Name ______________________

Topic 9 Notes
Ratios

Keywords/Topic and Assignments	**Information, Definitions, Solutions**
9.1 Ratios	
New Terms	
Ratio	A relationship in which for every x units of one quantity there are y units of another quantity. Ratios may be written in 3 ways. (ex. The ratio of boys (12) to girls (14) in Mr. Levine's class maybe written as 12:14, 12 to 14, or 12/14 (fraction form))
Terms of a Ratio	Are the quantities x and y in the ratio. The terms of the ratio 12:14 are 12 and 14.
Review Terms	
Today's Concept	Ratios are a great way to compare data, numbers, units, and other quantities. Ratios can be **written 3 different ways**. Mr. Levine has 25 action figures. There are 20 male action figures and 5 female action figures. We can write the ratio of male action figures to female action figures in each of these ways: 20 to 5 20:5 20/5 In each case the numbers 20 & 5 are called terms. We are comparing the number of male action figures to female action figures. We can say that for every 20 male action figures there are 5 female action figures. Notice the last ratio is written to look like a fraction, but it isn't a fraction. When we write fractions the numerator and denominator must be whole numbers. When we write ratios that look like fractions, they can have decimals as a top and bottom term. There are 3 types of ratios; **part-to-part, part-to-whole, and whole-to-part.** It's lunch time. The cafeteria is serving Bosco Sticks! At your table there are 15 Bosco sticks and 5 sauce cups. You can make two **part-to-part** ratios from this information. 15 sticks to 5 sauce cups or 5 sauce cups to 15 sticks

9.1 Ratios Continued	You can make two **part-to-whole** ratios from this information. 15 sticks:20 lunch items or 5 sauce cups:20 lunch items A part-to-whole ratio is a fraction You can make two **whole-to-part** ratios from this information. 20 lunch items:15 sticks items or 20 lunch items to 5 sauce cups

Keywords/Topic and Assignments	Information, Definitions, Solutions
9.2 Exploring Equivalent Ratios	
<u>New Terms</u> **Equivalent Ratios**	 Express the same relationship. (ex. 2:3 and 4:6 are equivalent ratios.)
<u>Review Terms</u> **Ratios**	 A relationship in which for every x units of one quantity there are y units of another quantity. Ratios may be written in 3 ways. (ex. The ratio of boys (12) to girls (14) in Mr. Levine's class maybe written as 12:14, 12 to 14, or 12/14 (fraction form))
Terms of a Ratio	Are the quantities x and y in the ratio. The terms of the ratio 12:14 are 12 and 14.
<u>Today's Concept</u>	Remember that Mr. Levine has 20 male action figures and 5 female action figures. A ratio of 20 to 5. Remember also that one of the ways we can write the ratio looks like a fraction. Instead of numerators and denominators we have terms. The ratio would look like 20/5. Sometimes it helps to find equivalent ratios. **Equivalent ratios are called proportions.** We can use what we know about fractions to help find proportions. We can **reduce ratios by common factors**. So we can say that for every 4 male action figures, Mr. Levine has 1 female action figure (4 to 1, 4:1, 4/1) because $\frac{20 \div 5}{5 \div 5} = \frac{4}{1}$ We can also multiply the top and bottom number by the same factor to find proportions, so $\frac{20*3}{5*3} = \frac{60}{15}$ So 20/5 = 4/1 = 60/15 are proportions (equivalent ratios).

Keywords/Topic and Assignments	Information, Definitions, Solutions
9.3 Ratios as Fractions & Ratios as Decimals **<u>New Terms</u>** **<u>Review Terms</u>**	
<u>Today's Concept</u>	As we talked about earlier, ratios can be written 3 different ways. One of the ways is in fraction form. Ratios are like super fractions. They have "powers" that fractions do not possess. One of those powers is the ability to have decimals in the ratio. Fractions can't have a decimal in the numerator or denominator. We don't have to worry about a ratio being improper either. The first term (top term) can be bigger than the 2nd term (bottom term). **<u>10.2</u> ounces of soup** **2 bowls of soup** Is an example of a valid ratio in fraction form, but not a valid fraction. Although it isn't always necessary, or best, to write ratios in simplest form, you use the same methods used to simplify fractions to simplify ratios. Now let's look at another way to write a ratio. You can buy 1 toy for \$4 or a ratio of $\frac{1}{4}$. If you convert ¼ into a decimal = .25, you no longer have two numbers to compare. If you turn a ratio into a decimal the comparison is always to 1. It's assumed that the ratio is .25:1 in this example. I recommend always using two numbers, but you may run across this decimal form for ratios.

Keywords/Topic and Assignments	Information, Definitions, Solutions
9.4 Unit Rates & Unit Prices	
<u>New Terms</u>	
Rate	A ratio involving two quantities measured in different units. (ex. You eat 4 candy bars in 30 minutes. Your eating rate is 4 bars/30 minutes.)
Unit Rate	The rate for one unit of a given quantity. The second term should be equal to 1. (ex. If you eat 16 bars/2 hours, then your unit rate is 8 bars/1 hour.)
Unit Price	The price of one item.
<u>Review Terms</u>	
<u>Today's Concept</u>	We use rates and unit rates all the time. Rates are special ratios and **unit rates are special rates whose bottom (2nd) term is always equal to 1**. Let's say we are going on a trip. It is 240 miles away and it takes 4 hours. Our rate equals 240 miles/4 hours. To calculate the unit rate, you have to divide the top term and the bottom term by the bottom term: $\frac{240 \text{ miles} \div 4}{4 \text{ hours} \div 4} = \frac{60 \text{ miles}}{1 \text{ hour}}$ **So our unit rate is 60 miles/hour.** Sometimes you will want to know how much one item costs in a store. Then you need to calculate the **unit price**. If the Canteen is selling 5 Sour Candy Packages for $2.75 and you want to split the cost with your 4 friends, you can calculate the unit price. $\frac{\$2.75 \div 5}{5 \text{ Sours} \div 5} = \frac{.55¢}{1 \text{ Sour}}$

Keywords/Topic and Assignments	Information, Definitions, Solutions
9.5 Constant Speed	
New Terms	
Distance	How far someone, or something, travels (moves).
Constant Speed	A rate that someone, or something, travels that doesn't change. The rate compares distance to time (ex. 20 miles/1 hour).
Review Terms	
Rate	A ratio involving two quantities measured in different units. (ex. You eat 4 candy bars in 30 minutes. Your eating rate is 4 bars/30 minutes.)
Today's Concept	You will use many formulas in math and throughout life. In this unit we are going to focus on the distance formula: **d=r*t** Where d=distance, r=rate (speed), t=time. Labels are always important. When we use formulas we often work with many labels at once. We can actually have different labels cancel each other out (sort of like when we reduce). Let's try an example. The Flash ran 3,462 miles. It took him 1.5 hours to run that far. How fast was the Flash moving? 1. Use the distance formula d=r*t. 2. Substitute what you know into the formula and don't forget our labels. 3,462 miles=r*1.5 hours 3. Isolate the variable by using the inverse operation. Divide both sides by 1.5 hours. $\frac{3{,}462 \text{ miles}}{1.5 \text{ hours}} = \frac{r*1.5\text{hours}}{1.5\text{hours}}$ $\frac{3{,}462 \text{ miles}}{1.5 \text{ hours}} = r$ 4. Calculate the unit rate by dividing both terms by the bottom term. 3,462/1.5 = 2,308 & 1.5/1.5=1 5. The Flash was moving 2,308 miles/hour

Keywords/Topic and Assignments	Information, Definitions, Solutions
9.6 Measurement and Ratios & Choosing the Appropriate Rate	
New Terms	
Conversion Factor	A conversion factor is a rate that equals 1.
Review Terms	
Unit Rate	The rate for one unit of a given quantity. The second term should be equal to 1. (ex. If you eat 16 bars/2 hours, then your unit rate is 8 bars/1 hour.)
Rate	A ratio involving two quantities measured in different units. (ex. You eat 4 candy bars in 30 minutes. Your eating rate is 4 bars/30 minutes.)
Reciprocal	Two numbers are reciprocals if their product is 1. If a nonzero number is a fraction a/b, then its reciprocal is b/a. (ex. 4/9 and 9/4 are reciprocals. When multiplied together their product is 36/36 = 1.)
Today's Concept	As you know there are many different ways to measure the same object or concept. For example you can run 1 mile or 1760 yards or 5, 280 feet etc. Running a mile might take you 10 minutes or $1/6^{th}$ of an hour or 600 seconds etc. Sometimes when working with different rates you will need to convert the measurements into similar units. You and your friend want to see who can run one mile faster. You promise each other to run 1 mile and tell each other the next day how long running a mile took. You tell your friend that you rant the mile in 620 seconds (a rate of 620 seconds/1 mile). Your friend told you that she rant the mile in 10.13 minutes (a rate of 10.13 minutes/1 mile). Who ran faster? You have to convert both rates to minutes/mile or seconds per mile. You have to use a **conversion factor.**

	Let's try minutes to seconds first. There are 60 seconds/minute so 60 is the conversion factor. **10.13 minutes • 60 = 600.8 seconds** your friend is faster! If we try seconds to minutes, we still use 60 as the conversion factor, but now we use division. **620 seconds ÷ 60 = 10.33 minutes** The key to using conversion factors is knowing when to multiply or when to divide the original rate by your conversion factor. If you are converting larger units to smaller units, multiply**.** If you are converting smaller units to larger units, **divide.** Remember that with two pieces of information you can make two different ratios, or rates if the information is two different measurements. For example;10 minutes:2 miles and 2 miles:10 minutes are two different rates. If we write them in fraction form, we get; $\frac{\textbf{10 minutes}}{\textbf{2 miles}}$ **and** $\frac{\textbf{2 miles}}{\textbf{10 minutes}}$ Notice the two rates are **reciprocals.** You can combine everything you know about unit rates, conversion factors, and ratios in general to get a lot of information from a small amount of data.