MAT 043

Quantitative Literacy Support Course

Order of Operations

Most calculators follow the order of operations used in mathematics to evaluate expressions. So, when using a calculator, one must always think about the order in which numbers are entered and how the calculator will interpret the entry. Below is a list of the rules for the order of operations.

Rules for Order of Operations (PEMDAS)

▶ Parentheses

▶ Exponents

▶ Multiply or Divide (from left to right)

▶ Add or Subtract (from left to right)

Note: When simplifying fractions, always simplify the numerator to a number and the denominator to a number before doing the division.

Solve the following using a calculator. Round answers to two decimal places as needed.

1) Percent Change:
$$\frac{8400 - 10550}{10550} \; x \; 100 =$$

2) Conversions:
$$100 \left(\frac{1}{12}\right)\left(\frac{1}{12}\right) =$$

$$6.21 \left(\frac{5280}{1}\right)\left(\frac{1}{12}\right) =$$

3) Taxes:
$$3215 + 0.25(54000 - 22180) =$$

4) Finances:
$$50(1 + 0.43) =$$

$$100e^{5(12)} =$$

$$\left(1 + \frac{0.06}{12}\right)^{12} - 1 =$$

$$500\left(1 + \frac{0.04}{12}\right)^{2(12)} =$$

$$\frac{5000\left(\frac{0.06}{12}\right)}{1 - \left(1 + \frac{.06}{12}\right)^{-24}} =$$

$$\frac{12(200)\left[\left(1 + \frac{0.036}{12}\right)^{24} - 1\right]}{0.036} =$$

5) Statistics:
$$z = \frac{96 - 90}{3} =$$

$$\frac{84 - 90}{3} =$$

$$E = 2\sqrt{\frac{0.4(1 - 0.4)}{125}} =$$

In this class, you will be using formulas. Solve the equation using the numbers given.

1. Simple Interest Formula is: $I = Prt$

    a. P = 600; r = 0.05; t = 2 years

    b. Find the value of I

2. Compound Interest Formula is: $A = P \times \left(1 + \frac{r}{n}\right)^{(nt)}$

    a. P = 600; r = 0.05; t = 2 years; n = 4

    b. Find the value of A

3. Compound Continuous Interest Formula is: $A = Pe^{(rt)}$

    a. P = 500; r = 0.04; t = 10 years

    b. Find the value of A

4. Monthly Payment Formula is: $M = \dfrac{P\left(\frac{r}{n}\right)}{\left(1 - \left(1 + \frac{r}{n}\right)^{(-nt)}\right)}$

    a. P = 120,000; r = 0.05; n = 12; t = 30

    b. Find the value of M

5. Effective Interest Rate Formula is: $E = \left(1 + \frac{r}{n}\right)^{n} - 1$

    a. r = 0.07; n = 12

    b. Find the value of E

6. Margin of Error Formula is: $Margin\ of\ Error = 2\sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}}$

    a. $\hat{p} = 0.3$; n = 120

    b. Find the $Margin\ of\ Error$
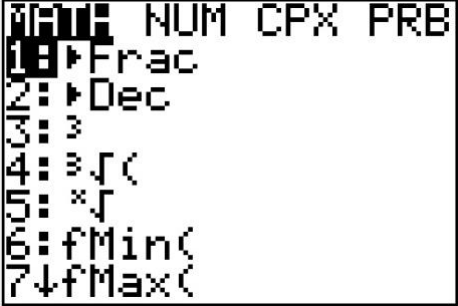
Converting Percentages:

Vocabulary:

▶ **Percent** means _____.

For instance, 81% means 81 out of 100. Percent's can be written as a percent, decimal or as a fraction. 81% can be written as:

$$81\% \quad \text{or} \quad 0.81 \quad \text{or} \quad \frac{81}{100}$$

When a number is followed by a percent symbol (%), it means that the number is a percent which means it is out of one hundred.

Use your calculator to quickly convert between fractions and decimals.
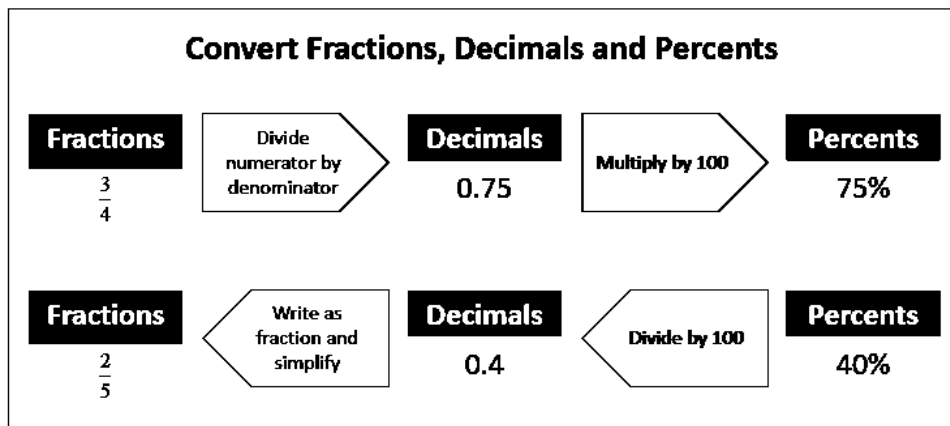
TI-30XS	TI-84
or	

Percentages used in Every Day Life!

List three ways you use percentages outside of school:

1.

2.

3.

How do you use percentages in school?

As stated earlier, percentages can be written as a percent, decimal or as a fraction. It is important to be able to convert a percentage into the desired format.

Convert Fractions, Decimals and Percents

Fractions $\frac{3}{4}$	Divide numerator by denominator	Decimals 0.75	Multiply by 100	Percents 75%
Fractions $\frac{2}{5}$	Write as fraction and simplify	Decimals 0.4	Divide by 100	Percents 40%

Write each percent as a decimal. Show each step.

1) $14\% = \frac{14}{100} = 0.14$

2) 62% =

3) 170% =

4) 5% =

Write each percent as a fraction. Show each step.

1) $20\% = \frac{20}{100} = \frac{1}{5}$

2) 67% =

3) 15% =

4) 4) 3% =

Write each decimal as a percent. Show each step.

1) 0.83 (100%) = 83%

2) 0.56 =

3) 1.16 =

4) 0.03 =

Write each fraction as a percent. Show each step.

1) $\frac{2}{5}$ (100%) = 40%

2) $\frac{3}{8} =$

3) $\frac{2}{100} =$

4) $\frac{15}{35}$

Mixed Practice: Fill in the table with the missing forms.

Percent	Decimal	Fraction
34%		
	.28	
		$\dfrac{7}{8}$
5%		
	1.12	
		$\dfrac{4}{72}$

Writing Percent Problems as Equations

There are two main ways of solving percent problems, using the **percent equation** or **proportions**. Depending on the problem one way may be easier to use than the other. We will explore using both methods.

Method 1:

Percent Equation	Breaking it Down
Percent · Base = Amount	**Base** is the whole, total, or 100% **Amount** is the part **Percent** is the percentage written in decimal form.

Key Words:
Of means **Multiplication** ($\cdot$) **Is** means **Equals** **Wha**t means the **Unknown Number**

Translate the statement into an equation and then solve for the missing number. Below is an example. Try the others.

1) 15 is what percent of 20?

Set up your equation:	$15 = p \cdot 20$
Isolate your variable by dividing by 20	$\frac{15}{20} = p$
Simplify	$p = 0.75$
Convert your answer to a percentage	$0.75 \; x \; 100 = 75\%$

2) 60 is 40% of what number?

3) What number is 10% of 40?

4) How many students are 8% of 200?

Method 2:

Remember, percent means per 100. We can write use the fraction $\frac{34}{100}$ to set up a proportion.

When using proportions, the percent is used as a percentage, not as a decimal. This eliminates the work of switching the percent to a decimal or vice a versa.

Percent as a Proportion	Breaking it Down
$$\frac{Part}{Whole\ or\ Total} = \frac{Percent}{100}$$	**Whole/Total** is the whole/total amount **Part** is the piece of the whole **Percent** is the percentage

Key Words:
$$\frac{Is}{Of} = \frac{\%}{100}$$

Once the proportion are set-up, **cross-multiply** to solve for the unknown.

Example: For instance, if 23 students out of 45 did the homework. What percentage of students completed the homework?

Identify your part, whole, and percent, as well as which one is your unknown.

$$\frac{23}{45} = \frac{\%}{100}$$

Cross-multiply and solve for your unknown.

$$23 * 100 = 45 * \%$$
$$2300 = 45 * \%$$
$$\% = 51\%$$

Try the next problems:

1) Susan took 2 tests in Mathematics. On the first test, she scored 48 pts out of 60. On the second test, she scored 55 pts out of 75. Which test did she score better on? (Hint: Convert each to a percentage and then compare.)

2) In an engineering class of 319 students, 19 students are female. What percentage of students are female?

Percent Change

Sometimes, we want to evaluate how a quantity has increased or decreased. To better answer these questions, use the **Percent Change Formula**.

Percent Change Formula
$$Percent\ Change = \frac{New\ Amount - Original\ Amount}{Original\ Amount}(100)$$

Note: A Positive Percent Change means the quantity increased. A Negative Percent Change means the quantity decreased.

Example: Enrollment went from 212 students to 253 students. By what percentage did the enrollment change?

$$Percent\ Change = \frac{253 - 212}{212}(100) = 19.3\%$$

Note: The answer is a percent because it was multiplied by 100.

Interpreting Pie Charts

A **Pie Chart** is a diagram used to compare the relative sizes of different parts of a whole. The whole is represented by the whole circle which is 100%. All the percentages of the parts will add up to 100%. Let's interpret a pie chart.

Example: 20 students were asked how they usually travel to school. How many pupils travel by each method? Answer below.

% REPORTED

■ Walking   ■ Uber/Lyft   ■ Bus   ■ Drive

Walking
11%

Uber/Lyft
5%

Bus
26%

Drive
58%
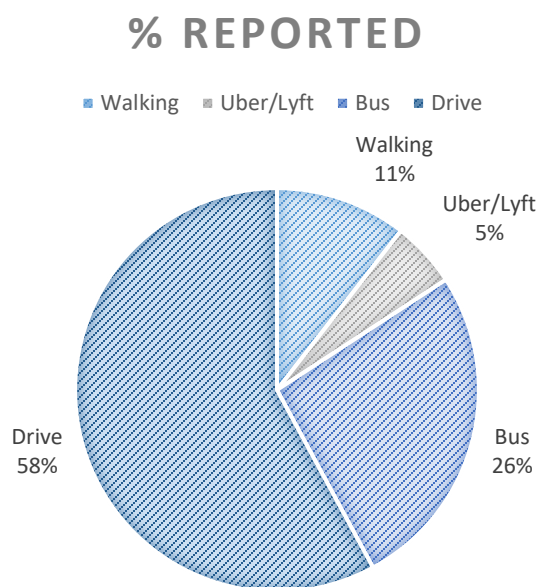
1) Walking =

2) Driving =

3) Uber/Lyft =

4) Bus =

Lab One: Perfect Percentages!

This is lab one. It should be completed in your groups and will be graded via submission in Blackboard.

1) A soccer team won 90% of 80 games played. How many games did they win?

2) A basketball team won 114 games throughout the season. If they won 95% of their games, how many games did they play?

3) At the Lying Lemon Used Car Store each salesperson receives a 6.5% commission on sales. A salesperson earned a commission of $603.85. At what price did he sell the car?

4) A tie that regularly sells for $18.50 is on sale for 20% off. What is the sale price?

5) What would you pay for the tie if there is an 8% sales tax?

6) The cost of tuition at a university increased from $10,500 to $11,300. What is the percent increase in tuition to the nearest tenth of a percent?

7) In a class of 56 students, the chart above shows the percentage of students having a particular food allergy. Determine the number of students with each type of allergies and fill in the table below.

Percent of Students with Food Allergies

Peanuts ■ Dairy ■ Wheat ■ None
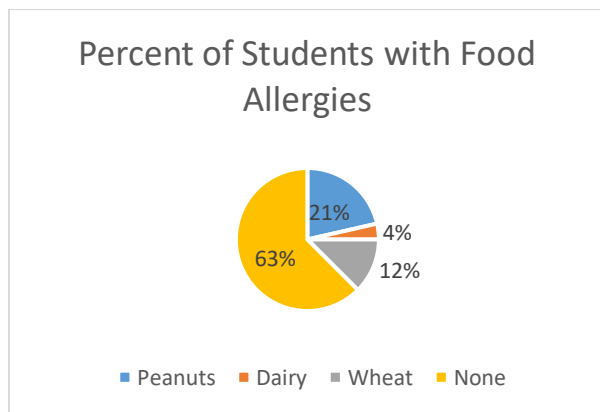
Type of Allergy	Percent	Calculations	Number of Students
Peanuts	21%	0.21(56) = 11.76	12
Dairy	4%		
Wheat	12%		
None	63%		

Lab Two: Fun with Fractions

This is lab one. It should be completed in your groups and will be graded via submission in Blackboard.

Solve the following equations by cross-multiplying

1) 1) $\frac{x}{20} = \frac{13}{72}$

3) $\frac{2}{x} = \frac{14}{35}$

2) 3) $\frac{6}{7} = \frac{x}{114}$

4) $\frac{8}{13} = \frac{21}{x}$

Solve the following expressions by multiplying the fractions.

8) $8\left(\frac{1}{12}\right) =$

9) $\frac{11}{13}\left(\frac{12}{29}\right)$

10) $5\left(\frac{2.54}{1}\right)\left(\frac{4}{7}\right) =$

11) $\left(\frac{5}{8}\right)\left(\frac{12}{21}\right)(10) =$

12) $52\left(\frac{3}{4}\right)\left(\frac{7}{21}\right) =$

Divide the following fractions.

13) $12 \div \frac{4}{3}$

14) $\frac{5}{6} \div 18$