MATH NEWS

Grade 7, Module 4, Topic B

LAFAYETTE PARISH SCHOOL SYSTEM

7th Grade Math

Module 4: Percent and Proportional Relationships

Math Parent Letter

This document is created to give parents and students a better understanding of the math concepts found in Eureka Math (© 2013 Common Core, Inc.) that is also posted as the Engage New York material which is taught in the classroom. In Module 4, students deepen their understanding of ratios and proportional relationships from Module 1 by solving a variety of percent problems. They convert between fractions, decimals, and percents to further develop a conceptual understanding of percent and use algebraic expressions and equations to solve multi-step percent problems. An initial focus on relating 100% to "the whole" serves as a foundation for students.

Focus Area Topic B:

Percent Problems Including More than One Whole

Students continue to apply their conceptual understanding of the *part*, *whole*, and *percent* as they solve complex real-world problems.

Words to Know:

Markup is the amount of increase in a price.
Markdown is the amount of decrease in a price.
Original price is the starting price. It is sometimes called the cost or wholesale price.
Selling price is the original price plus the markup or minus the markdown.
Markup rate is the percent increase in the price, and the markdown rate (discount rate) is the percent decrease in the price.
Absolute Error - How far away in units an approximate value is from the exact value.
Percent Error - The percent that the absolute error is of the exact value.

Markup and Markdown Problems

Most **markup** problems can be solved by the equation: $Selling\ Price = (1+m)(Whole)$, where m is the markup rate, and the whole is the original price.

Example:
Games Galore buys the latest video game at a wholesale price of $30.00. The markup rate at Game's Galore Super Store is 40%. You use your allowance to purchase the game at the store. How much will you pay, not including tax?

(store's cost + markup) of **original price**.

$P = (100\% + 40\%)(30)$
$P = (1 + 0.40)(30)$ change % to decimals and add
$P = (1.4)(30)$ multiply
$P = 42$ selling price

I would pay **$42.00** if I bought it from Games Galore.

Focus Area Topic B:

Percent Problems Including More than One Whole

Markup and Markdown Problems (continued)

Most **markdown** problems can be solved by the equation: $Selling\ Price = (1-m)(Whole)$, where m is the markdown

Example:
A $300 mountain bike is discounted 15%. Find the sales price of the bicycle.

(original price − markdown) of **original price**.

$P = (100\% - 15\%)(300)$
$P = (1 - 0.15)(300)$ change % to decimals and subtract
$P = (0.85)(300)$ multiply
$P = 255$ new selling price

The sales price of the bicycle is $255.

Finding Absolute Error

Given the exact value x of a quantity and an approximate value a of it, the absolute error is $|a-x|$.

Example:
Mabry was asked to measure the diagonal of a 15-inch screen (in inches) using a ruler. His measurement of the diagonal was $15\frac{2}{8}$ inches. Find the absolute error for his measurement.

his measurement – exact

$$\left|15\tfrac{2}{8} - 15\right| = |0.25| = 0.25$$

*Using the absolute value tells you how far the actual measurement is below or above your measurement. Absolute value is **always** positive.*

Mabry's measurement was 0.25 inches away from the actual measurement of 15 inches.

Finding Percent Error

The percent error is the percent the **absolute error** is of the exact value: $\frac{|a-x|}{|x|} \cdot 100\%$, where x is the exact value of the quantity and a is an approximate value of the quantity.

Example:
Using the previous example, find the percent error for Mabry's measurement.

Absolute Error

$$\frac{\left|15\frac{2}{8} - 15\right|}{|15|} \cdot 100\%$$

$$\frac{|0.25|}{|15|} \cdot 100\%$$

$$\frac{1}{60} \cdot 100\%$$

$$1\tfrac{2}{3}\%$$

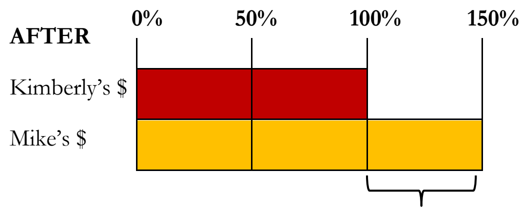
This means that Mabry's measurement of $15\frac{2}{8}$ inches was $1\frac{2}{3}$% off.

Problem Solving when the Percent Changes

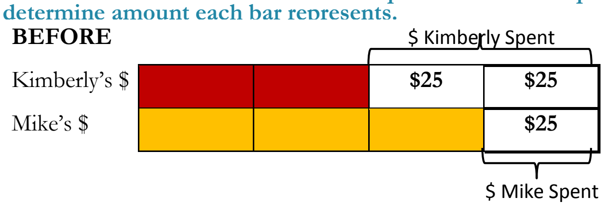
Equations or visual models can be used to solve multi-step word problems related to percents that change.

Example:
Kimberly and Mike have an equal amount of money. After Kimberly spent \$50 and Mike spent \$25, Mike's money is 50% more than Kimberly's. How much did Kimberly and Mike have at first?

Visual Model: (since money is being subtracted, create the "after" picture first)



Now the before model can be created using given information about the amounts each spent. This will help determine amount each bar represents.



Each bar is \$25. They both started with \$100.

Equation Method:
Let x be Kimberly's money ***after*** she spent \$50. After Mike spent \$25, his money is 50%, (0.5) more than hers. Mike's money is also \$25 more than Kimberly's.

$$0.5x = 25$$
$$\frac{0.5x}{0.5} = \frac{25}{0.5}$$
$$x = 50$$

Kimberly started with \$100 because \$100 - \$50 = \$50.
Mike has \$75 because (1.5)50 = 75

Simple Interest

Simple interest problems are solved using the formula $I=Prt$, where $I=$ interest, $P=$ principal, $r=$ interest rate, and $t=$ time. When using this formula both interest rate and time must be compatible. Units should be converted when necessary.

Example:
Larry invests \$100 in a savings plan. The plan pays $4\frac{1}{2}\%$ per year on his \$100 account balance. How much will Larry earn in interest in 3 years?

$$I = Prt$$
$$I = 100(0.045)(3)$$
$$I = 100(0.045)(3)$$
$$I = 13.50$$

Larry earned \$13.50 in interest after 3 years.

What is the new balance of his account?

\$100 + 13.50 **His new account balance is \$113.50**

Real-World Percent Problems:

Tax - *Taxes come in many forms, such as sales tax, hotel tax, property tax, etc.*

Example:
Ms. Stone purchased 3 new paintings for her house. Sales tax in her city is 9%. How much did she pay in taxes if each painting costs \$300.

Part = Percent • Whole
Tax = 9% • 900
t = .09(900)
t = 81

Ms. Stone paid \$81 in sales tax.

Tips - *Gratuity is another word for tip. It is an amount of money (typically ranging from 5%–20%) that is computed on the total price of a service.*

Example:
Devin paid \$125 to have her hair colored and cut.
If she tips her hairdresser 15%, what is her total bill?

Part = Percent • Whole
Tip = 15% • Whole
t = 0.15 • 125
t = 18.75

Total bill
125 + 18.75
143.75

Commission - *Commission on sales is money earned by a sales person (as a reward for selling items).*

Example:
Sarah is a sales representative for a cosmetic company. She is paid \$5.15 per hour each week plus a commission of 10% of the amount of sales over \$5000. She works 40 hours one week, and she sells \$7260 worth of cosmetics during that week. She has been offered a job for another cosmetic company that pays \$5.00 per hour for a 40-hour work week plus a commission of 4% of total sales. Which job would pay more?

Let x = total salary

Sarah's Current Job:	New company if Sarah maintains current level of sales.
x = 5.15(40) + 0.1(7260-5000)	x = 5(40) + 0.04(7260)
x = 206 + 226	x = 200 + 290.40
x = 432	x = 490.40

If Sarah maintains her current level of sales, she would make \$58.40 more with the new company.