Unit 2 · Solving Linear Equations Cheat Sheet

Unit 2 focus: solving one-step, two-step and multi-step equations, and checking solutions

1 KEY VOCABULARY

equation	Two expressions with an equal sign.	$2x + 3 = 11$
solution	A value that makes the equation true.	$x = 4$
inverse operation	An operation that undoes another.	$+ \leftrightarrow -$, $\times \leftrightarrow \div$
isolate	Get the variable alone on one side.	$x = \ldots$
like terms	Same variable, same exponent.	$3x$ and $-5x$
identity	True for every value: infinitely many solutions.	$2x = 2x$

2 ONE- AND TWO-STEP EQUATIONS

Undo addition or subtraction first, then multiplication or division. Do the same thing to **both sides**.

Example: Solve $3x - 5 = 16$.
Add 5: $3x = 21$
Divide by 3: $x = 7$
Answer: $x = 7$

3 MULTI-STEP EQUATIONS

Distribute, combine like terms on each side, then use inverse operations.

Example: Solve $3(x + 2) - 5 = 16$.
Distribute: $3x + 6 - 5 = 16$
Combine: $3x + 1 = 16$
Solve: $3x = 15,\ x = 5$
Answer: $x = 5$

4 VARIABLES ON BOTH SIDES

Collect the variable terms on one side and the constants on the other.

Example: Solve $4x - 3 = 2x + 9$.
Subtract $2x$: $2x - 3 = 9$
Add 3: $2x = 12$
Divide by 2: $x = 6$
Answer: $x = 6$

5 SPECIAL CASES & CHECKING

Variables cancel and a **false** statement is left: $3x + 6 = 3x + 9o6 = 9$	**no solution**
Variables cancel and a **true** statement is left: $4x - 12 = 4x - 12o0 = 0$	**infinitely many**
A value is left: $x = 2$	**one solution**
Check $x = 4$ in $2x - 5 = 3$: $2(4) - 5 = 3$	✔ **true**

6 QUICK REMINDERS & COMMON MISTAKES

✔ Do remember

- Keep the equation balanced: same step on both sides.
- Distribute to **every** term inside the parentheses.
- Check by substituting into the original equation.

✘ Common mistakes

- $3(x + 4) \neq 3x + 4$: it is $3x + 12$
- $x - 5 = 9 \rightarrow x = 4$: add 5: $x = 14$
- $-x = 6$: is $x = -6$, not 6

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More practice: writing equations from words, proportions, percents and literal equations

1 WORDS TO ALGEBRA

sum, more than, increased by	$+$
difference, less than, decreased by	$-$
product, times, twice	$\times$
quotient, divided by, half of	$\div$
is, equals, gives	$=$
“5 less than x”	$x - 5$ **(order matters!)**

2 WRITE AND SOLVE

Define a variable, write the equation, solve, and answer in words.

Example: A gym charges \$25 to join plus \$15 per month. Mia paid \$115. How many months?
Let m = months: $25 + 15m = 115$
Subtract 25: $15m = 90$
Divide by 15: $m = 6$
Answer: 6 months

3 PROPORTIONS

Two equal ratios. Use cross products: if $\frac{a}{b} = \frac{c}{d}$, then $ad = bc$.

Example: Solve $\frac{3}{4} = \frac{x}{12}$.
Cross multiply: $4x = 36$
Divide by 4: $x = 9$
Answer: $x = 9$

4 PERCENT EQUATIONS

part = percent × whole. Change the percent to a decimal first.

Example: 18 is what percent of 72?
Equation: $18 = p \cdot 72$
Divide: $p = 0.25$
Answer: 25%

5 LITERAL EQUATIONS (FORMULAS)

Solve for one letter; treat the other letters like numbers.

Example: Solve $A = \frac{1}{2}bh$ for h.
Multiply by 2: $2A = bh$
Divide by b: $h = \frac{2A}{b}$
Answer: $h = \frac{2A}{b}$

6 CHECK YOURSELF

- Did I distribute and combine like terms first?
- Did I do the same step to both sides?
- If the variables cancelled, is it no solution or infinitely many?
- Does my answer work in the original equation, and make sense in the story?