Unit 6 · Systems of Equations Cheat Sheet

Unit 6 focus: solving systems by graphing, substitution and elimination

1 KEY VOCABULARY

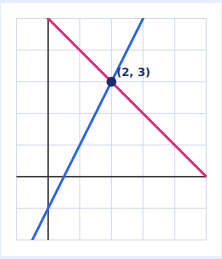
system	Two or more equations with the same variables.	$y = 2x + 1,\ y = -x + 4$
solution	An ordered pair that makes every equation true.	$(1, 3)$
intersection	Where the graphs cross; the solution.	$(1, 3)$
substitution	Replace a variable with an equal expression.	$y = 3x + 1$
elimination	Add or subtract equations to cancel a variable.	$+2y$ and $-2y$

2 SOLVING BY GRAPHING

Graph both lines. The point where they cross is the solution.

Example: $y = 2x - 1$ and $y = -x + 5$
Intersection: $(2, 3)$

Answer: $(2, 3)$



3 SOLVING BY SUBSTITUTION

Solve one equation for a variable, substitute into the other, solve, then substitute back.

Example: $y = 3x + 1$ and $2x + y = 11$
Substitute: $2x + (3x + 1) = 11$
Solve: $5x = 10,\ x = 2$
Back: $y = 3(2) + 1 = 7$

Answer: $(2, 7)$

4 SOLVING BY ELIMINATION

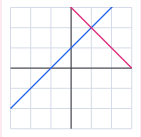
Line up the variables; add the equations so one variable cancels.

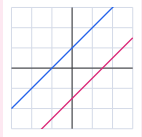
Example: $3x + 2y = 14$ and $5x - 2y = 2$
Add: $8x = 16,\ x = 2$
Substitute: $3(2) + 2y = 14,\ y = 4$

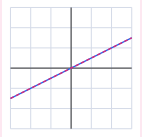
Answer: $(2, 4)$

5 TYPES OF SOLUTIONS

One: the lines cross. **None**: parallel lines (same slope, different intercept). **Infinitely many**: the same line.


one solution


no solution


infinitely many

6 QUICK REMINDERS & COMMON MISTAKES

✔ Do remember

- A solution must make **both** equations true.
- Write the answer as an ordered pair (x, y).
- Check in both original equations.

✘ Common mistakes

- Stopping after finding x: find y too
- Forgetting to multiply every term: when making opposite coefficients
- $0 = 5$ means “0”: it means no solution

Unit 6 · Systems of Equations Cheat Sheet

More practice: special systems, choosing a method and word problems

1 ELIMINATION: MULTIPLY FIRST

Multiply one or both equations so a variable has opposite coefficients.

Example: $2x + 3y = 8$ and $x - y = -1$
× 3 (2nd): $3x - 3y = -3$
Add: $5x = 5,\ x = 1$
Back: $1 - y = -1,\ y = 2$
Answer: $(1, 2)$

2 SPECIAL SYSTEMS

$y = 2x + 3$, $y = 2x - 1$: same slope, different intercepts	**no solution**
$y = 3x - 4$, $2y = 6x - 8$: the same line	**infinitely many**
Solving gives $0 = 4$ (false)	**no solution**
Solving gives $0 = 0$ (true)	**infinitely many**

3 CHOOSING A METHOD

a variable is already alone: $y = 4x - 2$	**substitution**
coefficients match or are opposites: $3y$, $-3y$	**elimination**
you need a picture or an estimate	**graphing**

4 WORD PROBLEMS

Define two variables, write one equation for each fact, solve, answer in words.

Example: 5 adult and 3 student tickets cost $43. Adult tickets cost $3 more.
Equations: $5a + 3s = 43,\ a = s + 3$
Substitute: $5(s + 3) + 3s = 43,\ s = 3.5$
Adult: $a = 6.5$
Answer: student $3.50, adult $6.50

5 CHECKING A SOLUTION

Is $(2, -1)$ a solution of $3x + y = 5$? $3(2) + (-1) = 5$	✔
...and of $x - 2y = 4$? $2 - 2(-1) = 4$	✔
Both are true, so $(2, -1)$ solves the system.	**solution**

6 CHECK YOURSELF

- Did I line up x, y and the constants before eliminating?
- Did I multiply **every** term of the equation?
- Did I substitute back to find the other variable?
- Does my ordered pair work in both equations?