Lesson 17: Mixture Problems

Classwork

Opening Exercise

Imagine you have two equally sized containers. One is pure water, and the other is 50% water and 50% juice. If you combined them, what percent of juice would be the result?

	1st liquid	2nd liquid	Resulting liquid
Amount of liquid (gallons)			
Amount of pure juice (gallons)			

If a 2-gallon container of pure juice is added to 3 gallons of water, what percent of the mixture is pure juice?

	1st liquid	2nd liquid	Resulting liquid
Amount of liquid (gallons)			
Amount of pure juice (gallons)			

If a 2-gallon container of juice mixture that is 40% pure juice is added to 3 gallons of water, what percent of the mixture is pure juice?

	1st liquid	2nd liquid	Resulting liquid
Amount of liquid (gallons)			
Amount of pure juice (gallons)			

If a 2-gallon juice cocktail that is 40% pure juice is added to 3 gallons of pure juice, what percent of the resulting mixture is pure juice?

	1st liquid	2nd liquid	Resulting liquid
Amount of liquid (gallons)			
Amount of pure juice (gallons)			

Example 1

A 5-gallon container of trail mix is 20% nuts. Another trail mix is added to it, resulting in a 12-gallon container of trail mix that is 40% nuts.

a. Write an equation to describe the relationships in this situation.

b. Explain in words how each part of the equation relates to the situation.

c. What percent of the second trail mix is nuts?

Exercise 1

Represent each situation using an equation, and show all steps in the solution process.

a. A 6-pint mixture that is 25% oil is added to a 3-pint mixture that is 40% oil. What percent of the resulting mixture is oil?

b. An 11-ounce gold chain of 24% gold was made from a melted down 4-ounce charm of 50% gold and a golden locket. What percent of the locket was pure gold?

c. In a science lab, two containers are filled with mixtures. The first container is filled with a mixture that is 30% acid. The second container is filled with a mixture that is 50% acid, and the second container is 50% larger than the first. The first and second containers are then emptied into a third container. What percent of acid is in the third container?

Example 2

Soil that contains 30% clay is added to soil that contains 70% clay to create 10 gallons of soil containing 50% clay. How much of each of the soils was combined?

Exercise 2

The equation $(0.2)(x) + (0.8)(6 - x) = (0.4)(6)$ is used to model a mixture problem.

a. How many units are in the total mixture?

b. What percents relate to the two solutions that are combined to make the final mixture?

c. The two solutions combine to make 6 units of what percent solution?

d. When the amount of a resulting solution is given (for instance, 4 gallons) but the amounts of the mixing solutions are unknown, how are the amounts of the mixing solutions represented?

Lesson Summary

- Mixture problems deal with quantities of solutions and mixtures.
- The general structure of the expressions for mixture problems are

$$\text{Whole Quantity} = \text{Part} + \text{Part}.$$

- Using this structure makes the equation resemble the following:

$$(\%\text{ of resulting quantity})(\text{amount of resulting quantity}) = (\%\text{ of } 1^{\text{st}}\text{ quantity})(\text{amount of } 1^{\text{st}}\text{ quantity}) + (\%\text{ of } 2^{\text{nd}}\text{ quantity})(\text{amount of } 2^{\text{nd}}\text{ quantity}).$$

Problem Set

1. A 5-liter cleaning solution contains 30% bleach. A 3-liter cleaning solution contains 50% bleach. What percent of bleach is obtained by putting the two mixtures together?

2. A container is filled with 100 grams of bird feed that is 80% seed. How many grams of bird feed containing 5% seed must be added to get bird feed that is 40% seed?

3. A container is filled with 100 grams of bird feed that is 80% seed. Tom and Sally want to mix the 100 grams with bird feed that is 5% seed to get a mixture that is 40% seed. Tom wants to add 114 grams of the 5% seed, and Sally wants to add 115 grams of the 5% seed mix. What will be the percent of seed if Tom adds 114 grams? What will be the percent of seed if Sally adds 115 grams? How much do you think should be added to get 40% seed?

4. Jeanie likes mixing leftover salad dressings together to make new dressings. She combined 0.55 L of a 90% vinegar salad dressing with 0.45 L of another dressing to make 1 L of salad dressing that is 60% vinegar. What percent of the second salad dressing was vinegar?

5. Anna wants to make 30 mL of a 60% salt solution by mixing together a 72% salt solution and a 54% salt solution. How much of each solution must she use?

6. A mixed bag of candy is 25% chocolate bars and 75% other filler candy. Of the chocolate bars, 50% of them contains caramel. Of the other filler candy, 10% of them contain caramel. What percent of candy contains caramel?

7. A local fish market receives the daily catch of two local fishermen. The first fisherman's catch was 84% fish while the rest was other non-fish items. The second fisherman's catch was 76% fish while the rest was other non-fish items. If the fish market receives 75% of its catch from the first fisherman and 25% from the second, what was the percent of other non-fish items the local fish market bought from the fishermen altogether?