



Krypto Solver

Player's Guide

Connect five cards with +, -, ×, ÷ to equal the Objective
Includes deck reference, options guide, step-by-step breakdown, and strategy tips

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1. What Is Krypto?

Krypto is a mental arithmetic card game first published in 1963. It is simple to learn but surprisingly deep, making it an ideal classroom tool and a satisfying challenge for players of all ages. The standard deck contains 56 cards numbered 1 through 25. A dealer reveals five playing cards and one objective card, and every player races to build an arithmetic expression that uses all five playing cards exactly once and evaluates to the objective.

Goal: Use all five card values — each exactly once — with addition, subtraction, multiplication, and division (and parentheses where needed) to reach the objective number.

The first player to announce a valid solution wins the hand. Krypto rewards pattern recognition and mental arithmetic speed, and because every hand has a different combination of cards, no two games are alike.

2. The Standard Deck

The 56-card Krypto deck is not uniformly distributed. Lower numbers appear more frequently than higher ones, which affects both the difficulty of hands and the likelihood of finding solutions.

Card Values	Copies	Card Count	Running Total
1 – 6	3 each	18	18
7 – 10	4 each	16	34
11 – 17	2 each	14	48
18 – 25	1 each	8	56

Note: Duplicate values are allowed within a single hand. You might be dealt two 3s, for example — as long as the total count of any given number does not exceed its deck count. The solver enforces this automatically in Standard mode.

3. How to Play

3.1 Standard Rules

In standard Krypto play, the following constraints apply to all intermediate values — the results of each arithmetic step on the way to the objective:

- **Positive integers only:** Every intermediate result must be a whole number greater than zero.
- **All five cards used:** You must use each of the five playing cards exactly once. Unused cards are not permitted.
- **Objective must match exactly:** The final result must equal the objective card, not merely be close to it.
- **Operations allowed:** Addition (+), subtraction (-), multiplication (\times), and division (\div) only. Exponentiation, concatenation, and factorial are not standard.

3.2 Parentheses and Order of Operations

Parentheses may be used freely to group any sub-expression. This dramatically expands the solution space. The expression $3 + 3 - 4 / (2 + 2)$, for example, is a valid solution for cards 2, 2, 3, 3, 4 with objective 5, even though it looks at first like it should not reach 5.

Because any parenthesization is allowed, the solver must search over all possible expression tree shapes — not just left-to-right evaluation. This is why exhaustive search is needed and why the solver can find solutions that are not immediately obvious.

4. Using the Krypto Solver

The Krypto Solver at betaprojects.com/games/krypto/ exhaustively searches every permutation, operator combination, and parenthesization to find all valid solutions for any hand — up to 200 distinct results. Equivalent solutions (those that are commutative or associative rearrangements of each other) are shown only once.

4.1 Entering Cards

1. **Card 1 through Card 5:** Type each of your five playing card values into the corresponding fields. Values must be between 1 and 25 in Standard mode.
2. **Objective:** Enter the objective card value in the Objective field.
3. Click Find Solutions (or press Enter). All valid expressions appear instantly in a solution grid.

4.2 Solver Options

Three checkboxes beneath the card fields adjust the rules the solver applies. Changes take effect immediately, re-running the search with the new constraints.

Option	What It Does
Allow any number (<200)	Disables standard deck validation. Useful for custom or classroom variants with values outside the 1–25 range.
Allow negative intermediates	Permits intermediate results below zero on the way to the objective. Expands the solution count significantly for difficult hands.
Allow fractional intermediates	Permits non-integer intermediate results, such as $7 \div 2 = 3.5$. The final answer must still be a whole number matching the objective.

Solutions that use a negative intermediate are labeled [N]. Solutions that use a fractional intermediate are labeled [F]. A solution using both is labeled [NF]. These labels only appear when the corresponding option is checked.

5. Step-by-Step Breakdown

Every solution in the results grid includes a built-in breakdown tool that shows exactly how to evaluate the expression one operation at a time — no mental juggling required. This is especially useful when teaching Krypto to new players, or when verifying an unfamiliar solution.

5.1 Revealing the Breakdown Button

The breakdown button is hidden by default to keep the solution list clean. It appears as a small “≡” icon (three horizontal lines with an arrow) at the right edge of each solution row.

- **Desktop:** Hover the mouse over any solution row. The ≡ icon fades in at the right end of that row.
- **Mobile / touch:** Tap a solution row once to reveal the ≡ icon for that row, then tap the icon to open the breakdown.

5.2 Reading the Breakdown Panel

Clicking or tapping the ≡ icon opens a floating panel positioned to the right of the solution (or to the left, or centered, depending on available screen space). The panel shows the full expression at the top in italic, followed by a numbered list of steps.

Each step corresponds to evaluating one operation in the expression tree, working from the innermost parentheses outward. The final step — which produces the objective value — is highlighted in red and bold.

Example: Cards 2, 2, 3, 3, 4 with Objective 5

Solution: $3 + 3 - 4 / (2 + 2) = 5$

Step	Calculation	What It Means
1	$3 + 3 = 6$	Evaluate the left branch of the subtraction
2	$2 + 2 = 4$	Evaluate the inner parentheses
3	$4 \div 4 = 1$	Use the result from Step 2 as the divisor
4	$6 - 1 = 5$	Final step — combine both branches (result in red)

How the order is determined: Steps follow a post-order traversal of the expression tree: both sub-expressions on either side of an operator are fully evaluated before that operator is applied. This means inner parentheses always resolve first, and the final step is always the outermost operation.

5.3 Fractions and Negative Intermediates

When a solution uses a fractional or negative intermediate (and the corresponding option is enabled), the breakdown reflects this faithfully. Fractional values are displayed as simple fractions where the denominator is 20 or less, such as $7/2$ or $1/3$. Larger or non-repeating fractions are shown as decimals rounded to five places.

Negative intermediates appear with a minus sign, for example -4 . These steps are still numbered sequentially and the final step is still shown in red regardless of the intermediate values along the way.

5.4 Closing the Panel

Click the \times button in the top-right corner of the breakdown panel to close it, or press the Escape key. Clicking anywhere outside the panel also dismisses it. Clicking the \equiv icon for a solution that is already open will close the panel.

6. Strategy Tips

The solver finds all solutions, but developing your own solving instincts makes the game more rewarding. Here are the most effective mental strategies:

- **Look for the objective in plain sight:** Scan for any single operation between two of your five cards that yields the objective directly. If the objective is 12 and you hold 3 and 4, you can try to reduce the other three cards to 1 using any operations, then multiply.
- **Factor the objective:** Express the objective as a product or quotient of values your cards can reach. Objective 20 might come from 4×5 , 10×2 , or $100 \div 5$.
- **Target 1 or 0:** Reducing a sub-expression to 1 (identity for multiplication) or 0 (identity for addition) simplifies what remains. Three cards that produce 1 leave the other two to reach the objective by themselves.
- **Work from the outside in:** Consider the last operation first: what two values, combined with one operator, produce the objective? Then figure out how to reach each of those two values with the remaining cards.
- **Use the breakdown to learn:** After the solver finds solutions, open the breakdown panel on a solution that looks surprising. Seeing it step by step often reveals a pattern you had not considered.

7. Quick Reference

Term / Label	Meaning
Objective	The target value your expression must equal.
Standard mode	Deck validation active (values 1–25, counts enforced). Positive integer intermediates only.
[N] label	Solution uses a negative intermediate value. Only shown when Allow Negative Intermediates is checked.
[F] label	Solution uses a fractional intermediate value. Only shown when Allow Fractional Intermediates is checked.
[NF] label	Solution uses both negative and fractional intermediates.
≡ icon	Breakdown button. Hover or tap a solution row to reveal it. Click to open the step-by-step panel.
Step-by-step panel	Floating panel showing each arithmetic step needed to evaluate the solution, innermost operations first. The final step is highlighted in red.
200-solution limit	The solver returns up to 200 distinct solutions per hand. 'Limit reached' appears in the count when this cap is hit.

Visit betaprojects.com/games/krypto/ to use the solver online.