Exercise walk-through

2.2.2 Inequalities

AQA · GCSE · Mathematics

Solving equations

- **Linear equations.** Collect the letters on one side and the numbers on the other. **Worked example 8.** $7x - 22 = 4x + 29$.
- Subtract $4x$: $3x - 22 = 29$.
- Add 22: $3x = 51$, so $x = 17$.
- **Quadratic equations by factorising.** Make one side zero and factorise.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Inequalities

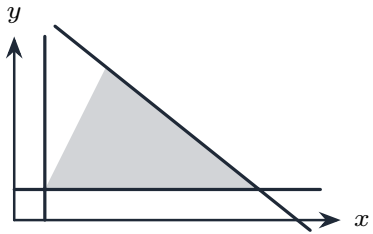
- Solve a linear inequality like an equation, but if you multiply or divide by a negative number, turn the sign round: from $-2x < 6$ you get $x > -3$.
- On a number line, an open circle means the end value is not included ($<$ or $>$) and a filled circle means it is ($\leq$ or $\geq$).
- **Worked example 15.** Find the integers n with $-3 < 2n + 1 \leq 9$.
- Subtract 1: $-4 < 2n \leq 8$.

Sequences

- A sequence is a list of numbers that follows a rule.
- A term-to-term rule says how to get the next term; a position-to-term rule, the **nth term** , gives any term from its position n.
- You should know the square numbers (1, 4, 9, 16, ...), cube numbers (1, 8, 27, ...), triangular numbers (1, 3, 6, 10, ...) and Fibonacci-type sequences, where each term is the sum of the two before.
- **Arithmetic sequences.** An **arithmetic progression** adds the same number each time.

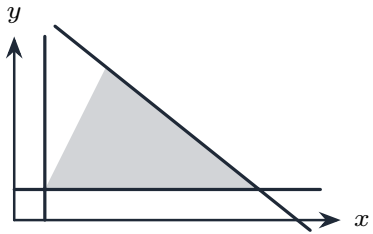
Exercise 2.1

2.1 Write down the inequality shown by a number line with a filled circle at 2 and an arrow to the right. [1]



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2.1

- filled circle means 2 is included; arrow to the right means greater: $\boldsymbol{x \geq 2}$

Exercise 2.2

2.2 Solve $3x + 5 \leq 17$. [2]



2.3 Solve $\frac{x}{4} - 1 > 2$. [2]



2.4 Solve $-2x < 6$. [1]



2.5 List the integers n such that $-2 \leq n < 3$. [2]

Exercise 2.2

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2.2

- subtract 5: $3x \leq 12$

Full solution on next slide

Full solution 2.2

2.2

- subtract 5: $3x \leq 12$
- divide by 3: $\boldsymbol{x \leq 4}$

2.3

- add 1: $\dfrac{x}{4} > 3$
- multiply by 4: $\boldsymbol{x > 12}$

2.4

- divide by -2 and reverse the sign: $\boldsymbol{x > -3}$

2.5

- -2 is included and 3 is not: $\boldsymbol{-2, -1, 0, 1, 2}$

Exercise 3.1

3.1 Leo solves $4 - x > 1$ and writes $x > 3$. Explain his mistake and give the correct answer. [2]

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3.1

- subtracting 4 gives $-x > -3$; dividing by -1 must **reverse** the sign, which Leo did not do
- $\boldsymbol{x < 3}$

Setup for exercise 3.2

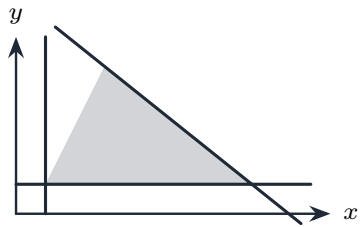
3.2 Solve $5x - 2 > 2x + 10$. [2]



3.3 Solve $-5 \leq 3x + 1 < 10$ and list the integer values of x. [3]

Exercise 3.2

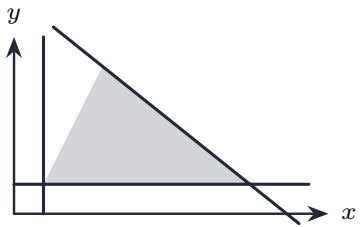
3.4 A taxi charges ¥8 plus ¥3 per kilometre. Mai has ¥50. Form and solve an inequality to find the greatest whole number of kilometres she can travel. [3]



3.5 n is an integer with $2n + 3 > 4$ and $3n - 2 \leq 13$. Find all possible values of n. [3]

Exercise 3.2

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3.5 n is an integer with $2n + 3 > 4$ and $3n - 2 \leq 13$. Find all possible values of n. [3]

3.2

- subtract $2x$ from both sides: $3x - 2 > 10$
- add 2: $3x > 12$, so $\boldsymbol{x > 4}$

Full solution on next slide

Full solution 3.2

3.2

- subtract $2x$ from both sides: $3x - 2 > 10$
- add 2: $3x > 12$, so $\boldsymbol{x > 4}$

3.3

- subtract 1 from all three parts: $-6 \leq 3x < 9$
- divide by 3: $-2 \leq x < 3$
- integers: $\mathbf{-2}, \mathbf{-1}, \mathbf{0}, \mathbf{1}, \mathbf{2}$

3.4

- cost for k km: $8 + 3k \leq 50$
- $3k \leq 42$, so $k \leq 14$
- the greatest distance is **14 km**

3.5

- $2n + 3 > 4$ gives $2n > 1$, so $n > 0.5$
- $3n - 2 \leq 13$ gives $3n \leq 15$, so $n \leq 5$
- integers with $0.5 < n \leq 5$: $\mathbf{1}, \mathbf{2}, \mathbf{3}, \mathbf{4}, \mathbf{5}$