

PROCESS APPROACH FOR MATH AND SCIENCE



**SHARON WELLMAN
EVERETT COMMUNITY COLLEGE**

Everett Community College does not discriminate on the basis of race, religion, creed, color, national origin, age, sex, marital status, disability, or veteran status

I. MEMORIZING-VS-UNDERSTANDING:

Everything has come basic “stuff” that needs to be memorized. Help the student understand that memory work lays the foundation for understanding.

Things to memorize:	Vocabulary
	Rules
	Principles
	Formulas

II. VOCUBULARY:

Remind the student of the way words are put together. Help them look for root words, prefixes and suffixes. Help them understand the repeating pattern of words in different subjects.

ex: parietal and visceral use in anatomy

III. DIRECTIONS:

Reinforce the importance of reading and following the directions. Help them understand that directions are vocabulary words and need to be memorized/understood in order to proceed with the problem. The words set up a process to be followed. Help them sort out the difference between words such as simplify and solve; explain and compare.

IV. CONCEPTS:

Help the students understand the importance of knowing the concepts taught in their classes. For mathematics they need to be able to understand what the concepts of factoring, and combining like terms are about and when you would use them. In chemistry they need to understand the concepts of chemical equations and LeChatlier’s Principle.

V. “PROCESS SHEET”:

Help the student learn to write out the processes to be followed in solving problems. This is just a step-by-step lists of steps to be followed.

TO SOLVE A LITERAL EQUATION

1. Remove fractions (if there are any) by multiplying both sides by the LCD.
2. Remove grouping symbols (if there are any).
3. Collect like terms: all terms containing the letter you are solving for on one side, all other terms on the other side.
4. Factor out the letter you are solving for (if it appears in more than one term).
5. Divide both sides by the coefficient of the letter you are solving for.

Solve for F

$$C = \frac{5}{9} (F-32)$$

$$9C = 5 (F-32)$$

$$9C = 5F - 160$$

$$9C + 160 = 5F$$

$$\frac{9C + 160}{5} = F$$

OR

$$\frac{9}{5}C + 32 = F$$

Multiply both sides by 9

Remove grouping symbols

Add 160 to each side

Divide each side by 5

WORK PROBLEMS

1. Read the problem carefully. **DON'T PANIC.**
2. Draw three fraction lines.
3. Put the # 1 in the numerator position (top) of each fraction.
4. If there are two things/people working together put a plus sign between the first two fraction lines and an equal sign between the last two. If the things/people are working against each other or in opposite directions then put a minus sign between the first two and an equal sign between the last two.

This is what your set up should look like:

$$\frac{1}{\quad} + \frac{1}{\quad} = \frac{1}{\quad}$$

5. In the denominator (bottom) of each fraction to the left of the equal sign, put the time required for each person to do the job alone. And on the bottom of the last fraction put how long it takes them to do the job together.
6. Find the LCD.
7. Multiply each side of the equation by the LCD. This step gets rid of all the fractions.
8. Solve for x.
9. Reread the problem to make sure you have answered the correct question. Label your answer.

UNIFORM MOTION PROBLEMS

1. Read the problem carefully, DON'T PANIC!
2. Draw a box like this, and put the formula $D = R \cdot T$ on top. Label the two lengthwise divisions according to the problem.

D	$=$	R	\cdot	T

3. Fill in the boxes with information from the problem. The only info that can go under D is distance, under R is rate, and under T is time. The first thing that you don't know is X , but remember that you can find D by multiplying rate and time.
4. Now set up your equation. Usually the problem will tell you that the boats, cars, or whatever caught up with each other so you know that they traveled the same distance so you let $D = D$. If they traveled the same length of time and you know what they were so many miles apart then you will need to **ADD** the distances to get the total they were apart. This is the tough part but think about it in terms of what you know makes sense, or what you have done in the past.
5. Solve the equation and go back and make sure that you answer the question asked.

EXAMPLE: At 8:00 am a truck leaves a town traveling south at 35 mph. One hour later a bus leaves from the same place and also travels south at 45 mph. What is the time when the bus overtakes the truck?

	D	$=$	R	\cdot	T	
Truck	$35x$		35		x	
Bus	$45(x-1)$		45		$X - 1$	One hour less

$$35x = 45(x - 1)$$

$$35x = 45x - 45$$

$$-45x \quad -45x$$

$$\frac{-10x}{-10} = \frac{-45}{-10}$$

$$x = 4.5$$

Answer: the bus will catch the truck after 3.5 hours so at 11:30 am the bus will catch the truck.

NOMENCLATURE FOR SIMPLE INORGANIC COMPOUNDS

STEPS TO FOLLOW WHEN GIVEN FORMULA AND ASKED TO NAME THE COMPOUND:

1. Look at the formula to see if it a binary compound – only 2 elements.
2. If it is a binary compound check to see it:
 - a) Metal + Non-metal
 - b) Transitional metal + Non-metal
 - c) Non-metal + Non-metal

se do this because each of the above has a different systems for naming.

IF: METAL + NON-METAL

- name the metal first
- name the non-metal, drop the ending of its' name and add "ide"

example: NaCl sodium chloride
MgF₂ magnesium fluoride

IF: TRANSITIONAL METAL + NON-METAL

- name the transition metal, follow the name with a Roman numeral showing the number of electrons the TM gave up (you have to calculate this number)
- name the non-metal, drop the ending and add "ide"

example: FeO

- to calculate how many electrons Fe gave up write the symbol for each element as many times as the subscript indicates
Fe O
- put the correct charge on the non-metal
Fe O⁻²
- now balance the charges (you only have one Fe so the total negative charge will be on that one atom)
Fe⁺² O⁻²
- now you are ready to name the compound
Iron II oxide

another example: Cu₂S

- calculate the charge on Cu, you have two atoms this time so write the symbol twice
Cu S
Cu
- put charge on non-metal
Cu S⁻²
Cu
- balance charges, distribute the -2 evenly on the two atoms of Cu
Cu⁺¹ S⁺²
Cu⁺¹
- now you are ready to name the compound
Copper I sulfide

Working with transitional metals takes practice so don't panic. Just make sure you go through all the steps and that you write the steps on the paper. It is not always beneficial to do this in your head.

IF: **NON-METAL + NON-METAL**

When we are naming this type of compound we use prefixes to show how many atoms of each element we have in the compound.

1 atom = mono
2 atoms = di
3 atoms = tri
4 atoms = tetra

5 atoms = penta
6 atoms = hexa
7 atoms = hepta
8 atoms = octa

- name the first element in the formula, using the proper prefix according to the subscript
- name the second element in the formula, using the proper prefix according to the subscript. Drop the ending and add "ide". The mon is usually only used with Carbon and Oxygen.

Example: CCl_4 Carbon tetrachloride
 N_2O_5 Dinitrogen pentoxide

By now you should be aware of the importance of being able to tell the difference on the Periodic Table between a metal, a transition metal, and a non-metal. Just in case you are still confused here are the groups:

METALS = IA, IIA, IIIA

NON-METALS = IVA, VA, VIA, VIIA

TRANSITION METALS = B GROUP (instructor will tell you which to learn)

DON'T FORGET ALL BINARY COMPOUNDS END IN "IDE"!!!

What about compounds that are NOT BINARY? Compounds that have three or more elements? The compounds that we will need to worry about are those that contain polyatomic ions and we need to memorize those ions given to us by the instructor.

To name these: again count the number of elements in the formula if three or more we are using polyatomic ions.

IF: **POLYATOMIC ION + NON-METAL**

- name the ion
- name the non-metal, drop ending and add "ide"

example: NH_4F Ammonium fluoride

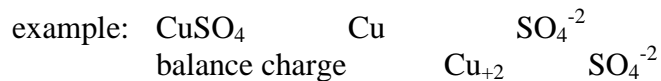
IF: **METAL + POLYATOMIC ION**

- name the metal
- name the polyatomic ion (drop the word ion)

example: $\text{Ca}(\text{NO}_3)_2$ Calcium nitrate
 K_2SO_4 Potassium sulfate

IF: **TRANSITION METAL + POLYATOMIC ION**

- name the TM, follow it by a Roman numeral showing charge
- name the polyatomic ion



 now name the compound Nickel II nitrate

IF: **POLYATOMIC ION + POLYATOMIC ION**

- name the first polyatomic ion
- name the second polyatomic ion

You will not be able to name compounds using polyatomic ions until you have memorized the list of polyatomic ions given to you by your instructor or that appear in your book. Using flashcards is a great way to learn them.