Chapter 2 Math Notes GM7 - 2018

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Percents, Fractions, Decimals

A **percent** is a ratio that compares a number to 100.

<u>To write a percent as a decimal</u>

Write each percent as a fraction with a denominator of 100. Divide by 100.

36% = 36/100 = 36 ÷ 100 = 0.36

<u>To write a percent as a fraction in simplest form</u>

Write each percent as a fraction with a denominator of 100. Simplify, if possible.

36% = 36/100 = 18/50 = **9/25**

<u>To write a fraction as a decimal or percent</u>

Divide the numerator by the denominator. Divide to the thousandths place (if possible) and round to the hundredths place.

4/15 = 4 ÷ 15 = 0.266. Round up to 0.27. This is 27%

<u>To find a percent from a mixed number</u>

Method 1:

Convert the mixed number into an improper fraction, then divide to find the decimal. Convert that answer into a percent.

<u>Example</u>:

$\mathbf{1\,\frac{1}{5}} = \frac{6}{5}$

Divide numerator by denominator: 6 ÷ 5 = 1.2
Multiply by 100 to get the percent 1.2 x 100 – 120. **120%**

Method 2:

1) Find the percent for the fractional part.
2) Convert the whole number part into a percent by multiplying by 100.
3) Add these two parts together to get the total percent.

Example:

$3\frac{4}{10} = \quad \frac{4}{10} = 4 \div 10 = 0.4 = \mathbf{40}\%$

3 x 100 = 300 = **300%.** Add **40%** to **300%** to get **340%**

Method 3:

1) If you have a fraction that can be easily converted to 100
   a. Write the mixed number as an improper fraction
   b. Multiply numerator and denominator by the same number to get the denominator equal to 100
   c. The new numerator is your percent.

Example:

$3\frac{4}{10} = \quad \frac{34}{10}\ x\ \frac{10}{10} = \frac{\mathbf{340}}{\mathbf{100}} = \mathbf{340\%}$

To find percent of a number, rewrite the percent as a decimal. Multiply the decimal by the whole number.

Example: Find 22% of 288
22% = 0.22
0.22 x 288 = 63.36
So 22% of 288 is 63.36

Estimating Percents

We estimate most with percents when we are working with taxes, tips, and discounts.

Most tax rates in the country are no more than 10%.

Use 10% as a base rate for *taxable* items. Note: A few products and most foods are taxed at a different rate, or not at all.

Example 1: You buy a shirt that costs $26.00. To find 10% of $26.00, simply move the decimal place one spot to the left. 10% of $26.00 is $2.60. ADD that to the original amount. $26.00 + $2.60 and your total should be around $28.60.

Example 2:

To find a normal tip (15%) on a restaurant bill of $25.20 …

First, round $25.20 to $25
Next, find 10% of $25. Move the decimal over one place to the left: $2.50 That is 10%.
Next, find half of that number ($2.50 ÷ 2 = $1.25). This is 5%. Add the two amounts (10% + 5% = 15%), $2.50 + $1.25 is $3.75. So the normal tip on $25 is $3.75.

Example 3:
You have a coupon for 20% off an item. The item is $15.00. How much will the item cost altogether?

Since 10% of $15.00 is $1.50, **20% is twice that** amount … $3.00

$15.00 - $3.00 = $12.00

But, there is tax on it, too.

$12.00 x 10% = $1.20. $12.00 + $1.20 = $13.20. So the total should be about $13.20

Is/Of Equation (or Percent Proportion)

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

or $\frac{part\ (or\ n\ if\ you\ don't\ know)}{whole\ (or\ n\ if\ you\ don't\ know)} = \frac{\%\ (or\ n\ if\ you\ don't\ know)}{100 <--- always\ 100}$

Cross-multiply the number numbers that are diagonal from each other and then divide by the number that does not match up diagonally with another number to solve

Example 1:
What is 20% of 150?

$$\frac{?or\ n}{150} = \frac{20\%}{100}$$

Multiply 20 by 150 = 3,000
Divide by 100 to find n (the "is") = 30

Example 2
15 is what percent of 90?

$$\frac{15}{90} = \frac{?\%}{100}$$

15 x 100 = 1,500
1,500 ÷ 90 = 16.66
So 15 is 16.7% of 90

Example 3
12 is 30% of what number?

$$\frac{12}{?or\ n} = \frac{30\%}{100}$$

12 x 100 = 1,200
1,200 ÷ 30 = 40
So 12 is 30% of 40

Percent of Change
A ratio that compares the change in quantity to the original amount

Equation: **percent of change** = $\frac{amount\ of\ change}{original\ amount}$

percent of increase = $\frac{amount\ of\ increase}{original\ amount}$

percent of decrease = $\frac{amount\ of\ decrease}{original\ amount}$

percent of error = $\frac{amount\ of\ error}{actual\ amount}$

Example 1: A Blue-Ray player was $280. Now it is on sale for $220. What is the percent of decrease?

percent of decrease = $\frac{amount\ of\ decrease = \$60}{original\ amount = \$280}$

Divide \$60 by \$280 to find the percent. = 0.214 = 21% (rounded)

Example 2: A Blue-Ray player was \$120. Now it is selling for \$220. What is the percent of increase?

$$\text{percent of increase} = \frac{amount\ of\ increase = \$100}{original\ amount = \$120}$$

Divide \$100 by \$120 to find the percent. = 0.833= 83% (rounded)

To Find Sales Tax

1) Turn the tax into a decimal.
2) Multiply the decimal by the total amount.
3) To find the final total, add the sales tax to the total amount

Example:

What is the total cost on exercise equipment that costs \$150 with a sales tax of 6%?

6% = 0.06

0.06 * 150 = 9.00 ← The tax is \$9.00

The total would be \$159 (\$150 + \$9 = \$159)

Markups and Selling Price

A store sells items for more that it pays for those items. The amount of increase is called the markup. The selling price is the amount the customer pays for the item.

Example: What is the selling price of a bicycle that the store bought for \$220 if the markup is 35%

Find 35% of \$220.

0.35 x 220 = \$77

Add that to \$220 to get the selling price: \$297

Discount or Markdown

Is the amount by which the regular price of an item is reduced. The sale price is the regular price minus the discount.

Method One: Multiply the original price by the discount and then subtract.

Method Two: Multiply the original price by the percent of the sale price.

Example 1: A Blue-Ray normally costs $22. It is on sale for 25% off. What is the sale price?
$22 x 0.25 = $5.50
Subtract $5.50 from $22
$22 - $5.50 = $16.50
So the sale price is $16.50

Example 1, Method 2:
Multiply $22 by 75% (0.75)
$22 * 0.75 = $16.50

Example 2:
A cell phone is on sale for 30% off. If the sale price is $360, what is the original price?
To solve this problem, use the Is/Of or Part/Whole equation

$$\frac{\$360}{whole} = \frac{70\%}{100}$$

Notice that the $360 is equal to 70%, not 30%.
In order to find the percent that it is equal to, we just subtract 30% from 100%.

Cross-Multply
$360 * 100 = $36,000
Divide by 70
$36,000 ÷ 70 = $514.29

The original price was $514.29

Simple Interest
Principal is the amount of money deposited (or borrowed)
Simple interest is the amount earned (or paid) for the money

Formula
I= prt

Interest = principal * rate * time

Example 1:

How much interest is earned on a savings account that pays 1.85% interest per year if the deposit amount is $500?

Interest = principal * rate * time

Interest = $500 * 0.0185 (changed percent into a decimal) * 1

$500 * 0.0185 = 9.25 * 1 = $9.25
So that bank will pay $9.25 interest on $500 per year.

Example 2:
How much interest is earned *per month* on a savings account that pays 1.85% interest per year if the deposit amount is $500?

Using the previous example, we divide by 12 (since there are 12 months in a year) to find out how much interest is earned each month.

$9.25 ÷ 12 = $0.77

Note: The trickiest part of finding interest is determining what to put in for time, so pay careful attention to what the question is asking.

Also note: In real-world applications, most interest rates are more complex (such as compound interest). In the bank example above, the interest would likely be compounded monthly, meaning that after 1 month, the account would be worth $500.77. The 1.85% interest would then be calculated on the new balance.