

The Factor Label Method: (15 min.)

Students will need to be able to use the factor label method to solve problems throughout the course. You may need to explain the significance of factor labeling (that it will be used throughout the course).

Essential Question:

What is the purpose of factor labeling in chemistry and how can it be used outside of the chemistry classroom?

The Factor Label Method: The most important mathematical process in chemistry!

What does “Factor-Label” mean?

- Factors are the **numbers**
- Labels are the **units**

When using the factor-label method, problems consist of three parts:

1. a known beginning – GIVEN
2. a desired end – WANTED
3. a connecting path – CONVERSION FACTORS

What are CONVERSION FACTORS?

- Equalities
- Examples:
 - ❖ $12 \text{ in} = 1 \text{ ft}$
 - ❖ $1 \text{ mi} = 5280 \text{ ft}$
- Conversion factors will be written as “tops & bottoms”
- Examples:
 - ❖ $\frac{12 \text{ in}}{1 \text{ ft}}$
 - ❖ $\frac{1 \text{ mi}}{5280 \text{ ft}}$
- Conversion factors can be “flipped” depending on which unit needs to be canceled.

Examples

1. Calculate the number of seconds in one day.

$$\frac{1 \text{ day}}{24 \text{ hr}} \frac{24 \text{ hr}}{60 \text{ min}} \frac{60 \text{ min}}{60 \text{ sec}} = \frac{1 \text{ day}}{1 \text{ day}} \frac{1 \text{ hr}}{1 \text{ hr}} \frac{1 \text{ min}}{1 \text{ min}}$$

2. At a meeting, 28 people are each given 3 pens. If there are eight pens in one package, priced at \$1.88 per package, what is the total cost of giving away the pens?

$$\frac{28 \text{ people}}{1 \text{ person}} \frac{3 \text{ pens}}{8 \text{ pens}} \frac{1 \text{ pkg}}{1 \text{ pkg}} \frac{\$1.88}{1 \text{ pkg}} = \frac{28 \times 3 \times 1 \times \$1.88}{1 \times 8 \times 1 \times 1} = \frac{155.52}{8} = \$19.44$$

ELABORATE: (40 min.)

The following activity (Factor-label Problems) will **elaborate** and provide practice following the discussion on factor labeling. Allow students to **explore** the notes and complete the practice problems.

Essential Question:

What is the purpose of factor labeling in chemistry and how can it be used outside of the chemistry classroom?

Factor-label Problems

1. How many basketballs can be carried by 8 buses? (1 bus=12 cars, 3 cars=1 truck, 1000 basketballs=1 truck)
2. A chemistry instructor provides each student with 8 test tubes at the beginning of the year. If there are 28 students per class, how many test tubes are required for three chemistry classes?
3. What is the cost in dollars for the nails used to build a fence 125 meters long if it requires 30 nails per meter? There are 40 nails per box at a cost of 75 cents per box.

4. Before the use of money, people bartered for goods they needed. If 25 chickens could be traded for 1 pig, 10 pigs exchanged for 1 cow, and 2 cows for 3 horses, how many horses could be exchanged for 500 chickens?

5. You are painting a room and find that the paint you are using will cover 75.0 square feet per quart. If the paint costs \$8.00 per gallon, what would be the cost to paint a room containing 2000 ft²?

6. Make the following conversions:

a.) 10 hours to seconds

b.) 115 inches to yards

c.) \$25 to nickels

d.) 10 weeks to minutes

7. A golf ball weighs 4 oz. How many golf balls would there be in a 2.5-ton sample of golf balls, assuming each golf ball had the same weight?

8. Making macaroni jewelry was therapeutic for Bobby. If he spent 50 cents per necklace and he made 1324 necklaces per month, what would his expenditures be for 5 years?

9. Rakeemah loved to eat pickles. She averaged eating 7.2 pickles per meal – every meal (3 meals per day) for a year. If pickles were sliced into 4 slices, how many pickle slices would she eat in a decade?

10. A car is traveling 65 miles per hour. How many feet does the car travel in one second?

11. Calculate the number of lab reports Mr. Jones will have to grade during the school year if his students each do 15 experiments. Mr. Jones had 4 classes of 24 students each.
12. Mr. Jones plans to do an experiment with his classes, which requires 2 test tubes per student. How many dozens of test tubes will Mr. Jones need to supply to the students in his 4 classes of 24 students each?
13. Determine the number of 4-ounce bottles of sodium chloride Mr. Jones will need to do the experiment mentioned in Problem 12 if each student needs 14.7 grams of sodium chloride. (1 oz= 29.5 grams)
14. If you could count at the rate of 2 numbers every second, how many days would it take you to count to 1 million?