

Algebra 1
Systems of Equations Word Problems

Systems of Equations Word Problems | A1-U06-P06

96 problems · Four activity formats

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Topic focus

Across 96 tasks this topic asks for algebraic check, contextual verdict, and rounding analysis, equations, rates or insufficiency, and verification, balance equations, source amounts, and feasibility, equations, quantities or insufficiency, and admissibility, semantic error, corrected variables/equations, and verification and exact shared input/output or no crossing, with domain assessment.

8 PDFs and a README; 74 buyer pages.

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Name: _____ Date: _____ Class: _____

Answer each question and record the matching bank letter. Give exact values. A value without its unit is not a complete answer.

A record shows 12 total adult tickets and student tickets. Each adult ticket contributes 3 dollars, and each student ticket contributes 5 dollars; the combined contribution is 56 dollars. Define x and y with units, write the two equality constraints, determine the quantities if possible, and assess whether the result is admissible. For the response cell, record the exact algebraic pair (x, y) , using the units defined in this question. Still provide the full model, checks and contextual admissibility assessment in your work.

Bank label: _____

Unknown component contributions x and y are constant across measurements. Measurement 1 has X -multiplicity 1 and Y -multiplicity 2 for total 19; Measurement 2 has multiplicities 2 and 2 for total 26. Build the weighted-sum system from the table, determine x and y if identifiable, and check every measured total. For the response cell, record the exact algebraic pair (x, y) , using the units defined in this question. Still provide the full model, checks and contextual admissibility assessment in your work.

measurement	X multiplicity	Y multiplicity	measured total
1	1	2	19
2	2	2	26

Bank label: _____

A record shows 21 total standard tasks and bonus tasks. Each standard task contributes 6 credits, and each bonus task contributes 11 credits; the combined contribution is 191 credits. Define x and y with units, write the two equality constraints, determine the quantities if possible, and assess whether the result is admissible. For the response cell, record the exact algebraic pair (x, y) , using the units defined in this question. Still provide the full model, checks and contextual admissibility assessment in your work.

Bank label: _____

A technician must make 14 liters of a mixture with $\frac{485}{14}\%$ active ingredient using Source A at 15% and Source B at 40%. Let x and y be liters from A and B. Use the table data to write total-volume and active-component equations, solve exactly, and decide whether the mixture is physically feasible. For the response cell, record the exact algebraic pair (x, y) , using the units defined in this question. Still provide the full model, checks and contextual admissibility assessment in your work.

source	concentration	amount liters	active liters
A	$\frac{3}{20}$	x	$\frac{3}{20}x$
B	$\frac{2}{5}$	y	$\frac{2}{5}y$
target	$\frac{97}{280}$	14	$\frac{97}{20}$

Bank label: _____

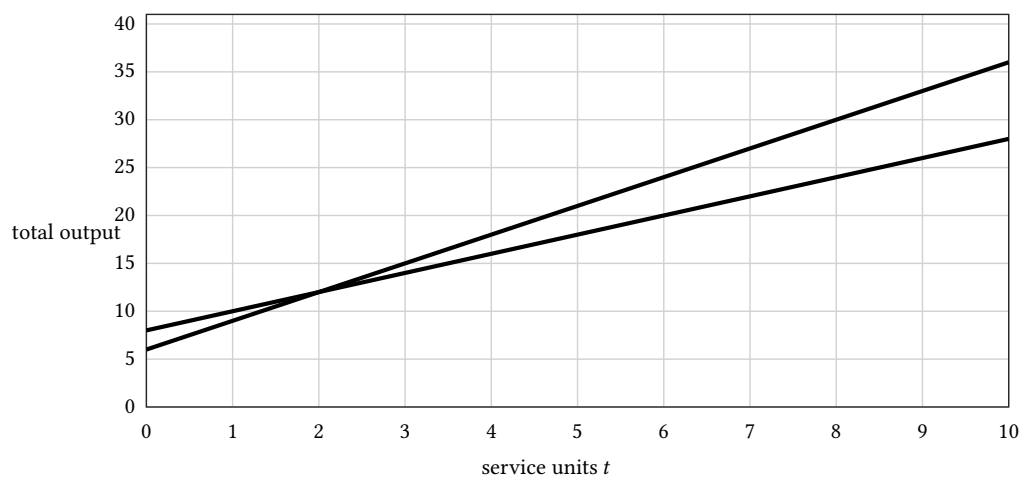
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Name: _____ Date: _____ Class: _____

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. A value without its unit is not a complete answer.

Plan A has output $A(t) = 8 + 2t$ and Plan B has output $B(t) = 6 + 3t$, where t is a nonnegative number of service units. Build the equality model, determine any shared input and output exactly, and decide whether it is a meaningful break-even point. Use the exact graph rules and scale in the provided data.



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Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

Incoming: $x = 14$ and $y = 16$; the pair is admissible as item counts.

Two drones leave the same marker in opposite directions at constant speeds x and y kilometers per hour. In Trial 1, drone X flies for 3 hours and drone Y for 6 hours, placing them 75 kilometers apart. In Trial 2, their flight times are 3 hours and 1 hour and their separation is 20 kilometers. Build the two rate-time equations from the table, determine both speeds, and verify both separations. For the response cell, record the exact algebraic pair (x, y) , using the units defined in this question. Still provide the full model, checks and contextual admissibility assessment in your work.

observation	X hours	Y hours	separation km
1	3	6	75
2	3	1	20

Your response: _____

Incoming: $x = 8$ units/hour and $y = 1$ unit/hour.

A record shows 18 total small boxes and large boxes. Each small box contributes 5 kilograms, and each large box contributes 9 kilograms; the combined contribution is 138 kilograms. Define x and y with units, write the two equality constraints, determine the quantities if possible, and assess whether the result is admissible. For the response cell, record the exact algebraic pair (x, y) , using the units defined in this question. Still provide the full model, checks and contextual admissibility assessment in your work.

Your response: _____

Incoming: $x = 4$ and $y = 12$; the pair is admissible as item counts.

Two constant production rates x and y are measured in units per hour. Observation 1 runs process X for 4 hours and process Y for 4 hours, producing 48 units total. Observation 2 uses 5 hours and 2 hours respectively and produces 48 units. Build the two rate-time equations from the table, determine both rates if the observations identify them, and verify against both totals. For the response cell, record the exact algebraic pair (x, y) , using the units defined in this question. Still provide the full model, checks and contextual admissibility assessment in your work.

observation	X hours	Y hours	total units
1	4	4	48
2	5	2	48

Your response: _____

Incoming: $x = 9$ and $y = 5$; the result is admissible. It comes from $x + y = 14$ and $x - y = 4$.

Unknown component contributions x and y are constant across measurements. Measurement 1 has X -multiplicity 3 and Y -multiplicity 6 for total 24; Measurement 2 has multiplicities 3 and 4 for total 18. Build the weighted-sum system from the table, determine x and y if identifiable, and check every measured total. For the response cell, record the exact algebraic pair (x, y) , using the units defined in this question. Still provide the full model, checks and contextual admissibility assessment in your work.

measurement	X multiplicity	Y multiplicity	measured total
1	3	6	24
2	3	4	18

Your response: _____

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Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

A model uses x and y under this domain requirement: nonnegative whole-number item counts. The stored equations are $x + y = 10$ and $2x + 3y = \frac{57}{2}$, and an algebraic solver reports $(\frac{3}{2}, \frac{17}{2})$. Assess the pair in context, explain whether rounding is allowed, and verify the original equalities. Compare algebraic validity with contextual admissibility, and justify the rounding conclusion using the actual equalities and stated domain.

Context: x and y count two item types; there are 22 items total, valued at 3 and 5 credits each, with combined value 92 credits. A student proposes $3x + 5y = 22$ and $3x + 5y = 92$. Identify the first semantic mismatch before solving, state the corrected two-equation model with variable units, and verify that the repaired model represents the context.

Context: x and y count two item types; there are 6 items total, valued at 4 and 6 credits each, with combined value 34 credits. A student proposes $4x + 6y = 6$ and $4x + 6y = 34$. Identify the first semantic mismatch before solving, state the corrected two-equation model with variable units, and verify that the repaired model represents the context.

One measurement of two unknown per-unit contributions gives $2x + 4y = 54$. A second measurement must use nonnegative integer multiplicities and be compatible with the same contributions. Compare candidates A: $4x + 8y = 108$, B: $2x + 4y = 56$, and C: $5x + 4y = 63$. Select the observation that uniquely identifies x and y , and explain why the other two fail without using a determinant formula.

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Full Worked Solutions - excerpt

Worked example

Problem. For two account balances in dollars, the conditions are: x is 6 more than y , and the stated total condition is $x + y = 18$ when x and y use the units named in context. Translate the comparison with the correct reference quantity, solve the two equality constraints, and assess whether both quantities are admissible.

Answer. $x = 12$ and $y = 6$; the result is admissible. It comes from $x + y = 18$ and $x - y = 6$.

Explanation and check.

The total condition is $x + y = 18$. The relationship 'x is 6 more than y' becomes $x - y = 6$. Solving the two independent equations gives $x = 12$ and $y = 6$. Both quantities satisfy the stated relationship and domain.

Worked example

Problem. For two collections of items, the conditions are: x is 4 times as large as y , and the stated total condition is $x + y = 10$ when x and y use the units named in context. Translate the comparison with the correct reference quantity, solve the two equality constraints, and assess whether both quantities are admissible.

Answer. $x = 8$ and $y = 2$; the result is admissible. It comes from $x + y = 10$ and $x - 4y = 0$.

Explanation and check.

The total condition is $x + y = 10$. The relationship 'x is 4 times as large as y' becomes $x - 4y = 0$. Solving the two independent equations gives $x = 8$ and $y = 2$. Both quantities satisfy the stated relationship and domain.