Solve It!

Write your solution in the white space on page 126

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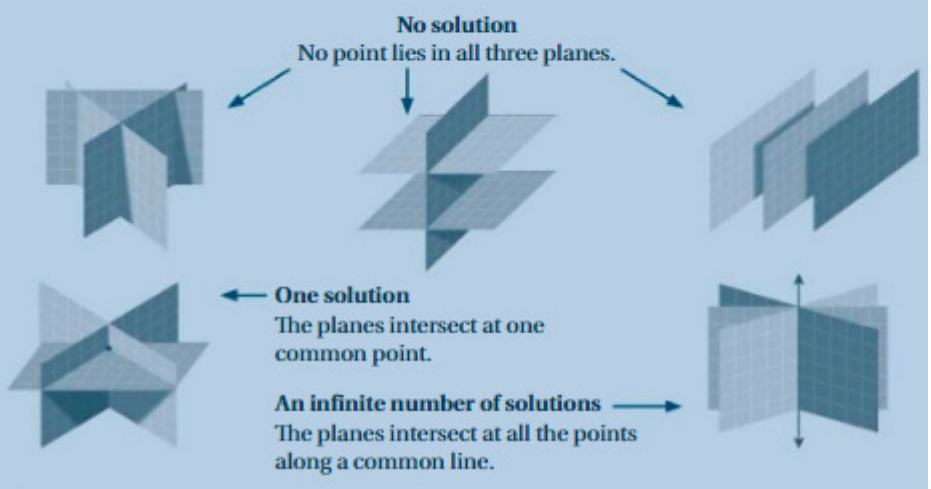
You can represent three relationships involving three unknowns with a system of equations.

Essential Understanding To solve systems of three equations in three variables, you can use some of the same algebraic methods you used to solve systems of two equations in two variables.

You can represent systems of equations in three variables as graphs in three dimensions. The graph of an equation of the form $Ax + By + Cz = D$, where A, B, and C are not all zero, is a plane. You can show the solutions of a three-variable system graphically as the intersection of planes.



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You can use the elimination and substitution methods to solve a system of three equations in three variables by working with the equations in pairs. You will use one of the equations *twice*. When one point represents the solution of a system of equations in three variables, write it as an ordered triple (x, y, z).

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Problem 1 **Solving a System Using Elimination**

Practice **Solve each system by elimination. Check your answers.**

1. $\begin{cases} x - y + z = -1 \\ x + y + 3z = -3 \\ 2x - y + 2z = 0 \end{cases}$

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2. $\begin{cases} x - y - 2z = 4 \\ -x + 2y + z = 1 \\ -x + y - 3z = 11 \end{cases}$

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You can apply the method in Problem 1 to most systems of three equations in three variables. You may need to multiply in one, two, or all three equations by one, two, or three nonzero numbers. Your goal is to obtain a system—equivalent to the original system—with coefficients that allow for the easy elimination of variables.

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Problem 2 **Solving an Equivalent System**

Practice Solve each system by elimination. Check your answers.

3. $\begin{cases} 3x + 3y + 6z = 9 \\ 2x + y + 3z = 7 \\ x + 2y - z = -10 \end{cases}$

4. $\begin{cases} 3x + 2y + 2z = -2 \\ 2x + y - z = -2 \\ x - 3y + z = 0 \end{cases}$

Problem 4 **Solving a Real-World Problem**

Got It? **Business** You manage a clothing store and budget $5400 to restock 200 shirts. You can buy T-shirts for $12 each, polo shirts for $24 each, and rugby shirts for $36 each. Suppose you want to have the same number of T-shirts as polo shirts. How many of each type of shirt should you buy?

Practice STEM

7. **Manufacturing** In a factory there are three machines, *A*, *B*, and *C*. When all three machines are working, they produce 287 bolts per hour. When only machines *A* and *C* are working, they produce 197 bolts per hour. When only machines *A* and *B* are working, they produce 202 bolts per hour. How many bolts can each machine produce per hour?