# 5.4 Identifying and Writing Proportions

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Students in Mr. Howell's math class are measuring the width $w$ and the length $l$ of their heads. The ratio of $l$ to $w$ is 10 inches to 6 inches for Jean and 25 centimeters to 15 centimeters for Pat.

These ratios can be written as the fractions $\frac{10}{6}$ and $\frac{25}{15}$. Since both simplify to $\frac{5}{3}$, they are equivalent. **Equivalent ratios** are ratios that name the same comparison.

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An equation stating that two ratios are equivalent is called a **proportion.** The equation, or proportion, below states that the ratios $\frac{10}{6}$ and $\frac{25}{15}$ are equivalent.

$$\frac{10}{6} = \frac{25}{15}$$

**Reading Math**

Read the proportion $\frac{10}{6} = \frac{25}{15}$ by saying "ten is to six as twenty-five is to fifteen."

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If two ratios are equivalent, they are said to be *proportional to* each other, or *in proportion*.

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**Determine whether the ratios are proportional.**

$\frac{24}{51}$ , $\frac{72}{128}$     $\frac{24}{51} \overset{?}{\neq} \frac{72}{128}$

not proportional

**Determine whether the ratios are proportional.**

$\frac{150}{105}$ , $\frac{90}{63}$     $\frac{150}{105} = \frac{90}{63}$

proportional

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**Determine whether the ratios are proportional.**

$\frac{54}{63}$ , $\frac{72}{144}$     $\frac{54}{63} \neq \frac{72}{144}$

**Determine whether the ratios are proportional.**

$\frac{135}{75}$ , $\frac{9}{4}$     $\frac{135}{75} \neq \frac{9}{4}$

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**Common Denominator**

Directions for making 12 servings of rice call for 3 cups of rice and 6 cups of water. For 40 servings, the directions call for 10 cups of rice and 19 cups of water. Determine whether the ratios of rice to water are proportional for both servings of rice.

| Servings of Rice | Cups of Rice | Cups of Water |
|---|---|---|
| 12 | 3 | 6 |
| 40 | 10 | 19 |

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$$\frac{3}{6} \neq \frac{10}{19}$$

$$\frac{1}{2} \neq \frac{10}{19}$$

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Use the data in the table to determine whether the ratios of beans to water are proportional for both servings of beans.

| Servings of Beans | Cups of Beans | Cups of Water |
|---|---|---|
| 8 | 4 | 3 |
| 35 | 13 | 9 |

$$\frac{4}{3}^{36} \neq \frac{13}{9}^{39}$$

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You can find an equivalent ratio by multiplying or dividing the numerator and the denominator of a ratio by the same number.

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Find a ratio equivalent to each ratio. Then use the ratios to find a proportion.   Possible Answers:

A. $\frac{3}{5}$    $\frac{3}{5} = \frac{30}{50}$

A. $\frac{2}{3}$    $\frac{2}{3} = \frac{4}{6}$

B. $\frac{28}{16}$    $\frac{28}{16} = \frac{7}{4}$

B. $\frac{16}{12}$    $\frac{16}{12} = \frac{8}{6}$

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**Determine whether the ratios are proportional.**

1. $\frac{9}{30}, \frac{12}{40}$    $\frac{9}{30}^{360} = \frac{12}{40}^{360}$    2. $\frac{12}{21}, \frac{10}{15}$

Yes

**Find a ratio equivalent to each ratio. Then use the ratios to write a proportion.**

3. $\frac{3}{8}$    $\frac{3}{8} = \frac{30}{80}$    4. $\frac{3}{7}$

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5. In pre-school, there are 5 children for every one teacher. In another preschool there are 20 children for every 4 teachers. Determine whether the ratios of children to teachers are proportional in both preschools.

$$\frac{5}{1} \stackrel{?}{=} \frac{20}{4}$$

Yes!

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