

STRUCTURE PROBLEMS

Understanding Mixture Problems

LESSON PLAN

Hook students with the Lab Tech question. As always, we want students to understand the problem before they represent it algebraically. Students will learn how to construct solutions, before they learn how to deconstruct them.

1. Have students use the multi-link cubes to represent 2L of 50% acid solution. Define one multi-link cube as one liter of solution. One color represents water, the other color represents acid. The students then represent the 5L of 20%. Record both of these on the student handout.
2. Ask the students why the combined percentage is not the average of the two percentages. The students see that the greater initial amount has a greater influence on the outcome (weighted averages). Then lead the students through the algebraic representation of their sticks. Show the students that the first step in solving the equations represents the number of acid cubes in each stick. The second step shows the number of acid cubes in the combined stick. The third step shows the final percentage.
3. Now that the students understand the dynamics of mixing solutions, it is time to deconstruct one solution into the initial two solutions (Separate one large stick into two smaller sticks). Have students first use the multi-link cubes to represent the 10L of 40% solution. Then challenge them to separate this stick into two smaller sticks. Don't be surprised how easily they accomplish this! Have them repeat this process for problem #4. They should record each stick diagram.
4. The ultimate task now, of course, is to get the students to represent these problems algebraically. The big question in splitting the sticks is "How many cubes (liters) are in each stick?" Once they can solve the problem algebraically, go back and tackle the original question regarding the Lab Tech.

Concepts

Mixture problems; fractions and percentages; geometric and algebraic representations

Time: 1-2 hours

Materials

Multi-link cubes or colored blocks

Preparation

Each pair of students needs 20 cubes of one color, and 20 of another color.

DIAGRAMS & SOLUTIONS (multi-link cube models)

*In order to protect the integrity of these lessons in the classrooms, the solutions have been removed from this version of the project. For a copy of the entire project, including all of the solutions, order **MPJ's Ultimate Math Lessons** at <http://www.mathprojects.com> or call 1-800-247-6553 to order over the phone.*

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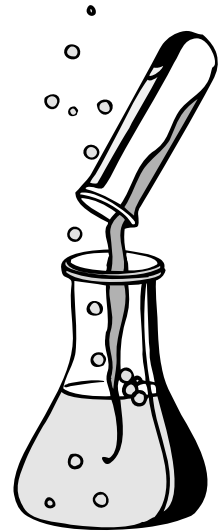
A lab technician has a solution that is 60% acid, and another that is 40% acid. How much of each solution should be mixed to produce 100L of 50% acid solution?

Representation with multi-link cubes: 1 cube equals 1 liter of solution or 1 liter of acid (depending on color).

1. Start with 2L of 50% solution and 5L of 20% solution. What percent of the 7L mixture will be acid?

- Use multi-link cubes to demonstrate the 2L of 50%.
- Use multi-link cubes to demonstrate the 5L of 20%.
- Combined the two to show the percentage of 7L solution.

2. Try again with 10L of 60% solution and 4L of 25% solution. What percent of the 14L mixture will be acid?



3. Now, some quantity of 50% acid solution and another quantity of 25% acid solution must be mixed to form 10L of solution that is 40% acid. How much of each must be mixed?

- Use multi-link cubes to represent the 10L of 40%.
- Split the 10L into two portions, one that is 50% and another that is 25% solution.

4. Finally, some quantity of 40% acid solution and another quantity of 10% acid solution must be mixed to form 15L of solution that 20% acid. How much of each must be mixed?