Linear Inequalities

Starter

1.   **(Review of last lesson)** Prove that the answer to every line of the pattern below is 3.

$2 \times 4 - 1 \times 5$ $3 \times 5 - 2 \times 6$ $4 \times 6 - 3 \times 7$

2.   **(Review of last lesson)** Prove that the sum of the squares of any two consecutive integers is an odd number.

Remember: $<$ — less than $>$ — more than
                 $\leq$ — less than or equal to $\geq$ — more than or equal to

N.B.   The inequality sign points to the smaller number

3.   **(Review of Y9 material)**
       Solve: (a) $2x - 1 = 5$ (find the value)
                      (b) $2x - 1 > 5$ (find the range of values).

Notes
Solving inequalities is similar to solving equations apart from the following important difference.

Multiplying/dividing by negative numbers
Given that $3 < 4$, write the inequality sign between -3 -4?

                                    $>$ i.e. the inequality sign has changed direction

E.g. 1 Solve the inequality $-2x < 8$.
       N.B.   It can be solved in two ways.
       Divide by -2 , change the   Swap $-2x$ and 8 over
       direction of the inequality
              $-2x < 8$ $-2x < 8$
              $x > -\dfrac{8}{2}$ $-8 < 2x$
              $x > -4$ $-\dfrac{8}{2} < x$

With *inequalities*, when *multiplying* or dividing by a *negative number*, *change* the *direction* of the *inequality sign*.

E.g. 2 Solve the inequalities: (a) $-\dfrac{x}{3} > -5$ (b) $-4x + 19 \geq -5$

Single inequalities
In single inequalities, the variable (i.e. the letter) is written on the left-hand side.
                      $x >$ a number $x \leq$ a number
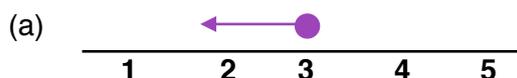
Inequalities diagram
Inequalities can be shown on a number line but we must distinguish between inequalities that include the number, $\leq$ and $\geq$, and those that don't include the number,$<$ and $>$.
       •   For $\leq$ and $\geq$: use a ball   ●
       •   For $<$ and $>$: use a circle   ○

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E.g. 3 Express these inequalities diagrammatically:
(a) $x \leq 3$ (b) $x > 2$ (c) $2 < x \leq 3$

Working: (a)

E.g. 4 Solve these inequalities, expressing your answer as both an inequality and is diagram form:
(a) $-3x - 7 \leq -1$ (b) $65 - 7x < -12$

Video: Solving inequalities (one sign)

Solutions to Starter and E.g.s

Exercise

9-1 class textbook: p509 M16.1 Qu 1, 2a-d, 3
A*-G class textbook: p465 M16.1 Qu 1, 2a-d, 3
9-1 homework book: p171 M16.1 Qu 1, 3, 4a, 6ab
A*-G homework book: p128 M16.1 Qu 1, 3, 4a, 6ab

Summary

With *inequalities*, when *multiplying* or dividing by a *negative number*, *change* the *direction* of the *inequality sign*.

Single inequalities: $x >$ *a number* $x \leq$ *a number*

Inequalities diagrams: For $\leq$ and $\geq$: use a ball ●
For $<$ and $>$: use a circle ○

Homework book answers (only available during a lockdown)