Section 8.1 and 1.3b : Systems of Linear Equations
Definitions

1: Solving Systems of Equations by Substitution

Step 1: Solve one of the equations for a single variable.
Step 2: Substitute the the expression from step 1 into the other equation.
Step 3: Solve this equation for the remaining variable.
Step 4: Now back substitute the result from step 3 into one of the equations and find the value for the remaining variable.
Step 5: Check your solution on the both equations.

2: Solving Systems of Equations by Elimination

Step 1: Rewrite both equations in the form of $Ax + By = C$ where A, B,and C are constants.
Step 2: If necessary, multiply one of the equations or both by an appropriate non-zero number so the sum of the coefficients of x or y is zero.
Step 3: Add the new equations together.
Step 4: Solve the equation for the remaining variable.
Step 5: Back-substitute and solve for the other variable.
Step 6: Check the solution in both of the original equations.

Types of Solutions and Their Graphical Representation

Number of Solutions	Graphical Expression	Example Solution
Exactly one ordered-pair	Two lines that intersect.	(1,1)
No solution	Two parallel lines.	$0 = 12$
Infinitely many solutions	Two identical lines	$10 = 10$

Examples

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1) Equation 1: $x + 7y = 12$
Equation 2: $3x - 5y = 10$

a) Substitution Method:

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b) Elimination Method:

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2) Equation 1: $3x = -11y + 4$
Equation 2: $-5y = 2x + 9$

3) Equation 1: $y = -3y - 8$
Equation 2: $y = 15 - 2x$

4) Equation 1: $6x + 5y = -3$
Equation 2: $-x - \frac{5}{6}y = -7$

5) Equation 1: $\frac{2}{3}x + \frac{1}{6}y = \frac{2}{3}$
Equation 2: $4x + y = 4$

6) Equation 1: $\frac{x}{6} - \frac{y}{2} = \frac{1}{3}$
Equation 2: $x + 2y = -3$

7) One Snickers bar and two Reese's Peanut Butter Cups contains 737 calories. Two Snickers Bars and one Reese's Peanut Butter Cup contain 778 calories. Find the calorie content of each candy bar.

8) A new restaurant is to contain two-seat tables and four-seat tables. Fire codes limit the restaurant's maximum occupancy to 56 customers. If the owners have hired enough servers to handle 17 tables of customers, how many of each kind of table should they purchase?

9) An airplane flying against the wind travels 450 miles in 5 hrs. On the return flight, flying with the wind, the distance is traveled in 3 hrs. Find the plane's rate in still air and the rate of the wind.

10) The average time Italians spend on vacation exceeds the average American vacation time by 4 weeks. The combined average vacation time for Americans and Italians is 11.8 weeks. On average, how many weeks do Americans spend on vacation and how many weeks do Italians spend on vacation?

11) You invested \$11,000 in two accounts paying 5% and 8% annual interest. If the total interest earned for the year was \$730, how much was invested at each rate?

12) Things did not go quite as planned. You invested \$12,000, part of it in stock that paid 14% annual interest. However, the rest of the money suffered a 6% loss. If the total annual income from both investments was \$680, how much was invested at each rate?