Your notes

GCSE Maths: revision notes

Solving linear equations

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Start here: what solving an equation means

- An **equation** says that two things are equal, like $2x + 3 = 11$. Solving it means finding the value of x that makes it true.
- Think of a balance: whatever you do to one side, do to the other, and it stays balanced.
- Undo what has been done to x, in reverse order. Here: take away 3 ($2x = 8$), then divide by 2 ($x = 4$). Check: $2 \times 4 + 3 = 11$.

Solving equations

- An **equation** stays balanced if you do the same to both sides. Use **inverse operations** to get the **unknown** on its own.
- One step: $x + 7 = 12 \rightarrow x = 5$; $4x = 28 \rightarrow x = 7$.
- Two steps: $3x - 5 = 16 \rightarrow 3x = 21 \rightarrow x = 7$.

Unknowns on both sides

- Collect the **unknowns** on the side with more of them: $5x + 2 = 3x + 10 \rightarrow 2x = 8 \rightarrow x = 4$.
- $7 - 2x = 1 \rightarrow 6 = 2x \rightarrow x = 3$.

Brackets and fractions

- Expand brackets first: $2(x + 3) = 14 \rightarrow 2x + 6 = 14 \rightarrow x = 4$.
- Multiply both sides to clear fractions: $x/3 = 6 \rightarrow x = 18$; $(x + 4)/2 = 5 \rightarrow x + 4 = 10 \rightarrow x = 6$.
- $(2x - 1)/3 = x - 2 \rightarrow 2x - 1 = 3x - 6 \rightarrow x = 5$.

Forming equations

- Use a letter for the **unknown** and write an **equation** from the information: 'I think of a number, multiply by 3 and add 4 to get 25' gives 3n + 4 = 25, so n = 7.
- Angles in a triangle x, 2x and 3x: 6x = 180, so x = 30.
- Always check by substituting your answer back in.

Exam tip

- Do the same to both sides, one step per line. At the end, put your answer back into the original **equation** to check it.

Common mistakes

- Losing a minus sign when moving a term across the equals sign.
- Multiplying some terms by a number but not all of them.

Worked examples

Solve 5x – 7 = 3x + 9

Get the x terms on one side: subtract 3x from both sides. **2x – 7 = 9**

Add 7 to both sides. **2x = 16**

Divide both sides by 2. **x = 8**

Check: 5 × 8 – 7 = 33 and 3 × 8 + 9 = 33, so both sides match. **33 = 33** ✓

Answer: x = 8

Solve 3(x + 4) = 2x – 1

Expand the bracket. **3x + 12 = 2x – 1**

Subtract 2x from both sides. **x + 12 = –1**

Subtract 12 from both sides. **x = –13**

Answer: x = –13

Key terms

Equation	A statement that two expressions are equal.
Solve	Find the value of the unknown that makes the equation true.
Unknown	The letter whose value you are finding.
Inverse operation	An operation that undoes another.
Balance method	Doing the same to both sides so the equation stays true.

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

Your notes

1. Solve $x + 7 = 12$.
2. Solve $4x = 28$.
3. Solve $3x - 5 = 16$.
4. Solve $5x + 2 = 3x + 10$.
5. Solve $2(x + 3) = 14$.
6. Solve $x/3 = 6$.
7. Solve $(x + 4)/2 = 5$.
8. Solve $7 - 2x = 1$.

Answers

1. $x = 5$
2. $x = 7$
3. $x = 7$
4. $x = 4$
5. $x = 4$
6. $x = 18$
7. $x = 6$
8. $x = 3$

What to do next

Practise 12 questions on this topic

Try 7 exam questions, with mark schemes

Read the lesson, one step at a time

Free revision for GCSE and KS3 at lycolearn.co.uk. Some notes are for one exam board only, and say so in brackets.

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