Cafeteria Grade 7 Equivalent Ratios Clarification

CCSSM: Grade 7

DOMAIN: Ratios and Proportional Relationships

Cluster: Analyze proportional relationships and use them to solve real-world and mathematical problems.

Standard: **7.RP.2:** Recognize and represent **proportional relationships** between quantities.
2a. Decide whether two quantities are in a **proportional relationship**.

Clarification of Math Discussion Terms

A **RATIO** is a comparison of two values that are written 1 out of 2, 1:2, or $\frac{1}{2}$. The comparison can be a part to part, whole to part, or part to whole relationship.

EQUIVALENT RATIOS have the same value. Two ratios with an equal sign between them form a **PROPORTION,** an equation indicating that two ratios are equivalent, such as $\frac{2}{3} = \frac{8}{12}$.

Classroom Example 1

If a class has 6 boys and 8 girls, what is the ratio of boys to girls?

6 to 8 or $\frac{6}{8}$, which is a part to part ratio

What is the ratio of students to boys?

14 to 6 or $\frac{14}{6}$, a whole to part ratio

What is the ratio of boys to the entire class?

6 to 14 or $\frac{6}{14}$, a part to whole ratio

To find an equivalent ratio, multiply the numerator and the denominator by the same number: $\frac{6 \times 2}{8 \times 2} = \frac{12}{16}$. This is actually multiplying by 1, since any fraction with the same numerator and denominator is equal to 1: $\frac{n}{n} = \frac{2}{2} = 1$

Classroom Example 2

Find a fraction equivalent to $\frac{3}{4}$.

$\frac{3 \times 5}{4 \times 5} = \frac{15}{20}$

An alternative method to find an equivalent ratio is to divide the numerator and the denominator by the same number. $\frac{6 \div 2}{8 \div 2} = \frac{3}{4}$ Dividing the ratio by the same numerator and denominator is the same as dividing by 1, since $\frac{n}{n} = \frac{2}{2} = 1$. This is the same method used when simplifying fractions, which some authors call “reducing” fractions.

Simplifying ratios can be accomplished more efficiently by dividing by the **GREATEST COMMON FACTOR, (GCF)** or **GREATEST COMMON DIVISOR (GCD)**, the largest number that will divide into both the numerator and denominator. For example, to find ratios equivalent to $\frac{24}{36}$, simply divide by the GCF, 12: $\frac{24 \div 12}{36 \div 12} = \frac{2}{3}$, rather than successive divisions: $\frac{24 \div 2}{36 \div 2} = \frac{12}{18,}$ and $\frac{12 \div 3}{18 \div 3} = \frac{4}{6}$, and $\frac{4 \div 2}{6 \div 2} = \frac{2}{3}$

Classroom Example 3

Write the ratio $\frac{25}{75}$ in simplest form.

$\frac{25 \div 5}{75 \div 5} = \frac{5}{15,}$ $\frac{5 \div 5}{15 \div 5} = \frac{1}{3}$, or, using the GREATEST COMMON FACTOR: $\frac{25 \div 25}{75 \div 25} = \frac{1}{3}$

The Math in the Puzzle

In the Cafeteria puzzle, players must place foods with the correct amounts on the appropriate trays by observing ratios among the foods that are already on the trays. Proportions must be maintained between the food values on each tray and between trays.

In the

screen shot above, a player could use the first monster's tray on the left to write a ratio relating the burger to the drumstick: $\frac{burger}{drumstick} = \frac{15}{20}$, or $\frac{3}{4}$. This means that the $\frac{15}{20}$ or $\frac{3}{4}$ ratio of burger to drumstick must be maintained for all of the trays. Likewise, the ratio of drumstick on the first tray to drumstick on the last tray is $\frac{20}{40}$, or $\frac{1}{2}$ so all items on the last tray must be twice the corresponding item on the first tray.