Ratios and Proportions

If you enjoy cooking, as Curtis Aikens does, you probably know quite a bit of math. Every time you make dressing for one portion of salad, for example, there's more to think about than just vinegar and oil. You're also dealing with **ratios**.

A **ratio** (RAY-she-o) shows a relationship between two numbers or quantities. If your dressing calls for 2 tablespoons of oil and 1 tablespoon of vinegar, the ratio of oil to vinegar is **2 to 1**. This means that for every 2 parts of oil, the dressing has 1 part of vinegar.

The ratio 2 to 1 can be written in two other ways:

- With a colon, 2:1
- As a fraction, $\frac{2}{1}$

The colon is always read as "to," as in "two to one."

TRY IT

Write the following ratios with a colon, and then as a fraction.

1. 5 to 3 _____ and _____

2. 21 to 4 _____ and _____

Back to our salad dressing. Using 2 tablespoons of oil and 1 tablespoon of vinegar makes dressing for only *your* salad. What if you're making salad for **three** people? **That means you'll need three times as much of each ingredient, since you are cooking for three times as many people as the recipe calls for**. But, you'll want the relationship of the ingredients (2:1) to stay the same.

So here's where your math skills come in. You **multiply** the amount you have of each ingredient by 3 — the number of total salad eaters. Instead of 2 tablespoons of oil and 1 tablespoon of vinegar (for 1 person), you'll need 6 tablespoons of oil and 3 tablespoons of vinegar for 3 people. Even though you are using more oil and more vinegar, the **ratio** of the ingredients stays the same: 6 parts oil to 3 parts vinegar is the same ratio as 2 parts oil to 1 part vinegar. Since you multiplied each ingredient by the same number, the **ratio** of oil to vinegar hasn't changed.

And now you've moved into a new math concept called **proportion** (pro-POR-shun).

A **proportion** is a statement that two ratios are equal: **2:1 = 6:3**, **2 to 1 equals 6 to 3**, or $\frac{2}{1} = \frac{6}{3}$. For our salad dressing, you've kept the same ratio of oil to vinegar — you've just *tripled* (or multiplied by 3) the quantity of the original recipe.

YOUR TURN

Write the ratios. Then set up the proportion.

1. To make chili, you use 3 hot chili peppers to 2 pounds of chopped meat. The ratio of how many hot peppers you use to how much meat you use is _____. For a Kwanzaa celebration, you want to make **four times** as much chili. The ratio of how many hot peppers you use to how much meat you use is _____. To show these two ratios are the same, write them as a proportion: _____.

2. For lemon sauce, the recipe calls for 6 lemons to 2 tablespoons of fresh chopped tarragon. The **ratio** of how many lemons you use to how much tarragon you use is _____. But if you want to want to double the recipe, you multiply the ingredients by 2. What's the new ratio of lemons and tarragon? _____ Now write the two ratios as a proportion. _____

MORE PRACTICE

Say you're making a pot of coffee, and you're following the directions on the can:

1. What's the ratio of coffee to water? _____

2. If you use 5 tablespoons of coffee, how many fl. oz. of water will you need to keep the ratio of coffee to water the same? Write your answer as a ratio. _____ (Hint: The directions call for 1 tablespoon of coffee for every 6 fl. oz. of water. If you use 5 tablespoons of coffee, you've multiplied the amount of coffee by 5. What do you need to multiply the amount of water by to keep the ratio of coffee to water the same?)

3. Since the two ratios are the same, they are in proportion. Write the proportion.

_____.

4. You're having a party. There are 17 men who've accepted the invitation, but only 8 women. What is the ratio of men to women?

_____

tips Always set up the ratio in the order in which it is written. Here, it is men to women — the number for men first, then the number for women.

5. A punch recipe calls for 3 cups of juice to every 4 cups of water. What is the ratio of juice to water in the punch? _____ You need to double (multiply by 2) the amount the recipe calls for. How many cups of juice and water should you mix? Write your answer as a ratio. _____ Now re-write the answer as a proportion.

_____

BUT WHAT IF...

Suppose you need **less** of a recipe, not more. You still have to keep the ingredients in proportion. To do that, you **divide** the ingredients by the same number. Dividing all ingredients by the same number keeps the amounts of all of the ingredients in the same proportion as the recipe calls for. Say you were planning to make a pot of coffee, calling for 10 tablespoons of coffee and 60 fluid ounces of water. If you decide to make half as much, just **divide** your ingredients by 2 to keep everything in proportion. Instead of 10 tablespoons of coffee, use 5; instead of 60 ounces of water, use 30: and your coffee will be good to the last drop.

10:60 = 5:30

TRY IT

A recipe calls for 4 cups of cornbread mix and 2 eggs. But you realize you have only one egg left in the fridge. If you want to keep the ratio of cornbread mix to eggs the same as the recipe calls for, how many cups of cornbread mix should you combine with your one egg? _____ Try re-writing the answer as a proportion. _____

Try It: 2 cups, for the ratio of 2:1 or $\frac{2}{1}$, 4:2 = 2:1 or $\frac{4}{2} = \frac{2}{1}$

More Practice: 1. 1:6 or $\frac{1}{6}$; **2.** 5:30 or $\frac{5}{30}$; **3.** 1:6 = 5:30 or $\frac{1}{6} = \frac{5}{30}$; **4.** 17:8 or $\frac{17}{8}$; **5.** 3:4 or $\frac{3}{4}$, 6:8 or $\frac{6}{8}$, 3:4 = 6:8 or $\frac{3}{4} = \frac{6}{8}$

ANSWERS: Try It: 1. 5:3, $\frac{5}{3}$; **2.** 21:4, $\frac{21}{4}$. **Your Turn: 1.** 3:2 or $\frac{3}{2}$, 12:8 or $\frac{12}{8}$, 3:2 = 12:8 or $\frac{3}{2} = \frac{12}{8}$; **2.** 6:2 or $\frac{6}{2}$, 12:4 or $\frac{12}{4}$, $\frac{6}{2} = \frac{12}{4}$ or 6:2 = 12:4

In the Kitchen

Vegetable Curry

A curry is a kind of stew made with spices. There are many different spices that go into a great curry sauce. You can make your own or simply add curry powder, which is sold in most supermarkets. This curry dish serves 4 people.

- 1/2 stick unsalted butter
- 1 large onion, chopped
- 3 cloves garlic, minced
- 2 tablespoons curry powder
- 4 carrots, peeled and diced
- 6-8 small red potatoes, peeled and diced
- 4 cups of chicken stock or vegetable broth (canned or bouillon)
- 1 teaspoon ground cinnamon
- 2 tablespoons honey
- 2 medium tomatoes, peeled and chopped
- 1 cup fresh or frozen peas
- 1 cup raw asparagus, cut into 1/2-inch pieces
- Salt and pepper to taste

1. In a heavy-bottomed pot, heat the butter over medium flame. Add the onion and cook until soft, about 10 minutes, stirring every now and then. Stir in the garlic and cook a few more minutes. Add curry powder and continue to cook, 1-2 minutes, stirring constantly. Add carrots and potatoes, stock or broth, cinnamon, and honey. Bring to a boil, lower the flame, cover, and simmer until the vegetables are tender, about 10 to 12 minutes.
2. Meanwhile, put the tomatoes in boiling water for 1-2 minutes until the skins start to peel away. Rinse them under cold water, then peel, seed, and chop. Add tomatoes to the stew, along with the peas and asparagus pieces. Cook the whole mixture for 5-6 more minutes, stirring, until the vegetables are tender. Taste and season with salt and pepper, if desired. Serve over rice.

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Build Your Vocabulary

PROPORTION

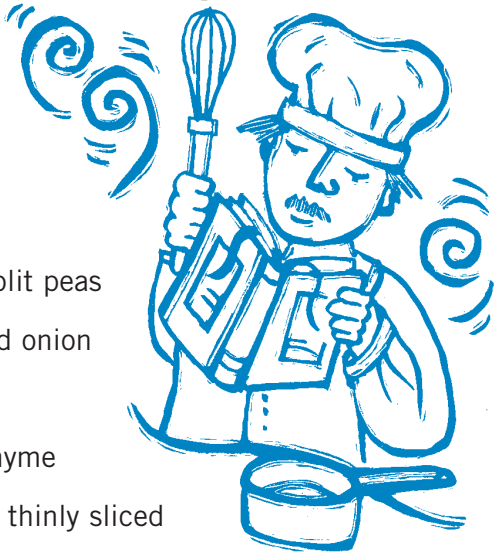
Proportion (pro-POR-shun) describes the relationship of one quantity, size, or part of something to another.

Let's say you're following a recipe for lemonade that calls for $1\frac{1}{2}$ cups of lemon juice to $\frac{1}{2}$ cup of sugar. The **proportion** or relationship of lemon juice to sugar will determine the sweetness of your lemonade — too much sugar and your drink may be too sweet, too little sugar and your drink may be too sour.

LET'S GET COOKING

When you adapt a recipe to make more or less of a dish, you must keep the **proportions** among the ingredients the same. Change one amount and you must change them all to keep the ingredients in the right relationship.

Here's a recipe for split pea soup that serves six. Rewrite this recipe so that it serves three. [**Hint:** You will have to divide each ingredient in half because three is half of six.]



Old-Fashioned Split Pea Soup

makes 6 servings		*makes 3 servings*
2 cups dried split peas	→	1. _____ dried split peas
1 cup chopped onion	→	2. _____ chopped onion
12 cups water	→	3. _____ water
1 teaspoon dried thyme	→	4. _____ dried thyme
4 carrots, thinly sliced	→	5. _____ carrots, thinly sliced

6. What would happen if you reduced the peas by half, but forgot to reduce the water?

KEEPING THINGS IN PROPORTION

Proportion is often used to describe a balanced, proper, or harmonious relationship of one thing to another. For example, a nose that's in **proportion** to a face isn't too big and isn't too small — it's just right!

Proportionate (pro-POR-shun-et) is an adjective meaning "in proportion." **Disproportionate** means "not in proportion."

Fill in the blanks with either **proportionate** or **disproportionate**.

7. The coach recruited girls for the soccer team so the number of boys would not be _____.

8. Katie and her two friends picked the winning number and won $900 in the lottery. They each took a _____ share of the winnings: $300 per person.

9. Sam protested the fine he received for jaywalking, claiming that a $2000 fine was _____ to his crime.

ANSWERS: 1. 1 cup; **2.** 1/2 cup; **3.** 6 cups; **4.** 1/2 teaspoon; **5.** 2; **6.** The soup would be thin and watery.; **7.** disproportionate; **8.** proportionate; **9.** disproportionate

MEET Curtis Aikens

Celebrity Chef

He was 26 years old when he learned to read with confidence. Six years later, he was writing popular cookbooks. Today he's a chef who appears regularly on radio and TV. How did he do it?

When he was a small boy in Georgia, Chef Curtis Aikens explains, he was a second-grader in a failing school. "It wasn't learning," he says today. "It was babysitting."

Curtis was transferred to a better school, but it was too late. He was far behind his classmates. Afraid to ask for help, he relied on his winning personality to make it through high school and get into college.

All along, though, Curtis had a particular passion: food and cooking. As a small boy, he had helped his grandfather tend the family garden. During his high school years, he worked in the produce department of the local supermarket. "I just loved fruits and vegetables," Curtis recalls.

In the early 1980s, Curtis turned his love for food into a career. From 1981 to 1986, he operated his own successful produce company, Peaches. But he was still afraid that his low literacy skills would be discovered.

One day, while watching television, Curtis saw a commercial for a free literacy program at his local library. He knew it was time to get help. After working hard with a tutor for several years, Curtis learned to read and write at an adult level.

Today, Curtis is a popular TV chef and culinary consultant, the author of four books about cooking and produce, and the father of two boys. He is also a tireless spokesman for literacy and a generous supporter of programs like the one that helped him improve his reading skills.

FINE-TUNE YOUR WRITING

Write a recipe that you particularly enjoy, or that has been handed down by someone in your family.