Ratios, Rates and Proportions

I. A ratio is a comparison of two quantities with the same units. There are three different ways to write a ratio.

For example if we want to compare the number 2 to the number 3, we would write it one of the following ways:

2 to 3   2:3 $\dfrac{2}{3}$

If we want to write a ratio that compares the number 3 to the number 1, we would write it one of the following ways:

3 to 1   3:1 $\dfrac{3}{1}$

Remember that a ratio must always be in simplest form but have two numbers.

Write the following ratios in fraction form, be sure they are in lowest terms.

A) 9:17   B) $12 to $38   C) $9\dfrac{1}{3} \, to \, 9\dfrac{1}{2}$

II. A rate is used to compare two quantities with different units. We also write rates in simplest form and when the denominator reduces to 1 we have a unit rate.

For example, if we want a rate for 5 cars for 20 people, we write:

$\dfrac{5\,cars}{20\,people} = \dfrac{1\,car}{4\,people}$. The last rate is the rate in simplest form.

Write the following rates in simplest fraction form.

A) 186 miles in 8 hours   B) 82 hours for 18 projects

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III. Unit rates are rates that have a one in the denominator. For example, to write 132 miles on 3 gallons of gas as a unit rate, we would:

$$\frac{132\,miles}{3\,gallons} = \frac{44\,miles}{1\,gallon} = 44 \text{ miles per gallon or 44 mpg}$$

Find the following unit rates:

A)   1200 cars in 400 households   B)   243 miles in 9 hours

C) $950 earned in 5 weeks

IV. Application problems involving ratios and unit rates.

A couple went out for the evening and spent $38 on dinner and $24 at the movies. What is the ratio of dollars spent on dinner to the total amount spent for the evening?

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Another Application Problem: One jar of jelly costs $2.32 for 16 ounces. Another jar costs $2.03 for 13 ounces. Find which is the better buy (lower cost per ounce) for the jelly. Round your unit prices to two decimal places (hundredths place).

V.   Proportions: A proportion is composed of two equal ratios. The following proportion can be written two different ways.

3 is to 5 as 6 is to 10

Can be written: 3:5::6:10 or $\dfrac{3}{5} = \dfrac{6}{10}$.

Remember: two fractions are equal when their cross products are equal.

$$\frac{3}{5} = \frac{6}{10}$$

$$3 \times 10 = 5 \times 6$$

$$30 = 30$$

To determine a proportion, make sure the cross products are equal. Determine if the following are proportions.

A) $\dfrac{1}{2} = \dfrac{3}{6}$ B) $\dfrac{4}{10} = \dfrac{16}{39}$

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C) $\dfrac{40}{39.2} = \dfrac{5}{5.3}$ 　　　　　　D) $\dfrac{2\frac{5}{9}}{5} = \dfrac{5\frac{1}{9}}{10}$

VI.　Using proportions, solve the following application problems. Answer the question with a complete sentence and give reasons for your answer.

A car traveled 578 miles in 8.5 hours. A truck traveled 272 miles in 4 hours. Did they travel at the same speed?

Sharon earned gross pay of $793.80 working 42 hours each week in a web design agency. Jesse's gross weekly pay was $737.10 for a 39-hour work week with a different agency. Was Sharon's pay per hour the same as Jesse's?