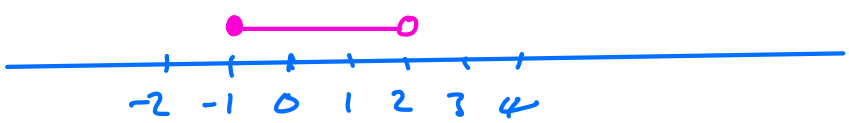
$x > -1$



$x \geq 0$



$-1 \leq x < 2$



Algebraic Inequalities

Equation

$$2x + 3 = 11$$
$$2x = 11 - 3$$
$$2x = 8$$
$$x = \frac{8}{2}$$
$$x = 4$$

Inequality

$$2x + 3 < 11$$
$$2x < 11 - 3$$
$$2x < 8$$
$$x < \frac{8}{2}$$
$$x < 4$$

Note that solving a linear inequality is much the same as solving a linear equation. The answer is an inequality.

Note that if an inequality is multiplied or divided by a negative number the inequality sign is reversed

eg $-2x < 6$

$\Rightarrow \quad x > \frac{6}{-2}$

$$\underline{x > -3}$$

Exercise

1) $3x - 7 \geq 17$

$3x \geq 17 + 7$

$3x \geq 24$

$x \geq \frac{24}{3}$

$x \geq 8$

2) $5x + 1 < 31$

$5x < 31 - 1$

$5x < 30$

$x < \frac{30}{5}$

$x < 6$

3) $5x - 2 \geq 30 - 3x$

$5x + 3x \geq 30 + 2$

$8x \geq 32$

$x \geq \frac{32}{8}$

$x \geq 4$

4) $3(x - 1) < 12$

$3x - 3 < 12$

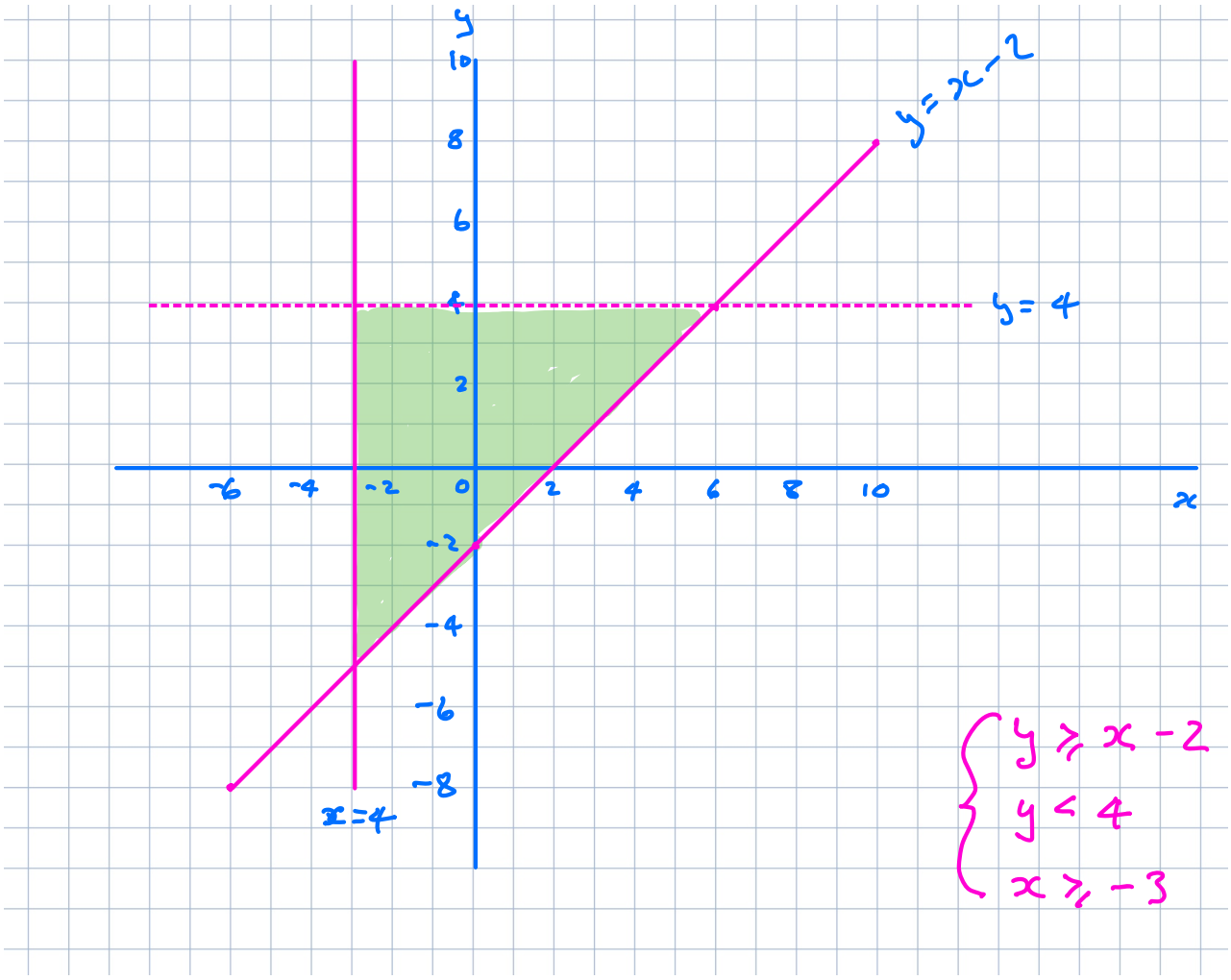
$3x < 12 + 3$

$3x < 15$

$x < \frac{15}{3}$

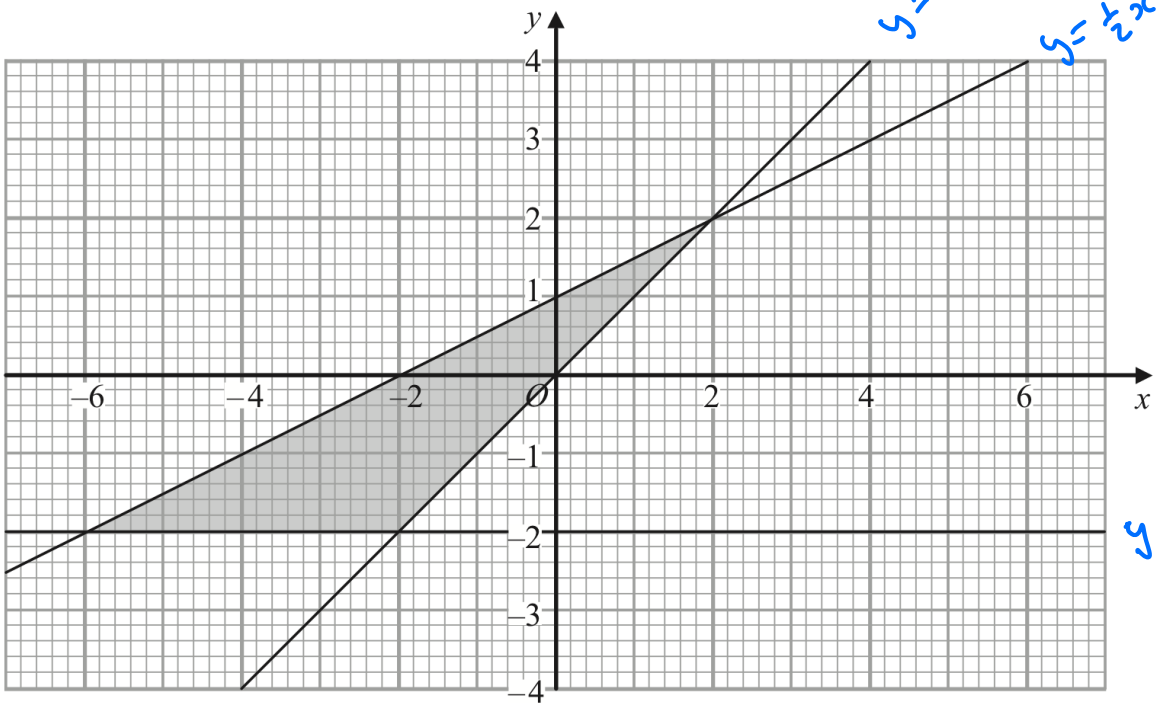
$x < 5$

Inequality Regions



$\begin{cases} y \geq x - 2 \\ y < 4 \\ x \geq -3 \end{cases}$

13



Write down the three inequalities that define the shaded region.

$y \geq -2$

$y \leq \frac{1}{2}x + 1$

$y \geq x$