

NOTES:

2: Linear Inequalities

Simple Inequalities:

1. Mathematical sentences containing symbols $<$, $>$, \leq or \geq are called **inequalities**. The solution of inequalities usually involves a range of values of the variable concerned.

2. Properties of inequalities are shown in the table below.

Operation	Property	Illustrations
Multiplied by a positive number.	If $x > y$, then $ax > ay$	- If $5 > 3$, then $5 \times 2 > 3 \times 2$ - If $-3 > -5$, then $-3 \times 2 > -5 \times 2$
Divided by a positive number.	If $x > y$, then $\frac{x}{a} > \frac{y}{a}$	- If $5 > 3$, then $\frac{5}{2} > \frac{3}{2}$ - If $-3 > -5$, then $\frac{-3}{2} > \frac{-5}{2}$
Multiplied by a negative number. (Change sign)	If $x > y$, then $-ax < -ay$	- If $5 > 3$, then $5 \times (-2) < 3 \times (-2)$ - If $-3 > -5$, then $-3 \times (-2) < -5 \times (-2)$
Divided by a negative number. (Change sign)	If $x > y$, then $\frac{x}{-a} < \frac{y}{-a}$	- If $5 > 3$, then $\frac{5}{-2} < \frac{3}{-2}$ - If $-3 > -5$, then $\frac{-3}{-2} < \frac{-5}{-2}$

3. To solve an inequality, we can

- **multiply** or **divide** both sides of an inequality by a **positive** number **without changing** the inequality sign.

- **multiply** or **divide** both sides of an inequality by a **negative** number, **changing** the inequality sign.

- **add** or **subtract** both sides of an inequality by a **positive/negative** number **without** changing the inequality sign.

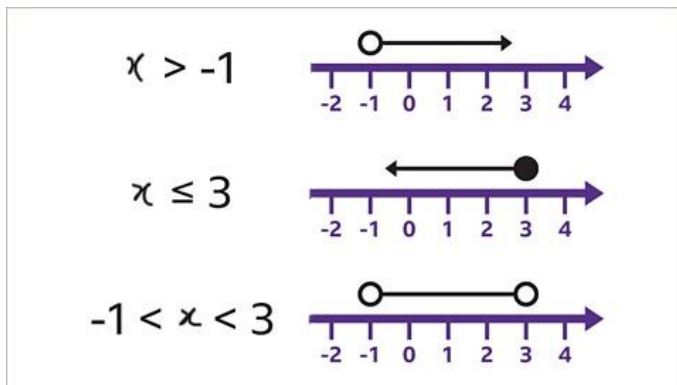
Solutions of Inequalities:

4. A solution of an inequality is any value of x which satisfies an inequality (e.g. $x \leq 5$)
Some integer solutions of the inequality $x \leq 5$ are $x = 5, 4, 3, 2, 1, \dots$ To represent all solutions of an inequality, we need to provide a number line alongside our solved inequality.

5. To draw a number line, we draw a scale of numbers with the number in the inequality being in the middle/right. After that:

- If the inequality contains $<$ or $>$: we draw a \bigcirc (hollow circle) on top of the number in the inequality and draw an arrow to the left or right depending on the inequality sign.
- If the inequality contains \leq or \geq : we draw a \bullet (shaded circle) on top of the number in the inequality and draw an arrow to the left or right depending on the inequality sign.

For example:



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