

~~Section 9-1~~ Ratios and Rates

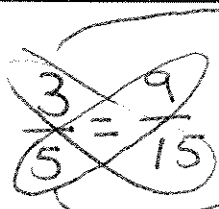
A **ratio** is a comparison of two numbers by division. You basically treat a ratio just like a fraction. For example, if we were comparing the height of a box which is 8 inches to the length of the box which is 30 inches the ratio would be $8/30$. We could then reduce the ratio down just like a fraction to $4/15$.

When you have a ratio and the two numbers you are comparing are two measurements with two different units of measurement then you are talking about a **rate**. For example, if you wanted to compare 10 gallons of gas in a car to the distance it traveled on those 10 gallons of gas which is 350 miles. The rate would be $10\text{gallons}/350\text{miles}$ which could reduce to $1\text{gallon}/35\text{miles}$. This number is still a ratio, but it is a special ratio (*rate*).

If we are dealing with a rate and when we reduce we have a 1 in the denominator then this is called a **unit rate**. We use unit rates a lot when finding out the cost of a particular item. For example if a can of soup contains 8 ounces and the can of soup cost \$2.40 we could find out how much each ounce of soup costs by using the rate $\$2.40/8\text{ ounces}$ which reduces to $\$0.30/1\text{ ounce}$. Thus for every ounce of soup it costs \$0.30

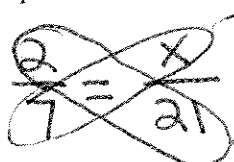
~~Section 2.1~~ Proportions

When we make two ratios equal to each other this is called a proportion. If we multiply opposite numbers in two proportions that results should be equal as long as the proportions are equal to each other. If when we multiply the opposite numbers and the results are not equal then the proportions are not equal to each other. Below is an example of what I mean when we multiply opposite numbers, this is really called finding the cross products.


$$3 \cdot 15 = 5 \cdot 9$$
$$45 = 45$$

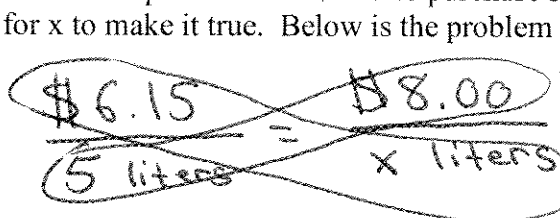
Thus the fractions are equal

Now if we know three of the four numbers in two different proportions and we want to find the fourth number to make the proportions equal we use the cross products (multiplying opposites) to find it. Below is an example of what I mean.


$$7x = 2 \cdot 21$$
$$\frac{7x}{7} = \frac{42}{7}$$
$$x = 6$$

thus $\frac{2}{7} = \frac{6}{21}$

Sometimes we have to come up with the proportions on our own after some information is given to us. The important thing to remember when writing proportions is to keep the correct labels across from one another. For example if it costs \$6.15 to purchase 5 liters of cola, and x liters costs \$8.00 what number goes in for x to make it true. Below is the problem worked out.


$$5 \cdot 8 = 6.15x$$
$$\frac{40}{6.15} = \frac{6.15x}{6.15}$$
$$6.5 = x$$

6.5 liters

If we are dealing with a rate and when we reduce we have a 1 in the denominator then this is called a unit rate. We use unit rates a lot when finding out the cost of a particular item. For example if a can of soup contains 8 ounces and the can of soup cost \$2.40 we could find out how much each ounce of soup costs by using the rate $\$2.40/8$ ounces which reduces to $\$0.30/1$ ounce. Thus for every ounce of soup it costs \$0.30

~~Section 9.1~~ Using the Percent Proportion

Now that we know how to use proportions we can express fractions as percents. A percent is some number out of 100. So to convert a fraction to a percent make the fraction equal to some number over 100 then use cross products to find the value of the variable. A few examples are below.

$$\frac{3}{20} = \frac{x}{100}$$

$$3(100) = 20x$$

$$\frac{300}{20} = \frac{20x}{20}$$

$$15\% = x$$

Sometimes we know the percent but want to find the fraction, then we use a nice formula for these it is listed below. Then use cross products to find the values you are looking for.

A % is always over 100, so take the % and put it over 100.

$$33\% = \frac{33}{100}$$

$$49\% = \frac{49}{100}$$

$$1.35\% = \frac{1.35}{100}$$

$$743\% = \frac{743}{100}$$

~~Section 9.7~~ Fractions, Decimals, and Percents

Now we can take any fraction, decimal, or percent, and convert it into a fraction, decimal, or percent.

Convert fraction into a decimal

Divide the numerator by the denominator

$$\frac{3}{5} \Rightarrow 5 \overline{)3} \quad \text{0.6}$$

Convert fraction into a percent (two ways)

- A. divide the numerator by the denominator to make it a decimal, then move the decimal to the right two place values

$$\frac{3}{5} \Rightarrow 5 \overline{)3} \quad \text{0.6} \quad \text{0.60} = 60\%$$

- B. Use the formula

$$\frac{3}{5} = \frac{x}{100}$$

$$3(100) = 5x$$

$$\frac{300}{5} = \frac{5x}{5}$$

$$60\% = x$$

Convert decimal into a fraction

Find the place value of the farthest right digit, then write the digits over this number

$$0.845 \quad \uparrow \text{thousandths}$$

$$\frac{845}{1,000}$$

Convert decimal into a percent (two ways)

- A. Move the decimal point to the right two place values

$$1.45 = 145\%$$

- B. Convert the decimal into a fraction, then convert the fraction into a percent (rules located towards top)

$$1.45 = 1 \frac{45}{100} = \frac{145}{100} = 145\%$$

Convert percent into a decimal

Move the decimal point two places to the left

$$38\% = 0.38$$

Convert percent into a fraction

A percent is always out of 100 so take the percent and this becomes your numerator (number on top) and place it over 100 which is your denominator (number on bottom) then reduce.

$$38\% = \frac{38}{100}$$

$$1.45\% = \frac{1.45}{100}$$

$$212\% = \frac{212}{100}$$

~~Section 9.5~~ Using Percent Equations

This is much like section 9.5 notes. You will use the formula

$$\frac{\text{is}}{\text{of}} = \frac{\%}{100}$$

I have written a few examples for you

38% of what number is 12

$$\frac{12}{X} = \frac{38}{100}$$

$$12(100) = 38X$$

$$\frac{1200}{38} = \frac{38X}{38}$$

$$31.58 = X = \text{Answer}$$

What percent of 50 is 2?

$$\frac{\text{is}}{\text{of}} = \frac{\%}{100}$$

$$\frac{2}{50} = \frac{X}{100}$$

$$2(100) = 50X$$

$$\frac{200}{50} = \frac{50X}{50}$$

$$4\% = X$$

~~Section 9.10~~ Percent of Change

Now sometimes numbers change concerning prices, population, etc. and we want to know what the percentage change was and we have a formula to do this for us.

- 1) Subtract the new number from the old number, this number becomes your "is" number in the formula, so substitute this number in for "is"
- 2) The old number goes in for "of" in the formula
- 3) 100 goes in the formula where it has always gone
- 4) Use cross products to solve the equation

Probability

Probability is the chance that some event will happen. Ratio of number of ways a certain event can occur to the number of possible outcomes is how it is expressed.

When determining the probability of an event you only have to identify to things

1. how many times the event you want to happen can occur
2. how many total things can occur

Example: What is the probability of rolling a 3 on a 6-sided dice.

- 1) the event we want to happen is rolling a 3 and there is only one three on the dice so there is only 1 time this event can happen
- 2) there are six different number on the dice so there is a total of 6 things or outcomes that can happen.

Now we express the two numbers as a probability in a ratio as $1/6$

Example: What is the probability of rolling either a 1 or 2 on a 6-sided dice.

- 1) the event we want to happen is rolling a 1 or 2 and there is one 1 and one 2 on the dice so there is only 2 times this event can happen
- 2) there are six different number on the dice so there is a total of 6 things or outcomes that can happen.

Now we express the two numbers as a probability in a ratio as $2/6$ or reduced $1/3$.